U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING

SUBJECT: EXPLORATORY STUDIES FACILITY (ESF) UPDATE AND PLANS FOR FY93

PRESENTER: DR. WILLIAM SIMECKA

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DALLAS, TX
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Discussion Topics:

- ESF mission, constraints/requirements
- Review of ESF Title I design
- Review of in-process design changes
- Status of NWTRB recommendations relating to the ESF
- Potential impact of thermal loading on ESF design
- ESF activities during FY92
- ESF activities planned during FY93
- Planned repository activities
- FY92-93 ESF design transition, RSN to M&O
- ESF excavation procurement
- CSM TBM-related research

ESF MISSION, CONSTRAINTS/REQUIREMENTS

ESF Mission is to Provide Access to Geologic Horizons

- Enable testing in "Underground Laboratory"
- Provide in situ data to evaluate geologic barriers
- Obtain information for potential repository design

ESF Constraints/Requirements

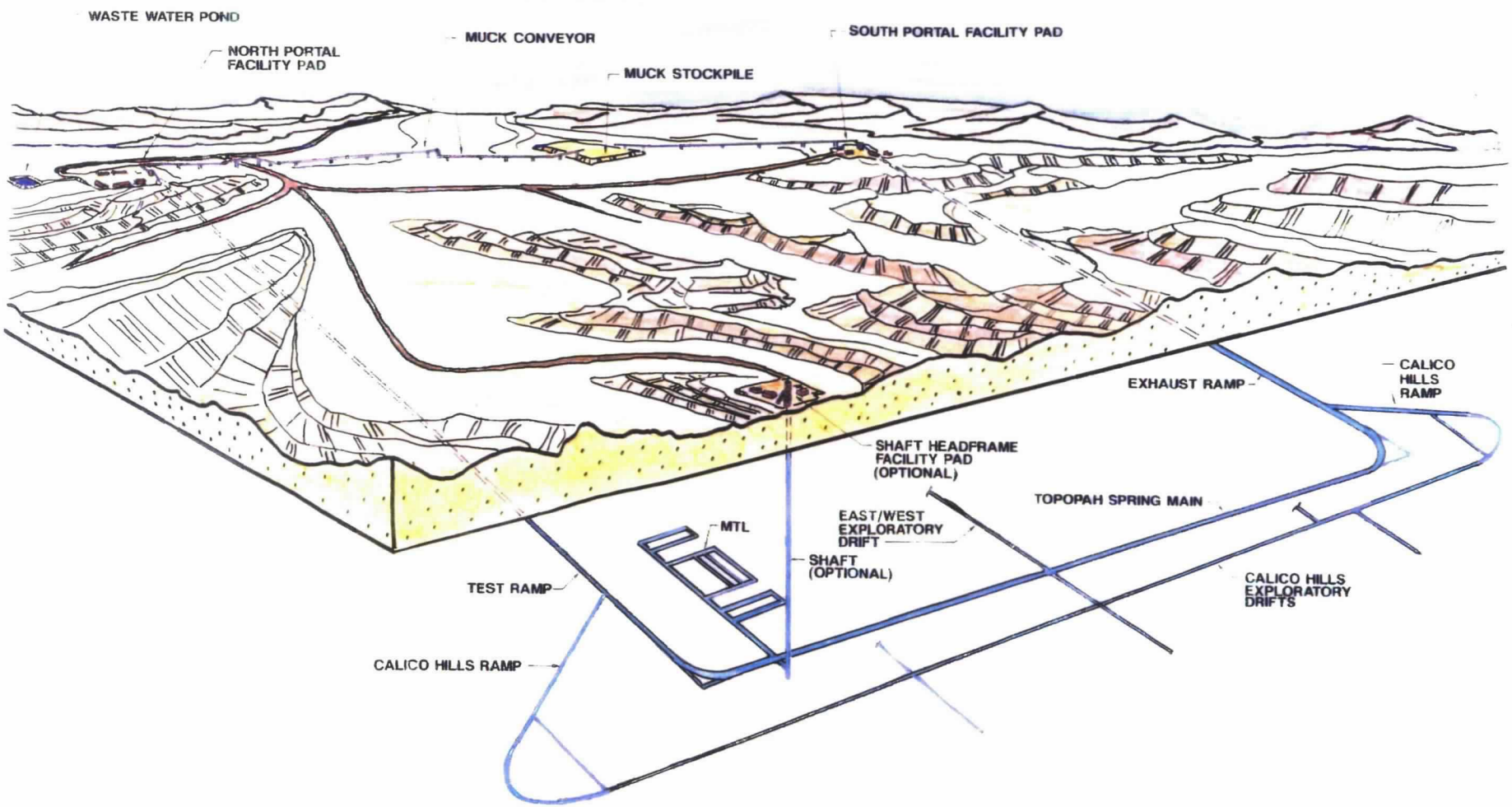
- Should not compromise waste isolation capability of the site
- Those areas of the ESF that would become part of the potential repository must be designed and constructed to repository standards
- Must facilitate the acquisition of adequate data for site characterization and design
- The number of exploratory boreholes and shafts (ramps) in the Geologic Repository Operations Area (GROA) should be limited to the extent practicable

ESF/Repository Interfaces

Major physical interfaces:

- ESF ramps would become potential repository main accesses
- ESF main TS drift would become one of the potential repository's main drifts
- Ground control measures installed in ESF would remain in place, or would be removed/maintained, if repository is built

REVIEW OF ESF TITLE I DESIGN



ESF PRELIMINARY DESIGN

Extent of Drifting

AREA	LINEAL FEET
TS NORTH RAMP	6,480
TS SOUTH RAMP	9,140
TS MAIN DRIFT	10,650
SUBTOTAL	26,270
CH NORTH RAMP	5,250
CH SOUTH RAMP	7,450
CH MAIN DRIFT	11,370
SUBTOTAL	24,070
TS IMBRICATE DRIFT	2,250
TS EAST DRIFT	3,220
TS WEST DRIFT	3,800
TS MAIN TEST AREA	9,350
SUBTOTAL	18,620
CH IMBRICATE DRIFT	2,160
CH WEST GHOST DANCE DRIFT	1,080
CH EAST GHOST DANCE DRIFT	1,520
CH SOLITARIO DRIFT	2,210
SUBTOTAL	6,970
TOTAL	75,930 (14.4 MILES)

Excavation

	Preliminary Diameters*
Ramps from surface to TS level	- 25' dia TBM
Calico Hills ramps	- 18' dia TBM
Main drifting, TS	- 25' dia TBM
Main drifting, CH	- 18' dia TBM
Other drifting, MTL, alcoves	- Varies

*Ramp sizing study in late FY92

REVIEW OF IN-PROCESS DESIGN CHANGES

Design Changes from Title I to Title II

Radius of curvature in north ramp to TS increased to 1000 ft.

- **Eliminates need for tangential conveyor drifts**
- **Will allow more workable conveyor arrangement at north ramp surface area**

Elevation of north end of potential repository horizon raised 140 ft

- **Lessens gradient of both the north ramp and the main north-south drift**

STATUS OF NWTRB RECOMMENDATIONS RELATING TO THE ESF

The Board's five ESF concerns, as related in the September 1991 Board Meeting, can be grouped under two headings:

- Ramp sizing
- Access to geologic features

NWTRB Recommendation:

Smaller-diameter tunnels (16 to 20 ft) with subsequent enlargement

Response:

A ramp/main drift sizing study is scheduled for July-September of this year. RSN will be the lead participant with support from the CRWMS/M&O

NWTRB Recommendation:

Provide for early access to important geologic features including the Calico Hills unit and the Ghost Dance Fault

Response:

The DOE is considering a development sequence for the ESF that will provide a balance between early access to MTL and to important geologic features including Calico Hills

Proposed Development Sequence:

- Use of four TBMs
- North ramp excavation will proceed uninterrupted from the surface to Topopah Spring level, past MTL location, and through Ghost Dance Fault. Ghost Dance Fault could be crossed approximately 21 weeks after start of TBM operations at the north portal.
- South ramp will be excavated just beyond the Calico Hills turnout. CH ramp then will be started and driven down to CH unit. After the CH ramp has been started, the South TS TBM will continue towards the breakthrough point in the TS formation.

POTENTIAL IMPACT OF THERMAL LOADING ON ESF DESIGN

Thermal-Mechanical Analyses

- Sandia National Laboratories (SNL) has recently completed preliminary far-field thermal-mechanical analysis of ESF drifts as a part of the potential repository

- The SNL thermal-mechanical report is currently being prepared

- The ESF A/E will use the results of this study during design of ESF subsurface openings scheduled for FY93 and FY94

Preliminary Results from the Far-Field Thermal-Mechanical Analysis Include:

Preclosure period:

North ramp curve--change in normal stress

horizontal: 0 to 2 MPa*
vertical: 0 to -1 MPa
peak temperature (no ventilation) ~ 79°F

Main access drift--change in normal stress

horizontal: 0 to 3 MPa
vertical: 0 to -4 MPa
peak temperature (no ventilation) ~ 92°F

East-west exploratory drift--change in normal stress

horizontal: 0 to 10 MPa
vertical: 1 to -4 MPa
peak temperature (no ventilation) ~ 172°F

* Unconfined compressive strength of intact TSW2 approximately 155 MPa

Preliminary results

(Continued)

Postclosure period:

North ramp curve--change in normal stress

horizontal:	1 to 2 MPa*
vertical:	0 to -1 MPa
peak temperature	~ 93°F

Main access drift--change in normal stress

horizontal:	0 to 5 MPa
vertical:	0 to -4 MPa
peak temperature	~ 147°F

East-west exploratory drift--change in normal stress

horizontal:	0 to 10 MPa
vertical:	1 to -4 MPa
peak temperature	~ 197°F

ESF ACTIVITIES DURING FY92

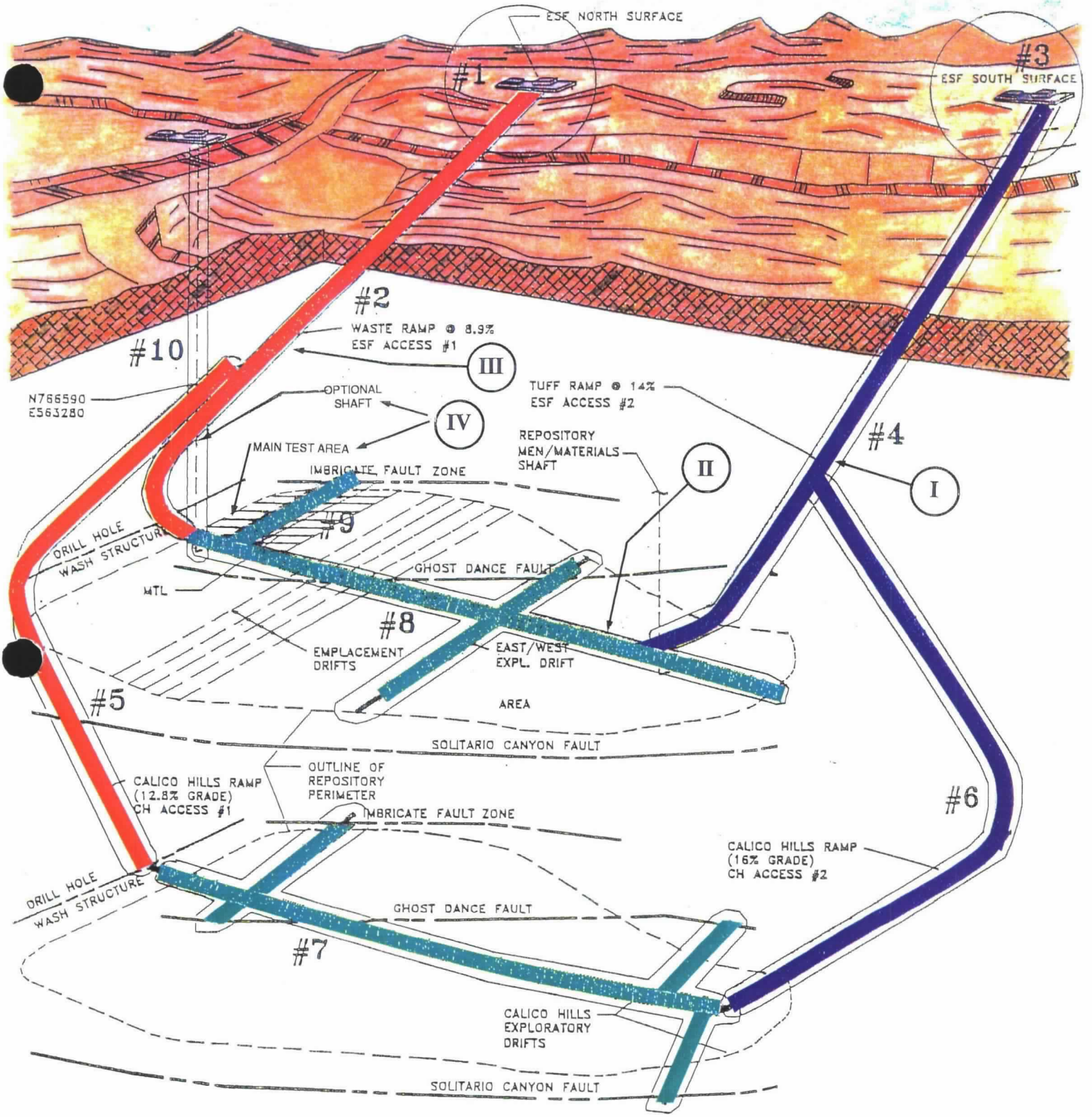
ESF Work Scope Summary, FY92

FY92 prepare for ESF construction (first access site preparation)

- Design first access site preparation package (design package 1A)
- Several key plans prepared (operations, maintenance, construction management, etc.)
- Determine seismic design criteria for ESF permanent potential repository structures

ESF Design Effort is Arranged in 10 Design Packages

1. North portal site prep and surface facilities
2. North ramp, surface to TS
3. South portal site prep and surface facilities
4. South ramp, surface to TS
5. North ramp to CH
6. South ramp to CH
7. CH drifting
8. TS drifting
9. MTL
10. Optional shaft



NOTE: THIS IS PICTORIAL ONLY AND NOT DRAWN TO SCALE

NOTE: DESIGN, CONSTRUCTION, AND TESTING PHASES SHOWN --- (#2)

ESF Arrangement

FY92 Funding Constraints Required that Package 1 be Split

- Package 1A: North portal site prep
  - Currently being designed
- Package 1B: North portal surface facilities
  - Scheduled to start October 1, 1992

Package 1A Contains Design of

- North portal access road
- North portal pad
- North ramp highwall and TBM launching chamber
- Pad electrical and water systems

ESF ACTIVITIES DURING FY93

ESF Work Scope Summary, FY93

FY93 Continue ESF Title II design and begin construction

- Complete ESF Title II Designs for first access (buildings/ surface facilities/utilities)(Package 1B)
- Initiate Title II design for second access site preparation (Package 3A)
- Initiate Title II design for first access ramp (Package 2)
- Start surface facilities construction
- Perform site preparation and highwall blasting at north portal

PLANNED REPOSITORY ACTIVITIES

Several Pre-ACD Studies Planned for Late FY92

- Ramp sizing study
- Waste emplacment mode study
- Repository horizon/gradient study

Repository Advanced Conceptual Design

- Scheduled to begin 1 OCT 92
- Early design studies to include
  - Repository/ESF/surface -based testing interface identification
  - Evaluation of ESF design details
  - Hot vs. cold repository
  - Co-located vs. separated waste handling building and repository portal
  - Evaluation of retrieval scenarios

FY92 - 93 ESF DESIGN TRANSITION
RSN TO M&O

M&O Transition Plan

- Establish core design team
- Become familiar with existing Title I and Title II design, SBT, and repository interfaces
- Continue work on basis for design and requirements
- Complete FY93 Engineering Plan
- Complete design procedures
- Train core team
- Hire staff
- Conduct design readiness review

ESF EXCAVATION PROCUREMENT

Procurement Strategies for ESF Excavation

- A single contractor will be responsible for underground excavation
- This contractor will report to the general contractor (REECo)
- Mechanical excavation equipment procurement options:
  - Government-furnished equipment
  - Subcontractor-procured equipment
  - Subcontractor-furnished existing equipment

The 10 February '92 CBD announcement does not preclude any of these options

The Role of Morrison-Knudsen:

- ESF subsurface designer as of 1 Oct 92
- Construction management support for YMP field construction activities
- Repository subsurface designer

COLORADO SCHOOL OF MINES
TBM-RELATED RESEARCH

CSM Subcontract Work

- Development of TBM specifications
- Determination of physical properties of welded tuffs
- Prediction of mechanical excavator performance
- Laboratory testing of coring and reaming bits