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U.S. DEPARTMENT OF ENERGY

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# YUCCA MOUNTAIN PROJECT

Document No. YMP/CM-0007  
 Revision 2  
 CI No. 13.1001  
 Date 11/29/90  
 WBS No. 1.2.1, 1.2.3, 1.2.5  
 QA QA 1.2.7

## PROJECT BASELINE DOCUMENT

# TECHNICAL REQUIREMENTS FOR THE YUCCA MOUNTAIN PROJECT (MIDWAY VALLEY TRENCHING AND CALCITE/SILICA ACTIVITIES)

### REV. 2

# UNCONTROLLED

**CHANGES TO THIS DOCUMENT REQUIRE PREPARATION  
AND APPROVAL OF A CHANGE REQUEST IN ACCORDANCE  
WITH PROJECT AP-3.3Q**



**UNITED STATES DEPARTMENT OF ENERGY  
NEVADA OPERATIONS OFFICE/YUCCA MOUNTAIN PROJECT OFFICE**

102

**YUCCA MOUNTAIN PROJECT  
DOCUMENT CHANGE NOTICE (DCN) RECORD**

1 Document Title:

2 Document No.:

Technical Requirements for the Yucca Mountain Project (Midway Valley Trenching and Calcite/Silica Activities)

The document identified in Blocks 1 and 2 has been changed. The changed pages attached to this DCN are identified in Block 7 opposite the latest DCN number in Block 3. The original issue of this document as modified by all applicable DCN's constitutes the current version of the document identified in Blocks 1 and 2.

3 DCN NO.	4 CR NO.	5 DOCUMENT Rev./ICN #	6 CR TITLE	7 AFFECTED PAGES	CHANGE	ADD	DELETE	8 DATE
001	91/021	2	YMP/CM-0007 Proposed Revision	All pages except VI-A-1, VI-A1-1 - 10, and VI-A2-1 - 5.	X			11/19/90



5 Condition (continued)

Request (CR) must be submitted, approved, and issued prior to initiation of field operations.

6 Implementation Direction (continued)

pertinent to the Project shall be held accountable to the requirements of revision #2 of the Technical Requirements for the Yucca Mountain Project Midway Valley Trenching and Calcite/Silica Activities).

3) The CCB Secretary shall ensure that the Configuration Information System (CIS) and the CCB Register are updated to reflect this approved revision to Document YMP/CM-0007.

4) A HOLD point shall be established in accordance with AP-5.20Q to insure that Implementation Direction No. 4 in the Change Directive approving 91/003 is captured into the next revision of YMP/CM-0006.

5) The Change Requests identified in Conditions 1 and 2, may be combined, at the discretion of the director, EDD, into a single CR.

6) The CCB Secretary shall ensure that the Cover Page and Title Page for revision #2 of Document YMP/CM-0007 are updated to reflect this approved change.

7) The Document Originator shall ensure that the document number and revision number is identified on each page of the Publication Ready Document (YMP/CM-0007, rev. 2). The Document Originator shall also ensure that the Document Change Notice (DCN) is updated to reflect revised pages and is provided to the CCB Secretary with the Publication Ready Document.

8. PAGE I-5, PAR. 1, LINE 5, CHANGE "QAPD" TO "QAPD/QAPP"

9. PAGE VI-B-4, ORGANIZATION RESPONSIBLE COMPLIANCE WITH REQUIREMENT, SOLID-WASTE DISPOSAL SYSTEM, CHANGE "RSN" TO "SITE OFFICE WITH ENVIRONMENTAL CONCURRENCE"

JB  
11/27/90  
MBB  
11-27-90

DISCLAIMER

These documents are limited to use for activities relating to (1) the evaluation of the location and recency of faulting near prospective surface facilities (Midway Valley Trenching), or (2) characterization of calcite and opaline-silica vein deposits (Calcite/Silica).

TECHNICAL REQUIREMENTS FOR THE YUCCA MOUNTAIN PROJECT  
(MIDWAY VALLEY TRENCHING AND CALCITE/SILICA ACTIVITIES)

REVISION 2

APPROVED:



E. H. Petrie, Acting Director  
Engineering and Development Division  
Yucca Mountain Project

11/19/90  
Date

APPROVED:



D. G. Horton, Director  
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Yucca Mountain Project

11/19/90  
Date

APPROVED:



C. P. Gertz, Associate Director (Acting)  
Office of Geologic Disposal

11/19/90  
Date

TECHNICAL REQUIREMENTS FOR THE YUCCA MOUNTAIN PROJECT  
(MIDWAY VALLEY TRENCHING AND CALCITE/SILICA ACTIVITIES)

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TECHNICAL REQUIREMENTS DOCUMENT  
TBD/TBV LISTING\*

STATUS	DESCRIPTION	COMMENT
PART A: TBDs AND TBVs WHICH IMPACT FLOWDOWN		
TBD	Sec. V, 2.10 Other Site-Specific Reclamation	(Area A Trenches and Trench 14 complete.) This information is required prior to design verification for any other areas.
TBV	Inputs to WMSR	Verification of inputs is indeterminate.

PART B: TBDs AND TBVs WHICH ARE NOT REQUIRED TO ESTABLISH FLOWDOWN

Since this document is limited to use for activities relating to Midway Valley Trenching and Calcite/Silica, there are several sections which are still TBD. These are not required at this time.

\* TBD is a statement where there is missing information which is To Be Determined.

TBV is a statement where the information is To Be Verified.

**Section I**

**Introduction  
to the  
Technical Requirements**

INTRODUCTION TO THE TECHNICAL REQUIREMENTS

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INTRODUCTION TO THE TECHNICAL REQUIREMENTS

## PURPOSE

The technical requirements provide a controlled basis for the Yucca Mountain Project. Technical requirements generally describe what is needed. Other controlled bases are the management requirements and cost/schedule requirements. QA controls are included as part of the management hierarchy.

Although they are all contained in a single volume, each of the following sections corresponds to a separate document in the Technical Hierarchy for the Project. Each section is numbered independently and includes any relevant appendices in addition to the main text. The five documents are:

- o Yucca Mountain Mined Geologic Disposal System Description (SD), Section II;
- o Yucca Mountain Mined Geologic Disposal System Requirements (SR), Section III;
- o Site Requirements Document (STRD), Section IV;
- o Test and Evaluation Planning Basis (TEPB), Section V; and
- o Surface-Based Testing Facility Requirements Document (SBTFRD), Section VI.

These documents serve three main purposes:

1. Provide input to the Design Organization (DO)\* for the design of facilities which support the activities commonly referred to as Midway Valley Trenching and Calcite/Silica.
2. Define the objectives and constraints which guide the conduct of the activities commonly referred to as Midway Valley Trenching and Calcite/Silica.
3. Define a basis traceable from the Waste Management Systems Requirements Document as to why the Midway Valley Trenching and Calcite/Silica activities are being conducted and which interactions must be controlled.

These Technical Requirements are designed to contribute to satisfying the upper tier requirements and to not violate any upper tier requirements. The requirements have been pruned to only include material relevant to the above purposes. Thus, the Technical Requirements described in these documents are not sufficient to satisfy all upper tier requirements. Documents in the technical hierarchy which are not needed for these purposes are not included.

\* The Design Organization is assigned by DOE. These duties are being transferred to Raytheon Services of Nevada.

## LIMITATIONS ON USE

These documents are limited to use for activities relating to the evaluation of the location and recency of faulting near prospective surface facilities (Midway Valley Trenching), or characterization of calcite and opaline-silica vein deposits (Calcite/Silica). Complete information is provided only for those activities related to the above activities. For example, the requirements which define the basis for activities other than these are not included. Similarly, only the facilities needed for these activities are described in the Surface Based Testing Facilities Document.

## CHANGE PROCESS

All changes to this document must have the concurrence of the Project Office. Changes required to this document will be evaluated to determine the area(s) of responsibility. Changes which are the responsibility of the Project office will be handled by the CCB. Changes which are the responsibility of the Participant organizations will be completed by the responsible participant."

When the requirements are revised, these documents will be superseded and any impacts will be evaluated. For example, if an upper tier requirement or description (such as the potential repository location) changes, then the impacts on the derived lower tier requirements would be re-evaluated and revised accordingly.

## WASTE MANAGEMENT SYSTEM REQUIREMENTS

The Waste Management System Requirements (WMSR) Volume I is the parent document which provides technical guidance and requirements for the Technical Requirements for the Yucca Mountain Project. Other directives external to the Yucca Mountain Project are also incorporated.

The Waste Management System Requirements (WMSR) Document Volume IV, which is a major document in the technical element of the OCRWM Baseline, contains the top-level requirements that guide Mined Geologic Disposal System (MGDS) development. Volume IV of WMSR incorporates by reference some requirements from Volume I of WMSR and thus is designed to be used in conjunction with Volume I of the WMSR, General System Requirements. Volume IV provides a set of requirements which must be satisfied. The status of WMSR IV, Rev. 0 is indeterminate as stated in the preliminary CAR generated as a result of the Headquarters audit. The actual status will be determined in the final audit report. The changes to WMSR IV which flowdown to impact the lower tier requirements documents will be included in the appropriate sections of this requirements document according to the change process."

## YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM DESCRIPTION

The Yucca Mountain Mined Geologic Disposal System Description (Section II) includes only the description of the elements of the systems needed to establish a basis for activities related to the Midway Valley Trenching and Calcite/Silica. Specifically, it describes the location of the repository relative to the site and the location of surface based testing facilities relating to Midway Valley Trenching and Calcite/Silica activities. This

information is used to control interfaces, and eliminates the need for several other interface control documents.

#### YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM REQUIREMENTS

The Yucca Mountain Mined Geologic Disposal System Requirements (Section III) provides an allocation of requirements to the MGDS subsystems. Volume IV of the WMSR and other Project specific documents serve as input to the SR.

#### SITE REQUIREMENTS DOCUMENT

The Site Requirements Document (Section IV) describes the functions that the site is expected to perform. The parameters to be characterized define what must be known about the site in order to establish how the site contributes to achieving upper tier requirements. These parameters are the performance criteria and constraints for the site. These parameters are subject to reallocation as the characterization program progresses.

#### TEST AND EVALUATION PLANNING BASIS

The Test and Evaluation Planning Basis (TEPB) (Section V) is the data base of scientific investigations and data needs on which the planned tests are based. While the above documents describe the natural and engineered systems, the TEPB describes the evaluations of these site systems. For example, this document describes how faulting characteristics which are related to some facilities important to safety will be evaluated. In addition, TEPB includes specific performance constraints on testing required to preserve the ability to characterize the site and to limit adverse impacts on the ability of the site to isolate waste. The TEPB also includes environmental constraints which apply to the development period.

#### SURFACE-BASED TESTING FACILITIES REQUIREMENTS DOCUMENT

In order to conduct the evaluations, facilities must be provided. The Surface-Based Testing Facilities Requirements Document\* (Section VI) provides the requirements for site preparation/site installations and utilities needed to conduct the tests. Specific operational requirements (e.g. mapping protocol) are covered in separate test instructions and guidance, e.g. study plans.

#### FUNCTIONAL ANALYSIS PROCESS

These Technical Requirements reflect the results of a top down functional analysis. The primary purpose of the analysis was to assure traceability of requirements. Even though many available source materials were used as input, this was a separate analysis and evaluation of the traceability of the requirements. Performing a functional analysis for a narrow slice of the operational systems and evaluations results in interfaces where the other systems or evaluations are still being defined. While this may result in increased probability of changes, they will be controlled by the normal change control processes.

\* This document has also been referred to as the Surface Based Test Facilities Requirements Document

The term "requirements" is used two ways in this process. First, it is used broadly to describe the entire contents of these documents, e.g. as in Technical Requirements. Second, it is used in the functional analysis process to describe the performance criteria and constraints, i.e. how functions must be performed. Function and functional requirement are used interchangeably and describe what the system or evaluation is to perform. Architecture is used to describe the system or evaluation. Architecture represents the answer to "What system or evaluation will perform the functions?"

The functional analysis divides into three major parts: operating system analysis, test and evaluation analysis, and testing facilities analysis. The operating system analysis describes the future systems and functions and supports the requirements described in the SR, SD, and STRD. Operating systems include the MGDS and its principle subsystems, the repository, the waste package, and the site. Environmental constraints are identified in the TEPB. The repository and waste package analyses are truncated from this analysis. The test and evaluation analysis describes how the system is to be evaluated and supports the System Performance Evaluation element of the SR and the T&EPB. The testing facilities analysis describes the facilities needed to support the test activities and support the SBTRD. The ESF is not required for this limited analysis. Laboratories are not intrusive on the operating system and are the responsibility of the individual test organizations.

An activity operations analysis is not included in these documents. While some new requirements (e.g. performance and environmental constraints) were identified and added in the process, most of the prior decisions still support the upper tier requirements. For example, the evaluations described in the T&EPB are fully consistent with those described in the Site Characterization Plan. This is reasonable since most of the additions were to constraints or lower tier testing facility requirements.

#### TRACEABILITY

The source of requirements statements will be given in each document. If necessary for clarity, these references are included directly in the text. Otherwise, they appear in brackets following the statement to which they apply. In addition, each section includes a list of reference documents as an appendix. The general format for in-text citation of another of the technical hierarchy documents is: [document abbreviation, section, type and number of statement]. Specific examples of citations are given below:

[W, 2.2.1(3)]: Waste Management System Requirements Volume IV, performance criterion 2.2.1(3).

[SR, 1.0, FR2]: Yucca Mountain Mined Geologic Disposal System Requirements (SR), section 1.0, functional requirement number 2.

#### MANAGEMENT REQUIREMENTS

The technical requirements hierarchy is only one part of the overall document hierarchy for the Project. Management requirements and cost/schedule requirements are also applicable to all activities. The interaction of these technical requirements documents and the management requirements is shown in Figure I-1. For example, other controls on test operations are prepared

separately as part of the Management Requirements as described in the Test and Evaluation Plan. Similarly, the quality assurance requirements implemented to conduct activities related to the Midway Valley Trenching and Calcite/Silica Activities will be accomplished in accordance with appropriate procedures designed to implement the OCRWM QARD, DOE/RW-0214, and the QAPDs/QAPPs for each participant.

#### AUTHORITY

The U.S. Department of Energy (DOE) has primary Federal responsibility for developing and implementing safe, environmentally acceptable, and cost-effective methods for the long-term disposal of radioactive waste. Within the DOE, the Office of Civilian Radioactive Waste Management (OCRWM) has chartered the Yucca Mountain Project (Project) to investigate the feasibility of using the Yucca Mountain site in southern Nevada for radioactive waste disposal.

If there is a conflict among the requirements it should be brought to the attention of the change control board. If there is a conflict or duplication among the requirements, the more authoritative requirement prevails. Public laws hold the highest authority, followed by the Code of Federal Regulations, Project Positions, guidance from the NRC staff, and lastly DOE orders. In general, DOE Orders cannot substitute for more authoritative requirements even if the Order() is more stringent. To the best of our knowledge, the requirements in these documents do not conflict.

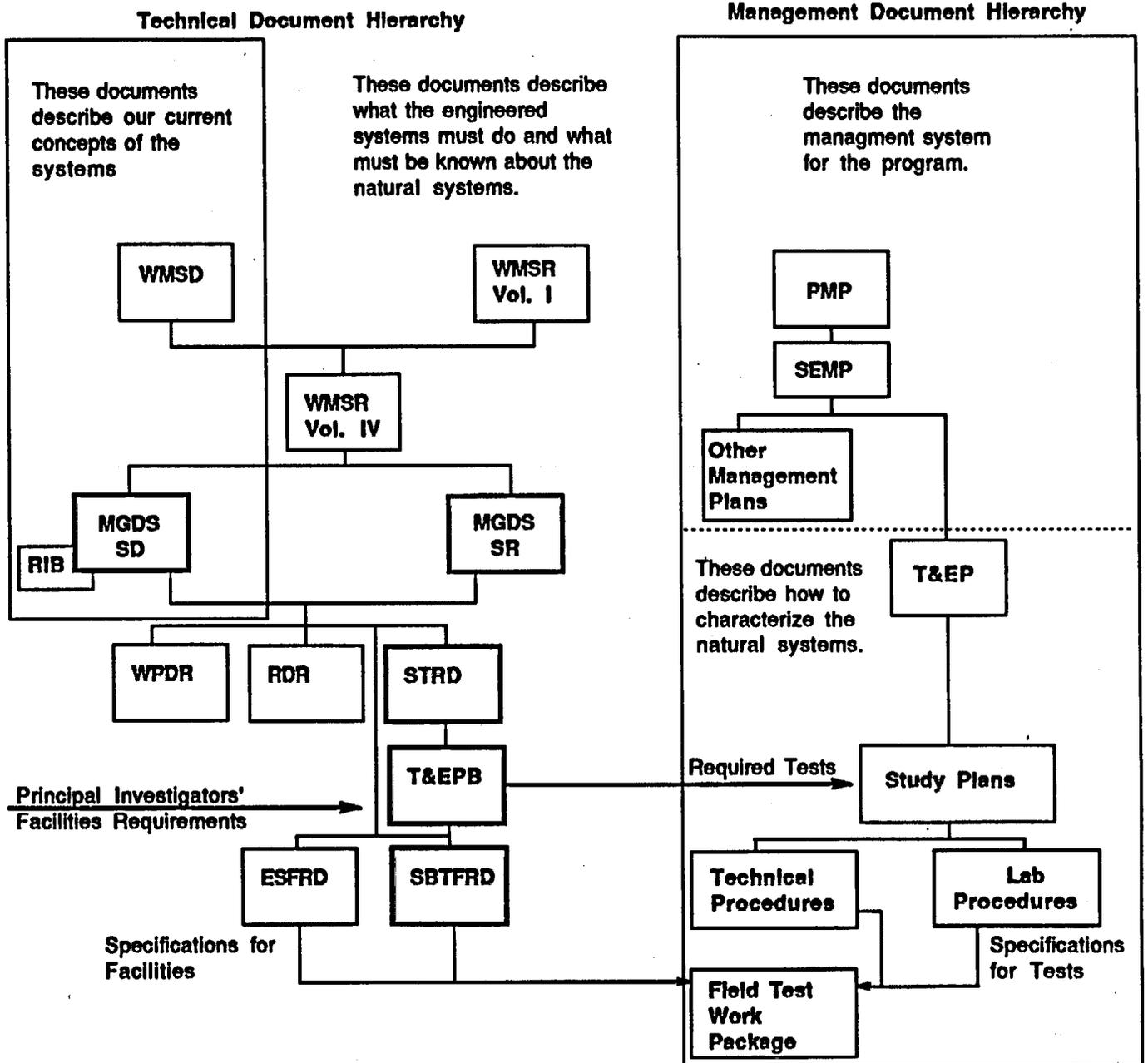


Figure I-1. Portions of the Yucca Mountain Project Document Hierarchy. Only documents with bold outlines are included in the Technical Requirements of the Yucca Mountain Project (Midway Valley Trenching and Calcite/Silica Activities).

## APPENDIX A

## EXPLANATION OF RESPONSIBILITY MATRIX

The responsibility matrix lists the organizations which are responsible for accomplishing two tasks associated with each requirement. The first task to be accomplished is to establish the requirement; the second is to implement it. The organizations responsible for the first task are listed under the heading, "Organization Responsible for Preparation of Requirement." Those listed are to determine that a requirement is correct and are responsible for defending the requirement. Although DOE is ultimately responsible for this, the responsibility can be delegated to other organizations, and such delegation is expected to occur. The organizations responsible for the second task are listed under the heading, "Organization Responsible for Compliance with Requirement." Those listed are responsible for demonstrating how the requirement has been met.

## APPENDIX A

RESPONSIBILITY MATRIX FOR  
INTRODUCTION TO THE TECHNICAL REQUIREMENTS

Introduction Section	Organization Responsible for Compliance with Requirement	Organization Responsible for Preparation of Requirement
All sections	N/A	DOE/YMPO

APPENDIX B

REFERENCES TO  
INTRODUCTION THE TECHNICAL REQUIREMENTS

- DOE (U. S. Department of Energy), 1988a. Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0199, Washington, D. C., December, 1988.
- DOE (U.S. Department of Energy), 1990. "Waste Management System Requirements Document," Volume I, DOE/RW-0268P, Rev. 0, Washington D.C., March, 1990.
- DOE (U.S. Department of Energy), 1990a. "Waste Management System Requirements Document," Volume IV: Mined Geologic Disposal System, DOE/RW-0268P, Rev. 0, Washington D.C., March, 1990.

## **Section II**

# **Yucca Mountain Mined Geologic System Description**

YUCCA MOUNTAIN MINED GEOLOGIC SYSTEM DESCRIPTION

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## YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM DESCRIPTION

The purpose of the Yucca Mountain Mined Geologic Disposal System Description Document (SD) is to describe the Mined Geologic Disposal System (MGDS) and its subparts. The MGDS includes the surface facilities and the underground emplacement facilities. The underground facilities are located within the proposed underground boundary shown on Figure II-1. Figure II-2 by Bechtel National, Inc. (SNL, 1987) provides the layout for the repository facilities in relationship to the Yucca Mountain study area. The location of surface facilities shown in Figure II-2 is only preliminary. Potential surface facility locations cover all of Midway Valley.

Figure II-1 shows Midway Valley areas of interest with potential trench locations, including Trench 14. The Midway Valley trenching areas shown on Figure II-1 apply to the first activity of the study only. The second activity, in which major trenching will occur, may use different locations.

The trenching locations are planned to be outside the repository disposal boundary. Consequently, the Midway Valley characterization activities described in this document are anticipated to have no significant adverse impact.

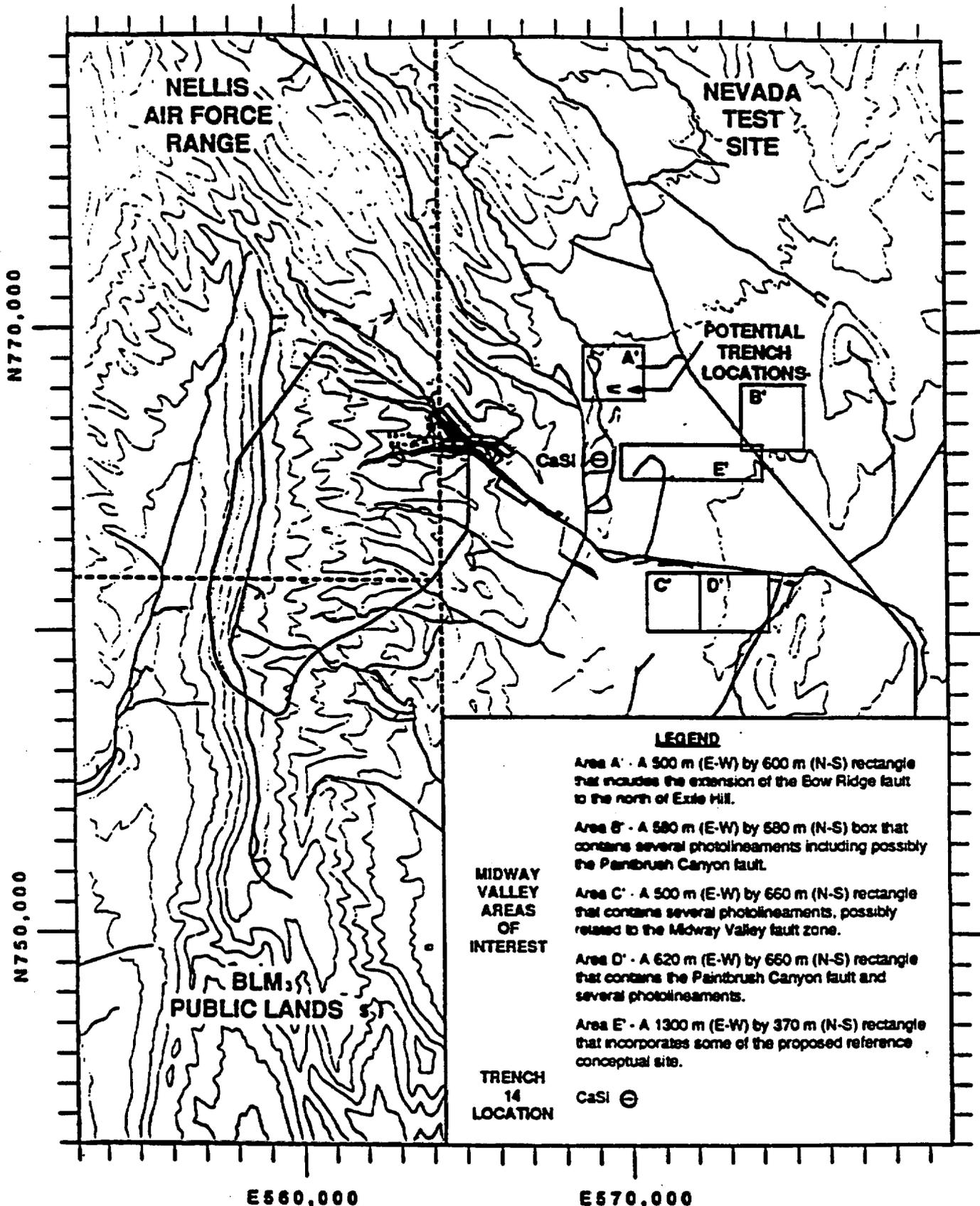
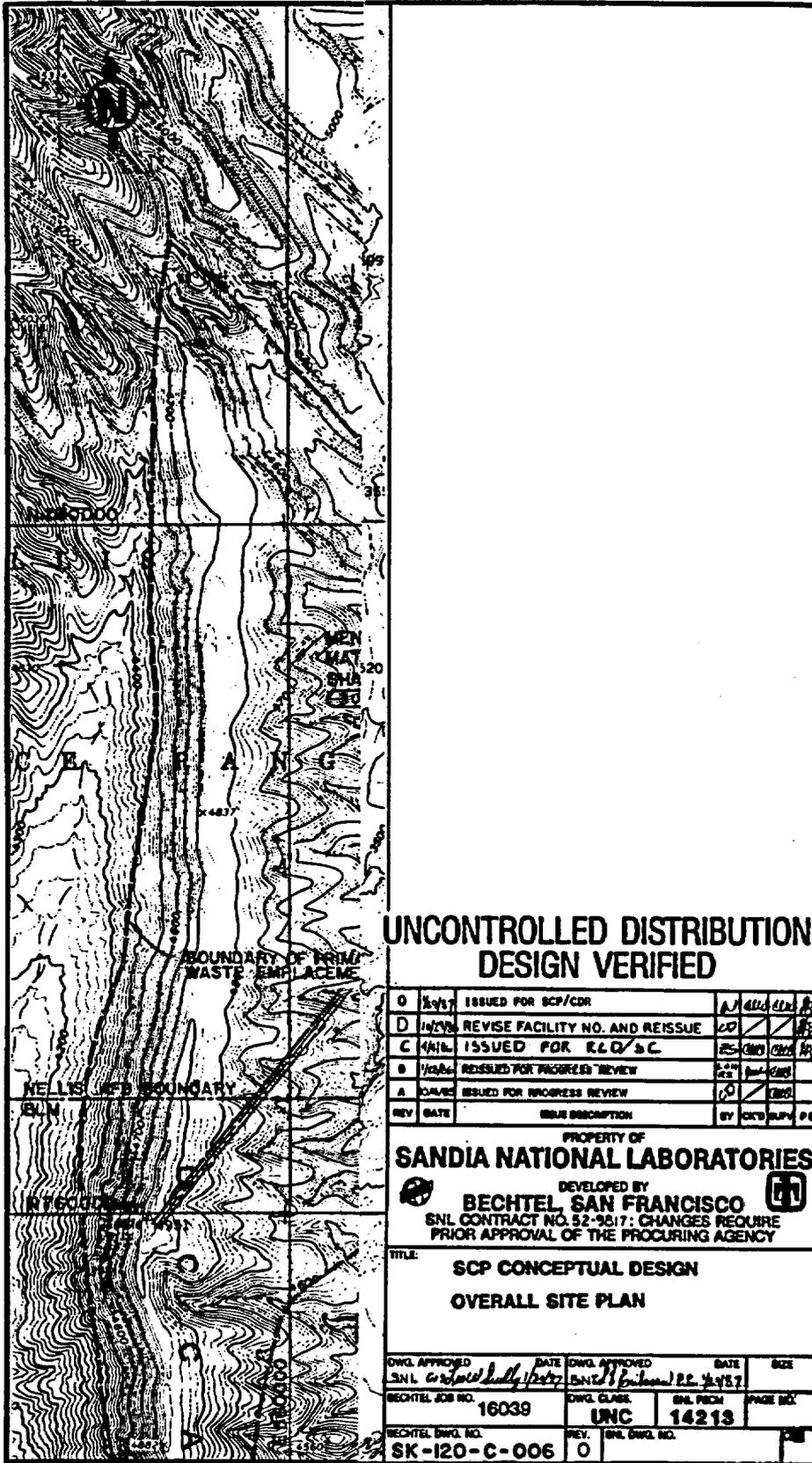


Figure II-1. Midway Valley areas of interest.



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TITLE:  
**SCP CONCEPTUAL DESIGN  
OVERALL SITE PLAN**

DWG. APPROVED SNL <i>Controlled by 1/2/87</i>	DATE 1/2/87	DWG. APPROVED SNL <i>Controlled by 1/2/87</i>	DATE 1/2/87	SIZE
BECHTEL JOB NO. 16039	DWG. CLASS UNC	SNL PROJ. 14213	PAGE NO.	
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## APPENDIX A

## EXPLANATION OF RESPONSIBILITY MATRIX

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APPENDIX A  
RESPONSIBILITY MATRIX  
FOR  
YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM DESCRIPTION

Systems Description Section	Organization Responsible for Compliance with Requirement	Organization Responsible for Preparation or Allocation of Requirement
II	DOE/YMPO	SNL Prepares DOE/YMPO reviews and accepts.

APPENDIX B

REFERENCES TO  
YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM DESCRIPTION

Sandia National Laboratories (SNL), Site Characterization Plan Conceptual Design Report, SAND 84-2641, Compiled by H. R. MacDougal, L.W. Sculley, and J. R. Tillerson, Albuquerque, NM, 1987.

**Section III**

**Yucca Mountain Mined Geologic  
Disposal System Requirements**

## YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM REQUIREMENTS

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## YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM REQUIREMENTS (SR)

## INTRODUCTION

The Yucca Mountain Mined Geologic Disposal System Requirements (SR) section specifies the definitions, functional requirements, performance criteria, and constraints for the YMMGDS and its subelements. The YMMGDS is the first section. The YMMGDS, as defined in this document, includes three subsystems as follows. Section 1.0 (Site) defines requirements for a suitable location of the MGDS. Section 2.0 (Repository) defines construction, operation, performance confirmation, closure, and decommissioning requirements. Section 3.0 (System Performance Evaluation) defines requirements for evaluation of the MGDS repository and site. These subsystems are developed from the WMSR functions (4.0) which are primarily to process (4.1) and isolate (4.2) wastes. These functions require that a suitable location and a processing facility be provided. Other potential subelements such as the Waste Package are not needed for this analysis and are not included.

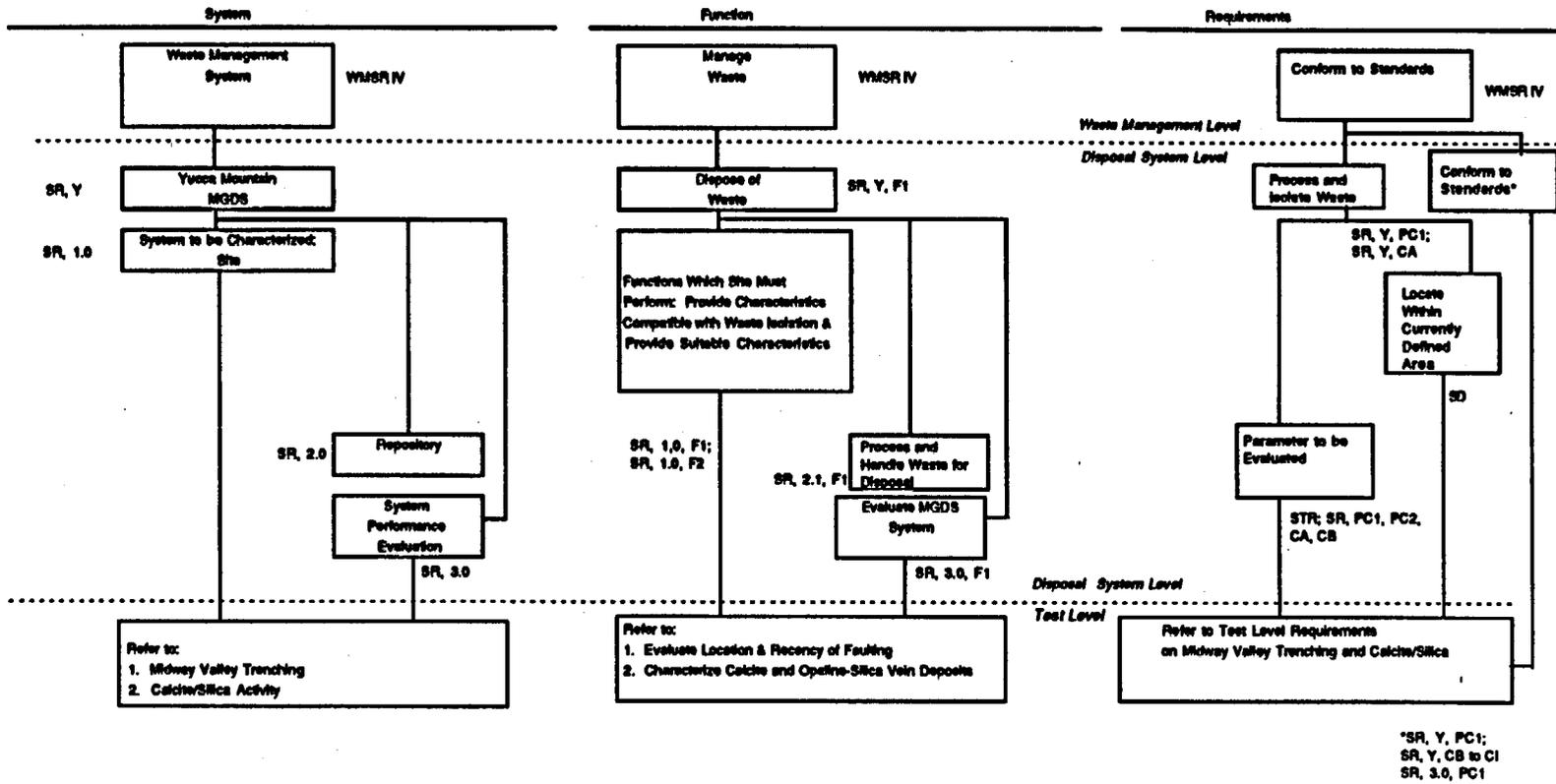
This section of the Technical Requirements Document is limited to use for activities relating to the evaluation of the location and recency of faulting near prospective surface facilities (Midway Valley Trenching) or characterization of calcite and opaline-silica vein deposits (Calcite/Silica). These activities are important to the proper evaluation of the ability of the site and repository to meet stated performance objectives (safe disposal and isolation of radioactive waste). The requirements contribute to satisfying the upper tier requirements described in WMSR IV, and do not violate any upper tier requirements. While these documents are sufficient for Midway Valley Trenching and Calcite/Silica, the lower tier requirements are not yet in themselves sufficient to satisfy all upper tier requirements in the WMSR.

The requirements include applicable regulations, codes, and specifications of Federal, State, and local agencies.

Figure III-1, Waste Management Systems, Functions, and Requirements, shows the general flow-down of requirements from the Waste Management Level. This figure summarizes the systems, functions and requirements. The reader should refer to the following text for specifics.

Figure III-1. Systems, Functions, and Requirements for Waste Management  
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III-2



Note that the functions and requirements indicated above flow down through each system level even though they are not repeated graphically. For instance, "Conform to Standards" is a requirement for six systems shown above.

## ORGANIZATION

This document is organized by systems architecture. For each system element, the functions are described in the function requirements (FR). The requirements of how well the function must be performed are included in the performance criteria (PC) and the constraints (C) sections.

The following format and definitions are used for all subsections of the Yucca Mountain Mined Geologic System Requirements.

### CONTENTS OF EACH SUBSECTION

Each of the following categories of information are included for each subelement.

**DEFINITION OF SUBSYSTEM.** This category states the general purpose of the subsystem or subsystem element or what it is.

**FUNCTIONAL REQUIREMENTS (FR).** This category contains definitions of what the system or subsystem element must accomplish. These FRs are set forth as statements of purpose and are listed in numeric order.

**PERFORMANCE CRITERIA (PC).** This contains criteria statements describing how a specific subsystem must perform its functional requirement and, in some cases, provides direction for evaluating its performance. These criteria are listed in numeric-alphabetic order as a means of identifying the functional requirement with which they are associated. As an example, Performance Criteria 1a through 1f would be subordinate to Functional Requirement 1.

**CONSTRAINTS (C).** This contains statements on the limitations which are placed on the subsystem by the following:

1. design processes;
2. interrelated subsystems;
3. environmental conditions within which the subsystem or subsystem element must function;
4. applicable regulations, codes, standards, policies, guidance, and the like.

Constraints are listed in alphabetic order.

**INTERFACES (I).** These identify the complementary subelements which may affect the satisfaction of the requirements.

In addition to the above listed categories, the Yucca Mountain Project Systems Engineering Management Plan (SEMP) includes the categories: (1) PURPOSE, (2) APPLICABLE REGULATIONS, CODES AND STANDARDS, (3) DESIGN AND OPERATING REQUIREMENTS, (4) INTERFACE REQUIREMENTS, (5) ASSUMPTIONS, and (6) SYSTEM CONFIGURATION. Category (1) has been included in the category DEFINITION SUBSYSTEM. Categories (2), (3), and (4) are included in the categories PERFORMANCE CRITERIA and CONSTRAINTS. Category (5) is not included because no assumptions were identified at this level. Category (6) is incorporated at the

beginning of each system/subsystem entry. System Configuration includes the system "name" and the associated "Subsystem." The overall System Configuration is also shown on Figure III-1.

TRACEABILITY. The basis for each statement in this section is given by a citation following the statement.

Specific examples of statement citations and their meanings are as follows:

[W, 2.2.1(3)] This citation identifies that this statement is derived from Performance Criteria 2.2.1(3) from Volume IV of the Waste Management System Requirements document (WMSR).

[10 CFR 60.133(d)] This citation example indicates that 10CFR60.133(d) has been quoted verbatim.

Appendix A contains the responsibility matrix for the requirements contained in this section of the document. Appendix B contains the references referred to in this section. Full citations to laws, regulations, and DOE Orders named in the text are provided in Appendix B. Plans, reports, and correspondence used in the text are identified by author and date citations, e.g., (DOE, 1990a). Complete citations are provided in Appendix B.

## YUCCA MOUNTAIN MINED GEOLOGIC DISPOSAL SYSTEM

Subelements include:

- 1.0 Site
- 2.0 Repository
- 3.0 System Performance Evaluation

DEFINITION: A system of engineered and natural barriers located at Yucca Mountain in southern Nevada, requiring licensing by the NRC, that is used for the disposal of high-level radioactive waste in an excavated geologic media.

## FUNCTIONAL REQUIREMENTS:

1. To dispose of radioactive waste safely. Subfunctions include: process waste and isolate waste. [W, 2.2.1.4.1, 2.2.1.4.2]

## PERFORMANCE CRITERIA:

1. The Mined Geologic Disposal System (MGDS) will comply with performance criteria in Waste Management System Requirements (WMSR), Vol. IV (DOE, 1990a).

## CONSTRAINTS:

- A. The MGDS shall comply with the requirements of 10CFR60 and 40CFR191 as reflected in the WMSR. [W, 2.2.1.4(2)]
- B. The MGDS shall not adversely impact the weapons program at Nevada Test Site (NTS) (Consistent with DOE Order 5600.1). [W, 2.2.1(3)]
- C. The MGDS shall be constructed, operated, and decommissioned in a manner that protects the quality of the environment. The MGDS shall comply with all applicable Federal, State of Nevada, and local environmental protection regulations (DOE Order 5440.1C) [W, 2.2.1(3)]. Such compliance shall include the following:
  1. Air emissions shall comply with Federal regulations pertaining to compliance with the Clean Air Act. These include: 40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards), and 40 CFR 60 (Standards of Performance for New Stationary Sources). Since the U.S. Environmental Protection Agency (EPA) has delegated the implementation and enforcement of this program to the Nevada Division of Environmental Protection (NDEP), the Project shall comply with State or local standards included under the stipulations of NRS 445.401-.601 for Air Quality - (1) Registration Certificate and (2) Permit to Operate. [W, 2.2.1(3.1)]
  2. All fugitive air emissions (non-point sources) shall be controlled in accordance with the provisions of the Clean Air Act, as amended (42 USC 7401), as well as all applicable State of Nevada and local air quality regulations. [W, 2.2.1(3.2)]

3. Additionally the MGDS shall comply with the following statutory requirements:
    - a. the Comprehensive Environmental Response, Compensation and Liability Act;
    - b. Executive Orders 12088, Federal Compliance with Pollution Control Standards and 11988, Floodplain Management;
    - c. the Nevada Water Pollution Control Law, NRS 445.131-.399;
    - d. the Nevada Water Appropriation Permit, NRS 533 and 534;
    - e. the Hazardous Materials Transportation Act;
    - f. the American Indian Religious Freedom Act.
  4. Runoff and erosion at the MGDS shall be controlled in accordance with applicable State of Nevada and local regulations.
  5. The management and disposal of solid and any hazardous and mixed wastes (excluding any radioactive wastes) shall be conducted in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA) as amended (42 USC 3521 et. seq.), which could include RCRA permitting for the hazardous wastes. Since parts of the RCRA program are administered by the NDEP, the Project shall comply with the State or local standards as may be required under the stipulations of NRS Chapter 459.400-.910, Hazardous Waste Management, NRS Chapter 444.440-.620, Solid Waste Management System, and Nevada Administrative Code (NAC) 444.570-.748, Solid Waste Disposal. [W, 2.2.1(3.6)]
  6. During preclosure activities, the effects on cultural resources, historic trails, and properties of historic significance in southern Nevada shall be evaluated and mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors in accordance with the requirements of the National Historic Preservation Act of 1966 [16 U.S.C. 470, the Archaeological Resources Protection Act of 1979 [16 U.S.C. 470aa, et. seq.], the American Antiquities Act [16 U.S.C. 432], the National Trails Systems Act [16 U.S.C. 1241, et. seq.], the Historic Sites, Buildings, and Antiquities Act [16 U.S.C. 461-469], and the Preservation of Historical Archaeological Data Threatened by Dam Construction or Alteration of Terrain (16 U.S.C. 469 et. seq.). [W, 2.2.1(3)]
- D. During preclosure activities, the effects on flora and fauna at the repository site shall be evaluated and adequate protection or restoration provided as required by the Endangered Species Act [16 U.S.C. 1531, et. seq.], the Bald and Golden Eagle Protection Act [16 U.S.C. 668-668d], and the Wild Free-Roaming Horses and Burros Act [16 U.S.C. 1331-1340]. [W, 2.2.1(3)]

- E. During preclosure activities, the applicable right-of-way grants, withdrawal-land-orders, and temporary-use-permits shall be appropriated as required by the Federal Land Policy and Management Act [43 U.S.C. 103f, 155-158, 302b, 501a-7, 504a, 507a, and 1701-1782]. [W, 2.2.1.4.2.4(3)]
- F. Repository construction and operations shall comply with Bureau of Land Management (BLM) and Air Force right of way requirements. [W,2.2.1.4.2.4(3)]
- G. Site characterization, design, construction, and operations through permanent closure shall provide protection against planned or accidental introduction to the subsurface of chemical or organic substances that might enhance radionuclide mobility by forming chemical complexes or colloids. [W, 2.2.1.4.2.2(1)]
- H. The MGDS shall be designed, constructed, operated, and decommissioned in such a manner as to ensure compliance with the applicable occupational safety and health standards of 29 CFR Part 1910, 29 CFR Part 1926, and 29 CFR Part 1960. [W, 2.2.1.4.1(11)]
- I. The MGDS shall comply with applicable non-radiological occupational safety and health standards and DOE Orders 3790.1A, 5483.1A, 5480.4, 5480.7, 5480.9, and 5480.10; including those with potential radiological safety consequences as imposed by 10 CFR Part 60. [W, 2.2.1.4.1(12)]

#### INTERFACES:

Because of the limited use of this document, no interfaces require control at this time.

## 1.0 SITE

Subelements include:

TBD

### DEFINITION:

For purposes of this document, the site includes the regional area as well as the controlled area. The site as defined in 10 CFR 60.2 includes only the "controlled area." "Site" means the location of the controlled area (10 CFR 60.2). "Controlled area" means: (1) A. surface location, to be identified by passive institutional controls, that encompasses no more than 100 square kilometers and extends horizontally no more than five kilometers in any direction from the outer boundary of the original location of the radioactive wastes in a disposal systems; and (2) the subsurface underlying such a surface location [40 CFR 191.12(g)].

### FUNCTIONAL REQUIREMENTS:

1. (Preclosure) To provide a suitable location for the construction, operations, closure, decommissioning, and supporting activities of a Mined Geologic Disposal System. [W, 2.2.1(3), 2.2.1.4(4)]
2. (Postclosure) To provide the characteristics compatible with radioactive waste isolation and to contribute to the control of radioactive releases. [W, 2.2.1.4.2, 2.2.1.4.1]

### PERFORMANCE CRITERIA:

- 1a. The site shall meet the applicable siting criteria of 10 CFR 60.122. [W, 2.2.1.4(4.4)]
- 1b. The site shall contribute to meeting the NRC performance objectives in 10 CFR 60.111. [W, 2.2.1.4.1(5)]
2. The site shall contribute to meeting the NRC performance objectives as reflected in 10 CFR 60.112 and 60.113. [W, 2.2.1.4.2(2)]

### CONSTRAINTS:

- A. Sections 10 CFR 60.131 through 10 CFR 60.134 specify minimum criteria for the design of the geologic repository operations area. These design criteria are not intended to be exhaustive, however. Omissions in 60.131 through 60.134 do not relieve DOE from any obligation to provide such safety features in a specific facility needed to achieve the performance objectives. All design bases must be consistent with the results of site characterization activities. [10 CFR 60.130] [W, 2.2.1(8.2)]

- B. The geologic setting shall be selected and the engineered barrier system and the shafts, boreholes and their seals shall be designed to assure that releases of radioactive materials to the accessible environment following permanent closure conform to such generally applicable standards for radioactivity as may have been established by the Environmental Protection Agency with respect to both anticipated process and events and unanticipated process and events [10 CFR 60.112] [W, 2.2.1.4.2(2.1)]

INTERFACES:

REPOSITORY  
SYSTEM PERFORMANCE EVALUATION

## 2.0 REPOSITORY\*

Subelements include:

TBD

### DEFINITION:

That subsystem of the MGDS devoted to construction, operation, performance confirmation, closure, and decommissioning.

### FUNCTIONAL REQUIREMENTS:

1. To implement and conduct construction of surface and subsurface facilities, operation (including receipt, handling, emplacement, and retrieval of wastes), performance confirmation activities, closure (including sealing of boreholes and shafts), and decommissioning activities. [W, 2.2.1.4]

### PERFORMANCE CRITERIA:

TBD

### CONSTRAINTS:

TBD

### INTERFACES:

SITE  
SYSTEM PERFORMANCE EVALUATION

\* The repository systems details are not considered below this level. The interface will be considered in the site and system performance evaluation activities which may affect the repository performance. See also the System Description in Section II.

### 3.0 SYSTEM PERFORMANCE EVALUATION

Subelements include:

TBD

#### DEFINITION:

Those systems and activities which provide the evaluation of the performance of the mined geologic disposal system.

#### FUNCTIONAL REQUIREMENTS:

1. To provide high confidence that the MGDS can meet the performance objective to dispose and safely isolate radioactive waste from the accessible environment. [W, 2.2.1(8)]

#### PERFORMANCE CRITERIA:

1. The evaluations of MGDS performance shall be sufficient to provide appropriate data to support the license application consistent with 10 CFR 60.21:
  - determining whether natural and engineered systems and components which are designed or assumed to operate as barriers for radioactive waste isolation after permanent closure, will function as intended and anticipated;
  - determining the processes and events that might affect the disposal system;
  - determining the effects of these processes and events on the performance of the MGDS;
  - determining the estimates of the cumulative releases of radionuclides considering the associated uncertainties, caused by all significant processes and events. Whereupon these estimates shall be incorporated into an overall probability distribution of cumulative release to the extent practicable;
  - analyzing changes from the baseline condition of parameters that could affect the performance of the geologic repository. [W, 2.2.1(8.1)]

CONSTRAINTS:

- A. The evaluations of natural and engineered barrier systems and components shall be implemented as early as is practicable to support the license application and the Safety Analysis Report as required by 10 CFR 60.21. [W, 2.2.1(8.17)]
- B. All studies and evaluations necessary to perform the assessments required under 10 CFR 60.21(c) shall be undertaken. [W, 2.2.1(8.1)]

INTERFACES:

SITE  
REPOSITORY

## APPENDIX A

## EXPLANATION OF RESPONSIBILITY MATRIX

The responsibility matrix lists the organizations which are responsible for accomplishing two tasks associated with each requirement. The first task to be accomplished is to establish the requirement; the second is to implement it. The organizations responsible for the first task are listed under the heading, "Organization Responsible for Preparation of Requirement." Those listed are to determine that a requirement is correct and are responsible for defending the requirement. Although DOE is ultimately responsible for this, the responsibility can be delegated to other organizations, and such delegation is expected to occur. The organizations responsible for the second task are listed under the heading, "Organization Responsible for Compliance with Requirement." Those listed are responsible for demonstrating how the requirement has been met.

APPENDIX A  
 RESPONSIBILITY MATRIX  
 FOR  
 YUCCA MOUNTAIN MINED GEOLOGIC SYSTEM REQUIREMENTS

Systems Requirements Section	Organization Responsible for Compliance with Requirement	Organization Responsible for Preparation of Requirement
<u>YMMGDS</u>		
YMMGDS PC #1	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #A	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #B	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #C	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #D	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #E	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #F	Project Office	SNL prepares Project Office reviews/accepts
YMMGDS C #G	Project Office	SNL prepares Project Office reviews/accepts

1.0 SITE

1.0 PC #1	Project Office	SNL prepares Project Office reviews/accepts
1.0 PC #2	Project Office	SNL prepares Project Office reviews/accepts
1.0 C #A	Project Office	SNL prepares Project Office reviews/accepts
1.0 C #B	Project Office	SNL prepares Project Office reviews/accepts

2.0 REPOSITORY

NONE TO ALLOCATE

3.0 SYSTEM PERFORMANCE EVALUATION

3.0 PC #1	USGS & SNL	SNL prepares Project Office reviews/accepts
3.0 C #A	USGS & SNL	SNL prepares Project Office reviews/accepts
3.0 C #B	Project Office	SNL prepares Project Office reviews/accepts

## APPENDIX B

REFERENCES TO  
YUCCA MOUNTAIN MINED GEOLOGIC SYSTEM REQUIREMENTS

- American Indian Religious Freedom Act, 1978. "American Indian Religious Freedom Act," Pub. L. 95-341, 42 USC 1996, August 11, 1978.
- Antiquities Act of 1906, 1906. "Antiquities Act of 1906," 16 USC 431, 432, 433; 25 CFR 261, 36 CFR 296; 43 CFR 3 and 7.
- Archaeological and Historic Preservation Act. "Archaeological and Historic Preservation Act," 16 USC 469-469c.
- Archaeological Resources Protection Act of 1979, 1979. "Archaeological Resources Protection Act of 1979," 16 USC 470AA et seq.
- Bald and Golden Eagle Protection Act, 1940. "Bald and Golden Eagle Protection Act," 54 Stat. 250, 16 USC 668-668d, June 8, 1940.
- CERCLA (Comprehensive Environmental Response, Compensation, Liability Act), 1980. "Comprehensive Environmental Response, Compensation, Liability Act," as amended, 42 USC 9601 et seq.
- Clean Air Act, 1983. "Clean Air Act," as amended, Pub. L. 88-206, 42 USC 7401 et seq., December 8, 1983.
- DOE (U.S. Department of Energy), 1979. "Management of the DOE Weapons Program and Weapon Complex," Order 5600.1, Washington, D. C., June 27, 1979.
- DOE (U.S. Department of Energy), 1983. "Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities," Order 5483.1A, Washington, D. C., June 22, 1983.
- DOE (U.S. Department of Energy), 1984. "Environmental Protection, Safety and Health Protection Standards," Order 5480.4, Washington, D. C., May 15, 1984.
- DOE (U.S. Department of Energy), 1984. "Federal Employee Occupational Safety and Health Program," Order 3790.1A, Washington, D. C., October 22, 1984.
- DOE (U.S. Department of Energy), 1985. "Contractor Industrial Hygiene Program," Order 5480.10, Washington, D. C., June 26, 1985.
- DOE (U.S. Department of Energy), 1985. "National Environmental Policy Act," Order 5440.1C, Washington, D. C., April 9, 1985.
- DOE (U.S. Department of Energy), 1987. "Construction Safety and Health Program," Order 5480.9, Washington, D. C., November 18, 1987.
- DOE (U.S. Department of Energy), 1987. "Fire Protection," Order 5480.7, Washington, D. C., November 16, 1987.

- DOE (U.S. Department of Energy), 1990a. "Waste Management System Requirements Document," Volume IV: Mined Geologic Disposal System, DOE/RW-0268P, Rev. 0, Washington D.C., March, 1990.
- Endangered Species Act, 1973. "Endangered Species Act of 1973," Pub. L. 93-205, 16 USC 1531 et seq., December 28, 1973.
- E.O. (Executive Order) 11988, 1977. "Floodplain Management" (as amended by E.O. 12148, 1977), May 24, 1977.
- E.O. (Executive Order) 12088, 1978. "Federal Compliance with Pollution Control Standards" (as amended by E.O. 12580, January 23, 1987), October 13, 1978.
- Federal Land Policy and Management Act, 1976. "Federal Land Policy and Management Act," Pub. L. 94-5799, 43 USC 103f, 155-158, 302b, 501a-7, 504a, 507a, and 1701-1782, October 21, 1976.
- Hazardous Materials Transportation Act, 1975. "Hazardous Materials Transportation Act," Pub. L. 93-633, 49 USC 1801 et seq., January 3, 1975.
- Historic Sites, Building, and Antiquities Act. "Historic Sites, Building, and Antiquities Act," 16 USC 461-469.
- NHPA (National Historic Preservation Act), 1966. "National Historic Preservation Act of 1966." 16 USC 470, et. seq.
- National Trails Systems Act. "National Trails Systems Act," 16 USC 1241, et seq.
- NAC (Nevada Administrative Code) 444.570-.748, "Solid Waste Disposal."
- NRS (Nevada Revised Statutes) 444.440-.620, "Solid Waste Management."
- NRS (Nevada Revised Statutes) 445.131-.399, "Water Pollution Control Law."
- NRS (Nevada Revised Statutes) 445.401-.601, "Air Quality - Permit to Construct; Prevention of Significant Deterioration; and Permit to Operate."
- NRS (Nevada Revised Statutes) 459.400-.910, "Hazardous Waste Management."
- NRS (Nevada Revised Statutes) 533 and 534, "Permit to Appropriate Public Waters."
- RCRA (Resource Conservation and Recovery Act), 1988. "Resource Conservation and Recovery Act of 1976," as amended, Pub. L. 94-580, 42 USC 6901 et seq., November 1, 1988.
- Wild Free-Roaming Horses and Burros Act, 1971. "Wild Free-Roaming Horses and Burros Act," Pub. L. 92-195, 16 USC 1331-1340, December 15, 1971.

- 10 CFR Part 60 (Code of Federal Regulations), 1990. Title 10, "Energy," Part 60, "Disposal of High-Level Radioactive Wastes In Geologic Repositories," U. S. Government Printing Office , Washington, D.C., March, 1990.
- 29 CFR Part 1910 (Code of Federal Regulations), 1988. Title 29, "Labor," Part 1910, "Occupational Safety and Health Standards," U. S. Government Printing Office , Washington, D.C., July 1, 1988.
- 29 CFR Part 1926 (Code of Federal Regulations), 1988. Title 29, "Labor," Part 1926, "Safety and Health Regulations for Construction," U. S. Government Printing Office , Washington, D.C., July 1, 1988.
- 29 CFR Part 1960 (Code of Federal Regulations), 1986. Title 29, "Labor," Part 1926, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters," U. S. Government Printing Office , Washington, D.C., July 1, 1986.
- 40 CFR Part 50 (Code of Federal Regulations), 1985. Title 40, "Protection of Environment," Part 50, "National Primary and Secondary Ambient Air Quality Standards," U. S. Government Printing Office , Washington, D.C., July 1, 1985.
- 40 CFR Part 60 (Code of Federal Regulations), 1985. Title 40, "Protection of Environment," Part 60, "Standards of Performance for New Stationary Sources," U. S. Government Printing Office , Washington, D.C., July 1, 1985.
- 40 CFR Part 191 (Code of Federal Regulations), 1985. Title 40, "Protection of Environment," Part 191, "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Wastes," U. S. Government Printing Office , Washington, D.C., September 19, 1985.

**Section IV**

**Site Requirements Document**

SECTION IV: SITE REQUIREMENTS DOCUMENT

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## INTRODUCTION

Section III, Yucca Mountain Mined Geologic Disposal Systems Requirements (SR), defines two functional requirements for the site:

1. (Preclosure): To provide a suitable location for the construction, operation, closure, decommissioning, and supporting activities of a Mined Geologic Disposal System.
2. (Postclosure): To provide the characteristics compatible with radioactive waste isolation and to contribute to the control of radioactive releases.

The functions of the site are described in terms of the function/process, the performance measure, and the performance/design parameter. In addition, scenarios are defined which describe potential future states of the site. The functions describe how the site systems are expected to perform with respect to meeting the overall objectives (e.g., contain and isolate the nuclear waste).

The Department of Energy was required by the Nuclear Waste Policy Act, [Section 113(b)(1)(A)], to prepare a Site Characterization Plan (SCP) (DOE, 1988a). This section of the Act and 10 CFR 60.17 present general specifications for the content of the SCP.

The Waste Management System Requirements Document (WMSR), Volume IV MGDS states, in requirement 2.2.1.4(4), "Suitability of the Geologic Repository Site for licensing by the NRC and for compliance with the National Environmental Policy Act, 1970, as amended (42 USC 4321) shall be determined to site characterization in accordance with the NWPA, as amended." The Performance Criterion for requirement 2.2.1.4(4) states that "The Site Characterization activities shall provide sufficient information to address the subset regulatory requirements related to site suitability and licensing that are identified in DOE/RW-0101, Issues Hierarchy for a Mined Geologic Disposal System (PE-09, formerly OGR/B-10)" (DOE, 1986a). The issues hierarchy from OGR/B-10 is incorporated in Section 8.2, Table 8.2-1, of the Yucca Mountain Site Characterization Plan, and provides the basis for the remainder of Chapter 8. Therefore, there is a direct Regulatory and Licensing flowdown from WMSR, Volume IV to Chapter 8 of the SCP.

The Site Program is discussed in SCP Section 8.3.1 Sections 8.3.1.2 through 8.3.1.9 address Postclosure performance and design issues. Sections 8.3.1.10 through 8.3.1.14 address Preclosure design and safety issues. The site investigations described in each section are divided into studies and activities. Midway Valley trenching requirements are described in Study 8.3.1.17.4.2 (DOE, 1989a), and the Calcite/Silica Trench 14 requirements in activity 8.3.1.5.2.1.5 which is part of Study 8.3.1.5.2.1, Characterization of the Quaternary Regional Hydrology (DOE, 1989b).

Thus, the two functional site requirements can be traced directly from the SR and from WMSR, Volume IV, through DOE/RW-0101. The site functional requirements presented in the next section, Section 1.0, are consistent with the SCP.

## 1.0 FUNCTIONS OF THE SITE SYSTEM

This section describes the functions, performance measures, and parameters which must be characterized or evaluated in order to understand the natural systems. Not all functions and performance measures are included. Those not impacting Midway Valley Trenching or Calcite/Silica activities have been deleted. All requirements in this section are consistent with the Site Characterization Plan for the Yucca Mountain Site (DOE, 1988a).

### 1.1 PRECLOSURE FUNCTION

The following subsection and Table 1 summarizes the site conditions and processes which are required to evaluate faulting in the Midway Valley area with respect to the site system's preclosure functional requirement.

#### 1.1.1 TECHNOLOGY OF CONSTRUCTION, OPERATION, AND CLOSURE

To meet the preclosure design criteria of 10 CFR 60.131(b) (1) and 10 CFR 60.111(a), it is necessary to provide structures that protect public radiological safety and worker safety. Specific design and performance parameters from the site surface and subsurface components are required as input to this determination. The system element that is pertinent to this evaluation is the site.

A preliminary performance allocation for the site is summarized in Table 1. This table provides the function or process, a preliminary performance measure, and the associated design parameter which is needed to address the ability to construct, operate, and close a repository at Yucca Mountain using readily available technology. Not all functions and performance measures are included; those not impacting Midway Valley Trenching have been deleted.

### 1.2 POSTCLOSURE FUNCTION

The following subsection and Tables 2 and 3 summarize the site conditions and processes required to evaluate the postclosure functional requirement with respect to the Calcite/Silica Activity.

#### 1.2.1 TOTAL SYSTEMS PERFORMANCE

The DOE plans to demonstrate compliance with the total system performance objective by conducting performance assessments. These performance assessments will (1) identify all significant processes and events which may affect the geologic repository; (2) evaluate the effects of these processes and events on release of radionuclides to the accessible environment; (3) combine estimates of these effects to the extent practicable into a complementary cumulative distribution function (CCDF) displaying the likelihood that the amount of radioactive material released to the accessible environment will not exceed the

Table 1. Site system and associated performance measure and performance and design parameter for the Midway Valley Study

Function/Process	Performance Measure	Design Parameter
Provide facility sites (including underground accesses) that are not jeopardized by natural or manmade phenomena	Location for surface facilities	Total Probability of exceeding 5 cm faults displacements at locations proposed for FITS.

IV-3

SCP reference: Table 8.3.2.5-1, p. 8.3.2.5-7  
 Table 8.3.1.17-3a, p. 8.3.1.17-8 (DOE, 1988a)

specified values; and (4) compare the numerical predictions with the performance objective, evaluating the importance of any uncertainties in conclusions from this comparison.

The specification of data needs from the site system to assess total systems performance is framed in terms of a set of scenario classes which address all processes and events considered to be potentially significant to the release of radionuclides to the accessible environment at Yucca Mountain. This set includes the undisturbed (this class is called the nominal class; it is associated with anticipated or expected conditions) class. This class is defined by the conditions that current data suggest are expected at the site. The remaining classes address all the credible disruptions to this undisturbed class. This set of scenarios is considered adequate to guide the testing program. The few scenarios which have been excluded from the Site Requirements Document (STRD) (such as glaciation and meteorite impact) have been evaluated (Ross, 1987; DOE, 1986) and are considered not applicable to the Yucca Mountain site.

Site investigations are structured to provide the data needed to determine the probabilities of occurrence of each credible scenario and to evaluate the potential releases of radionuclides associated with each scenario. For convenience, the scenarios have been organized according to their effects on waste isolation. First, the undisturbed scenario class defines the parameters required to assess expected, undisturbed conditions at the site. Because there is substantial uncertainty in the data used to define the undisturbed scenario, scenario classes were developed to define the parameters required to assess the disruptive scenarios. These scenarios evaluate processes and events which may significantly disturb the barriers important to waste isolation from the conditions defined in the undisturbed scenario class. There are four classes of disruptive scenarios; these include the following:

- (A) direct release scenarios;
- \* (B) scenarios for partial failure to the engineered barriers;
- \*\* (C) scenarios for partial failure of the unsaturated zone barriers;
- \*\* (D) scenarios for partial failure of the saturated zone barriers.

The nominal scenario class (E) assumes undisturbed performance of all natural barriers (matrix flow predominates in the unsaturated zone barriers; some Carbon-14 is released in gas phase). Table 2 summarizes scenario classes C and D which pertain to disturbed performance of natural barriers. Table 3 defines the performance parameter which is required to assess each Class C and D scenario for the expected partial performance measure (EPPM), a measure for determining whether a scenario class needs to be included in the final calculation of the complementary cumulative distribution function (CCDF).

\* No independent, potentially significant classes have been associated with this category.

\*\* Scenario classes for Calcite/Silica.

Table 2. Scenario classes C and D (pertaining to disturbed performance of barriers) according to potential impacts on barriers of the geologic repository.

---

<u>Scenario Class</u>	<u>Description</u>
C-1, 2, & 3	Partial failure of unsaturated zone barriers:
C-1	Not pertinent to these activities.
C-2	Accelerated releases to the water table attending a rise in the water table (foreshortening of unsaturated zone (UZ)).
C-3	Accelerated releases to the water table attending changes in unsaturated zone rock or hydrologic properties or geochemical properties.
D-1, 2	Partial failure of saturated zone barriers:
D-1	Accelerated releases to the accessible environment owing to appearance of discharge points within 5 km downgradient of controlled area (foreshortening of the saturated zone flow path), or changes in flow direction in saturated zone (SZ).
D-2	Accelerated releases to the accessible environment owing to increased linear water velocity in the saturated zones, changed rock or hydrologic properties, or changed geochemical properties.

---

SCP reference: Table 8.3.5.13-3 (13-35) (DOE, 1988a)

Table 3. Performance parameters for scenario class C-2 (foreshortening of the unsaturated zone) and D-1 (appearance of surficial discharge points within the C-area) for the performance measure EPPM<sup>a</sup>

Initiating Event or Process	Intermediate Performance Measure	Performance Parameter
Episodic changes in strain in the rock mass due to faulting causes changes in water-table level	Radiological transport time through UZ, given fixed UZ rock, hydrologic, and geochemical properties	Probability that strain-induced changes increase potential level to >850 m mean sea level

<sup>a</sup>EPPM = expected partial performance measure

<sup>b</sup>C-area = the controlled area

SCP reference - Table 8.3.5.13-13, p. 8.3.5.13-13 to 100 (DOE, 1988a)

## APPENDIX A

## RESPONSIBILITY MATRIX

The responsibility matrix lists the organizations which are responsible for accomplishing two tasks associated with each requirement. The first task to be accomplished is to establish the requirement; the second is to implement it. The organizations responsible for the first task are listed under the heading, "Organization Responsible for Preparation of Requirement." Those listed are to determine that a requirement is correct and are responsible for defending the requirement. Although DOE is ultimately responsible for this, the responsibility can be delegated to other organizations, and such delegation is expected to occur. The organizations responsible for the second task are listed under the heading, "Organization Responsible for Compliance with Requirement." Those listed are responsible for demonstrating how the requirement has been met.

APPENDIX A  
 RESPONSIBILITY MATRIX  
 FOR  
 SITE REQUIREMENTS DOCUMENT

Systems Requirements Section	Organization Responsible for Compliance with Requirement*	Organization Responsible for Preparation of Requirement
<u>Site Functions, Performance Measures, and Parameters</u>		
All Sections	Project Office	OGD**

\* The Project Office will provide direction to organizations responsible for collecting or developing the information, e.g. TEPB and study plans.

\*\* OCRWM was separate when these were first prepared. This is now the responsibility of the Office of Geologic Disposal.

## APPENDIX B

REFERENCES TO  
SITE REQUIREMENTS DOCUMENT

- DOE (U. S. Department of Energy), 1988a. Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0199, Washington, D. C., December, 1988.
- DOE (U. S. Department of Energy), 1986. Final Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0073, Washington, D. C.
- DOE (U. S. Department of Energy), 1986a. Issues Hierarchy for a Mined Geologic Disposal System, PE-09 (formerly OGR/B-10), RW-0101, Washington, D. C.
- DOE (U.S. Department of Energy), 1990a. "Waste Management System Requirements Document," Volume IV: Mined Geologic Disposal System, DOE/RW-0268P, Rev. 0, Washington D.C., March, 1990.
- DOE (U.S. Department of Energy), 1989a. Study Plan 8.3.1.17.4.2 - Study Plan for Evaluating the Location and Recency of Faulting Near Prospective Surface Facilities, Rev. 0, Washington, D. C., May, 1989.
- DOE (U.S. Department of Energy), 1989b. Study Plan 8.3.1.5.2.1 - Study Plan for Characterization of the Yucca Mountain Quaternary Regional Hydrology, Rev. 0, Washington, D. C., June, 1989.
- NEPA (National Environmental Policy Act), 1970, as amended. "National Environmental Policy Act," 42 USC 4321, et seq.
- NWPA (Nuclear Waste Policy Act), 1987. "Nuclear Waste Policy Act of 1982," as amended, 42 USC 10101 et seq.
- Ross, B., 1987. A First Survey of Disruption Scenarios for a High-Level Waste Repository at Yucca Mountain, Nevada, SAND85-7117, Sandia National Laboratories, Albuquerque, New Mexico.
- 10 CFR Part 60 (Code of Federal Regulations), 1990. Title 10, "Energy," Part 60, "Disposal of High-Level Radioactive Wastes In Geologic Repositories; Licensing Procedures," U. S. Government Printing Office, Washington, D.C., March, 1990.

## **Section V**

# **Test and Evaluation Planning Basis**

TEST AND EVALUATION PLANNING BASIS

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## TEST AND EVALUATION PLANNING BASIS

## 1.0 PLANNED TESTING

This chapter discusses the planned characterization testing and evaluation for Midway Valley Trenching and for Calcite/Silica activities. It discusses requirements for the conduct of the planned tests and defines the constraints on the planned tests. Procedural controls for these activities are included in the grading packages.

Figures V-1 and V-2 show ties to other sections. Table V-1 (Midway Valley Trenching) and Table V-2 (Calcite/Silica) show the specific inputs from the Site Requirements section which describe the functions and performance measures and parameters for the site system that must be evaluated. The following paragraphs briefly describe the planned tests.

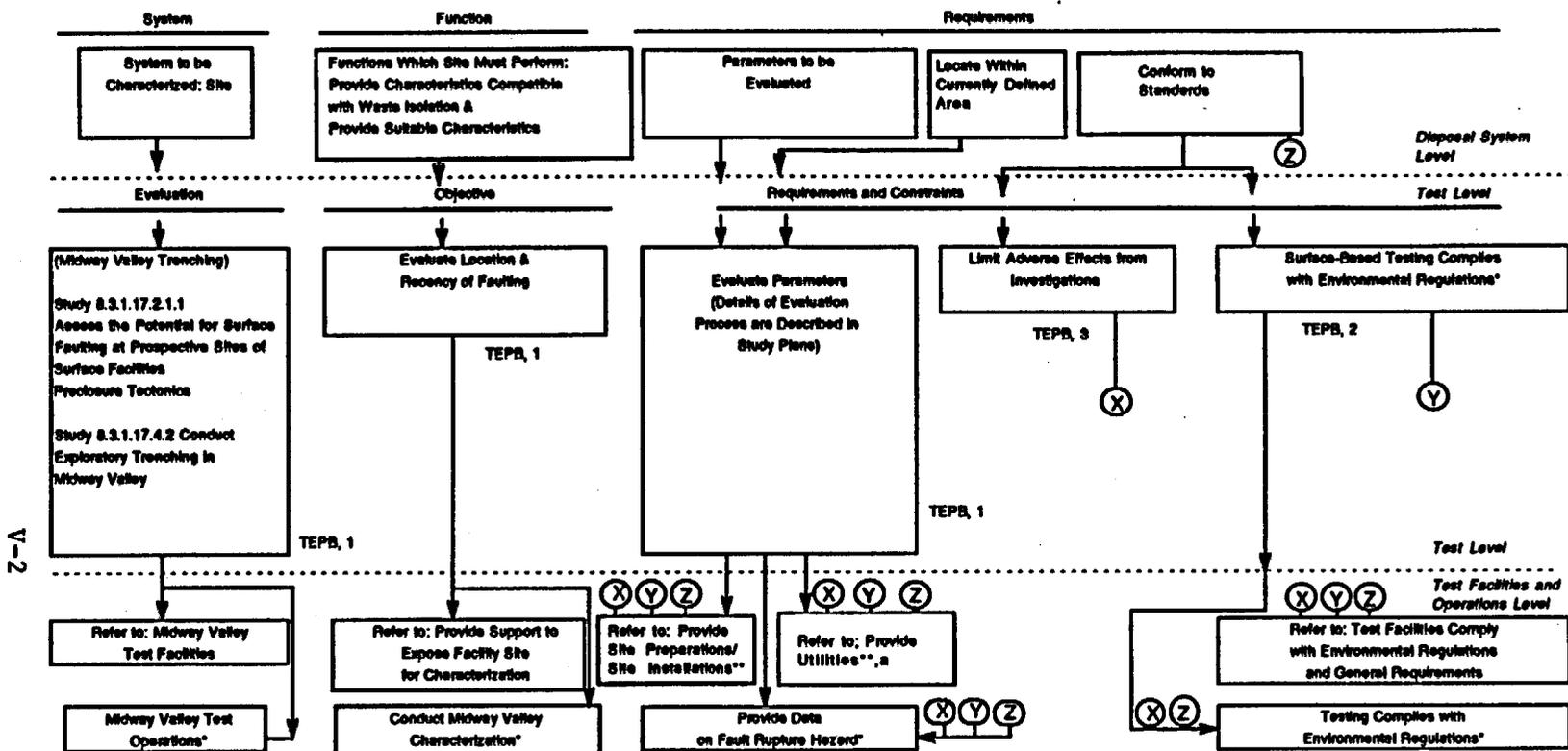
**Midway Valley Trenching:** several sites in Midway Valley near Yucca Mountain are being considered as potential locations for siting surface facilities and a reference conceptual site has been defined (Neal, 1985). The potential for fault displacement near the surface facilities must be considered as a part of site characterization. The general plans describing the activity to characterize Midway Valley are found in Section 8.3.1.17.4.2 of the Site Characterization Plan for the Yucca Mountain Site. This section of the SCP provides the objectives and describes the information needed to be obtained from the tests to be conducted. This section also establishes the basis for a more detailed discussion of the planned activity which may be found in Study Plan 8.3.1.17.4.2: Study Plan for Evaluating the Location and Recency of Faulting Near Prospective Surface Facilities (DOE, 1989a). The objective of this study is to investigate the possible occurrence of late Quaternary surface rupture in the vicinity of planned surface facilities locations and identify sites without evidence of significant late Quaternary faulting.

The performance of characterization activities for the calcite and opaline-silica vein deposits require that an existing trench be deepened. The performance of characterization activities for Midway Valley Trenching require that trenches be dug.

**Calcite/Silica studies:** Cryptocrystalline calcite, with and without opaline-silica, fills many faults and fractures in the vicinity of Yucca Mountain. The general plans describing the activity to characterize these calcite and opaline-silica vein deposits are found in Section 8.3.1.5.2.1.5 of the Site Characterization Plan (SCP) for the Yucca Mountain Site (DOE, 1988a). This section of the SCP provides the objectives and describes the information needed to be obtained from the tests to be conducted. This section also establishes the basis for a more detailed discussion of the planned activity which may be found in Study Plan 8.3.1.5.2.1: Characterization of the Yucca Mountain Quaternary Regional Hydrology (DOE, 1989b). The objective of this activity is to determine the ages, distribution, origin, and paleohydrologic significance of the calcite and opaline-silica deposits.

The SCP information has been evaluated and it has been determined that it is adequate for its intended use.

Figure V-1. Evaluation Titles, Objectives, Requirements, and Constraints for Midway Valley Trenching  
Page 1 of 1



Notes:  
\* Details on test operations, faults, and environmental regulations are beyond the scope of this material and will be contained in study plans, etc.

\*\*Preparations, installations, and utilities differ for Midway Valley and Caliche /Silica. Refer to the text for details.

a. Water measurement is part of utilities.

V-2

Table V-1 Characterization Parameters Required to Address the Design Parameter Identified in Section IV

Design Parameter

Total Probability of exceeding 5 cm fault displacement at locations proposed for FITS

Characterization Parameter

Estimate of total probability for > 5 cm displacement beneath FITS, considering known and possibly concealed faults and tectonic interrelationships among local faults

Identification and characterization of faults within 100 m of FITS that have apparent Quaternary slip rates > 0.001 mm/yr or that measurably offset materials less than 100,000 yr old

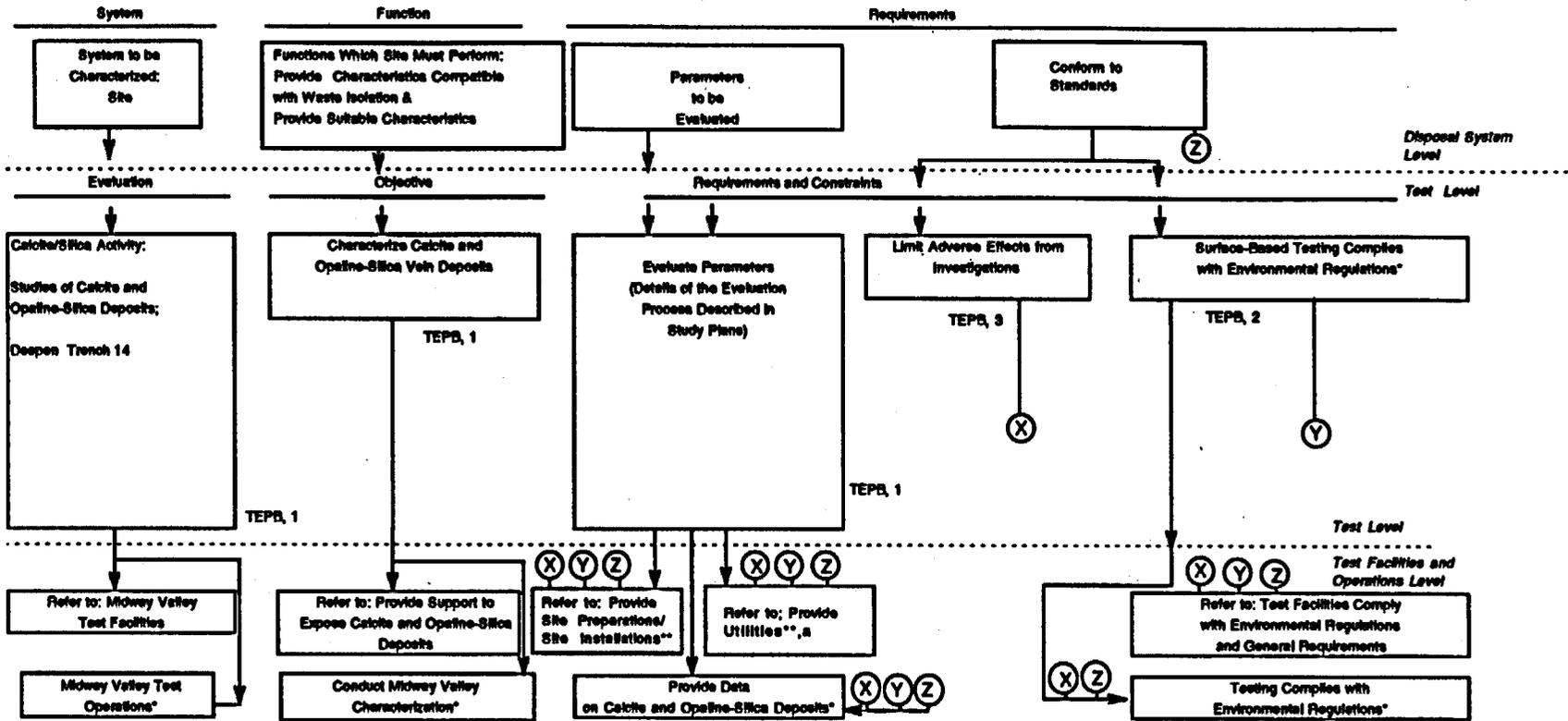
Key Study supplying parameters

Study 8.3.1.17.2.1.1  
Assess the potential for surface faulting at prospective sites of surface facilities

Study 8.3.1.17.4.2  
Conduct exploratory trenching in Midway Valley

-----  
Modified from SCP Tables 8.3.1.17-3a and 8.3.1.17-3b  
FITS

Figure V-2. Evaluation Titles, Objectives, Requirements and Constraints for Calcite/Silica  
Page 1 of 1



Notes:  
\* Details on test operations, faults, and environmental regulations are beyond the scope of this material and will be contained in study plans, etc.

\*\*Preparations, installations, and utilities differ for Midway Valley and Calcite /Silica. Refer to the text for details.

<sup>a</sup>. Water measurement is part of utilities.

V-4

Table V-2 Characterization parameters required to address the performance parameter identified in Section V for the calcite silica activity

Performance Parameter

Probability that strain-induced changes increase potentiometric level to > 850 m mean sea level

Origin of Calcite and Opaline Silica deposits

Characterization Parameters

Mineralogy of calcite-silica deposits  
 Petrology of calcite-silica deposits  
 Morphology of calcite-silica deposits  
 Paleontology of calcite-silica deposits  
 Chemistry of calcite-silica deposits  
 Ages of calcite-silica deposits  
 Isotopic concentrations of calcite-silica deposits

Key Activity supplying parameters

8.3.1.5.2.1.5 Studies of calcite and opaline silica vein deposits; deeped trench 14.

modified from SCP Table 8.3.1.5-2, page 8.3.1.5-12

## 2.0 ENVIRONMENTAL CONSTRAINTS ON TESTING

Approved scientific and engineering practices will be used at all times to comply with environmental laws, with DOE Orders, and with Yucca Mountain Project policies which require that all Project activities to be performed in an environmentally acceptable manner. Workers will be instructed and supervised so their activities are conducted within the environmental constraints.

The constraints specified below will be updated (and some may be deleted) once the environmental compliance and land access approval process described in the Environmental Management Plan (EMP) (DOE, 1990d) has been completed and any additional requirements (i.e., permit requirements) have been identified. Specific provisions of the applicable regulations can be found in the Environmental Regulatory Compliance Plan (ERCP) (DOE, 1988d). Approval to proceed with the proposed testing will be granted in writing by the Project Office once preactivity surveys and reviews have been completed. This approval includes access and environmental regulatory compliance.

### TRACEABILITY

The source of requirements statements will be given in each document. If necessary for clarity, these references are included directly in the text. Otherwise, they appear in brackets following the statement to which they apply. In addition, each section includes a list of reference documents as an appendix. The general format for in-text citation of another of the technical hierarchy documents is [document abbreviation, section, type and number of statement]. A specific example of a citation is given below:

[SR, Y, CF]: Yucca Mountain Mined Geologic Disposal System Requirements (SR), Section Yucca Mountain Mined Geologic Disposal System (Y), Constraint (C), alpha-numeric designator F.

References for documents that are not part of the technical hierarchy are provided in Appendix B. Laws, regulations, and DOE Orders are identified in the text by name. Plans, reports, and other documents are identified in the text with an author and date citation, e.g., (DOE, 1988a).

## 2.1 PERMIT

- A. Construction and investigation activities must be coordinated with the Project Office, including activity locations, dates, and durations.  
[SR, Y, CC, CF]
- B. Land disturbing activities cannot begin until an Air Quality Permit for Land Disturbance has been granted, as required by the Clean Air Act and Nevada Revised Statutes (NRS 445.401-.601). As committed to in the Air Quality Permit application, water will be used to control dust. If water cannot be used, an alternative dust control method must be used.  
[SR, Y, CC2]

- C. Water used at the site must come from an appropriated source, i.e., a source with an approved Nevada State Engineer Water Appropriation Permit (NRS 553.010-.480). If tracers are used in the water, State of Nevada approval will be required. [SR, Y, CC3d]
- D. The requirements of AP-6.13, Authorization for Use of Hazardous Materials (DOE, 1990b), must be satisfied. [SR, Y, CC5]
- E. Sand and gravel must be obtained from a source authorized by a BLM free use permit or from a duly permitted commercial source. [SR, Y, CE]
- F. If an activity is initiated in the 100-year floodplain, a floodplain assessment must be prepared. [SR, Y, C3C]

## 2.2 LAND ACCESS REQUIREMENTS

- A. Access approval for the activity must be confirmed by Project Office. [SR, Y, CF]
- B. A copy of the BLM Right-of-Way Reservation (ROWR) Agreement (BLM, 1988; BLM, 1989) must be available at the job-site (Midway Valley Calcite/Silica study areas) when working in the field. [SR, Y, CF]
- C. Stipulations listed in the ROWR Agreement (BLM, 1988; BLM, 1989) must be followed. [SR, Y, CF]
- D. Off-road driving or parking is prohibited unless specifically permitted in writing by the Project Office. Any access route or area of disturbance will be specifically approved through the environmental review process. Existing trails may be used if prior environmental approval is obtained. [SR, Y, CD, CF]

## 2.3 BIOLOGICAL RESOURCES PROTECTION

The Endangered Species Act of 1973 required the Yucca Mountain Project Office in consult with the Secretary of the Interior, through the F&WS, to ensure that actions taken during site characterization do not jeopardize the continued existence of the tortoise or its essential habitat. The following constraints are derived from requirements set forth in the consultation and Biological Opinion (McNatt, 1990) and consistent with accepted revisions (Hallock, 1990). [SR, Y, CD]

- A. A preactivity survey must be conducted by qualified Project Office designated participants to determine if the proposed activity will impact any important biological resources. [SR, Y, CD]
- B. A new desert tortoise survey must be conducted if the proposed activity does not start within 60 days of completing the original survey. This applies to activities taking place from March through October while the tortoises are not hibernating. [SR, Y, CD]

- C. All harassment of the desert tortoise is to be avoided. Neither the animal itself nor its burrow may be touched or disturbed unless by a qualified biologist. Stay at least ten feet away from any burrow that is six inches or larger (in height or width). [SR, Y, CD]
- D. If a desert tortoise is seen in the construction area, work shall cease and the Yucca Mountain Project Office and the Project Site Manager shall be notified. The tortoise will have to be relocated by a qualified biologist before work may resume. Coordination with the F&WS is a Project Office option. [SR, Y, CD]
- E. Attempt safely to avoid hitting any animals which may be crossing roads or trails on which vehicle traffic is permitted. [SR, Y, CD]
- F. The trenches shall be constructed so that one end of the trench is sloped to allow animals to get out of the trench. [SR, Y, CD]
- G. The trenches will be fenced to keep tortoises from falling into the trenches. Trenches excavated between March 1 and November 1 of a given year should be fenced within 48 hours after a depth of approximately 3 feet has been reached. If trenching occurs subsequent to November 1, the trench must be fenced prior to March 1 of the following year. Fencing material should be wire mesh with openings typically less than 2 inches. Fence should be installed so that approximately 12 inches of wiremesh are buried and approximately 18 inches extends above the surface. [SR, Y, CD]
- H. Field participants are required to notify the Project Office immediately upon finding an injured or dead tortoise. Injured animals must be taken to qualified veterinary care. A qualified biologist will handle animals. F&WS will provide direction and disposition of dead animals. The Project Office must report to F&WS within three days the finding of any endangered species found dead or injured during this project. [SR, Y, CD]
- I. Field participants will notify the Project Office two weeks prior to initiation of surface disturbing activities. A qualified biologist will search each burrow in the area. The burrows will be collapsed if the burrow is unoccupied. If a tortoise is found, the tortoise will be moved out of harms way and the burrow will be collapsed. [SR, Y, CD]
- J. Covered trash containers will be provided during work activity so that food and other garbage is discarded in a manner which will not attract ravens. [SR, Y, CD, CF]

#### 2.4 ARCHAEOLOGICAL RESOURCES PROTECTION

The following Archaeological Resources Protection constraints are consistent with applicable Federal, State of Nevada, and local environmental protection regulations. The implementation of the "Programmatic Agreement" between the United States Department of Energy and the Advisory Council on Historic Preservation (DOE, 1988f) will satisfy the Project's responsibilities under the National Historic Preservation Act (NHPA) and guidelines for Federal agency responsibilities under the NHPA.

objectives of the activity. Then, from the top of the main fault in the south wall, the trench must be excavated to a depth of about 20 feet. The main fault is located in section 4 on the Trench 14 profile (fig. 2). The deepening should be accomplished by digging a small trench inset within the current trench.

The inset trench will be constructed to leave a 3-ft-wide bench (at the level of the current trench floor) on the north and south sides of the inset. The inset trench will be cut to provide a 20-foot deep exposure of the main fault zone, unless the on-site geologist determines that the objectives of trenching have been met at a shallower depth. The length of the trench will be determined by the minimum distance needed to provide a safe ramped access to the main fault zone from the west. The east end of the trench may be left as a vertical wall about 2 or 3 ft east of the main fault zone, as determined by the on-site geologist.

#### Special Requirements

Commonly accepted industry standards for excavation and trenching will be used during the work specified in this criteria letter. To ensure that the main fault zone does not become saturated with water, only a minimum amount of water will be used by the contractor during excavation (dust control, etc.). Furthermore, the finished trench will be protected from surface runoff by diversion ditches (or similar barriers) upslope from the current trench boundaries. Contamination by foreign substances, such as fluid spills from machinery, will be cleaned up by the trenching contractor.

#### Location

Trench 14 is located on the west side of Exile Hill, in Area 25 of the Nevada Test Site.

#### Equipment

All equipment for trenching will be supplied by the DOE-YMP contractors. No USGS equipment will be needed.

#### Hold and Witness Points

There are no specific hold and witness points. However, the on-site geologist will have authority to terminate trenching at a depth shallower than 20 ft should objectives of the activity be achieved.

#### Quality Assurance Requirements

This activity is covered by approved Study Plan 8.3.1.5.2.1, Characterization of the Quaternary Regional Hydrology.

Quality Assurance requirements for work done in the trench have been met by approved graded quality assurance for activity 8.3.1.5.2.1.5.

The USGS technical procedures that will be used during this activity are: NWM-USGS-GP-07 (latest revision), Geologic Trenching Studies. NWM-USGS-GP-27 (latest revision), Trench Wall and Natural Outcrop Sampling for Coordinated Studies.

#### Requested Starting Date

On or after January 21, 1991. However, if permits are granted by

the State of Nevada for land disturbing activities prior to this date, we will be ready to begin site activities as early as November 15, 1990.

Points of Contact

Principal Investigator:

John S. Stuckless  
U.S. Geological Survey  
Box 25046, MS 963  
Denver Federal Center  
Denver, Colorado 80025

Phone: FTS 776-7886  
(303) 236-7886

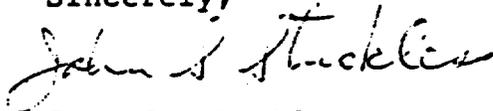
Co-Investigator:

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Denver Federal Center  
Denver, Colorado 80225

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(303) 236-1141

If you have any questions, please call me at the number listed above.

Sincerely,



John S. Stuckless  
Principal Investigator

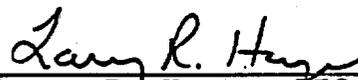
Enclosures (3)

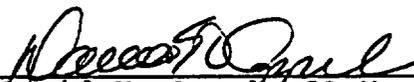
Figure 1; Figure 2; and the Grading Package with internal support documents.

Copy to:

L.R. Hayes  
A. Buono  
R.W. Craig  
D.H. Appel  
D.C. Gillies  
R.B. Raup  
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USGS LRC, Denver

Approved:

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Larry R. Hayes, TPO, USGS

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David H. Appel, QA Manager, USGS

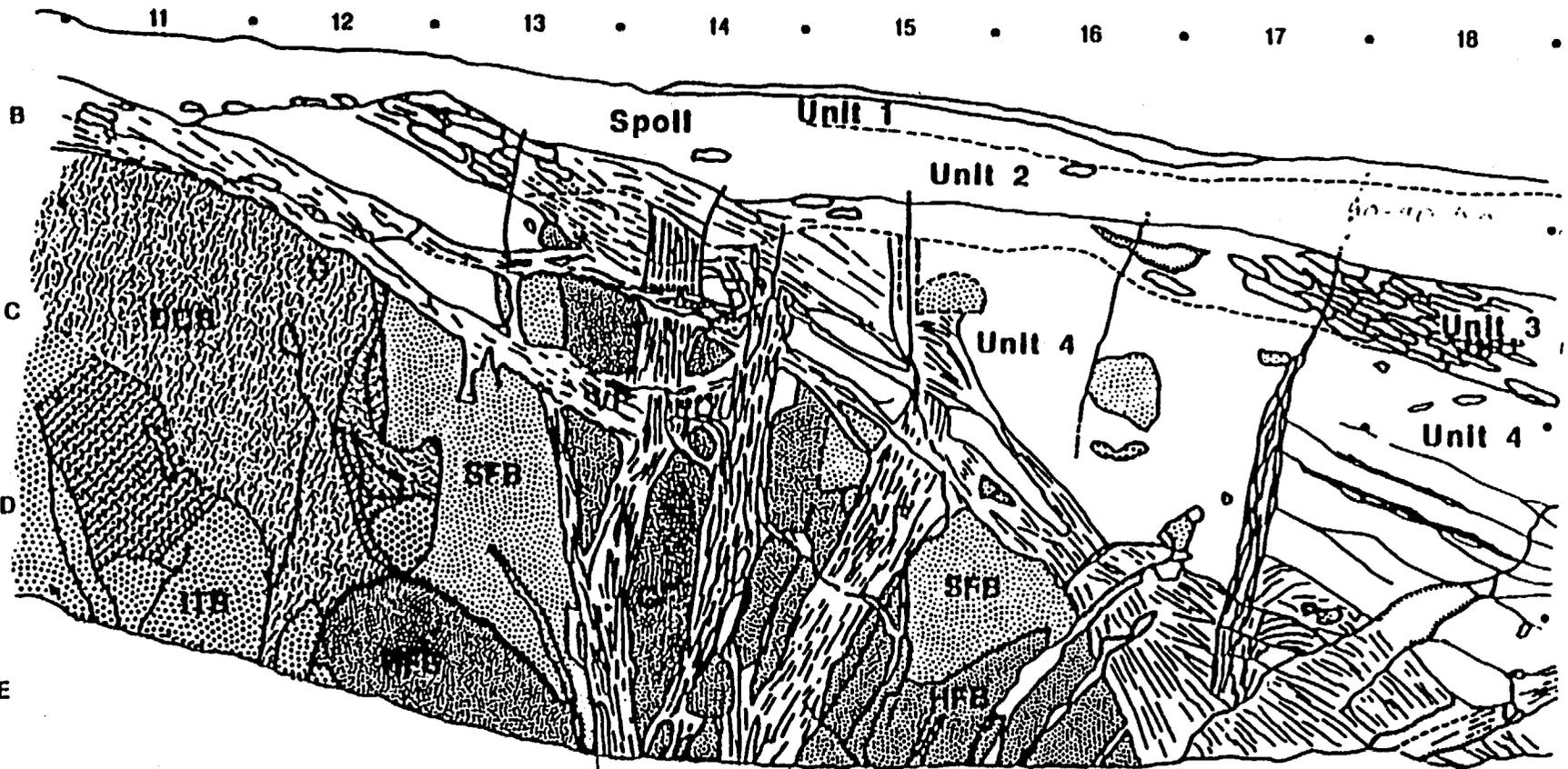


Figure 3.5-3. Map of the southern wall of Trench 14 as viewed from the north. Dots around the edge of the map form a 1-meter grid. Bedrock (in various states of induration) is shown by patterns; colluvium is not patterned; calcite- (and minor opaline-silica) filled fractures are shown by light subparallel lines; ash-filled fractures are indicated by heavy, broad, irregular, and subvertical lines. Descriptions of identified units are in the Appendix.

VI-A2-4  
3.5-7

January 25, 1988

Figure 1

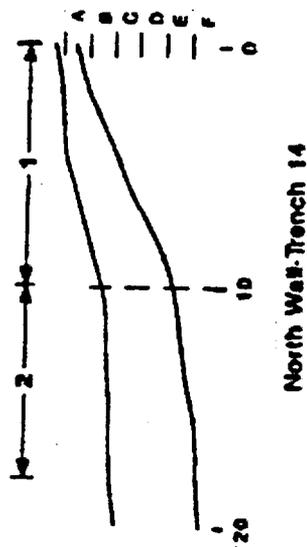


Figure 2 Index Sketches of Logs from Trench 14

- 1 North Wall East End-Bedrock
- 2 North Wall Center Section-Main Fault
- 3 South Wall East End-Bedrock
- 4 South Wall Center Section-Main Fault
- 5 South Wall West of Center Section-Colluvium
- 6 South Wall West End-Colluvium

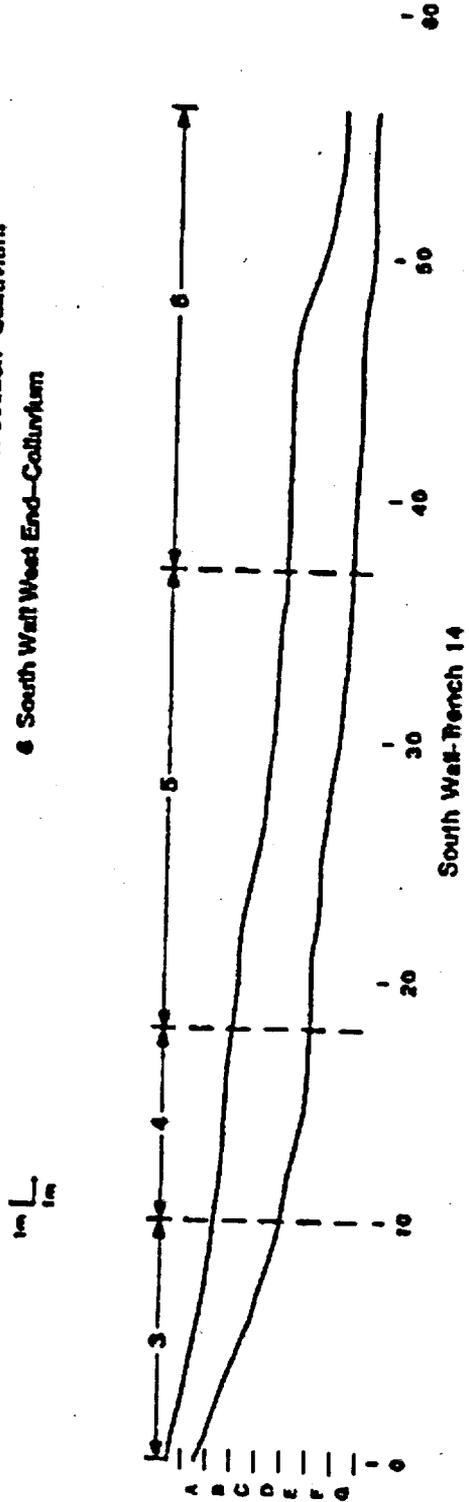


Figure 2

## APPENDIX B

RESPONSIBILITY MATRIX FOR  
SURFACE-BASED TESTING FACILITY REQUIREMENTS DOCUMENT

The responsibility matrix lists the organizations which are responsible for accomplishing two tasks associated with each requirement. The first task to be accomplished is to establish the requirement; the second is to implement it. The organizations responsible for the first task are listed under the heading, "Organization Responsible for Preparation of Requirement." Those listed are to determine that a requirement is correct and are responsible for defending the requirement. Although DOE is ultimately responsible for this, the responsibility can be delegated to other organizations, and such delegation is expected to occur. The organizations responsible for the second task are listed under the heading, "Organization Responsible for Compliance with Requirement." Those listed are responsible for demonstrating how the requirement has been met.

## APPENDIX B

**RESPONSIBILITY MATRIX FOR  
SURFACE-BASED TESTING FACILITY REQUIREMENTS DOCUMENT**

SBTFRD SECTION	ORGANIZATION RESPONSIBLE COMPLIANCE WITH REQUIREMENT	ORGANIZATION RESPONSIBLE FOR PREPARATION OF REQUIREMENT
<b>GENERAL</b>		
1.2.3.0FR1	RSN	Project Office
1.2.3.0FR2	Project Office Site Office, Project Office	Project Office
1.2.3.0FR3	RSN	Project Office
1.2.3.0PC1a	RSN	Project Office
1.2.3.0PC1b	RSN	Project Office
1.2.3.0PC1c	RSN, REECo	Project Office
1.2.3.0PC2a	Project Office	Project Office
1.2.3.0PC2b	Project Office	Project Office
1.2.3.0PC3	All	Project Office
1.2.3.0CAi	REECo, Project Office	Project Office
1.2.3.0CAii	RSN	Project Office
1.2.3.0CAiii	RSN, Project Office	Project Office
1.2.3.0CAiv	RSN, Project Office	Project Office
1.2.3.0CAv	RSN, Project Office, REECo	Project Office
1.2.3.0CAvi	RSN, Project Office, REECo	Project Office
1.2.3.0CAvii	RSN, REECo	Project Office
1.2.3.0CAviii	RSN, Project Office	Project Office
1.2.3.0CB	RSN, Project Office	Project Office
1.2.3.0CCi	REECo	Project Office
<b>SITE PREPARATION/ SITE INSTALLATIONS</b>		
1.2.3.1FR1	RSN	Project Office
1.2.3.1FR2	RSN	Project Office
1.2.3.1FR3	RSN	Project Office
1.2.3.1FR4	RSN	Project Office
1.2.3.1PC1	RSN	Project Office
1.2.3.1PC2	RSN, REECo	Project Office
1.2.3.1PC3	RSN	Project Office
1.2.3.1PC4	RSN, REECo	Project Office
1.2.3.1CA	RSN, REECo	Project Office
1.2.3.1CB	RSN	Project Office
1.2.3.1CC	RSN, REECo	Project Office
1.2.3.1CD	RSN, REECo	Project Office
1.2.3.1CE	RSN, REECo	Project Office
1.2.3.1CF	RSN, REECo	Project Office

Trenches

1.2.3.1.1FR1	RSN	Project Office
1.2.3.1.1PC1a	RSN, REECO	Project Office
1.2.3.1.1PC1b	RSN, REECO, SNL, USGS	Project Office
1.2.3.1.1PC1c	RSN, REECO	Project Office
1.2.3.1.1PC1d	RSN, REECO	Project Office
1.2.3.1.1CA	RSN, REECO, SAIC, USGS	Project Office
1.2.3.1.1CB	REECO, SNL, USGS, RSN	Project Office
1.2.3.1.1CC	RSN, REECO	Project Office
1.2.3.1.1CD	RSN, REECO	Project Office
1.2.3.1.1CE	REECO, RSN	Project Office
1.2.3.1.1CF	RSN, REECO	Project Office
1.2.3.1.1CG	RSN, REECO	Project Office

Access Roads

1.2.3.1.2FR1	RSN	Project Office
1.2.3.1.2PC1a	RSN, REECO	Project Office
1.2.3.1.2PC1b	RSN	Project Office
1.2.3.1.2CA	RSN	Project Office
1.2.3.1.2CB	RSN	Project Office

Unimproved Roads

1.2.3.1.2.1FR1	RSN	Project Office
1.2.3.1.2.1PC1a	RSN	Project Office
1.2.3.1.2.1PC1b	RSN	Project Office
1.2.3.1.2.1PC1c	RSN	Project Office
1.2.3.1.2.1PC1d	RSN, REECO	Project Office
1.2.3.1.2.1PC1e	RSN	Project Office
1.2.3.1.2.1PC1f	RSN, REECO	Project Office

Trails

1.2.3.1.2.2FR1	RSN	Project Office
1.2.3.1.2.2PC1	RSN	Project Office

UTILITIES

1.2.3.2FR1	RSN	Project Office
1.2.3.2PC1	RSN	Project Office

Water System

1.2.3.2.1FR1	RSN	Project Office
1.2.3.2.1PC1	RSN	Project Office
1.2.3.2.1CA	RSN, REECo	Project Office
1.2.3.2.1CB	RSN, Project Office	Project Office
1.2.3.2.1CC	RSN	Project Office
1.2.3.2.1CD	RSN	Project Office

Sanitation System

1.2.3.2.2FR1	RSN	Project Office
1.2.3.2.2PC1	RSN	Project Office
1.2.3.2.2CA	RSN	Project Office

Communications System

1.2.3.2.3FR1	RSN, Project Office	Project Office
1.2.3.2.3PC1	RSN, Project Office	Project Office

Solid-Waste Disposal System

1.2.3.2.4FR1	Site Office with Environmental concurrence	Project Office
1.2.3.2.4PC1a	Site Office with Environmental concurrence	Project Office
1.2.3.2.4PC1b	Site Office with Environmental concurrence	Project Office
1.2.3.2.4CA	Site Office with Environmental concurrence	Project Office
1.2.3.2.4CB	Site Office with Environmental concurrence	Project Office
1.2.3.2.4CC	Site Office with Environmental concurrence	Project Office

APPENDIX A1	RSN	SNL prepares Project Office accepts
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APPENDIX A2	RSN	USGS prepares Project Office accepts
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## APPENDIX C

REFERENCES TO  
SURFACE-BASED TESTING FACILITY REQUIREMENTS DOCUMENT

The following codes, standards, regulations, and DOE Orders must be consulted by the DO to fully understand the requirements imposed upon the design.

BLM (Bureau of Land Management), 1988. Right-of-Way Reservation N-47748, January 6, 1988.

BLM (Bureau of Land Management), 1989. Right-of-Way Reservation N-48602, October 10, 1989.

CERCLA (Comprehensive Environmental Response, Compensation, Liability Act), 1980. "Comprehensive Environmental Response, Compensation, Liability Act," as amended by (SARA) "The Superfund Amendment and Reauthorization Act of 1986," 42 USC 9601 et seq.

Clean Air Act, 1983. "Clean Air Act," as amended, Pub. L. 88-206, 42 USC 7401 et seq., December 8, 1983.

DOE (U.S. Department of Energy), 1984. "Environmental Protection, Safety and Health Protection Standards," Order 5480.4, Washington, D. C., May 15, 1984.

DOE (U. S. Department of Energy), 1986. Final Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0073, Washington, D. C.

DOE (U.S. Department of Energy), 1987a. OCRWM Mission Plan Amendment - With Comments on the Draft Amendment and Responses to the Comments, DOE/RW-0128, Washington, D. C., June, 1987.

DOE (U.S. Department of Energy), 1988f. "Programmatic Agreement Between the United States Department of Energy and the Advisory Council on Historic Preservation," Yucca Mountain Project, Las Vegas, Nevada, December, 1988.

DOE (U.S. Department of Energy), 1988g. Radiological Monitoring Plan for the NNWSI Project, NNWSI/88-14, Rev. 0, NNWSI Project, Las Vegas, Nevada, March, 1988.

DOE (U.S. Department of Energy), 1989. "General Design Criteria," Order 6430.1A, Washington, D. C., April 6, 1989.

DOE (U.S. Department of Energy), 1990b. "Administrative Procedure-6.13, Authorization for Use of Regulated Hazardous Substances and Materials," Revision 0, Yucca Mountain Project, Las Vegas, Nevada, October 19, 1990.

DOE (U.S. Department of Energy), 1990f. Exploratory Shaft Facility (ESF)-Subsystem Design Requirements Document (ESF-SDRD) For Title II, YMP/CM-0006, Rev. 2, Yucca Mountain Project, Las Vegas, Nevada, October 24, 1990.

- DOE (U.S. Department of Energy), 1990g. "Administrative Procedure (AP)-3.3Q, Change Control Process," Revision 2, Yucca Mountain Project, Las Vegas, Nevada, October 17, 1990.
- DOE (U.S. Department of Energy), 1990h. "Administrative Procedure (AP)-3.5Q, Field Change Control Process," Revision 0, Yucca Mountain Project, Las Vegas, Nevada, October 17, 1990.
- DOE (U.S. Department of Energy), 1990i. "Administrative Procedure (AP)-5.19Q, Interface Control," Revision 1, Yucca Mountain Project, Las Vegas, Nevada, October 19, 1990.
- Endangered Species Act, 1973. "Endangered Species Act of 1973," Pub. L. 93-205, 16 USC 1531 et seq., December 28, 1973.
- NAC (Nevada Administrative Code) 444.570-.748 "Solid Waste Disposal"
- NAC (Nevada Administrative Code) 444.8500-.9555 "Hazardous Waste Disposal"
- NAC (Nevada Administrative Code) 445.430-.846 "Air Pollution"
- NRS (Nevada Revised Statutes) 444.440-.620, "Solid Waste Management"
- NRS (Nevada Revised Statutes) 445.361-.399, "Public Water System"
- NRS (Nevada Revised Statutes) 445.401-.601, "Air Pollution"
- NRS (Nevada Revised Statutes) 459.400-.910, "Hazardous Waste Management"
- RCRA (Resource Conservation and Recovery Act), 1988. "Resource Conservation and Recovery Act of 1976," as amended, Pub. L. 94-580, 42 USC 6901 et. seq., November 1, 1988.
- State of Nevada Department of Transportation. Design Manual, Parts 1 & 2, Carson City, Nevada.
- State of Nevada Department of Transportation, 1986. Standard Specifications for Road and Bridge Construction, Carson City, Nevada.
- 29 CFR Part 1910 (Code of Federal Regulations), 1988. Title 29, "Labor," Part 1910, "Occupational Safety and Health Standards," U. S. Government Printing Office, Washington, D.C., July 1, 1988.
- 29 CFR Part 1926 (Code of Federal Regulations), 1988. Title 29, "Labor," Part 1926, "Safety and Health Regulations for Construction," U. S. Government Printing Office, Washington, D.C., July 1, 1988.
- 40 CFR Part 50 (Code of Federal Regulations), 1985. Title 40, "Protection of Environment," Part 50, "National Primary and Secondary Ambient Air Quality Standards," U. S. Government Printing Office, Washington, D.C., July 1, 1985.

40 CFR Part 60 (Code of Federal Regulations), 1985. Title 40, "Protection of Environment," Part 60, "Standards of Performance for New Stationary Sources," U. S. Government Printing Office, Washington, D.C., July 1, 1985.

The following are the sources of complete requirements stated in SBTFRD. They need not be consulted to understand the requirement.

American Indian Religious Freedom Act, 1978. "American Indian Religious Freedom Act," Pub. L 95-341, 42 USC 1996, August 11, 1978.

Antiquities Act of 1906, 1906. "Antiquities Act of 1906," 16 USC 431, 432, 433; 25 CFR 261, 36 CFR 296; 43 CFR 3 and 7.

Archaeological and Historic Preservation Act. "Archaeological and Historic Preservation Act," 16 USC 469-469c.

Archaeological Resources Protection Act of 1979, 1979. "Archaeological Resources Protection Act of 1979," 16 USC 470AA et seq.

DOE (U. S. Department of Energy), 1988a. Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0199, Washington, D. C., December, 1988.

Historic Sites, Building, and Antiquities Act. "Historic Sites, Building, and Antiquities Act," 16 USC 461-469.

NHPA (National Historic Preservation Act), 1966. "National Historic Preservation Act of 1966." 16 USC 470 et seq.

NWPA (Nuclear Waste Policy Act), 1987. "Nuclear Waste Policy Act of 1982," as amended, 42 USC 10101 et seq.

10 CFR Part 60 (Code of Federal Regulations), 1990. Title 10, "Energy," Part 60, "Disposal of High-Level Radioactive Wastes In Geologic Repositories; Licensing Procedures," U. S. Government Printing Office, Washington, D.C., March, 1990.

- A. A preactivity survey must be conducted by qualified Project Office designated participants to determine if the proposed activity will affect archaeological resources. [SR, Y, CF]
- B. If archaeological resources are identified, the proposed trenching activity will have to be relocated, data recovered from the site prior to trenching, or an "Inclusion Area" specified for the activity. An inclusion area should clearly delineate an area within which surface-disturbing activities can be conducted. Any area beyond the inclusion area boundary is off limits for equipment and personnel to deter inadvertent disturbance of an archaeological resource. A site-specific Data Recovery Plan shall be prepared by a designated archaeologist and approved by the Advisory Council on Historic Preservation (AHCP) prior to data recovery at the site. This site-specific Data Recovery Plan must be approved by the ACHP before recovery begins. [SR, Y, CC6, CF]
- C. If archaeological resources are discovered within the area approved for activity, work shall cease and the Project Office OCB and Project Site Manager notified. [SR, Y, CC6, CF]

## 2.5 RECLAMATION

The following reclamation constraints are derived from the Environmental Management Plan (EMP) and BLM right-of-way reservation requirements (BLM, 1988; BLM, 1989). These constraints are consistent with the Reclamation Guidelines (RG) of June, 1989 (DOE, 1989c).

- A. A preactivity survey must be conducted to determine soil type and reclamation capability of the site. [SR, Y, CF]
- B. The least disturbing form of access required to satisfy the needs for equipment, personnel access, and protection of soil from erosion must be used. [SR, Y, CC, CE]
- C. Site-specific reclamation must be developed for each site, including, but not limited, to the following: [SR, Y, CC, CF]
  - i. Vegetation and soil salvage specifications, if applicable.
  - ii. Topsoil storage and management specifications, if applicable.
  - iii. Control of surface runoff from disturbed areas to minimize erosion.
  - iv. Backfill disturbances, replace topsoil and reclaim site upon completion of the activity and the trenches and access routes are no longer needed.
  - v. Road design and maintenance will provide for drainage and erosion control, if applicable.

## 2.6 TRAINING

- A. All personnel working at the site must complete the Environmental Requirements Training Program (ERTP) (DOE, 1990e). [SR, Y, CC]

## 2.7 ENVIRONMENTAL PROTECTION

- A. Use of hazardous materials onsite must receive prior approval from the Project Office, as per AP-6.13 (DOE, 1990b). [SR, Y, CC5]
- B. Non-hazardous refuse will be collected and hauled to an approved landfill, as required by applicable Nevada Revised Statutes (NRS 444.440-.620). [SR, Y, CC5]
- C. Surface-disturbing activity specifications shall include considerations to minimize dust and other environmental impacts. [SR, Y, CC2, CC5]
- D. Self-contained portable restrooms will be provided as appropriate. [SR, Y, CC]
- E. Spills or release of oil or hazardous substances to the environment will be reported and cleaned up as required by Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and Nevada Revised Statutes (NRS 459.400-.910). [SR, Y, CC3a, CC5]
- F. Equipment is considered to be potentially contaminated if it has been used or stored in a controlled area that has contained unconfined radioactive material, consistent with the requirements of DOE Order 5480.11. Prior to use of such equipment, it must be surveyed to determine whether both removable and total surface contamination is greater than the levels specified in DOE Order 5400.5. [SR, Y, CC]
- G. The T&MSS Radiological Field Programs Department should be notified at least three weeks prior to initiation of the activity. Notification shall include date, duration, and type of all field activities being initiated so that potential changes to the radiological data can be reconciled consistent with the Environmental Monitoring and Mitigation Plan (EMMP) (DOE, 1988c). [SR, Y, CC]

## 2.8 AREA A PRIME SITE-SPECIFIC RECLAMATION

Implementation of the following site-specific reclamation constraints are derived from the general reclamation constraints discussed above. These constraints apply specifically to activities in the A prime area.

- A. Access from existing roads will be by trail. Trails are defined as access routes located by stakes or flagging, cleared via preactivity surveys and established through vehicle and equipment traffic. Trails are not constructed. On occasion, however, light blade work may be necessary on a trail to create a dip, for example, to keep water from a drainage crossed, from coursing down the trail. If future conditions

warrant due to unforeseen traffic levels and/or weather, improvements to the trail or upgrading to a road may be necessary. [SR, Y, CC, CF]

- B. Topsoil will be salvaged. The upper twelve inches (12") of material will be removed from the location of the actual trench excavation, the spoilpile locations and the ramps into the trenches. Tolerances for removal will be plus or minus approximately two inches (2"). Soil will not be salvaged from access trails, equipment parking areas or similar areas where vegetation will be destroyed and minor surface disturbance created, but within which the topsoil will remain essentially intact. [SR, Y, CC, CF]
- C. Topsoil stockpiles must be located in areas where water erosion will not occur. Stockpile(s) may be located at the west end of either trench or other Project Office approved area, but not in the small drainages to either side of the trenches. [SR, Y, CC, CF]
- D. Topsoil stockpiles will be constructed so that depths do not exceed six feet nor the side slopes exceed 3:1 (h:v). [SR, Y, CC, CF]
- E. Waste stockpile(s) may be located at the east end of the trenches or other Project Office approved area, and are not subject to height or slope restrictions. If other locations are chosen, they should be in areas where water erosion will not occur. [SR, Y, CC, CF]
- F. Topsoil erosion protection will be the responsibility of EG&G EM. If the pile is built between Oct. 1 and Apr. 1, this will be accomplished by seeding and watering to establish a vegetative cover. If built outside of those dates, then temporary protection will consist of a thin veneer of gravel or a straw mulch held in place by plastic netting. Specifications for mulches, seeds and seeding appear in O'Farrell, 1990. [SR, Y, CC, CF]
- G. If a backhoe is utilized rather than a crawler tractor or similar large equipment, then only the topsoil within the area to be excavated by the bucket will be salvaged if the period the trench will remain open is for six months or less. Spoilpiles can be stored linearly immediately adjacent to the trench on the undisturbed topsoil. If the trench will remain open in excess of six months, then the topsoil under the spoilpile should be salvaged for the topsoil pile. Topsoil may be stored linearly adjacent to the trench as well. [SR, R, CC, CF]
- H. Decommissioning requirements will be evaluated at the time of reclamation planning. [SR, Y, CF]

## 2.9 CALCITE/SILICA (TRENCH 14) SITE-SPECIFIC RECLAMATION

Implementation of the following site-specific reclamation constraints are derived from the general reclamation constraints discussed above. These constraints apply to the activities associated with Calcite/Silica study associated with Trench 14.

- A. Access will be by the presently-existing route. [SR, Y, CC, CF]

- B. Topsoil will be salvaged. The upper twelve inches (12" ± approximately 2") of the material will be removed from the location of surface excavation activities and the spoilpile locations. [SR, Y, CC, CF]
- C. Topsoil stockpiles will be constructed so that depths do not exceed six feet. The side slopes will not exceed 3:1 (h:v). [SR, Y, CC, CF]
- D. Stockpiles may be located to the north or south of Trench 14 or other Project Office approved area. If stockpiles are to be located to the south, they should avoid the existing radiological environmental monitoring plot. [SR, Y, CC, CF]
- E. Spoils material and topsoil stockpiles will be protected from upslope surface drainage. [SR, Y, CC, CF]
- F. Topsoil erosion protection will be the responsibility of EG&G EM. The type of cover and protection will be consistent with the requirements noted in constraint 2.8H. [SR, Y, CC, CF]
- G. Decommissioning requirements will be evaluated at the time of reclamation planning." [SR, Y, CF]

#### 2.10 OTHER SITE-SPECIFIC RECLAMATION

Statement of additional site-specific constraints to be provided by Project office upon determination of criteria for the conduct of other Midway Valley trenching activities. [SR, Y, CC]

### 3.0 PERFORMANCE CONSTRAINTS ON TESTING

In order to comply with the provisions of 10CFR60.15(c)(1), the following test controls are established. The justification for selection of these controls is contained in Dyer's memoranda for the Record, (Dyer, 1990). These controls are consistent with those enumerated in Section 8.4.2 of the Site Characterization Plan (DOE, 1988a). Section 8.4.2 of the SCP was prepared in response to the requirements of 10CFR60.17(a)(2)(iv).

- A. The quantities and source (e.g., well J-13) of water used for construction and dust control shall be measured and recorded. A permanent record of this information shall be maintained. [SR, Y, CA]
- B. The quantity of water for dust control should be limited to an average of 2 gallons per square yard of access road per day, or other similar value that, following discussions with the constructors, is considered a practical limit using standard practices. [SR, Y, CA]
- C. Trench excavations shall be limited to depths no greater than 10 meters unless test controls have been reevaluated and the greater depth found to be acceptable. [SR, Y, CA]
- D. The location of trenches, roads, excavations and structures, and a chronology of construction and testing activities shall be maintained as a historical record. [SR, Y, CA]

## APPENDIX A

## RESPONSIBILITY MATRIX

The responsibility matrix lists the organizations which are responsible for accomplishing two tasks associated with each requirement. The first task to be accomplished is to establish the requirement; the second is to implement it. The organizations responsible for the first task are listed under the heading, "Organization Responsible for Preparation of Requirement." Those listed are to determine that a requirement is correct and are responsible for defending the requirement. Although DOE is ultimately responsible for this, the responsibility can be delegated to other organizations, and such delegation is expected to occur. The organizations responsible for the second task are listed under the heading, "Organization Responsible for Compliance with Requirement." Those listed are responsible for demonstrating how the requirement has been met.

APPENDIX A  
 RESPONSIBILITY MATRIX  
 FOR  
 TEST AND EVALUATION PLANNING BASIS

T&EPB Section	Organization Responsible for Compliance with Requirement	Organization Responsible for Preparation of Requirement
Activity 8.3.1.5.2.1.5	USGS	Project Office
Study 8.3.1.17.4.2	SNL	Project Office
Permit Requirements	All field orgs.	Project Office
Land Access Requirements	All field orgs.	Project Office
Biological Protection Requirements	All field orgs.	Project Office
Archaeological Protection Requirements	All field orgs.	Project Office
Reclamation	All field orgs.	Project Office
Training	All field orgs.	Project Office
Environmental Protection	All field orgs.	Project Office
Site-Specific Reclamation except at noted below:	All field orgs.	Project Office
2.8F	EG&G EM	Project Office
2.9F	EG&G EM	Project Office
Performance Constraints on Testing	All test orgs.	Project Office

## APPENDIX B

REFERENCES TO  
TEST AND EVALUATION PLANNING BASIS

- BLM (Bureau of Land Management), 1988. Right-of-Way Reservation N-47748, January 6, 1988.
- BLM (Bureau of Land Management), 1989. Right-of-Way Reservation N-48602, October 10, 1989.
- CERCLA (Comprehensive Environmental Response, Compensation, Liability Act), 1980. "Comprehensive Environmental Response, Compensation, Liability Act," as amended, 42 USC 9601 et seq.
- Clean Air Act, 1983. "Clean Air Act," as amended, Pub. L. 88-206, 42 USC 7401 et seq., December 8, 1983.
- DOE (U.S. Department of Energy), 1988a. Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0199, Washington D.C.
- DOE (U.S. Department of Energy), 1988b. "Radiation Protection for Occupational Workers," Order 5480.11, Washington, D. C., December 21, 1988.
- DOE (U.S. Department of Energy), 1988c. "Environmental Monitoring and Mitigation Plan," DOE/RW-0208, NNWSI Project, Las Vegas, Nevada.
- DOE (U.S. Department of Energy), 1988d. "Draft Environmental Regulatory Compliance Plan for Site Characterization" DOE/RW-209, NNWSI Project, Las Vegas, Nevada
- DOE (U.S. Department of Energy), 1988f. "Programmatic Agreement Between the United States Department of Energy and the Advisory Council on Historic Preservation," Yucca Mountain Project, Las Vegas, Nevada, December, 1988.
- DOE (U.S. Department of Energy), 1989a. Study Plan 8.3.1.17.4.2 - Study Plan for Evaluating the Location and Recency of Faulting Near Prospective Surface Facilities, Rev. 0, Washington, D. C., May, 1989.
- DOE (U.S. Department of Energy), 1989b. Study Plan 8.3.1.5.2.1 - Study Plan for Characterization of the Yucca Mountain Quaternary Regional Hydrology, Rev. 0, Washington, D. C., June, 1989.
- DOE (U.S. Department of Energy), 1989c. "Yucca Mountain Project Reclamation Guidelines," Yucca Mountain Project, Las Vegas, Nevada, June, 1989.
- DOE (U.S. Department of Energy), 1990b. "Administrative Procedure (AP)-6.13, Authorization for Use of Regulated Hazardous Substances and Materials," Revision 0, Yucca Mountain Project, Las Vegas, Nevada, October 19, 1990.
- DOE (U.S. Department of Energy), 1990c. "Radiation Protection of the Public and the Environment," Order 5400.5, Washington, D. C., June 5, 1990.

- DOE (U.S. Department of Energy), 1990d. "Environmental Management Plan." YMP/90-15, Yucca Mountain Project, Las Vegas, Nevada.
- DOE (U.S. Department of Energy), 1990e. "Environmental Requirements Training Program," Yucca Mountain Project, Las Vegas, Nevada.
- Dyer, J. R., 1990. Memorandum from J. R. Dyer concerning test and construction controls to support the Midway Valley/Calcite-Silica trenching activities requirements document, September 14, 1990. Memorandum from J. R. Dyer concerning test and construction controls to support the Midway Valley/Calcite-Silica trenching activities requirements document, November 26, 1990.
- Endangered Species Act, 1973. "Endangered Species Act of 1973," Pub. L. 93-205, 16 USC 1531 et seq., December 28, 1973.
- Hallock, R., 1990. Letter from R. Hallock to C. P. Gertz regarding revisions to conditions in the February 9, 1990 Biological Opinion letter (Mc Natt to Gertz). May 4, 1990.
- Mc Natt, R. M., 1990. Letter from R. M. Mc Natt to C. P. Gertz regarding the U. S. Fish and Wildlife Service consultation and Biological Opinion on the potential for adverse impacts on the desert tortoise from Site Characterization Plan Activities. February 9, 1990.
- NHPA (National Historic Preservation Act), 1966. "National Historic Preservation Act of 1966." 16 USC 470.
- Neal, J.T., 1985. Location Recommendation for Surface Facilities for the Prospective Yucca Mountain Nuclear Waste Repository. SAND84-2015, Sandia National Laboratories, Albuquerque, NM.
- NRS (Nevada Revised Statutes) 444.440-.620. "Solid Waste Management."
- NRS (Nevada Revised Statutes) 445.401-.601. "Air Pollution."
- NRS (Nevada Revised Statutes) 459.400-.910. "Hazardous Waste Management."
- NRS (Nevada Revised Statutes) 533.010-.480. "Adjudication of Vested Water Rights; Appropriation of Public Waters."
- O'Farrell, T. P., 1990. EG&G Letter from T. P. O'Farrell to W. R. Dixon, YMPO regarding site specific reclamation stipulations for Trench A. September 11, 1990, (LV90-628)
- 10 CFR Part 60 (Code of Federal Regulations), 1990. Title 10, "Energy," Part 60, "Disposal of High-Level Radioactive Wastes In Geologic Repositories; Licensing Procedures," U. S. Government Printing Office , Washington, D.C., July, 1990.

**Section VI**

**Surface-Based Testing Facility  
Requirements Document**

## SURFACE-BASED TESTING FACILITIES REQUIREMENTS DOCUMENT

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## INTRODUCTION

## SCOPE

Site characterization, as defined in the Nuclear Waste Policy Act (NWP), includes "...activities, whether in the laboratory or in the field, undertaken to establish the geologic condition and the ranges of the parameters of a candidate site relevant to the location of a repository, including borings, surface excavations, excavations of exploratory shafts, limited subsurface lateral excavations and borings, and in situ testing needed to evaluate the suitability of a candidate site for the location of a repository,...."

The activities referred to in the NWP quote will include sampling and testing to be carried out from the ground surface (surface-based activities). This document covers facilities for these activities. A closely related document (Exploratory Shaft Facility-Subsystems Design Requirements Document [ESF-SDRD]) includes those activities to be performed as part of the exploratory shaft facility. The ESF satisfies the 10 CFR 60 requirements that the characterization include a program of in situ testing at the depths the wastes would be emplaced.

The Surface-Based Testing Facilities Requirements Document (SBTFRD) sets forth for the Design Organization (DO) the requirements for facilities to support surface-based testing. Examples of such facilities include roads, warehouses, power supply, water supply, sanitary utilities, foundation pads, security arrangements, and others. They will enable the planned sampling and testing activities to be carried out.

## ORGANIZATION

The SBTFRD is divided into the following three sections, each covering a subsystem:

- 1.2.3.0-General
- 1.2.3.1-Site Preparation/Site Installations
- 1.2.3.2-Utilities

Sections contain subparts for significant elements of the subsystem. Sections and subparts are organized in the following format:

DEFINITION OF SUBSYSTEM (OR OF SUBSYSTEM ELEMENT). This is further divided into two parts: (1) Definition, and (2) Boundaries and Interfaces. The definition section states the general purpose of the subsystem or subsystem element. The Boundaries and Interfaces section identifies the complementary elements of the SBTFRD and ESF-SDRD which may impact the satisfaction of the requirements.

APPLICABLE REGULATIONS, CODES, AND SPECIFICATIONS. This identifies those regulatory documents associated with the subject of the section. This division is found only in the primary part of the section.

**FUNCTIONAL REQUIREMENTS (FR).** This contains definitions of what the system or subsystem element must accomplish. These FRs are set forth as statements of purpose and are listed in numeric order.

**PERFORMANCE CRITERIA (PC).** This contains criteria statements describing how a specific subsystem or subsystem element must perform its functional requirement and, in some cases, provides direction for evaluating its performance. These criteria are listed in numeric-alphabetic order as a means of identifying the functional requirement with which they are associated. As an example, Performance Criteria 1a through 1f are subordinate to Functional Requirement 1.

**INTERFACE CONTROL REQUIREMENTS (ICR).** ICRs either document or identify the source of the subject system or subsystem with other SBTFRD facilities, project structures and services, or site features.

**CONSTRAINTS (C).** This contains statements on the limitations which are placed on the subsystem or subsystem element by the following:

1. design processes;
2. interrelated subsystems;
3. environmental conditions within which the subsystem or subsystem element must function;
4. applicable regulations, codes, standards, policies, guidance, and the like.

Constraints are listed in alphabetical order.

**ASSUMPTIONS (A).** This contains site specific condition statements which may limit the design or needs of the subsystem or subsystem element to a certain alternative, action, route, or piece of equipment.

**DESIGN AND OPERATING REQUIREMENTS.** This is not included separately, but is included in performance criteria and constraints.

**SYSTEM CONFIGURATION.** This is included as part of the definition of subsystem or subsystem element.

An attempt has been made to avoid repetition of requirements. A requirement having application to more than one section is placed in the highest tier section appropriate to it. It is then incorporated into lower tier sections (subparts) by reference. Lower tier sections may also expand, modify, or focus the upper tier requirement for a specific application. A requirement in an upper tier section does not necessarily apply to all lower tier sections.

Requirements (mostly environmental) having broad application to much of the work are placed in Section 1.2.3.0.

Requirements having wide application to one particular type of facility are placed in Section 1.2.3.1 or 1.2.3.2. The process described above may be repeated for subparts. A requirement may first appear in a subpart and apply to further subdivisions of the subpart.

## GENERAL DESCRIPTION OF CONTENT

The SBTFRD is written for use by the DO. Accordingly, it contains information required for designs (including specifications for construction) and decisions to be made by the DO. Requirements concerning decisions that are not to be made by the DO have not been included, even though the requirements are an important part of the field test and study.

The main sections of the SBTFRD (1.2.3.0, 1.2.3.1, and 1.2.3.2) present the test support requirements to the DO in broad terms that cover the overall surface-based testing program. Specific information and requirements for the initial tests to be performed beginning in January 1991 are given in Appendix A.

Some of the environmental requirements presented in the main sections of the SBTFRD are amplified in Section V, 2.0, Test and Evaluation Planning Basis of this Technical Requirements Document. Additional environmental requirements are also given there.

## TRACEABILITY

Each statement in the SBTFRD is followed by a citation to trace it to a higher level requirement. SBTFRD statements take several forms relative to the higher requirements: they may be quotes or modifications of them, or they may be derived from or support them.

Specific examples of statement citations and their meanings are as follows:

- [SCP8.4.2.2.2.1] This citation indicates the statement is consistent with Section 8.4.2.2.2.1 of the Site Characterization Plan (SCP) (DOE, 1988a).
- [SR, Y, CA] This citation indicates the statement traces to Constraint A from the YMMGDS Section of Section III, Yucca Mountain Mined Geologic Disposal System Requirements of this Technical Requirements Document.
- [TEPB, 2.2, CB] This citation indicates the statement traces to Constraint B of Section V, 2.2., Test and Evaluation Planning Basis of this Technical Requirements Document.

Many statements in SBTFRD (especially in Section 1.2.3.2) are consistent with the ESF SDRD (DOE, 1990f). This is logical because surface-based testing and the ESF are both a means of performing site characterization: the former performs it from the ground surface and the latter from underground. Both programs could have been combined into a single program for execution. There are similarities between the SBT and ESF characterization programs:

1. Both have similar potential effects on the site and thus require the same or similar controls.

2. Both require similar surface facilities, some of which may be shared, to support characterization.

No "consistent with ESF SDRD" citations have been included.

References for other documents cited in the SBTFRD are provided in Appendix B. Laws, regulations, and DOE Orders are identified by name only in the text. Plans, reports, and other documents are identified in the text by author and date citations, e.g., (DOE, 1988a).

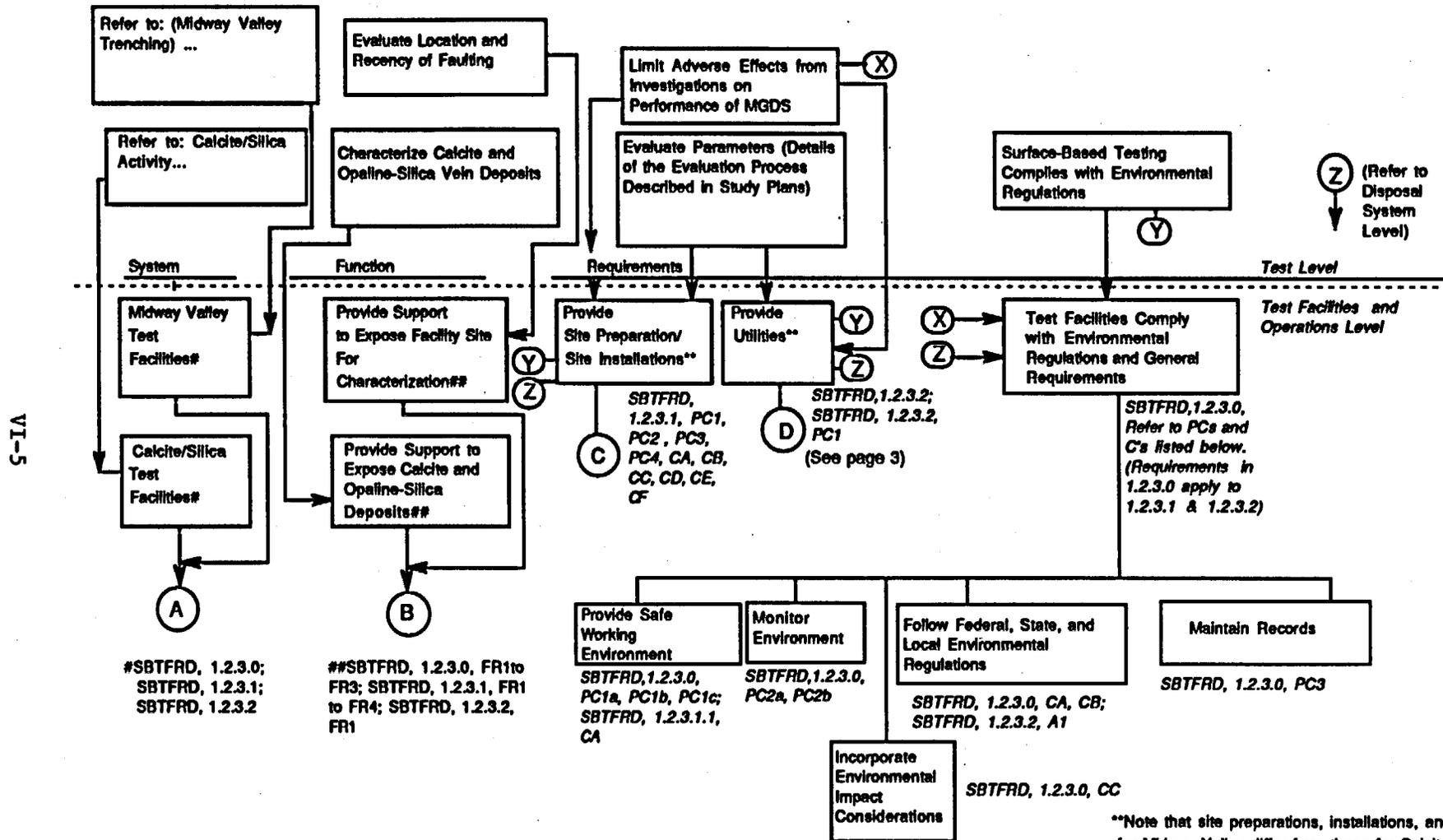
#### CHANGE CONTROL

Changes will be handled in accordance with Project Administrative Procedure (AP)-3.3Q, Change Control Process (DOE, 1990g), and AP-3.5Q, Field Change Control (DOE, 1990h).

#### FLOW CHART

The structure of the surface-based testing facilities system, function, and requirements tree is shown on Figure VI-1. The tree was developed to show the traceability of the technical requirements.

Figure VI-1. Surface-Based Testing Facilities Systems, Functions, and Requirements Trees  
Page 1 of 3



\*\*Note that site preparations, installations, and utilities for Midway Valley differ from those for Calcite Silica. Refer to the text for details.

Also, facilities to conduct tests and test facilities are described in a parallel fashion for both Midway Valley and Calcite Silica. This is for convenience; refer to the text for details on how these differ.

S-IA

Figure VI-1. Surface-Based Testing Facilities System, Function, & Requirements Trees  
Page 2 of 3

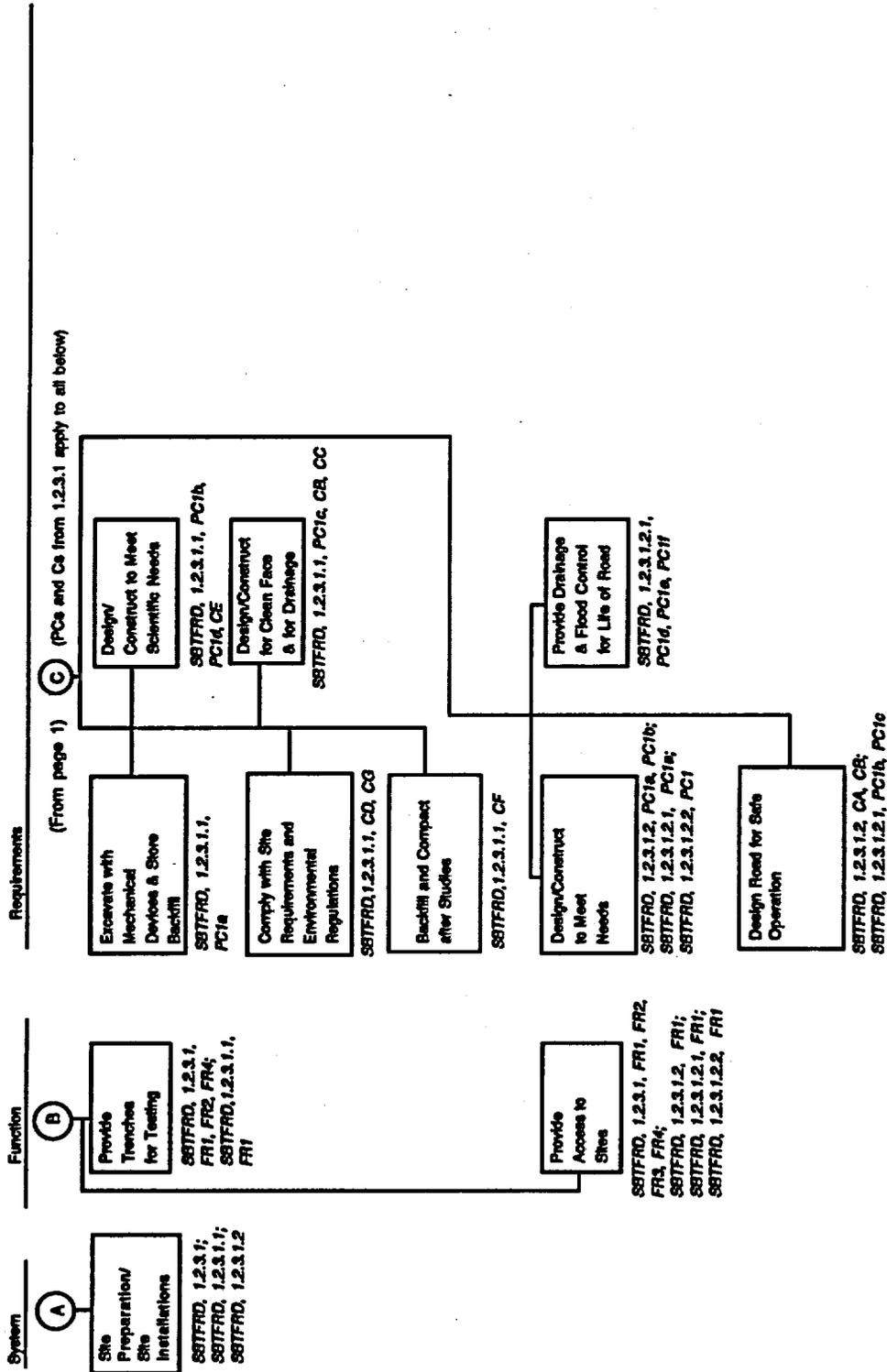
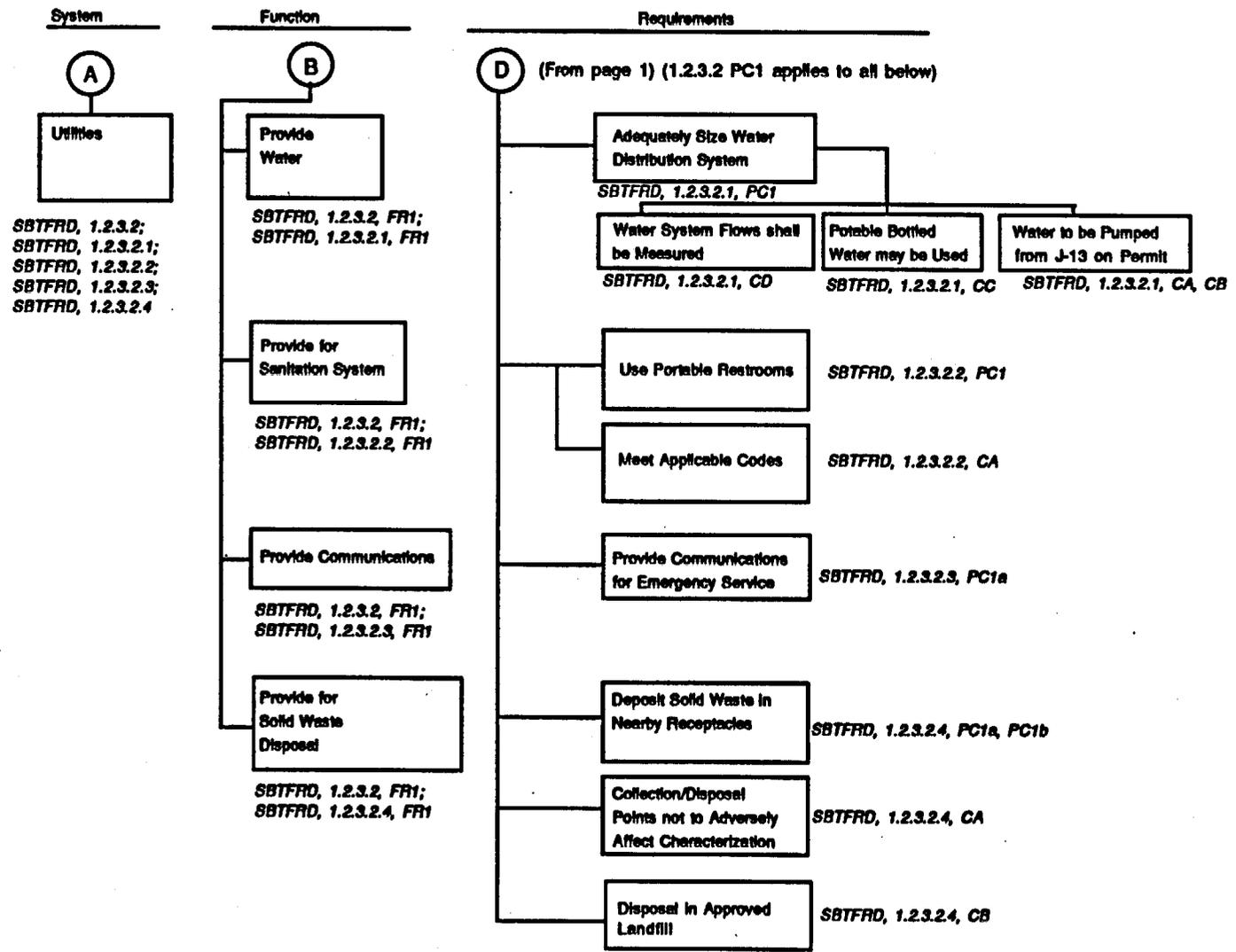


Figure VI-1. Surface-Based Testing Facilities  
 System, Function, & Requirements Trees  
 Page 3 of 3

VI-7



## 1.2.3.0 GENERAL

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

The Surface-Based Testing (SBT) Facilities are defined as those systems, subsystems, and components required to support in situ site characterization testing, performed from above ground, for the proposed Yucca Mountain repository. This section presents those criteria and requirements which are so general that they may impact most or all of the SBT facilities. [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with the requirements and criteria of Section 1.2.3.0 necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

## SBTFRD

1.2.3.1 SITE PREPARATION/SITE INSTALLATIONS

1.2.3.2 UTILITIES

## APPLICABLE REGULATIONS, CODES, AND SPECIFICATIONS

It is the responsibility of the Design Organization (DO) to identify which specific regulations, codes, standards, and DOE Orders apply. General references to some of these can be found in each section of this document. The latest edition or revision in effect at the time of initiation of design shall be used. Subsequent revisions of a regulation, code, standard, or DOE Order during the design shall be evaluated using the applicable Project approved change control process to determine the expected impacts of the revision on the design process and when implementation of the revision shall be invoked.

In the event of conflicting requirements, the mandatory standard providing the greater protection shall apply.

Written requests shall be made to the Project Manager of the Yucca Mountain Project Office, or his designee, to approve or obtain any required waivers.

## FUNCTIONAL REQUIREMENTS

1. Provide a safe working environment. [SR, Y, CH, CI]
2. Provide the facilities to alert on-site personnel of possibly dangerous working situations. [SR, Y, CH, CI]
3. Provide records of site activities. [TEPB, 3.0, CD]

## PERFORMANCE CRITERIA

- 1a. The design shall conform to applicable Federal, State, and local codes and standards, and DOE Orders pertaining to natural hazards and foundation stability, such as the requirements specified in DOE Order 6430.1A, General Design Criteria. [SR, 1.0, CH, CI]
- 1b. All geotechnical information used in the design shall be consistent with information contained in the Reference Information Base (RIB), Yucca Mountain Project controlled documents, or standard reference information (e.g., standard handbooks). [SR, Y, CH, CI]
- 1c. The design, construction, and operations shall comply with 29 CFR 1910 and 29 CFR 1926. [SR, Y, CH]
- 2a. Monitoring of the radiological background shall be conducted in compliance with the Yucca Mountain Project Radiological Monitoring Plan (DOE, 1988g). [TEPB, 2.7, CG]
- 2b. Environmental monitoring shall take into account the requirements of DOE Order 5480.4, Environmental Protection, Safety and Health Protection Standards. [TEPB, 2.7, CG]
3. The location of trenches, roads, excavations, and structures, and a chronology of construction and testing activities shall be maintained as a historical record. [TEPB, 3.0, CD]

## INTERFACE CONTROL REQUIREMENTS

1. The basic interface control requirements are established by the Yucca Mountain Project Administrative Procedure AP-5.19Q, Interface Control Procedure. This procedure is applicable to all work to be performed by participating organizations and contractors during the engineering phases. Specific working groups may be formed, as required, to coordinate Project-specific interfaces. [TEPB, 1.0]

## CONSTRAINTS

- A. The surface-based testing system shall comply with all applicable Federal environmental regulations and with State and local environmental regulations consistent with the DOE's responsibilities under the Nuclear Waste Policy Act of 1982 (NWPA) as amended. Such compliance shall include the following: [SR, Y, CC]
  - i. Air emissions shall comply with Federal regulations pertaining to compliance with the Clean Air Act. These include: 40 CFR 50 (National Primary and Secondary Ambient Air Quality Standards) and 40 CFR 60 (Standards of Performance for New Stationary Sources). Since the EPA has delegated the implementation and enforcement of this program to the Nevada Division of Environmental Protection (NDEP), the Project shall comply with the State or local standards included under the stipulations of NRS Chapter 445.401-.601 for Air Quality - (1) Registration Certificate and (2) Permit to Operate. [SR, Y, CC1]

- ii. All fugitive air emissions (non-point sources) shall be controlled in accordance with the applicable provisions of the Clean Air Act, as amended (42 USC 7401), as well as all applicable State and local air quality regulations. [SR, Y, CC2]
- iii. The management and disposal of solid and any hazardous wastes (excluding any radioactive wastes) shall be conducted in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6901, et seq.), which could include RCRA permitting for the hazardous wastes. Since parts of the RCRA program are administered by the NDEP, the Project shall comply with State or local standards stated under the stipulations of NRS Chapter 459.400-.910 Hazardous Waste Management, NRS Chapter 444.440-.620, Solid Waste Management System, and Nevada Administrative Code (NAC) 444.570 -.748, Solid Waste Disposal and (NAC) 444.8500-.9555, Hazardous Waste Disposal. [SR, Y, CC5]
- iv. The clean-up and emergency response procedures for hazardous substances released into the environment shall be conducted according to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. CERCLA requires notification of the National Response Center and appropriate agencies and officials when release of a reportable quantity of a hazardous substance occurs. Applicable emergency planning and community right-to-know requirements under Title III of SARA will also be implemented. [SR, Y, CC3a]
- v. The Programmatic Agreement (DOE, 1988f) must be followed to protect cultural resources. The Programmatic Agreement states the specific requirements for the Yucca Mountain Project to comply with the following Acts:
  - Antiquities Act of 1906 (16 USC 431, 432, 433; 25 CFR 261, 36 CFR 296, 43 CFR 3 and 7);
  - American Indian Religious Freedom Act (42 USC 1996, 36 CFR 296, 43 CFR 7);
  - Archaeological and Historic Preservation Act (16 USC 469-469c);
  - Archaeological Resources Protection Act of 1979 (16 USC 470AA et seq.);
  - Historic Sites, Building, and Antiquities Act (16 USC 461-469);
  - National Historic Preservation Act of 1966, as amended (16 USC 470 et seq.).
 [SR, Y, CC3f, CC6]
- vi. Discovery of threatened or endangered species shall trigger compliance with the Endangered Species Act. [SR, Y, CD]

- vii. Onsite storage capacity shall be sufficient for satisfying backfill requirements (if required and reusable); onsite/off-site rock handling capacity shall be capable of disposing of all excess excavated rock in an environmentally acceptable manner.  
[TEPB, 2.5, CCI, CCii, CCiv, 2.8, CC, CE, CF]
- viii. Environmental requirements in Section V, Test and Evaluation Planning Basis of this Technical Requirements Document shall be complied with.  
[TEPB, 2.0]
- B. Applicability of State and local regulations shall be determined in consultation with State and local officials as stated in the final EAs (DOE, 1986), Mission Plan (DOE, 1987a) and NWSA, as amended. [TEPB, 2.0]
- C. The program of (activities relating to) site characterization shall be conducted in accordance with the following:

Precautions shall be taken to avoid and/or control spills of hydrocarbons, solvent, and cementitious materials. Spills which do occur shall be cleaned up to the extent practicable. Spilled and contaminated material (including soil) shall be disposed of in accordance with Federal and State requirements. Specifically, this means the following regarding cleanup:

Liquid spills - remove all puddles and remove all soil that is nearly saturated with the spilled material.

Powder spills - remove all spilled material. Final cleanup from solid surfaces shall be by sweeping; final cleanup from soil surfaces shall include removal of soil in contact with the spilled material.

[TEPB, 2.7, CE]

#### ASSUMPTIONS

None.

### 1.2.3.1 SITE PREPARATION/SITE INSTALLATIONS

Subparts are:   1.2.3.1.1       Trenches  
                   1.2.3.1.2       Access Roads  
                   1.2.3.1.7.1     Unimproved Roads  
                   1.2.3.1.7.2     Trails

### DEFINITION OF SUBSYSTEM ELEMENTS

#### Definition

Site, for purposes of this section, is defined as an area where a test, investigation, or activity will be conducted. Site preparations are actions required at a site prior to implementation of a test, investigation, or activity, such as drill pad construction. These actions include preparations for work described in 1.2.3.2, Utilities. Tests/investigations are scientific studies as described in the Site Characterization Plan (SCP) (DOE, 1988a) such as borehole logging, conducting geophysical surveys, or the collection of meteorological data. Installation refers to apparatus or structures required at a site to support or supplement a test/investigation such as an IDAS instrument shelter, a meteorological trailer, or a gauging station. [TEPB, 1.0]

#### Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with requirements and criteria in this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

#### SBTFRD

1.2.3.0           GENERAL  
 1.2.3.2           UTILITIES

### APPLICABLE REGULATIONS, CODES, AND SPECIFICATIONS

All applicable Federal, State, and local laws and applicable standards, DOE Orders, codes, and policies as specified in the Environmental Regulatory Compliance Plan for site characterization shall be followed. In particular, the design shall be in accordance with: [SR, Y, CC]

#### Site Preparation

1. DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards.
2. DOE Order 6430.1A, General Design Criteria.
3. State of Nevada, Department of Transportation, Road Design Division, Design Manual, Parts 1 and 2 (for roadways only).
4. State of Nevada, Department of Transportation, Standard Specifications for Road and Bridge Construction.

5. DOE/Bureau of Land Management (BLM) Right-of-Way Agreements (BLM, 1988; BLM, 1989)

#### FUNCTIONAL REQUIREMENTS

1. Provide survey information to be used for an environmental analysis and assessment. [TEPB, 2.1, 2.3, 2.4, 2.5]
2. Provide site improvements including clearing, excavations and backfilling, and topsoil stockpile areas. [TEPB, 2.5, 2.8, 2.9]
3. Provide access to the sites. [TEPB, 2.2]
4. Provide for dust control. [TEPB, 2.2]

#### PERFORMANCE CRITERIA

1. Sites shall be surveyed and locations identified in sufficient detail for construction needs and to allow the conduct of an environmental analysis and assessment (archaeological, biological, and soil pre-activity surveys, etc). [STR, 2.1, CA, 2.3, CA, CB, 2.5, CA]
2. Topsoil shall be handled in an environmentally acceptable manner. [TEPB, 2.5, CCI, CCii, CCiv, 2.8, 2.9]
3. Existing roads shall be incorporated if shown to be cost effective and they do not reduce the validity of the investigations. [TEPB, 2.2, CD]
4. Dust control shall be provided at potential dust-generating areas, such as roads and earth-moving sites, in order to minimize airborne particulates as required by applicable Federal, State, and local codes. The current EPA standard is based on the fraction of TSP that is less than 10 micrometers in aerodynamic diameter (PM-10). This new standard will limit PM-10 particulates to less than 33 micrograms per cubic meter per day. [TEPB, 2.1, CB, 2.7, CC] [Consistent with 40 CFR 50.6]

#### INTERFACE CONTROL REQUIREMENTS

No further interface identification is required. Detailed interfacing is the responsibility of the DO. [TEPB, 1.0]

#### CONSTRAINTS

- A. Work shall be discontinued and the appropriate persons (as identified in other Project Plans) notified immediately upon discovery of desert tortoises, artifacts or archeological structures on the jobsite. [TEPB, 2.3, CD, 2.4, CB, CC]
- B. The designs for site preparation shall ensure that construction activities disturb only the amount of land necessary to accomplish the project. [TEPB, 2.5, CB]

- C. The ground at each site shall be restored to a contour compatible with its initial condition. This shall be done after all use for a site is completed and all facilities have been removed. [TEPB, 2.5, CCiv]
- D. The construction and operation of the test/investigation sites and access roads shall limit adverse chemical changes by controlling the use of hydrocarbons, solvents, and chemicals. [TEPB, 2.7, CA]
- E. The amount of water used in site preparation and operations should be limited to that required for sanitation, dust control, and proper equipment operation. [TEPB, 3.0, CB]
- F. The quantity of water for dust control should be limited to an average of 2 gallons per square yard of access road per day, or other similar value that, following discussions with the constructors, is considered a practical limit using standard practices. [TEPB, 3.0, CB]

ASSUMPTIONS

None.

## 1.2.3.1.1 TRENCHES

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

Trenches, which include test pits, soil pits, and associated features, are defined as shallow surface excavations to disclose subsurface conditions. [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with the requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

## SBTFRD

1.2.3.0 GENERAL

1.2.3.1 SITE PREPARATION/SITE INSTALLATIONS

## FUNCTIONAL REQUIREMENTS

1. Provide trenches, test pits, and/or soil pits to perform required testing. [TEPB, 1.0]

## PERFORMANCE CRITERIA

- 1a. Surface excavations shall be made with mechanical devices, and excavated material shall be stored for backfilling trenches. [TEPB, 1.0]  
[Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]
- 1b. Trenches shall be deep enough and long enough to satisfy scientific requirements, and they shall expose the necessary sequences for geological, tectonic, or paleohydrological studies. [TEPB, 1.0]  
[Consistent with SCP 8.3.1.17.4.2.2, SCP 8.4.2.2.2.1 (DOE, 1988a)]
- 1c. When required by the PI, trench faces shall be cleaned, including the faces of some existing trenches. [TEPB, 1.0] [Consistent with SCP 8.3.1.17.4.2.2 (DOE, 1988a)]
- 1d. Some existing trenches will be enlarged and deepened. [TEPB, 1.0]

## CONSTRAINTS

- A. Trench excavation shall comply with 29 CFR 1926, Subpart P. The PI will specify the preferred method of trench stability to be used to satisfy the requirements for the test. [SR, Y, CH] [TEPB, 1.0]
- B. The contractor shall coordinate excavation with the PI so that freshly exposed sequences can be examined as the excavation proceeds. Requirements for a "clean" trench face will be supplied by the PI. [TEPB, 1.0]

- C. Trenches and soil pits shall be gravity drained where practical. [TEPB, 1.0] [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]
- D. Each trench shall have one end sloped to allow animals entering the trench to exit. Desert tortoises shall be prevented from falling into trenches. [TEPB, 2.3, CF, CG]
- E. The contractor's operations must allow for final trench sites to be located by field reconnaissance. [TEPB, 1.0] [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]
- F. After completion of studies, trenches shall be backfilled and compacted using the originally removed material. [TEPB, 2.5, CCiv] [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]
- G. Trench excavations shall be limited to depths no greater than 10 meters unless test controls have been reevaluated and the greater depth found to be acceptable. [TEPB, 3.0, CC]

ASSUMPTIONS

None.

## 1.2.3.1.2 ACCESS ROADS

Subparts are: 1.2.3.1.7.1 Unimproved Roads  
 1.2.3.1.7.2 Trails

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

Access roads, which includes trails, are defined as all features needed to provide vehicular access to all designated surface areas (e.g., investigation sites, facilities, and utility support systems except for infrequently visited sites for which access is by use of off-road vehicles). [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with the requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

SBTFRD	
1.2.3.0	GENERAL
1.2.3.1	SITE PREPARATION/SITE INSTALLATIONS
1.2.3.2	UTILITIES

## FUNCTIONAL REQUIREMENTS

1. Provide roads to accommodate access and all anticipated services. [TEPB, 2.2]

## PERFORMANCE CRITERIA

- 1a. Access roads shall be designed and constructed to ensure that they meet the requirements of all anticipated service. This includes site security, safety, and anticipated loads during construction and operation for site characterization. [TEPB, 1.0, 2.2, CD]
- 1b. Roads shall be designed for the duration of their anticipated use (e.g., a road which will be used for 10 years shall be designed for a 10-year flood). [TEPB, 1.0]

## CONSTRAINTS

- A. Access roads used for hauling drill rigs or other heavy loads shall be identified as such and shall not exceed a grade that permits safe operation. [TEPB, 1.0]

- B. Access roads used by normal vehicular traffic to reach facilities and activity sites shall be identified as such and shall not exceed a grade that permits safe operation. [TEPB, 1.0]

ASSUMPTIONS

None.

## 1.2.3.1.2.1 UNIMPROVED ROADS

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

Unimproved roads are defined as bladed roads with or without road base and/or gravel. These roads allow two vehicles to pass safely. Unimproved roads also include, where appropriate, drainage ditches, berms, cut-and-fill slopes, culverts, and water bars. [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with the requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

## SBTFRD

- 1.2.3.0           GENERAL
- 1.2.3.1           SITE PREPARATION/SITE INSTALLATIONS
- 1.2.3.1.2        Access Roads
- 1.2.3.2           UTILITIES

## FUNCTIONAL REQUIREMENTS

1. Provide unimproved roads to accommodate all anticipated traffic.  
[TEPB, 1.0, 2.2]

## PERFORMANCE CRITERIA

- 1a. Access roads to be categorized as unimproved roads shall be determined through evaluation by the DO. [TEPB, 1.0]
- 1b. Road width shall allow two vehicles to pass safely. [TEPB, 1.0]
- 1c. The need for road base and/or gravel shall be determined through evaluation by the DO. [TEPB, 1.0]
- 1d. Roads shall be designed, constructed, and maintained in such a manner that runoff will be prevented from ponding, and water will drain laterally from the road. [TEPB, 2.5, CCv] [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]
- 1e. Road crossings of natural drainages shall minimize potential impacts to natural runoff patterns. [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]  
[TEPB, 2.5, CCv]
- 1f. Water bars shall be provided as necessary to control runoff.  
[TEPB, 2.5, CCv]

CONSTRAINTS

None.

ASSUMPTIONS

1. Short spur roads connecting study sites with primary roads normally will not be graveled. [TEPB, 1.0]

## 1.2.3.1.2.2 TRAILS

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

Trails are defined as access routes located by stakes or flagging, cleared via preactivity surveys and established through vehicle and equipment traffic. Trails are not constructed. On occasion, however, light blade work may be necessary on a trail to create a dip, for example, to keep water from a drainage crossed, from coursing down the trail. If future conditions warrant due to unforeseen traffic levels and/or weather, improvements to the trail or upgrading to a road may be necessary. [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with the requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

## SBTFRD

- |           |                                     |
|-----------|-------------------------------------|
| 1.2.3.0   | GENERAL                             |
| 1.2.3.1   | SITE PREPARATION/SITE INSTALLATIONS |
| 1.2.3.1.2 | Access Roads                        |

## FUNCTIONAL REQUIREMENTS

1. Provide dirt trails or tracks to access infrequently visited sites. [TEPB, 1.0] [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]

## PERFORMANCE CRITERIA

1. Trails shall provide access to infrequently visited study sites, or to study sites which will be used for short periods of time only. [TEPB, 1.0, 2.8, CA] [Consistent with SCP 8.4.2.2.2.1 (DOE, 1988a)]

## CONSTRAINTS

None.

## ASSUMPTIONS

None.

### 1.2.3.2 UTILITIES

Subparts are: 1.2.3.2.1 Water System  
 1.2.3.2.2 Sanitation System  
 1.2.3.2.3 Communications System  
 1.2.3.2.4 Solid-Waste Disposal System

#### DEFINITION OF SUBSYSTEM ELEMENTS

##### Definition

The surface utilities are defined as those systems, subsystems, structures, and components necessary to meet the needs of Participant organizations in carrying out surface-based testing for site characterization. These include provisions for water, sanitation, communications, and solid waste disposal. [TEPB, 1.0]

##### Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with requirements and criteria in this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

SBTFRD

1.2.3.0 GENERAL

1.2.3.1 SITE PREPARATION/SITE INSTALLATION

#### APPLICABLE REGULATIONS, CODES, AND STANDARDS

All applicable Federal, State, and local laws and applicable standards, orders, codes, and policies as specified in the Environmental Regulatory Compliance Plan for Site Characterization shall be followed. In particular, the designs shall be in accordance with: [SR, Y, CC]

##### Water system

1. DOE Order 6430.1A, General Design Criteria, Division 2 Site and Civil Engineering and Division 15 Mechanical
2. NRS Chapter 445, Public Water System, paragraphs .361 through .399

#### FUNCTIONAL REQUIREMENTS

1. Provide surface utility systems. [TEPB, 1.0]

#### PERFORMANCE CRITERIA

1. Necessary utility services shall be made available to meet the requirements of site preparation, installations and testing. [TEPB, 1.0]

**INTERFACE CONTROL REQUIREMENTS**

No further interface identification is required. Detailed interfacing is the responsibility of the DO. [TEPB, 1.0]

**CONSTRAINTS**

None.

**ASSUMPTIONS**

None.

## 1.2.3.2.1 WATER SYSTEM

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

The water system is defined as those systems, subsystems, and components that supply and distribute the potable and process water for surface facilities, for site preparation/site installation, and for tests and investigations.  
[TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

## SBTFRD

- 1.2.3.0 GENERAL
- 1.2.3.1 SITE PREPARATION/SITE INSTALLATIONS
- 1.2.3.2 UTILITIES

## FUNCTIONAL REQUIREMENTS

1. Provide a water supply, storage, and distribution system. [TEPB, 1.0]

## PERFORMANCE CRITERIA

1. The water supply, storage, and distribution systems, subsystems, and components shall be adequately sized with sufficient capacity to supply and distribute potable water and nonpotable dust suppression water in accordance with all anticipated needs and services for the operation of facilities, for tests and investigations, and for site preparation/site installation.  
[TEPB, 1.0]

## CONSTRAINTS

- A. The non-potable water supply will be pumped from existing Well J-13 on the NTS. [TEPB, 2.1, CC]
- B. Water withdrawal for specific uses from Water Well J-13 is subject to approval of the water appropriation permit application. [TEPB, 2.1, CC]
- C. Potable bottled water will be used when appropriate. [TEPB, 2.1, CC]

- D. The quantities and source (e.g., well J-13) of water used for construction and dust control shall be measured and recorded. A permanent record of this information shall be maintained. [TEPB, 3.0, CA]

ASSUMPTIONS

None.

1.2.3.2.2 SANITATION SYSTEM

DEFINITION OF SUBSYSTEM ELEMENTS

Definition

The sanitation system provides for the collection and disposal of sanitary waste generated at investigation sites. [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

SBTFRD

- 1.2.3.0 GENERAL
- 1.2.3.1 SITE PREPARATION/SITE INSTALLATION
- 1.2.3.2 UTILITIES

FUNCTIONAL REQUIREMENTS

- 1. Provide for the collection and disposal of sanitary waste during site characterization activities. [TEPB, 1.0]

PERFORMANCE CRITERIA

- 1. Portable restrooms may be required at some sites. [M, TEPB, 2.7, CD]

CONSTRAINTS

- A. The sanitation system shall meet applicable State and local codes. [SR, Y, CC]

ASSUMPTIONS

None.

### 1.2.3.2.3 COMMUNICATIONS SYSTEM

#### DEFINITION OF SUBSYSTEM ELEMENTS

##### Definition

The communications system is defined as those systems, subsystems, and components which provide equipment and services for linking surface areas, the investigation sites, and the facilities with each other and with outside commercial communications systems. [TEPB, 1.0]

##### Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with requirements and criteria of this section necessitates an evaluation and understanding by the designer of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

##### SBTFRD

- 1.2.3.0 GENERAL
- 1.2.3.1 SITE PREPARATION/SITE INSTALLATIONS
- 1.2.3.2 UTILITIES

#### FUNCTIONAL REQUIREMENTS

1. Supply the communications link within and external to the surface area of the repository block during site preparation/site installations and during surface-based investigations. [TEPB]

#### PERFORMANCE CRITERIA

1. The system shall provide communications to NTS law enforcement, medical, fire-fighting, or emergency agencies in the local Nye County area. [TEPB, 1.0]

#### CONSTRAINTS

None.

#### ASSUMPTIONS

None.

## 1.2.3.2.4 SOLID-WASTE DISPOSAL SYSTEM

## DEFINITION OF SUBSYSTEM ELEMENTS

Definition

Solid-waste disposal is defined as the collection and removal of refuse (eg., garbage, trash, construction materials, etc.) or hazardous (non-radioactive) materials from the Project site and disposal of same. [TEPB, 1.0]

Boundaries and Interfaces

Specific boundaries and interfaces between participating organizations' designs are identified in the Project Interface Control Document(s). Full compliance of the design with the requirements and criteria of this section necessitates an evaluation and understanding, by the designer, of the boundary and interface impacts of the requirements and criteria in the following sections of this document:

## SBTFRD

- 1.2.3.0 GENERAL
- 1.2.3.1 SITE PREPARATION/SITE INSTALLATIONS
- 1.2.3.2 UTILITIES

## FUNCTIONAL REQUIREMENTS

1. Provide for the collection and disposal of any solid-waste generated during surface-based testing activities. [TEPB, 1.0]

## PERFORMANCE CRITERIA

- 1a. All solid-waste shall be deposited in receptacles (trash barrels, dumpsters, etc.) to be picked up and transported to an approved disposal site. [TEPB, 1.0]
- 1b. Receptacles shall be placed in locations proximate to the test sites and work areas. [TEPB, 1.0]

## CONSTRAINTS

- A. Solid-waste collection and disposal points shall not adversely affect any site characterization activities. [TEPB, 1.0]
- B. Solid-waste shall be disposed of in an approved landfill. [TEPB, 2.7, CB]
- C. Hazardous materials shall be identified prior to use as required by AP-6.13 (DOE, 1990b). Any hazardous wastes produced will be identified prior to disposal. [TEPB, 2.1, CD]

## ASSUMPTIONS

None.

APPENDIX A  
SPECIFIC DESIGN CRITERIA

**Sandia National Laboratories**

Albuquerque, New Mexico 87185

WBS: 1232842

QA

AUG 16 1990

Carl P. Gertz, Project Manager  
 Yucca Mountain Project Office  
 U.S. Department of Energy  
 Nevada Operations Office  
 P.O. Box 98518  
 Las Vegas, Nevada 89193-8518

Dear Carl:

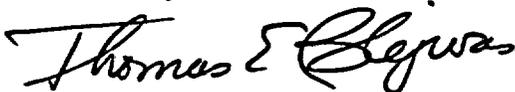
Subject: Letter of Criteria for Trench Excavation (SCP Study 8.3.1.17.4.2)

Enclosed is a letter of criteria (LOC) for Nevada Test Site (NTS) contractor support of Sandia National Laboratories. This LOC includes requirements for the initial surface-disturbing work of SCP study 8.3.1.17.4.2, Evaluate the Location and Recency of Faulting Near Prospective Surface Facilities. The information contained within should be sufficient to organize environmental and archeological surveys. Conceptual design of excavations, if needed, can begin. Results of these environmental/archeological evaluations must be combined with geological information before final excavation locations and specifications can be determined. It is essential that the process of selecting and excavating trenches remain flexible to ensure achieving the scientific objectives in an efficient manner.

It is important that we continue efforts to resolve archeological and environmental conflicts within Midway Valley. The Reference Conceptual Site, in particular, is vital to the objectives of this study. The older QTa surface in northern Midway Valley may provide the most confidence in predicting the potential of surface faulting within Midway Valley if this unit proves to be unfaulted. Access to these areas for excavation is essential to the study.

As per SNL DOP 3-15<sup>1</sup>, SNL requests that the YMP Office conduct a surveillance of each participating organization and/or NTS contractor involved in performing the work described in this criteria letter. The purpose of this surveillance is to determine whether the activity is being performed or the item is being produced in accordance with the SNL requirements.

Sincerely,

*for*   
 Thomas O. Hunter, Manager  
 Nuclear Waste Repository Technology  
 Department 6310

JDG:6315:mb

<sup>1</sup> Sandia National Laboratories, Department Operating Procedure DOP 3-15, Rev. A, Providing Instructions for NTS Contractor Work, Effective Date, July 25, 1989.

Carl P. Gertz, Project Manager

-2-

AUG 16 1990

Enclosure

Copy to: (w/enc.)

6310 T. O. Hunter

6310 J. Teak

*YPS* 6315 L. E. Shephard

6315 J. D. Gibson

GMTX F. H. Swan

USGS K. Fox

YMPO T. Sullivan

6310 10/1232842/1.2/QA

6310 80/12525/8.3.1.17.4.2/1.2/QA

6310 YMP CRF

LETTER OF CRITERIA  
TRENCH EXCAVATION  
SCP STUDY 8.3.1.17.4.2

Approved: J. Deane Gibson 8-10-90  
Author Date

Approved: James D. Hansen 8-10-90  
Technical Reviewer Date

Approved: J.E. Shyl 8-16-90  
Division Supervisor Date

Approved: Taber D. Husum for 8-10-90  
QA Division Supervisor Date

Approved: Thomas E. Bejwa 8-16-90  
for NWRD Department Manager Date

This letter of criteria (LOC) requests field support for initial surface-disturbing activities for Work Breakdown Structure (WBS) element 1.2.3.2.8.4.2 of the Yucca Mountain Project (YMP). This LOC supersedes the LOC prepared by SNL requesting REECO support, dated April 13, 1989. NTS support contractors must supply manpower and equipment to excavate trenches in five areas within Midway Valley, immediately east of Yucca Mountain. The Principal Investigator or his representative is available to meet, as required, with contractors to discuss this area. This LOC represents only a small portion of the total effort envisaged as part of this WBS element within upcoming months. Exploratory trenches and soil pits, as discussed in the study plan<sup>2</sup> for Site Characterization Plan (SCP) Activity 8.3.1.17.4.2.1 and SNL Experiment Procedure EP-0001, Rev. B<sup>3</sup> may be excavated based on the results of environmental/archeological surveys and geologic mapping. Subsequent excavations (exploratory, long, and supplemental trenches; soil pits) will be discussed in future criteria letters.

The study for evaluating the location and recency of faulting near prospective surface facilities (SCP study 8.3.1.17.4.2) will focus on Quaternary faults near the proposed surface facilities site within Midway Valley. If potentially active faults are present, the expected amount of displacement and rate of offset will be calculated. This study will provide much of the information needed in the final selection of the site for the surface facilities and design parameters for the waste handling buildings.

SCP study 8.3.1.17.4.2, informally called the "Midway Valley study," has a YMP-approved QA grading package that was approved (March 9, 1990) under YMP Administrative Procedure (AP) 5.17Q ("Application of Graded Quality Assurance"), before implementation of YMP AP 5.28Q ("Quality Assurance Grading"). All work for this study is QA Level I. This QA Level I work is equivalent to "quality-affecting" work under AP 5.28Q. Work Plan 1232842 is currently on controlled distribution at SNL.

The description of work that follows provides details of the support requirements anticipated for these areas. Excavation is scheduled to begin in January, 1991. An estimated 3-4 Sandia/Geomatrix personnel will be in the field at a given time, performing trench mapping. The SNL PI or his representative will be present during the excavation process and will halt the excavation if continuation potentially interferes with the scientific objectives of the study. Initial mapping will be done in the 4-6 weeks following each excavation, with a reduced level of effort in subsequent weeks. All necessary excavation equipment will be supplied by NTS support contractors.

<sup>2</sup> Gibson, J. D., L. E. Shephard, and C. A. Rautman, 1989, "Study Plan for Evaluating the Location and Recency of Faulting Near Prospective Surface Facilities," SAND89-0206, Sandia National Laboratories, Albuquerque, NM.

<sup>3</sup> Experiment Procedure EP-0001, Rev. B, Geologic Surface Mapping Near the Prospective Surface Facilities, Effective Date, August 8, 1990.

As additional trench locations and configurations are identified as a part of this study, criteria letters will be forwarded to the Regulatory and Site Evaluation Division, YMP Office, for approval and inclusion in the appropriate requirements documents.

Duane Gibson, Org. 6315, Sandia National Laboratories, Albuquerque, NM 87185, (FTS or 505) 844-8823 is the task leader/principal investigator (PI) for this WBS element and the primary Sandia contact. Les Shephard (FTS or 505) 844-3604 and Bert Swan [Geomatrix Consultants, tel (415)-957-9557] are alternate contacts.

Commonly accepted industry standards for excavation will be followed during the work specified in this LOC<sup>4</sup>. Any additional environment, safety, and health requirements<sup>4,5</sup> that are applicable to this work also will be met. Water is not required as part of the scientific effort envisaged for this study.

---

<sup>4</sup> DOL (U.S. Department of Labor), "Occupational Safety and Health Standards-Excavations," Code of Federal Regulations, Title 29, Part 1926, U.S. Government Printing Office, Washington, DC, 1989.

<sup>5</sup> SOP -10300 8904, Safe Operating Procedure for Geotechnical Studies Within Midway Valley at the Nevada Test Site, Sandia National Laboratories, Effective Date, April 5, 1989.

## DESCRIPTION OF WORK

## Area of Interest:

Five areas (Areas A'- E'; see attached location maps) lie within Midway Valley, immediately east of Yucca Mountain on the NTS, Nye County, Nevada. These areas expand those identified (areas A-E) in earlier correspondence (Hunter to Gertz, May 4, 1989)

Area A' - A 500 m (E-W) by 600 m (N-S) rectangle that includes the extension of the Bow Ridge fault to the north of Exile Hill.

Area B' - A 580 m (E-W) by 580 m (N-S) box that contains several photolineaments including possibly the Paintbrush Canyon fault.

Area C' - A 500 m (E-W) by 660 m (N-S) rectangle that contains several photolineaments, possibly related to the Midway Valley fault zone.

Area D' - A 620 m (E-W) by 660 m (N-S) rectangle that contains the Paintbrush Canyon fault and several photolineaments.

Area E' - A 1300 m (E-W) by 370 m (N-S) rectangle that incorporates some of the proposed reference conceptual site.

## Nature of Excavations:

A trench excavation will be prepared for providing vertical exposures for geologic mapping. Excavation walls should be vertical to the extent possible with usual construction equipment. These excavations are expected to be confined to alluvium.

## Location of Excavations:

The exact location and specification of each trench excavation will be determined by the principal investigator after preliminary environmental, archeological, and geological mapping is completed in each area. Pending the results of these activities and for planning purposes only, end points of two potential trench locations in area A' are:

234140N 173575E West End  
234150N 173705E East End and

234055N 173575E West End  
234045N 173680E East End

Specific trench locations will be selected for each area by the PI after consulting with personnel responsible for permitting and trench excavation.

**Depth of Excavations:**

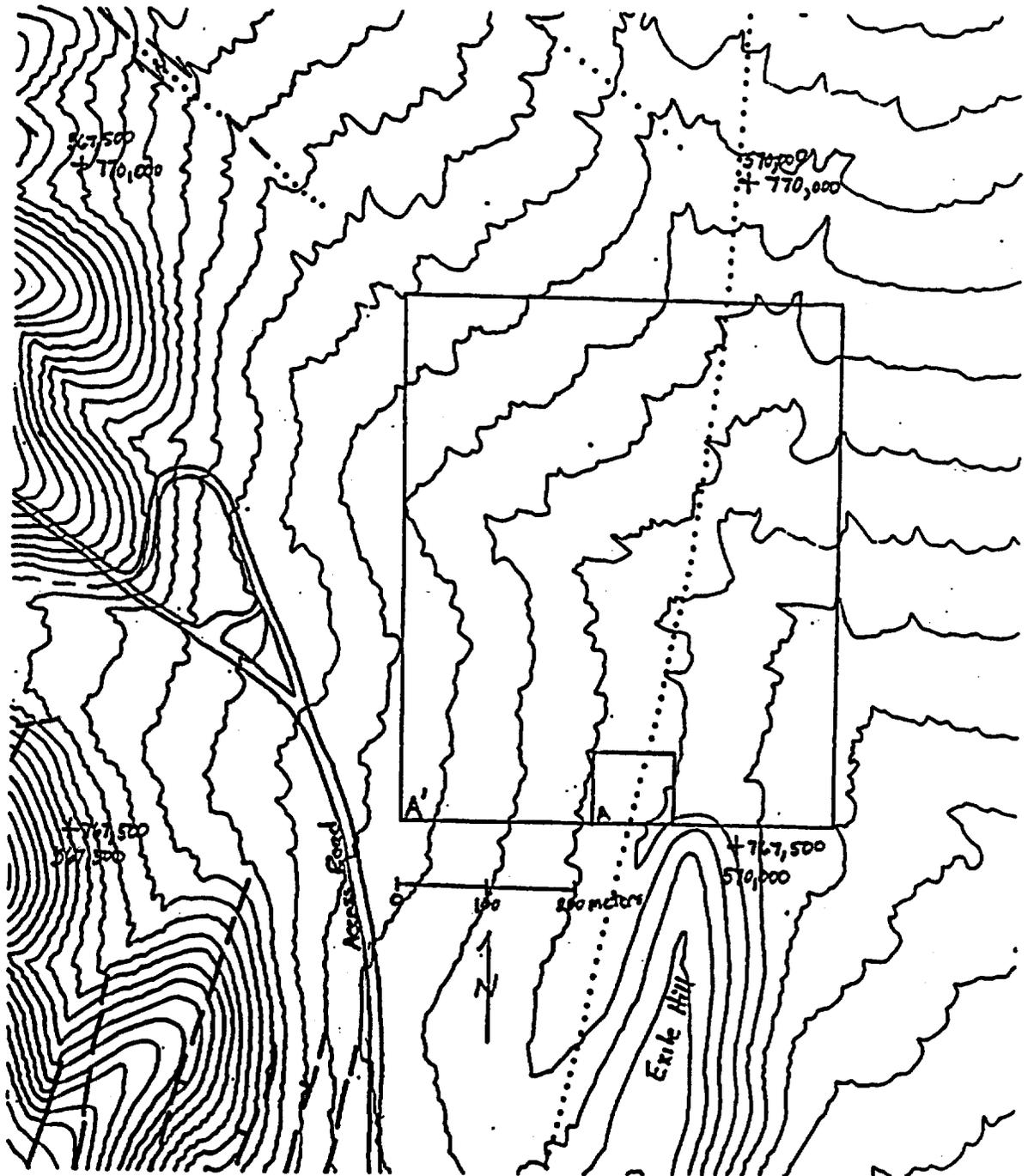
Trench excavations will be made to an initial nominal depth of 5 feet and a minimum nominal width equivalent to a bulldozer blade. Requirements must be flexible enough to allow for deepening, widening and/or lengthening of excavations. The final excavation depth will depend on the materials uncovered in the upper portions of the trench. Final depth of excavation is assumed to be 12-15 feet, or deeper, as specified by the SNL PI or designated representative depending on conditions encountered.

**Nature of Surveying:**

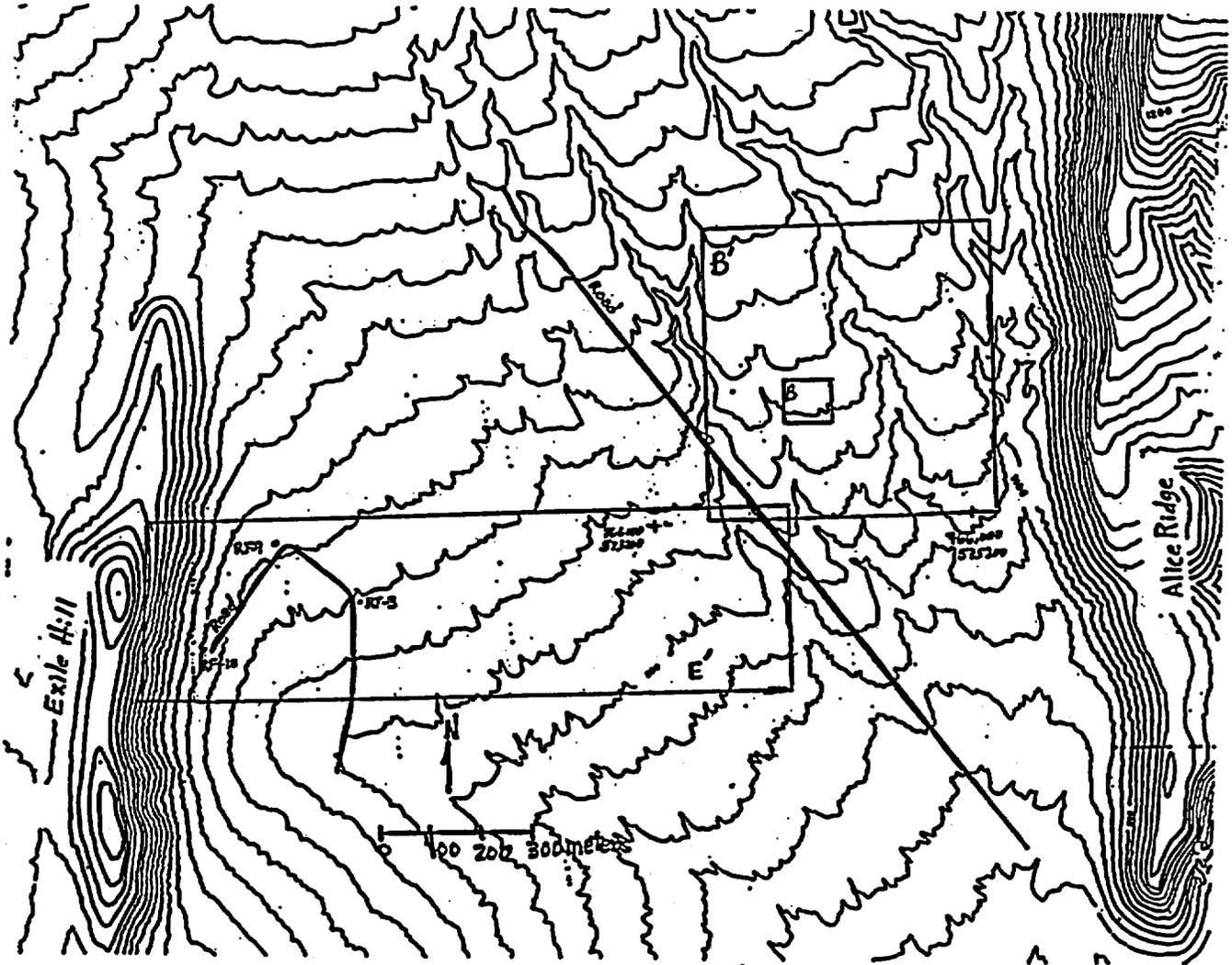
Stakes will be surveyed to within +/-2 m at the corners of the area for environmental and archeological evaluation and at the ends of the trench. Intermediate surveys of the trench may be requested at the discretion of the PI. A final survey of the trench end points will be required to transfer trench locations onto an area base map.

**Water Usage:**

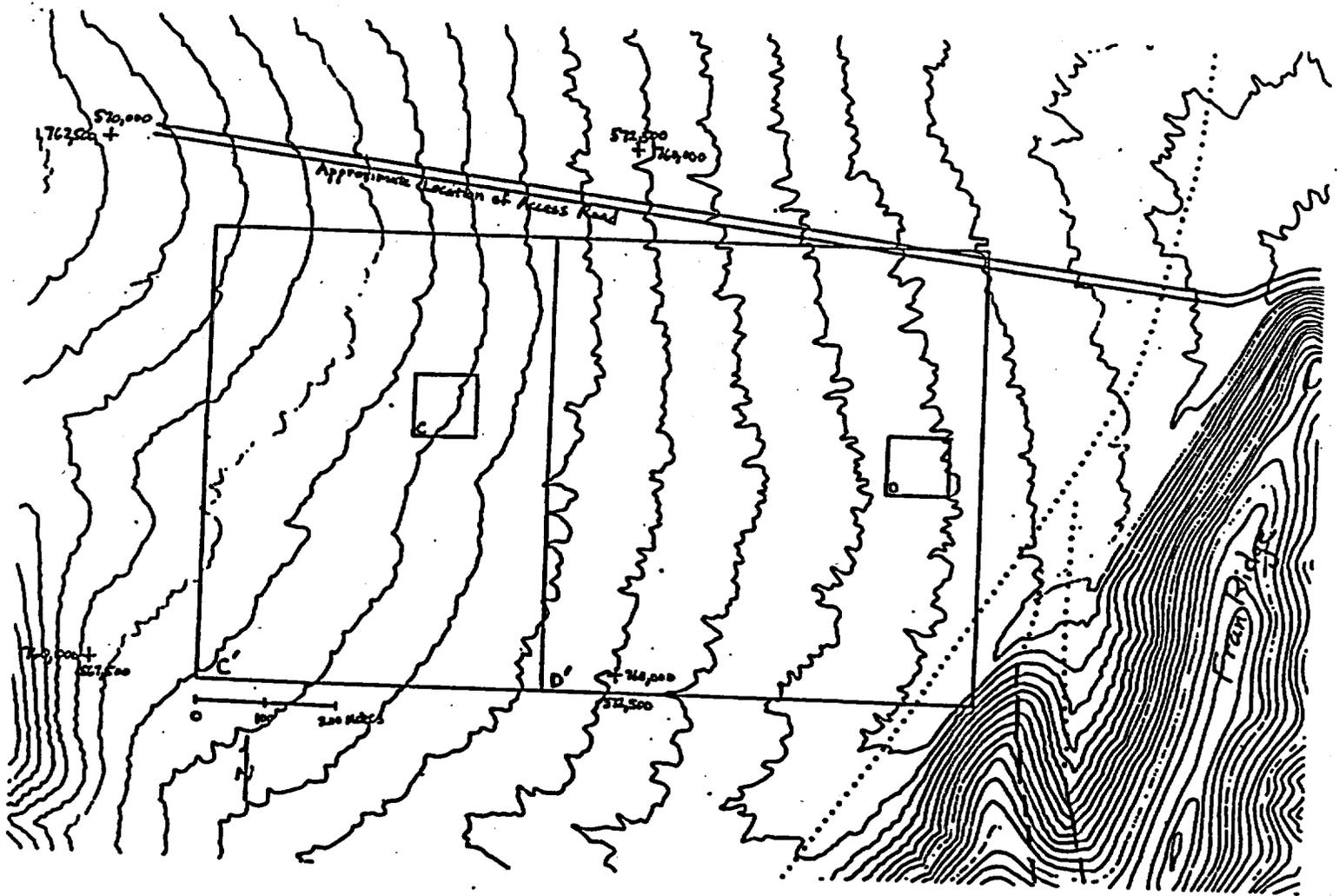
No water is required for use as part of the scientific investigation.



Location Map for Area A'



Location Map for Areas B' and E'



Location Map for Areas C' and D'



# United States Department of the Interior

GEOLOGICAL SURVEY  
Geologic Division  
Branch of Isotope Geology

Box 25046, MS 963  
Denver Federal Center  
Denver, Colorado 80225

YMP-USGS-123233G-01-C2, R0  
QA=QA  
August 10, 1990

J. Timothy Sullivan  
Site Investigations Branch  
Yucca Mountain Project Office  
U.S. Department of Energy  
P.O. Box 98608  
Las Vegas, Nevada 89193-8608

## CRITERIA LETTER FOR DEEPENING TRENCH 14

The U.S. Geological Survey requests DOE-YMP and contractor support for deepening Trench 14 for work proposed in Study Plan 8.3.1.5.2.1. This activity requires that the origin of the calcite and opline silica vein-like deposits exposed in the trench be determined because of the various proposed origins have differing consequences in assessing the performance of a proposed repository for high-level radioactive waste at Yucca Mountain. In order to determine the origin, the morphology of the vein system at depth below the plant root zone must be determined. Presently exposed deposits lack calcareous microfossils, but it is possible that the absence of these fossils could be due to lack of preservation owing to respired CO<sub>2</sub> in the root zone. The lack of microfossils is critical evidence against formation of the veins in a saturated environment, and therefore, samples from greater depth than currently exposed are needed in order to complete the paleontological work outlined in activity 8.3.1.5.2.1.5. Finally, samples from depth will be compared with near-surface samples to see if any chemical, mineralogical, or isotopic gradients exist. Such gradients would be inconsistent with any type of spring origin.

### Funding

Funding will be required for DOE contractor support under WBS#1.2.3.5.3.18

### General Description of Work

Prior to deepening the trench, the top of the main fault must be exposed by removing the loose material (spoil and colluvial units 1, 2, and 3 shown on figure 1) on the sides of Trench 14 to a depth of about 3 ft. An on-site geologist will decide when an adequate amount of material has been removed in the vicinity of the main fault. The lateral extent of removed material in terms of either distance east or west from the main fault zone, or north or south from the existing trench walls is not important to the scientific