

SUMMARY OF U.S. NUCLEAR REGULATORY COMMISSION (NRC)-
U.S. DEPARTMENT OF ENERGY TECHNICAL EXCHANGE ON
EXPLORATORY STUDIES FACILITY (ESF) DESIGN CONTROL
September 16, 1991
Washington, D.C.

Agenda: See Attachment 1.

List of Attendees: See Attachment 2.

Summary:

On September 16, 1991, NRC and DOE conducted a technical exchange concerning DOE's ESF design control process. In its Site Characterization Analysis of DOE's Yucca Mountain Site Characterization Plan (SCP), NRC had previously raised an objection to the SCP because DOE had not demonstrated the adequacy of its ESF Title I design or its ESF design control process. DOE has revised its ESF Title I design under a newly developed design control process. The primary purpose of this technical exchange was for DOE to explain its new design control process (Attachments 3-5), to provide examples of how it has been implemented in the revised ESF Title I design (Attachment 5), and to indicate how the portion of the NRC objection pertaining to ESF design control process has been addressed (Attachment 6). A second purpose was for DOE to present a schedule of the major milestones for initial ESF design and construction (Attachment 7). A representative of the State of Nevada also attended this exchange.

DOE concluded its presentations on the ESF design control process by stating that DOE considers it has adequately addressed the portion of NRC's objection regarding the ESF design control process. NRC indicated that based upon the information presented at this exchange, as well as upon other NRC-DOE interactions in which NRC has had visibility of the ESF design control process, it appears that DOE is addressing the ESF design control process portion of the objection. NRC further indicated that DOE needs to document the ESF design control process presented at this exchange and demonstrate its effective implementation before NRC can make an independent determination of whether that part of the objection is resolved.


King Stablein, Sr. Project Manager
Repository Licensing and Quality
Assurance Project Directorate
Division of High-Level Waste Management
U.S. Nuclear Regulatory Commission


Priscilla Bunton
Regulatory Integration Branch
Office of Systems and Compliance
Office of Civilian Radioactive
Waste Management
U.S. Department of Energy

AGENDA

DOE-NRC TECHNICAL EXCHANGE ON ESF DESIGN CONTROL

September 16, 1991
 8:30 a.m.
 Forrestal Building, 1E-245
 Washington, D.C.

PURPOSE: The purpose of this technical exchange is to discuss the status and progress of the ESF design process and control activities.

SCOPE: This technical exchange will focus on discussion of the ESF design process and its control.

<u>Agenda Topic</u>	<u>Discussion Leader</u>
I. INTRODUCTION AND OPENING REMARKS	DOE, NRC, State
II. ESF DESIGN, PROCESS, AND CONTROL	
A. Overview	M. Blanchard
B. Title I Design Study	T. Petrie
1. Process	
2. Design Inputs (Hierarchy)	
3. Interfaces	
4. Design Activities	
5. Reviews	
6. Traceability	
7. Design Outputs	
C. Title II Design	T. Petrie
1. Process	
2. Design Inputs	
3. Status and Schedule	
D. Key Points of SCA Objection 1	D. Dobson
IV. CLOSING REMARKS	DOE, NRC, State

**NRC/DOE Technical Exchange
ESF Design Control
September 16, 1991**

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Ted Petrie	"	202-794-7961
David Dobson	DOE/YMP	202-794-7940
STEPHAN BROCOMB	DOE/RW-22	202-586-5355
Jim Thompson	Thompson Engineering/ State of Nevada	713-462-6250
Keith John	SAIC	702-994-7509
David Rasmussen	Weston/DOE	202-646-6648
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**NRC/DOE Technical Exchange
ESF Design Control
September 16, 1991**

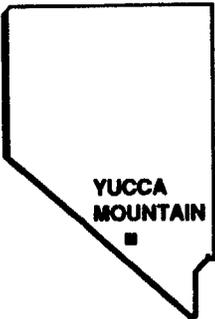
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Bob Jackson (Part time)	R.F. Weston	202-646-6600
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John Buckley	NRC	492-0513
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**NRC/DOE Technical Exchange
ESF Design Control
September 16, 1991**

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U.S. DEPARTMENT OF ENERGY

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**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE - NRC TECHNICAL EXCHANGE
ON DESIGN CONTROL**

INTRODUCTION

PRESENTED BY

DWIGHT D. SHELOR
ASSOCIATE DIRECTOR,
OFFICE OF SYSTEMS AND COMPLIANCE



SEPTEMBER 16, 1991
WASHINGTON, D.C.

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Received with letter dated 10/29/91 Attachment 3

INTRODUCTION

BRIEFING OBJECTIVES:

- **TO DESCRIBE THE OCRWM DESIGN CONTROL PROCESS APPLIED TO THE ESF**
- **TO PRESENT A SCHEDULE OF THE MAJOR MILESTONES FOR INITIAL ESF DESIGN AND CONSTRUCTION**
- **TO PRESENT OCRWM'S BASES FOR RESOLUTION OF SCA OBJECTION NUMBER 1 (DESIGN CONTROL)**

INTRODUCTION

(CONTINUED)

OCRWM WILL ADDRESS THE MAJOR ATTRIBUTES OF DESIGN CONTROL AND DESCRIBE THE MANAGEMENT PROCESS USED FOR DESIGN CONTROL OF THE ESF DESIGN AND CONSTRUCTION

● DESIGN CONTROL

- CONFIGURATION MANAGEMENT OF DATA, ANALYSES, REQUIREMENTS, SPECIFICATIONS, INTERFACES, AND DRAWINGS**
 - * DOCUMENT CONTROL**
 - * CHANGE CONTROL**
- DESIGN REVIEW**
- DESIGN VERIFICATION**
- QUALITY ASSURANCE GRADING**

INTRODUCTION

(CONTINUED)

DURING OCRWM'S PRESENTATION, ALL SEVEN OF THE TECHNICAL POSITION STATEMENTS IN SECTION 3.0 OF NUREG - 1439 WILL BE ADDRESSED.

THESE ARE:

- **APPROACH FOR COMPLIANCE WITH 10 CFR PART 60 REQUIREMENTS**
- **QUALITY ASSURANCE**
- **PLANNING AND COORDINATION OF THE ESF DESIGN AND CONSTRUCTION WITH THE GROA DESIGN**
- **CONSIDERATION OF ALTERNATIVES FOR DESIGN FEATURES**
- **EXCAVATION METHODS**
- **TEST INTERFERENCE**
- **ESTABLISHMENT OF RANGES OF SITE PARAMETERS**

INTRODUCTION

(CONTINUED)

IN SUMMARY, THE PRESENTATIONS WILL DEMONSTRATE:

- **OCRWM MANAGEMENT HAS DEVELOPED AND IMPLEMENTED A DESIGN CONTROL PROCESS APPROPRIATE FOR THE ESF**
- **OCRWM MANAGEMENT HAS CONTROL OF THE DESIGN**
- **NRC HAS AN OPPORTUNITY TO OBSERVE AND COMMENT ON THE ESF DESIGN DEVELOPMENT, CONSTRUCTION, AND TESTING**
- **IF THE SITE IS FOUND SUITABLE AND OCRWM ELECTS TO SUBMIT A LICENSE APPLICATION FOR A REPOSITORY THAT INCLUDES A GEOLOGIC REPOSITORY OPERATION AREA (GROA) COLOCATED WITH AN ESF, THE DOCUMENTATION OF THE ESF DESIGN DECISIONS WILL SHOW THAT THEY WERE DERIVED THRU A PROCESS THAT IS IN COMPLIANCE WITH 10 CFR PART 60 AND IN ACCORDANCE WITH NUREG-1439**

U.S. DEPARTMENT OF ENERGY

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**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE - NRC TECHNICAL EXCHANGE
ON DESIGN CONTROL**

OVERVIEW

PRESENTED BY

MAXWELL B. BLANCHARD
DEPUTY PROJECT MANAGER



SEPTEMBER 16, 1991
WASHINGTON, D.C.

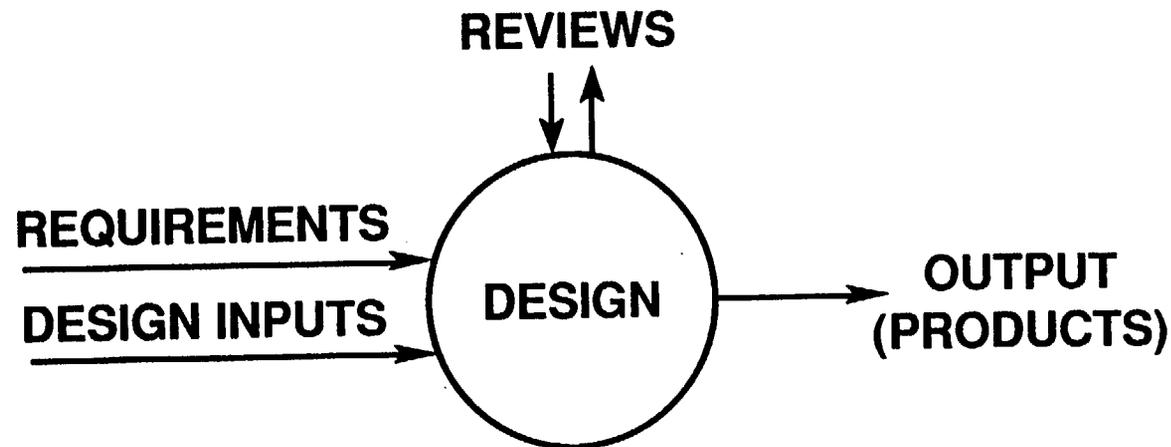
Attachment 4

OBJECTIVE

**PROVIDE BASIS FOR RESOLUTION OF NRC
CONCERN WITH ESF DESIGN PROCESS AND ITS
CONTROL**

DESIGN PROCESS

TECHNICAL AND MANAGEMENT PROCESSES THAT COMMENCE WITH IDENTIFICATION OF DESIGN INPUT AND THAT LEAD TO AND INCLUDE THE ISSUANCE OF DESIGN OUTPUT DOCUMENTS (NQA-1-1989 SUPPLEMENT S-1)



DESIGN CONTROL

- **MEASURES TO ASSURE THAT APPLICABLE REQUIREMENTS AND THE DESIGN BASIS ARE CORRECTLY TRANSLATED INTO SPECIFICATIONS, DRAWINGS, PROCEDURES, AND INSTRUCTIONS (10 CFR 50, APPENDIX B)**

- **ELEMENTS OF DESIGN CONTROL (QAPD SECTION 3)**
 - **SYSTEMS ENGINEERING**
 - **PROCESSING OF DATA**
 - **DESIGN INPUTS**
 - **DESIGN PROCESS**
 - **INTERFACE CONTROL**
 - **READINESS REVIEWS**
 - **TECHNICAL REVIEWS**
 - **DESIGN VERIFICATION**
 - **DESIGN CHANGE CONTROL**
 - **DESIGN DEFICIENCY CONTROL**

NRC'S BASIS FOR OBJECTION 1 ON SCP/ESF TITLE I DESIGN (NUREG - 1347)

- **ADEQUACY OF ESF TITLE I DESIGN CONTROL PROCESS**

- **KEY POINTS**
 - **CONSIDERATION OF 10 CFR 60 REQUIREMENTS**

 - **INTEGRATION OF TECHNICAL DATA INTO DESIGN**

 - **POTENTIAL FOR TEST INTERFERENCES**

EVOLUTION OF ESF DESIGN CONTROL PROCESS SINCE OBJECTION 1 WAS RAISED

- **PROCESS HAS BEEN MODIFIED TO INCORPORATE
REQUIRED CONTROLS**
- **NRC ACCEPTANCE OF OCRWM , YMP & PARTICIPANT
QA PLANS**
- **DESIGN CONTROL PROCESS BEING USED DURING
PRESENT ESF DESIGN STUDY (REVISED TITLE 1
DESIGN SUMMARY REPORT) CONSISTENT WITH
APPROVED QA PROGRAM**
- **DESIGN CONTROL PROCESS TO BE USED DURING
TITLE II DESIGN WILL COMPLY WITH APPROVED QA
PROGRAM**

QA PROGRAM QUALIFICATION

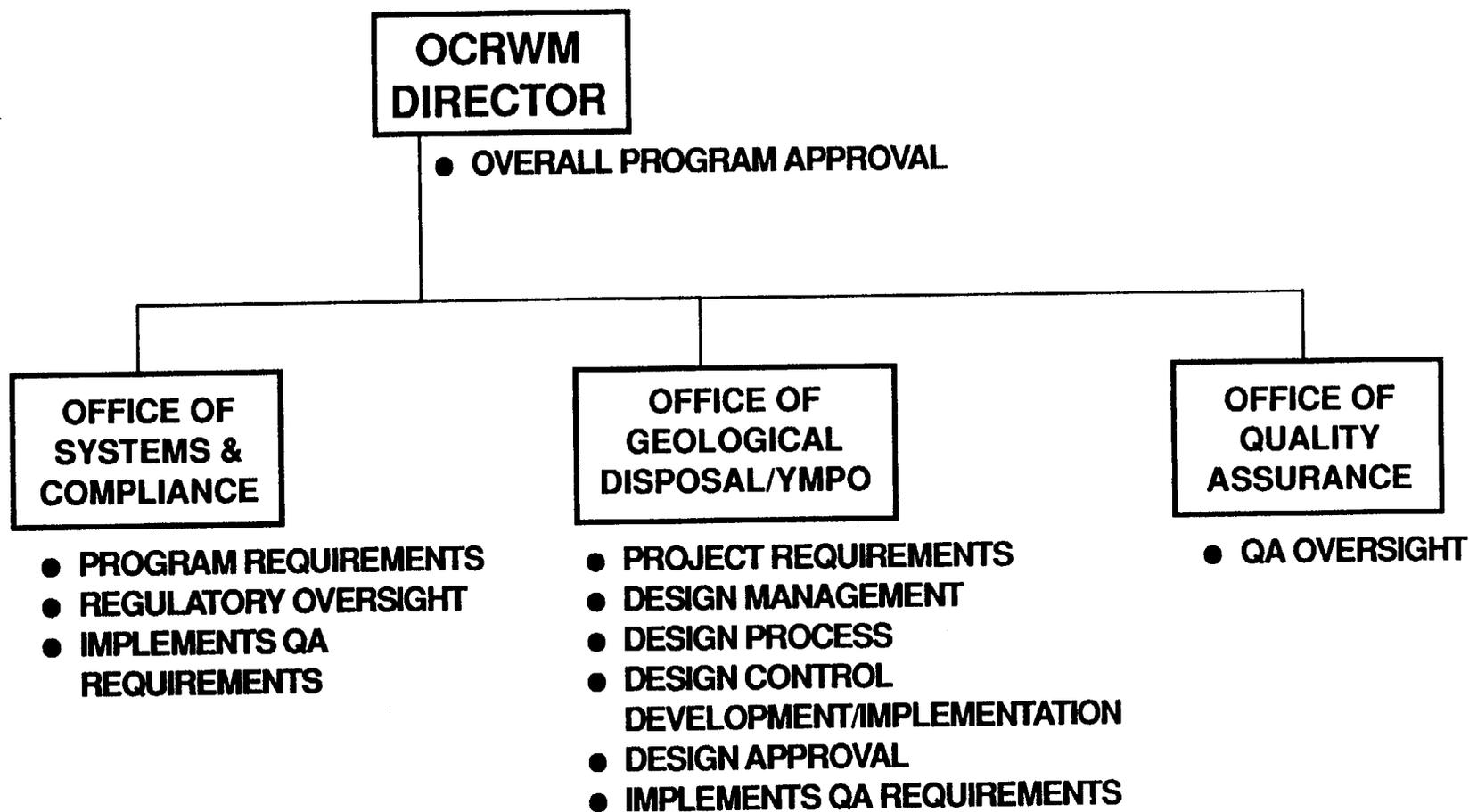
- **QUALIFICATION OF DOE AND PARTICIPANT QA PROGRAMS DEMONSTRATED BY SUCCESSFUL QA AUDITS**
- **NRC ACCEPTANCE OBTAINED**

STATUS OF OCRWM QA PROGRAM APPLICABLE TO ESF

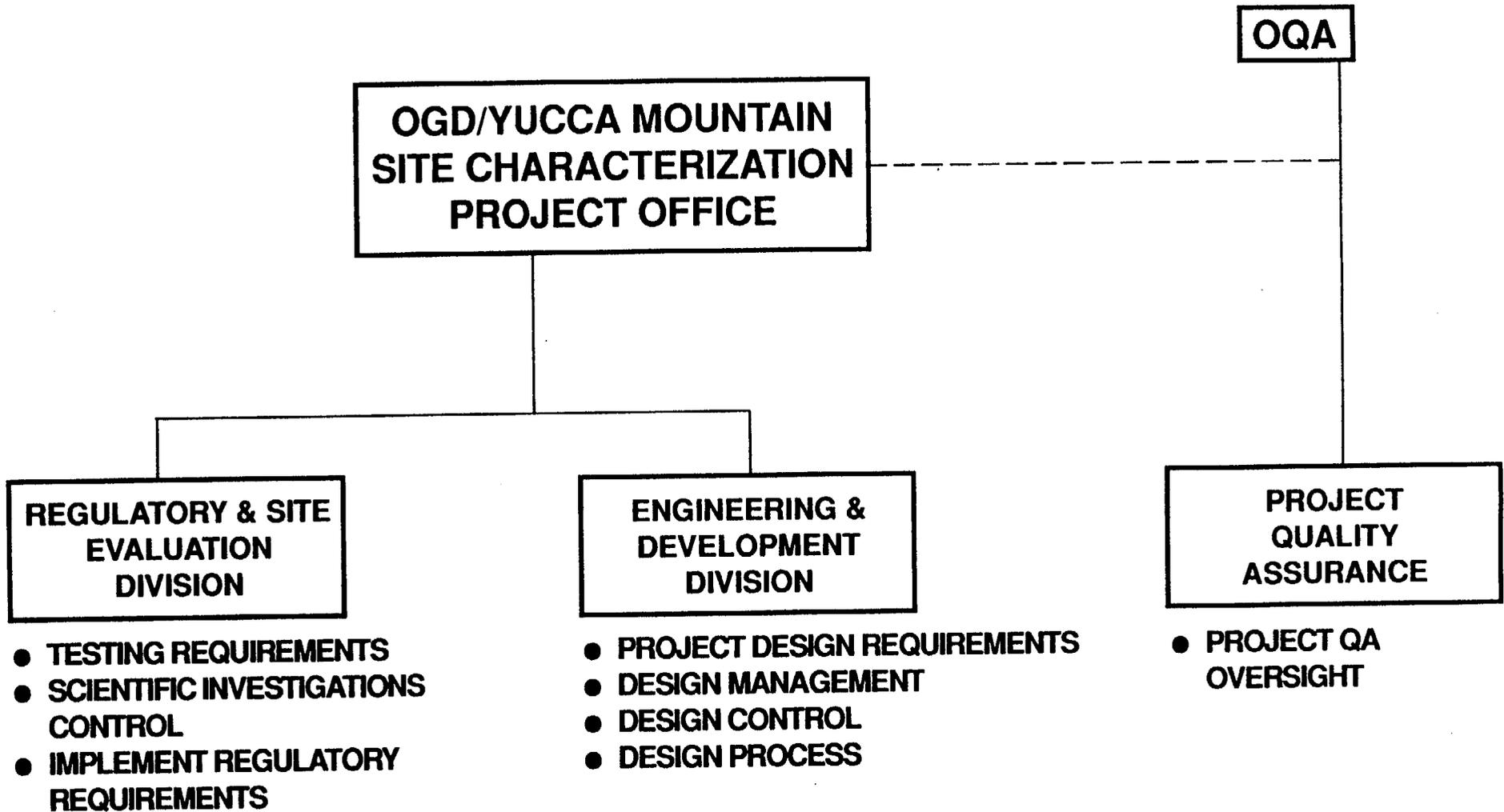
	QUALIFICATION AUDIT	NRC QA ACCEPTANCE LETTER
OCRWM	10/26/90	3/11/91*
SNL	9/12/89	10/24/90
USGS	8/23/89	10/24/90
LLNL	6/9/89	10/24/90
LANL	4/2/90	5/29/91
T&MSS	11/19/90	8/22/91
REECo	9/5/89	10/24/90
RSN - H&N	4/28/89	10/24/90
RSN - FSN	4/14/90	10/24/90
NWMS - M&O	TBD	TBD

* FOR LIMITED FIELD WORK

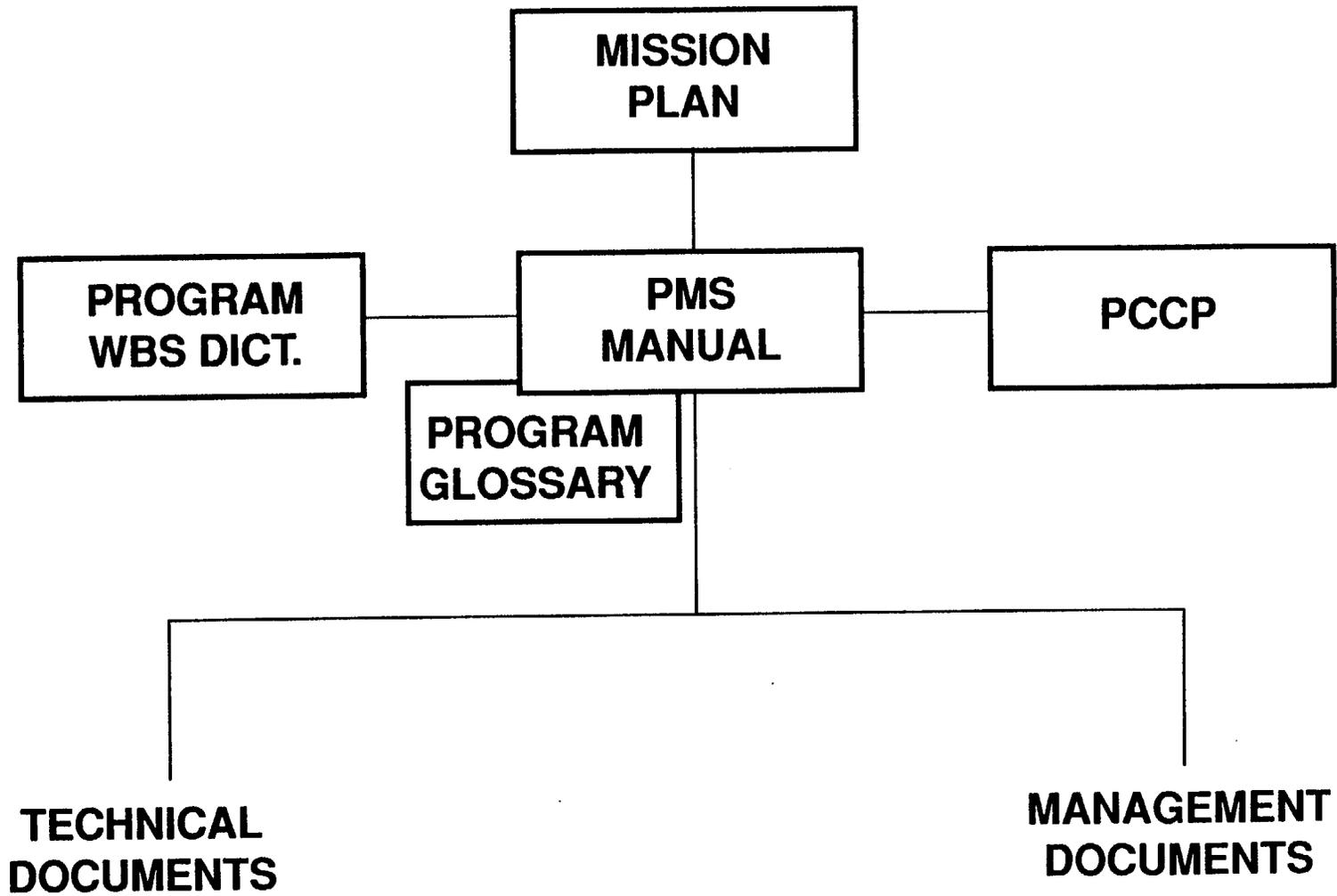
ORGANIZATIONAL RESPONSIBILITIES



ORGANIZATIONAL RESPONSIBILITIES



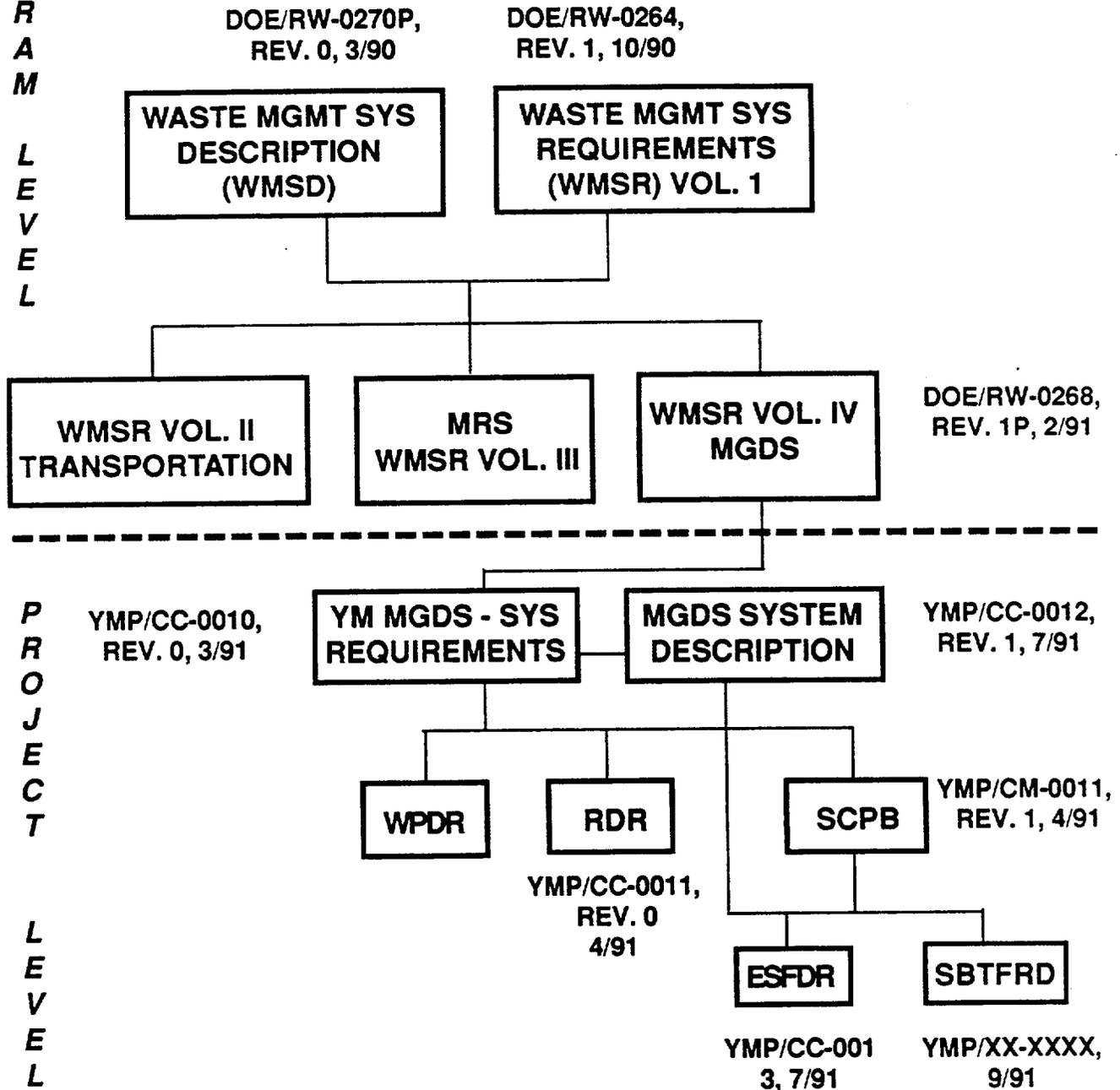
OCRWM DOCUMENT HIERARCHY



TECHNICAL DOCUMENT HIERARCHY

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SELECTED MANAGEMENT DOCUMENTS

PROGRAM LEVEL

**PMS
MANUAL**

DOE/RW-0043,
PREV5,
8/91

**PROGRAM
SEMP**

DOE/RW-0051,
PREV2,
8/91

**MGDS
PROJECT
PLAN**

DOE/RW-0313
REV 0, 8/91

PROJECT LEVEL

**MGDS
PMP**

YMP/88-2,
REV. 2, ICN 1,
6/91

YMP/CC-0007,
REV. 3, 4/91

**MGDS
SEMP**

**MGDS
SHP**

YMP/90-37,
REV. 0, 10/90

LEVEL

**MGDS
DP**

YMP/CC-0009,
REV. 3, 7/91

**MGDS
T&EP**

YMP/90-22,
REV. 0, ICN 1,
6/91

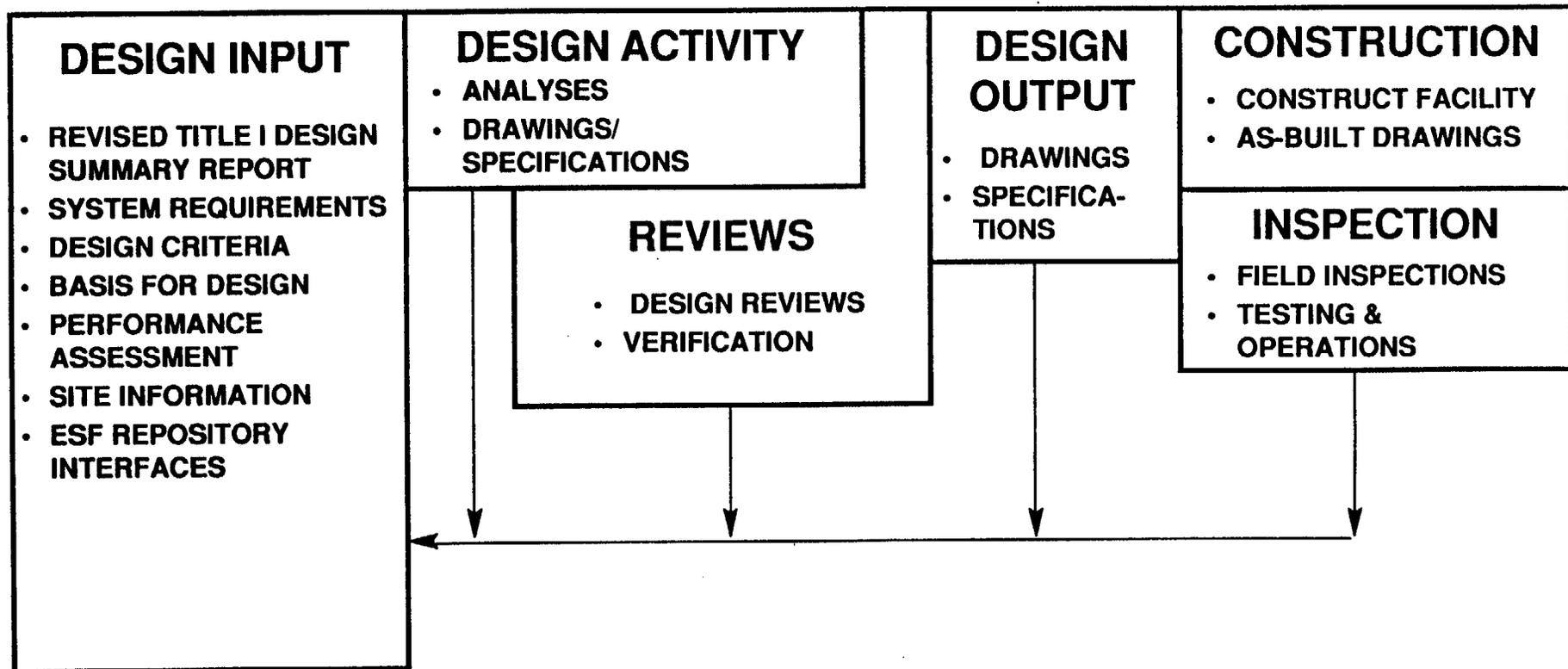
**MGDS
EMP**

YMP/CC-0006,
REV. 0, 1/91

CHANGE CONTROL BOARDS

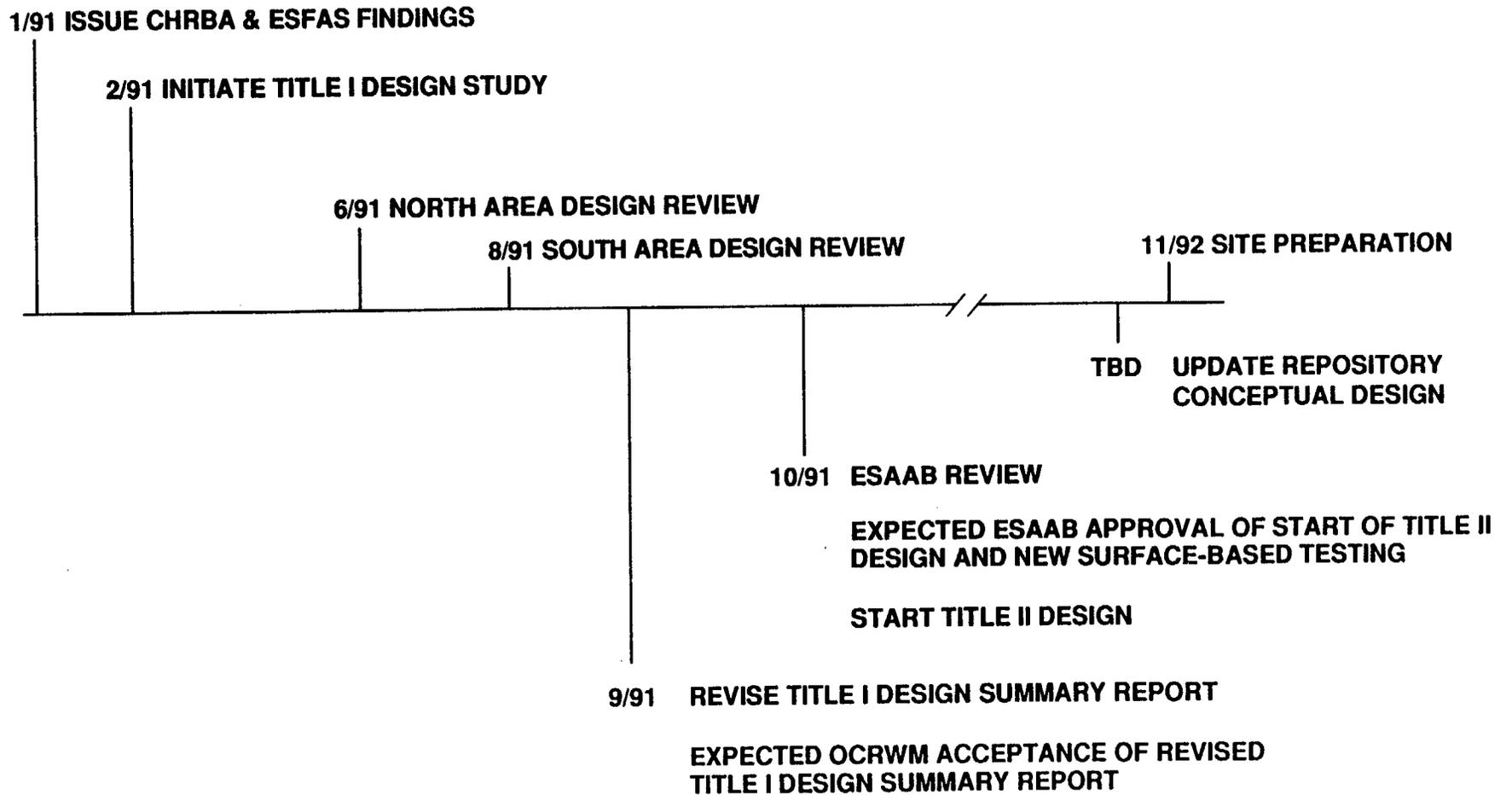
SECRETARY (<u>ESAAB</u>)	<u>PROGRAM</u>	<u>PROJECT</u>	<u>FIELD</u>
UNDER SECRETARY OF ENERGY (CHAIRMAN)	OCRWM DIRECTOR (CHAIRMAN)	DEPUTY PROJECT MANAGER (CHAIRMAN)	DEPUTY PROJECT MANAGER (CHAIRMAN)
ASSISTANT SECRETARY OF ENERGY FOR ES&H	CONFIGURATION MANAGEMENT BRANCH CHIEF (SECRETARY)	PROJECT CONTROL BRANCH CHIEF (SECRETARY)	PROJECT CONTROL BRANCH CHIEF (SECRETARY)
DIRECTOR OF THE OFFICE OF NUCLEAR SAFETY	ASSOCIATE DIRECTORS	SITE OFFICE MANAGER	SITE OFFICE MANAGER
DIRECTOR OF ADMINISTRATION AND HUMAN RESOURCES MANAGEMENT	OFFICE DIRECTORS	DIVISION DIRECTORS	DIVISION DIRECTORS (AD HOC)
DIRECTOR OF PROCUREMENT AND ASSISTANCE MANAGEMENT			TPO REPRESENTATIVES (AD HOC)
CONTROLLER			
GENERAL COUNSEL			

ESF TITLE II DESIGN PROCESS



ALL STEPS ABOVE ARE UNDER CHANGE CONTROL

TENTATIVE ESF SCHEDULE



NRC INVOLVEMENT IN ESF ACTIVITIES

- **NUMEROUS DOCUMENTS AVAILABLE TO ALLOW NRC THE OPPORTUNITY TO COMMENT ON DOE'S ACTIVITIES**
 - **CHRBA (YMP/91-6, 1/91)**
 - **ESFAS FINDINGS (SAND90-3232, 12/90)**
 - **ESFAS FINAL REPORT (SAND91-0025)**
 - **REVISED TITLE I DESIGN SUMMARY REPORT**
 - **OTHER PREVIOUS WORK**
 - * **SCP SECTION 8.4 ANALYSES (DOE/RW-0199, 12/88)**
 - * **DAA RECOMMENDATIONS (YMP/89-3, 2/89)**
 - * **TAR ON GEOPHYSICAL ANOMALY (YMP/90-2, 1/90)**
 - **SEMIANNUAL PROGRESS REPORTS**

- **NRC STAFF OBSERVED TWO DESIGN REVIEWS (TITLE I DESIGN STUDY)**

NRC INVOLVEMENT IN ESF ACTIVITIES

(CONTINUED)

- **OPPORTUNITIES WILL BE PROVIDED DURING TITLE II DESIGN**
 - **OBSERVATION OF DESIGN REVIEWS**
 - **OBSERVATION OF DOE QA AUDITS**
 - **SEMIANNUAL PROGRESS REPORTS**

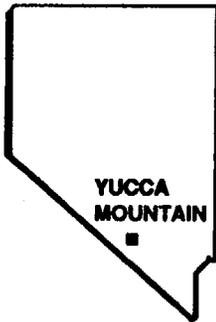
- **OPPORTUNITIES WILL BE PROVIDED DURING ESF CONSTRUCTION**
 - **SITE VISITS**
 - **SEMIANNUAL PROGRESS REPORTS**
 - **OBSERVATION OF DOE QA AUDITS**

SUMMARY

- **ADEQUATE DESIGN CONTROL PROCESS IS IN PLACE (MEETS QA REQUIREMENTS)**
- **DOE READY TO PROCEED WITH TITLE II DESIGN**
- **DURING TITLE II PROCESS, NRC TO BE GIVEN AMPLE OPPORTUNITY TO INTERACT AND PROVIDE COMMENTS AND OBSERVATIONS**

U.S. DEPARTMENT OF ENERGY

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**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE - NRC TECHNICAL EXCHANGE
ON DESIGN CONTROL**

ESF DESIGN PROCESS AND ITS CONTROL



PRESENTED BY
EDGAR H. PETRIE
ACTING DIRECTOR,
ENGINEERING & DEVELOPMENT DIVISION

**SEPTEMBER 16, 1991
WASHINGTON, D.C.**

Attachment 5

AGENDA

1. DEFINITIONS

2. ELEMENTS OF DESIGN CONTROL PROGRAM (PROGRAM CONTROL OF DESIGN ACTIVITIES)

- 2.1 SYSTEM ENGINEERING { Design Activities}
 - a. DEFINITION & DEVELOPMENT OF TECHNICAL BASELINE AND CONFIGURATION MANAGEMENT
 - b. DISCIPLINE INTEGRATION
 - c. TRACEABILITY
 - d. IDENTIFICATION OF ORGANIZATIONAL RESPONSIBILITY
- 2.2 ACQUISITION OF DATA & DATA PROCESSING. {Design Activities}
- 2.3 DEVELOPMENT OF DESIGN INPUTS {Design Activities}
- 2.4 DESIGN PROCESS {Design Activities}
- 2.5 READINESS REVIEWS {Design Control}
- 2.6 TECHNICAL REVIEWS {Design Control}
- 2.7 VERIFICATION {Design Control}
- 2.8 PEER REVIEWS {Design Control}
- 2.9 CHANGE CONTROL {Design Control}
- 2.10 DEFICIENCY CONTROL {Design Control}
- 2.11 DOCUMENTATION & RECORDS {Design Control}

3. PRELIMINARY DESIGN (TITLE I)

(Title I Design Summary Report for ESF Revision)

- 3.1 DOE DESIGN PROCESS
 - a. CONCEPTUAL DESIGN
 - b. PRELIMINARY DESIGN (TITLE I)
 - c. TITLE I DESIGN REVISION
 - 1. DESIGN INPUTS
 - ESFAS
 - REGULATIONS
 - INTERFACES
 - RIB
 - DESIGN CODES & STANDARDS
 - DOCUMENT HIERARCHY
 - 2. DESIGN OUTPUTS
 - 3. REVIEWS
 - d. TRACEABILITY DESIGN INPUTS TO OUTPUTS WITH EXAMPLES
 - e. INTERFACES

4. TITLE II DESIGN

- 4.1 DOE DESIGN PROCESS
 - a. DESIGN INPUTS
 - b. DESIGN ACTIVITIES
 - c. BASELINE COMPONENTS

5. HANDOUTS

- 5.1 10CFR60 PART G REQUIREMENTS (QA)
- 5.2 10CFR60 TO ESFAS CROSSWALK
- 5.3 10CFR60 LIST OF APPLICABLE REQUIREMENTS. (ESFDR)

DESIGN PROCESS AND ITS CONTROL

1. DEFINITIONS FOR:

(DESIGN CONTROL PROGRAM - DESIGN, DESIGN ACTIVITIES AND DESIGN CONTROL PARAPHRASED FROM NRC REVIEW PLAN FOR HIGH LEVEL NUCLEAR WASTE, (QAPD) PART 3, SUB-SECTION 3.)

● DESIGN

(NOUN). . . . SPECIFICATIONS, DRAWINGS, CRITERIA, AND COMPONENT PERFORMANCE REQUIREMENTS (DESIGN DOCUMENTS) FOR THE NATURAL AND ENGINEERED COMPONENTS OF THE REPOSITORY SYSTEM INCLUDING DESIGN INPUTS, OUTPUTS, DATA AND ANALYSIS

● DESIGN ACTIVITIES

ACTIVITIES PERFORMED TO COLLECT DATA, ANALYSES, AND COMPUTER CODES WHICH ARE USED IN SUPPORTING DESIGN DEVELOPMENT AND VERIFICATION INCLUDED ARE GENERAL PLANS AND PROCEDURES FOR DATA COLLECTION, AND ANALYSIS AND RELATED INFORMATION SUCH AS TEST RESULTS AND ANALYSES

● DESIGN CONTROL

MEASURES ESTABLISHED TO ENSURE APPLICABLE REGULATORY REQUIREMENTS, DESIGN BASES AND DESIGN FEATURES DEVELOPED ARE CORRECTLY TRANSLATED INTO SPECIFICATIONS, DRAWINGS, PLANS AND PROCEDURES (DESIGN DOCUMENTS)

2. ELEMENTS OF DESIGN CONTROL PROGRAM (PROGRAM CONTROL OF DESIGN ACTIVITIES)

QAPD, PART 3
QARD, PART 3
NRCRP-3
NQA-1, 1989-3S-1

2.1 SYSTEM ENGINEERING PROVIDES FOR:

a. DEFINITION AND DEVELOPMENT OF TECHNICAL
BASELINE AND CONFIGURATION MANAGEMENT

b. DISCIPLINE INTEGRATION.....
PROVIDES FOR PROCEDURAL CONTROL OF AND
DOCUMENTATION OF INTERFACES AMONG
RESPONSIBLE DESIGN ORGANIZATIONS

NRCRP 3.3.8
RSN PP-03-05
AP-5.19Q

c. TRACEABILITY.....
PROVIDES THE ABILITY, WHEN SPECIFIED BY
CODES, STANDARDS OR SPECIFICATIONS TO INCLUDE
SPECIFIC IDENTIFICATION OR TRACEABILITY
REQUIREMENTS SO THE PROGRAM CAN PROVIDE SUCH
IDENTIFICATION AND TRACEABILITY CONTROL

NQA-1, 1989-3S-1
RSN PP-03-19
RSN PP-03-01

d. IDENTIFICATION OF ORGANIZATIONAL.....
RESPONSIBILITIES FOR PREPARING, REVIEWING,
APPROVING, VERIFYING, AND VALIDATING DESIGN DOCUMENTS

NRCRP 3.3.6
RSN PP-03-01
QMP-01-01

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.2 ACQUISITION OF DATA

AND DATA PROCESSING

**NQA-1, 1989, 3S-1
QAPD, PART 3
QARD, PART 3**

2.3 DEVELOPMENT OF DESIGN INPUTS

RSN PP-03-01

**THOSE CRITERIA PARAMETERS, BASES, OR OTHER DESIGN
REQUIREMENTS UPON WHICH DESIGN IS BASED**

- NRC REGULATIONS**
- LEVEL OF DETAIL NECESSARY FOR DESIGN
ACTIVITY TO BE PERFORMED**
- CONSISTENCY WITH BASIS FOR MAKING DESIGN DECISIONS**
- SPECIFIED AND APPROVED ON A TIMELY BASIS**
- QA GRADING REPORTS**
- EXPLORATORY STUDIES FACILITY ALTERNATIVES STUDY**

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.4 DESIGN PROCESS

RSN PP 03.02

PROVIDE FOR PLANNED, DOCUMENTED, AND CONTROLLED, ANALYSES (INCLUDES COMPUTER CODES) AND INCLUDES THE FOLLOWING FEATURES:

- LEGIBLE ANALYSIS DOCUMENTS, SUITABLE FOR REPRODUCTION FILING AND RETRIEVAL (SPECIFICATIONS, DRAWINGS, REPORTS, ETC**
- SUFFICIENT DETAIL TO PROVIDE METHODS, ASSUMPTIONS, DESIGN INPUTS, REFERENCES AND UNITS**
- PROVISIONS FOR ENSURING CALCULATIONS ARE IDENTIFIABLE FOR RETRIEVAL**

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.5 READINESS REVIEWS..... (ESTABLISHED HOLD POINTS)

RSN-03-06 AP.5.13Q AP.5.20Q

- READINESS REVIEWS ARE PERFORMED IF NEEDED TO CONFIRM THE FOLLOWING:
 - * SYSTEM ENGINEERING APPROACH FACTORED INTO DESIGN SCHEDULES
 - * CODES, STANDARDS, AND CONTROLS HAVE BEEN IDENTIFIED
 - * DESIGN AND INTERFACE RESPONSIBILITIES IDENTIFIED
 - * DESIGN SCHEDULE IDENTIFIES DESIGN REVIEW MILESTONE
 - * PROCEDURES EXIST FOR BASELINING DESIGN DOCUMENTS AND CONTROLLING SUBSEQUENT CHANGES

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

RSN-PP-03-04
RSN-PP-03-21
QMP-06-04
NRCRP 3.3.9

2.6 QA/TECHNICAL REVIEWS

- **PERFORMED DURING DESIGN PROCESS**
- **PROCEDURES REQUIRE IDENTIFICATION OF**
 - * **REVIEWERS**
 - * **ELEMENTS OF DESIGN REVIEWED**
 - * **COMMENT RESOLUTION METHODS**

- **PROCEDURES REQUIRE DESIGN DOCUMENTS ARE PREPARED, REVIEWED, AND APPROVED IN ACCORDANCE WITH DOCUMENTED PROCEDURES AND QA REQUIREMENTS TO ASSURE THAT APPROPRIATE QUALITY STANDARDS ARE INCLUDED**

- **GRADED QUALITY ASSURANCE DETERMINES THE EXTENT OF QUALITY ASSURANCE AND PROCEDURAL CONTROLS SELECTIVELY APPLIED TO ITEMS AND ACTIVITIES RELATIVE TO SAFETY WASTE ISOLATION OR PROGRAM OBJECTIVES**

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.7 VERIFICATION.....

RSN PP-03-04 NRC RP 3.3.10

- **PROVIDES FOR COMPLETE VERIFICATION AND VALIDATION OF DESIGN DOCUMENTS BEFORE PROCUREMENT, MANUFACTURING, CONSTRUCTION, OPERATION OR USE OF ITEM**
- **VERIFICATION OF ADEQUACY OF DESIGN BY PERSONS OTHER THAN THE PERSON WHO ACTUALLY PERFORMED THE DESIGN**
- **CRITERIA FOR DETERMINING VERIFICATION METHOD**
- **QUALIFICATION & INDEPENDENCE OF VERIFICATION AND VALIDATION OF PERSONNEL**
- **ALTERNATE CALCULATIONS**
- **SUITABLE TESTING PROGRAM**
- **INCLUSION OF MOST ADVERSE DESIGN CONDITIONS IF VERIFICATION IS PERFORMED BY TEST**

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.8 PEER REVIEWS

QAPD 3.1.10

**REQUIRED WHEN ADEQUACY OF INFORMATION OR
SUITABILITY OF ESSENTIAL PROCEDURES AND METHODS
CANNOT BE CONFIRMED BY TESTING, ALTERNATE
CALCULATIONS OR REFERENCED TO PREVIOUS
ESTABLISHED STANDARDS AND PRACTICES**

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.9 CHANGE CONTROL/CONFIGURATION MANAGEMENT

RSN-PP-03-15
RSN-PP-03-16
RSN-PP-03-17
AP-3-3Q
AP-3-8Q

5

- PROVIDES FOR PLACING DESIGN DOCUMENTS UNDER CONFIGURATION MANAGEMENT AT THE EARLIEST PRACTICABLE TIME
- CHANGES SUBJECT TO SAME CONTROLS AS ORIGINAL DOCUMENT
- EVALUATION OF DESIGN CHANGES PERFORMED BY CHANGE CONTROL BOARD
- PROCEDURES REQUIRE THAT VERIFIED COMPUTER CODES ARE CERTIFIED FOR USE AND USED AS SPECIFIED

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.10 DEFICIENCY CONTROL.....

RSN PP-03-05 NRCRP-3.3.8 AP-5-19Q
--

- DOCUMENTATION OF THE EXISTENCE OF AND ACTIONS TAKEN TO CONTROL AND RESOLVE DESIGN DOCUMENT DEFICIENCIES**

2. ELEMENTS OF DESIGN CONTROL PROGRAM

(CONTINUED)

2.11 DOCUMENTATION AND RECORDS

NQA1,1989,3.7
RSN PP-6

- **PROCEDURES REQUIRE DESIGN DOCUMENTS WHICH PROVIDE EVIDENCE OF DESIGN, AND DESIGN VERIFICATION PROCESSES, ARE PERFORMED, COLLECTED, STORED, AND MAINTAINED IN ACCORDANCE WITH DOCUMENTED PROCEDURES**
- **DOCUMENTATION SHALL ALSO IDENTIFY IMPORTANT STEPS, INCLUDING SOURCES OF DESIGN INPUTS THAT SUPPORT FINAL DESIGN**

3. PRELIMINARY DESIGN (TITLE I)

(TITLE I DESIGN SUMMARY REPORT FOR ESF (REVISION1))

NQA-1, 1989, 3S-1
NRCRP-3.3.4
QARD, PART 3
QAPD, PART 3

3.1 DOE DESIGN PROCESS

- APPLIED DURING ALL DESIGN PHASES (STARTING WITH CONCEPTUAL DESIGN) TO THE EXTENT THAT THE DESIGN WILL BECOME A PART OF THE FINAL DESIGN**

- APPLICABLE TO ENGINEERED ITEMS RELATED TO SAFETY AND WASTE ISOLATION**

- DOE ORDER 4700.1 REQUIRES THE FOLLOWING**
 - CONCEPTUAL DESIGN**
 - PRELIMINARY DESIGN (TITLE I)**
 - FINAL OR DEFINITIVE DESIGN (TITLE II)**
 - INSPECTION (TITLE III)**

3.1.a CONCEPTUAL DESIGN

- **OBJECTIVES INCLUDE:**

- **DEVELOP A PROJECT SCOPE THAT WILL SATISFY PROGRAM NEEDS**
- **ASSURE PROJECT FEASIBILITY AND ATTAINABLE PERFORMANCE LEVELS**
- **DEVELOP COST ESTIMATES AND SCHEDULES**
- **DEVELOP INITIAL SET OF PROJECT CRITERIA AND DESIGN PARAMETERS**
- **SPACE ALLOWANCE FOR VARIOUS FUNCTIONS**

- **ALL THE ABOVE IS SUMMARIZED IN A CONCEPTUAL DESIGN REPORT**

DOE 4700.1

3.1.b PRELIMINARY DESIGN (TITLE I)

- **THE PRELIMINARY STAGE OF PROJECT DESIGN UTILIZES THE CONCEPTUAL DESIGN AND DESIGN CRITERIA THAT HAVE BEEN PREPARED FOR THE PROJECT AS A DESIGN BASIS**
- **SUFFICIENT DESIGN NEEDS TO BE PERFORMED TO ILLUSTRATE THE EXTENT OF THE PROJECT SCOPE AND CONSTRUCTION FEATURES. FURTHERMORE, FROM THIS PRELIMINARY DESIGN, CONSTRUCTION COST AND SCHEDULES CAN BE DEVELOPED**

DOE 4700.1

3.1.b PRELIMINARY DESIGN (TITLE I)

(CONTINUED)

● TASKS INCLUDE:

- PRELIMINARY STUDIES, TRADE OFF STUDIES, ALTERNATIVE DESIGN APPROACHES**
- FURTHER DEFINITION OF DESIGN CRITERIA AND QUALITY REQUIREMENTS**
- PRELIMINARY SAFETY ASSESSMENT**
- PRELIMINARY DRAWINGS**
- OUTLINE CONSTRUCTION SPECIFICATIONS, EQUIPMENT PROCUREMENT SPECIFICATIONS**
- PROJECT SCHEDULE AND COST ESTIMATE**

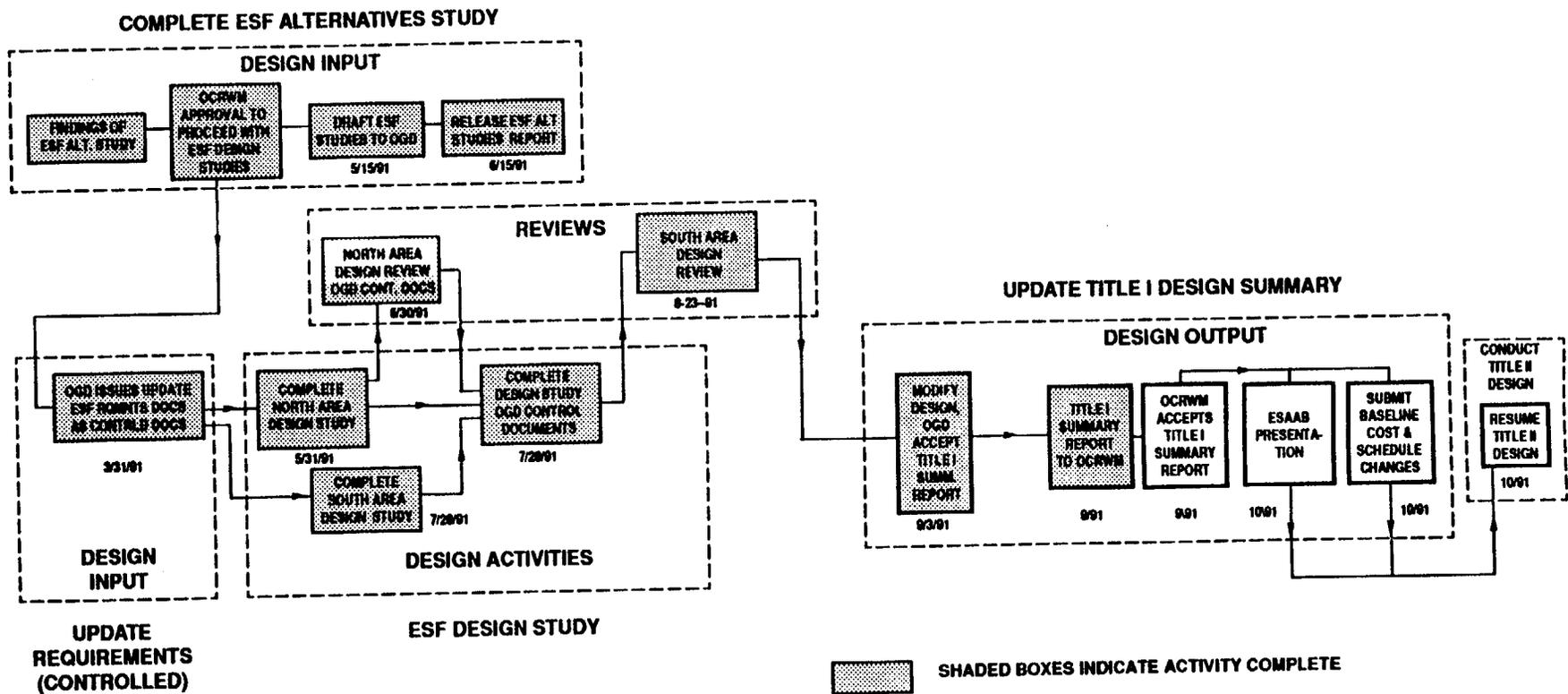
● ALL THE ABOVE IS SUMMARIZED IN A TITLE I DESIGN SUMMARY REPORT

3.1.b PRELIMINARY DESIGN (TITLE I)

(CONTINUED)

- **MAJOR CHANGES AFTER APPROVAL OF TITLE I DESIGN ARE ALLOWED BUT REQUIRE A REVISION TO THE TITLE I DESIGN SUMMARY REPORT**

3.1.c TITLE I DESIGN REVISION



3.1.c.1 TITLE I DESIGN REVISION DESIGN INPUTS ESFAS

- **10 CFR PART 60 REQUIREMENTS CONSIDERED
IN THE ESFAS PER DOE/NRC AGREEMENT
(SEE HANDOUT 3 FOR LIST OF 10CFR60 REQUIREMENTS)**
- **ALL 34 OPTIONS STUDIED IN THE
ALTERNATIVES STUDY WERE JUDGED TO BE
CAPABLE OF MEETING THESE REQUIREMENTS**
- **REQUIREMENTS WERE USED TO DISCRIMINATE
AMONG OPTIONS**

- **EXTRACT FROM THE ESFAS SHOWING
10CFR60 SUBSECTIONS DETERMINED TO BE
DISCRIMINATORS FOR THE ESF REPOSITORY**

10 CFR 60 SUBSECTIONS DETERMINED TO BE DISCRIMINATORS FOR ESF-REPOSITORY

10 CFR 60 REFERENCES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
60.15 (c) (1)	X						X	X		X	X	X	X	X	
60.15 (c) (2)	X			X			X	X		X	X	X	X	X	
60.15 (c) (3)	X			X			X	X		X	X	X	X	X	
60.15 (c) (4)	X			X			X	X		X	X	X	X	X	
60.21 (c) (1) (II) (D)	X							X		X	X	X	X		X
60.21 (c) (1) (II) (E)	X														
60.21 (c) (11)	X			X			X	X							
60.74 (a)	X	X	X				X	X			X	X	X	X	
60.74 (b)	X						X	X						X	
60.111 (a)* & (b)*	X		X												X
60.112	X														X
60.113 (a) (1) & (a) (2)	X									X	X	X	X	X	
60.122 (a) (2) & (b) (1)	X									X	X			X	
60.130	X			X										X	
60.131(b) (1)	X														
60.133 (a) (1) & (a) (2)	X			X			X							X	
60.133 (b)	X													X	
60.133 (c)															X
60.133 (e) (1) & (e) (2)	X			X			X			X	X	X	X	X	X
60.133 (f)	X						X							X	
60.133 (g)	X			X			X							X	
60.133 (h)	X													X	
60.133 (i)	X													X	
60.134	X														
60.135 (a) (1) & (2)	X	X	X				X					X	X		
60.137	X							X							

*ELEVATED TO DISCRIMINATOR DURING REVIEW

**INCLUDES INFLUENCE OF DIAGRAM 3, 11, & 14

LEGEND

The following titles relate to the "INFLUENCE DIAGRAM NUMBERS."

Postclosure Health	1 Health Effects Portion Transport Through Natural Barriers Portion Engineered Barrier System Portion Scenario Portion
Pre-closure Health and Safety	2 Radiological Worker Health 3 Radiological Public Health 4 Nonradiological Worker Safety
Environment	5 Aesthetics 6 Historical Properties
Cost - Direct	7 Total System Life Cycle Cost Repository Life Cycle Cost ESF Cost
Schedule - Indirect	8 Schedule - Indirect Costs Schedule - Indirect Costs
Programmatic Viability	9 Probability of Programmatic Viability ★ ★★
Characterization Testing	10 Probability of Early False Positive 11 Probability of Late False Positive 12 Probability of Early False Negative 13 Probability of Late False Negative (Page 1 of 2) Probability of Late False Negative (Page 2 of 2)
Regulatory Authorization	14 Likelihood of Construction/Operation Approval
Closure	15 Likelihood of Retrieval

- **EXTRACT FROM THE ESFAS SUMMARIZING CONFIGURATIONS OF THE REPOSITORY AND ESF OPTIONS**

ESF ALTERNATIVE STUDY

SUMMARY OF ESF/REPOSITORY OPTIONS

OPTION #			E.S.F.								REPOSITORY				TOTAL ACCESSES
			ACCESS 1		ACCESS-2		MAIN TEST LEVEL				ACCESSES		CONSTRUCTION METHOD		
			SIZE	CONST. METHOD	SIZE	CONST. METHOD	LAYOUT	CONST. METHOD	LOCATION	ELEVATION	SHAFTS	RAMPS (TBM)	RAMPS & DRIETS	EMPL. AREA	
18	1	BASE CASE	12' SHAFT	DRILL & BLAST	12' SHAFT	DRILL & BLAST	TITLE II G.A.	DRILL & BLAST	NE	SAME AS REPOS.	2-20'	1-25' 1-23'	TBM	DRILL & BLAST	6
19	2	A1	16' SHAFT	..	25' RAMP	TBM	MODIFIED T II G.A.	..	..	..	2-25'	1-25' +ESF	..	..	5
20	3	A2	16' SHAFT	..	16' SHAFT	DRILL & BLAST	..	..	..	..	..	2-25'	..	..	6
21	4	A4 REV.1	16' SHAFT	..	12' SHAFT 25' RAMP	D&B TBM	..	..	..	..	1-25' ENLARGE ES-2-25'	1-25' +ESF	..	..	5
22	5	A5	16' SHAFT	..	25' RAMP	TBM	..	..	S	..	2-25'	..	..	..	5
23	6	A7	25' RAMP	TBM	25' RAMP	..	..	..	NE	..	..	IN ESF	..	..	4
24	7	B3, REV. 2-	16' SHAFT	SBM	..	..	..	MECH.	..	..	..	1-25' +ESF	..	TBM	5
25	8	B3,REV.3-		V-MOLE											
26	9	B3,REV. 4-		BLIND BORE											
27	10	B3,REV. 5-		RAISE BORE											
28	11	B3, REV. 6-		DRILL & BLAST											
29	12	B4	16' SHAFT	DRILL & BLAST	..	..	..	..	S	..	..	..	..	..	5
30	13	B7	25' RAMP	TBM	..	..	..	..	..	..	..	IN ESF	..	..	4
31	14	B8	16' SHAFT	DRILL & BLAST	..	..	..	..	..	..	1-25'	2-25' +ESF	..	..	5
32	15	C1	16' SHAFT	..	..	..	TWO LEVEL	..	NE	TWO LEVELS SAME AS REPOS.	2-25' ENLARGE ES-1-25'	1-25' +ESF	..	..	4
33	16	C4	16' SHAFT	..	..	..	..	..	S	..	2-25'	..	..	..	5
34	17	R11	12' SHAFT	..	12' SHAFT	DRILL & BLAST	TITLE II G.A.	DRILL & BLAST	NE	SAME AS REPOS.	2-25'	2-25'	..	..	6

ESF ALTERNATIVES STUDY

ALL TOP RANKED OPTIONS SHARE THE FOLLOWING COMMON FEATURES:

- **ALL WERE CAPABLE OF MEETING REGULATORY REQUIREMENTS**

- **ABILITY TO ENHANCE DATA ACQUISITION**
 - **CAPABILITY TO SUPPORT EXTENSIVE DRIFTING IN THE CALICO HILLS**
 - **MULTIPLE INTERCEPTS OF STRUCTURAL FEATURE AT BOTH STRATIGRAPHIC LEVELS**
 - **E-W DRIFTS ACROSS REPOSITORY HORIZON IN TOPOPAH SPRING TUFF**

- **PRIMARY RELIANCE ON MECHANIZED MINING TECHNIQUES**

- **RAMP ACCESS FROM THE EAST**

TITLE I DESIGN REVISION DESIGN INPUTS

REGULATIONS/PUBLIC LAW:

- **NUCLEAR WASTE POLICY ACT AND 1987 AMENDMENTS**
- **10 CFR 20, 60, 960**
- **OSHA (1910, SUBPART S)**
- **MSHA (30 CFR 57)**
- **CALIFORNIA MINE AND TUNNEL SAFETY CODES**
- **NEVADA MINE SAFETY AND HEALTH CODES**

REVISED TITLE I DESIGN SUMMARY REPORT

DESIGN INPUTS

- **INTERFACES**

- PERFORMANCE ASSESSMENT
- ENVIRONMENTAL
- REPOSITORY
- TEST

- **REFERENCE INFORMATION BASE (RIB)**

- **DESIGN CODES AND STANDARDS**

- **APPLICABLE DOE ORDERS**

TECHNICAL DOCUMENT HIERARCHY

P
R
O
G
R
A
M

L
E
V
E
L

DOE/RW-0270P,
REV. 0, 3/90

DOE/RW-0264,
REV. 1, 10/90

WASTE MGMT SYS
DESCRIPTION
(WMSD)

WASTE MGMT SYS
REQUIREMENTS
(WMSR) VOL. 1

WMSR VOL. II
TRANSPORTATION

MRS
WMSR VOL. III

WMSR VOL. IV
MGDS

DOE/RW-0268,
REV. 1P, 2/91

P
R
O
J
E
C
T

YMP/CC-0010,
REV. 0, 3/91

YM MGDS - SYS
REQUIREMENTS

MGDS SYSTEM
DESCRIPTION

YMP/CC-0012,
REV. 1, 7/91

WPDR

RDR

SCPB

YMP/CM-0011,
REV. 1, 4/91

YMP/CC-0011,
REV. 0
4/91

ESFDR

SBTFRD

YMP/CC-001
3, 7/91

YMP/XX-XXXX,
9/91

L
E
V
E
L

* ASSOCIATED DISCRIPTION DOCUMENTS

SELECTED MANAGEMENT DOCUMENTS

PROGRAM LEVEL

**PMS
MANUAL**

DOE/RW-0043,
PREV5,
8/91

**PROGRAM
SEMP**

DOE/RW-0051,
PREV2,
8/91

**MGDS
PROJECT
PLAN**

DOE/RW-0313
REV 0, 8/91

* CURRENTLY UNDERGOING REVISION

PROJECT LEVEL

**MGDS
PMP**

YMP/88-2,
REV. 2, ICN 1,
6/91

YMP/CC-0007,
REV. 3, 4/91

**MGDS
SEMP**

**MGDS
SHP**

YMP/90-37,
REV. 0, 10/90

LEVEL

**MGDS
DP**

YMP/CC-0009,
REV. 3, 7/91

**MGDS
T&EP**

YMP/90-22,
REV. 0, ICN 1,
6/91

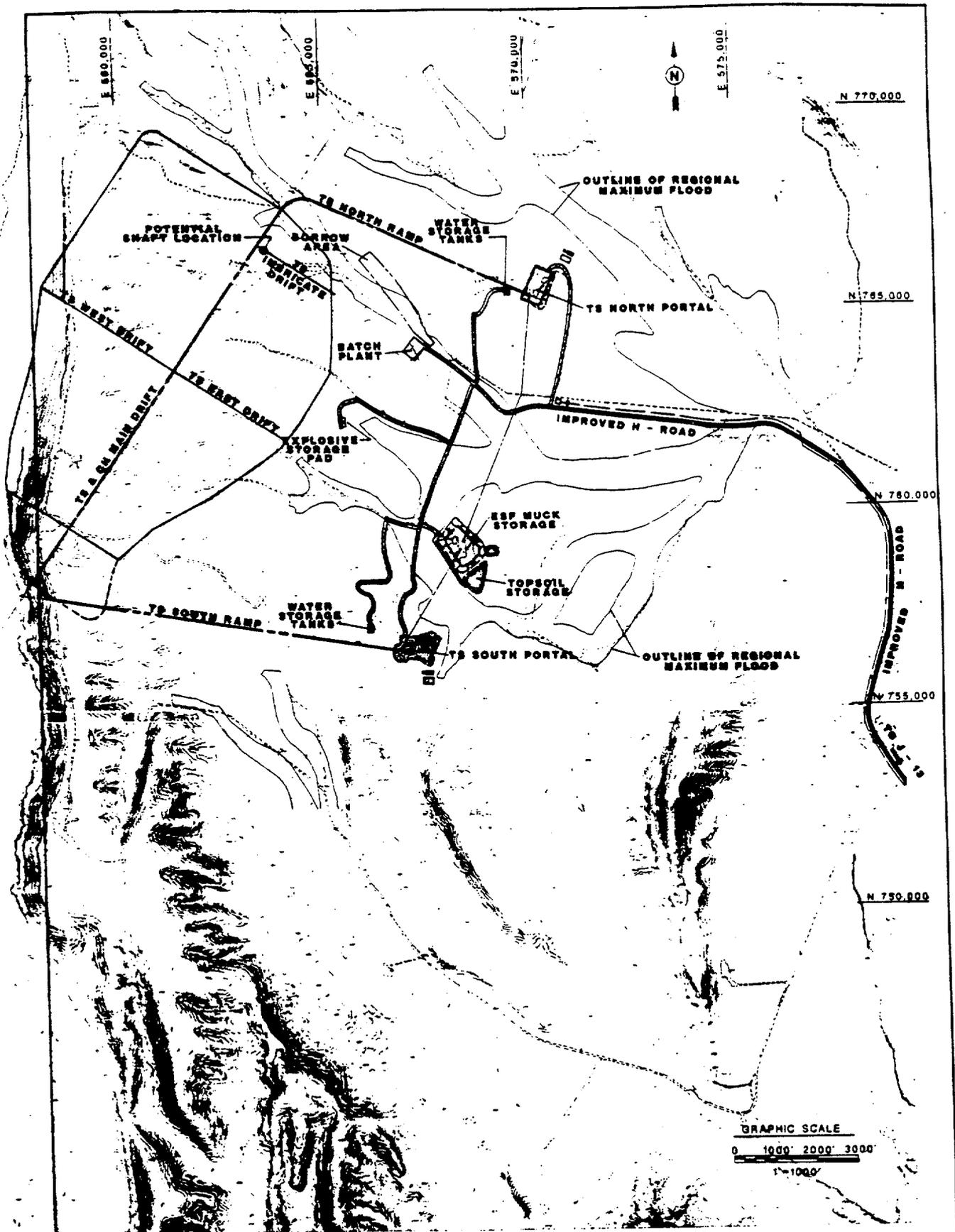
**MGDS
EMP**

YMP/CC-0006,
REV. 0, 1/91

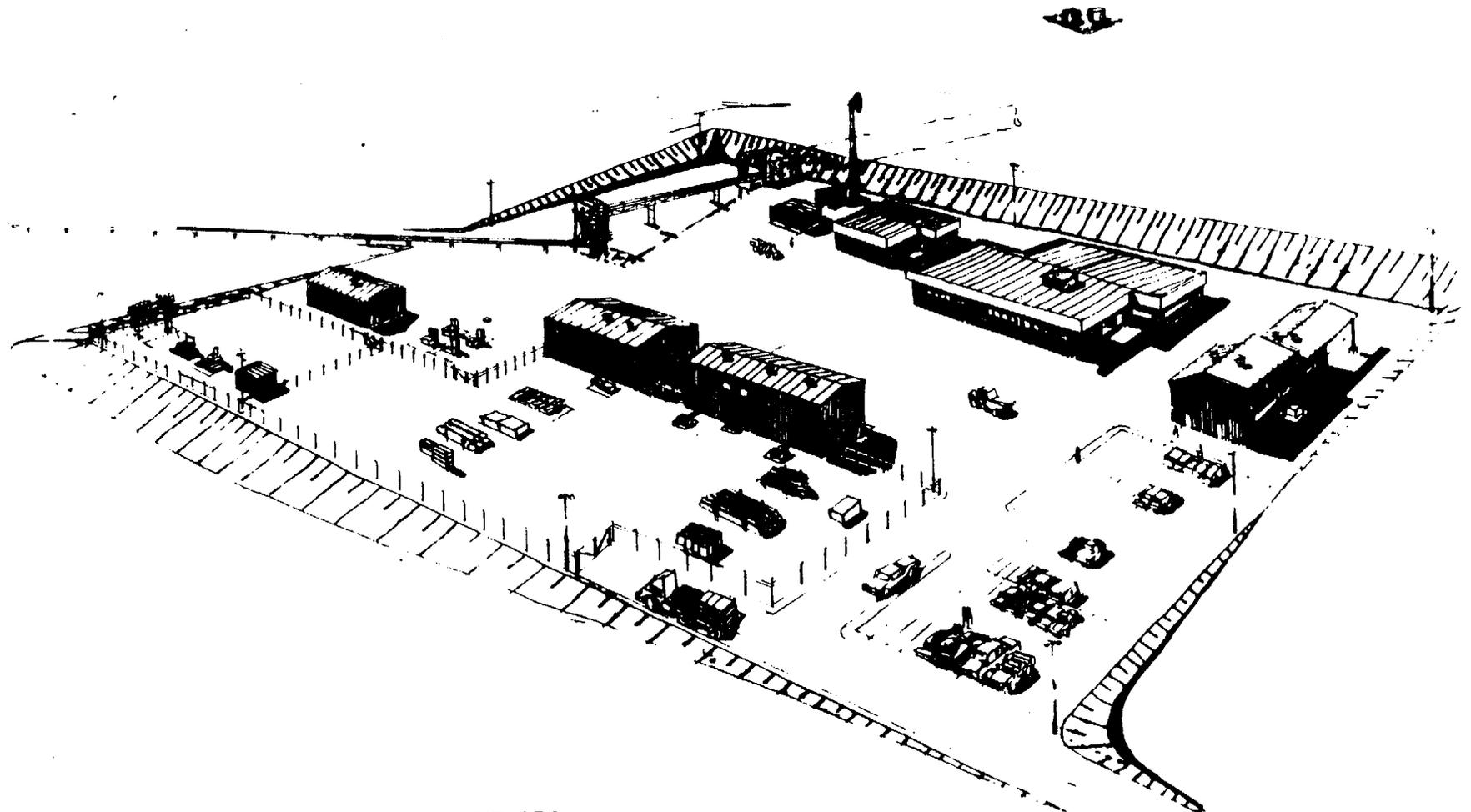
3.1.c.2 DESIGN OUTPUT TITLE I DESIGN SUMMARY REPORT FOR ESF (REVISION 1)

- **TECHNICAL AND TRADE STUDIES (18)**
- **GENERAL ARRANGEMENT DRAWINGS (199)**
 - GENERAL
 - ARCHITECTURAL
 - CIVIL
 - ELECTRICAL
 - MINING
 - STRUCTURAL

- **100 OUTLINE SPECIFICATIONS**
- **PRELIMINARY INDUSTRIAL SAFETY ANALYSIS REPORT**
- **OUTLINE SPECIFICATIONS FOR LONG-LEAD
PROCUREMENT ITEMS**
- **SITING STUDIES FOR TWO RAMPS AND OPTIONAL SHAFT**
- **COST ESTIMATE AND SCHEDULE FOR TITLE II DESIGN**
- **CONSTRUCTION COST ESTIMATE AND SCHEDULE**



EXPLORATORY STUDIES FACILITY
Proposed - General Arrangement



**RAYTHEON SERVICES NEVADA
NORTH PORTAL PAD
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT**

3.1.c.3 REVIEW CRITERIA

- **CAN DETAILED REGULATORY CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH REGULATORY REQUIREMENTS?**
- **CAN DETAILED SITE CHARACTERIZATION TEST CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH SITE CHARACTERIZATION TEST REQUIREMENTS?**
- **CAN THIS DESIGN BE ACCOMPLISHED CONSISTENT WITH MSHA, OSHA? IS THE DESIGN AS PRESENTED INCONSISTENT WITH MSHA AND OSHA REQUIREMENTS?**
- **CAN DETAILED RELIABILITY, MAINTAINABILITY, AND OPERABILITY CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH RELIABILITY, MAINTAINABILITY, AND OPERABILITY**

3.1.c.3

REVIEW CRITERIA

(CONTINUED)

- **CAN DETAILED ENVIRONMENTAL CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH ENVIRONMENTAL REQUIREMENTS?**
- **CAN DETAILED SOCIO-ECONOMIC CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH SOCIO-ECONOMIC REQUIREMENTS?**
- **CAN DETAILED CONSTRUCTABILITY CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH CONSTRUCTABILITY REQUIREMENTS?**
- **CAN DETAILED STRESS AND THERMAL CONSIDERATIONS BE IMPLEMENTED IN THIS DESIGN? IS THE DESIGN AS PRESENTED INCONSISTENT WITH STRESS AND THERMAL REQUIREMENTS?**

INDEPENDENT REVIEWERS

SUBJECT MATTER EXPERTS	NAME
CIVIL	I.C. BRUNO
ELECTRICAL	J.D. McMULLEN
MECHANICAL	J.F. HANSEN
MINING	J.L. PHILIPPUS, E. FITCH
STRUCTURAL	C.I. KIM
SAFETY	J.W. BARTLETT
GEOLOGY	N. HOPTON
HYDROLOGY	K. BULLARD, W. GRAHM
TESTING	H. KALIA
PERFORMANCE ASSESSMENT	R.C. KALINSKI
PROJECT QA	P. KARNOSKI
CONSTRUCTION	R.R. ROMMER, T. JESSEN
ESF/REPOSITORY INTERFACES	J. COPELAND, J. TAIPALE, J. BEYER
MAINTENANCE	H.H. SPEIKER
ENVIRONMENTAL	J.K. PRINCE, C.D. POWERS
REGULATORY	B.D. FOSTER
PROJECT OFFICE	J. GARDINER
DECISION ANALYSIS	J. LATHROPE
MECH. EXCAVATION	J. TAIPALE
	J. BEYER
	R. McDONALD

INDEPENDENT OBSERVERS

OBSERVER ORGANIZATIONS

NAME

- NWTRB

RUSS McFARLAND
EDWARD CORDING

- NRC

JOHN GILRAY, JOHN PESHEL
PAUL PRESTHOLT, MARK
DELLIGATTI
DINESH GUPTA

- STATE OF NEVADA

PLATT THOMPSON, JIM THOMPSON

- COUNTIES

BRAD METTAM, CRAIG JORGENSON

- DOE/HQ

DEAN STUCKER,
DAVID RASMUSSEN
FRANK BUGG

- B.O.M.

LINDSAY MUNDELL

- MSHA

LARRY WEBERG,
RICHARD FEEHANN

3.1.d TRACEABILITY OF INPUT/OUTPUT

- **FROM:**
ESF DESIGN REQUIREMENTS (ESFDR)
 - REGULATORY REQUIREMENTS (10CFR60)

- **TO:**
DELIVERABLE DESCRIPTION (DESIGN)
 - EXAMPLE: RAMP STATION CONSTRUCTION SEQUENCE

10 CFR 60 Quote

ESFDR Location

10 CFR 60.15(b)	1.2.6.4 PC 1a.
10 CFR 60.15(b)	1.2.6.5 PC 1a.
10 CFR 60.15(b)	1.2.6.6 PC 1a.
10 CFR 60.15(c)(1)	1.2.6.0 C C.(1)
10 CFR 60.15(c)(1)	1.2.6.4 PC 2a.
10 CFR 60.15(c)(1)	1.2.6.5 PC 2a.
10 CFR 60.15(c)(1)	1.2.6.6 PC 2a.
10 CFR 60.15(c)(1)	1.2.6.7 C B.
10 CFR 60.15(c)(2)	1.2.6.0 C C.(2)
10 CFR 60.15(c)(2)	1.2.6.4 PC 1b.
10 CFR 60.15(c)(2)	1.2.6.5 PC 1b.
10 CFR 60.15(c)(2)	1.2.6.6 PC 1b.
10 CFR 60.15(c)(3)	1.2.6.0 C C.(3)
10 CFR 60.15(c)(3)	1.2.6.1.1 C A.
10 CFR 60.15(c)(3)	1.2.6.4 PC 2b.
10 CFR 60.15(c)(3)	1.2.6.5 PC 2b.
10 CFR 60.15(c)(3)	1.2.6.6 PC 2b.
10 CFR 60.15(c)(3)	1.2.6.8 C D.
10 CFR 60.15(c)(4)	1.2.6.0 C C.(4)
10 CFR 60.15(c)(4)	1.2.6.6 PC 2c.
10 CFR 60.74(a)	1.2.6.0 C D.
10 CFR 60.74(a)	1.2.6.4 C A.
10 CFR 60.74(a)	1.2.6.5 C A.
10 CFR 60.74(a)	1.2.6.6 C A.
10 CFR 60.74(a)	1.2.6.7 C C.
10 CFR 60.74(b)	1.2.6.0 C D.[2]
10 CFR 60.74(b)	1.2.6.4 C A.[2]
10 CFR 60.74(b)	1.2.6.5 C A.[2]
10 CFR 60.74(b)	1.2.6.6 C A.[2]
10 CFR 60.130	1.2.6.0 C E.
10 CFR 60.130	1.2.6.4 PC 2c.
10 CFR 60.130	1.2.6.5 PC 2c.
10 CFR 60.130	1.2.6.6 PC 2d.
10 CFR 60.131(b)(9)	1.2.6.0 C G.
10 CFR 60.133(a)(1)	1.2.6.4 PC 2d.
10 CFR 60.133(a)(1)	1.2.6.5 PC 2d.
10 CFR 60.133(a)(1)	1.2.6.6 PC 2e.
10 CFR 60.133(a)(2)	1.2.6.4 PC 2e.
10 CFR 60.133(a)(2)	1.2.6.5 PC 2e.
10 CFR 60.133(a)(2)	1.2.6.6 PC 2f.
10 CFR 60.133(a)(2)	1.2.6.7 C D.
10 CFR 60.133(b)	1.2.6.4 PC 2f.
10 CFR 60.133(b)	1.2.6.5 PC 2f.
10 CFR 60.133(b)	1.2.6.6 PC 2g.
10 CFR 60.133(b)	1.2.6.7 C E.
10 CFR 60.133(d)	1.2.6.0 PC 2e.
10 CFR 60.133(d)	1.2.6.4 PC 2g.
10 CFR 60.133(d)	1.2.6.5 PC 2g.
10 CFR 60.133(d)	1.2.6.6 PC 2h.
10 CFR 60.133(d)	1.2.6.7 C F.
10 CFR 60.133(d)	1.2.6.8 C E.

DELIVERABLE DESCRIPTION

WBS NO: 1.2.6.5 ENGINEER: M. Esp DISCIPLINE: Mining

ACTIVITY TITLE: Ramp Station Construction Sequence

ACTIVITY ID: YMP-025-2-MING-MI49, YMP-025-2-MING-MI50

NO. OF DOCUMENTS: 2

CATEGORY: Title I

QUALITY AFFECTING: Yes

DURATION HRS. EA. DOCUMENT: 160

ACTIVITY DESCRIPTION: Generate drawings which depict the sequence of ramp utility movement and replacement, excavation, support, muck transfer, excavation equipment installation, and temporary facilities required to support station development. Show the various stages of development at logical breakpoints up to the engineer in different views on the drawing sheets. Use the appropriate rock and material symbols to indicate the media being excavated.

Note: The term "station" is highly generic in the case of these drawings. No specific station or station dimensions are applicable. The interpretation of the term "station" for these drawings is; 'any breakout off of the main ramp greater than five feet'. The station could be a test alcove, major access intersection, refuge chamber, sump, etc. The intent of these drawings is to put forth major construction considerations applicable to all station excavations regardless of whether they are mechanically or conventionally excavated. It will be left to the reviewer of these drawings to interpret and apply these parameters to specific stations in the ESF.

Compile a drawing reference file to include:

- . This description sheet (completed)
- . Sketches used for the drawing concept
- . Check prints and drawing review notices
- . Copies of any input or references used in the drawing makeup, e.g. copies of pages out of the ramp sizing and ramp location studies.

FUNCTION : ESFDR, Rev. 5/31/91, YMP/CC-0013

- 1.2.6.5.3.FR1.
- 1.2.6.6.FR1.
- 1.2.6.6.FR2.
- 1.2.6.7.FR1.

10 CFR 60 TRACEABILITY TO DESIGN ACTIVITY

- **10 CFR 60.133(b) FLEXIBILITY OF DESIGN**

THE UNDERGROUND FACILITY SHALL BE DESIGNED WITH SUFFICIENT FLEXIBILITY TO ALLOW ADJUSTMENTS WHERE NECESSARY TO ACCOMMODATE SPECIFIC SITE CONDITIONS IDENTIFIED THROUGH IN SITU MONITORING, TESTING, OR EXCAVATION

- **ESFDR**

- 1.2.6.6 PC (2g)**

THE UNDERGROUND FACILITY SHALL BE DESIGNED WITH SUFFICIENT FLEXIBILITY TO ALLOW ADJUSTMENTS WHERE NECESSARY TO ACCOMMODATE SPECIFIC SITE CONDITIONS IDENTIFIED THROUGH IN SITU MONITORING, TESTING, OR EXCAVATION [10 CFR 60.133 (b)]

THE FOLLOWING VIEWGRAPHS SHOW HOW THIS REQUIREMENT IS PASSED ON FROM THE A/E ENGINEERING DEPARTMENT TO THE APPLICABLE DESIGNER

3.1.e INTERFACES

- **ESF HAS MAJOR INTERFACES WITH THE FOLLOWING:**
 - **REPOSITORY**
 - **TESTING**
 - **ENVIRONMENTAL**
 - **PERFORMANCE ASSESSMENT**

- **INTERFACE REQUIREMENTS ARE IN APPENDICES TO THE ESFDR**

CRITERIA/REQUIREMENTS: ESFDR, Rev. 5/31/91, YMP/CC-0013

1.2.6.5.3.PC1a.	1.2.6.6.PC1d.xv.
1.2.6.5.3.PC1d.	1.2.6.6.PC2g.i. ←
1.2.6.5.3.PC1e.	1.2.6.6.PC2j.i.
1.2.6.6.PC1c.vi.	1.2.6.6.PC2j.iv.
1.2.6.6.PC1d.ii.	1.2.6.6.PC2j.vii.
1.2.6.6.PC1d.xii.	1.2.6.7.PC1a.

CONSTRAINTS: ESFDR, Rev. 5/31/91, YMP/CC-0013

1.2.6.7.C.A.

ASSUMPTIONS: ESFDR, Rev. 5/31/91, YMP/CC-0013

1.2.6.6.A.1

INTERFACES: Verbal communication from meeting between Steve Brown (Long Airdox Co.) and Raytheon Services Nevada, 6/27/91, Subject: Long Airdox continuous conveyor systems.

REFERENCE DOCUMENTS:

ST-MN-010, Rev. 1, Preliminary Transportation Methods Analysis, R. Jurani, (RSN).

ST-MN-020, Rev. 1, Preliminary Excavation Plan, M. Esp, (RSN).

ESF/GROA RELATIONSHIP

ESF ELEMENTS EXPECTED TO BECOME PART OF THE POTENTIAL REPOSITORY AND REQUIRING SPECIAL CONSIDERATIONS ARE

- **OPENINGS**

- RAMPS
- SHAFTS
- DRIFTS

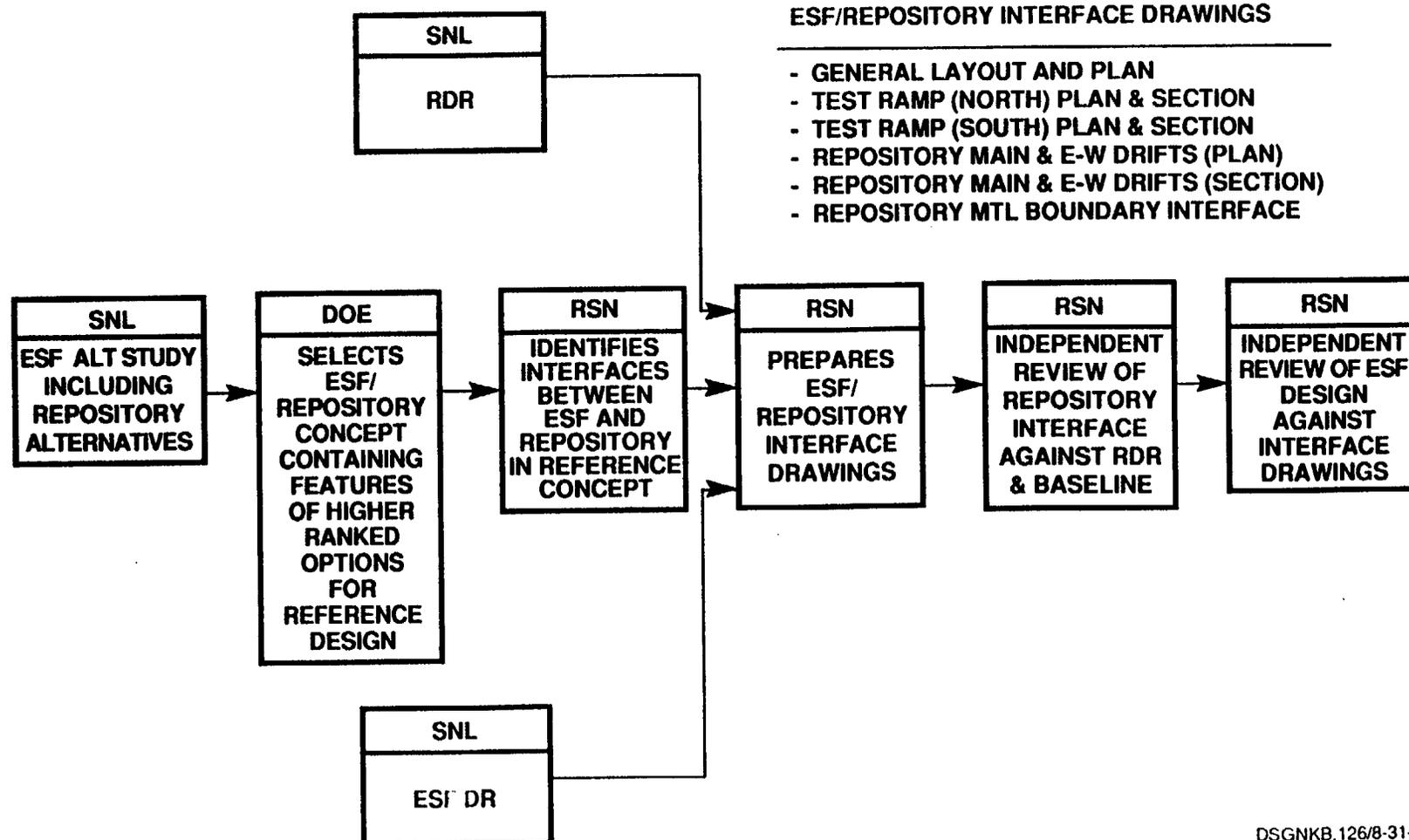
- **SEALS LOCATIONS**

- OPERATIONAL
- POST CLOSURE

- **UNDERGROUND LAYOUT**

- GEOMETRY (IN TERMS OF LAYOUT)
- PILLAR SIZES
- OPENING DIMENSIONS
- ORIENTATION

ESF/REPOSITORY (GROA) INTERFACE FOR REVISED TITLE I DESIGN SUMMARY REPORT



APPENDIX B

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<u>Number</u>			
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ESF/TESTING INTERFACES

**3.1.e TESTING INTERFACES
ARE DELINEATED IN THE ESFDR**

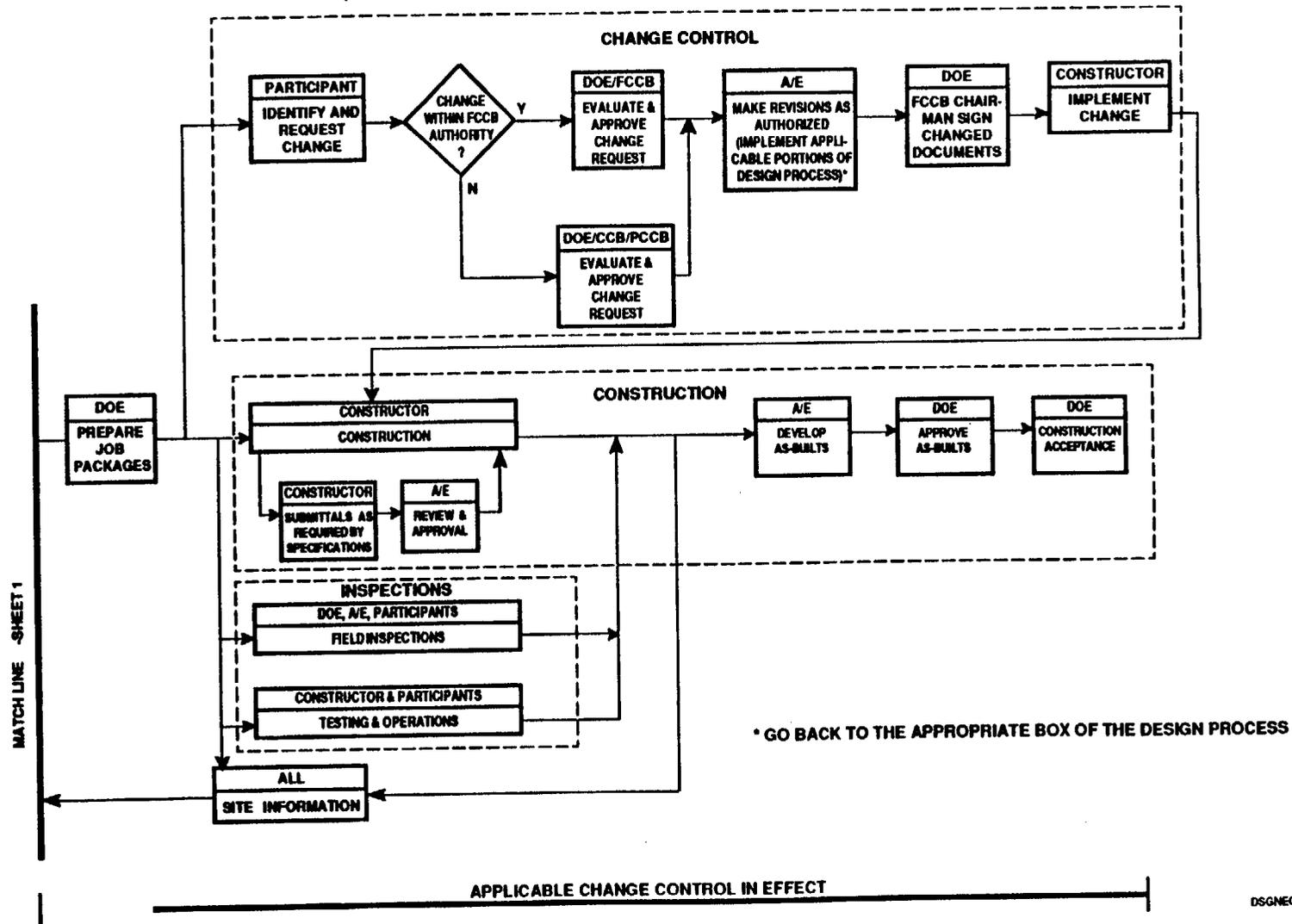
ESF/PA INTERFACES FOR REVISED TITLE I DESIGN SUMMARY REPORT

- **PRELIMINARY PERFORMANCE ASSESSMENT PERFORMED IN SUPPORT OF ESF:**
 - **SURFACE CONSTRUCTION WATER MOVEMENT**
 - **SHAFT CONSTRUCTION WATER MOVEMENT**
 - **SEWAGE AND SETTLING POND WATER MOVEMENT**
 - **WATER ENTRY INTO SHAFTS THROUGH ROCK MASS SURROUNDING SHAFT COLLAR AND LINER**
 - **SHAFT AND MAIN PAD BLASTING EFFECTS**
 - **SHAFT AND COLLAR CREEP**
 - **SHAFT AND COLLAR THERMAL STRESS**
 - **FAR FIELD THERMAL EFFECTS**
 - **SYSTEMS AND COMPONENTS IMPORTANT TO SAFETY**
 - **HYDROLOGIC AND GEOCHEMICAL EFFECTS OF TRACERS**
 - **HYDROLOGIC AND GEOCHEMICAL EFFECTS OF CHEMICALS**

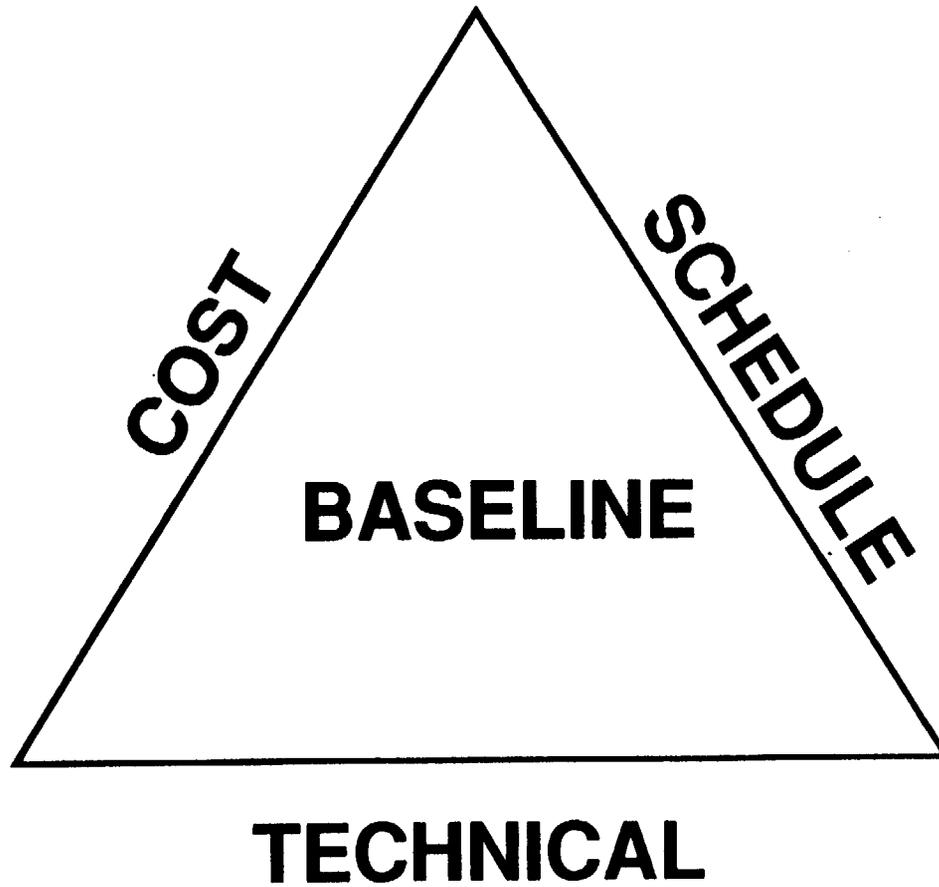
4. TITLE II DESIGN

4.1 ESF TITLE II DESIGN PROCESS

(NOTE: INCLUDES TITLE III & CONSTRUCTION ACTIVITIES)



BASELINE COMPONENTS



4. TITLE II DESIGN

INCLUDES:

4.1.a DESIGN INPUTS

- APPROVED TITLE I DESIGN**
- DESIGN INPUTS AS REVISED DURING TITLE I**

4.1.b DESIGN ACTIVITIES:

- REVISIONS THAT MAY BE REQUIRED TO TITLE I**
- FINAL PREPARATION OF ANALYSIS, SPECS, DRAWING, STUDIES, ETC.**
- DESIGN CONTROL**
- VERIFICATION OF DESIGN**

4.1.c ESF TECHNICAL BASELINE WILL INCLUDE THE FOLLOWING CONTROL DOCUMENTS (ESF TITLE II START - PROJECT LEVEL)

- **SITE CHARACTERIZATION PROGRAM BASELINE**
- **SYSTEM REQUIREMENTS**
- **SYSTEM DESCRIPTION**
- **REPOSITORY DESIGN REQUIREMENTS**
- **EXPLORATORY STUDIES FACILITIES DESIGN REQUIREMENTS**
- **REFERENCE INFORMATION BASE**
- **ESF TITLE I DESIGN SUMMARY REPORT REV. 1**
- **TITLE I ESF / REPOSITORY INTERFACE DRAWINGS**
NOTE: REPOSITORY CONCEPTUAL DESIGN MODIFIED AS TITLE II DESIGN IS ACCEPTED BY DOE
- **YUCCA MOUNTAIN SITE DESCRIPTION**
- **CONCEPTUAL DESIGN OF REPOSITORY**
- **WASTE PACKAGE DESIGN BASIS**

5. HANDOUT

5.1 10 CFR60 PART G TO ESFDR (QA)

(CROSSWALK IS IN YOUR HANDOUT)

- QA REQUIREMENTS DOCUMENTS AND OCRWM QA DOCUMENTS COVERING ESF DESIGN ACTIVITIES ARE

REQUIREMENTS DOCUMENTS	OCRWM QA DOCUMENTS	ESF ACTIVITY
10CFR60, SUBPART G 10CFR50, APPENDIX B NQA-1 (1989)	QARD (R-4) QAPD (R-3)	ESF DESIGN

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 2

REQUIREMENT SOURCE	REQUIREMENT	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 2.0 SRP 3.20	3.8	The design input shall be specified and approved on a timely basis and to the level of detail necessary to permit the design activity to be carried out in a correct manner and to provide a consistent basis for making decisions, accomplishing design verification measures, and evaluating design changes.	3.0; 1st para. 3.1.4 App. A, Para. 3.2 (partial)	QMP 06-04 AP 6.01Q AP 5.1Q, AP 5.2Q AP 5.3Q, AP 5.9Q
3S-1, 2.0	3.9	Changes from approved design inputs, including the reason for the changes, shall be identified, approved, documented, and controlled. DESIGN PROCESS	3.0; para. 3.1.8	AP 3.3Q, AP 3.5Q PP 03-02, PP 03-03 PP 03-04 (LATER) PP 03-12, PP 03-15 PP 03-07
3S-1, 3.0	3.10	The responsible design organization shall prescribe and document the design activities on a timely basis and to the level of detail necessary to permit the design process to be carried out in a correct manner, and to permit verification that the design meets requirements.	3.0; para. 3.1.4	QMP 06-04, AP 6.1Q
3S-1, 3.0	3.11	Design documents shall be adequate to support facility design, construction, and operation.	3.0; para. 3.1.4	QMP 06-04, AP 6.1Q
3S-1, 3.0	3.12	Appropriate quality standards shall be identified and documented, and their selection reviewed and approved.	3.0; para. 3.1.3 App. A; 3.2	QMP 06-04 AP 6.1Q
3S-1, 3.0	3.13	Changes from specified quality standards, including the reasons for these changes, shall be identified, approved, documented, and controlled.	3.0; para. 3.1.8 (partial)	AP 3.3Q, QMP 06-04 AP 6.1Q
3S-1, 3.0	3.14	Design methods, materials, parts, equipment, and processes that are essential to the function of the structure, system, or component shall be selected and reviewed for suitability of application.	3.0; paras. 3.1.5, & 3.1.6	QMP 06-04 AP 6.1Q

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
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Section 3 - 1

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
SECTION 3 - DESIGN CONTROL			
DESIGN CONTROL			
OCRWM	3.1 Requirements of this section shall apply to design, from conceptual design through final design (QARD, 3.0).	3.0; para. 3.0	
NQA-1, Basic Criteria 3	3.2 The design shall be defined, controlled, and verified. Applicable design inputs shall be appropriately specified on a timely basis and correctly translated into design documents.	3.0; para. 3.1.1(a) App. A; para. 3.2 (partial)	QMP 06-04 AP 6.1Q AP 5.1Q, AP 5.2Q AP 5.3Q, AP 5.9Q
NQA-1, Basic Criteria 3	3.3 Design interfaces shall be identified and controlled.	3.0; para. 3.1.1	AP 5.19Q
NQA-1, Basic Criteria 3	3.4 Design adequacy shall be verified by persons other than those who designed the item.	3.0; para. 3.1.6	QMP 06-04
NQA-1, Basic Criteria 3	3.5 Design changes, including field changes, shall be governed by control measures commensurate with those applied to the original design.	3.0; para. 3.1.8 (partial)	QMP 03-09 AP 3.5Q AP 3.3Q
SRP 3.7	3.6 Deficiencies in approved design and design information documents shall be documented, and corrective action shall be taken in accordance with Section 16 (QARD, 3.1).	3.0; para. 3.1.9	QMP 06-04
DESIGN INPUT			
3S-1, 2.0 SRP 3.3	3.7 Applicable design inputs, such as design bases, performance requirements, regulatory requirements, codes, and standards, shall be identified and documented, and their selection reviewed and approved by the responsible design organization.	3.0; para. 3.1.3, 3.1.5b, App. A; Paras. 3.2.1, 3.2.2 (partial)	AP-5.1Q, AP-5.2Q, AP-5.3Q & AP-5.9Q QMP 06-04, AP 6.1Q

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 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 4

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 3.1	3.20 Calculations shall be identifiable by subject (including structure, system, or component to which the calculation applies), originator, reviewer, and date; or by other data such that the calculations are retrievable.	3.0; para. 3.1.4(c) (partial)	QMP 03-01, QMP 02-08 QMP 06-04, AP 6-1Q
3S-1, 3.1	3.21 Computer programs may be utilized for design analysis without individual verification of the program for which each application provided: 1. The computer program has been verified to show that it produces correct solutions for the encoded mathematical model within defined limits for each parameter employed; and 2. The encoded mathematical model has been shown to produce a valid solution to the physical problem associated with the particular application.	3.0; para. 3.1.4 which refers to 19.0	
3S-1, 3.1	3.22 Computer programs shall be controlled to assure that changes are documented and approved by authorized personnel. Where changes to previously verified computer programs are made, verification shall be required for the change, including evaluation of the effects of these changes on (1) and (2) above.	19.0 (Entire section)	
3S-1, 3.1	3.23 Documentation of design analyses shall include (1) through (6) below. 1. Definition of the objective of the analyses. 2. Definition of design inputs and their sources.	Not addressed	QMP 03-01, QMP 06-04 AP 6.1Q

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 3

REQUIREMENT SOURCE	3	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 3.0	3.15	Applicable information derived from experience, as set forth in reports or other documentation, shall be made available to cognizant design personnel.	3.0; para. 3.1.1 4th para. (partial)	AP 5.1Q AP 5.2Q AP 5.3Q
3S-1, 3.0	3.16	The final design (approved design output documents and approved changes thereto) shall:	Does not apply to OCRWM scope of design activities.	QMP 06-04, AP 6.1Q
		a. Be relatable to the design input by documentation in sufficient detail to permit design verification; and		
		b. Identify assemblies and/or components that are part of the item being designed. When such an assembly or component part is a commercial grade item that, prior to its installation, is modified or selected by special inspection and/or testing to requirements that are more restrictive than the supplier's published product description, the component part shall be represented as different from the commercial grade item in a manner traceable to a documented definition of the difference.		
		DESIGN ANALYSES		PP 03-03, PP 03-02
3S-1, 3.1	3.17	Design analyses shall be performed in a planned, controlled, and documented manner.	3.0; para. 3.1.4	QMP 06-04, QMP 02-08 QMP 03-01
3S-1, 3.1	3.18	Design analyses documents shall be legible and in a form suitable for reproduction, filing, and retrieval.	3.0; para. 3.1.4(a)	QMP 17-01
3S-1, 3.1	3.19	They shall be sufficiently detailed as to purpose, method, assumptions, design input, references, and units such that a person technically qualified in the subject can review and understand the analyses and verify the adequacy of the results without recourse to the originator.	3.0; para. 3.1.4(b)	QMP 03-01, QMP 02-08 QMP 06-04, AP 6.1Q

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3.- 6

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
	DESIGN VERIFICATION		PP 03-03 PP 03-04 (LATER)
3S-1, 4.0 SRP 3.10	3.28 Design control measures shall be applied to verify the adequacy of design, such as by one or more of the following: the performance of design reviews, the use of alternate calculations, or the performance of qualification tests or peer review (QARD, A, 3.1).	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 06-04 QMP 02-08 QMP 03-01 PP 03-04 (LATER)
SRP 3.12	3.29 Procedures for design verification shall require the identification of the reviewers, the area or features reviewed, and the resolution methods for resolving comments (QARD, 3.3).	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 02-08 QMP 03-01 QMP 06-04 PP 03-04 (LATER)
SRP 3.13	3.30 Design verification procedures assure the following (QARD, 3.3): (a) Criteria for determining the method of verification are established; (b) the responsibilities of the persons performing the verification or validation are defined; (c) areas or features to be verified are specified; (d) the extent of documentation is defined.	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 02-08 QMP 03-01 QMP 06-04 PP 03-04 (LATER)
3S-1, 4.0	3.31 The verification of computer programs shall include appropriate Testing.	3.0; para. 3.1.7 - delegates this activity to program participants	

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 5

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QARD, REV. 3	QUALITY PROCEDURES
	3. Results of literature searches or other applicable background data.		
	4. Identification of assumptions and indication of those that must be verified as the design proceeds.		
	5. Identification of any computer calculation, including computer type, computer program (e.g., name), revision identification, inputs, outputs, evidence of or reference to computer program verification, and the bases (or reference thereto) supporting application of the computer program to the specific physical problem.		
	6. Review and approval.		PP 03-09, PP 03-21
	TECHNICAL REVIEW		
OCRWM	3.24 Technical reviews shall be performed when the information or document under review is within the state of the art and is based on accepted standards, criteria, principles, and practices (QARD, 3.4).	3.0; para. 3.1.6, App. A; para. 20.4.1	QMP-06-04, AP 6.1Q QMP 02-08, QMP 03-01 PP 03-09, PP 03-21
OCRWM	3.25 Technical reviews shall be used when documents, activities, material, or data require technical evaluation for applicability, correctness, adequacy, completeness, and assurance that established requirements are satisfied (QARD, 3.4).	3.0; para. 3.1.6, App. A; para. 20.4.1	QMP-06-04, AP 6.1Q QMP 02-08, QMP 03-01 PP 03-09, PP 03-21
OCRWM	3.26 Technical reviews shall be performed by individuals with sufficient technical knowledge of the area under review (QARD, 3.4).	3.0; para. 3.1.6, App. A; para. 20.4.1	QMP-06-04 QMP 02-08 AP 6.1Q, QMP 03-01
OCRWM	3.27 The results shall be documented (QARD, 3.4).	6.0; para. 6.1.1e,	QMP-06-04, AP 6.1Q QMP 03-01, QMP 02-08

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 8

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 4.0	3.38 Design verification, for the level of design activity accomplished, shall be performed prior to release for procurement, manufacture, construction, or release to another organization for use in other design activities except in those cases where this timing cannot be met, such as when insufficient data exist.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.0 SRP 3.3	3.39 In those cases, the unverified portion of the design shall be identified and controlled.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.0 SRP 3.3	3.40 In all cases the design verification shall be completed prior to relying upon the component, system, structure, or computer program to perform its function.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
	EXTENT OF DESIGN VERIFICATION		PP 03-04 (LATER)
3S-1, 4.1	3.41 The extent of the design verification required is a function of the importance to safety, the complexity of the design, the degree of standardization, the state of the art, and the similarity with previously proven designs.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.1	3.42 Where the design has been subjected to verification process in accordance with this standard, the verification process need not be duplicated for identical designs.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.1	3.43 However, the applicability of standardized or previously proven designs, with respect to meeting pertinent design inputs, shall be verified for each application.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 7

REQUIREMENT SOURCE		REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 4.0	3.32	The responsible design organization shall identify and document the particular design verification method(s) used.	3.0; para. 3.1.7 - delegates this activity to program participants	
3S-1, 4.0	3.33	The results of design verification shall be clearly documented with the identification of the verifier clearly indicated.	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.0 SRP 3.13, 3.14	3.34	Design verification shall be performed by any competent individual(s) or group(s) other than those who performed the original design but who may be from the same organization.	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.0 SRP 3.14	3.35	This verification may be performed by the originator's supervisor, provided the supervisor did not specify a singular design approach or rule out certain design considerations and did not establish the design inputs used in the design or, provided the supervisor is the only individual in the organization competent to perform the verification.	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.0	3.36	Cursory supervisory reviews do not satisfy the intent of this standard.	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.0	3.37	Verification shall be performed in a timely manner.	3.0; para. 3.1.7 - delegates this activity to program participants	AP 6.1Q QMP 06-04 QMP 02-08 QMP 03-01

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 10

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
	<ol style="list-style-type: none"> 1. Were the design inputs correctly selected? 2. Are assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent reverification when the detailed design activities are completed? 3. Was an appropriate design method used? 4. Were the design inputs correctly incorporated into the design? 5. Is the design output reasonable compared to design inputs? 6. Are the necessary design input and verification requirements for interfacing organizations specified in the design documents or in supporting procedures or instructions? 		
	ALTERNATE CALCULATIONS		PP 03-04 (LATER)
3S-1, 4.2.2	3.50 These are the calculations or analyses that are made with alternate methods to verify correctness of the original calculations or analyses.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2.2	3.51 The appropriateness of assumptions, input data used, and the computer program or other calculation method used shall also be reviewed.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
	QUALIFICATION TESTS		PP 03-04 (LATER)
3S-1, 4.2.3	3.52 Where design adequacy is to be verified by qualification tests, the tests shall be identified.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 9

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 4.1	3.44 Known problems affecting the standard or previously proven designs and their effects on other features shall be considered.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.1	3.45 The original design and associated verification measures shall be adequately documented and referenced in the files of subsequent application of the design.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.1	3.46 Where changes to previously verified designs have been made, design verification shall be required for the changes, including evaluation of the effects of those changes on overall design and any design analyses upon which the design is based that are affected by the change to previously verified design.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
SRP 3.17	3.47 The impact of design changes on procedures and training shall be evaluated (QARD, 3.2).	3.0; para. 3.1.7 - delegates this activity to program participants	AP 3-3Q PP 03-04 (LATER)
3S-1, 4.2	3.48 Acceptable verification methods include, but are not limited to, any one or a combination of the following: design reviews, alternate calculations, and qualification testing and peer reviews (QARD, A, 3.1).	3.0; para. 3.1.7 - delegates this activity to program participants	PP 03-04 (LATER)
3S-1, 4.2.1	3.49 These are critical reviews to provide assurance that the final design is correct and satisfactory. Where applicable, (1) through (6) below shall be addressed.	3.0; para. 3.1.7 - delegates this activity to program participant	QMP 06-04 QMP 02-08 QMP 03-01

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 12

REQUIREMENT SOURCE		REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 4.2	3.60	The results of model test work shall be subject to error analysis, where applicable, prior to use in final design work.	3.0; para. 3.1.7 - delegates this activity to program participants	
SRP 3.16	3.61	Peer Reviews shall be performed in accordance with the guidance provided in NUREG-1297, Peer Review for the High-Level Waste Repositories Generic Technical Position, February 1988 (QARD, A, 3.1). CHANGE CONTROL	App. A, para. 20.4.2	QMP-03-01 PP 03-07, PP 03-12 PP 03-17
3S-1, 5.0 SRP 3.17	3.62	Changes to final designs, field changes, modifications to operating facilities and nonconforming items dispositioned use as is or repair shall be justified and subject to design control measures commensurate with those applied to the original design.	3.0; para. 3.1.8 15.0; para. 15.4 (partial)	QMP-03-09 AP-3.3Q, AP-3.5Q & AP-3.6Q
3S-1, 5.0	3.63	These measures shall include assurance that the design analyses for the structure, system, or component are still valid.	Not addressed	QMP 03-09, AP 3.3Q, AP 3.5Q & AP 3.6Q
3S-1, 5.0	3.64	Changes shall be approved by the same affected groups or organizations which reviewed and approved the original design documents; except where an organization which originally was responsible for approving a particular design document is no longer responsible, then the Owner or his designee shall designate a new responsible organization which could be the owner's engineering organization.	3.0; para. 3.1.8	QMP 03-09, AP 3.3Q, AP 3.5Q & AP 3.6Q
3S-1, 5.0	3.65	The designated organization shall have demonstrated competence in the specific design area of interest and have an adequate understanding of the requirements and intent of the original design.	Not addressed	QMP 03-09, AP 3.3Q, AP 3.5Q & AP 3.6Q

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 QUALITY ASSURANCE REQUIREMENTS DOCUMENT, REV. 4, MATRIX

Section 3 - 11

REQUIREMENT SOURCE	REQUIREMENT	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 4.2.3	3.53	The test configuration shall also be clearly defined and documented.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2.3 SRP 3.15	3.54	Testing shall demonstrate adequacy of performance under conditions that simulate the most adverse design conditions.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2.3	3.55	Operating modes and environmental conditions in which that item must perform satisfactorily shall be considered in determining the most adverse conditions.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2.3	3.56	Where the test is intended to verify only specific design features, the other features of the design shall be verified by other means.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2.3	3.57	Test results shall be documented and evaluated by the responsible design organization to assure that test requirements have been met.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2.3	3.58	If qualification testing indicates that modifications to the item are necessary to obtain acceptable performance, the modification shall be documented and the item modified and retested or otherwise verified to assure satisfactory performance.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01
3S-1, 4.2	3.59	When tests are being performed on models or mockups, scaling laws shall be established and verified.	3.0; para. 3.1.7 - delegates this activity to program participants	QMP 06-04 QMP 02-08 QMP 03-01

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Section 3 - 14

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
	DOCUMENTATION AND RECORDS		PP 03-01, PP 03-02 PP 03-03, PP 03-05 PP 03-04 (LATER) PP 03-07, PP 03-09 PP 03-10, PP 03-12 PP 03-13, PP 03-15 PP 03-16, PP 03-17 PP 03-18, PP 03-19
3S-1, 7.0	3.72 Design documentation and records, which provide evidence that the design and design verification processes were performed in accordance with the requirements of this standard, shall be collected, stored, and maintained in accordance with documented procedures.	17.0; para. 17.0	QMP 17-01
3S-1, 7.0	3.73 The documentation shall include not only final design documents, such as drawings and specifications, and revisions thereto but also documentation which identifies the important steps, including sources of design inputs that support the final design.	Not addressed	QMP 17-01

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Section 3 - 13

REQUIREMENT SOURCE	REQUIREMENT	WHERE SATISFIED IN QAPD, REV. 3	QUALITY PROCEDURES
3S-1, 5.0 SRP 3.17	3.66 Where a significant design change is necessary because of an incorrect design, the design process and verification procedure shall be reviewed and modified as necessary. INTERFACE CONTROL	Not addressed	QMP 03-09, AP 03-09 AP 3.3Q, AP 3.5Q AP 3.6Q PP 03-05, PP 03-09 PP 03-15
3S-1, 6.0 SRP 3.8	3.67 Design interfaces shall be identified and controlled and the design efforts shall be coordinated among the participating organizations.	3.0; para. 3.1.1	AP 5.19Q
3S-1, 6.0 SRP 3.8	3.68 Interface controls shall include the assignment of responsibility and the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces.	6.0; para. 6.1.1 3.0; para. 3.0	AP 5.19Q
3S-1, 6.0 SRP 3.8	3.69 Design information transmitted across interfaces shall be documented and controlled.	3.0; para. 3.1.1	AP 5.19Q AP 5.1Q, AP 5.2Q AP 5.3Q
3S-1, 6.0	3.70 Transmittals shall identify the status of the design information or document provided and, where necessary, identify incomplete items which require further evaluation, review, or approval.	Not addressed	AP 5.19Q
3S-1, 6.0	3.71 Where it is necessary to initially transmit design information orally or by other informal means, the transmittal shall be confirmed promptly by a controlled document.	Not addressed	AP 5.19Q

5. HANDOUT

5.2 10CFR60 TO ESFAS CROSSWALKS..

(CROSSWALK IS IN YOUR HANDOUT)

**ESFAS
APPENDIX C**

ESF CROSSWALK

Diagram ID Diagram Name
 1 Health Effects Portion (9/5/90)

Element ID	Element Name	Requirement	Rank
22	Releases to the accessible environment	10 CFR 60.112	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
		NMFA Sec. 113(a)	1
71	Direct releases	10 CFR 60.112	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1

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Diagram ID Diagram Name
 2 Transport through Natural Barriers Portion (8/15/90)

Element ID	Element Name	Requirement	Rank
23	Saturated zone ground water pathway	10 CFR 60.112	1
		10 CFR 60.137	2
		10 CFR 60.74(b)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
30	Saturated zone retardation	10 CFR 60.122(b)(1)	2
31	Saturated zone ground water velocity distribution (including GWT)	10 CFR 60.113(a)(2)	1
		10 CFR 60.122(a)(2)	2
		10 CFR 960.4-2-1(d)	1

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ESF CROSSWALK

Diagram ID Diagram Name
 2 Transport through Natural Barriers Portion (8/15/90)

Element ID	Element Name	Requirement	Rank
32	Ground water transport through saturated zone	10 CFR 60.133(i)	2
33	Unsaturated zone ground water pathway	10 CFR 60.112	1
		10 CFR 60.137	2
		10 CFR 60.74(b)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
40	Unsaturated zone retardation	10 CFR 60.122(a)(2)	2
41	Unsaturated zone ground water velocity distribution (including GWTT)	10 CFR 60.113(a)(2)	1
		10 CFR 60.122(a)(2)	2
		10 CFR 960.4-2-1(d)	1
42	Ground water transport through unsaturated zone	10 CFR 60.112	1
		10 CFR 60.133(i)	2
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
45	Release to unsaturated zone	10 CFR 60.133(h)	1
47	Gas phase transport through unsaturated zone	10 CFR 60.112	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1

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ESF CROSSWALK

Diagram ID Diagram Name
3 Engineered Barrier System Portion (8/15/90)

Element ID	Element Name	Requirement	Rank
48	Gas phase transport through engineered barrier system and seals	10 CFR 60.112	1
		10 CFR 60.113(a)(1)	1
		10 CFR 60.133(h)	1
		10 CFR 60.134(a)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
49	Gas phase releases	10 CFR 60.112	1
		10 CFR 60.137	2
		10 CFR 60.74(b)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
51	Ground water transport through engineered barrier system and seals	10 CFR 60.113(a)(1)	1
		10 CFR 60.134(a)	1
53	Waste package releases	10 CFR 60.112	1
		10 CFR 60.113(a)(1)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
54	Retardation in engineered barrier system and seals	10 CFR 60.112	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1

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Diagram ID Diagram Name
 3 Engineered Barrier System Portion (8/15/90)

Element ID	Element Name	Requirement	Rank
55	Ground water velocity distribution through engineered barrier system and seals	10 CFR 60.112	1
		10 CFR 60.74(b)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
57	Waste form dissolution	10 CFR 60.113(a)(1)	1
		10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
58	Volume of water contacting waste	8CAC4.17 7237 (c) (2)	2
		8CAC4.20 8438 (a)	1
59	Container degradation	10 CFR 60.112	1
		10 CFR 60.113(a)(1)	1
		10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
		10 CFR 60.137	2
		10 CFR 60.74(a)	1
		10 CFR 60.74(b)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
62	Ground water chemistry	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1

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Diagram ID Diagram Name
 4 Scenario Portion (5/14/90)

Element ID	Element Name	Requirement	Rank
44	Post-waste-emplacment characteristics of natural barriers	10 CFR 60.112	1
		10 CFR 60.137	2
		10 CFR 60.74(b)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
56	Post-waste-emplacment characterization of engineered barrier system and seals	10 CFR 60.112	1
		10 CFR 60.130	2
		10 CFR 60.133(a)(1)	1
		10 CFR 60.133(a)(2)	2
		10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
		10 CFR 60.21(c)(1)(ii)(D)	2
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
		63	Pre-waste-emplacment characterization of natural barriers	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
64	Changes in state of disposal system	10 CFR 60.112	1
		10 CFR 60.122(a)(2)	2
		10 CFR 60.21(c)(1)(ii)(E)	2
		10 CFR 60.74(a)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1

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ESF CROSSWALK

Diagram ID Diagram Name
 4 Scenario Portion (5/14/90)

Element ID	Element Name	Requirement	Rank
66	ESF repository-induced changes	10 CFR 60.112	1
		10 CFR 60.133(a)(1)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.21(c)(1)(ii)(E)	2
		10 CFR 60.74(a)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
		SCA, Comment 123	2
67	Faulting	10 CFR 960.4-2-7(d)	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
72	Repository design	10 CFR 60.112	1
		10 CFR 60.122(a)(2)	2
		10 CFR 60.130	2
		10 CFR 60.131(b)	2
		10 CFR 60.133(a)(1)	1
		10 CFR 60.133(a)(2)	2
		10 CFR 60.133(b)	1
		10 CFR 60.133(c)(1)	2
		10 CFR 60.133(c)(2)	1
		10 CFR 60.133(f)	1
		10 CFR 60.133(g)	1
		10 CFR 60.133(h)	1
		10 CFR 60.133(i)	2
		10 CFR 60.134(a)	1
		10 CFR 60.137	2
		10 CFR 60.21(c)(1)(ii)(E)	2
		10 CFR 60.21(c)(11)	2
		10 CFR 60.74(a)	1
40 CFR 191.13(a)	1		

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ESF CROSSWALK

Diagram ID Diagram Name
 4 Scenario Portion [5/14/90]

Element ID	Element Name	Requirement	Rank
		40 CFR 191.15	1
		40 CFR 191.16	1
73	ESF configuration	10 CFR 60.112	1
		10 CFR 60.113(a)(2)	1
		10 CFR 60.122(a)(2)	2
		10 CFR 60.130	2
		10 CFR 60.131(b)	2
		10 CFR 60.133(a)(1)	1
		10 CFR 60.133(a)(2)	2
		10 CFR 60.133(b)	1
		10 CFR 60.133(e)(1)	2
		10 CFR 60.133(e)(2)	1
		10 CFR 60.133(f)	1
		10 CFR 60.133(g)	1
		10 CFR 60.133(h)	1
		10 CFR 60.133(i)	2
		10 CFR 60.134(a)	1
		10 CFR 60.137	2
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
		10 CFR 60.21(c)(1)(ii)(E)	2
		10 CFR 60.21(c)(11)	2
		10 CFR 60.74(a)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
		SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1

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ESF CROSSWALK

Diagram ID Diagram Name
 4 Scenario Portion (5/14/90)

Element ID	Element Name	Requirement	Rank
74	Main Test Level location	SCA, 3.2.1	1
75	ESF connection with repository	10 CFR 60.15(c)(1)	1
76	Nature and extent of Calico Hills penetration	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
77	Fluid and material usage	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(4)	1
		SCA, Comment B9	2
		SCA, Question 55	2
78	ESF construction method	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(4)	1
		SCA, Comment 57	1
79	Extent of exploratory drifting at the repository horizon	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(4)	1
		SCA, 3.2.1	1
80	ESF access	10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
		10 CFR 60.74(a)	1
83	ESF access location	10 CFR 60.15(c)(3)	1

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ESF CROSSWALK

Diagram ID Diagram Name
 4 Scenario Portion (5/14/90)

Element ID	Element Name	Requirement	Rank
84	Repository construction method	10 CFR 60.133(f)	1
85	Areal power density	10 CFR 60.133(i) 10 CFR 60.74(a)	2 1
86	Waste age	10 CFR 60.74(a)	1
87	Number and types of accesses	10 CFR 60.15(c)(2)	1
88	Repository location	10 CFR 60.133(a)(1)	1
89	Rock support system	10 CFR 60.133(e)(1) 10 CFR 60.133(e)(2)	2 1
90	Repository configuration	10 CFR 60.112 10 CFR 60.133(a)(1) 10 CFR 60.15(c)(3) 10 CFR 60.21(c)(11) 40 CFR 191.13(a) 40 CFR 191.15 40 CFR 191.16	1 1 1 2 1 1 1
91	Change in water table level	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1

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ESF CROSSWALK

Diagram ID Diagram Name
 5 Radiological Worker Health (5/14/90)

Element ID	Element Name	Requirement	Rank
3	Worker population dose from accidents	10 CFR 60.111(a)	2
		10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
		10 CFR 60.74(a)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
40 CFR 191.16	1		
5	Drift collapse	10 CFR 960.5-2-9(d)	1
8	Frequency of collapse	10 CFR 960.5-2-11(d)	1
		10 CFR 960.5-2-9(d)	1
10	Transporter collision/fire exposure	DOE Order 6430.1a 0110-6.2	2

Diagram ID Diagram Name
 6 Radiological Public Health (6/18/90)

Element ID	Element Name	Requirement	Rank
3	Public population dose from accidents	10 CFR 60.111(a)	2
		10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
		10 CFR 60.74(a)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
40 CFR 191.16	1		
8	frequency of collapse	10 CFR 960.5-2-11(d)	1

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Diagram ID Diagram Name
 6 Radiological Public Health [6/18/90]

Element ID	Element Name	Requirement	Rank
10	Transporter collision/fire exposure	DOE Order 6430.1a 0110-6.2	2

Diagram ID Diagram Name
 7 Nonradiological Worker Safety [5/14/90]

Element ID	Element Name	Requirement	Rank
5	Hazard (fatalities/man-hour)	10 CFR 60.133(e)(2) 10 CFR 960.5-2-9(d)	1 1
7	Other hazard (fatalities/man-hour)	DOE Order 6430.1a 0110-6.2	2
8	Horizontal openings	10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3)	1 1
9	Ramp (Tunnel Boring Machine)	10 CFR 60.15(c)(2) 10 CFR 60.15(c)(4)	1 1
10	Vertical shaft	10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3)	1 1
14	Mining technique (Tunnel Boring Machine/drill and blast)	8CAC4.17 7237 (c) (2) 8CAC4.20 8438 (a)	2 1
22	Horizontal openings	10 CFR 60.133(e)(2) 10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3)	1 1 1

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ESF CROSSWALK

Diagram ID Diagram Name
 7 Nonradiological Worker Safety (5/14/90)

Element ID	Element Name	Requirement	Rank
23	Ramp (Tunnel Boring Machine)	10 CFR 60.133(e)(2)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
24	Vertical shaft	10 CFR 60.133(e)(2)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
39	Orientation with respect to natural rock stratigraphy and structure	10 CFR 960.5-2-11(d)	1
40	Ventilation system design	10 CFR 60.130	2
		10 CFR 60.133(e)(2)	2
		10 CFR 60.133(g)	1
42	Materials handling system	10 CFR 60.133(e)(2)	1
43	Number of ramps and/or shafts	30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1

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Diagram ID Diagram Name
 10 Total System Life Cycle Cost (8/1/90)

Element ID	Element Name	Requirement	Rank
14	ESF cost	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1

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ESF CROSSWALK

Diagram ID Diagram Name
 11 Repository Life Cycle Cost (8/1/90)

Element ID	Element Name	Requirement	Rank
18	Costs of closure and decommissioning (60-70)	10 CFR 60.21(c)(11)	2
24	Ventilation and cooling requirements	10 CFR 60.133(e)(1) 10 CFR 60.133(e)(2) 10 CFR 60.133(g)	1 2 1
25	Rock treatment	10 CFR 60.133(e)(2)	1
36	Excavation method	10 CFR 60.133(e)(2) 10 CFR 60.133(f)	1 1
38	Number of ESF openings	10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3) 30 CFR 57.11050 BCAC4.20 8496 (1)	1 1 1 1
67	Cost of emplacement containers	10 CFR 60.135(a)(1) 10 CFR 60.135(a)(2)	2 2

Diagram ID Diagram Name
 12 ESF Cost (8/1/90)

Element ID	Element Name	Requirement	Rank
14	ESF cost	10 CFR 60.15(c)(1)	1
44	Number and location of underground accesses	10 CFR 60.15(c)(2)	1

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ESF CROSSWALK

Diagram ID Diagram Name
 12 ESF Cost (8/1/90)

Element ID	Element Name	Requirement	Rank
		10 CFR 60.15(c)(3)	1
		30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1
45	Underground accesses (shafts, ramps)	10 CFR 60.133(e)(1)	2
		10 CFR 60.133(e)(2)	1
		30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1
46	Main Test Level configuration and extent	10 CFR 60.133(e)(1)	2
		10 CFR 60.133(e)(2)	1
		SCA, 3.2.1	1
		SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 4.1 Obj. 1, 3rd bullet item e	2
		SCA, 4.1 Obj. 1, 3rd bullet item h	1
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1
		SCA, 4.1 Obj. 1, 3rd bullet, item d	2
47	Cost of exploratory drifting	SCA, 3.2.1	1
48	Schedule	SCA, 4.1 Obj. 1, 3rd bullet, item c	2
50	Installation of Main Test Level testing	SCA, 4.1 Obj. 1, 3rd bullet, item d	2
51	Extent of exploratory drifting	SCA, 3.2.1	1
52	Number and duration of underground access testing	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1

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Diagram ID Diagram Name
 12 ESF Cont (8/1/90)

Element ID	Element Name	Requirement	Rank
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
54	Method of construction	10 CFR 60.133(f)	1
		SCA, Comment 57	1
58	Flexibility of construction method	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
59	Modifications to Main Test Level testing	SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
		SCA, 4.1 Obj. 1, 3rd bullet item e	2
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1
		SCA, Comment 119	1
61	Adequacy of test program	SCA, Comment 72, Question 28	1
63	Configuration of Main Test Level	SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
		SCA, 4.1 Obj. 1, 3rd bullet item e	2
		SCA, 4.1 Obj. 1, 3rd bullet item h	1
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1

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Diagram ID Diagram Name
 14 Schedule p. 2 (1/4/91)

Element ID	Element Name	Requirement	Rank
5	ESF construction duration	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
		30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1
		SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
8	Title II design duration	30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1
11	Construction method	10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
		SCA, Comment 57	1
12	Test program	30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
14	Decommissioning and closure duration	10 CFR 60.21(c)(11)	2
16	Regulatory requirements	10 CFR 60.21(c)(1)(11)(D)	2
		DOE Order 5480.4 Sec. 4 Item c	1
		DOE Order 5480.4 Sec. 5	1

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Diagram ID Diagram Name
 16 Schedule p. 2 (1/4/91)

Element ID	Element Name	Requirement	Rank
18	Calico Mills characterization	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
		SCA, 3.2.1	1
20	Test requirements	10 CFR 60.74(a)	1
21	Main Test Level	SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 4.1 Obj. 1, 3rd bullet item h	1
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1
22	Exploratory footage	SCA, 3.2.1	1
		SCA, 3.2.1	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
23	Test plan	10 CFR 60.74(a)	1
25	Additional requirements for MWTRB/MRC/NV testing	10 CFR 60.137	2
		10 CFR 60.74(a)	1
		10 CFR 60.74(b)	1
		SCA, 3.2.1	1
		SCA, 3.2.1	1
		SCA, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2

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Diagram ID Diagram Name
 14 Schedule p. 2 (1/4/91)

Element ID	Element Name	Requirement	Rank
		SCA, Comment 72, Question 28	1
27	Construction and test sequencing	SCA, 4.1 Obj. 1, 3rd bullet, Item c	2

Diagram ID Diagram Name
 15 Probability of Early False Negative (8/14/90)

Element ID	Element Name	Requirement	Rank
2	Inaccurate models/analyses	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
3	Inaccurate data	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35 SCA, 4.1 Obj. 1, 3rd bullet Item e	1 2
4	Insufficient data	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
6	Inability to obtain data to refute erroneous observation and interpretation	10 CFR 60.15(c)(1) 10 CFR 60.74(a)	1 1
7	Non-representative data	SCA, 3.2.1	1
9	Inadequate amount of data	SCA, 3.2.1 SCA, Comment 72, Question 28	1 1
11	Inability to understand interference	10 CFR 60.15(c)(1)	1
12	Test interference	10 CFR 60.15(c)(1)	1

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Diagram ID Diagram Name
 15 Probability of Early False Negative (8/14/90)

Element ID	Element Name	Requirement	Rank
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
		SCA, 2.7, 3.7.1(2), 4.1 Obj. 1	2
		SCA, 4.1 Obj. 1, 3rd bullet Item e	2
		SCA, 4.1 Obj. 1, 3rd bullet Items f and g	1
		SCA, 4.1 Obj. 1, 3rd bullet, Item i	2
		SCA, Comment 123	2
		SCA, Question 55	2
		SCA, Question 60	2
13	Test to test	SCA, 4.1 Obj. 1, 3rd bullet Item e	1
		SCA, 4.1 Obj. 1, 3rd bullet, Item d	2
14	Adverse influence of construction on test	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
		BCAC4.17 7093 (b)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
16	Adverse construction sequencing	10 CFR 60.15(c)(4)	1
17	Construction method	10 CFR 60.21(c)(1)(i)(v)	2

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Diagram ID Diagram Name
 15 Probability of Early False Negative (8/14/90)

Element ID	Element Name	Requirement	Rank
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
		SCA, Comment 57	1
18	Inability to design or conduct engineered barrier system tests	10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
		10 CFR 60.15(c)(1)	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
19	Inability to design or conduct natural barrier tests	10 CFR 60.15(c)(1)	1
20	Inability to adequately characterize the Calico Hills unit	10 CFR 60.113(a)(2)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(4)	1
		10 CFR 60.74(a)	1
		SCA, 3.2.1	1
21	Location representativeness	10 CFR 60.15(c)(3)	1
22	Shaft versus ramp/number and location	10 CFR 60.133(e)(2)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.21(c)(1)(11)(D)	2
		30 CFR 57.11050	1
		BCAC4.20 8496 (1)	1

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Diagram ID Diagram Name
 15 Probability of Early False Negative (8/14/90)

Element ID	Element Name	Requirement	Rank
23	Repository horizon elevation	10 CFR 60.113(a)(2)	1
25	Poor timing of test	SCA, 4.1 Obj. 1, 3rd bullet, Item c	2
26	Inability to adequately characterize rock units above Calico Hills	10 CFR 60.74(a)	1
27	Option requires changing test configuration	10 CFR 60.15(c)(4)	1
28	Inadequate duration for early tests	SCA, Comment 119 SCA, Question 59	1 2

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Diagram ID Diagram Name
 16 Probability of Late False Negative-p. 1 (8/14/90)

Element ID	Element Name	Requirement	Rank
2	Inaccurate models/analyses	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
3	Inaccurate data	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35 SCA, 4.1, 3rd bullet Item e	1 2
4	Insufficient data	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35 SCA, Comment 72, Question 28	1 1
6	Inability to obtain data to refute erroneous observation and interpretation	10 CFR 60.15(c)(1) 10 CFR 60.74(a)	1 1

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Diagram ID Diagram Name
 16 Probability of Late False Negative-p. 1 (8/14/90)

Element ID	Element Name	Requirement	Rank
7	Non-representative data	SCA, 3.2.1	1
8	Inability to satisfy add. information needs beyond those obtained from 35 tests	10 CFR 60.15(c)(1) 10 CFR 60.74(a)	1 1
9	Inadequate amount of data	SCA, 3.2.1	1
11	Inability to understand interference	10 CFR 60.15(c)(1)	1
12	Test interference	10 CFR 60.15(c)(1) 10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3) 10 CFR 60.15(c)(4) BCAC4.17 7093 (b) BCAC4.17 7094 (a) BCAC4.17 7237 (c) (2) BCAC4.20 8438 (a) BCAC4.20 8458 (a) SCA, 2.7, 3.7.1(2), 4.1 Obj. 1 SCA, 4.1 Obj. 1, 3rd bullet, item i SCA, 4.1, 3rd bullet item e SCA, 4.1, 3rd bullet items f and g SCA, Comment 123 SCA, Question 55 SCA, Question 60	1 1 1 1 1 1 2 1 1 1 2 2 1 2 2 2
13	Test to test	SCA, 4.1 Obj. 1, 3rd bullet, item d SCA, 4.1, 3rd bullet item e	2 1

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Diagram ID Diagram Name
 16 Probability of Late False Negative-p. 1 (8/14/90)

Element ID	Element Name	Requirement	Rank
14	Adverse influence of construction on test	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
	BCAC4.20 8458 (a)	1	
16	Adverse construction sequencing	10 CFR 60.15(c)(4)	1
17	Construction method	10 CFR 60.21(c)(1)(11)(D)	2
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
		SCA, Comment 57	1
18	Inability to design or conduct engineered barrier system tests	10 CFR 60.135(a)(1)	2
		10 CFR 60.135(a)(2)	2
		10 CFR 60.15(c)(1)	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
19	Inability to design or conduct natural barrier tests	10 CFR 60.15(c)(1)	1

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Diagram ID Diagram Name
 16 Probability of Late False Negative-p. 1 (8/14/90)

Element ID	Element Name	Requirement	Rank
25	Poor timing of test	SCA, 4.1 Obj. 1, 3rd bullet, Item c	2
26	Insufficient ability to change and expand testing program	10 CFR 60.15(c)(1) 10 CFR 60.74(a)	1 1
27	Option requires changing test configuration	10 CFR 60.15(c)(4)	1

Diagram ID Diagram Name
 17 Probability of Late False Negative, p. 2 (8/14/90)

Element ID	Element Name	Requirement	Rank
20	Inability to adequately characterize the Calico Mills unit	10 CFR 60.113(a)(2) 10 CFR 60.15(c)(1) 10 CFR 60.15(c)(4) 10 CFR 60.74(a) SCA, 3.2.1	1 1 1 1 1
21	Location representativeness	SCA, 3.2.1	1
22	Shaft versus ramp/number and location	10 CFR 60.133(e)(2) 10 CFR 60.15(c)(1) 10 CFR 60.21(c)(1)(1)(D) 30 CFR 57.11050 BCAC4.20 8496 (i)	1 1 2 1 1
23	Repository horizon elevation	10 CFR 60.113(a)(2)	1

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Diagram ID Diagram Name
 17 Probability of Late False Negative, p. 2 (8/14/90)

Element ID	Element Name	Requirement	Rank
	duration of early tests		
		SCA, Comment 119	1
		SCA, Question 59	2

Diagram ID Diagram Name
 18 Probability of Early False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
2	Inaccurate models/analyses	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35 SCA, 3.2.1	1 1
3	Misjudged global characteristic	10 CFR 60.15(c)(2)	1
4	Missed adverse feature	10 CFR 60.122(a)(2) 10 CFR 60.15(c)(2) SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35 SCA, 3.2.1	2 1 1 1
5	Systematic biased data obscures problem	SCA, 4.1 Obj. 1, 3rd bullet items f and g SCA, Obj. 1, 3rd bullet item e	1 2
6	Non-representative data	10 CFR 60.15(c)(2) SCA, 3.2.1	1 1
7	Inadequate amount of data	10 CFR 60.15(c)(2) SCA, Comment 72, Question 28	1 1

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Diagram ID
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Diagram Name
Probability of Early False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
8	Inadequate spatial coverage of data	10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		SCA, 3.2.1	1
9	Experimental design error	SCA, 4.1 Obj. 1, 3rd bullet items f and g	1
		SCA, 4.1 Obj. 1, 3rd bullet, item c	2
		SCA, 4.1 Obj. 1, 3rd bullet, item d	2
10	Test interferences	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
		SCA, 2.7, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 4.1 Obj. 1, 3rd bullet, item i	2
		SCA, Comment 123	2
		SCA, Obj. 1, 3rd bullet item e	2
		SCA, Obj. 1, 3rd bullet items f and g	1
		SCA, Question 55	2
SCA, Question 60	2		
11	Precludes ability to do realistic tests	10 CFR 60.15(c)(1)	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
		SCA, Obj. 1, 3rd bullet item e	2

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Diagram ID Diagram Name
 18 Probability of Early False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
12	Construction method	10 CFR 60.15(c)(1)	1
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
		SCA, Comment 57	1
13	Inadequate physical space	10 CFR 60.15(c)(1)	1
		SCA, 2.7, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 4.1 Obj. 1, 3rd bullet item h	1
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1
14	Inability to design or conduct natural barrier tests	10 CFR 60.15(c)(1)	1
15	Shaft versus ramp/number and location	10 CFR 60.133(e)(2)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.21(c)(1)(i)(D)	2
		30 CFR 57.11050	1
		BCAC4.20 8496 (i)	1
16	Repository horizon elevation	10 CFR 60.113(e)(2)	1
17	Location representativeness	10 CFR 60.15(c)(3)	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA 3.2.1	1

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Diagram ID Diagram Name
 18 Probability of Early False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
18	Inability to adequately characterize the Calico Hills unit	10 CFR 60.113(a)(2)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
		SCA, 3.2.1	1
21	Drill and blast versus mechanical mining	10 CFR 60.15(c)(1)	1
		10 CFR 60.21(c)(1)(1)(D)	2
22	Inadequate duration for early tests	SCA, Comment 119	1
		SCA, Question 59	2

Diagram ID Diagram Name
 19 Probability of Late False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
2	Inaccurate models/analyses	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
3	Misjudged global characteristic	10 CFR 60.15(c)(2)	1
4	Missed adverse feature	10 CFR 60.122(a)(2)	2
		10 CFR 60.15(c)(2)	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
5	Systematic biased data obscures problem	SCA, 4.1 Obj. 1, 3rd bullet Item e	2

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Diagram ID Diagram Name
 19 Probability of Late False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
		SCA, 4.1 Obj. 1, 3rd bullet Items f and g	1
6	Non-representative data	10 CFR 60.15(c)(2) SCA, 3.2.1	1 1
7	Inadequate amount of data	10 CFR 60.15(c)(2) SCA, Comment 72, Question 28	1 1
8	Inadequate spatial coverage of data	10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3) SCA, 3.2.1	1 1 1
9	Experimental design error	SCA, 4.1 Obj. 1, 3rd bullet Items f and g SCA, 4.1 Obj. 1, 3rd bullet, Item c SCA, 4.1 Obj. 1, 3rd bullet, Item d	1 2 2
10	Test Interferences	10 CFR 60.15(c)(1) 10 CFR 60.15(c)(2) 10 CFR 60.15(c)(3) 10 CFR 60.15(c)(4) BCAC4.17 7093 (b) BCAC4.17 7094 (a) BCAC4.17 7237 (c) (2) BCAC4.20 8438 (a) BCAC4.20 8458 (a) SCA, 2.7, 3.7.1(2), 4.1 Obj. 1 SCA, 4.1 Obj. 1, 3rd bullet Item e SCA, 4.1 Obj. 1, 3rd bullet Items f and g	1 1 1 1 1 1 2 1 1 1 2 1 1

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Diagram ID Diagram Name
 19 Probability of Late False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
		SCA, 4.1 Obj. 1, 3rd bullet, Item i	2
		SCA, Comment 123	2
		SCA, Question 55	2
		SCA, Question 60	2
11	Precludes ability to do realistic tests	10 CFR 60.15(c)(1)	1
		10 CFR 60.74(a)	1
		SCA, 3.7.1(2), Comment 82, Question 58; 118	2
		SCA, 4.1 Obj. 1, 3rd bullet Item e	2
12	Construction method	10 CFR 60.15(c)(1)	1
		BCAC4.17 7093 (b)	1
		BCAC4.17 7094 (a)	1
		BCAC4.17 7237 (c) (2)	2
		BCAC4.20 8438 (a)	1
		BCAC4.20 8458 (a)	1
		SCA, Comment 57	1
13	Inadequate physical space	10 CFR 60.15(c)(1)	1
		SCA, 2.7, 3.7.1(2), 4.1 Obj. 1	1
		SCA, 4.1 Obj. 1, 3rd bullet Item h	1
		SCA, 4.1 Obj. 1, 3rd bullet Item f and g	1
14	Inability to design or conduct natural barrier tests	10 CFR 60.15(c)(1)	1
		10 CFR 60.74(a)	1
15	Shaft versus ramp/number and location	10 CFR 60.133(e)(2)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1

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Diagram ID
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Diagram Name
Probability of Late False Positive (8/14/90)

Element ID	Element Name	Requirement	Rank
		10 CFR 60.15(c)(3)	1
		10 CFR 60.21(c)(1)(1)(D)	2
		30 CFR 57.11050	1
		BCAC4.20 8496 (i)	1
16	Repository horizon elevation	10 CFR 60.113(a)(2)	1
17	Location representativeness	10 CFR 60.15(c)(3)	1
		SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
18	Inability to adequately characterize the Calico Hills unit	10 CFR 60.113(a)(2)	1
		10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(4)	1
		SCA, 3.2.1	1
21	Drill and blast versus mechanical mining	10 CFR 60.15(c)(1)	1
		10 CFR 60.21(c)(1)(1)(D)	2
22	Inadequate duration for late tests	SCA, Comment 119	1
		SCA, Question 59	2
24	Inability to adequately characterize the rock units above the Calico Hills	10 CFR 60.15(c)(2)	1

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Diagram ID Diagram Name
 20 Likelihood of Construction/Operation Approval (11/1/90)

Element ID	Element Name	Requirement	Rank
2	Technical confidence	SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35	1
		SCA, 3.2.1	1
		SCA, 3.7.1(2), Comment 82, Question 58, 118	2
		SCA, 4.1 Obj. 1, 3rd bullet item e	2
		SCA, 4.1 Obj. 1, 3rd bullet items f and g	1
3	Procedural confidence	DOE Order 5480.4 Sec. 4 Item c	1
		DOE Order 5480.4 Sec. 5	1
		NMPA Sec. 113(a)	1
15	Releases	10 CFR 60.112	1
		10 CFR 60.113(a)(1)	1
		40 CFR 191.13(a)	1
		40 CFR 191.15	1
		40 CFR 191.16	1
17	Option facilitates tests by NRC (10 CFR 60.74(e))	10 CFR 60.74(e)	1
19	Option promotes confidence for impl. of perf. conf. plan (10 CFR 60.140-143)	10 CFR 60.74(b)	1
		SCA, Comment 119	1
		SCA, Comment 72, Question 28	1
20	Option facilitates demonstration of compliance with (60.15(c)1-4)	10 CFR 60.15(c)(1)	1
		10 CFR 60.15(c)(2)	1
		10 CFR 60.15(c)(3)	1
		10 CFR 60.15(c)(4)	1

2C-34

DRAFT

ESF CROSSWALK

Diagram ID Diagram Name
 20 Likelihood of Construction/Operation Approval [11/1/90]

Element ID	Element Name	Requirement	Rank
21	Option facilitates comparative evaluation of alternatives (60.21(c)(1)(ii)(D))	10 CFR 60.21(c)(1)(ii)(D) SCA, Comment 132	2 2
22	Option facilitates compliance with [10 CFR 60.133] }	10 CFR 60.130 10 CFR 60.133(a)(1) 10 CFR 60.133(a)(2) 10 CFR 60.133(b) 10 CFR 60.133(e)(1) 10 CFR 60.133(e)(2) 10 CFR 60.133(f) 10 CFR 60.133(g) 10 CFR 60.133(h) 10 CFR 60.133(i)	2 1 2 1 2 1 1 1 1 2
24	Capability for extended-duration tests	10 CFR 60.74(b)	1
25	Option allows high-level waste test	SCA, 3.7.1(2), Comment 82, Question 58, 118	2

DRAFT

Diagram ID Diagram Name
 21 Likelihood of retrieval (8/2/90)

Element ID	Element Name	Requirement	Rank
2	Insufficient technical confidence	10 CFR 60.133(e)(1)	2
3	Insufficient procedural confidence	10 CFR 60.111(b)	2

2C-35

ESF CROSSWALK

Diagram ID
21

Diagram Name
Likelihood of retrieval (8/2/90)

Element ID Element Name

16 Option promotes insufficient conf. for Impl. of perf. conf. plan (60.140-143)

17 Option allows high-level waste test

18 Ramps versus shafts

21 Capability for extended-duration tests

Requirement

Rank

SCA, Comment 119
SCA, Comment 72, Question 28

1
1

SCA, 3.7.1(2), Comment 82, Question 58,
118

2

10 CFR 60.21(c)(1)(ii)(D)

2

SCA, Question 59

2

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2C-36

Diagram ID
22

Diagram Name
Probability of Programmatic Viability (8/28/90)

Element ID Element Name

15 Inufficient technical credibility

17 Unclear evidence of information gathering for

Requirement

Rank

SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35
SCA, 2.7, 3.7.1(2), 4.1 Obj. 1 3rd
bullet item a
SCA, 3.2.1
SCA, 3.7.1(2), Comment 82, Question 58,
118
SCA, 4.1 Obj. 1, 3rd bullet item e
SCA, 4.1 Obj. 1, 3rd bullet item h
SCA, 4.1 Obj. 1, 3rd bullet items f and
g

1
1
1
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1
1
1

SCA, 2.2.3, 3.7.1(2), 4.1, Comment 35

1

5. HANDOUT

5.3 10CFR60 LIST OF APPLICABLE REQUIREMENTS IN ESFDR (APPENDIX F1, F2, & F3)

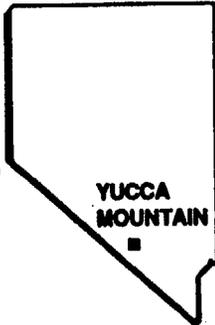
(CROSSWALK IS IN YOUR HANDOUT)

5.3 HANDOUT - LIST OF 10CFR60 REQUIREMENTS EXTRACT FROM APPENDIX F1 F2 AND F3 OF THE ESFDR

<u>10CFR60 Quote</u>	<u>Sections Not Quoted Verbatim</u>	<u>Sections Addressed During Title II</u>
10CFR60.15(b)	10CFR60.21	10CFR60.4
10CFR60.15(c)(1)	10CFR60.72	10CFR60.16
10CFR60.15(c)(2)	10CFR60.112	10CFR60.17
10CFR60.15(c)(3)	10CFR60.122	10CFR60.21
10CFR60.15(c)(4)	10CFR60.122(c)(1)	10CFR60.24(a)
10CFR60.74(a)	10CFR60.141 & 142	10CFR60.111(a)
10CFR60.74(b)		10CFR60.111(b)
10CFR60.130		10CFR60.112
10CFR60.131(b)(9)		10CFR60.113(a)
10CFR60.133(a)(1)		10CFR60.113(b)(2)
10CFR60.133(a)(2)		10CFR60.113(b)(3)
10CFR60.133(b)		10CFR60.113(b)(4)
10CFR60.133(d)		10CFR60.122
10CFR60.133(e)(2)		10CFR60.131(a)
10CFR60.133(f)		10CFR60.131(b)
10CFR60.133(i)		10CFR60.133(c)
10CFR60.134(a)		10CFR60.133(g)
10CFR60.134(a)(2)		10CFR60.133(h)
10CFR60.134(b)		10CFR60.140
10CFR60.137		10CFR60.141
		10CFR60.142
		10CFR60.143
		10CFR60.151
		10CFR60.152

U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN

SITE CHARACTERIZATION

PROJECT

DOE - NRC TECHNICAL EXCHANGE ON DESIGN CONTROL

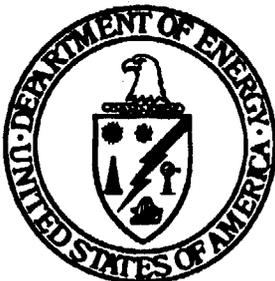
KEY POINTS OF SCA OBJECTION 1

PRESENTED BY

DAVID C. DOBSON

DIRECTOR,

REGULATORY AND SITE EVALUATION DIVISION



SEPTEMBER 16, 1991
WASHINGTON, D.C.

Attachment 6

DISCUSSION TOPICS

- **KEY POINTS OF OBJECTION 1**

- **CONSIDERATION OF 10 CFR 60 REQUIREMENTS**
- **INTEGRATION OF TECHNICAL DATA INTO DESIGN**
- **POTENTIAL FOR TEST INTERFERENCES**

- **NRC GUIDANCE ON REGULATORY CONSIDERATIONS IN ESF DESIGN AND CONSTRUCTION**

- **COORDINATION OF ESF/REPOSITORY DESIGNS**

CONSIDERATION OF 10 CFR 60 REQUIREMENTS

- **PAST ESF DESIGN ACTIVITIES (TITLE I, DAA) INCORPORATED 10 CFR 60 REQUIREMENTS (GENERIC REQUIREMENTS DOCUMENT APPENDIX E, TECHNICAL OVERSIGHT GROUP (TOG) REPORT)**
- **SCA COMMENT 128 IDENTIFIED 11 ADDITIONAL REQUIREMENTS TO BE CONSIDERED**

CONSIDERATION OF 10 CFR 60 REQUIREMENTS

(CONTINUED)

- **FEBRUARY 27, 1990 (LETTER, G. APPEL TO J. LINEHAN) - DOE PROVIDED RATIONALE FOR HOW THESE ADDITIONAL REQUIREMENTS ARE TO BE ADDRESSED AND COMMITTED TO CONSIDERING THEM IN FUTURE ESF DESIGN ACTIVITIES, STARTING WITH THE ESF ALTERNATIVES STUDY (INCORPORATED IN WMSR VOLUME IV)**
- **MAY 11, 1990 (LETTER, J. LINEHAN TO R. STEIN) - NRC CONCURRED WITH DOE'S RATIONALE**
- **ESF REQUIREMENTS DOCUMENTS HAVE BEEN REVISED TO REFLECT THESE REQUIREMENTS (ESFDR)**

CONSIDERATION OF 10 CFR 60 REQUIREMENTS

(CONTINUED)

- **CONSIDERATION OF 10 CFR 60.21(c)(1)(ii)(D):**
 - **ESF ALTERNATIVES STUDY EVALUATED 15 REPOSITORY CONFIGURATIONS (EMPHASIS ON HISTORICAL AS WELL AS NEW REPOSITORY CONCEPTS)**
 - **52 BASIC ESF CONFIGURATIONS WERE EVALUATED**
 - **MAJOR FEATURES OF DESIGNS, INCLUDING INTERFACES BETWEEN REPOSITORY AND ESF, WERE IDENTIFIED**
 - **DISCRIMINATING SUBSET OF REGULATORY REQUIREMENTS WERE USED TO DEVELOP BASIC REPOSITORY/ESF CONCEPTS**
 - **17/34 ALTERNATIVE REPOSITORY/ESF OPTIONS WERE DEVELOPED FOR DETAILED EVALUATION**

CONSIDERATION OF 10 CFR 60 REQUIREMENTS

(CONTINUED)

- VARIOUS FACTORS, INCLUDING WASTE ISOLATION, WERE CONSIDERED**
- AS A RESULT, FAVORABLE DESIGN FEATURES WERE IDENTIFIED**
- DOCUMENTED IN ESF ALTERNATIVES STUDY REPORT**
- MAJOR COMPARISONS WERE CONDUCTED IN ESFAS, BUT FURTHER EVALUATIONS ARE TO BE DONE DURING TITLE II DESIGN**

DISCUSSION TOPICS

- **KEY POINTS OF OBJECTION 1**

- **CONSIDERATION OF 10 CFR 60 REQUIREMENTS**
- **INTEGRATION OF TECHNICAL DATA INTO DESIGN**
- **POTENTIAL FOR TEST INTERFERENCES**

- **NRC GUIDANCE ON REGULATORY CONSIDERATIONS IN ESF DESIGN AND CONSTRUCTION**

- **COORDINATION OF ESF/REPOSITORY DESIGNS**

INTEGRATION OF TECHNICAL DATA INTO DESIGN

- **GENERAL PROCESS:**

- **SCP BASELINE IDENTIFIES NEEDED PROGRAM ACTIVITIES**
- **PROGRAM ACTIVITIES PRODUCE TECHNICAL DATA WHICH ARE INCORPORATED IN THE TECHNICAL BASELINE**
- **A/E OBTAINS NEEDED DATA FROM THE TECHNICAL BASELINE (RIB AND TECHNICAL REPORTS), DEFINES WHAT DATA IT WILL USE IN BASIS FOR DESIGN DOCUMENT**

- **EXAMPLES:**

- **CONCERN THAT GEOPHYSICAL ANOMALY NEAR ES-1, ES-2 WAS NOT CONSIDERED**
- **IMPLEMENTATION OF DAA RECOMMENDATIONS IN ESF DESIGN**

INTEGRATION OF TECHNICAL DATA INTO DESIGN: EXAMPLES

- **EXAMPLE: CONCERN THAT GEOPHYSICAL ANOMALY NEAR ES-1, ES-2 WAS NOT CONSIDERED**
 - **TECHNICAL ASSESSMENT REVIEW WAS PERFORMED PER QMP 02-08; RECOMMENDATIONS WERE ENTERED INTO COMMITMENT ACTION RESPONSE SYSTEM, TRACKED AND CONTROLLED PER AP 1.14**
 - **ANY CHANGES TO SCP TECHNICAL BASELINE RESULTING FROM RECOMMENDATIONS ARE CONTROLLED BY AP 3.3Q, e.g., SOIL AND ROCK PROPERTIES STUDY PLAN WILL PRODUCE RELATED DATA FOR USE BY A/E IN SITING ANALYSIS REPORT**
 - **TAR RECOMMENDATIONS WERE ALSO ENTERED INTO ESFDR AS REQUIREMENTS, AS APPROPRIATE (e.g., REQUIREMENTS TO ALLOW GEOLOGIC MAPPING AT PAD EXCAVATIONS.)**

INTEGRATION OF TECHNICAL DATA INTO DESIGN: EXAMPLES

- **EXAMPLE: DAA PRODUCED RECOMMENDATIONS WHICH MUST BE FACTORED INTO ESF DESIGN**
 - **DAA RECOMMENDATIONS REGARDING REQUIREMENTS HAVE BEEN INCORPORATED INTO ESFDR AND ASSIGNED VIA RESPONSIBILITY MATRIX TO VARIOUS PARTICIPANTS**
 - **RESPONSIBLE PARTICIPANT MUST:**
 - * **TRACK RECOMMENDATION AS DESIGN INPUT**
 - * **ADDRESS/ANALYZE RECOMMENDATION DURING DESIGN**
 - **DESIGN REVIEWS WILL VERIFY COMPLIANCE WITH REQUIREMENTS**

DISCUSSION TOPICS

- **KEY POINTS OF OBJECTION 1**
 - **CONSIDERATION OF 10 CFR 60 REQUIREMENTS**
 - **INTEGRATION OF TECHNICAL DATA INTO DESIGN**
 - **POTENTIAL FOR TEST INTERFERENCES**

- **NRC GUIDANCE ON REGULATORY CONSIDERATIONS IN ESF DESIGN AND CONSTRUCTION**
 - **COORDINATION OF ESF/REPOSITORY DESIGNS**

POTENTIAL FOR TEST INTERFERENCES

- TEST INTERFERENCE ANALYSIS WAS PERFORMED FOR SCP ESF DESIGN IN SCP 8.4
- ESF ALTERNATIVES STUDY USED TEST INTERFERENCE AS A MAJOR CRITERION FOR EVALUATING OPTIONS. THE STUDY PRODUCED A RECOMMENDED CONFIGURATION WITH LARGER CORE TEST AREA
- TEST AND EVALUATION PLAN GOVERNS PLANNING, IMPLEMENTATION, ANALYSIS OF TESTS. TEST INTERFERENCES ARE SPECIFICALLY ADDRESSED
 - AP 5.32Q (TEST PLANNING AND IMPLEMENTATION) IMPLEMENTS THE TEST AND EVALUATION PLAN.

POTENTIAL FOR TEST INTERFERENCES

(CONTINUED)

- **NRC CONCERNS ON TEST INTERFERENCE ARE ADDRESSED VIA AP 1.14. SCP TECHNICAL SCOPE IS CHANGED AS REQUIRED. STUDY PLANS WHICH IMPLEMENT TECHNICAL SCOPE ARE MODIFIED VIA AP 1.10Q**
- **REVISED ESF TITLE I DESIGN SUMMARY REPORT WILL DESCRIBE THE CURRENT DESIGN/TEST LAYOUT**
- **DURING TITLE II DESIGN, DOE WILL RE-EVALUATE CORE TEST AREA FOR TEST INTERFERENCE POTENTIAL**

DISCUSSION TOPICS

- **KEY POINTS OF OBJECTION 1**

- **CONSIDERATION OF 10 CFR 60 REQUIREMENTS**
- **INTEGRATION OF TECHNICAL DATA INTO DESIGN**
- **POTENTIAL FOR TEST INTERFERENCES**

- **NRC GUIDANCE ON REGULATORY CONSIDERATIONS IN ESF DESIGN AND CONSTRUCTION**

- **COORDINATION OF ESF/REPOSITORY DESIGNS**

NRC GUIDANCE

(NUREG - 1439)

- **NRC STAFF TECHNICAL POSITION ADDRESSED:**
 - **APPROACH FOR COMPLIANCE WITH 10 CFR PART 60 REQUIREMENTS**
 - * **ADDRESSED BY INCORPORATION OF ALL APPLICABLE PART 60 REQUIREMENTS IN REQUIREMENTS DOCUMENTS**
 - **QUALITY ASSURANCE**
 - * **ADDRESSED THROUGH NRC ACCEPTANCE OF QA PROGRAMS AND OBSERVATION OF AUDITS**
 - **PLANNING AND COORDINATION OF THE ESF DESIGN AND CONSTRUCTION WITH THE GROA DESIGN**
 - * **ADDRESSED IN ESFAS, REVISED TITLE I DESIGN STUDY, AND WILL CONTINUE TO BE ADDRESSED DURING TITLE II DESIGN**
 - **CONSIDERATION OF ALTERNATIVES FOR DESIGN FEATURES**
 - * **ADDRESSED IN ESFAS, REVISED TITLE I DESIGN STUDY, AND WILL CONTINUE TO BE ADDRESSED DURING TITLE II DESIGN**

NRC GUIDANCE

(NUREG - 1439)

(CONTINUED)

● NRC STAFF TECHNICAL POSITION ADDRESSED:

(CONTINUED)

- EXCAVATION METHODS

- * ADDRESSED IN ESFAS, REVISED TITLE I DESIGN STUDY, AND WILL CONTINUE TO BE ADDRESSED DURING TITLE II DESIGN**

- TEST INTERFERENCE

- * ADDITIONAL ANALYSES WERE CONDUCTED DURING THE REVISED TITLE I DESIGN STUDY AND WILL BE CONDUCTED DURING TITLE II DESIGN**
- * TESTING PROGRAM DESCRIBED IN SCPB WILL BE REVISED, AS APPROPRIATE**

- ESTABLISHMENT OF RANGES OF SITE PARAMETERS

- * AMOUNT OF DRIFTING HAS BEEN INCREASED TO OBTAIN MORE REPRESENTATIVE DATA**
- * TESTING PROGRAM DESCRIBED IN SCPB WILL BE REVISED, AS APPROPRIATE**

● DOE DESIGN ACTIVITIES ARE CONSISTENT WITH THE INTENT OF THE NRC STAFF GUIDANCE

COORDINATION OF ESF/REPOSITORY DESIGN

- **BECAUSE OF CHANGES RESULTING FROM THE ESFAS AND THE ESF DESIGN STUDY, CHANGES TO THE REFERENCE REPOSITORY DESIGN ARE PLANNED**
- **CONFIGURATION TO BE UPDATED TO REFLECT**
 - **CHANGES IN REPOSITORY FEATURES**
 - **CHANGES IN CONSTRUCTION METHOD**
 - **REVISED INTERFACES**

COORDINATION OF ESF/REPOSITORY DESIGN

(CONTINUED)

- **OTHER AFFECTED DOCUMENTS (e.g., SCPB) WILL BE UPDATED, AS APPROPRIATE**

- **TITLE II ESF INTERFACE DEFINITION REQUIRES SUPPORTING REPOSITORY DESIGN STUDIES (e.g., ISOLATION/CONTAINMENT IMPACT ASSESSMENTS)**

SUMMARY

- **DOE HAS PROVIDED THE BASIS FOR RESOLUTION OF OBJECTION 1 REGARDING THE DESIGN PROCESS**

- **DOE HAS ADDRESSED THE SPECIFIC KEY CONCERNS IDENTIFIED IN OBJECTION 1**
 - **THE AGREED-UPON SET OF 10 CFR 60 REQUIREMENTS ARE BEING ADEQUATELY CONSIDERED IN ESF DESIGN**

 - **A WORKABLE PROCESS EXISTS FOR THE INTEGRATION OF TECHNICAL DATA INTO DESIGN**

 - **POTENTIAL FOR TEST INTERFERENCES ARE BEING PROPERLY EVALUATED AND CONTROLLED**

SUMMARY

(CONTINUED)

- **DOE HAS IDENTIFIED SPECIFIC ACTIONS TO BE TAKEN AS ESF DESIGN CONTINUES**
 - **UPDATE REPOSITORY CONFIGURATION**
 - **CONDUCT ADDITIONAL REPOSITORY DESIGN STUDIES**

- **THE ABOVE ACTIONS ADDRESS NRC CONCERNS NOTED IN THE STAFF TECHNICAL POSITION REGARDING COORDINATION OF ESF/REPOSITORY DESIGN**

CONCLUSION

- **ADEQUATE DESIGN CONTROL PROCESS IS IN PLACE (MEETS QA REQUIREMENTS)**
- **DOE READY TO PROCEED WITH TITLE II DESIGN**
- **DOE BELIEVES IT HAS RESOLVED NRC OBJECTION 1 REGARDING THE DESIGN CONTROL PROCESS**
- **DOE WILL CONTINUE TO ADDRESS NRC's SPECIFIC SCA CONCERNS DURING TITLE II DESIGN**
- **DURING TITLE II PROCESS, NRC TO BE GIVEN AMPLE OPPORTUNITY TO INTERACT AND PROVIDE COMMENTS AND OBSERVATIONS**

U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN

SITE CHARACTERIZATION

PROJECT

DOE - NRC TECHNICAL EXCHANGE ON DESIGN CONTROL

PROJECT STATUS

PRESENTED BY

CARL P. GERTZ

**ASSOCIATE DIRECTOR,
OFFICE OF GEOLOGIC DISPOSAL**



SEPTEMBER 16, 1991
WASHINGTON, D.C.

Attachment 7

AGENDA

I. INTRODUCTION AND OPENING REMARKS

DOE, NRC,
STATE

II. PROJECT STATUS

C. GERTZ

III. ESF DESIGN, PROCESS, AND CONTROL

A. OVERVIEW

M. BLANCHARD

B. TITLE I DESIGN STUDY

T. PETRIE

C. TITLE II DESIGN

T. PETRIE

D. KEY POINTS OF SCA OBJECTION I

D. DOBSON

IV. SUMMARY REMARKS

NRC, STATE,
DOE

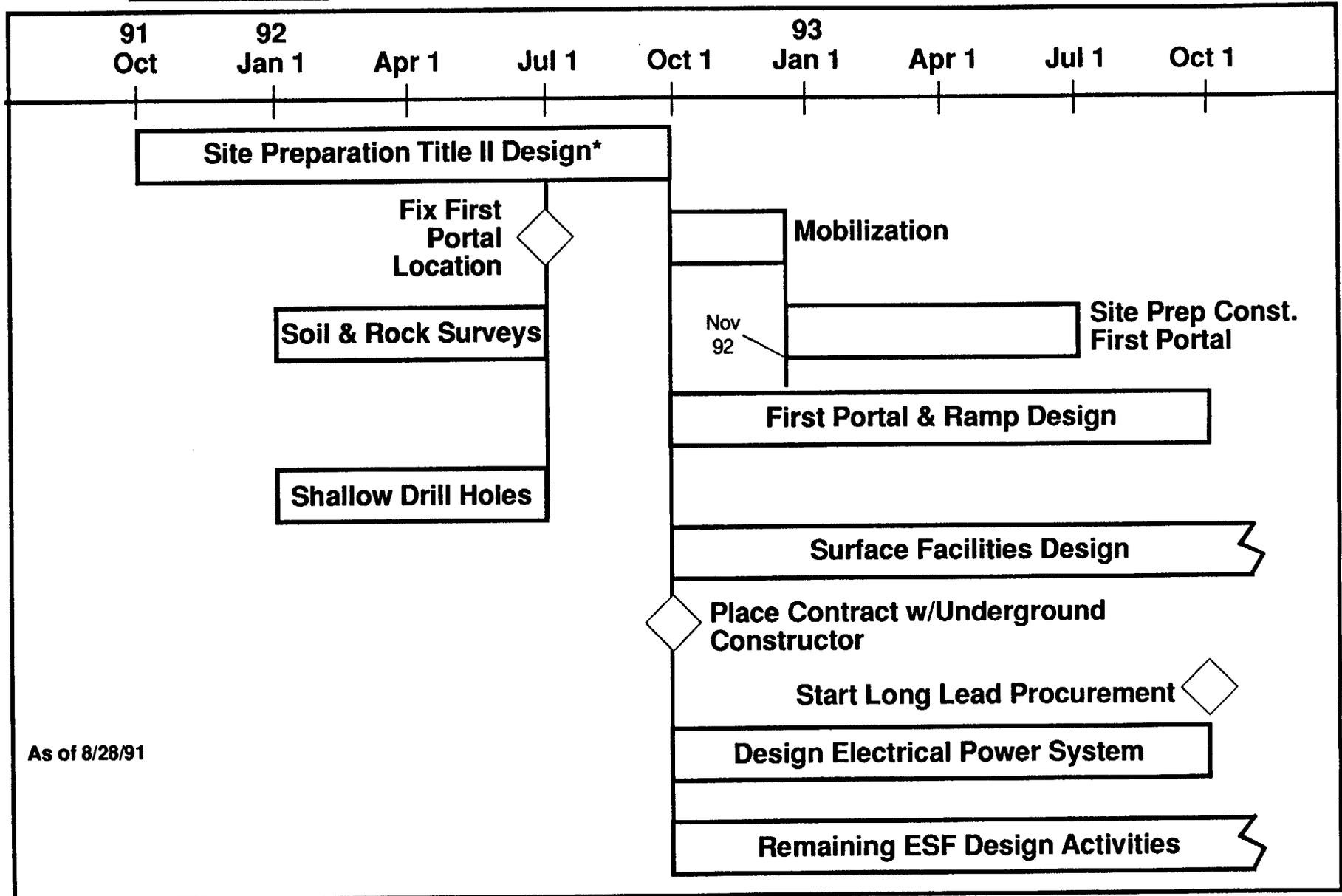
OBJECTIVE

**PROVIDE BASIS FOR RESOLUTION OF NRC
CONCERN WITH ESF DESIGN PROCESS AND ITS
CONTROL**

ESF MISSION

PROVIDE ACCESS TO GEOLOGIC HORIZONS AT YUCCA MOUNTAIN, SO TESTS CAN BE CARRIED OUT IN THE "UNDERGROUND LABORATORY" TO PROVIDE DATA TO EVALUATE THE SUITABILITY OF THE GEOLOGIC BARRIERS TO ISOLATE WASTE FROM THE ACCESSIBLE ENVIRONMENT AND OBTAIN INFORMATION FOR THE DESIGN OF A POTENTIAL REPOSITORY

PROPOSED ESF DESIGN/CONSTRUCTION ACTIVITIES FY92 & 93

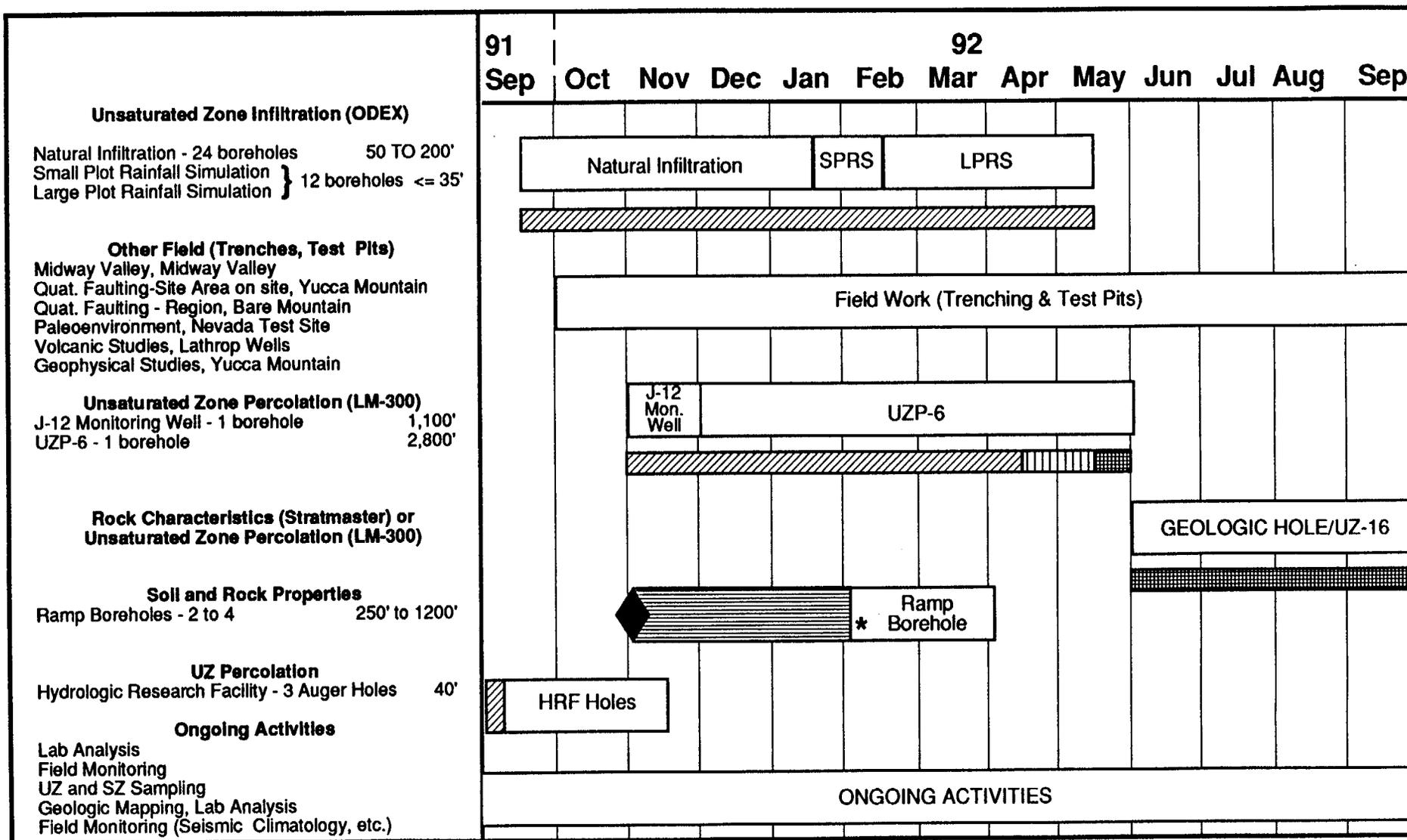


* INCLUDES

- PORTAL DESIGN SUFFICIENT FOR BLASTING
- AREA DESIGN SUFFICIENT FOR BLASTING AND SITE
- GRADING
- TOPSOIL AND SUBSOIL STORAGE

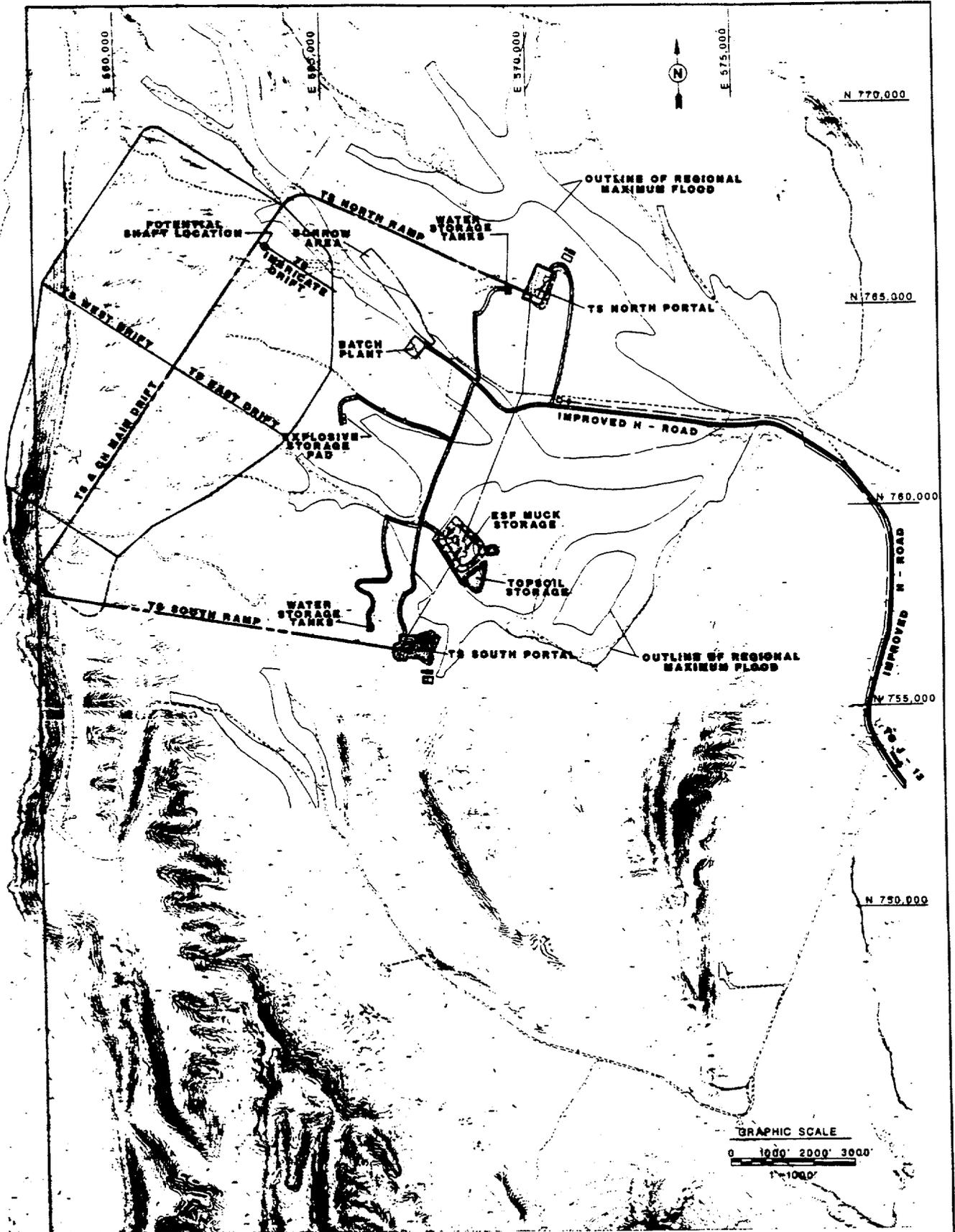
- WASTE WATER DISPOSAL
- POTABLE AND INDUSTRIAL WATER DISTRIBUTION
- ELECTRICAL SUBSTATION ENVELOPE
- FACILITY LAYOUTS
- BUILDING ENVELOPES

PROPOSED FY92 SURFACE DISTURBING ACTIVITIES



RIG WORK SCHEDULE





EXPLORATORY STUDIES FACILITY
Proposed - General Arrangement

EXTENSIVE MANAGEMENT AND INDEPENDENT REVIEWS OF THE ESF TITLE I DESIGN WERE PERFORMED, USING REVIEWERS AND OBSERVERS FROM THE FOLLOWING ORGANIZATIONS

● OVERALL REVIEW PERIOD

- JUNE 3, 1991 THROUGH AUGUST 19, 1991

● ORGANIZATIONS PROVIDING INDEPENDENT REVIEWERS

- RAYTHEON SERVICES OF NEVADA
- SANDIA NATIONAL LABORATORY
- LOS ALAMOS NATIONAL LABORATORY
- REYNOLDS ELECTRIC & ENGINEERING CO.
- SCIENCE APPLICATIONS INTERNATIONAL CORP.
- NUCLEAR WASTE MANAGEMENT SYSTEMS -
MANAGEMENT AND OPERATIONS
- DEPARTMENT OF ENERGY -
PROJECT QUALITY ASSURANCE

TOTAL NUMBER OF REVIEWERS - 70

● ORGANIZATIONS PROVIDING OBSERVERS

- DEPARTMENT OF ENERGY -
 - * YUCCA MOUNTAIN PROJECT OFFICE
 - * OFFICE OF CIVILIAN RADIOACTIVE
WASTE MANAGEMENT
 - * NEVADA TEST SITE OPERATIONS
- MINE SAFETY AND HEALTH
ADMINISTRATION
- U.S. BUREAU OF MINES
- MINERAL COUNTY, NV
- ESMERALDA COUNTY, NV
- WESTON
- STATE OF NEVADA
- NUCLEAR REGULATORY COMMISSION
- NUCLEAR WASTE TECHNICAL REVIEW BOARD

**FOR ALL REVIEWS A TOTAL OF 1,779
COMMENTS WERE SUBMITTED
FOR RESOLUTION**

FOCUS OF COMMENTS

DESIGN SUMMARY REPORT - 536

DRAWINGS - 764

SPECIFICATIONS - 101

DESIGN STUDIES - 324

COMPLETE ESF TITLE I DESIGN PACKAGE INCLUDES

NORTH AREA

90 DRAWINGS

SOUTH AREA

111 DRAWINGS

DESIGN TRADE STUDIES

10 FOR NORTH AREA

9 FOR SOUTH AREA

103 OUTLINE SPECIFICATIONS

6 ESF/REPOSITORY INTERFACE DRAWINGS

SUMMARY

- **ADEQUATE DESIGN CONTROL PROCESS IS IN PLACE (MEETS QA REQUIREMENTS)**
 - **APPROACH FOR COMPLIANCE WITH 10 CFR PART 60 REQUIREMENTS**
 - **QA**
 - **PLANNING AND COORDINATION OF THE ESF DESIGN AND CONSTRUCTION WITH THE GROA DESIGN**
 - **CONSIDERATION OF ALTERNATIVES FOR DESIGN FEATURES**
 - **EXCAVATION METHODS**
 - **TEST INTERFERENCE**
 - **ESTABLISHMENT OF RANGES OF SITE PARAMETERS**

- **DOE READY TO PROCEED WITH TITLE II DESIGN**

SUMMARY

(CONTINUED)

- **DOE BELIEVES IT HAS RESOLVED NRC OBJECTION 1 REGARDING THE DESIGN CONTROL PROCESS**
- **DOE WILL CONTINUE TO ADDRESS NRC'S SPECIFIC SCA CONCERNS DURING TITLE II DESIGN**
- **DURING TITLE II PROCESS, NRC TO BE GIVEN AMPLE OPPORTUNITY TO INTERACT AND PROVIDE COMMENTS AND OBSERVATIONS**