



TRW Environmental
Safety Systems Inc.

Viability Assessment Design and Review Plan

Civilian Radioactive Waste Management System

Management & Operating Contractor

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QA: N/A

**Civilian Radioactive Waste Management System
Management and Operating Contractor**

Viability Assessment Design and Review Plan

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May 22, 1997

Prepared for:

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Viability Assessment Design and Review Plan

CHANGE HISTORY

REV	ICN	DATE	DESCRIPTION
00		12/19/96	Initial Issue
01		3/14/97	Revised Subsection 3.3 to clarify the expected design progress toward the VA milestone. Revised Appendix B to expand and clarify all Issue Resolution Plans. Modified Appendix G to clarify the expected accomplishments for the Phase I Design. Added program interfaces to Section 6.0 and Appendix L.
01	1	5/22/97	Corrected errors in Issue Resolution Plan numbers 4 and 10.

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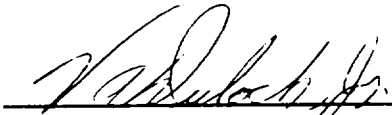


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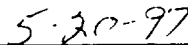


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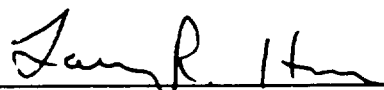


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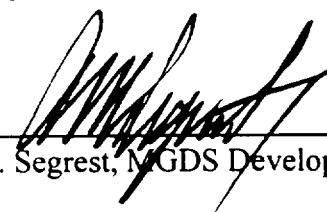
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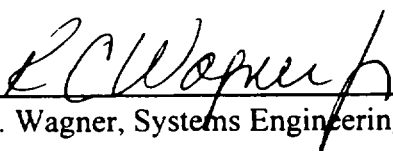
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3/12/97
Date


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3/11/97
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1. INTRODUCTION

1.1 PURPOSE

This Viability Assessment (VA) Design and Review Plan (Plan) will identify and discuss the organizations and tools (schedules, processes, plans, etc.) that will be used to direct, control, and monitor progress toward the timely and successful development of design and systems engineering components of the VA package. It will address the activities and products of the Civilian Radioactive Waste Management System Management and Operating (M&O) Contractor's Engineering and Integration (E&I) Operations area, which has responsibility for the design and systems engineering of the repository and engineered barrier system, and for interfacing with other M&O Operations areas. The creation of this Plan will facilitate the identification and organization of the E&I activities and products required to support the VA milestone.

1.2 SCOPE

As required by the fiscal year (FY) 1997 Energy and Water Appropriations Act, the VA package will include four components:

- “(1) the preliminary design concept for the critical elements for the repository and waste package;
- (2) a total system performance assessment, based upon the design concept and the scientific data and analysis available by September 30, 1998, describing the probable behavior of the repository in the Yucca Mountain geological setting relative to the overall system performance standards;
- (3) a plan and cost estimate for the remaining work required to complete a license application; and
- (4) an estimate of the costs to construct and operate the repository in accordance with the design concept.”

This Plan will address the scope of the Design and Systems Engineering activities and products required to support the development of these four components. The VA milestone support addressed in this Plan will focus on those aspects of waste package and repository design that are important to post-closure criticality control, and to post-closure waste containment and isolation performance. The Design and Systems Engineering activities will both support and be supported by the total system performance assessment for the VA milestone. This Plan will also address those aspects of repository surface and subsurface operations, and of waste package and repository design required to support the cost estimates and License Application (LA) planning. The results of these activities will be documented in a VA package to be developed in accordance with the *Viability Assessment Monitoring Plan* (VA Monitoring Plan) (in development).

Those Design and Systems Engineering activities and products required to support the VA milestone are a subset of the total set of activities to be performed in FY 97/98. For example, FY 97/98

activities and products that will not be included in this Plan or in the VA package are those related to planning, the National Environmental Protection Act (NEPA), operational safety, construction methods, maintenance, and operations not affecting the repository performance.

1.3 OBJECTIVES

Many of the objectives of this Plan will be accomplished by the act of creating and delivering the Plan. That is, it is the forcing function for organizing the E&I activities required to support the VA milestone and for developing the management tools required to direct, control, and monitor those activities. An additional objective is to provide a general understanding of the relationship between the E&I activities and products and the VA management tools. This Plan will provide guidance on remaining current on the revisions and evolution of VA management tools, and information on how to access those tools to obtain the current status of the E&I activities and planning which support the VA milestone.

Because the VA management tools exist as "living" entities outside of this Plan, there is no intention of updating this Plan once it has been delivered. One of the primary VA management tools will be the VA Monitoring Plan, which is described in Subsection 1.2. In addition, there will be a sequel to this Plan which will address those Design and Systems Engineering related topics and issues that are important to the Site Recommendation (SR) milestone and to the preparation of an LA. This draft LA Plan is scheduled to be delivered in September of 1997.

2. BACKGROUND

2.1 ACTIVITIES LEADING TO LA

In response to Congressional guidance from the 1996 fiscal year appropriation, and the additional policy decisions made by the U.S. Department of Energy (DOE) during development of the President's 1997 fiscal year budget request, the path forward for completing the Yucca Mountain Site Characterization Project (YMP) has been revised. This revision rescheduled the completion of major YMP milestones of the Environmental Impact Statement (EIS), SR, and LA to maintain the DOE's long-term objective of beginning repository operations in the year 2010. This revised YMP schedule was provided in the *Civilian Radioactive Waste Management Program Plan*, Revision 1, dated May 1996.

Based on the knowledge the DOE has gained through scientific investigations and engineering design activities conducted to date, as well as streamlining and focusing both technical and regulatory elements of the YMP, the Yucca Mountain Site Characterization Office (YMSCO) has defined the following three near-term objectives:

- 1) complete an update to the YMP regulatory framework (DOE's siting guidelines in 10 CFR 960, *General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories*.) in 1997;
- 2) complete the VA milestone in 1998;
- 3) complete the remaining statutory milestones to issue an EIS in 2000, recommend the repository site to the President in 2001, and submit an LA to the Nuclear Regulatory Commission (NRC) in 2002.

This Plan addresses the E&I activities and products which support the near-term VA milestone objective.

2.2 COMPONENTS OF THE VA MILESTONE

The four components of the VA package, as identified in Subsection 1.2, address the design, total system performance assessment (TSPA), LA planning, and the Mined Geologic Disposal System (MGDS) cost estimate.

The first component of the VA package will address those design elements that are critical to determining the feasibility and performance of the repository and the engineered barrier system. This effort will evaluate the technological feasibility of the designs but will not yet contain the detail needed for licensing. The designs will build on existing design work documented in the *1996 MGDS Advanced Conceptual Design Report*, with emphasis placed on the key technical questions that affect licenseability, criticality control, waste containment and isolation, handling and packaging of waste, performance, and cost. These questions revolve around design of waste packages, surface and subsurface facilities, thermal management of the waste-generated heat, corrosion of waste packages, the role of supplemental engineered barriers, degradation of waste forms, and transport of

radionuclides. In addition, the effort will address concepts for waste retrieval operations, performance confirmation requirements, safety systems, and other factors that could significantly affect repository costs.

The second component of the VA package will be a TSPA based on an updated design and the analyses of available site and engineering data. The primary objective of the TSPA is to evaluate the probable behavior of the potential repository. An additional objective is to further refine the evaluations of repository performance under a range of normal conditions and an initial evaluation under a selected set of conditions imposed by potentially disruptive events, such as tectonic movements along geologic faults. The TSPA will also evaluate the possible change in performance as a consequence of the uncertainty in key factors such as groundwater flow, thermal effects, and corrosion.

The third component of the VA package is the LA Plan, which, among other functions, will identify the remaining scientific investigations, engineering information, and estimated costs required to complete an LA. The preparation of the LA Plan will provide an opportunity to assess the adequacy of the revised approach to site characterization and design, and the effectiveness of updates to the Office of Civilian Radioactive Waste Management (OCRWM) Program's regulatory framework.

The fourth component of the VA package provides cost estimates for the repository system. The cost estimates are not for the total system life-cycle costs (TSLCC), but will address all relevant costs for the MGDS. It will provide information for policy decisions regarding the feasibility and rationale for continuing with licensing and construction of a geologic repository at Yucca Mountain.

2.3 DESIGN AND SYSTEMS ENGINEERING ROLE

The E&I Operations area of the M&O is responsible for the Design and Systems Engineering organizations' activities which will directly support the first and fourth VA package components on design and cost estimates. The E&I Operations area will also be responsible for providing accurate and timely information required to develop the second and third VA package components on TSPA and LA planning. This Plan will discuss the role of the E&I organization and its activities and products. Other organizations, activities and products that are dependent on the products of the E&I Operations area, and which support the VA milestones, are discussed in the VA Monitoring Plan.

2.4 QUALITY ASSURANCE (QA)

Based on an evaluation in accordance with QAP-2-0, *Conduct of Activities*, this Plan was determined to be a non-Q product.

The quality affecting aspects of the Design and Systems Engineering products required to support the VA milestone will be determined in accordance with applicable procedures.

3. ENGINEERING ACTIVITIES

3.1 VA CONCERNS

A list of the Design and Systems Engineering related concerns important to the VA milestone has been developed and is provided in Appendix A. These concerns are areas of work with relatively higher risk. Consequently, the concerns list will be used to focus the planning and performance of activities leading to the VA milestone.

3.2 VA ISSUES

A list of the Design and Systems Engineering related issues important to the VA milestone has been developed and is provided in Appendix B. These issues are related to trade-offs or decisions with significant, potential impacts for the OCRWM Program. Consequently, the planning for issue resolution will help provide timely answers to significant questions and will help manage risk leading to the VA milestone. The method for resolving the issues and keeping the list current is also provided in the appendix.

3.3 VA DESIGN AND SYSTEMS ENGINEERING PRODUCTS

The Design and Systems Engineering products developed in preparation for the VA milestone are of two basic types. Some consist of information passed along to other YMP organizations to support their activities leading to the VA milestone (see Section 6 for a detailed discussion of YMP integration). Other products consist of the components which make up the MGDS design. Examples of such components are requirements documents, analysis documents, drawings, technical reports, etc. The current lists of the specific E&I products are provided in the following appendices:

- Waste Package Development and Materials Products (Appendix C)
- Repository Surface and Subsurface Products (Appendix D)
- Systems Engineering Products (Appendix E)

Descriptions for these products are provided in the M&O earned value guidelines documents that have been developed by the E&I Operations Area and coordinated with the DOE. These descriptions provide the standards for the stages of completion for each type of document. The FY97/98 schedules (Appendices I, J and K) identify when the products are expected to be completed. By comparing the contents and timing of each product with the stage of completion standards contained in the earned value documents and the timing standards contained in the schedules, management is able to evaluate the progress accomplished toward the VA milestone. Engineering documents will represent the most important systems, structures, and components as determined by the binning process. Those systems which are most important to licensing and capital cost are being given priority in the planning. Studies, reports, and requirements documents, when delivered in compliance with the earned value guidelines and the planning schedules, will illustrate that timely decisions are being made on important issues, and that assumptions are being made as necessary to facilitate progress in completing engineering for the MGDS.

4. DESIGN REVIEWS

The products to support the VA milestone need not be completed to a level suitable for construction release. The level of completion for each product will be as required to support defined objectives of the VA milestone in accordance with the VA Monitoring Plan..

The process for reviewing the design throughout its development has been proposed by the M&O to include the following:

- 1) reviews of each product or deliverable during the design process and in accordance with applicable QA procedures;
- 2) informal, in-process product status reviews;
- 3) formal administrative status reviews of cost, schedule, earned value, and deliverables; and
- 4) formal high-level management system design reviews.

Together, these reviews provide a comprehensive means for assessing progress and ensuring customer confidence throughout the design development.

4.1 QA REVIEWS

When each design product (drawings, analyses, specifications, reports) has been developed to a point suitable to support the VA milestone, it will be released. The product will be reviewed and released in accordance with the appropriate M&O QA procedures. The following are examples of some of those procedures:

QAP-3-5, *Development of Technical Documents*
QAP-3-8, *Specifications*
QAP-3-9, *Design Analysis*
QAP-3-10, *Engineering Drawings*

At this stage of the preliminary design, nearly all the engineering documents will present concepts that will be carried forward to LA design. These documents represent decisions affecting layout of the Yucca Mountain Site and the various facilities, design of the most important systems, structures and components, and plans for design at a more detailed level. As such, all of these engineering documents will be distributed to the DOE for review. Documents prepared in accordance with QA procedures will be submitted during the design review process, thus giving the DOE an opportunity to comment. Documents that are *not* prepared in accordance with QA procedures will be provided to the DOE concurrent with the M&O internal review process. This phase of the design will establish the direction for all subsequent phases of design development. For this reason, the DOE must be given the opportunity to participate in the process. A copy of all products both before and after the M&O review, will be distributed to the DOE.

4.2 IN-PROCESS REVIEWS

In-process status reviews are key to maintaining an on-going communication between the M&O engineers and their DOE counterparts throughout the development process. This ongoing interaction is typically informal, but is frequent and regular. Several forums have been established to facilitate these interactions in which the progress on products or product sets, or briefings for upcoming reviews, are discussed. The reviews which address Work Breakdown Structure (WBS) unique topics are facilitated and controlled by the DOE and M&O WBS Managers. The reviews which address topics common to two or more WBS areas are facilitated by the M&O's MGDS Project Engineering Office.

4.3 ADMINISTRATIVE STATUS REVIEWS

A less frequent but regularly scheduled review of cost, schedules, earned value, and deliverable status has also been established. This more formal, higher level management review provides an assessment of how efficiently and timely the design is being developed and provides an opportunity to identify problems or to pursue specific issues. This review is controlled by the E&I Manager and DOE counterparts, and is facilitated by the M&O's MGDS Project Engineering Office.

4.4 MANAGEMENT REVIEWS

The purpose of the management reviews is to provide a high-level review of how all elements of the design work together to complete the overall mission of safely disposing radioactive waste. During these reviews, design information provided to other YMP organizations is validated, course corrections are made, and an assessment performed on the soundness of the overall design. A series of three management reviews are planned en route to the VA milestone: the June Design Review, the Phase I Design Review, and the MGDS VA Review. These reviews will be structured, where appropriate, to also meet the VA monitoring requirements as identified in the VA Monitoring Plan.

4.4.1 June Design Review

The purpose of this June 1997 review is to assess the overall engineering approach and obtain high-level management concurrence. It will address the major issues, topics, risks, concerns and progress within the E&I area of responsibility. It will not get into a review of the design details nor the contents of the information being provided to the other YMP organizations to support their VA milestone activities. These topics will be covered in the Phase I Design Review. A discussion of this review and a description of the planning for this review are provided in Appendix F.

4.4.2 Phase I Design Review

The purpose of the Phase I Design Review is two-fold. The first purpose is to review all the information exchanged between Design and Systems Engineering and the interface organizations such as Performance Assessment (PA), Site, NEPA, etc., to ensure completion. The second purpose is to compare those activities completed to date, with the planned progress of activities in order to identify and refocus efforts toward a successful VA milestone. It will be a review of the design and operational concepts at a more detailed level than covered at the June Design Review. A discussion

of the Phase I Design Review and a description of the planning for this review are provided in Appendix G.

4.4.3 MGDS VA Review

The focus of the MGDS VA Review is to ensure that all relevant design information has been completed and summarized in VA supporting documentation or in the Project Integrated Safety Assessment. A discussion of this review and a description of the planning for this review are provided in Appendix H.

5. SCHEDULES

The FY 97/98 schedules are being developed as part of the current planning activity. Planning is continuing and the schedules are expected to be completed in March 1997. The current versions of the E&I schedules are:

- Systems Engineering Schedule (Appendix I)
- Waste Package Development and Materials Schedule (Appendix J)
- Repository Surface and Subsurface Schedule (Appendix K)

All activities identified in the schedules support the VA milestone except those that are completely outside the scope of the VA package (see Subsection 1.2). These schedules are used with the other management tools identified in this Plan to allocate resources and monitor progress toward the VA milestone.

6. INTERFACES

The interfaces of the Design and Systems Engineering organizations with other YMP and OCRWM areas involve both data needs (input) and data deliveries (products). These data needs and deliveries and their associated dates are captured in the schedules listed in Section 5. These schedules were used to create a point of departure checklist of the interactions and exchanges of information planned between the E&I Operations area and other YMP and Program areas both within the M&O and external to it. This checklist is provided in Appendix L. Some anticipated interfaces are not yet funded and included in the planning; however, it is expected that when funding and guidance is provided, the planning will address these Program level interfaces. Specifically, these Program interfaces will include DOE/EM for the DOE-SNF and other waste, RSAs for waste receipt characteristics, and potential interfaces for co-located, government directed, federal receiving facilities. Additionally, there are plans for various organizations to provide support to E&I activities, with budget provided for that support. These interactions with other organizations are captured within the Basis of Estimates for these specific activities. Numerous organizations are invited to participate during review of E&I documents. Some participation is required by procedures, but most of the participation is administratively controlled in the review process.

The design organization will request qualified input in accordance with the QA process. When qualified input is not available, unqualified input will be used and will be labeled as such.

Design and engineering products (i.e., functional and design analyses, drawings, specifications, etc.) that address major features and parameters of the developed design and operations will be provided to support the TSPA-VA and the planning to the LA. Some of this output may be preliminary or be considered a work in progress (i.e., some products may not be fully reviewed and approved). Such engineering products will be identified as preliminary and released for a specific purpose.

7. SUMMARY OF M&O VA MANAGEMENT TOOLS

The M&O VA management tools identified and discussed in this Plan are summarized in the following Table. A brief description is provided, along with a reference to the corresponding Appendix which provides a version of the tool that was available at the time this Plan was developed. These tools are kept current and controlled by the individuals identified in the Table.

Summary Table - M&O VA Management Tools

Title	Description	M&O Controller	M&O Keeper	Appendix
VA Concerns	A list of concerns used to focus the planning and performance of activities leading to the VA milestone.	J. Bailey	C. Hastings	A
VA Issues	Issues are identified and the plans to resolve them are provided. The resolutions of these issues are used to provide direction and manage risk leading to the VA milestone.	J. Bailey	C. Hastings	B
Waste Package Development and Materials Products	A list of products to be developed by the Waste Package Development and Materials group in FY 97.	A. Segrest	C. Chagnon	C
Repository Surface and Subsurface Products	A list of products to be developed by the Repository Surface and Subsurface group in FY 97.	A. Segrest	B. Stanley	D
Systems Engineering Products	A list of products to be developed by the Systems Engineering group in FY 97.	A. Segrest	F. VanDerLaan	E
June Design Review	Description and planning for the June Review used to integrate the E&I activities required to support the review.	R. Snell	M. Sellers	F
Phase I Design Review	Description and planning for the Phase I Review used to integrate the E&I activities required to support the review.	R. Snell	J. Clouet	G

Title	Description	M&O Controller	M&O Keeper	Appendix
MGDS VA Review	Description and planning for the MGDS VA Review used to integrate the E&I activities required to support the review.	R. Snell	J. Clouet	H
Systems Engineering Schedule	FY 97/98 schedule of Systems Engineering tasks and milestones used to monitor and control its activities and products.	R. Wagner	F. VanDerLaan	I
Waste Package Development and Materials Schedule	FY 97/98 schedule of Waste Package Development and Materials tasks and milestones used to monitor and control its activities and products.	A. Segrest	C. Chagnon	J
Repository Surface and Subsurface Schedule	FY 97/98 schedule of Repository Surface and Subsurface tasks and milestones used to monitor and control its activities and products.	A. Segrest	B. Stanley	K
E&I Interfaces	A point of departure checklist of the FY 97/98 Planning summary accounts which involve interfaces with other YMP and Program areas.	R. Wagner	M. Sellers	L

APPENDIX A

VA CONCERNS

The data contained in this appendix reflects the status of the Yucca Mountain Site Characterization Project as of 12/16/96. Because of the evolving conditions of the Yucca Mountain Site Characterization Project, data in this appendix is changed or updated as necessary. However, this VA Design and Review Plan will not be revised or reissued as a result of data updates. For a current status of the data in this appendix and/or a copy of the current version, contact C. Hastings. For suggested changes to the contents, contact J. Bailey.

VA CONCERNS

A list of concerns has been developed to help focus the planning and performance of the E&I activities leading to a successful VA milestone. The list includes a title and the organization that is primarily responsible for addressing the concern in their planning. Sometimes, a short description of the concern is provided with the title.

Viability Assessment Design Concerns

Concern No.	Concern Title	E&I Org. of Primary Responsibility
C-1	Waste package emplacement concept for thermal management (point load vs line load)	MGDS PE
C-2	Subsurface ventilation concept, feasibility & operation (continuous emplacement drift, preclosure ventilation vs during emplacement only) (concepts for dust control); includes subsurface ventilation redundancy.	Repository Design
C-3	Waste package materials	Waste Package Development
C-4	Waste stream characteristics and throughput requirements from receipt to emplacement	Systems Engineering
C-5	Lag storage capacity requirements and concept	Systems Engineering
C-6	Updated Q-list	Systems Engineering
C-7	Closure & decommissioning concepts for equipment, facilities & operations procedures	Repository Design
C-8	Remote welding and NDE of loaded disposal containers	Repository Design
C-9	Determine the appropriate and necessary levels of geologic fault characterization	Repository Design
C-10	Identify constraints (standards) from EPA & NRC on waste package loading relative to normal and off-normal operations	Repository Design
C-11	List of prohibited and limited use materials	Systems Engineering
C-12	Waste package fabrication method	Waste Package Development
C-13	LA strategy for DOE SNF	Waste Package Development
C-14	Design basis waste characteristics	Waste Package Development
C-15	Safeguards and security requirements and concepts; includes IAEA inspection requirements and concepts.	Systems Engineering
C-16	SNF burnup measurement requirements and concepts	Waste Package Development
C-17	Surface facilities requirements and concepts	Repository Design
C-18	Restricted area requirements and concepts	Systems Engineering
C-19	Seismic design requirements	Repository Design
C-20	Subsurface fault standoff requirements	Repository Design
C-21	OSHA and MSHA code compliance requirements	Systems Engineering
C-22	Design basis rock fall characteristics - Post Closure	Repository Design
C-23	Waste package containment requirements	Waste Package Development
C-24	Near field environment design basis	Repository Design
C-25	Nevada transportation routes and modes	System Engineering
C-26	Off site utility requirements and concepts	Repository Design
C-27	Subsurface drainage requirements and concepts	Repository Design
C-28	Number of HLW glass canisters per disposal container	Waste Package Development
C-29	Design development of engineered features that demonstrate licensability of unprecedented systems, structures, components or activities (SSCA)	MGDS Development
C-30	Design development of engineered features that while using existing technology are unique to the MGDS operations and have little or no design precedence	MGDS Development
C-31	Design development of engineered features that have significant impact on cost and schedule estimates for MGDS construction, operation, and closure	MGDS Development

APPENDIX B

VA ISSUES

The data contained in this appendix reflects the status of the Yucca Mountain Site Characterization Project as of 3/7/97. Because of the evolving conditions of the Yucca Mountain Site Characterization Project, data in this appendix is changed or updated as necessary. However, this VA Design and Review Plan will not be revised or reissued as a result of data updates. For a current status of the data in this appendix and/or a copy of the current version, contact C. Hastings. For suggested changes to the contents, contact J. Bailey.

VA ISSUES

A list of key VA issues has been developed, the resolution of which will provide direction and reduce risk to the Program. The following steps will be used to track progress of resolving the issues and for updating the list as required:

- An M&O and a DOE Responsible Individual (RI) is identified for each key VA issue as given in the table below.
- For each key VA issue, the M&O RI will prepare a resolution plan in accordance with the guidance given in attachment 1.
- Each resolution plan will be coordinated within M&O and DOE.
- Each resolution plan will be implemented and tracked to the conclusion of the key VA issue.
- On a regular basis, the list of key VA issues and the resolution plans will be reviewed and updated as required.

The latest version of these resolution plans are provided in Attachment 2. Status of activities addressed in these resolution plans will be monitored in accordance with the VA Monitoring Plan. E&I management will direct remedial actions and provide necessary resources if progress toward resolution is not in accordance with the resolution plan.

Viability Assessment Design Issues

Issue No	Issue Title	VA Issue POC - DOE	VA Issue POC - M&O
1	Thermal loading range (high, medium, low) (reference values)	Harrington	Blink
2	EBS performance enhancements (backfill, drip shields, etc.)	Haught	Balady
3	Criticality control: NRC strategy (probabilistic vs. deterministic) and concepts (filler, control rods, partially filled WP, use of DU) (assuming burn up credit)	Russell	Benton
4	Emplacement drift ground support concept (steel vs cast in place concrete vs precast concrete)	Gonzalez	Nolting
5	Performance Confirmation concept (monitoring system, sampling approach, sampling rate, etc.)	Boyle	Memory
6	Retrievability concept (instant & continuous vs develop when required)	Harrington	Saunders
7	Confirmation of high volume and long period waste handling capability and DBE consequences (dry vs pool)	Verna	Meyers
8	Disposal of site generated waste (on site vs off site)	Verna	Memory
9	Strategy for mapping repository subsurface	Boyle	Memory
10	Post closure performance standards	Van Lulk	Kalla
11	Viability of underground, remote control concepts	Harrington	McAfee
12	Burnup credit limits (none vs principal isotopes)	Russell	P. Hastings
13	Repository seals requirements and concepts	Harrington	Memory

Attachment 1 - Resolution Plan Form and Instructions

Key VA Issue Resolution Plan

1. Issue Title: _____ Date: _____ Rev. # _____
2. Issue Description: _____

3. Responsible Individuals: DOE: _____ Phone: _____
 M&O: _____ Phone: _____
4. Describe the current status and the significance of the issue. _____

5. Indicate its importance and what effects it will have on a VA. _____

6. Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning. _____

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA. _____

8. Describe the steps in a process that the project will use to bring closure on this issue

No.	Title	Description	Summary Account #
1	Assign Tasks		
2	Gather Data		
3	Document Resolution		
4	Report Conclusions		

9. Provide a rough schedule of when this issue will be resolved for VA

			FY97												FY98											
No.	POC (Name/Phone)	Date	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	John/x55555	10/1/96	X																							
2	Joe/x66666	11/12/96 - 4/30/98		X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X					
3	John/55555	8/1/98 - 9/1/98																							X	X
4	John/x55555	9/30/98																								X

10. Describe a process that will be used to measure performance towards closure. Performance will be measured in accordance with the process documented in the VA Monitoring Plan.

11. Describe how status will be reported during the process of closing this issue. Status will be reported in accordance with the process documented in the VA Monitoring Plan.

Coordination:

DOE RI: _____

M&O RI: _____

DOE Manager: _____

M&O Manager: _____

**Key VA Issue
Resolution Plan**

Continuation Page for Paragraphs 4 through 7

Continuation for Paragraph Number ____:

**Key VA Issue
Resolution Plan**

Continuation Page for Paragraph 8

No.	Title	Description	Summary Account #

1

[illegible]

Key VA Issue Resolution Plan

Guidance

- Issue Title:** Taken from list of Key VA Issues.
- Date:** Date the form was completed sans the coordination signatures.
- Rev. #:** 1st version submitted for coordination signature is Rev. # 00.
After all coordination signatures on Rev. # 00, the 1st modified version submitted for coordination signatures is Rev. # 01. Etc. for other modified versions.
- Issue Description:** A description of the issue including scope, constraints and specific examples.
- Responsible Individuals:** Taken from list of Key VA Issues.

For Paragraphs 4 - 7, confine oration to the space provided on the form. However, if additional space is necessary to communicate the full extent of the planning, use the appropriate continuation page.

- Paragraph 4:** Address what has been done and what is currently being done. Describe the work scope(s) that it is a part of. Identify groups outside of E&I that are key players. Discuss why it is significant for the OCRWM Program.
- Paragraph 5:** Address the importance to VA design of resolving this issue. Identify the impact if it is not resolved by VA.
- Paragraph 6:** Describe the products and their contents (if any) that will be used to communicate the resolution of this issue to those working on TSPA-VA, VA cost estimate, and/or LA planning.
- Paragraph 7:** Describe the VA closure criteria for this issue and the general strategy for achieving closure.
- Paragraph 8:** Identify and describe the major tasks required to resolve the issue. Type over the examples given in the form. Try to confine the description to the space provided on the form. Use the appropriate continuation page for additional space for the major tasks and for any sub-tasks.
- Paragraph 9:** For each of the major tasks of paragraph 8, provide the point of contact (POC), dates and schedule notation. Type over the examples given in the form. Use the appropriate continuation page for additional space for major tasks and for any sub-tasks.

Key VA Issue Resolution Plan

Plan Coordination Procedure

The M&O RI shall complete the plan and obtain the required coordination signatures in accordance with the following procedure:

1. Complete Paragraphs 1 through 7.
2. Submit the partially completed form to your supervisor for a verbal concurrence and direction to proceed with completing the form. Continue to rework these paragraphs as necessary until verbal direction is received.
3. Complete Paragraphs 8 and 9, and sign the form as the M&O RI.
4. Submit the draft form to your supervisor for a verbal concurrence from your supervisor, E&I OM signature, and direction to proceed with the DOE coordination process. Continue to rework the form as necessary until the M&O Manager's signature is obtained.
5. Review the contents of the form with your DOE RI counterpart, and obtain his coordination signature. Continue to rework the form as necessary until the DOE RI counterpart signature is received. If non-editorial, technical changes are required, repeat step 4 before obtaining the DOE RI signature.
6. Request assistance from your DOE RI counterpart in obtaining the appropriate DOE Manager's signature. Continue to rework the form as necessary until the DOE Manager's signature is received. If non-editorial, technical changes are required, repeat steps 4 and 5 before obtaining the DOE Manager's signature.
7. Insure that copies of the completed form have been delivered to the following distribution:
 - Your Supervisor
 - E&I OM
 - DOE RI
 - DOE Coordinating Manager
 - E&I Assistant Manager
 - MGDS PE Office Manager
 - M&O Systems Engineering Manager
 - M&O Design Engineering Manager
 - Others as Appropriate

Attachment 2 - Resolution Plans for Key VA Issues

The following resolution plans for the VA issues have been reviewed by E&I management, but have not yet been coordinated with the DOE. The M&O is currently working to complete the coordination with the DOE.

The resolution plans will be updated as necessary during progress toward the VA milestone. C. Hastings is responsible for maintaining the plans based on input from the DOE and M&O Responsible Individuals. J. Bailey is responsible for controlling the content of the plans. Any changes to the plans will require rolling the "Rev" number and obtaining the appropriate DOE and M&O coordination signatures.

**Key VA Issue
Resolution Plan**

1. **Issue #1: Thermal Management**

March 10, 1997

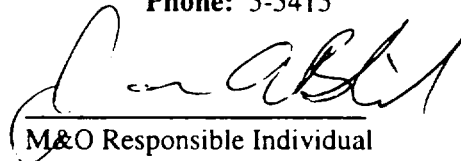
Rev. #01

2. **Assigned to:** **M&O Responsible Individual:** Jim Blink
DOE Contact: Paul Harrington

Phone: 5-4371

Phone: 5-5415


M&O Manager


M&O Responsible Individual

3. **Issue Description:**

Determine thermal management techniques that will be used for VA design (and others that will be reconsidered for LA design), and then develop design solutions to implement them. Candidate techniques include overall areal mass loading, line vs. point loading, edge loading, active ventilation, passive ventilation, the use of backfill or other EBS components, WP sequencing within the repository, SNF assembly sequencing within individual WPs, and the degree of lag storage required to implement WP or SNF assembly sequencing. Evaluations to select thermal management techniques will use as criteria the existing thermal goals stated in the CDA for protection of cladding, limiting the drift wall mechanical loading, protection of zeolites, limitation of surface temperature rise and uplift, and shear of the TSw/PTn interface. The evaluations will also consider additional goal(s) to limit the exposure of WPs to moisture and high humidity (for high AML), to limit temperature-dependent corrosion for low AML, and to allow drainage of mobilized water through the repository pillars (for high and low AML). Performance assessment types of criteria, including WP failure history, EBS radionuclide release rate, and accessible environment dose rate will also be used. This issue is related to issues 2 (EBS Performance Enhancements), 3 & 12 (Criticality), and 7 (Surface Facility Waste Handling); resolution of these five issues will require coordination and integration. This issue is also related to issue 18 (Design Basis Modeling) and will be a subset of the design options modeled in that issue.

4. **Describe the current status and the significance of the issue:**

The VA design will use a specific AML within the 80-100 MTU/acre range. The VA design is currently using point loading at 83 MTU/acre, but may adjust the AML during VA design. The FY96 Thermal Systems Study recommended reducing the upper bound to 90 MTU/acre, but that recommendation was not accepted by management because of insufficient evidence, and certainty of the evidence, to support making a change in requirements. Point loading will be used as the reference case for VA design, but line loading will continue to be evaluated as a PA sensitivity analysis during VA. Edge loading, active and passive ventilation, and the use of backfill will not be considered for the VA design, but may be reconsidered for the LA design. The current design does not consider WP or SNF assembly sequencing, but that situation may need to change, depending on the additional thermal goal(s). The current design is limited by the zeolite temperature goal, with the drift wall temperature goal and the cladding temperature goal being nearly limiting for some of the WPs. The current design (point loading, no WP or SNF assembly sequencing) may not meet the additional goal(s) to limit exposure of WPs to moisture and high humidity. Ultimately, the overall design will be evaluated to regulatory requirements (substantially complete containment, controlled release from the EBS, releases to the accessible environment, criticality control, etc.). TSPA will be the tool to

make such evaluations, and aspects of the TSPA tool will be refined using process model improvements and data from ongoing laboratory and field testing of thermal processes. If the TSPA evaluations show the current design does not meet the regulatory requirements, the design organization is retaining flexibility to go toward a low AML as an alternative. Interfaces for this issue are Subsurface Design, Surface Design, WPD, WP Materials, Systems, PA, SPO, and the EIS process.

5. **Indicate its importance and what effects it will have on a VA:**

The performance of the repository and its cost are dependent on thermal management decisions and associated design solutions. Not making the appropriate design decisions for VA could lead to an unacceptable performance in the TSPA for VA. To date, the TSPA calculations have not had enough fidelity to be used as a tool to easily select thermal management options; the ability of PA to make such sensitivity analyses has improved considerably in the past few years and is expected to improve much more as part of the TSPA-VA abstraction process.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

The products of resolving this issue will be decisions on thermal management options to be implemented in the VA and LA designs, and the design solutions implementing these decisions. The design solutions will be incorporated in cost estimates and the TSPA. It will be important for the TSPA abstraction process to include the selected thermal options. For thermal management techniques not used in the VA design, we will need to plan how to evaluate them, and decide whether to incorporate them, in the LA design; this planning will need to be part of the LA planning which is one of the four components of the VA.

7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**

The near term focus will be on the line vs. point loading issue and determining the overall AML. For the intermediate time frame, the additional thermal goal(s) will be formulated and applied to the VA design; this should be of use to the PA effort as well. It is anticipated that the new thermal goal(s) will result in some constraints on the WP and SNF assembly sequencing, and thus on the design and operational concept.

Closure of this issue will be documented by inclusion of the selected thermal design techniques in the Controlled Design Assumptions document. Closure for VA will be for a limited subset of thermal management techniques; the issue will not be fully resolved for VA.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Line Load Evaluation	<p>Phase 1: Follow up to 96 Thermal Loading Study; reconcile three analysts' results; plan VA activity in area. (2/18 - 5/19/97)</p> <p>Phase 2: Use temperature & humidity histories in WP degradation PA models, predict WP failure time distribution for LL vs. PL and for AMLs in the 80-100 MTU/acre range (5/20 - 6/23/97).</p> <p>Phase 3: Use WP failure time distribution & NF water flux to predict total system performance (6/24 - 7/21/97) (provide feedback to management).</p> <p>Phase 4: Compare point and line load from Engineering, SCC, and TSPA perspectives; evaluate margin and uncertainty; develop T/RH goals to gain margin and reduce uncertainty (7/22 - 10/13/97).</p> <p>Phase 5: Apply T/RH goals to simulations of various WP sequences; develop WP sequence operational rules (10/1 - 12/5/97).</p> <p>Phase 6: Add T/RH goals and WP sequence operational rules to CDA (12/6/97 - 4/3/98).</p>	<p>TR11FB2</p> <p>TR11FB2</p> <p>TR11FB2</p> <p>TR11FB2</p> <p>TR11FB2</p> <p>TR11FB2, TR12FB2</p>
2	TSPA-VA	<p>VA scenario development</p> <p>TSPA-VA (PISA Chapter 8), total system calculations</p> <p>Peer review, and process model improvement due to the review</p> <p>TSPA abstraction process. Four of the ten workshops have a strong link to thermal issues. They are:</p> <p>WP Degradation (workshop Jan 8-10, 1997) (also, expert elicitation)</p> <p>Thermal Hydrology (workshop Jan 21-23, 1997) (also, expert elicitation)</p> <p>Waste Form Degradation/Mobilization (workshop Feb 19-21, 1997) (also, expert elicitation)</p> <p>Near Field Environment (workshop Mar 5-7, 1997)</p>	<p>TR541FB1; SL105AM3, 9/30/97; SL105E12, 1/28/98 TR541FB3; SL230GM3, 1/30/98; SL230KM3, 6/12/98; SL230M3, 8/20/98 TR541FB8, TR57FB3, TR57GB3, TR57GB5, TR57GB6, TR57GB7, TR57GB8; SLSR500M, 6/20/97</p> <p>TR542FB2, TR57FB4; SL208DM, 2/24/97; SL5X4E1M, 6/30/97; SL208J9, 1/30/98 TR543FB3, TR543GB2, TR57FB2; SLX09M, 3/18/97; SL5X41CM, 9/30/97; SLX09M3, 1/30/98; SLX10M3, 4/14/99 TR542FB1, TR542FB3, TR542GB1, TR57GB1; SL210DM, 5/15/97; SL204FX, 6/30/97; SL204S3, 12/19/97; SL210M3, 2/27/98; SL206M3, 5/10/99 TR543FB2, TR543GB1; SLX07MM, 6/30/97; SLX07M3, 4/2/98, SLX08M3, 7/19/99</p>

No.	Title	Description	Summary Account #
3	Corrosion Testing and Modeling	<p>Tests and models to determine the critical humidity for candidate materials and possible conditions (such as salt on surface). Tests to determine corrosion rates as a function of environment.</p> <p>Model development, and abstraction for TSPA</p> <p>Long term corrosion tests (large tanks with multiple samples)</p> <p>Short term thermogravimetric apparatus tests</p> <p>Long term relative humidity chamber corrosion tests</p> <p>Crack growth tests</p> <p>MIC tests: 2 abiotic and 4 biotic MIC tests, CR: 3/31/97.</p> <p>Screening electrochemical potential tests</p> <p>Long-term controlled electrochemical potential tests</p> <p>Short term electrochemical tests of galvanic corrosion</p> <p>Long term galvanic corrosion tests</p> <p>Thermal stability (aging) measurements</p> <p>Issue EMCR, Rev. 1.</p> <p>Ceramic testing and modeling</p>	<p>TR251FBE, TR251FA2</p> <p>TR251FBG; WB 60116, 7/8/97; WP 60118, 7/8/97 (don't know why 2A and 2B tanks have same date)</p> <p>TR251FB5</p> <p>TR251FBH; WP61607, 1/13/97</p> <p>TR251FBC; WP60703A, 1/16/97</p> <p>TR251FB1; WP26708, 1/16/97</p> <p>TR251FB4</p> <p>TR251FBA; WP26402, 2/10/97</p> <p>TR251FB7</p> <p>TR251FBB; WP60801A, 2/28/97 (7/30/97 in 97AP); WP60121, 9/11/97</p> <p>TR251FBK</p> <p>TR251FB9; WP015A3, 2/28/97</p> <p>TR256FB1, TR256FB2; WP60315A, 6/13/97</p>
4	Waste Isolation Requirements Study	<p>Analyses to determine importance of features and components to waste isolation. Includes resolution of locations of zeolites and performance allocation. Performance allocation will be addressed. This study will follow up on the FY96 evaluation of backfill and other engineered barrier components such as drip shields. These components influence thermal performance.</p>	<p>TR15FB1, TR541FA3; SE440M3, 3/31/97 (4/1 in 97AP?)</p>
5	Performance Confirmation Follow-on Work	<p>Analyses to determine performance confirmation methodology and consequent requirements imposed on design. The deliverable report will include drafts of the PC baseline and PC program plan.</p>	<p>TR15FB1; SE050BM3, 9/30/97</p>
6	WP Size Study	<p>This study will develop the rationale for the WP size used in VA and LA design. WP size is a key factor in thermal performance. The current rationale is based on an MPC baseline.</p>	<p>TR15FB1; SE460M3, 9/30/97</p>

No.	Title	Description	Summary Account #
7	Waste Quantity, Mix, & Throughput Study	This study will add definition to expected waste streams and surface facility requirements. Its results will be used to develop WP and SFA sequencing scenarios for thermal analyses. Its deliverable will recommend a consistent approach for utilization of the waste stream, for use in surface, subsurface, and WP design. Will address temporary storage requirements driven by thermal loading and/or surges in shipment rate.	TR15FB2; SE200M3, 3/31/97
8	Retrievability Study	Analyses to determine constraints placed on design by the regulatory retrievability design. This could influence thermal performance, depending on the constraints.	TR15FB3; SE502M3, 4/30/97
9	MGDS CONOPS	Develop CONOPS in support of VA. Document in PISA Chapter 11. The milestone is a review draft	TR12FB3; TR142GB1, TR12GB5; SE400BM3, 9/30/97
10	Test & Evaluation Plan	Develop the Test and Evaluation Plan (T&EP) to support the VA to integrate Project testing. Emphasis will be on developing test requirements; identifying test architecture; and allocating requirements to the identified tests.	TR13FB1; SE418M3, 9/30/97
11	MGDS RD	MGDS Requirements Document, Rev. 3; includes "in-situ environment requirements" and "operational requirements"	TR12FB2, TR541FA4, TR12GB2; SE422M3, 3/3/97

No.	Title	Description	Summary Account #
12	Subsurface EBS Design	<p>Subsurface design is key to thermal performance. The AML will be determined by evaluating (using ANSYS with initial water vaporization energy included) temperature at the surface, drift wall, and zeolite layer (170 m below the repository horizon). The zeolite temperature is thought to be controlling. Without backfill, the drift wall temperature is more controlling than the cladding temperature.</p> <p>Support requirements development Prepare VA and LA Design and Review plans</p> <p>Support system studies (activities 4-8, 10) SDD Development Evaluate NFE impacts on Subsurface Design Drift stability design Subsurface layout</p> <p>Emplacement system design Radiological design Ventilation design Retrieval design Backfill, invert, and WP support design Performance Confirmation design</p>	<p>TR42FA3 TR42FA6; RP120MG1, 12/31/96; RP120MG2, 9/30/97 TR42FB4 TR42FB5; RP120M3H, 9/30/97 TR47FB2 TR47FB3; RP120M3C, 9/30/97 TR47FB5; RP120M3, 7/31/97; RP120M3A, 7/31/97; RP120M3B, 9/30/97 TR47FB6; RP502M3, 9/30/97 TR47FB7 TR47FB9; RP120M3D, 9/30/97 TR47FBA; RP504M3, 8/29/97 TR47FB1; RP120M3E, 3/31/97 TR47FBJ; RP120M3F, 4/1/97</p>
13	Surface Design	<p>General arrangements and operating concept of the surface facilities. The first deliverable is the establishment of the number of operating trains and capacity of in-process staging areas for waste handling operations. The second is waste handling and cask flow diagrams. The third are the general arrangements. Two other deliverables (not listed) concern HVAC and secondary waste.</p> <p>Radiological safety design</p>	<p>TR46FB2, TR46FB5; RP243AMA, 1/30/97; RP243AMB, 5/30/97; RP243AME, 9/30/97; RP243CM, 9/30/97</p> <p>TR46FB3; RP242AM, 9/30/97</p>
14	WP Design	<p>Develop waste stream scenarios to define the Design Basis WP. Evaluate internal WP temp. for various WP sequencing scenarios. Evaluate criticality (flooded WP, flooded degraded WP, and external) to develop design basis WP constraints. Evaluate NFE impacts on WP performance Evaluate DOE-Owned SNF impacts on WP design Analyze additional Engineered Barriers such as drip shields</p>	<p>TR231FA1 TR233FB7 TR233FBE, TR233FB2; WP233755, 09/16/97 TR22FB5 TR233FA1 TR233FB5</p>

No.	Title	Description	Summary Account #
15	Site Characterization	<p>3-D Mineralogy Model, including locations of zeolitic zones Mineralogic & Hydrologic Characteristics of the PTn Coupling Between Mineralogic & Hydro. Char. of the PTn Thermal Properties of Repository Horizon samples Percolation Flux at the Repository Horizon Unsaturated Zone Synthesis & Modeling, incl UZ site flow model Modeling the influence of heat on UZ Hydrologic Flow 3-D Integ Site Model Ver 2.0</p> <p>Mineral changes & formation of flow barriers in the Altered Zone Near-field geochemistry and hydrology</p> <p>Near-field thermal-mechanical behavior Effects of introduced materials on the chemical composition of water contacting WPs & Waste Near Field and Altered Zone Report, Vol. 1; and summary reports on models and processes</p> <p>Large Block Test</p> <p>Single Heater Test</p> <p>Drift Scale Test</p>	<p>TR32111FBB TR32112FB4 TR32112FB5 TR32711FB1 TR33124FB8 TR33129FBG; SP24BM3, 6/16/97 TR33129FBH TR395FA1, TR395FB1; SP23BM3, 2/28/97 TR3A1FB1, TR3A2FB2, TR3A2FB6 TR3C1FB1, TR3C2FB2, TR3C2FB3, TR3C2FB4, TR3C2FB5, TR3C2FB6, TR3C2FB7, TR3C2FBC TR3C3FB8 TR3C5FBB</p> <p>TR3C5FB54, TR3C5FB9, TR3C5FBA4; SP3000M3, 8/19/97; SP3005M3, 8/29/97; SP3100M3, 11/17/97 TR3E1FB1, TR3E1FB2, TR3E1FB3; SP9901C3, 1/27/97; SP9903M3, 8/29/97 TR3E2FB1, TR3E2FB2, TR3E2FB3, TR3E2FB4; SP9200M3, 5/23/97; SP23RM3, 8/29/97 TR3E2FB13, TR3E2FB23, TR3E2FB33, TR3E2FB43; SP3305M3, 7/16/97; SP3308M3, 8/4/9 8/4/97; SP3320C3, 12/8/97</p>

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	FY97												FY98											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Jim Blink/5-4371	02/18/97 - 04/13/98																								
2	Bob Andrews/5-5549	10/01/96 - 99+																								
3	Dave Stahl/5-4383	10/01/96 - 99+																								
4	Steve Saterlie/5-4026	10/01/96 - 04/01/97																								
5	Brent Thomson/5-4060	10/01/96 - 09/30/97																								
6	Ovadia Lev/5-4029	04/01/97 - 09/30/97																								
7	Rick Memory/5-3938	10/01/96 - 03/31/97																								
8	Rick Memory/5-3938	10/01/96 - 04/30/97																								
9	Richard Wagner/5-3935	10/01/96 - 09/30/98																								
10	Mark Balady/5-4032	10/01/96 - 09/30/97																								
11	Sam Rindskopf/5-3943	10/01/96 - 01/04/99																								
12	Dan McKenzie/5-4393	10/01/96 - 99+																								
13	Steve Meyers/5-4392	10/01/96 - 99+																								
14	Hugh Benton/5-4389	10/01/96 - 99+																								
15	Larry Hayes/5-5152	10/01/96 - 99+																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue.**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

**Key VA Issue
Resolution Plan**

1. **Issue #2:** EBS Performance Enhancements (Backfill, Drip Shields, etc.) February 3, 1997 Rev. #01A

2. **Assigned to:** **M&O Responsible Individual:** Mark Balady **Phone:** 5-4032
DOE Contact: David Haught **Phone:** 4-5474


M&O Manager


M&O Responsible Individual

3. **Issue Description:**

The long-term performance of the potential repository must be calculated to be compliant with a long-term performance standard. Given the possibility that the Performance Assessment "reference case" results scheduled to be completed in 1/98 may demonstrate that the potential repository modeled without EBS performance enhancements has insufficient performance margin, what EBS performance-related work should have already been conducted and subsequently incorporated into the MGDS design to support VA? Also, given the possibility that the 1/98 PA results will show sufficient calculated compliance with the performance standard, what EBS performance-related work should nevertheless have been conducted in support of VA?

4. **Describe the current status and the significance of the issue:**

A FY 1996 system study entitled "Engineered Barrier System Performance Requirements Systems Study" was conducted and determined that, based on the information available at the time of the study, there is no need to impose a requirement to use backfill, drip shields, or any other EBS performance enhancements outside the waste package. However, since this assessment was based on, among other things, an assumed post-closure performance standard and an infiltration rate to the repository horizon that may be of significantly less magnitude than we currently believe to be the case, the study concluded that we should not preclude the option to backfill at a later time if deemed necessary. Currently, work is ongoing in Subsurface Design (Summary Account TR47FBI, "Subsurface EB Segment Design") to establish that the emplacement system design can accommodate the use of emplacement drift backfill. This is scheduled to be completed by 4/97. The issue of postclosure performance standards (Issue #10) has also been identified as a Key VA design issue, and must be tracked by this issue.

Interfaces:

The Performance Assessment department is a key interface because it is their assessment of total system performance compared against the assumed performance standard that serves as the technical basis for stating the current lack of need for additional EBS performance barriers. Scientific Program Operations is also a key interface since it will be their ongoing characterization of the mountain, and corresponding abstractions by Performance Assessment, that may cause us to re-evaluate the need for additional EBS performance barriers. Also important will be any further modeling of the near-field environment, especially regarding flow and transport through and around the emplacement drifts as well as through emplacement drift backfill and the invert. Finally, Regulatory Operations is a key

interface as their support will be required to develop a regulatory compliance strategy for this issue as part of the overall license strategy conducted in support of VA.

5. Indicate its importance and what effects it will have on a VA:

If we find in the 1/98 time frame that the calculated long-term performance of the potential repository modeled without any EBS performance enhancements has insufficient performance margin relative to a long-term performance standard, then not resolving this issue will result in a VA that reflects insufficient long-term repository performance. This could result in a determination that the site is not viable.

6. Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:

Resolution of this issue is only possible with input from TSPA. An assessment of whether additional EBS performance barriers are required will be possible only when the performance assessment results of 1/98 are produced. Given the short time remaining to VA once the PA results are available, it is clear that the TSPA should include long-term performance sensitivities that reflect the use of emplacement drift backfill and/or a chemically conditioned invert, if appropriate. If it is determined that these additional EBS performance enhancements are necessary, then there will be an impact to the MGDS cost estimate. For this reason, cost estimates for emplacement drift backfill and/or a chemically conditioned invert (if appropriate) should be included as contingencies in the MGDS cost estimate. With regard to LA planning, it must be emphasized that even if the PA results of 1/98 reflect satisfactory long-term repository performance without the use of EBS performance enhancements, there is still the possibility that information obtained subsequent to VA (i.e., during the performance confirmation period) may require a reassessment of repository performance. For this reason a regulatory compliance strategy for this issue should be adopted in support of LA planning.

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA:

The overall goal of this strategy is to achieve the performance required from the EBS such that the repository is calculated to meet long-term performance requirements. An integral element of this strategy is to identify those key assumptions that must be made in order that this issue can be resolved. Once identified, these key assumptions should be placed into the Controlled Design Assumptions document. In support of VA, a part of this strategy is to determine no later than 1/98 whether EBS performance enhancements are required to achieve the long-term performance criteria. A table depicting the performance enhancements, their calculated benefit to total system performance, and their associated costs, will be employed to aid in determining which enhancements, if any, should be incorporated into the VA design.

Closure sufficient for VA will be achieved when the following criteria are satisfied for each potential EBS enhancement being addressed:

a preliminary assessment of the total system performance benefits of the EBS enhancement is determined

design concept is developed that depicts incorporation of the EBS enhancement into the repository design

a cost estimate is developed for the potential EBS enhancement concept

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Repository Performance Assessment	Determine whether the reference case long-term repository performance assessment shows sufficient performance margin without additional EBS barriers	TR541FB3
2	Infiltration rate determination	Determine the net infiltration rate to be used for the TSPA - VA	TR543FB2
3	Backfill Thermohydrology	Determine the thermohydrological benefits of backfill at fluxes higher than those examined in TSPA-1995	TR47FB1
4	Viability of Backfilling	Establish the viability of backfilling emplacement drifts given the current emplacement drift envelope	TR255FB1, TR255FB2
5	Material Interaction of Backfill	Determine the long-range material interaction effects of backfill on waste packages	TR255FB1, TR255FB2
6	EBS Enhancements Study	Conduct a study that addresses the total system performance benefits of EBS enhancements (backfill, chemically treated invert) at higher fluxes	TR15GB4
7	EBS Enhancements Decision	Use the previous activity as part of the basis for deciding whether additional EBS performance barriers should be incorporated in the VA Design	milestone associated with previous activity
8	Incorporation of EBS Enhancements	Incorporate the recommended additional EBS enhancements, if any, into the VA Design	TR47GBD, TR46FB5
9	Regulatory Compliance Strategy	Develop a regulatory compliance strategy for this issue as part of the overall license strategy conducted in support of VA	TR524FB5, TR524GA5
10	Integration and Facilitation of Key VA Design Issue	Status individual activities identified to help resolve this issue; identify with a plan to resolve any developing problems that may endanger resolution of this issue	preliminary unfunded
11	Waste Isolation System Study	As part of this study, establish the feasibility of conditioning the emplacement drift invert with sedimentary apatite ore by determining the amount necessary under a waste package to sorb the ^{237}Np in a waste package	TR15FB1
12	Key Assumptions Identification	Develop and document those key assumptions that must be made in order for this issue to be resolved	preliminary unfunded
13	Waste Package Support/Invert Design	Address the possibility of chemical additives (sedimentary apatite or) in the invert	TR233FB6, TR233GB1

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	-----FY97-----												-----FY98-----											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	R. Andrews/5-5549	10/01/96 - 01/30/98																								
2	M. Pendleton/5-5550	12/01/96 - 05/30/97																								
3	R. Andrews/5-5549	10/01/96 - 01/30/98																								
4	D. McKenzie/4-1863	10/01/96 - 03/31/97																								
5	D. Stahl/4-7778	10/01/96- 08/29/97																								
6	R. Memory/4-7247	10/01/97 - 04/30/98																								
7	DOE/M&O Management	02/27/98																								
8	A. Segrest/4-1924	10/01/96 - 09/30/98																								
9	K. Ashe/5-5563	10/01/96 - 09/29/97 02/03/98 - 08/12/98																								
10	M. Balady/5-4032	10/01/96 - 09/30/98																								
11	S. Saterlie/5-4026	10/01/96 - 04/01/97																								
12	M. Balady/5-4032	10/01/96 - 03/17/97																								
13	T. Doering/5-4382	10/01/96 - 08/15/98																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue.**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

**Key VA Issue
Resolution Plan**

1. **Issue #3: Criticality Control**

February, 13, 1997

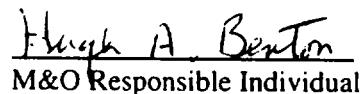
Rev. # 01A

2. **Assigned to:** **M&O Responsible Individual:** Hugh Benton
 DOE Contact: Paige Russell

Phone: 5-4389

Phone: 4-1315


M&O Manager


M&O Responsible Individual

3. **Issue Description:**

Demonstrating to the satisfaction of the NRC that criticality will be controlled during pre- and postclosure over the time period of regulatory concern (assumed to be at least 10,000 years) is one of the most important issues in the development of a viable MGDS design. The current 10 CFR 60.131(H) regulation does not recognize a probabilistic risk methodology.

4. **Describe the current status and the significance of the issue:**

Criticality control has a major impact on waste package and engineered barrier segment designs and their licensing. Criticality considerations govern many aspects of design including waste package capacity for some fuels, basket design, and amount and type of neutron absorbing material. The methods of validating the codes and models used in predicting long-term performance as it impacts the probabilities of criticality involve major interdisciplinary effort. Interfaces include: Scientific Programs, for the environmental conditions; LLNL, for the material confirmation tests; Performance Assessment, for the consequence evaluation process; Scientific studies, for the data reduction of the environment. Validating and justifying the amount of credit for burnup of the commercial spent fuel is an integral part of the overall development and documentation of criticality analysis methodology. Information on the methodology and the probabilistic approach have been presented to the NRC staff in the Disposal Criticality Analysis Methodology Technical Report along with examples of the design controls. Changes to the current deterministic regulations have been proposed, but not yet incorporated by the NRC.

5. **Indicate its importance and what effects it will have on a VA:**

The means of providing and demonstrating disposal criticality control will have important impacts on the engineered barrier segment and repository designs. The "Disposal Criticality Analysis Methodology" is being developed to be submitted to the NRC for review in late 1998. In support of VA, the methodology used for analysis of PWR and BWR SNF needs to be developed sufficiently to provide an understanding of the general and detailed processes that make up the methodology, including: PWR and BWR Commercial Reactor Criticals; available chemical assay data evaluation; risk based processes. This methodology will be used to show the applicability of the waste packages/engineered barrier segment design concepts.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

Demonstrating the validity of the criticality control measures incorporated into the designs and the probabilistic approach will make the MGDS cost estimate significantly lower than it would be otherwise. Although the issue cannot be fully resolved prior to VA, proceeding as far as time and budget will allow will reduce the uncertainties attendant to the license application. Evaluations to date indicate that a small number of criticality events over extended time periods will have little impact on TSPA. The Disposal Criticality Analysis Methodology Technical and Topical Reports will

be used to communicate the status of the disposal criticality analysis methodology. Evaluations using the methodology will provide the status of the design and control features.

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA:

Complete the draft Topical Report by the time of the viability assessment. Resolution of this issue also requires meeting with the NRC staff to discuss the important details of the methodology and the design features that are planned to provide criticality control. Specifically:

- 1) Keeping the NRC staff informed about the planned disposal criticality analysis methodology,
- 2) Seeking feedback from the NRC staff on the acceptability of the methodology
- 3) Showing the NRC staff preliminary results using the methodology to analyze the designs.

The specific criteria for determining the sufficiency of the methodology for viability assessment is:

- 1) NRC staff has not identified any major technical topic that would preclude acceptance of the methodology, including risk-based approach.
- 2) NRC does not indicate that burnup credit is infeasible.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Meetings with NRC staff	Technical exchanges and Appendix 7 meetings are being planned to discuss the issue	TR233FB9
2	Technical Report, Rev. 1	Disposal Criticality Analysis Methodology Technical Report, Revision 1	TR233FB9
3	Criticality Analyses	Ongoing analytical work demonstrating the disposal criticality control work with the analysis methodology	TR233FB2, TR233EB005, TR233FBE
4	Topical Report	Disposal Criticality Analysis Methodology Draft Topical Report	TR233GBD
5	Topical Report, SER	Safety Analysis Report for the Disposal Criticality Analysis Methodology Topical report from the NRC	TR233GB8
6	Criticality Design for LA	Criticality control design to be licensed evaluated using the disposal criticality analysis methodology	TR233(TBD)

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	-----FY97-----												----- FY98 -----											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Mike Scott/5-4885	11/01/96 - 10/01/98																								
2	Hugh Benton/4-1891	10/01/96 - 09/04/97																								
3	Hugh Benton/4-1891	10/01/96 - 2000+																								
4	Hugh Benton/4-1891	10/01/97 - 09/30/98																								
5	Hugh Benton/4-1891	2000+																								
6	Hugh Benton/4-1891	2000 +																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue:**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

**Key VA Issue
Resolution Plan**

1. **Issue #4:** Emplacement Drift Ground Support Concept April 21, 1997 Rev. # 02

2. **Assigned to:** **M&O Responsible Individual:** Richard Nolting **Phone:** 5-4450
 DOE Contact: Jaime Gonzalez **Phone:** 5-5454



M&O Manager



M&O Responsible Individual

3. **Issue Description:**

At issue are the stability and maintenance of emplacement drifts. Constraints on the issue are:

- Construction materials for ground support must be compatible with post-closure performance.
- The ground support method must be compatible with performance confirmation requirements and the construction method.
- Drifts must be safely useable for a long operational life including a potential retrieval period.
- Emplaced waste packages producing heat and radiation will make access difficult for drift maintenance.

4. **Describe the current status and the significance of the issue:**

- A preliminary analysis of emplacement drift stability and support methods is in progress to support VA and will be completed by 9/30/97. Linings are being designed to be durable and capable of accommodating thermally-imposed rock deformation, because a robust, long-lived structure is needed to provide for performance confirmation and for possible retrieval.
- A preliminary assessment has been made of an appropriate pH and mix design for concrete. Work continues on a concrete formulation suitable for repository construction.
- A strategy is being developed for geologic mapping of the emplacement area which will largely determine the permissible method of lining construction. For example, the currently preferred support method using rapid installation of precast segments does not easily accommodate mapping.
- As currently planned, drift maintenance will be accomplished by removal of waste packages to temporary storage drifts to allow access without a radiation hazard.

Significance includes:

- The analysis and design of a robust lining system will increase the safety of preclosure operations and closure, and support the viability of retrieval, and backfill, if needed.
- Determination of a concrete formulation that meets PA approval for postclosure performance is needed to support the use of concrete as the most important repository construction material.

- The emplacement drift support system must meet performance confirmation requirements, be compatible with construction methods, and achieve efficient installation.
5. **Indicate its importance and what effects it will have on a VA:**
The issue affects the following significant aspects of repository design: the ground support system, the repository layout, and retrievability. Until all aspects of the issue are resolved, alternative, but viable, methods of ground support will be developed for VA. This approach should not significantly affect VA if longevity and maintenance aspects are acceptable.
 6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**
 - Selection of materials suitable for postclosure (e.g., an acceptable concrete formulation) will be provided to PA for use in the TSPA.
 - MGDS cost estimate - determination of types and quantities of construction materials, associated costs of fabrication, and erection and efficiency of overall construction methods.
 - LA planning - resolution of the issue forms the design basis for long-term, maintainable drift design.
 7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**
The strategy for VA is to present designs for three ground support options (CDA, DCSS 034). These options, which will bound the possible range of alternative criteria, are as follows:

Option 1: Precast concrete segmental lining - This is the preferred option because it can be rapidly installed and can be fabricated under controlled conditions to enhance quality. Assumptions: (1) concrete allowed by PA (CDA, DCSS 027), (2) geologic mapping strategy based on mapping selected non-emplacement drifts prior to emplacement drift lining (this is an alternative to be used with CDA, Key 061, 10a.).

Option 2: Cast-in-place concrete lining - This is the second preference and requires initial installation of support such as rockbolts. Assumptions: (1) concrete allowed by PA (CDA, DCSS 027), (2) geologic mapping strategy based on mapping all emplacement drifts (this is an alternative to be used with CDA, Key 061, 10a.).

Option 3: Steel sets with steel lagging - This is the third preference and allows steel lagging to be installed in stages at different times. Assumptions: (1) concrete use restricted or not allowed by PA (this is an alternative to CDA, DCSS 027), (2) geologic mapping strategy can be either mapping of all emplacement drifts or selected mapping of other drifts to meet CDA, Key 061, 10a.).

Completion of current design analyses and drawings will establish the three alternative ground support options for VA, thus giving sufficient flexibility to accommodate changes in important aspects of the issue such as acceptance of the ground support material by PA and the method of support construction by the performance confirmation group. The alternative ground support methods also demonstrate that stability and maintenance can be achieved using different materials. Development of a geologic mapping strategy is necessary to define the final ground support method and develop a position which is licensable. A reference ground support method will be selected for TSPA based on resolution of the geologic mapping strategy (late FY97) and the use of cementitious materials (early FY98).

In summary, closure for VA will be achieved in one of the following three ways:

- (1) If concrete is found to be acceptable for postclosure use and the acceptable geologic mapping strategy is to map nonemplacement drifts, then the reference ground support for VA will be Option 1 - precast concrete segments.
- (2) If concrete is found to be acceptable for postclosure use but the only acceptable geologic mapping strategy is to map all emplacement drifts, then of the remaining available options, Option 2 - cast-in-place concrete would become the reference ground support for VA.
- (3) If concrete is found to be unacceptable for postclosure use, then Option 3 - steel sets and steel lagging - would be the reference ground support for VA, regardless of the geologic mapping strategy.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Develop Materials of Construction Database (RP500705, RP1206M3, RP47832)	Determine design parameters and properties of selected materials (e.g., concrete and steel) for the expected range of mechanical loads, temperature, and other conditions. Level 4 milestone to deliver engineering data to PA (9/30/97).	TR47FB1 TR47GBE
2	Identify Ground Support Materials (RP506705, RP47824)	Complete assessment and selection of appropriate materials with input from PA studies. Supports level 4 milestone to deliver data to PA.	TR47FB3 TR47GBE
3	Perform thermal/mechanical analysis (RP506710, RP47826)	Complete analysis of alternative ground support methods for thermal/mechanical, seismic, and in-situ load cases. Includes FY98 update to incorporate added data.	TR47FB3 TR47GBE
4	Develop Ground Support Designs (RP506715)	Present three ground support design options based on results of analysis and criteria/constraints developed from findings from PA and PC studies.	TR47FB3
5	Preparation of Drawings (RP506720)	Level 3 milestone for FY97: Drawings - Emplacement Drift Ground Support (09/30/97)	TR47FB3
6	Update Ground Support Design (RP47830)	Reevaluate FY97 work using latest information and results from PA and PC to update emplacement drift ground control and select a reference option.	TR47GBE
7	Near Field Environment (RP510710)	Assess emplacement drift environment conditions under a range of thermal conditions and ventilation scenarios.	TR47FB2
8 ⁽¹⁾	Near field environment PA study (Not identified)	Work on cementitious materials is not an identified task but is being included in the activity dealing with evaluation of near-field environmental models for VA. Deliverables are (1) documentation of a workshop on near-field models (6/30/97) and (2) documentation for near-field models for VA (4/2/98).	TR543FB2
9 ⁽²⁾	Development of mapping strategy (SE050705, SE050710)	Identify requirements, needed geologic parameters, level of confidence needed for data, and predicted data distributions. Develop a mapping strategy and document requirements for mapping.	TR15FB1
10	Select Candidate Materials for WP Support & Invert (WP220746)	Identify candidate materials that are compatible with WP design, and are acceptable for WP support and emplacement drift invert design. (11/1/96 - 4/1/97).	TR22FB4

9. Provide a rough schedule of when this issue will be resolved for VA:

			-----FY97-----												-----FY98-----											
			--																							
No	POC (Name/Phone)	Date	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	R. Nolting/5-4450	10/01/96 - 09/30/97 01/02/98 - 03/31/98																								
2	R. Nolting/5-4450	10/01/96 - 12/31/96 11/03/97 - 03/31/98																								
3	R. Nolting/5-4450	10/14/96 - 04/10/97 12/01/97 - 07/31/98																								
4	R. Nolting/5-4450	10/14/96 - 04/01/97																								
5	R. Nolting/5-4450	02/03/97 - 09/30/97																								
6	R. Nolting/5-4450	02/02/98 - 09/30/98																								
7	R. Nolting/5-4450	10/01/96 - 07/31/97																								
8 ⁽¹⁾	Sassani/5-4635	10/01/96 - 06/30/98																								
9 ⁽²⁾	Memory/5-3938	03/00/97 - 07/00/97																								
10	D. Stahl/5-4383	11/01/96 - 04/01/97																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue:**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

NOTES:

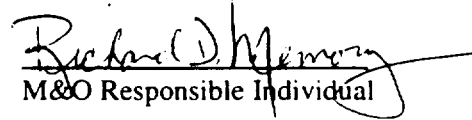
- 1 Further explanation of Step 8 (Near-field environment PA study), Paragraph 8:
 - A report will be issued by PA on 6/30/97 documenting the results of "near-field" model studies that are being done as part of the Introduced Materials program at LLNL. Including in this report will be an assessment of the long-term postclosure behavior of concrete and a determination of the importance of certain concrete characteristics, such as pore solution pH, to the emplacement drift environment.
 - A statement of work is being submitted this month (3/97) outlining a 6-month testing program to investigate certain key mechanisms in concrete that will determine the long-term pH of the drift environment. Results of this testing will be available by the first quarter FY98.
 - A report will be issued by PA on 4/2/98 to complete the documentation of the near-field model studies at LLNL. Results of these and other tests will provide the basis for a final assessment of concrete pH.
- 2 Further explanation of Step 9 (Development of mapping strategy), Paragraph 8:
 - An initial consensus will be developed by the end of April FY97 on a geologic mapping strategy. This strategy will provide a focus for continued assessment through the end of FY97.
 - In early FY98 discussions will be held with the NRC in order to fully understand the regulatory requirements regarding geologic mapping before finalizing a strategy.

**Key VA Issue
Resolution Plan**

1. **Issue #5:** Performance Confirmation Concept (monitoring system, sampling approach, etc.) November 6, 1996 Rev. #01A

2. **Assigned to:** **M&O Responsible Individual:** Richard Memory **Phone:** 4-7247
DOE Contact: William Boyle **Phone:** 4-5506


M&O Manager


M&O Responsible Individual

3. **Issue Description:**
Concepts and technology requirements driven by the need to conduct a performance confirmation program are not fully developed. The list of site and engineering parameters, together with related process models, which must be observed or monitored will evolve as our understanding of the natural and engineered barriers evolves. As this list evolves, so must the Performance Confirmation program. In addition, per 10 CFR 60 the performance confirmation program must begin during the site characterization period. An overall approach and plan for PC currently does not exist.
4. **Describe the current status and the significance of the issue:**
10 CFR 60 Subpart F mandates the requirement to conduct performance confirmation. The VA design and the LA design need to insure that performance confirmation is considered and included in the design. A Performance Confirmation Concepts Study Report was completed in FY96. This report recommended an initial set of design requirements and provided a draft Performance Confirmation Plan. The Study also developed an initial set of concepts for use in the VA design as a point of departure. Specific requirements for the amount of sampling have not been developed. The types of parameters to be monitored and tested were identified in the study report. Performance Confirmation Follow-on work has been initiated to develop portions of a reference PC baseline, supplement and specify PC requirements on the amount of sampling necessary, and to develop the PC Plan. A PC Design activity has been initiated to develop a design (including the layout, alcoves and openings) that will address the initial set of design requirements. Remote equipment and development design may also be utilized. Interfaces: Resolution of this issue will require compiling input from the licensing, Performance Assessment, design groups, and scientific programs organizations.
5. **Indicate its importance and what effects it will have on a VA:**
Both the repository layout and surface facilities design and operational concepts can be impacted by the Performance Confirmation program requirements. Additionally, instrumentation development could be impacted by these requirements. This issue directly impacts VA in terms of the design presented for VA, the MGDS cost estimated for VA, and the license application plan for VA.
6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**
As discussed above, the MGDS cost estimate and LA plan are directly influenced by resolution of the issue. Resolution of this issue will involve both technical and programmatic concerns. The programmatic concerns, e.g. what level of performance confirmation will the NRC require, will be addressed in the LA plan.

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA:

Conduct the performance confirmation follow-on work to develop PC requirements to a level of detail sufficient to develop concepts for conducting the PC program. Closure of this issue sufficient for VA will involve the development of a plan that provides enough detail to show that the objectives of the performance confirmation program can be met.

Closure of this issue sufficient for VA will involve:

- (1) Development of a plan that provides enough detail to show that the objectives of the performance confirmation program can be met.
- (2) Initial identification of parameters important to performance confirmation
- (3) Update of important parameters based on updated performance assessment inputs
- (4) Identification of location and number of data sets, detailing the time duration of interest.
- (5) Initiation of Appendix 7 discussions with the NRC regarding performance confirmation

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Prepare Fleshed-out PC Plan (SE050720)	A Fleshed-out draft PC Plan will be prepared based on the draft PC Plan contained in the FY96 PC Concepts Study Report and readily available information. The draft Plan is expected to have incomplete areas (TBDs).	TR15FB1, TR241FA2, TR251FA1, TR39BFA1D, TR523FA1, TR541FA2
2	M&O Review and Approval of Draft PC Plan (SE050725)	The Draft PC Plan will be reviewed internal to the M&O prior to delivery to DOE for their Review and Comment.	TR15FB1
3	Support DOE Review and Comment Resolution of Draft PC Plan (SE050720)	DOE comments on the Draft PC Plan will be resolved and incorporated into a draft that meets with DOE concurrence.	TR15FB1, TR241FA2, TR251FA1, TR39BFA1D, TR523FA1, TR541FA2
4	Develop Prioritized List of TBDs To Be Resolved (SE050720)	A list of TBDs will be developed and prioritized. Criteria used to prioritize the list should be documented. For each TBD in the list, should contain what is needed to resolve the TBD, when is needs to be resolved, and the rationale for when it needs to be resolved.	TR15FB1, TR241FA2, TR251FA1, TR39BFA1D, TR523FA1, TR541FA2
5	Resolve Selected TBDs (SE050720)	Based on the prioritized list of TBDs, the areas that are selected for resolution in FY97 will be planned, analyzed, resolved, and documented.	TR15FB1, TR241FA2, TR251FA1, TR39BFA1D, TR523FA1, TR541FA2
6	Update the PC Plan with the Resolved Sections (SE050720)	Using the DOE concurrence draft of the PC Plan, those areas that have been resolved will be incorporated into the PC Plan. Those areas which are needed to provide enough detail to show that the objectives of the performance confirmation program can be met will be resolved. The list of TBDs will be updated, also.	TR15FB1, TR241FA2, TR251FA1, TR39BFA1D, TR523FA1, TR541FA2
7	Review the PC Plan and Deliver PC Plan to DOE (SE050725)	A review of the updated PC Plan will be conducted prior to delivery of the PC Plan to DOE.	TR15FB1
8	Review PC parameters based on PA updates	Utilize PA model updates to review existing list of important parameters and update (refine) as necessary	
9	NRC exchange	Initiate Appendix 7 discussions with the NRC regarding Performance Confirmation.	

9. Provide a rough schedule of when this issue will be resolved for VA:

			FY97												FY98											
No	POC (Name/Phone)	Date	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Brent Thomson/4-7708	12/13/97 - 02/21/97																								
2	Brent Thomson/4-7708	02/21/97 - 02/28/97																								
3	Brent Thomson/4-7708	03/03/97 - 04/30/97																								
4	Brent Thomson/4-7708	02/07/97 - 05/16/97																								
5	Brent Thomson/4-7708	03/03/97 - 08/14/97																								
6	Brent Thomson/4-7708	08/15/97 - 09/05/97																								
7	Brent Thomson/4-7708	09/08/97 - 09/30/97																								
8	Brent Thomson/4-7708	10/01/97 - 01/30/98																								
9	Brent Thomson/4-7708	02/01/98 - 02/28/98																								

10. Describe a process that will be used to measure performance towards closure:

Performance will be measured by tracking to the schedule identified in item #9 above. As each of the activities is completed, the issue will be progressing toward closure sufficient for VA.

11. Describe how status will be reported during the process of closing this issue:


Status will be reported monthly and as each activity is scheduled for completion. A number of deliverable documents will be produced documenting the outcome of this issue resolution activity with one at the end of February 1997, one in mid May 1997, and one at the end of FY 97.

**Key VA Issue
Resolution Plan**

1. **Issue #6:** Retrievability Concept February 6, 1997 Rev. # 01A

2. **Assigned to:** **M&O Responsible Individual:** Robert Saunders **Phone:** 5-4380
DOE Contact: Paul Harrington **Phone:** 5-5415


M&O Manager


M&O Responsible Individual

3. **Issue Description:**

- A retrievability strategy to meet the 10CFR60 requirements has not yet been developed. At heart of this issue are questions on how easy retrieval needs to be and how to incorporate a retrieval strategy into the repository design. Questions regarding the proof-of-principle aspects of retrievability must also be addressed.
- A retrieval strategy for recovery of resources has to be developed and incorporated into the design
- Credible off-normal scenarios for retrieval have not yet been developed.
- Retrieval equipment design, including associated remote systems, and concepts of operations have to be developed to meet normal and off-normal conditions.
- The emplacement drift environment of high heat and radiation, and the size and weight of emplaced waste package add to the complexity of the retrievability issue.
- The long retrievability period and associated complexities of providing access to the emplacement drifts are also part of this issue.

4. **Describe the current status and the significance of the issue:**

Current Status: Engineering studies to examine the retrievability period beyond the prescribed time of 50 years were performed during ACD. Conceptual designs for retrievability and operations were developed. The expected environment during retrieval period has also been examined. During the VA design, equipment concepts will be developed to meet the various off-normal scenarios postulated in the DBE study. The remote system control and communications systems for retrieval equipment are also being analyzed. The FY97 scope of work includes an engineering study to develop a retrieval strategy.

A number of changes to the ACD repository layout make retrievability more credible. Included in these changes is a provision for retrieval from both ends of the emplacement drifts, and an enhanced ventilation system with a central exhaust air main. The change from the ACD rail car emplacement concept to gantry emplacement of the waste packages onto pedestals also enhances the retrievability.

The retrievability issue is significant because it impacts wide areas of repository design including the subsurface layout, emplacement mode, emplacement and retrieval equipment, remote systems design, ground support systems, ventilation system, and surface facilities.

5. **Indicate its importance and what effects it will have on a VA:**

As indicated in section 4 above, the retrievability issue impacts virtually every aspect of subsurface design. The viability of retrieval has to be demonstrated by the completion of VA design, and will include a plan and strategy for retrieval, design of long term low maintenance ground support systems, and remote systems to operate retrieval equipment during normal and off-normal retrieval operations.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

The retrieval issue has no direct ties to the TSPA. The MGDS cost estimate will be greatly affected by the strategy and concept of the selected retrieval design. The retrieval issue is a "bin 3" product and as such must be substantially completed for LA. Therefore, LA planning will be affected by the extent of completion of this issue. If the LA strategy includes demonstrating a retrieval "proof-of-principle" concept, a larger impact on the LA planning may well occur.

7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**

VA design during FY97 and FY98, will develop the strategy for retrieval, and retrieval equipment and remote handling systems. The VA design (currently in progress) revises the ACD layout configuration and waste emplacement method (now utilizing a gantry system in the emplacement drift rather than rail cars) and as a result better accommodates retrieval. Retrieval under normal conditions is essentially the reverse process of emplacement and will use the same equipment. VA design will also address retrieval under off-normal conditions, in such cases special recovery equipment may be required. Section 8 lists the tasks, including analyses and studies, that will be performed to develop a viable retrieval approach. The first task listed in Section 8, will be to document the assumptions for the retrieval baseline design in the CDA. The systems engineering study will describe the strategy for retrieval and analyses will provide a preliminary design of the waste package transportation system, the mechanism for loading and unloading waste packages, the emplacement gantry - also used for retrieval, and the subsurface layout and facilities design. Other analyses will address ventilation and retrieval scenarios.

At VA we will have developed a preliminary design for retrieval of waste packages from the emplacement drift and their transportation and storage at surface. Subsequent design work will refine the retrieval strategy and approach, and add detail to the waste handling equipment and subsurface and surface layout and facilities design.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Controlled Design Assumptions Document (CDA)	Document assumptions relating to retrievability in the CDA section that describes the VA baselined design.	
2	Retrievability Strategy Report (SE502705, SE502710)	A Systems Engineering study to examine retrieval issues and develop a retrievability strategy with sufficient detail to support development of the License Application Plan. The study will provide input to the FY 97 repository retrieval design for Viability Assessment.	TR15FB31
3	Waste Package Transport and Emplacement Equipment Analysis (RP502700)	Develops system for transporting waste packages from surface to the subsurface emplacement horizon and emplacing in the emplacement drifts. Normal retrieval is considered a reversal of the emplacement process.	TR47FB6
4	Repository Subsurface Layout Configuration Analysis (RP120795)	Develop subsurface layout configuration for the emplacement drifts, access ramps and mains, and ventilation openings. Layout development addresses constructability, waste package transportation and emplacement, and retrieval.	TR47FB5
5	Equipment for Waste Package Retrieval (RP504705)	Develop preliminary equipment description for recovery of waste package, waste package transporter, and retrieval gantry involved in off-normal situations.	TR47FBA
6	Sub Surface HVAC Analysis (RP122725)	Perform analysis that establishes normal ventilation conditions and system capacities as they apply to normal operations and retrieval processes.	TR47FB9
7	Airflow Control Analysis (RP122720)	Determine the quantity and type of airflow control devices to be used under normal and retrieval conditions to allow for altered airflow scenarios.	TR47FB9
8	Near Field Design Analysis (RP510710)	Develop a description of the near field conditions that could be expected during the retrieval process. This provides input for equipment evaluation and performance.	TR47FB2
9	DBE/Scenario Analysis (RP123762)	Define the Design Basis Events and Scenarios that may impose special conditions on a retrieval process. Events may cause emergency or off-normal conditions under which retrieval must be performed	TR47FBD
10	Retrieval Scenario Analysis (RP47500)	Develop the scenarios under which retrieval would be performed. This includes evaluation of package spacing, waste type, temporary redistribution of waste packages, and logistics of the retrieval process.	TR47GB9

No.	Title	Description	Summary Account #
11	RH&C Description Document (RP502740)	Prepare a description of the Remote Handling and Controls equipment that is envisioned for the emplacement equipment. These same controls will be utilized in the retrieval equipment, and will serve as input to the retrieval equipment design	TR47FB6
12	Retrieval Drawings and Specifications (RP47504, RP47506)	Develop drawings and outline specifications that depict and describe the equipment to be utilized under the expected retrieval conditions and scenarios. These products are preliminary in nature, not to be used for procurement or fabrication, and will serve as input to detailed design for the following design phase.	TR47FBA TR47GB9
13	Refinement of Equipment Description (RP47502)	Enhance the design of the major retrieval equipment items to address remote handling and control, and special handling scenarios developed under RP47500.	TR47GB9

9. Provide a rough schedule of when this issue will be resolved for VA:

			-----FY97-----												-----FY98-----											
No	POC (Name/Phone)	Date	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	R. Saunders/5-4380	10/01/97 - 01/31/98																								
2	P. Gehner/4-7503	11/08/96 - 01/10/97																								
3	F. Bierich/5-9686	10/01/96 - 07/14/97																								
4	R. Saunders/4-1865	10/15/96 - 02/11/97																								
5	F. Bierich/5-9686	10/01/96 - 06/13/97																								
6	R. Saunders/4-1865	10/01/96 - 04/30/97																								
7	R. Saunders/4-1865	11/01/96 - 02/28/97																								
8	R. Nolting/4-1833	10/01/96 - 07/31/97																								
9	D. McAfee/5-9656	05/01/97 - 09/30/97																								
10	M. Haas/5-9631	10/01/96 - 09/30/97																								
11	F. Bierich/5-9686	10/01/97 - 02/27/98																								
12	F. Bierich/5-9686	12/15/97 - 09/30/98																								
13	F. Bierich/5-9686	12/01/97 - 05/29/98																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue:**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

**Key VA Issue
Resolution Plan**

1. **Issue #7:** Confirmation of High Volume and Long Period Waste Handling Capability and DBE Consequence (wet vs dry)

March 11, 1997

Rev. #01A

2. **Assigned to:** **M&O Responsible Individual:** Steven Meyers **Phone:** 5-4392
 DOE Contact: Bernie Verna **Phone:** 4-1374


M&O Manager

 3-12-97
M&O Responsible Individual

3. **Issue Description:**

The repository will annually package about 11,000 commercial spent nuclear fuel assemblies into about 420 large disposal containers. Fuel handling operations at commercial reactors are conducted wet, using pools and readily accessible equipment. It is expected that for the repository the disposal containers will not be loaded in a pool because the presence of water negatively impacts the design of the waste packages. As a result, the waste handling operations are expected to be performed dry in remotely operated hot cells. The technical challenge is designing reliable systems to remotely handle large containers (e.g., 60 tons), and large numbers of spent fuel assemblies.

4. **Describe the current status and the significance of the issue:**

The ACD included dry handling systems to transfer spent fuel assemblies from shipping casks to disposal containers. In this design, 98% of the assemblies remained within MPCs. The VA design will be based on transferring 100% fuel as individual uncanistered assemblies. This will require significantly more transfer operations and higher secondary waste generation rates than in the ACD. Design analyses have not been prepared to establish the type of handling system (i.e., wet or dry) or number of operating lines/stations; demonstrate that the dry design will be reliable, available, and maintainable; or determine the quantity of low-level waste generated from equipment/cell decontamination operations.

5. **Indicate its importance and what effects it will have on a VA:**

Resolution of this issue could significantly impact the size, configuration and operations of the waste handling and secondary waste treatment facilities. VA effects are described in Paragraph 6.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

TSPA is not impacted by this issue. The MGDS cost estimate may be significantly impacted by this issue as the waste handling and secondary waste treatment facilities are cost drivers. LA planning is impacted because the schedule may need to accommodate a dry handling prototype program. This program would be executed during detail design and would be required to lower program risk. The key products required to resolve this issue are design analyses (see Paragraph 7) and drawings (flow, equipment and general arrangement).

7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**

Design analyses will be performed in to establish a defensible basis for the waste handling and secondary waste treatment operations design. A key analysis in early FY97 will select the type of waste handling systems, establish the number operating lines, and size of the in-process staging areas. This analysis will be based on the Revision 4 of the CDA, which assumes: the repository must be capable of emplacing 70,000 MTHM of waste over 24 years starting in 2010, 100% of the

commercial SNF will at times be received as uncanistered fuel or in canisters that are not suitable for disposal, at other times a significant portion of the commercial SNF may be received in disposable canisters, other wastes (will be received in disposable canisters. Other key assumptions used for this analysis include: waste will be received in approximately the same order it is emplaced, empty DPCs will be packaged and shipped off-site for disposal/recycle, and uniformity of waste shipments will be similar to what is found with commercial transportation networks. A waste mix and throughput study will be conducted in mid FY97 by systems to confirm or update the assumptions related to waste receipt form and schedule. The impact of this study on the waste handling facility design will be assessed and if necessary updated. Other key analyses will address failed equipment recovery strategies, waste handling systems design, space allocation, and secondary waste generation and treatment.

This issue will be closed when general arrangements that describe the selected concept are issued.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Finalize Waste Handling Concept (RP2403A2)	Establish the basic concept for the waste handling operations including technology selections, the number of operating trains and capacity of in-process staging areas. Analysis deliverable is due January 30, 1997.	TR46FB2
2	Size Waste Handling Equipment/Areas (RP2403A3)	Prepare flow diagrams, selected equipment drawings, preliminary equipment layout drawings, supporting design analyses, and design description for the waste handling systems. Flow diagram deliverable is due May 30, 1977.	TR46FB2
3	Size Waste Treatment Equipment/Areas (RP2403A5)	Determine the quantity of secondary waste generated, and adjust/add features to minimize waste and the spread of contamination. Flow diagram deliverable with waste rates is due June 30, 1997.	TR46FB2
4	Develop Initial Integrated Facility Layout (RP2403A6)	Develop a preliminary general layout of the Waste Handling Building based on the space requirements and design concept.	TR46FB2
5	Complete Throughput Study (SE200M3)	Confirm or update the Revision 4 of the CDAs related to waste receipt form and schedule.	TR15FB2
6	Provide RAM Support to SRA/Design (SE724700)	Provide Reliability, Availability, and Maintainability (RAM) data and review input.	TR18FA1
7	Prepare Space Summaries and General Arrangements (RP2403A9)	Update the general arrangements, to incorporate revised support area room sizes, structural member sizes, HVAC space requirement, and the results of a RAMI review. GA deliverable is due September 30, 1997.	TR45FB2
8	Complete Design Descriptions (RP2403AA)	Prepare input to SDDs and a letter report that outlines the requirements for prototype testing.	TR46FB2
9	Prepare/Update Configuration Analyses (RP7402A1)	Prepare additional analyses to resolve lower tier issues that are required for LA and will provide additional credibility for VA.	TR46GB3
10	Provide RAM Support to SRA/Design (SE724A)	Provide additional RAMI data and review input.	TR18GA1

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	FY97												FY98											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Meyers/5-4392	10/12/96 - 01/30/97																								
2	Meyers/5-4392	11/18-96 - 04/11/97																								
3	Meyers/5-4392	04/14/97 - 06/13/97																								
4	Meyers/5-4392	06/16/97 - 07/11/97																								
5	Lev/5-4029	10/01/96 - 04/11/97																								
6	Robertson/4-7611	10/01/96 - 09/30/97																								
7	Meyers/5-4392	08/01/97 - 09/30/97																								
8	Meyers/5-4392	04/14/97 - 09/30/97																								
9	Meyers/5-4392	10/01/97 - 03/31/98																								
10	Robertson/4-7611	10/01/97 - 07/26/99																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue:**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

Key VA Issue Resolution Plan

- | | | | |
|----|---|---|----------------------|
| 1. | Issue #8: Disposal of Site Generated Waste | November 6, 1996 | Rev. #01A |
| 2. | Assigned to: | M&O Responsible Individual: Richard Memory | Phone: 4-7247 |
| | | DOE Contact: Bernie Verna | Phone: 4-1374 |

M&O Manager

Richard D. Henry
M&O Responsible Individual

3. **Issue Description:**
This issue deals with the types and quantities of waste expected to be generated during construction and operation of the repository as well as with the disposal location (on-site vs. off-site) of this waste. A feasible plan for disposing of the site-generated waste should be in place by the time of the VA.
4. **Describe the current status and the significance of the issue:**
A draft of REV 03 of the Civilian Radioactive Waste Management System Requirements Document, paragraph 3.2.2 D states that "site generated hazardous, low-level radioactive and mixed waste shall be transported to government-approved off-set facilities for disposal." However, at this time, the off-site location for the site generated waste has not been identified. This issue requires identification of feasible off-site disposal locations for this waste or identification of feasible on-site disposal options. Depending on the quantity of waste generated this issue could have significant impacts on cost, schedule, and/or repository licensing strategy. The resolution of this issue will require working with the licensing, PA, and environmental, safety, and health organizations. The resolution of this issue will support both VA and LA.
5. **Indicate its importance and what effects it will have on a VA:**
This issue is directly related to the cost, license application plan, and design portions of the VA. This is a question that must have a clear plan for resolution by the VA in order to provide closure to this unanswered question.
6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**
The amount of waste generated and the disposal location both have the potential to significantly impact the MGDS cost. Cost may be impacted by waste packaging requirements as well as disposal and/or transportation requirements. If the waste is disposed of on-site, then a new section of the LA plan may be required to address LLW disposal regulations.
7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**
Identify the types and quantify the amounts of wastes that will potentially be generated at the repository for several different waste stream scenarios, identify options for disposal of site-generated waste for each of the scenarios, and evaluating these scenarios in terms of licensing requirements, costs, local government review requirements, schedule, etc. Criteria for resolution closure sufficient for VA will identify viable options for the disposal of the site-generated waste and produce a plan for implementation of those options. This will be completed by October 1997.


8. Describe the steps in a process that the project will use to bring closure on this issue:

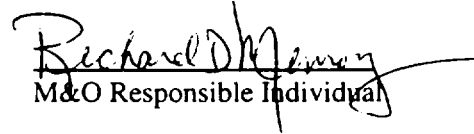
No.	Title	Description	Summary Account #
1	Identify and quantify the types of wastes generated	Using the range of potential waste streams, including anticipated DPCs, identify the types of wastes generated, the quantities and its sources.	Waste Gen Study 97
2	Identify the Options available for disposal	Determine where the waste may be disposed, i.e. on-site, at the NTS, another DOE facility, or a commercial (non DOE) facility. Assess the likelihood of the availability of the off-site disposal options.	Waste Gen Study
3	Identify the regulatory issues associated with each waste type and disposal option	NRC regulates the disposal of LLW on-site per 10CFR60.135(d). DOE regulates the disposal LLW generated at DOE sites. The states are involved in the regulation of mixed and hazardous waste disposal. Document the roles and responsibilities of the potential regulators associated with each disposal option	Waste Gen Study
4	Assess Performance Assessment impacts	Given the potential interaction between the organics in the LLW, mixed, and hazardous wastes and the additional sources of RNs or chemical pollutants determine the feasibility and complexity of developing reasonable assurance arguments for each of the disposal options.	Waste Gen Study
5	Consider Impacts on the Repository EIS	Determine the impacts, in terms of cost, schedule, and content, on the repository EIS.	Waste Gen Study
6	Assess the costs of the disposal options	Determine costs to the repository and to society associated with each of the disposal options.	Waste Gen Study
7	Develop a recommendation	Utilize the information generated to recommend a viable approach for disposal of site generated wastes	Waste Gen Study
8	Develop a plan for implementation	Develop a plan which demonstrate the feasibility of the option(s) recommended.	Waste Gen Plan 98

**Key VA Issue
Resolution Plan**

1. **Issue #9:** Strategy for Mapping Repository Subsurface December 18, 1996 Rev. #01A

2. **Assigned to:** **M&O Responsible Individual:** Richard Memory **Phone:** 4-7247
 DOE Contact: William Boyle **Phone:** 4-5506


M&O Manager


M&O Responsible Individual

3. **Issue Description:**

The extent of geologic mapping of emplacement drift wall surfaces required for performance confirmation activities or for other reasons could significantly impact the design and emplacement method of the emplacement drift ground support system. At this time the amount of drift wall mapping required to satisfy scientific needs, repository construction needs, and regulatory needs has not been determined.

4. **Describe the current status and the significance of the issue:**

The Performance Confirmation Concepts Study made recommendations for the type of parameters that need to be collected during emplacement drift construction and that must be acquired through subsurface geologic mapping. The study recommended a requirement that states "Any ground support system (i.e., shotcrete or concrete) that covers the emplacement drift rock wall surface shall not be installed until after any necessary rock mapping is complete." The amount of mapping that is necessary has yet to be specified. A currently favored method for providing ground support is with the use of a reinforced precast concrete lining. This lining is most economically emplaced immediately after the drift is excavated, allowing no time for geologically mapping the drift walls. If a large portion of the drift walls must be mapped then the advantages of this type of ground support system is reduced and the overall cost of the ground support system could be significantly increased. Interfaces: Resolution of the mapping issue will require interfacing with the scientific programs, licensing, and Performance Assessment organizations.

5. **Indicate its importance and what effects it will have on a VA:**

The amount of mapping that is necessary prior to emplacement of the ground support system could affect the ground control system selected, its cost, its installation, and overall effectiveness. This unresolved issue could have significant impact on the VA MGDS cost estimate and as well as on the VA LA plan.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

This issue ties directly to cost and LA planning, however, it is not expected to affect the post closure performance of the repository.

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA:

The strategy for achieving closure of this issue will be to identify the parameters and features that require observation through geologic mapping. In addition, the exact use to be made of this information will be identified in order to facilitate determination of the incremental value of mapping anywhere from a few drift walls, several drift walls, most of the drift walls, to all of the emplacement drift walls. Finally, a licensing analysis will be conducted in order to identify the anticipated regulatory based mapping requirements. The technical and programmatic requirements will then be considered in the development of a mapping implementation strategy. Closure of the issue deemed sufficient for VA will be the identification of the minimum amount of mapping required to support engineering, scientific, and licensing needs.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Identify Data Needs To Be Acquired by Mapping (SE050710)	Identify those parameters or features which are needed that can be acquired through mapping. Requests for data needs from the following affected organizations will be solicited: Repository Subsurface Design, Site Evaluation, Performance Assessment, and Regulatory and Licensing.	TR15FB1, TR39BFA1D, TR523FA1, TR541FA2
2	Perform a Regulatory and Licensing Analysis to Develop Mapping Design Inputs	An regulatory and licensing analysis will be performed and documented to establish a regulatory and licensing position on mapping requirements as input to a broader analysis considering design, site evaluations, and model verification and performance confirmation.	TR523FA1
3	Establish Current Level of Significance or Confidence in Data Needs (SE050705)	Documentation will be identified or referenced which provide the existing information on the parameters or features to be acquire by mapping. Summaries this information on the parameters and features will be established. An assessment of the significance or level of confidence in the data will be developed.	TR15FB1, TR39BFA1D, TR523FA1, TR541FA2
4	Identify Assumptions and/or Establish Expected Values for Data Needed (SE050705)	Current assumptions or predicted distributions (e.g., expected values and uncertainties) used in design, process modeling, or performance assessments related to the parameters and features will be documented.	TR15FB1, TR39BFA1D, TR523FA1, TR541FA2
5	Establish Confidence Level Needed for Data (SE050710)	A level of confidence in the assumptions or predicted parameter distributions will be established based on sensitivity of the parameters to design or performance.	TR15FB1, TR39BFA1D, TR523FA1, TR541FA2
6	Develop Minimum Mapping Requirements (SE050710)	Establish the minimum mapping requirements based on the current information, assumptions, predictions, and confidence level needed. Consideration of the regulatory and licensing input will be assess to determine the driving requirements.	TR15FB1
7	Develop Mapping Strategy (SE050710)	Develop a strategy for mapping to meet the minimum mapping requirements.	TR15FB1, TR39BFA1D, TR47FB3, TR523FA1, TR541FA2
8	Document Analysis (SE050710)	Document the results.	TR15FB1

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	-----FY97-----												-----FY98-----											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Brent Thomson/4-7708	03/01/97 - 03/14/97																								
2	Ken Ashe/5-5563	03/01/97 - 03/14/97																								
3	Brent Thomson/4-7708	03/07/97 - 03/31/97																								
4	Brent Thomson/4-7708	03/15/97 - 04/07/97																								
5	Brent Thomson/4-7708	03/15/97 - 04/07/97																								
6	Brent Thomson/4-7708	04/07/97 - 04/21/97																								
7	Brent Thomson/4-7708	04/07/97 - 04/21/97																								
8	Brent Thomson/4-7708	04/15/97 - 04/30/97																								

10. Describe a process that will be used to measure performance towards closure:

Performance will be measured by tracking to the schedule identified in item #9 above. As each of the activities is completed the issue will be progressing toward closure sufficient for VA.

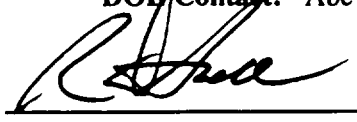
11. Describe how status will be reported during the process of closing this issue:

Status will be reported monthly and as each activity is scheduled for completion. The results of the analysis will be captured in a deliverable document will be produced documenting the outcome of this issue resolution activity at the end of FY97.

**Key VA Issue
Resolution Plan**

1. **Issue #10:** Post Closure Performance Standard April 21, 1997 Rev. #02

2. **Assigned to:** **M&O Responsible Individual:** Hemi Kalia **Phone:** 5-4734
DOE Contact: Abe VanLuik **Phone:** 4-1424



M&O Manager



M&O Responsible Individual

3. **Issue Description:**

Final post closure standards are not available to the Yucca Mountain project. The VA design is based on interim DOE post closure guidance. The DOE guidance may or may not be consistent with the standards to be issued in the future by the EPA. Because of this the VA design and the TSPA are being developed at risk.

4. **Describe the current status and the significance of the issue:**

For the VA design, the Yucca Mountain Project (YMP) is using the Department of Energy (DOE) recommended interim guidance for the postclosure standards. No NRC approved guidelines are available to the DOE. The DOE guidance is a 10,000 year peak dose standard measured against a critical group living 20 to 30 km down gradient from the Yucca Mountain. The guidance also requires that the engineered measures that have the potential of significantly reducing the peak dose, and could be implemented at reasonable cost, be evaluated for possible inclusion in the reference design. Therefore, the VA design is required to carry options for some segments of the design. The VA design should interface with the Performance Assessment organizations, Regulatory and Licensing and Systems engineering.

5. **Indicate its importance and what effects it will have on a VA:**

Because of the lack of final post closure standards, the MGDS design, by necessity, will be based on the DOE Interim guidance. Furthermore the VA design will be required to carry alternate design options for segments of the design most vulnerable to the post closure standards. Any significant change in standards such as from dose to risk base or from 10,000 years to whenever peak occurs or change in location of the focus group from 20-30 km to 5 km such as at the WIPP site could have a significant impact on the VA design.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

The TSPA must evaluate the VA design and its performance consistent with the EPA issued post closure standards. However, since the formal published standards are not available, the TSPA will be based on the interim DOE guidance. Significant deviation from this guidance could result in major impact on the costs. It should have no impact on the LA design. It is assumed that the postclosure standards will have been published by the time the LA design is started.

Depending on when the postclosure standards are published by the accepted by the EPA and adapted by the NRC and they differ from the DOE guidance the impact on the VA may or may not be significant. The overall VA schedule may or may not be impacted. It will depend on the published standards. The MGDS cost estimates will be at risk. The measures required to satisfy the standards may impact the construction schedule for the repository and the emplacement duration thus impacting the overall MGDS costs.

The lack of standards may not impact the LA planning. It is expected that the standards will be published within FY 97. However, should the standard not be released before the LA design is initiated could have some impact on the LA planning.

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA:

Strategy: (1) DOE will continue discussions with the EPA and the NRC to ascertain the most likely date for the release of the post closure standards. These discussions will include the DOE interim guidance that the Project is currently using to get some response as to the acceptability of these standards; (2) the VA design and the PA will be kept apprised of any further developments as the DOE interactions with the EPA and the NRC on the standards, especially if they appear to be substantially different from the interim DOE guidance; (3) the DOE will incorporate into the CDA, as additional consideration, risk base standards and 5 km down stream focused group requirement for the purposes of evaluating their impact on the VA design; (4) to mitigate the impact of any deviation from the DOE guidance, the VA the design will include alternate design concepts for most impacted segments of the design.

Criteria for Closure. 1. Release of post closure standards by the EPA and acceptance of these standards by the NRC will close this issue. 2. In the interim include in the CDA as additional design requirements to consider risk based standard whenever peak occurs and focus group at 5 km down stream from the repository.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Regulatory Review and Consultation	This issue is beyond the control of the Project. The postclosure standards have to be developed by the EPA and provided to the NRC for implementation. Consequently, specific tasks cannot be assigned for its completion. The Project Licensing and Regulatory team keep cognizant of what Regulatory bodies are doing. All that is necessary is to keep the design and the PA team apprised of any major deviations from the DOE guidance, to which the Project is working with. A systems study, "Waste Isolation Requirements Study" will be tracked to identify any potential requirements that may result from this study for the postclosure standards.	TR523FA1 TR523GA1
2	Develop additional Requirements for the CDA	Develop requirements to be added to the CDA to include risk base standards and focus group located at 5 km.	TBD
3	Update CDA to Include Additional Requirements	Incorporate into the CDA information to include risk base standards and focus groups located at 5 km down stream from the repository.	TR12FB2 SE422705
4	Waste Isolation Requirements Study	This study will investigate how the performance should be allocated to various elements of the repository. Primary objective is to consider allocating the performance that will enhance the post closure performance of the repository. Sensitivity analysis will be performed to thoroughly evaluate the performance of various repository elements and their impact on the post closure standards.	TR15FB1 SE440M3

9. Provide a rough schedule of when this issue will be resolved for VA:

			-----FY97-----												-----FY98-----											
			--																							
No	POC (Name/Phone)	Date	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Mike Lugo	10/01/96 - 09/30/97																								
2	H. N. Kalia	02/04/97 - 02/28/97																								
3	Sam Rindskopf	10/01/96 - 03/31/97																								
4	Richard Memory	10/01/96 - 04/01/97																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue:**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

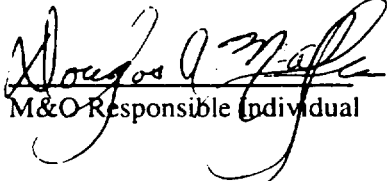
**Key VA Issue
Resolution Plan**

1. **Issue #11:** Viability of Underground Remote Control Concepts January 31, 1997 Rev. #01A

2. **Assigned to:** **M&O Responsible Individual:** Douglas McAfee **Phone:**
 DOE Contact: Paul G. Harrington **Phone:** 5-9656



M&O Manager



M&O Responsible Individual

3. **Issue Description:**

At issue is the feasibility of application of remote control and remote handling technology to subsurface repository operations, including emplacement, performance confirmation, and retrieval, which are characterized by an environment of elevated temperatures, high radiation, confined operating areas, and limited access for maintenance/repair.

4. **Describe the current status and the significance of the issue:**

(1) The repository design concept relies on the successful implementation of remote systems for WP emplacement, performance confirmation monitoring and WP retrieval. Due to elevated temperatures and high radiation, emplacement drifts will be off-limits to humans and all activities inside these drifts will need to be by remotely controlled systems. (2) Preliminary studies, technology reviews, and design analyses have been performed. (3) Initial design strategies and design concepts are being developed and investigated. (4) Key remote system technologies, such as remote communications and mobile power sources are being evaluated. (5) Current evaluations are seeking to determine the viability of developing remote systems that can be used in 200 °C performance confirmation environments.

5. **Indicate its importance and what effects it will have on a VA:**

Reliance on remotely controlled and operated systems will be an important aspect of the repository concept of operations. Emplacement drifts will eventually constitute over 90% of the subsurface area and no human entry is planned in emplacement drifts while waste packages are present. Developing viable and defensible conceptual designs for remote operation within the emplacement drifts is critical during the VA. Repository viability will consider the viability of design concepts for emplacement, monitoring and response to off-normal events.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

(1) TSPA - remote systems will be required to gather data parameters used to confirm short and long term performance of the repository and engineered barriers. (2) MGDS Cost Estimates - Development, fabrication, installation, testing and operation of robust and highly reliable remote systems for emplacement and performance confirmation activities will affect total costs by more than \$250 M. (3) LA Planning - Due to the unique nature of the equipment, special consideration will likely be needed for approval of remote systems. Conceptual designs will need to adequately address issues such as: functionality, reliability, maintainability, survivability, and personnel safety.

7. Describe the strategy and criteria for achieving a degree of closure sufficient for VA:

The strategy to resolve this issue is to: (1) Narrow and document design concepts to a single VA concept. (2) Evaluate and develop CDA assumptions to be used for the VA. The assumptions will clearly define the VA design basis and any alternatives that must not be precluded. The CDA assumptions will be developed using available data and documented and TBV'd as necessary. (3) Obtain E&I Management approval of the assumptions. (4) Work the issues and update the documentation. (5) Maintain flexibility throughout the design process. (6) To enhance confidence in design concepts, design analyses will be completed that address viability of key remote control technologies in elevated thermal and radiation environments. (7) Remote system concepts will be evaluated for maintainability, reliability, and recovery from off-normal scenarios.

Closure for VA will be demonstrated by an analytical basis for the remote control concepts chosen. A series of analysis will show feasibility of the concept by addressing the level of development and maturity of the technology for its intended application.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Develop Remote Monitoring Concepts for Performance Confirmation RP120M3F	Complete a review of available technology for PC environment. Establish the basic design concept for remote monitoring and data acquisition. Provide general equipment descriptions and performance characteristics. Analysis and drawings will be completed by April 1, 1997	TR47FBJ
2	Refine Remote Control Concepts for Emplacement Systems RP502M3	Refine remote control and communication concepts for emplacement systems such as the Emplacement Gantry, WP Transporter, and support equipment. Provide general equipment descriptions and performance characteristics. Analysis and drawings will be completed by Sept, 1997	TR47FB6
3	Develop Electrification Design Concepts of Subsurface Rail Vehicles RP502705	Analyze and establish electrification technology for mobile-remote systems. Analysis and drawings will be completed by April, 1997	TR47FB6
4	Refine Remote Control Concepts for Waste Package Retrieval Equipment RP504M3	Refine remote control concepts for normal and off-normal retrieval operations. Analysis and drawings will be completed by Aug 29, 1997	TR47FBA
5	Evaluations of Key Technologies RP170A	Focused technology evaluations to resolve lower tier design issues that are required for LA will be started in FY'98. Initial test results will be available by March, 1998 and will provide additional credibility for VA design issues.	TR47GBJ
6	Evaluate and Develop new CDA	Evaluate alternative remote control concepts for Performance Confirmation and Retrieval VA design basis. Develop and define new CDA.	TBD

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	-----FY97-----												-----FY98-----											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	McAffee/5-4491	10/01/96 - 04/01/96																								
2	McAffee/5-4491	10/01/96 - 09/30/97																								
3	Fernandez/4310	10/01/96 - 06/31/97																								
4	McAffee/5-4491	10/01/96 - 09/01/97																								
5	McAffee/5-4491	10/01/97 - 03/01/98																								
6	McAffee/5-4491	02/01/97 - 04/30/97																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue.**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.


**Key VA Issue
Resolution Plan**

1. **Issue #12: Burnup Credit** December 14, 1996 Rev. #01A

2. **Assigned to:** **M&O Responsible Individual:** Peter Hastings **Phone:** 4-1946
DOE Contact: Paige Russell **Phone:** 4-1315



M&O Manager



M&O Responsible Individual

3. **Issue Description:**

NRC has not approved methodologies for burnup credit (i.e., accounting for reduced reactivity of spent fuel as compared with fresh fuel). It is not clear that the OCRWM program has a consistent position on requesting consideration of burnup credit as part of a license application from NRC.

4. **Describe the current status and the significance of the issue:**

MGDS has developed the *Disposal Criticality Analysis Technical Report* (September 1996); OWAST has developed a similar report that describes a different methodology. Issue has potential to create competing licenses between OWAST (for storage and transportation) and MGDS.

5. **Indicate its importance and what effects it will have on a VA:**

Without an approved burnup credit methodology, waste packages may be limited to fewer assemblies, thereby requiring more packages and a larger emplacement area. In addition, different methodologies (i.e., between OWAST and MGDS) could result in confusion between licenses, or impacts to allowable reactivity margin on the "less conservative" of the two approaches (i.e., potential for less credit at MGDS for disposal). Potential impact on VA is primarily associated with cost of disposal.

6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**

Issue is not closely associated with TSPA, except inasmuch as postclosure performance assumes a given reactivity inventory. MGDS cost estimate will be potentially impacted by number of required waste packages (via waste package utilization as a function of allowed burnup credit). LA planning is affected by interactions with NRC on technical exchanges, Topical Reports and SERs, and extent of agreement with methodology in advance of LA submittal.

7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**

- Outline schedules and links for (1) submittal, NRC review, and resolution of comments for the OWAST Topical Report on Actinide-Only (AO) burnup credit for storage and transportation, (2) preparation and submittal of follow-on OWAST Topical Report for Principal Isotope (PI) burnup credit, and (3) preparation of an MGDS Topical Report on PI burnup credit.
- Summarize key technical differences between OWAST and MGDS approaches, describe interface issues between methodologies, and propose approach for integration of methods (may range from combining methods in common approach for single NRC submittal to complete separation of approaches and addressing interface only between license/certification applications), including assessment of cost impact and licensing risk.

The specific criteria for determining the sufficiency of the methodology for viability assessment is:

- 1) NRC staff has not identified any major technical topic that would preclude acceptance of the methodology, including risk-based approach.
- 2) NRC does not indicate that burnup credit is infeasible.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	M&O/DOE concurrence	Confirm extent of design and TSPA impact (i.e., concurrence with issue resolution) and link with VA issue #3 (criticality control), and document potential impact on criticality control methods and VA-level design	TR11FA2
2	Evaluate commercial status	Identify commercial analogs for burnup credit and status of utility efforts	TR11FA2
3	Identify schedule links	Identify and summarize related activities and links from FY97/98 schedule; include identification of anticipated milestones associated with NRC review and comment	TR11FA2
4	Evaluate technical differences in approaches	Develop executive summary of technical differences between approaches; analytical interfaces or disconnects between methodologies; and impacts of use of one methodology versus another, including impacts to physical interfaces or regulatory risk (i.e., one regulator reviewing different methods for dealing with the same issue from the same licensee)	TR11FA2
5	Implementation	Implement strategy as part of criticality control issue	TR11FA2, TR233FB9

9. Provide a rough schedule of when this issue will be resolved for VA:

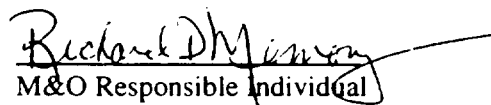
No	POC (Name/Phone)	Date	-----FY97-----												-----FY98-----											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	Hastings/5-3961	12/05/96 - 12/20/96																								
2	Hastings/5-3961	01/06/97 - 01/31/97																								
3	Hastings/5-3961	04/01/97 - 04/04/97																								
4	Hastings/5-3961	04/01/97 - 05/16/97																								
5	Benton/4-1891	10/01/96 - 09/04/97																								

10. **Describe a process that will be used to measure performance towards closure:**
Performance will be measured in accordance with the process documented in the VA Monitoring Plan.
11. **Describe how status will be reported during the process of closing this issue:**
Status will be reported in accordance with the process documented in the VA Monitoring Plan.

Key VA Issue Resolution Plan

1. **Issue #13:** Repository Seals Requirements and Concepts February 3, 1997 Rev. #01A
2. **Assigned to:** **M&O Responsible Individual:** Richard Memory **Phone:** 5-3938
DOE Contact: Paul Harrington **Phone:** 4-5415


M&O Manager


M&O Responsible Individual

3. **Issue Description:**
Establish requirements for permanent sealing of boreholes, ramps, and shafts. The challenge of this issue is to identify the proper requirements for the repository seals. The objective of sealing these openings is to prevent the creation of preferential pathways allowing significant amounts of surface or ground water from reaching emplaced waste, and to prevent significant amounts of gaseous radionuclides from escaping through these artificially created preferential pathways to the accessible environment. The seals need not provide any greater performance than would have been provided by the mountain had the boreholes, ramps, and shafts not been created.
4. **Describe the current status and the significance of the issue:**
Sealing of abandoned boreholes and shafts is required by state of Nevada laws. The federal regulations (10 CFR 60 with further guidance in NUREG-1373) requires that sealing be done so that the ability to isolate radioactive wastes will not be degraded. A significant amount of effort was done on this problem in the 1984 to 1991 time frame to evaluate the technical aspects of sealing and sealing material performance. The results of these studies indicate that available technology exists to seal boreholes and a variety of materials can be used. The sealing methodology and evaluation of performance will be an important issue in License Application and it needs to be incorporated into the designs. Interfaces: Resolution of this issue will require interfacing with the Performance Assessment and scientific programs organizations.
5. **Indicate its importance and what effects it will have on a VA:**
The VA design will need to incorporate a sealing plan as part of the overall design of the subsurface system and the license application plan. In order to develop this sealing plan requirements on which to base this design must be developed.
6. **Describe how the issue ties to the TSPA, MGDS cost estimate, and LA planning:**
The presence and type of seals must be considered in the TSPA work. The MGDS cost estimate will need this information since the costs will depend on whether or not a fairly costly sealing methodology is needed or whether much less costly methodologies would be adequate. In addition to the above, it will be necessary to define what set of testing is needed to support the sealing methods in LA and this will need to be incorporated in the LA planning.
7. **Describe the strategy and criteria for achieving a degree of closure sufficient for VA:**
A study is underway to evaluate the issues related to seals and to develop recommendations for sealing requirements. This study will first examine performance issues to determine what performance the seals must achieve. The latest site information will be used in this evaluation. Secondly the study will examine whether or not the sealing methodology recommended meets the expectations in the regulatory guidance. Seals should not need to be any more sophisticated than what is necessary to achieve the desired performance, including longevity. If the recommended

methodology is not in keeping with the regulatory expectations then it may be necessary to conduct discussions with the NRC. Additionally, there will likely need to be some testing prior to LA and some testing during performance confirmation. Closure of this issue sufficient for VA will be the identification of what the seals need to do (considering technical and regulatory concerns) and recommendations produced in the study (completion April 30, 1997) for requirements as to what to seal, how to seal, and when to seal. Based on the requirements established, design will produce sealing designs which will be completed in February 1988 to support VA. Any testing recommendations to support LA will be incorporated in test plans.

8. Describe the steps in a process that the project will use to bring closure on this issue:

No.	Title	Description	Summary Account #
1	Identify sealing options	Using previous studies and current information, the options for sealing boreholes, shafts, and ramps will be identified.	97 Seals Study SE506705
2	Establish evaluation criteria	The evaluation criteria that will be used to evaluate the various sealing options will be established.	97 Seals study SE506715
3	Conduct performance analysis	Performance assessments will be done to evaluate the need for seals and the performance that those seals must have.	97 Seals Study SLSE5061
4	Evaluate sealing requirements options	Utilize the performance assessments and the criteria established to identify the sealing performance that must be achieved.	97 Seals Study SE506720
5	Develop recommendation for sealing	The study will develop a recommendation for requirements to seal the boreholes, shafts, and ramps.	97 Seals Study SE506M3
6	Establish requirements	Establish requirements in the Controlled Design Assumptions Document.	Requirements SE530800
7	Produce VA sealing design	Preliminary designs will be developed for VA for sealing the boreholes, shafts, and ramps which meet the criteria established.	Seals/decom-missioning RP47954

9. Provide a rough schedule of when this issue will be resolved for VA:

No	POC (Name/Phone)	Date	-----FY97-----												-----FY98-----											
			O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
1	J. Fernandez	11/15/96-12/30/96																								
2	S. Saterlie	12/31/96-2/13/97																								
3	J. Fernandez	12/21/96-3/30/97																								
4	S. Saterlie	2/14/96-4/30/97																								
5	S. Saterlie	4/1/97-5/30/97																								
6	B. Thom	6/1/97-9/30/97																								
7	K. Bhattacharyya	10/1/97-2/27/98																								

10. Describe a process that will be used to measure performance towards closure:

Performance will be measured by tracking to the schedule identified in item #9 above. As each of the activities is completed the issue will be progressing toward closure sufficient for VA.

11. Describe how status will be reported during the process of closing this issue:

Status will be reported monthly and as each activity is scheduled for completion. A deliverable document will be produced documenting the outcome of the system study in May 1997, the CDA will be updated in September 1997, and designs will be included in the VA design in 1998.

APPENDIX C

WASTE PACKAGE DEVELOPMENT AND MATERIALS PRODUCTS

The data contained in this appendix reflects the status of the Yucca Mountain Site Characterization Project as of 12/16/96. Because of the evolving conditions of the Yucca Mountain Site Characterization Project, data in this appendix is changed or updated as necessary. However, this VA Design and Review Plan will not be revised or reissued as a result of data updates. For a current status of the data in this appendix and/or a copy of the current version, contact C. Chagnon. For suggested changes to the contents, contact A. Segrest.

WASTE PACKAGE DEVELOPMENT AND MATERIALS PRODUCTS

A list of products to be developed by the Waste Package Development and Materials Products organization is provided. The planning and summary account number, summary account number, work breakdown structure, and activity number are provided for each product. If the product is part of a deliverable, the deliverable number is provided. The product type and the estimated end date are also provided. If the product is directly related to any of the four VA components, that information is also provided.

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.1	TR21FA5	WP21702	12-Sep-97	Statement that the EBS/WP Phase I design work is done	WP21704	Ltr				
1.2.2.2	TR22FA1	WP22FA1	30-Sep-97	Initial engineering file for Waste Package and EBS		IOC				
				Final engineering file for Waste Package and EBS		IOC				
	TR22FA5	WP22FA5	30-Dec-97	WP Heat Evaluation Large Scale Thermal Analysis		Anal	X			
				Engineering sketches for WP heat evaluation large scale thermal analysis		IOC	X			
				Design input sheets for WP heat evaluation large scale thermal analysis		IOC	X			
	TR22FB2	WP220724	31-Mar-97	Documentation of available data and models for cladding degradation		IOC		X		
		WP220728	31-Jul-97	Statement of design basis cladding		IOC		X		
	TR22FB3	WP220733	17-Mar-97	Revised WP Off-Normal and Accident Scenario Report		Tech Doc	X	X		
		WP220731	01-Apr-97	Estimate of frequency of MGDS DBEs		Ltr Rept	X	X		
		WP220736	01-Jul-97	Identification of which WPs need DBE design analysis		Ltr Rept	X			
		WP220737	30-Sep-97	Definition of WP DBE parameters evaluation		Ltr Rept	X	X		
	TR22FB4	WP220756	01-Apr-97	Documentation of candidate materials and reference materials for EBS		IOC	X	X		X
		WP220752	15-Aug-97	EBS/WP Materials Selection Analysis	WP220754	Anal	X	X		X
	TR22FB5	WP220764	29-Jul-98	Description of effects of near field environment on degradation of EBS		IOC		X		
	TR22FB6	WP220701	30-Sep-97	WBS 1.2.2 WPD writeups for PR #16		IOC				
				WBS 1.2.2 WPD writeups for PR #17		IOC				
		WP220711	30-Sep-97	Comments on issues raised during reviews of PR #15		IOC				
				Comments on issues raised during reviews of PR #16		IOC				
1.2.2.3.3	TR233FB1	WP233703	13-Dec-96	Parts List for 21 PWR UCF Disposal Container	WP233735	Ltr	X			
				Parts List for 12 PWR UCF Disposal Container	WP233735	Ltr	X			
				Parts List for 44 BWR UCF Disposal Container	WP233735	Ltr	X			

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.3.3 Cont'd	TR233FB3 Cont'd	WP233703 Cont'd		Parts List for 4 Pack DHLW Disposal Container	WP233735	Ltr	X			
				Parts List for 5 Pack DHLW Disposal Container	WP233735	Ltr	X			
		WP233738	20-Sep-97	Sketch for closure weld mockup		IOC	X			
		WP233730	30-Jun-97	21 PWR UCF disposal container overall drawing		Dwg	X	X		X
				21 PWR UCF disposal container outer barrier drawing		Dwg	X	X		X
				21 PWR UCF disposal container inner barrier drawing		Dwg	X	X		X
				21 PWR UCF disposal container internals drawing		Dwg	X	X		X
				12 PWR UCF disposal container overall drawing		Dwg	X	X		X
				12 PWR UCF disposal container outer barrier drawing		Dwg	X	X		X
				12 PWR UCF disposal container inner barrier drawing		Dwg	X	X		X
				12 PWR UCF disposal container internals drawing		Dwg	X	X		X
				44 BWR UCF disposal container overall drawing		Dwg	X	X		X
				44 BWR UCF disposal container outer barrier drawing		Dwg	X	X		X
				44 BWR UCF disposal container inner barrier drawing		Dwg	X	X		X
				44 BWR UCF disposal container internals drawing		Dwg	X	X		X
				4 Pack DHLW disposal container overall drawing		Dwg	X	X		X
				4 Pack DHLW disposal container outer barrier drawing		Dwg	X	X		X
				4 Pack DHLW disposal container inner barrier drawing		Dwg	X	X		X
				4 Pack DHLW disposal container internals drawing		Dwg	X	X		X
				5 Pack DHLW disposal container overall drawing		Dwg	X	X		X
				5 Pack DHLW disposal container outer barrier drawing		Dwg	X	X		X
				5 Pack DHLW disposal container inner barrier drawing		Dwg	X	X		X

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.3.3 Cont'd	TR233FB3 Cont'd	WP233730 Cont'd		5 Pack DHLW disposal container internals drawing		Dwg	X	X		X
	TR233FB2	WP233745	28-Feb-97	Identification of prior analyses/configurations needing refinement/update		Ltr Rept	X	X		
		WP233746	06-Jun-97	Internal WP Criticality 3rd Probabilistic Analysis		Anal	X	X		
		WP233753	16-Sep-97	WP Probabilistic Criticality Analysis	WP233755	Anal	X	X		
		WP233752	06-Jun-97	External Criticality 2nd Probabilistic Analysis		Anal	X	X		
	TR233FB3	WP233756	31-Mar-97	Draft design sections for the non-fuel components waste container SDD		IOC	X			
				Draft design sections for the waste package supports SDD		IOC	X			
				Draft design sections for the UCF waste container SDD		IOC	X			
		WP233758	30-Sep-97	Final design sections for the non-fuel components waste container SDD		IOC	X			
				Final design sections for the UCF waste container SDD		IOC	X			
				Final design sections for the waste package supports SDD		IOC	X			
	TR233FB5	WP233712	30-Sep-97	Study of benefits of additional barriers and material selection recommendations		Ltr Rept	X			X
		WP233714	30-Sep-97	Engineering sketch package for additional barriers evaluations		IOC	X			X
	TR233FB6	WP233702	28-Mar-97	WP Support and Pier Static Analysis		Anal	X	X		
				WP Support and Pier Seismic/Vibration Loading Analysis		Anal	X	X		
				WP Support and Pier 21 PWR Drop Onto Support Analysis		Anal	X	X		
				Design input sheets for WP support and pier design analyses		IOC	X			
				EBS Temperature Distributions Thermal Analysis		Anal	X	X		
				EBS Emplacement Scale Thermal Update Analysis		Anal	X	X		
				Design input sheets for EBS thermal analyses analyses		IOC	X			
				Primary PWR Waste Package Thermal Analysis		Anal	X	X		
				Primary BWR Waste Package Thermal Analysis		Anal	X	X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.3.3 Cont'd	TR233FB6 Cont'd	WP233710	30-Sep-97	Engineering sketches for WP support and pier design analyses		IOC	X			X
				Engineering sketches for EBS thermal analyses		IOC	X			X
	TR233FB7	WP233A29	01-Jul-97	Secondary PWR Waste Package Thermal Analysis		Anal	X	X		
				Multiple WP Emplacement Scale Thermal Analysis		Anal	X	X		
	WP233A30	30-Sep-97		UCF WP Static Loads, Thermal Expansion Loads, and Internal Pressure Analysis		Anal	X	X		
				UCF Waste Package 2-meter Drop Analysis		Anal	X	X		
				WP Handling/Lifting Analysis		Anal	X	X		
				UCF WP Slap Down Related Events Analysis		Anal	X	X		
				UCF WP 21 PWR Response to Slap Down Analysis		Anal	X	X		
				Statement of WP residual stresses for welding		Ltr Rept	X	X		
				UCF WP Basket Assembly Analysis		Anal	X	X		
				Missile from Failure of Pressurized Component DBE Analysis		Anal	X	X		
	WP233A32	09-Apr-97		WP Design Basis Fuel Analysis		Anal	X	X		
				Waste Package Design Basis Fuel Analyses		Anal	X	X		
				UCF WP Criticality Analysis		Anal	X	X		
				UCF WP PWR, BWR and DHLW Source Term Analysis		Anal	X	X		
				WP Radiolysis /Shielding Analysis		Anal	X	X		
	WP23A34	09-Apr-97		Design input sheets for UCF WP slap down evaluations		IOC	X			
				Design input sheets for primary and secondary WP thermal analyses analyses		IOC	X			
				Design input sheets for WP DBE static evaluations		IOC	X			
				Design input sheets for UCF WP static evaluations		IOC	X			
				Design input sheets for UCF WP drop evaluations		IOC	X			

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.3.3 Cont'd	TR233FB7 Cont'd	WP233A34 Cont'd		Design input sheets for UCF WP miscellaneous components evaluations		IOC	X			
		WP233A36	30-Sep-97	Engineering sketches for primary and secondary WP thermal analyses		IOC	X			
				Engineering sketches for UCF WP drop evaluations		IOC	X			
				Engineering sketches for UCF WP miscellaneous component evaluations		IOC	X			
				Engineering sketches for UCF WP slap down evaluations		IOC	X			
				Engineering sketches for UCF WP static evaluations		IOC	X			
				Engineering sketches for WP DBE evaluations		IOC	X			
	TR233FB8	WP233782	13-Dec-96	List of available computer codes acquired		IOC	X			
		WP233786	12-Mar-97	Consequence model algorithms & codes		Ltr Rept	X	X		
		WP233784	14-May-97	Criticality consequence model		Ltr Rept	X	X		
	TR233FB9	WP233784	04-Sep-97	Disposal Criticality Technical Report, Rev. 1	WP150A3	Tech Doc	X	X	X	
	TR233FBC	WP233790	19-Dec-96	Algorithms and codes for identifying critical configurations		Ltr Rept	X	X		
		WP233792	01-May-97	Probabilistic criticality methodology		Ltr Rept	X	X		
	TR233FBE	WP233A02	28-Mar-97	PWR CRC Reactivity Analysis		Anal	X	X		
				BWR CRC Isotopic Analysis		Anal	X	X		
				PWR Isotopic Concentration Analysis		Anal	X	X		
				BWR CRC Reactivity Analysis		Anal	X	X		
				BWR Isotopic Concentration Analysis		Anal	X	X		
				PWR CRC Isotopic Analysis		Anal	X	X		
		WP233A06	28-Mar-97	Results of benchmark critical evaluations		Tech Doc	X	X		
				Benchmark Critical Analysis		Anal	X	X		
		WP233A18	13-Dec-97	Summary of BWR CRC data		Tech Doc	X	X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.3.3 Cont'd	TR233FBE Cont'd	WP233A18 Cont'd		Summary of PWR CRC data		Tech Doc	X	X		
1.2.2.3.4	TR234FB1	WP234702	30-Sep-97	Cost estimates for disposal containers		IOC				X
				Cost estimates for pedestal and supports		IOC				X
				Cost estimate for closure weld equipment		IOC				X
	TR234FB2	WP234708	18-Dec-96	Closure weld Technical Guidelines Document		Tech Doc	X			
				TDPP for closure weld TGD		IOC	X			
		WP234715	24-Mar-97	Closure weld mockup for NDE testing		Hardware	X			
		WP234720	29-Aug-97	WP Closure Methods Report	WP234721	Tech Doc	X			
				TDPP for WP Closure Methods Report		IOC	X			
		WP234722	30-Dec-96	Weld equipment envelope		IOC	X			
		WP234724	30-Sep-97	Weld equipment envelope update		IOC	X			
	TR234FB3	WP234727	13-Dec-96	TDPP for NDE Technical Guidelines Document		IOC	X			
				NDE Technical Guidelines Document		Tech Doc	X			
		WP234734	15-Sep-97	TDPP for WP NDE Methods Report		IOC	X			
				WP NDE Methods Report	WP234736	Tech Doc	X			X
	TR234FB4	WP234738	30-Sep-97	Package of 5 fabrication sketches		IOC	X			X
		WP234740	29-Aug-97	Fabrication Report		Ltr Rpt	X			X
1.2.2.4.1	TR241FB2	WP035A3	08-Apr-97	Waste Forms Characteristics Report	WP035A3	Tech Doc	X	X		
		WP35A05	22-Jan-97	WFCR Rev 1 Draft to Performance. Assess.		Draft Rpt.		X		
		WP35A07	26-Feb-97	Draft WFCR Rev 1 to YMSCO for Review		Draft Rpt.		X		
	TR241FB4	WP08522	15-Nov-96	TGA Oxidation Data to Oxidation Models		IOC		X		
		WP08523	02-Dec-96	Input to Models, GENISIS		IOC		X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.4.1 Cont'd	TR241FB4 Cont'd	WP08524	02-Dec-96	TGA Oxidation Test Data to GENESIS		IOC		X		
		WP08525A	12-Dec-96	Oxidation Test WFCR Rev 1 Chapter		IOC		X		
		WP08527	12-Jun-97	TGA Oxidation Test Data to Oxidation Mod		IOC		X		
	TR241FB5	WP085301	15-Nov-96	SF Diss Flow Thru Data to Models		IOC		X		
		WP085302	02-Dec-96	SF Diss Flow Thru Test Data to GENESIS		IOC		X		
		WP085305	25-Jun-97	SF Diss Flow Thru Test Data to Models		IOC		X		
		WP085303A	20-Dec-96	SF Diss Flow Thru Test Chap to WFCR-R1		IOC		X		
	TR241FB6	WP0862A	13-Jun-97	Spent Fuel ATM Procurement Report	WP0862A	Ltr Report		X		
	TR241FB9	WP122401	12-Dec-96	Waste Form Model Chap to WFCR-R1		IOC		X		
		WP122403	25-Jun-97	Response Models Results to PA		IOC		X		
	TR241FBA	WP122201	15-Nov-96	Unsaturation SF Drip Data to Models		IOC		X		
		WP122202	13-Dec-96	Unsaturation SF Drip Test Data to GENESIS		IOC		X		
		WP122205	25-Jun-97	Unsaturation SF Drip Test Data to Models		IOC		X		
	TR241FBB	WP122101	15-Nov-96	Dry Bath Oxidation. Data to SF Oxidation Model		IOC		X		
		WP122102	16-Dec-96	Dry Bath Oxidation Data to GENESIS		IOC		X		
		WP122105	25-Jun-97	Dry Bath Oxidation Data to Oxidation Mod		IOC		X		
	TR241GB2	WP110A05	29-Jul-96	Provide WFCR Rev 2 Draft to Performance. Assess.		IOC		X		
		WP110A07	22-Sep-96	WFCR Rev 2 to YMSCO for Review		IOC		X		
		WP110A3	27-Oct-96	Waste Form Char. Report. Rev 2		IOC		X		
	TR241GB3	WP08567	23-Dec-97	Activity Plan		Tech. Doc.		X		
		WP08572A	21-May-96	SF C-14 Release Data to GENESIS		IOC		X		
		WP08574	31-Jul-96	SF C-14 Release Test Data Report/WFCR2		IOC		X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.4.1 Cont'd	TR241GB4	WP08529	29-May-98	TGA Oxidation Data to Oxidation Models		IOC		X		
		WP08534	30-Jun-98	TGA Oxidation Chapter to WFCR Rev 2		IOC		X		
	TR241GB5	WP085307	11-Jun-98	SF Diss Flow Thru Data to Models		IOC		X		
		WP085309	14-Jul-98	SF Diss Flow Thru Chapter to WFCR Rev 2		IOC		X		
		WP085311	11-Jun-98	SF Diss Flow Thru Test Data to Models		IOC		X		
	TR241GB6	WP08552	30-Sep-98	SF Hardware Release Test Report		Tech Doc		X		
	TR241GB8	WP08616	30-Jun-98	Letter Report to YMSCO	WP08616	Ltr report		X		
	TR241GB9	WP122408	31-Aug-98	Response Model to PA & WFCR-Rev 2		IOC		X		
	TR241GBA	WP122207	11-Jun-98	Unsaturated SF Drip Data to Models		IOC		X		
		WP122209	14-Jul-98	Drip Test Chapter to WFCR Rev 2		IOC		X		
		WP122211	14-Oct-98	Unsaturated SF Drip test Data to Models		IOC		X		
	TR241GBB	WP122107	11-Jun-98	Dry Bath Data to Oxidation Models		IOC		X		
		WP122109	14-Jul-98	Dry Bath Oxidation Chap to WFCR Rev 2		IOC		X		
		WP122111	30-Sep-98	Dry Bath Data to Oxidation Models		IOC		X		
	TR241GBC	WP241800	30-Jan-98	Activity Plan		Tech Doc		X		
1.2.2.4.2	TR242FB1	WP085600	31-Jan-97	Activity Plan		Tech Doc		X		
	TR242FB2	WP122301	15-Nov-98	HLWG Drip Data to Models		IOC		X		
		WP122302	02-Dec-98	Unsaturated HLWG Drip Test Data to GENISIS		IOC		X		
		WP122307	12-Jun-97	HLWG Drip Test Data to Models		IOC		X		
	TR242FB3	WP085101	12-Dec-98	HWG Dissolution Rate Model Chap to WFCR-R1		IOC		X		
		WP085103	13-Jun-97	HWG Dissolution Rate Model Results to PA		IOC		X		
	TR242GB1	WP085620	30-Jun-98	HLWG Flow Thru Test Chap to WFCR Rev 2		IOC		X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.4.2 Cont'd	TR242GB1 Cont'd	WP085625	29-Jan-99	HLWG Flow Thru Test Data to Models		IOC		X		
		WP085630	30-Nov-98	Data to Model		IOC		X		
		WP085631	29-Dec-98	Data to GENESIS		IOC		X		
	TR242GB2	WP122309	09-Apr-98	HLWG Drip Test Chapter to WFCR Rev 2		IOC		X		
		WP122311	10-Jul-98	HLWG Drip Test Data to Models		IOC		X		
	TR242GB3	WP085105	29-Jun-98	HWG Dissolution Rate Model Results/WFCR-R2		IOC		X		
		WP085106	29-Jun-98	HWG Dissolution Rate Model Results to PA		IOC		X		
1.2.2.5.1	TR251FB1	WP26708	16-Jan-97	Statement of Initiation of Abiotic & Biotic MIC tests	WP26708	Ltr report		X		
		WP26709	31-Jul-97	MIC Data Input Update to PA		IOC		X		
		WP26713	16-Jan-97	MIC Data Input to PA		IOC		X		
	TR251FB4	WP26305	29-Aug-97	Critical Pot. Measurement Update Data to PA		IOC		X		
		WP26309	15-Jan-97	Critical. Pot. Measurements Data to PA(1)		IOC		X		
	TR251FB5	WP26505	15-Jan-97	Thermogravimetric Anal. Data to PA		IOC		X		
		WP26506	30-Sep-97	Thermogravimetric Anal Update to PA		IOC		X		
	TR251FB7	WP26203	14-Jan-97	Critical Potential Test Data to PA		IOC		X		
		WP26204	31-Jul-97	Diff Area Ratios Test Update Data to PA		IOC		X		
	TR251FB9	WP015A3	28-Feb-97	Engineered Materials Characterization Report	WP015A3	Tech Doc		X		
		WP15A05	15-Jan-97	EMCR Rev 1 Draft to Performance. Assess.		IOC		X		
		WP15A10	01-Apr-97	EMCR Rev. 1		Draft Rpt		X		
	TR251FBA	WP26402	10-Feb-97	Statement of initiation of controlled electrochemical potential tests	WP26402	Ltr Report		X		
		WP26403	30-Jun-97	Potential Control Data Update to PA		IOC		X		
		WP26404	16-Jan-97	Potential Control Data to PA		IOC		X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.5.1 Cont'd	TR251FBB	WP60801	11-Aug-97	Startup 3B Tanks	WP60801	Ltr Report		X		
		WP60801A	30-Jul-97	Statement of Initiation of LT galvanic corrosion testing	WP60801A	Ltr Report		X		
	TR251FBC	WP60703A	16-Jan-97	Letter Rep Initiation of Crack Growth Rate Testing	WP60703A	LTR		X		
		WP60705B	30-Jun-97	Data to PA		IOC		X		
	TR251FBE	WP60504	18-Jul-97	Crevice Corrosion Data to PA		IOC		X		
		WP60506	30-Sep-97	Prelim SCC/HE Model Info to EMCR-R2		IOC		X		
		WP60508	30-Sep-97	SCC/HE/Prelim. Galvanic. Corrosion. Model Data to PA		IOC		X		
	TR251FBG	WP60103	31-Mar-97	1st Tanks 1st Specimen Results to PA		IOC		X		
		WP60107	30-May-97	1st Specimen (1st Tanks) Report to EMCR-R2		IOC		X		
		WP60116	08-Jul-97	Startup 2A Tanks	WP60116	LTR		X		
		WP60118	08-Jul-97	Startup 2B Tanks	WP60118	LTR		X		
	TR251FBH	WP61607	13-Jan-97	Initiation of Rel Humidity Chamber Corrosion Tests	WP61607	LTR		X		
		WP61613	30-Jul-97	1st Batch Report to PA		IOC		X		
	TR251FBK	WP26904	31-Jul-97	Data input to PA		IOC		X		
	TR251GB2	WP20A01	30-Oct-96	EMCR Rev 2 Prelim Draft		IOC		X		
		WP20A04	02-Dec-96	EMCR Rev 2 Draft to Performance. Assess.		IOC		X		
		WP27005	31-Aug-96	Input to EMCR-R2		IOC		X		
	TR251GB4	WP26303	31-Jul-96	Critical. Pot. Measurements Report. to EMCR-R2		IOC		X		
	TR251GB5	WP26511	30-Sep-96	Input to EMCR Rev. 2		IOC		X		
	TR251GB6	WP25810	30-Sep-96	Input to EMCR-R2 2		IOC		X		
	TR251GB7	WP25206	30-Sep-96	Input EMCR-R2		IOC		X		
		WP26209	29-Sep-96	Data to Model Activity		IOC		X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.5.1 Cont'd	TR251GB8	WP25860	30-Sep-98	Results to EMCR Rev 2		IOC		X		
	TR251GBA	WP60908	31-Jul-98	Electrochemical Potential Report to EMCR-R2		IOC		X		
	TR251GBB	WP60810	05-Dec-97	3rd Tank/1st Batch Report to EMCR-R2		IOC		X		
	TR251GBC	WP60707	31-Aug-88	Self Loaded SCC Growth Report to EMCR-R2		IOC		X		
	TR251GBD	WP26826	30-Sep-98	Input to EMCR-R2		IOC		X		
		WP26829	04-Dec-97	Data to Performance Assessment		IOC		X		
		WP26831	30-Mar-98	Planning Input to Longer Term Testing		IOC		X		
		WP26833	30-Sep-98	Additional Input to Near Field environment		IOC		X		
	TR251GBE	WP60503	20-Jul-98	Preliminary Crevice Corrosion Update to EMCR-R2		IOC		X		
		WP60516	27-Jul-98	Preliminary Galvanic Corrosion Info to EMCR-R2		IOC		X		
		WP60518	27-Jul-98	Preliminary Galvanic Corrosion Info to PA		IOC		X		
		WP60524	30-Sep-98	MIC Model Info to EMCR-R2		IOC		X		
		WP60526	30-Sep-98	MIC Model Info to PA		IOC		X		
		WP60532	31-Aug-98	Phase Stability Model Update to EMCR-R2		IOC		X		
		WP60534	31-Aug-98	Phase Stability Model Update to PA		IOC		X		
		WP60538	30-Sep-98	Pitting Corrosion Model Update to EMCR-R3		IOC		X		
		WP60539	30-Sep-98	Pitting Corrosion Model Update to PA		IOC		X		
		WP60543	31-Aug-98	Oxidation/General Corrosion Update to EMCR-R2		IOC		X		
		WP60544	31-Aug-98	Oxidation/General Corrosion Model Update to PA		IOC		X		
	TR251GBG	WP60109	28-Sep-98	1st Tanks 2nd specimen Results to PA		IOC		X		
		WP60111	30-Jun-98	Analytical/Biological Feedback to NFE		IOC		X		
		WP60113	02-Dec-98	2nd Specimen (1st Tanks) Report to EMCR-R2		IOC		X		

WBS 1.2.2 Waste Package Products (Rev 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.2.5.1 Conf'd	TR251GBG Conf'd	WP60126	22-May-96	Analytical/Biological Samples to NFE		IOC		X		
		WP60130	22-Jul-96	1st Batch (2nd Tanks) Report to EMCR-R2		IOC		X		
	TR251GBH	WP61609	03-Aug-96	2nd Batch Report for EMCR-R2		IOC		X		
	TR251GBK	WP26906	31-Aug-96	Input to EMCR-R2		IOC		X		
		WP26909	31-Aug-96	Input Conditions-Long Term Aging Tests		IOC		X		
	TR251FB1	WP61004	31-Jul-97	Prelim. Basket Material Performance. Model to PA & Design.		IOC		X		
1.2.2.5.2	TR262FB2	WP27210	15-Jan-97	ST Basket Materials Test Data to PA		IOC		X		
		WP27211	31-Jul-97	ST Basket Materials Test Data Update to PA		IOC		X		
	TR252GB1	WP61003	31-Jul-96	Input to EMCR-R2		IOC		X		
	TR252GB2	WP27208	30-Sep-96	Input to EMCR-R2		IOC		X		
1.2.2.5.5	TR256FB1	WP60404	30-Jun-97	Data Input to PA		IOC		X		
	TR255FB2	WP26809	29-Aug-97	Feedback to Near-Field Environment		IOC		X		
		WP26815	29-Aug-97	Data to Performance Assessment		IOC		X		
	TR255GB1	WP60406	30-Sep-96	Input to EMCR-R2		IOC		X		
	TR255GB2	WP26807	30-Sep-96	Input to EMCR-R2		IOC		X		
		WP26811	31-Dec-97	Planning Input to Longer Term Testing		IOC		X		
1.2.2.5.6	TR266FB1	WP60413	30-Jun-97	Data Input to PA		IOC		X		
	TR256FB2	WP60301	30-Jun-97	Into LA, Design		IOC		X		
		WP60315A	13-Jun-97	Ceramic Feasibility/Mech. Tests & Evaluation	WP60315A	Ltr. Rpt.		X		
	TR256GB1	WP60417	30-Apr-96	Inputs to PA, Design		IOC		X		
		WP60420	30-Sep-96	Input to EMCR-R2		IOC		X		
	TR256GB2	WP60320A	31-Jul-96	Input to EMCR Rev 2		IOC		X		

APPENDIX D

REPOSITORY SURFACE AND SUBSURFACE PRODUCTS

The data contained in this appendix reflects the status of the Yucca Mountain Site Characterization Project as of 12/16/96. Because of the evolving conditions of the Yucca Mountain Site Characterization Project, data in this appendix is changed or updated as necessary. However, this VA Design and Review Plan will not be revised or reissued as a result of data updates. For a current status of the data in this appendix and/or a copy of the current version, contact D. Stahl. For suggested changes to the contents, contact A. Segrest.

REPOSITORY SURFACE AND SUBSURFACE PRODUCTS

A list of products to be developed by the Repository Surface and Subsurface Products organization is provided. The planning and summary account number, summary account number, work breakdown structure, and activity number are provided for each product. If the product is part of a deliverable, the deliverable number is provided. The product type and the estimated end date are also provided. If the product is directly related to any of the four VA components, that information is also provided.

WBS 1.2.4 Repository Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.2	TR42FA6	RP100702	31-Dec-96	VA Design & Review Plan	RP120MG1	Tech Doc	X	X		X
			30-Sep-97	Draft LA Design & Review Plan	RP120MG2	Tech Doc			X	
	TR42FB3	RP2402D1	05-Nov-97	Design Guide Plan		Plan				
		RP2402D2	29-May-97	Source Terms Design Guide	RP120MBH	Guides	X			
		RP2402D4	30-Sep-97	Remote Operations Design Guide	RP120MBH	Guides	X			
	TR42FB4	RP2405B1	31-Mar-97	Input to WAST, Quantity, Mix/Thruput SE200A		Input	X			
		RP2405B2	31-Mar-97	Input to Support Retrieval Strategy SE502		Input	X			
		RP2405B3	07-Apr-97	Input to Seals Closure, SE506		Input	X			
		RP2405B4	30-Sep-97	Input to S&S Requirements, SE730		Input	X			
		RP2405B5	30-Sep-97	Input to Waste Package Size, SE460		Input	X			
		RP2405B6	30-Sep-97	Input to Waste Generated (Disp.), SE436		Input	X			
		RP2405B7	25-Jul-97	Input to Test & Evaluation Plan, SE 504		Input	X			
		RP2405B8	30-Sep-97	Input to Perform. Confirmation, SE050B		Input	X			
	TR42FB5	RP120700	15-Jul-97	Radiation Design Guide	RP120M3H	DG	X			
		RP120710	30-Sep-97	Drift Design Guide	RP120M3H	DG	X			
		RP120715	30-Sep-97	Ground Control SDD		Tech Doc	X			
				EBS SDD		Tech Doc	X			
				SS HVAC SDD		Tech Doc	X			
				WP Handling SDD		Tech Doc	X			
				PC Monitoring SDD		Tech Doc	X			
				Seal System SDD		Tech Doc	X			
				SS Repository Area SDD		Tech Doc	X			

WBS 1.2.4 Repository Products (Rev 0, 12/18/96)

P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.2 Cont'd	TR42FB5 Cont'd	RP120715 Cont'd		Subsurface Accesses SDD		Tech Doc	X			
				Retrieval System SDD		Tech Doc	X			
				Backfill Emplacement SDD		Tech Doc	X			
				SS Electrical Power Distribution SDD		Tech Doc	X			
				SS Fire Suppression SDD		Tech Doc	X			
				SS Radiation Monitoring SDD		Tech Doc	X			
				Excavation/Muck Handling SDD		Tech Doc	X			
1.2.4.6	TR46FB2	RP2403A1	14-Jun-97	Space Allocation Analysis Input		Specs	X			
		RP2403A2	29-Jan-97	System Configuration Analysis/ Model	RP243AMA	Anal	X			
		RP2403A2	29-Jan-97	Qualification of Witness		V&V	X			
		RP2403A3	30-May-97	Waste Handling Overview	RP243AMB	Dwg	X			X
				Carrier Unloading & Cask Preparation	RP243AMB	Dwg	X			X
				DPC Removal and Opening	RP243AMB	Dwg	X			X
				Spent Fuel Assembly Handling	RP243AMB	Dwg	X			X
				Waste Canister Handling	RP243AMB	Dwg	X			X
				Unloaded Cask Prep & Carrier Loading	RP243AMB	Dwg	X			X
				DC Welding and Transfer	RP243AMB	Dwg	X			X
				Equipment Drawings (4)			X			
		RP2403A3	15-May-97	Horizontalizer			X			
				DPC Delidding System			X			
				Fuel Transfer System			X			
				Fuel Staging Rack			X			

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.6 Cont'd	TR248FB2 Cont'd	RP2403A3 Cont'd		Space Allocation Analysis Input		Input	X			
		RP2403A3	30-May-97	Recovery Operations		Anal	X			
				Fuel Transfer System		Anal	X			
				DPC Transfer & Opening		Anal	X			
		RP2403A4	30-May-97	Cask Handling Operations	RP243AMB	Dwg	X			X
				Cask Decontamination	RP243AMB		X			X
				Pool Purification	RP243AMB	Dwg	X			X
				Cask Cleaning	RP243AMB	Dwg	X			X
				Space Allocation Analysis Input		Anal	X			
		RP2403A5	01-Jul-97	Liquid LLW Processing (11 Sheets)	RP243AMC	Dwg	X			X
				Liquid and Solid LLW Material Balance	RP243AMC	Dwg	X			X
				DPC Processing (2 sheets)	RP243AMC	Dwg	X			
				Solid LLW Processing (8 sheets)	RP243AMC	Dwg	X			X
				Space Allocation Analysis Input		Dwg	X			X
				Secondary Waste Generation Analysis		Anal	X			
				LLW Treatment Systems			X			
				DPC Disposition System		Anal	X			
		RP2403A6	11-Jul-97	Functional Relationship Diagram		Anal	X			
				WHO EL. 100+0		Drft GAs	X			
				WHO EL. 116+0		Drft GAs	X			
				WHO EL. 130 +0		Drft GAs	X			
				WHO EL. 143 + 0		Drft GAs	X			

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.6 Cont'd	TR246FB2 Cont'd	RP2403A6 Cont'd		WHO EL. 160 + 0		Drft GAs	X			
				WHO EL. 100 + 0		Drft GAs	X			
				WHO EL. 115 +0		Drft GAs	X			
				WHO (2 sheets)		Drft GAs	X			
				WTO		Drft GAs	X			
				WHO		Drft GAs	X			
				WTO		Drft GAs	X			
				WHO		Drft GAs	X			
				WTO		Drft GAs	X			
		RP2403A7	30-Sep-87	WHO		Anal	X			
				WTO		Anal	X			
				WHO (2 sheets)		Dwg	X			
				WTO		Dwg	X			
				WHO (2 sheets)		Dwg	X			
				WTO		Dwg	X			
		RP2403A8	30-Sep-87	Composite Key	RP243AMD	Dwg	X			X
				Carrier Bay/HVAC Equipment Room	RP243AMD	Dwg	X			X
				Primary Confinement Supply Air	RP243AMD	Dwg	X			X
				Secondary & Tertiary Confinement Supply Air	RP243AMD	Dwg	X			X
				Primary Confinement Areas	RP243AMD	Dwg	X			X
				Secondary & Tertiary Area (EL. 100+0)	RP243AMD	Dwg	X			X
				Secondary & Tertiary Area (EL. 116+0)	RP243AMD	Dwg	X			X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TS/PA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.6 Cont'd	TR246FB2 Cont'd	RP2403A8 Cont'd		Secondary & Tertiary Area (EL. 130+0)	RP243AMD	Dwg	X			X
				Secondary & Tertiary Area (EL. 143+0)	RP243AMD	Dwg	X			X
				HVAC Equipment Room	RP243AMD	Dwg	X			X
				Primary Confinement Exhaust Air	RP243AMD	Dwg	X			X
				Secondary & Tertiary Exhaust Air	RP243AMD	Dwg	X			X
				HVAC Exhaust Stacks	RP243AMD	Dwg	X			X
				Neutral Areas	RP243AMD	Dwg	X			X
				Plan at EL. 100+0		Dwg	X			
				Plan at EL. 116+0		Dwg	X			
				Plan at EL. 130+0		Dwg	X			
				Plan at EL. 143+0		Dwg	X			
				Plan at EL. 160+0		Dwg	X			
				WHO		Anal	X			X
				WTO		Anal	X			X
				WHO		Anal	X			X
				WTO		Anal	X			X
		RP2403A9	11-Jul-97	Space Allocation Analysis		Anal	X			X
				WHO EL. 116+0	RP243AME	Final GAs	X			X
				WHO EL. 130+0	RP243AME	Final GAs	X			X
				WHO EL. 143+0	RP243AME	Final GAs	X			X
				WHO EL. 160+0	RP243AME	Final GAs	X			X
				WTO EL. 100+0	RP243AME	Final GAs	X			X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.6 Cont'd	TR246FB2 Cont'd	RP2403A9 Cont'd		WTO EL. 115+0	RP243AME	Final GAs	X			X
				WHO (2 sheets)	RP243AME	Final GAs	X			X
				WTO	RP243AME	Final GAs	X			X
				WHO	RP243AME	Final GAs	X			X
				WTO	RP243AME	Final GAs	X			X
				WHO	RP243AME	Final GAs	X			X
				WTO	RP243AME	Final GAs	X			X
		RP2403AA	30-Sep-97	Waste Handling Prototype Study		Ltr	X			X
				Carrier Staging Shed		Input	X			
				Carrier Staging Shed Material Handling		Input	X			
				Waste Handling Facility		Input	X			
				Waste Handling Facility Ventilation		Input	X			
				Cask/Canister Handling		Input	X			
				Uncanistered Waste Transfer		Input	X			
				Canistered Waste Transfer		Input	X			
				Disposal Container Handling		Input	X			
				Waste Package Remediation		Input	X			
				Cask Maintenance Facility		Input	X			
				Cask Handling, Maintenance and Certification		Input	X			
				Cask Maintenance Facility Ventilation		Input	X			
				Radiological Waste Treatment Facility		Input	X			
				Site Generated Radiological Waste Handling		Input	X			

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.6 Cont'd	TR246FB2 Cont'd	RP2403AA Cont'd		Radiological Waste Treatment Facility Ventilation		Input	X			
	TR46FB3	RP2402A1	30-May-97	Radiological Safety Design Analysis		Anal	X			
				Qualification of Microshield		V&V	X			
				Qualification of Qadcgpp 1.2		V&V	X			
				Qualification of MCNP		V&V	X			
				Waste Handling Facility Radiological Monitoring		Input	X			
		RP2402A2	30-Sep-97	Normal & Off-normal Dose Assessment	RP242AM	Anal	X			
	TR46FB4	RP2402C5	30-Jan-97	Operations/Staffing Letter Report	RP242CM	Ltr	X			X
	TR46FB5	RP2403C1	30-Sep-97	Site Grading & Drainage Plan		Dwg	X			X
				MGDS Facility Layout		Input	X			
				Carrier/Cask Transport		Input	X			
		RP2403C3	30-Sep-97	Repository Surface Operations Overview	RP243CM	Dwg	X			X
				North Portal Operations Overview	RP243CM	Dwg	X			X
				North Portal Operations Area Site Map	RP243CM	Dwg	X			X
	TR46FB7	RP2405C1	01-May-97	DBE Screening Analysis II		Anal	X			
				Complete the Surface DBE Pilot Analysis		Comp.-Anal	X			
				Shipping Cask Shutdown in NOB Analysis		Anal	X			
				Spent Fuel Damage During Welding Analysis		Anal	X			
		RP2405C2	01-Jul-97	External Events Analysis		Anal	X			
		RP2405C3	27-Feb-97	Input to Aircraft Crash Credibility Analysis		Input	X			
		RP2405C4		Classification Analysis Support	LOE	LOE	X			
	TR46FB8	RP24071	30-Apr-97	Reference Design Roadmap		Ltr				

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							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.6 Cont'd	TR46FB8 Cont'd	RP24071 Cont'd		Engineering Files Report Input	RP247M3	Ltr				
		RP24072	30-Sep-97	Operational Staffing Impacts Analysis		Input	X			X
				Operational Wastes/Emissions Impacts Analysis		Input	X			
				HVAC Energy Analysis For Support Structures		Input	X			X
				Electrical Load Estimate		Input	X			X
				Water/Sewage Balance		Input	X			X
				Other Resource Data		Input	X			X
				Off-normal consequences analysis		Input	X			
				Construction Impacts Analysis		Input	X			X
				Engineering Files Report Input Update	RP247M3B	Ltr				
1.2.4.6		RP020700	01APR97	Fifth Rail Corridor Analysis						
		RP020702	05JUN97	Refinement of Rail Corridor Alignments	RP020M3	Dwg	X			X
1.2.4.7	TR47FB1	RP500705	30-Sep-97	Database of Repository Construction Material	RP120M3	Tech Doc	X	X		X
	TR47FB2	RP510710	31-Jul-97	Near Field Environment of Emplacement Drifts		Anal	X	X		
	TR47FB3	RP508705	31-Dec-96	Materials for Emplacement Drift Ground Support		Anal	X	X		X
		RP508710	01-Apr-97	Stability Analysis for Emplacement Drifts		Anal	X	X		
		RP508715	16-Apr-97	Lining Design for Emplacement Drifts		Anal	X	X		X
		RP508720	30-Sep-97	Emplacement Drift Ground Support GA - Isometric	RP120M3C	Dwg	X	X		
				Emplacement Drift Ground Support Plan & Profile	RP120M3C	Dwg	X	X		X
				Emplacement Drift Ground Support Sections	RP120M3C	Dwg	X	X		X
				Emplacement Drift Ground Support Segment Details & Tolerances	RP120M3C	Dwg	X	X		X
				Accesses Ground Support Section Views	RP120M3C	Dwg	X	X		X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FB3 Cont'd	RP506720 Cont'd		Access Intersections Ground Support - GA	RP120M3C	Dwg	X	X		X
				Access Intersections Ground Support - Sections	RP120M3C	Dwg	X	X		X
				TBM Launch & Recovery Chamber Ground Support - GA	RP120M3C	Dwg	X	X		X
				TBM Launch & Recovery Chamber Ground Support - Sections	RP120M3C	Dwg	X	X		X
				Exhaust Main Ground Support - GA	RP120M3C	Dwg	X	X		X
				Exhaust Main Ground Support - Sections	RP120M3C	Dwg		X		X
				Ventilation Raise Ground Support - GA	RP120M3C	Dwg	X	X		X
				Ventilation Raise Ground Support - Sections	RP120M3C	Dwg	X	X		X
				Emplacement Drift Turnout Ground Support - GA	RP120M3C	Dwg	X	X		X
				Emplacement Drift Turnout Ground Support - Sections	RP120M3C	Dwg	X	X		X
				Shaft Ground Support - GA	RP120M3C	Dwg	X	X		X
				Shaft Ground Support - Sections	RP120M3C	Dwg	X	X		X
	TR47FB5	RP120760	06-May-97	Site Geology and Determination of Available Emplacement Area		Anal	X	X		
		RP120795	11-Feb-97	Subsurface Layout Analysis		Anal	X	X		
		RP120765	29-Aug-97	Subsurface Layout Coordinate Geometry Analysis		Anal	X	X		X
		RP120755	30-Apr-97	Subsurface Construction and Development Methodology Analysis		Anal	X			X
		RP120780	01-Jul-97	Subsurface Construction and Operations Integrated Schedule		Anal	X			X
		RP120789	01-Apr-97	Thermal Load Management Analysis		Anal	X	X		
		RP120775	01-Jul-97	Preliminary List of Construction Equipment		Tech Doc	X			X
		RP120785	30-Sep-97	Site Geology Details Plan & Sections, Sheet 1	RP120M3	Dwg	X	X		X
				Site Geology Details Plan & Sections, Sheet 2	RP120M3	Dwg	X	X		X
				Overall Subsurface Layout GA (3D)	RP120M3	Dwg	X	X		X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FB5 Cont'd	RP120785 Cont'd		Overall Layout Showing Usable Emplacement Area	RP120M3	Dwg	X	X		X
				Potential Emplacement Expansion Areas	RP120M3	Dwg	X	X		X
				Overall Layout Showing Excavation Method & Drift Sizes	RP120M3	Dwg	X	X		X
				Subsurface Drainage Patterns	RP120M3	Dwg	X	X		X
				Typical Access Ramps and Mains Elevations & Cross Sections - Construction Phase	RP120M3	Dwg	X	X		X
				Typical Access Ramps and Mains Elevations & Cross Sections - Emplacement Mode	RP120M3	Dwg	X	X		X
				Emplacement Side Ventilation Shaft GA	RP120M3	Dwg	X	X		X
				Development Side Ventilation Shaft GA	RP120M3	Dwg	X	X		X
				7.62 m TBM Launch and Recovery Chambers (3D)	RP120M3	Dwg	X	X		X
				Exhaust Main and Ventilation Raise GA (3D)	RP120M3	Dwg	X	X		X
				Emplacement Drift Details - Section and Elevation	RP120M3	Dwg	X	X		X
				Emplacement Drift Turnouts	RP120M3	Dwg	X	X		X
				Shadow Shields Details (3D)	RP120M3	Dwg	X	X		X
				Roadheader Openings - Miscellaneous Sections	RP120M3	Dwg	X	X		X
				Pre-Emplacement Construction Schedule	RP120M3A	Dwg	X	X		X
				Emplacement & Development Schedule	RP120M3A	Dwg	X	X		X
				Subsurface Construction & Development Sequence - Phase 1	RP120M3A	Dwg	X	X		X
				Subsurface Construction & Development Sequence - Phase 2	RP120M3A	Dwg	X	X		X
				Subsurface Construction & Development Sequence - Phase 3	RP120M3A	Dwg	X	X		X
				Emplacement Drift Construction Sequence (3D)	RP120M3A	Dwg	X	X		X
				7.62 m TBM and Trailing Gear Configuration (3D)		Dwg	X	X		X
				7.62 m TBM Launch & Recovery (3D)		Dwg	X	X		X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TS&PA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FB5 Cont'd	RP120785 Cont'd		Roadheader Excavation of Emplacement Drift Turnout (3D)		Dwg	X	X		X
				Emplacement Drift TBM and Trailing Gear Configuration (3D)		Dwg	X	X		X
				Emplacement Drift TBM Launch (3D)		Dwg	X	X		X
				Emplacement Drift TBM Recovery (3D)		Dwg	X	X		X
				Equipping of Mains for Emplacement Operations		Dwg	X	X		X
				Emplacement Drift Equipping		Dwg	X	X		X
				Emplacement Drift Ventilation Raises Excavation and Lining Installation		Dwg	X	X		X
				Muck Handling P&ID		Dwg	X	X		X
				Muck Handling Equipment and Operations Details		Dwg	X	X		X
				Emplacement Drift Ground Support Installation (3D)		Dwg	X	X		X
				Ventilation Shafts Excavation Sequence and Lining Installation		Dwg	X	X		X
				Emplacement Area for 70,000 MTU of Waste	RP120M3B	Dwg	X	X		X
				Emplacement Drift and Waste Package Emplacement Arrangement	RP120M3B	Dwg	X	X		X
	TR47FB6	RP502700	14-Jul-97	Emplacement Equipment Design Analysis		Anal	X			
		RP502730	14-Aug-97	Remote Handling and Communications for WP Emplacement Systems		Anal	X			
		RP502705	15-Jul-97	Electrification of SS Railed Vehicles		Anal	X			
		RP502715	30-Sep-97	Emplacement Equipment Description		Tech Doc	X			X
		RP502740	30-Sep-97	RH&C Equipment Description		Tech Doc	X			X
		RP502735	20-Jun-97	Transport Locomotive	RP502M3	Dwg	X			X
				WP Transporter with Unloading System	RP502M3	Dwg	X			X
				Gentry Carrier	RP502M3	Dwg	X			X
				Rail Car	RP502M3	Dwg	X			X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FB6 Cont'd	RP502735 Cont'd		Emplacement Rail System	RP502M3	Dwg	X			X
				WP Gantry Plan & Elevation	RP502M3	Dwg	X			X
				WP Gantry Vertical Lift Detail	RP502M3	Dwg	X			X
				WP Gantry Traction Motor Detail	RP502M3	Dwg	X			X
				WP Gantry Length Adjustment Method	RP502M3	Dwg	X			X
				Repository Partial Plan - Drift Isolation Doors	RP502M3	Dwg	X			X
				Interface Logic Diagram for Mobile Equipment	RP502M3	Dwg	X			X
				Typical Main Drift Overhead Wire System	RP502M3	Dwg	X			X
				Typical Emplacement Drift Conductor Bar System	RP502M3	Dwg	X			X
				Typical Drift Turnout Conductor Bar System	RP502M3	Dwg	X			X
				Emplacement Transfer/Loading Dock	RP502M3	Dwg	X			X
				SS Layout of the Rail Rectifier Units	RP502M3	Dwg	X			X
				Rail Electrification One-Line Diagram	RP502M3	Dwg	X			X
				Emplacement System: Control Systems	RP502M3	Dwg	X			X
				Overview of Control and Communication Systems for WP Emplacement	RP502M3	Dwg	X			X
				Emplacement System: Communications System	RP502M3	Dwg	X			X
				Emplacement Gantry: Control & Communication Systems	RP502M3	Dwg	X			X
	TR47FB7	RP123750	30-Sep-97	Shielding Analysis		Anal	X			
		RP123758	30-Jun-97	Retrieval OPS Analysis		Anal	X			
		RP123752	30-Sep-97	Computer Code Qualification		Tech Doc	X			
	TR47FB9	RP122725	30-Apr-97	Devel./Emplacement. Ventilation Analysis		Anal	X	X		
		RP122710	28-Feb-97	Emplacement. Exhaust. HEPA Filter Analysis		Anal	X			

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							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FB9 Cont'd	RP122720	28-Feb-97	Airflow Control Analysis		Anal	X	X		
		RP122705	31-Jan-97	Dust Control Analysis		Anal	X	X		
		RP122730	30-Apr-97	Preliminary Equipment List and Description		Tech Doc	X			X
		RP122745	30-Sep-97	Overall Subsurface Ventilation GA - Pre-emplacment Construction Early Phase	RP120M3D	Dwg	X	X		X
				Overall Subsurface Ventilation GA - Pre-emplacment Construction Mid Phase	RP120M3D	Dwg	X	X		X
				Overall Subsurface Ventilation GA - Pre-emplacment Construction Late Phase	RP120M3D	Dwg	X	X		X
				Overall Subsurface Ventilation GA - Development and Emplacement Early Phase	RP120M3D	Dwg	X			X
				Overall Subsurface Ventilation GA - Development and Emplacement Mid Phase	RP120M3D	Dwg	X	X		X
				Overall Subsurface Ventilation GA - Development and Emplacement Early Final Phase	RP120M3D	Dwg	X	X		X
				Overall Subsurface Ventilation GA - Caretaker Phase	RP120M3D	Dwg	X	X		X
				Exhaust Shaft GA Fans & HEPA Filters Sheet 1	RP120M3D	Dwg	X			X
				Exhaust Shaft GA Fans & HEPA Filters Sheet 2	RP120M3D	Dwg	X			X
				Exhaust Shaft GA Fans & HEPA Filters Sheet 3	RP120M3D	Dwg	X			X
				South Portal Intake Fans and Airtlock GA Sheet 1	RP120M3D	Dwg	X			X
				South Portal Intake Fans and Airtlock GA Sheet 2	RP120M3D	Dwg	X			X
				South Portal Intake Fans and Airtlock GA Sheet 3	RP120M3D	Dwg	X			X
				Emplacement/Development Isolation Airtlocks (3D)	RP120M3D	Dwg	X			X
				Emplacement Drift Ventilation Doors (3D)	RP120M3D	Dwg	X			X
	TR47FBA	RP504705	13-Jun-97	Waste Package Retrieval Equipment		Anal	X			
		RP504715	29-Aug-97	WP Retrieval Equipment Description		Tech Doc	X			X
		RP504710	18-Jun-97	Retrailer	RP504M3	Dwg	X			X
				Heavy Duty Forklift		Dwg	X			X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FBa Cont'd	RP504710 Cont'd		Inclined Plane Hauler	RP504M3	Dwg	X			X
				Inclined Plane Hauler & Shielding	RP504M3	Dwg	X			X
				LHD with Ejector Bucket		Dwg	X			X
				H.D. Forklift for Emplacement Drift		Dwg	X			X
				Covered Shuttle Car & LHD Unit		Dwg	X			X
				Multipurpose Vehicle w/Impact Hammer		Dwg	X			X
				Multipurpose Vehicle w/Bucket		Dwg	X			X
				Multipurpose Vehicle w/Shear	RP504M3	Dwg	X			X
				Hydraulic Shear	RP504M3	Dwg	X			X
				Retrieval Skid Plate	RP504M3	Dwg	X			X
	TR47FBD	RP123762	30-Sep-97	DBE Scenario Analysis		Anal	X			
		RP123768	30-Sep-97	CMF Logic Analysis		Anal	X			
		RP123764	15-Sep-97	SSC Support Document		Tech Doc	X			
		RP123766	30-Apr-97	Computer Code Qualification		Tech Doc	X			
	TR47FBH	RP126715	04-Aug-97	Subsurface Repository Engineering File		Tech Doc	X			
		RP126705	30-Jun-97	General Surface, Subsurface Arrangement - Proposed Action		Dwg	X			
				Subsurface Layout - Proposed Action (High Thermal Load)		Dwg	X			
				Subsurface Layout - Alternative (Medium Thermal Load)		Dwg	X			
				Subsurface Layout - Alternative (Low Thermal Load)		Dwg	X			
	TR47FBI	RP126710	14-Jan-97	Backfill Strategy and Preliminary Design		Anal	X	X		X
		RP126720	28-Feb-97	Waste Package Support System		Anal	X	X		X
		RP126700	31-Jan-97	Emplacement Drift Invert		Anal	X	X		X

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P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	VA COMPONENT			
							PRELIMINARY DESIGN CONCEPT	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.4.7 Cont'd	TR47FBI Cont'd	RP126730	31-Mar-97	Backfilling Operations (3D)	RP120M3E	Dwg	X	X		X
				Backfilling P&ID	RP120M3E	Dwg	X	X		X
				Waste Package Support System	RP120M3E	Dwg	X	X		X
				Emplacement Drift Invert & Support System (3D)	RP120M3E	Dwg	X	X		X
	TR47FBJ	RP124700	15-Apr-97	Remote Monitoring, Communications, and Control Systems for Performance Confirmation		Anal	X			
		RP124705	02-Apr-97	Performance Confirmation Facilities		Anal	X			
		RP124715	01-Apr-97	Mobile Remote Monitoring System: Physical Layout	RP120M3F	Dwg	X	X		X
				Mobile Remote Monitoring System: Electrical Subsystems	RP120M3F	Dwg	X			X
				Mobile Remote Monitoring System: Control and Instrumentation	RP120M3F	Dwg	X			X
				Performance Confirmation Drift and Access - Sheet 1	RP120M3F	Dwg	X	X		X
				Performance Confirmation Stations Detail	RP120M3F	Dwg	X	X		X
				Performance Confirmation Stations Detail	RP120M3F	Dwg	X	X		X
				Performance Confirmation Drift Ventilation System	RP120M3F	Dwg	X	X		X
				Performance Confirmation Drift Ventilation System	RP120M3F	Dwg	X	X		X
				Performance Confirmation Test Drilling Arrangement - Sheet 1	RP120M3F	Dwg	X	X		X
				Performance Confirmation Test Drilling Arrangement - Sheet 2	RP120M3F	Dwg	X	X		X

APPENDIX E

SYSTEMS ENGINEERING PRODUCTS

The data contained in this appendix reflects the status of the Yucca Mountain Site Characterization Project as of 12/16/96. Because of the evolving conditions of the Yucca Mountain Site Characterization Project, data in this appendix is changed or updated as necessary. However, this VA Design and Review Plan will not be revised or reissued as a result of data updates. For a current status of the data in this appendix and/or a copy of the current version, contact S. Meyers. For suggested changes to the contents, contact A. Segrest.

SYSTEMS ENGINEERING PRODUCTS

A list of products to be developed by the Systems Engineering Products organization is provided. The planning and summary account number, summary account number, work breakdown structure, and activity number are provided for each product. If the product is part of a deliverable, the deliverable number is provided. The product type and the estimated end date are also provided. If the product is directly related to any of the four VA components, that information is also provided.

WBS 1.2.1 Systems Engineering Products (Rev. 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
1.2.1.2	TR12FB2	SE422M3	03-Mar-97	MGDS-RD Update		Document	X	X	X	X
	TR12GB2	SE530AM4	31-Mar-97	Rqmts Doc Status Report		Ltr Report	X	X	X	X
	TR12FB3	SE400BM3	30-Sep-97	MGDS Conops, Rev 1		Document	X	X	X	X
	TR12GA1	SE400AM4	02-Feb-98	MGDS Conops Status Report		Ltr Report	X	X	X	X
	TR12FB2	SE422705	30-Apr-97	CDA Update		Document	X	X		X
		SE422710	30-Sep-97	CDA Update		Document	X	X		X
		SE580AM4	02-Feb-97	CDA Status Report		Ltr Report	X	X		X
	TR12FB1	SE405AM4	31-Dec-96	SDD Status Report		Ltr Report	X	X		X
		SE405BM4	31-Mar-97	SDD Status Report		Ltr Report	X	X		X
		SE405CM4	30-Jun-97	SDD Status Report		Ltr Report	X	X		X
		SE405M4	30-Sep-97	SDD Status Report		Ltr Report	X	X		X
	TR12GB1	SE522AM4	31-Dec-97	SDD Status Report		Ltr Report	X	X		X
		SE522BM4	31-Mar-97	SDD Status Report		Ltr Report	X	X		X
		SE522CM4	30-Jun-97	SDD Status Report		Ltr Report	X	X		X
1.2.1.3	TR13FB1	SE418701	31-Mar-97	Test & Evaluation Plan Development Status Update		Briefing	X	X		X
		SE418M3	30-Sep-97	VA Test & Evaluation Plan		Document	X		X	
		SE488706	25-Mar-97	Design Compliance Plan for LA Status Update		Briefing	X	X	X	X
		SE488M3	30-Sep-97	Draft Design Compliance Plan for LA		Document	X		X	X
	TR13GB1	SE419AM4	31-Mar-98	Status of Update to T&EP		Briefing	X		X	X
		SE419M3	30-Sep-98	Final VA T&EP		Document	X		X	X
		SE540M3	30-Sep-98	Design Compliance Plan for LA, Rev 0		Document	X		X	X
1.2.1.5	TR15FB1	SE050705	05-Mar-97	Establish Draft Performance Confirmation Baseline		IOC	X		X	X
		SE050720	29-Aug-97	Complete Initial Performance Confirmation Plan		IOC	X		X	X

WBS 1.2.1 Systems Engineering Products (Rev. 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
		SE050BM3	30-Sep-97	Performance Confirmation Plan, Rev 0		Document	X		X	X
		SE436700	01-Apr-97	Start Waste Generated Study		Briefing	X	X		X
		SE436M3	30-Sep-97	Complete Waste Generated Study		Document	X	X		X
		SE440700	01-Oct-96	Conduct Research for Waste Isolation Requirements Study		Briefing	X	X		X
		SE440M3	01-Apr-97	Complete Waste Isolation Requirements Study		Document	X	X	X	X
		SE460700	01-Apr-97	Start Waste Package Size Study		Briefing	X	X		X
		SE460M3	30-Sep-97	Waste Package Size Study Report		Document	X	X		X
		SE506700	01-Oct-96	Start Seals Study		Briefing	X	X		X
		SE506M3	03-Jun-97	Seals Study Report		Document	X	X	X	X
	TR15FB2	SE200700	01-Oct-97	Start Waste Quantity, Mix, Throughput Study		Briefing	X	X		X
		SE200M3	11-Apr-97	Waste Quantity, Mix, Throughput Study		Document	X	X		X
	TR15FB3	SE502700	01-Oct-96	Start Retrievability Study		Briefing	X		X	X
		SE502M3	06-May-97	Retrievability Study		Document	X		X	X
	TR15FB4	SE456700	01-Oct-96	Start Rail Corridor Evaluation		Briefing	X			X
		SE456M3	30-Apr-97	Rail corridor Evaluation Report		Document	X			X
1 2 1 7	TR17FB1	SE124700	01-Oct-96	Start MGDS Cost Estimate Planning		Briefing	X		X	X
		SE124AM3	30-Sep-97	Draft MGDS Cost Plan		Document	X		X	X
	TR17681	SE124850	20-Aug-98	Final VA Cost Estimate		Document	X		X	X
1 2 1 8	TR18FB2	SE500M3	27-Jun-97	Safe Guards and Security VA Rqmts Study		Document	X		X	X
1 2 1 11	TR18FB1	SE310700	31-Mar-97	DBE FY97 - 1st Half		Briefing	X		X	X
		SE320700	31-Mar-97	CA/Q-List FY97		Briefing	X		X	X
		SE310705	30-Sep-97	DBE FY97 - 2nd Half		Briefing	X		X	X
		SE320705	30-Sep-97	CA/Q-List-FY97		Briefing	X		X	X

WBS 1.2.1 Systems Engineering Products (Rev. 0, 12/18/96)

							VA COMPONENT			
P&S ACCOUNT	SUMMARY ACCOUNT	ACTIVITY NUMBER	ACTIVITY END DATE	PRODUCT TITLE	DELIVERABLE NUMBER	PRODUCT TYPE	PRELIMINARY DESIGN CONCE	TSPA-VA	LA PLAN	ESTIMATE OF COST
	TR1BGB1	SE310800	31-Mar-98	DBE FY98 - 1st Half		Briefing	X		X	X
		SE322800	31-Mar-98	CA/Q-List FY98 - 1st Half		Briefing	X		X	X
		SE310805	30-Sep-98	CA/Q-List FY98 - 2nd Half		Briefing	X		X	X
		SE322805	30-Sep-98	CA/Q-List FY98 - 2nd Half		Briefing	X		X	X