MINUTES OF THE JUNE 3, 1996
U.S. NUCLEAR REGULATORY COMMISSION/U.S. DEPARTMENT OF ENERGY
TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

On June 3, 1996, staff from the U.S. Nuclear Regulatory Commission met with staff from the U.S. Department of Energy (DOE) to discuss items of mutual interest regarding progress at DOE's Exploratory Studies Facility (ESF) at Yucca Mountain and technical issues related to repository design. The items discussed included the design of the planned heater test; fracture and fault data; DOE's response to NRC's letter of December 14, 1995; and DOE's proposed "binning system." The meeting was held by four-way videoconference at DOE offices in Washington, D.C.; DOE offices in Las Vegas, Nevada; NRC offices in Rockville, Maryland; and Center for Nuclear Waste Regulatory Analyses (CNWRA) offices in San Antonio, Texas. The meeting was another of the continuing series of quarterly ESF technical meetings. Although the meeting was scheduled to begin at 12:30 p.m. Eastern Daylight Time (EDT), it did not start until after 1:15 because of difficulties in establishing the proper video interfaces.

Attachment 1, the meeting agenda, was included with the meeting announcement and also made available at the meeting. It was noted during the opening remarks that notes on an earlier agenda (Attachment 2) were inadvertently omitted from the final version of the agenda.

Organizations other than NRC and DOE that were represented at the meeting were the CNWRA; the Nuclear Energy Institute (NEI); the State of Nevada Nuclear Waste Project Office (NWPO); the State of Nevada Nuclear Waste Task Force (NWTF); Clark County, Nevada; Nye County, Nevada; U.S. Geological Survey (USGS); DOE's Management and Operating Contractor (M&O); DOE's Quality Assurance Technical Support Services (QATSS); and Weston. Attachment 3 is a list of those who were at the meeting.

The first presentation was made by the M&O. It covered the ESF thermal tests, and Attachment 4 provides the handouts/overheads that were used during this presentation. The planned tests include a single heater test - scheduled to start in August 1996 - and a drift scale test - scheduled to start in September 1997. While the information provided allows the NRC staff to progress toward resolution of whether or not the thermal test program will provide sufficient information to support a license application for a construction authorization at Yucca Mountain, DOE indicated that the test design report will not be available to the NRC until August 1996, shortly before test initiation. It was also noted that the schedule will not produce

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test data from the drift scale heater test in time for use in DOE's viability assessment.

DOE then described the goals and status of its fracture and fault data studies that are ongoing in the ESF. Attachment 5 includes the handouts/overheads that were used during this part of the meeting. ESF mapping was reported to be complete up to station 52+37, about 300 meters behind the tunnel boring machine. This includes full periphery mapping, detailed line survey, stereophotography, and rock mass quality data. Much new information on fault/fracture data collection activities and plans was provided to the NRC during this meeting on the following subjects:

1. User groups were identified,

2. Fracture length mapping cut-off had been increased from 35 centimeter to 1 meter in response to a request from hydrology user group.,

3. The status of deliverables for Fiscal Year 1996 was provided,

4. Sources of data were cited, and

5. The zone of intense fracturing, as reported to the NRC, was discussed.

Topics that were mentioned include testing plans for alcoves, chlorine-36 data and their implications, geometry of the Paintbrush Tuff Nonwelded Unit, Rock Valley seismic line data, fracture-orientation stereoplots, and list of Activity 8.3.1.4.2.2.4 milestones. Limited progress was made toward NRC staff resolution of the issue of adequacy of fracture/fault data for licensing.

A presentation on DOE's response to the NRC (Bell) letter of December 14, 1995, to DOE (Brocoum) concerning DOE's Regulatory Compliance Review Report followed. Attachment 6 provides the handouts/overheads that were used during the discussion. In addition to addressing each of the NRC recommendations and comments in that letter so that the open items resulting from the NRC's in-field verification regarding ESF design control can be closed, DOE stated that its response will also provide rationale to close Site Characterization Analysis Comment 130 concerning 10 CFR Part 60 requirements. The letter is undergoing DOE review. The NRC staff indicated that it will review DOE's response upon receipt and work toward resolving the open items and comment.

DOE then described its proposed design item binning system which is to identify items most important to safety and waste isolation. Attachment 7 includes the handouts/overheads that were used during this part of the meeting. Binning is DOE's response to its understanding of NRC expectations for the content of a license application that is acceptable for docketing. Bin 3 will include items important to safety and/or waste isolation that have little or no regulatory precedent. Bin 2 will include items important to safety and/or waste isolation that have well established regulator precedent, and Bin 1 will have balance of plant items. DOE has projected that the design necessary to understand and review the function, performance, and class of construction of items in Bins 3 and 2 would be about 90% and 60%, respectively, at the time of license application. DOE projects that the design necessary to illustrate and/or describe the function, performance, and construction of items in Bin 1 would be about 20% at the time of license application. DOE requested feed-back from the NRC concerning its proposed design item binning system.

The meeting concluded at about 4:00 p.m. EDT with no discussion concerning the schedule for the next meeting.

John G. Spraul
Division of Waste Management
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission

Christian E. Einberg
Regulatory Integration Division
Office of Civilian Radioactive
Waste Management
U.S. Department of Energy

AGENDA
DOE-NRC TECHNICAL MEETING
EXPLORATORY STUDIES FACILITY
VIDEO CONFERENCE

Summerlin, 1551 Hillshire Drive, Atrium Room, Las Vegas, Nevada
Forrestal Building, Room GF-277, Washington, DC
June 3, 1996

9:30 PDT (12:30 EDT)	Opening Remarks	DOE, NRC, NV, AUG
9:45 PDT (12:45 EDT)	Heater Test design Details	DOE
10:45 PDT (1:45 EDT)	Goals and Status of Fracture and Fault Data	DOE
11:30 PDT (2:30 EDT)	Break	ALL
11:45 PDT (2:45 EDT)	Response to NRC 12/14/95 Letter	DOE
12:15 PDT (3:15 EDT)	Design Items Binning System	DOE
1:00 PDT (4:00 EDT)	Closing Remarks and Discussion	DOE, NRC, NV, AUG
1:30 PDT (4:30 EDT)	Adjourn	

ATTACHMENT 1

DOE-NRC TECHNICAL MEETING AGENDA *(PRELIMINARY DRAFT)*
EXPLORATORY STUDIES FACILITY DESIGN AND CONSTRUCTION
VIDEO CONFERENCE
Summerlin, Hillshire, Videoconference Room, Las Vegas, Nevada
Forrestal Building, Room GF-277, Washington, DC
June 3, 1996

9:30 PDT (12:30 EDT)	**Opening RemarksDOE, NRC, NV, AULG**
9:45 PDT (12:45 EDT)	**Heater Test design Details1DOE**
10:30 PDT (1:30 EDT)	**Response to NRC 12/14/95 Letter2DOE**
11:00 PDT (2:00 EDT)	**Break**
11:15 PDT (2:15 EDT)	**Design Items Binning System3DOE**
11:45 PDT (2:45 EDT)	**Closing Remarks and DiscussionDOE, NRC, NV, AULG**
12:30 (3:30 EDT)	**Adjourn**

Notes:

1. NRC would like to discuss heater test design details which would lead to resolution of design related issues.

2. NRC would like to discuss DOE's draft response to the NRC 12/14/95 letter leading to resolution of document hierarchy and flowdown issues.

3. M&O & DOE Engineering organizations want to share information and receive feedback from the NRC staff on a system for placing design items into three categories called bins 1-3. These bins are:
   1) items designed routinely for which the NRC will have no problems,
   2) items to be designed for which there is regulatory precedent that can be used, and
   3) items to be designed for a first time with no regulatory precedent.

Mr. Snell and Mr. Bailey would like to discuss this subject with the NRC staff and CNWRA reviewers because this system will be a factor in determining the amount of design that will be accomplished for a construction LA.

Draft Agenda - April 24, 1996

ATTACHMENT 2

DOE/NRC ESF TECHNICAL MEETING

June 3, 1996

ATTENDANCE LIST

NAME	ORGANIZATION	PHONE
- DOE, Las Vegas, Nevada -		
Hawe, Tim	DOE	(702) 794-1441
Haghi, Ali	M&O	(702) 295-4873
Harrington Paul	DOE	(702) 794-5415
Tynan, Mark C.	DOE	(702) 794-5457
LeRoy, Steve	M&O	(702) 295-5563
Skipper, Ken	DOE	(702) 794-5473
Frishman, Steve	NV NWPO	(702) 687-3744
McKinnon, Barbara	M&O	(702) 794-5480
Segrest, Alden	M&O	(702) 794-1924
Gil, April	DOE	(702) 794-5578
Treichel, Judy	NWTF	(702) 248-1127
v. Tiesenhausen, E.	Clark County, NV	(702) 455-5175
Royer, Dennis	DOE	(702) 794-1358
Geer, Tom	M&O	(702) 794-7868
Datta, Robin	M&O	(702) 794-7565
Glenn, Chad	NRC	(702) 388-6125
Hastings, Carl	M&O	(702) 295-4871
Bu~h, Brad	M&O	(702) 794-5551
Sullivan, Tim	DOE	(702) 794-5589
Murphy, M. R.	Nye County, NV	(360) 943-5610
Seddon, W. A.	DOE	(702) 794-5422
Dana, Steve	QATSS	(702) 794-1496
Williams, Albert	DOE	(702) 794-5549

ATTACHMENT 3

Martin, John	QATSS	(702) 794-5591
Bechtel, Dennis	Clark County, NV	(702) 794-5178
Craun, Richard	DOE	(702) 794-1488
Boyle, William	DOE	(702) 794-5506
Snell, Dick	M&O	(702) 295-5168
- DOE, Washington, D.C. -		
Einberg, Chris	DOE	(202) 586-8869
Dresser, Don	Weston	(202) 646-6781
Wallace, Ray	USGS	(202) 586-1244
Murthy, Ram	DOE	(202) 586-1239
Quan, Choon	DOE	(202) 586-2834
- NRC, Rockville MD -		
Spraul, Jack	NRC	(301) 415-6715
Garcia, Anne	NRC	(301) 415-6631
Pohle, Jeffrey	NRC	(301) 415-6703
Jagannath, Banad	NRC	(301) 415-6653
Anerson, Ralph	NEI	(202) 739-8111
Weller, Rick	NRC	(301) 415-7287
Rusell, John	CNWRA	(301) 881-0289
Nataraja, Mysore	NRC	(301) 415-6695
Bradbury, John	NRC	(301) 415-6597
Bell, Michael	NRC	(301) 415-7286
Chang, Kien	NRC	(301) 415-6612
Colton-Bradley, V.	NRC	(301) 415-7372
Justus, Phil	NRC	(301) 415-6745
Coleman, Neil	NRC	(301) 415-6615
Brooks, Dave	NRC	(301) 415-7284
Stirewalt, Gerry	CNWRA	(301) 881-0289
Ibrahim, Bakr	NRC	(301) 415-6651

- CNWRA, San Antonio, Texas -		
Patrick, Wes	CNWRA	(210) 522-5158
Sagar, Budhi	CNWRA	(210) 522-5252
Choudhury, Asad	CNWRA	(210) 522-5151
Green, Ron	CNWRA	(210) 522-5305
Hsiung, Simon	CNWRA	(210) 522-5209
Stamatakos, John	CNWRA	(210) 522-5247

YUCCA
MOUNTAIN
PROJECT

Studies

Exploratory Studies Facility Thermal Test

Presented to:
DOE-NRC ESF Technical Meeting

Presented by:
Robin Datta, Management and Operating Contractor

June 3, 1996

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

ATTACHMENT 4

ESF THERMAL TESTS

* Single Heater Test
* Drift Scale Test

Goals of Single Heater Test

* Measure Rock Mass Thermal and Mechanical Properties
* Observe Response of Rock Bolts to Elevated Temperature
* Try Out and Refine All Measuring Systems to be Used in the Drift Scale Test
* Evaluate Extent of Convective Heat Transfer
* Observe the Development of Dry-Out Zone
* Observe Chemical Changes, if any, in the Rock

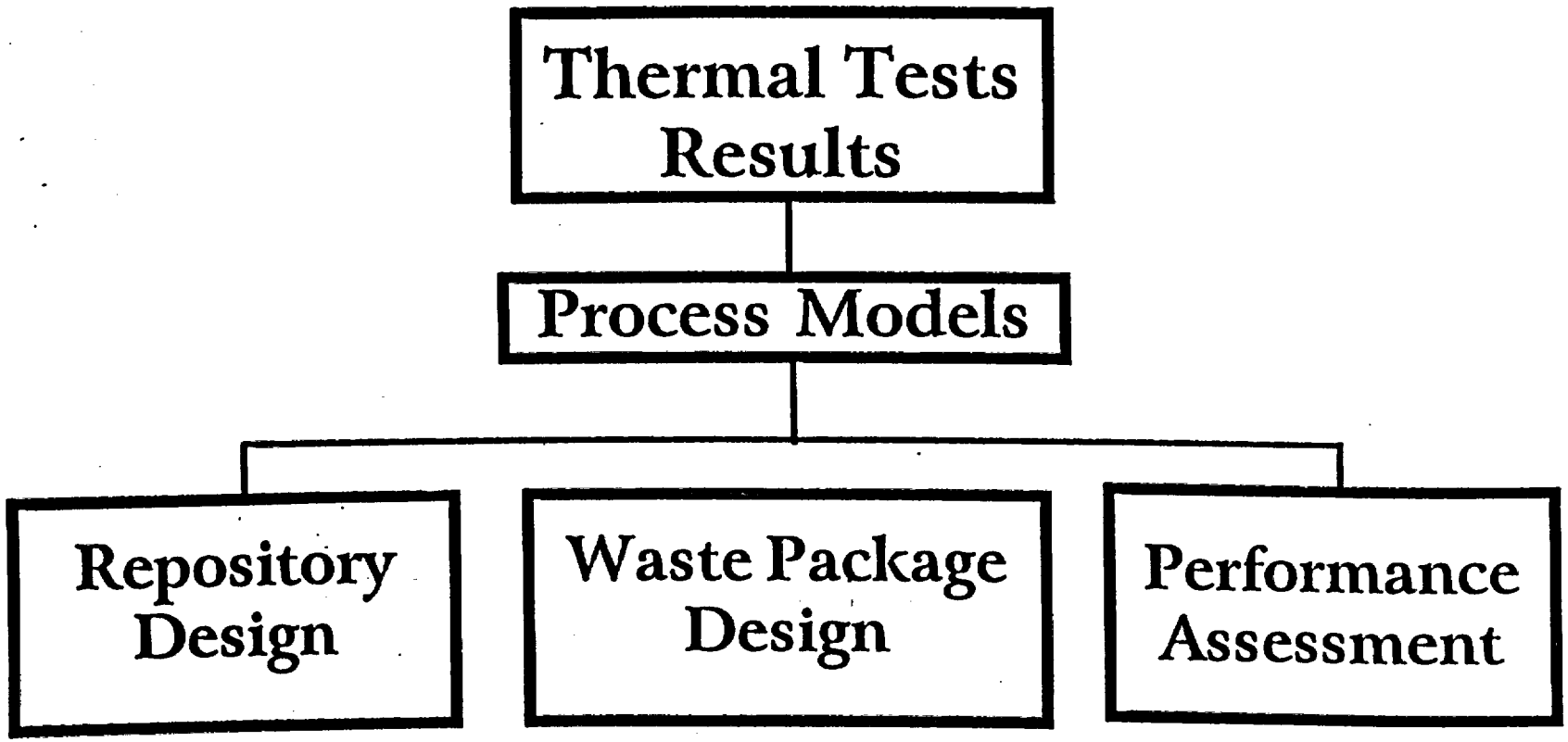
Goals of Drift Scale Test

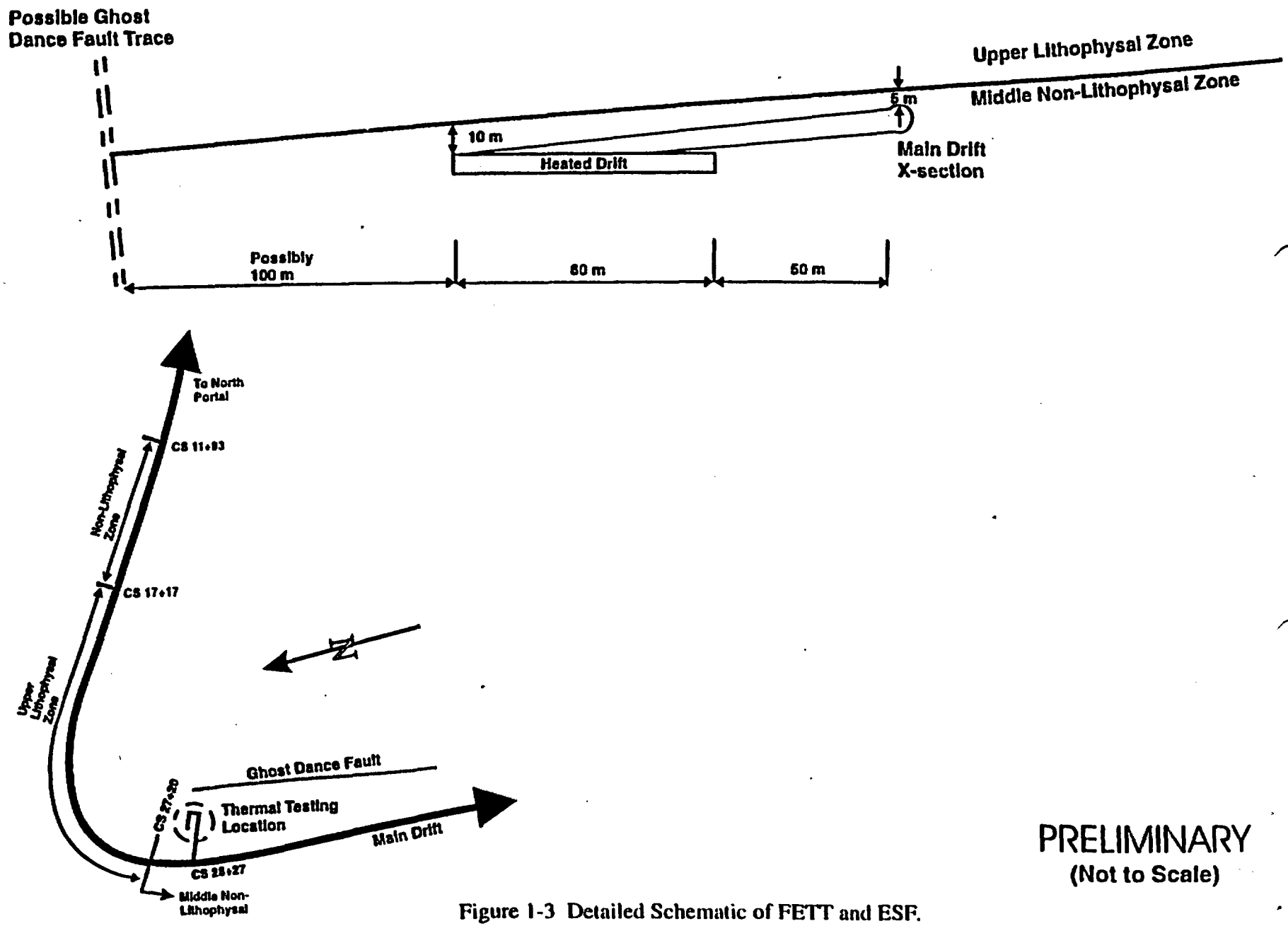
* Study the Large Scale Heat Transfer Mechanism
* Observe the Movement of Liquid Saturation of the Rock with the Application and Withdrawal of Heat
* Observe Changes in Chemical Composition of Water in the Rock
* Observe Chemical Changes in the Rock
* Measure Rock Mass Thermal and Mechanical Properties

Goals of Drift Scale Test, cont.

* Observe Changes in Rock Stress Due to Elevated Temperature
* Observe Response of Various Types of Ground Support to Elevated Temperature
* Observe the Stability of the Roof of the Heated Drift
* Observe and Study the Corrosion, if any, of Waste Package and Ground Support Materials

END USERS OF THERMAL TEST RESULTS





PRELIMINARY
(Not to Scale)

Figure 1-3 Detailed Schematic of FETT and ESF.

ESFTT.CDR.123/5-14-96

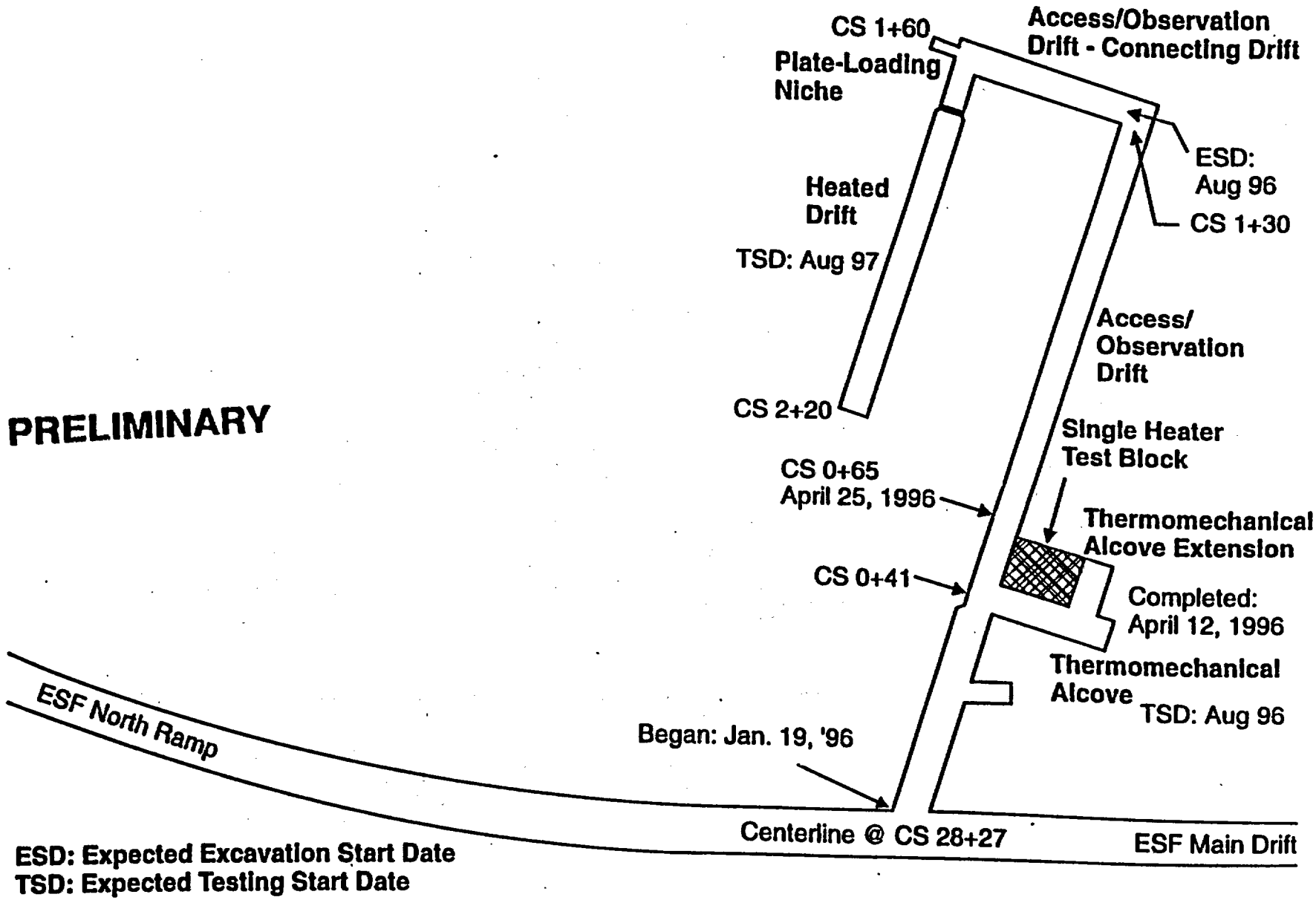
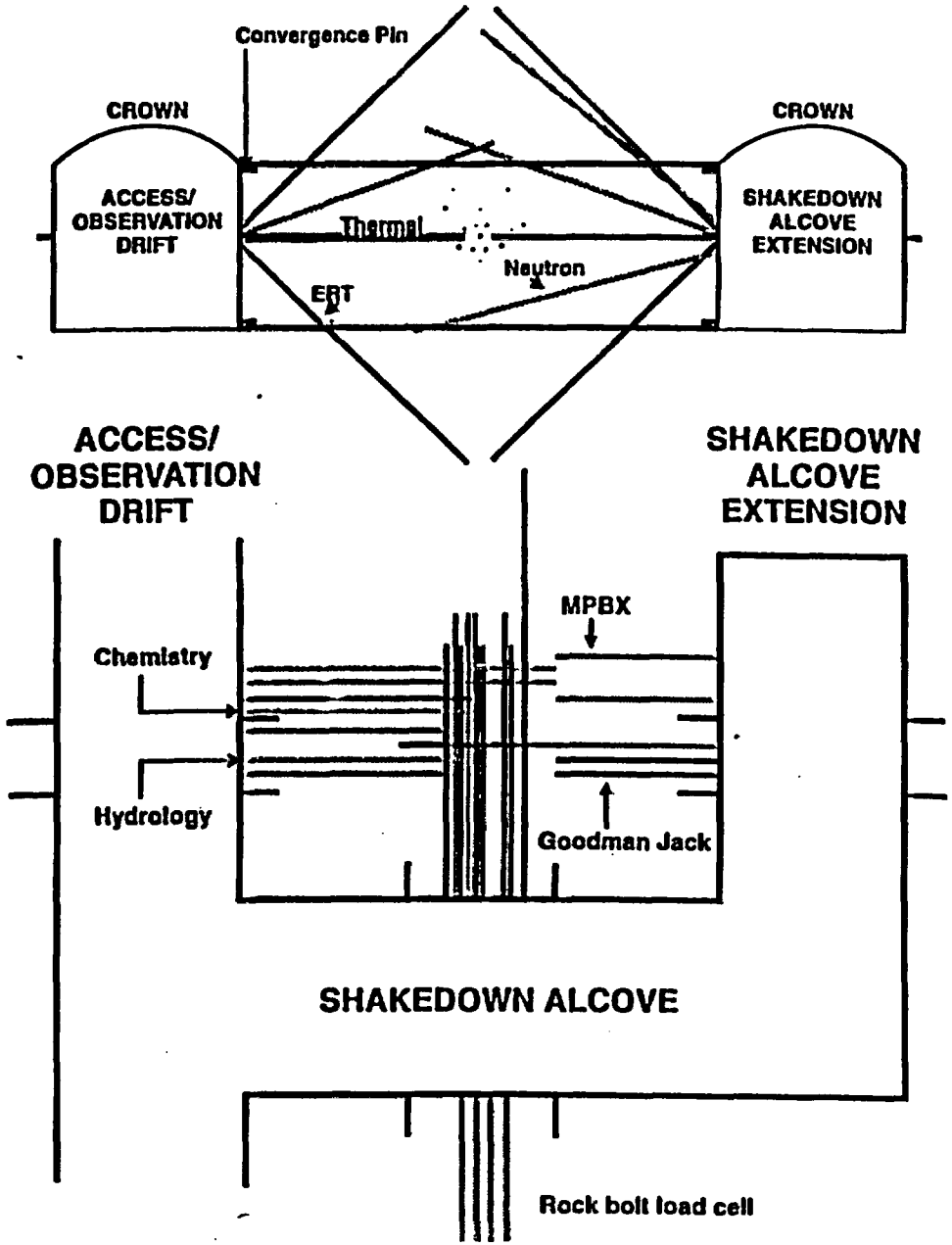
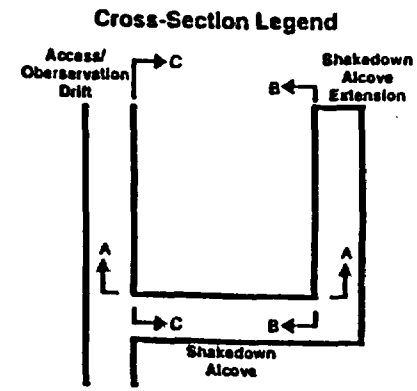


Figure 1-4. Plan View of FETT Facility.

ESFTT.CDR.123/5-14-96





PRELIMINARY
(Not to Scale)

Figure 1-5. Layout of Single Heater Test

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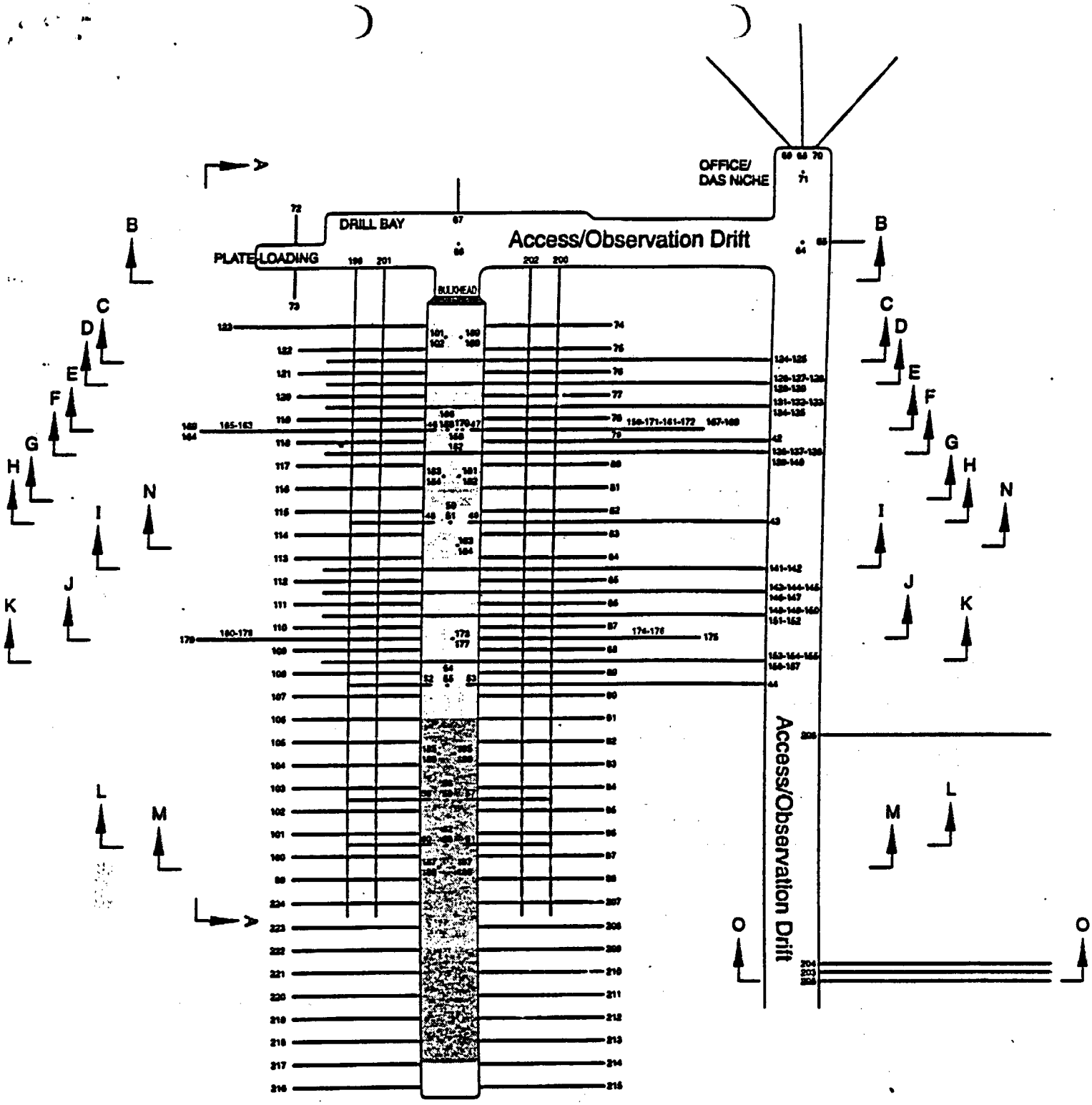


PRELIMINARY

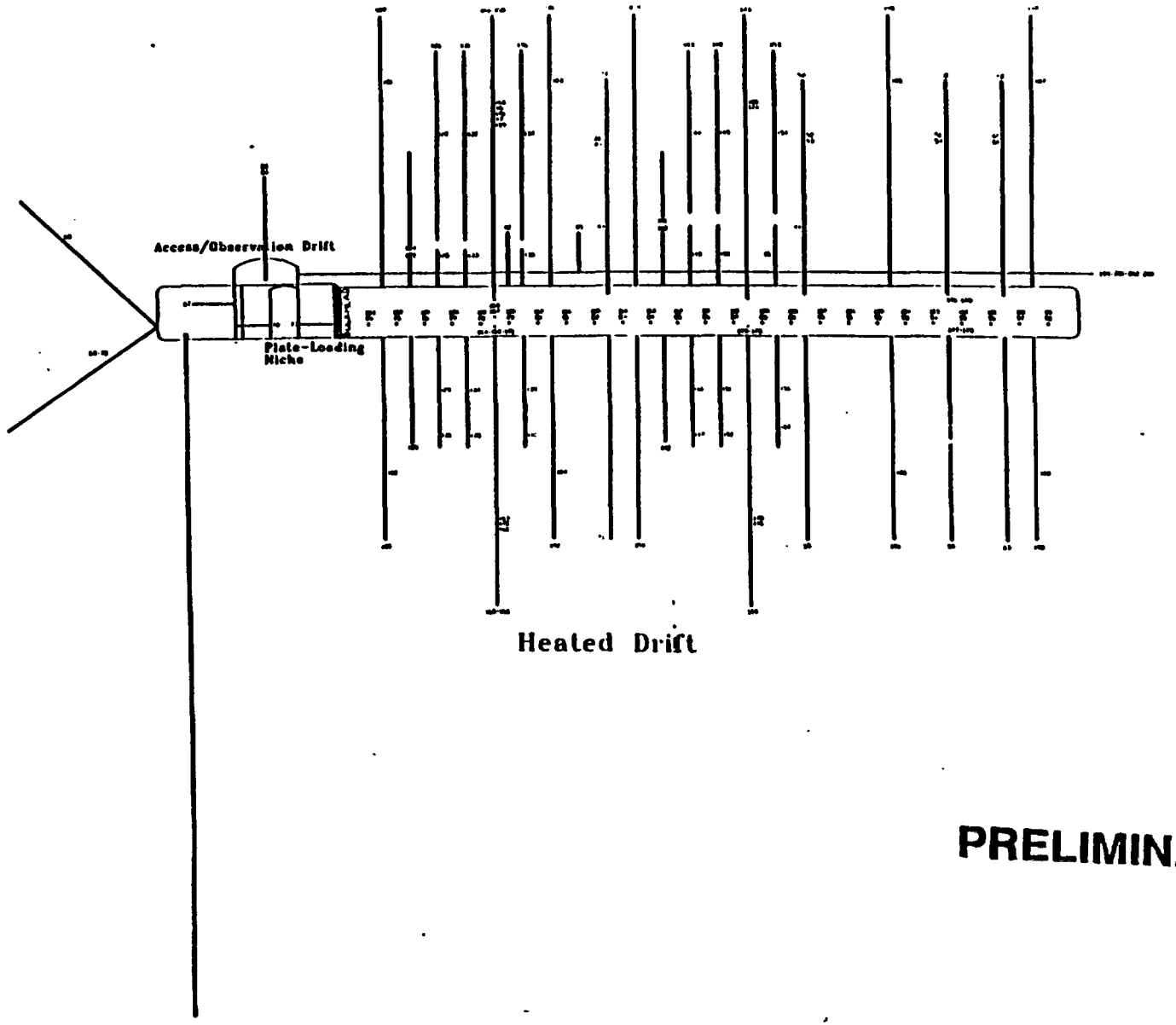
1. Full circle steel sets with partial lagging above springline, regularly spaced to accommodate observation and instrumentation. Rockbolts and Welded Wire Fabric (WWF) may be installed prior to steel set erection to provide a safe working environment.
2. Full circle cast-in-place concrete liner. Rockbolts and WWF may be installed prior to concrete liner installation to provide a safe working environment.
3. Grouted rockbolts, WWF, and Shotcrete above springline.
4. Rockbolts and WWF installed to provide a safe working environment under ambient temperature conditions.

Heated Drift - General Borehole Arrangement

ESFTTPLN.CDR.123/5-28-96

SECTION A-A

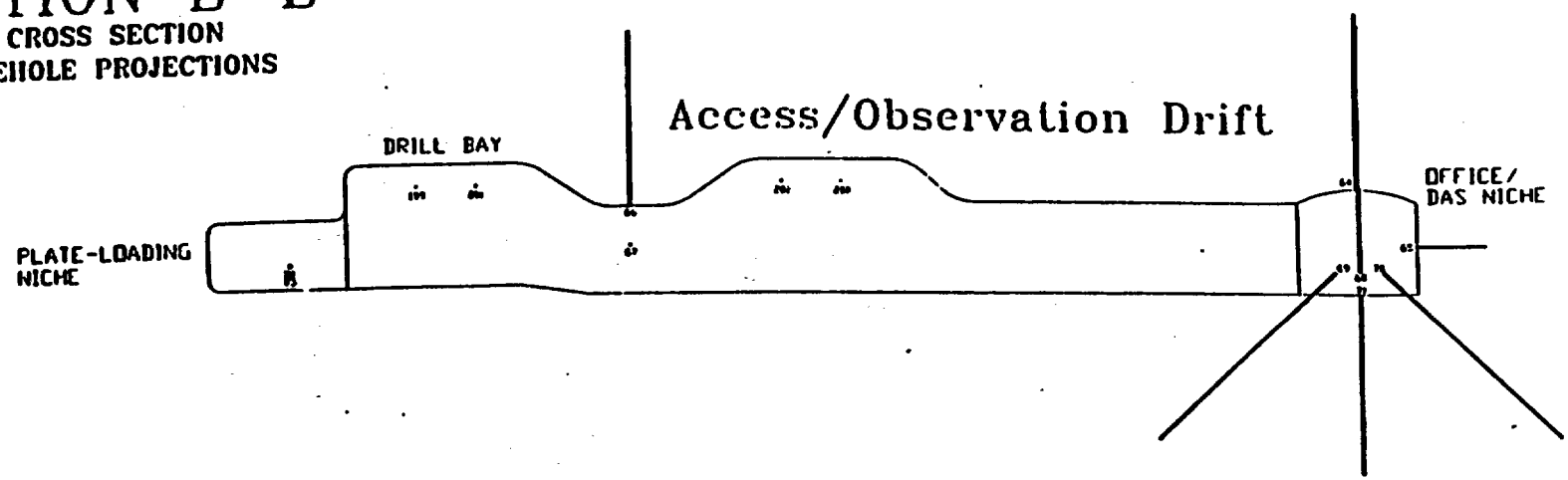
TYPICAL CROSS SECTION
W/ BOREHOLE PROJECTIONS



PRELIMINARY

SECTION B-B

TYPICAL CROSS SECTION
W/ BOREHOLE PROJECTIONS



PRELIMINARY

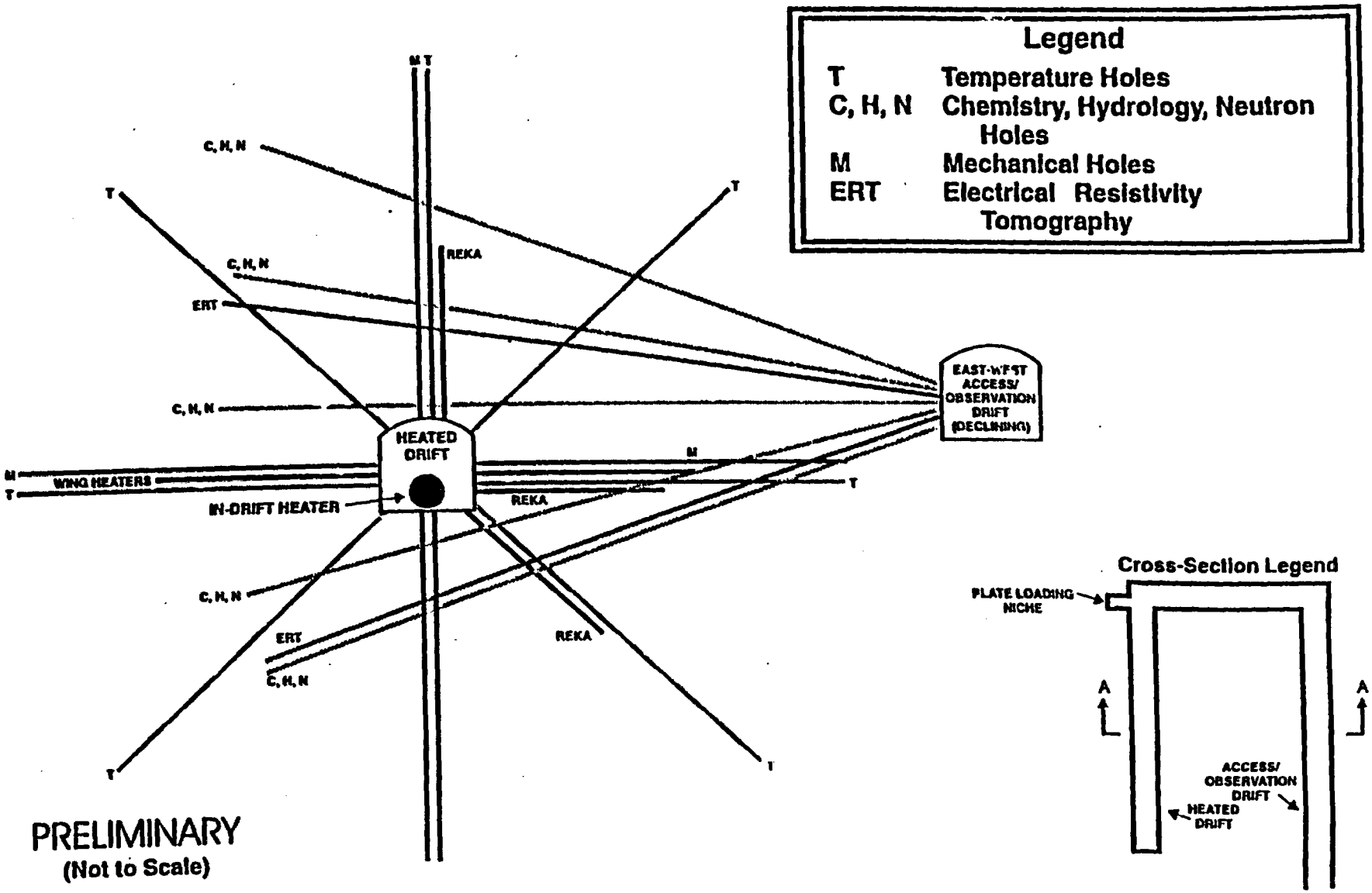
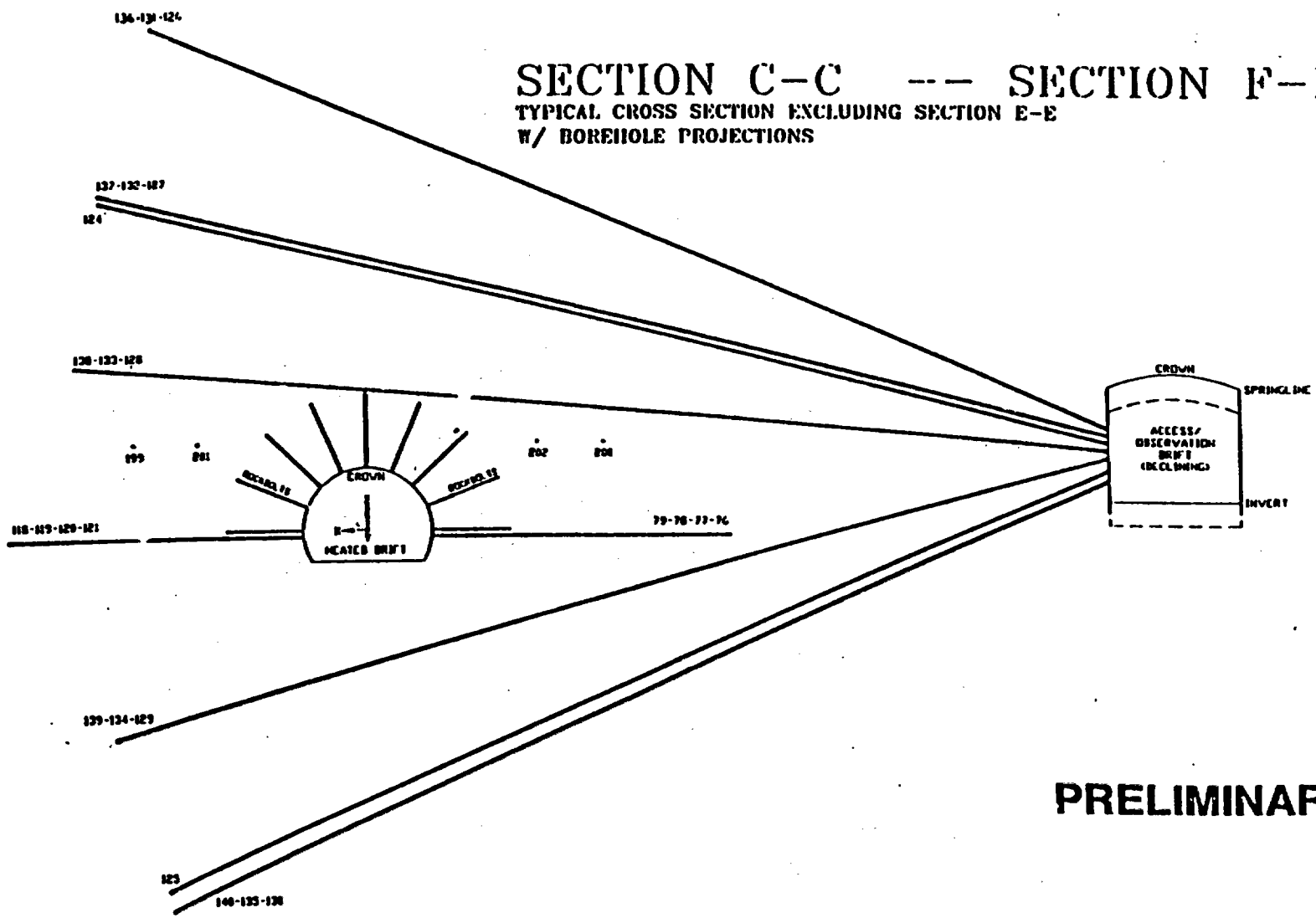


Figure 1-6. Conceptual Layout (borehole arrangement and typical cross section) of the Drift-Scale Heater Test

ESFTT.CDR.123/5-14-96

SECTION C–C -- SECTION F–F

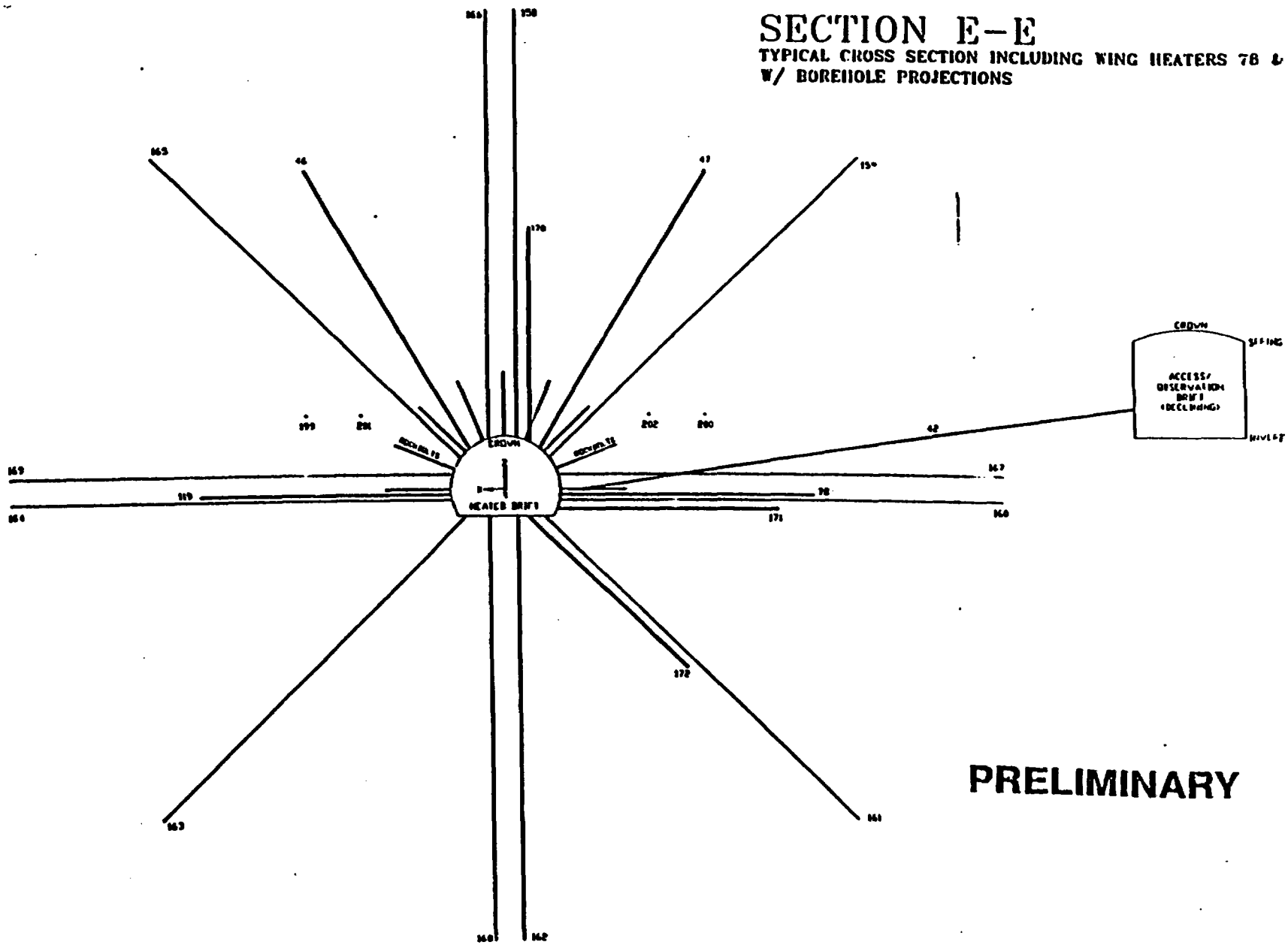
TYPICAL CROSS SECTION EXCLUDING SECTION E–E
W/ BOREHOLE PROJECTIONS



PRELIMINARY

SECTION E–E

TYPICAL CROSS SECTION INCLUDING WING HEATERS 78 & 119
W/ BOREHOLE PROJECTIONS



PRELIMINARY

MEASUREMENTS TO BE MADE FOR THERMAL TESTS

* Mapping of Exposed Rock Surfaces
* Laboratory Measurement of Rock Samples from Test Block
  - *Thermal, mechanical, hydrologic properties*
  - *Mineralogic-petrologic analysis*
* Field Permeability Measurement (Pneumatic)
  - *Single hole and cross-hole*

Measurements to Be Made for Thermal Tests, cont.

* Infrared Thermal Imaging
* Amount of Applied Heat
* Rock Temperature
* Temperature, Relative Humidity and Pressure of Air in Holes and in Drift
* Rock Stress
* Rock Moisture Content by Neutron Logging

Measurements to Be Made for Thermal Tests, cont.

* Rock Moisture Content by ERT
  (electric resistivity tomography)

* Water Chemistry by SEAMIST

* Response of Waste Package Material Coupons by SEAMIST

* Response of Various Types of Ground Support

Most Measurements Will Be Made Before Start of Heating, During Heating and Cooling, and After Cooling.

SCHEDULE OF THERMAL TESTS

* **Single Heater Test Heating Starts**
  — late AUGUST 1996

* **Drift Scale Test Heating Starts**
  — early SEPTEMBER 1997

YUCCA
MOUNTAIN
PROJECT

Studies

Scientific Program Update: Goals and Status of Fracture and Fault (Data) Studies

Presented to:

DOE-NRC Technical Meeting

Presented by:

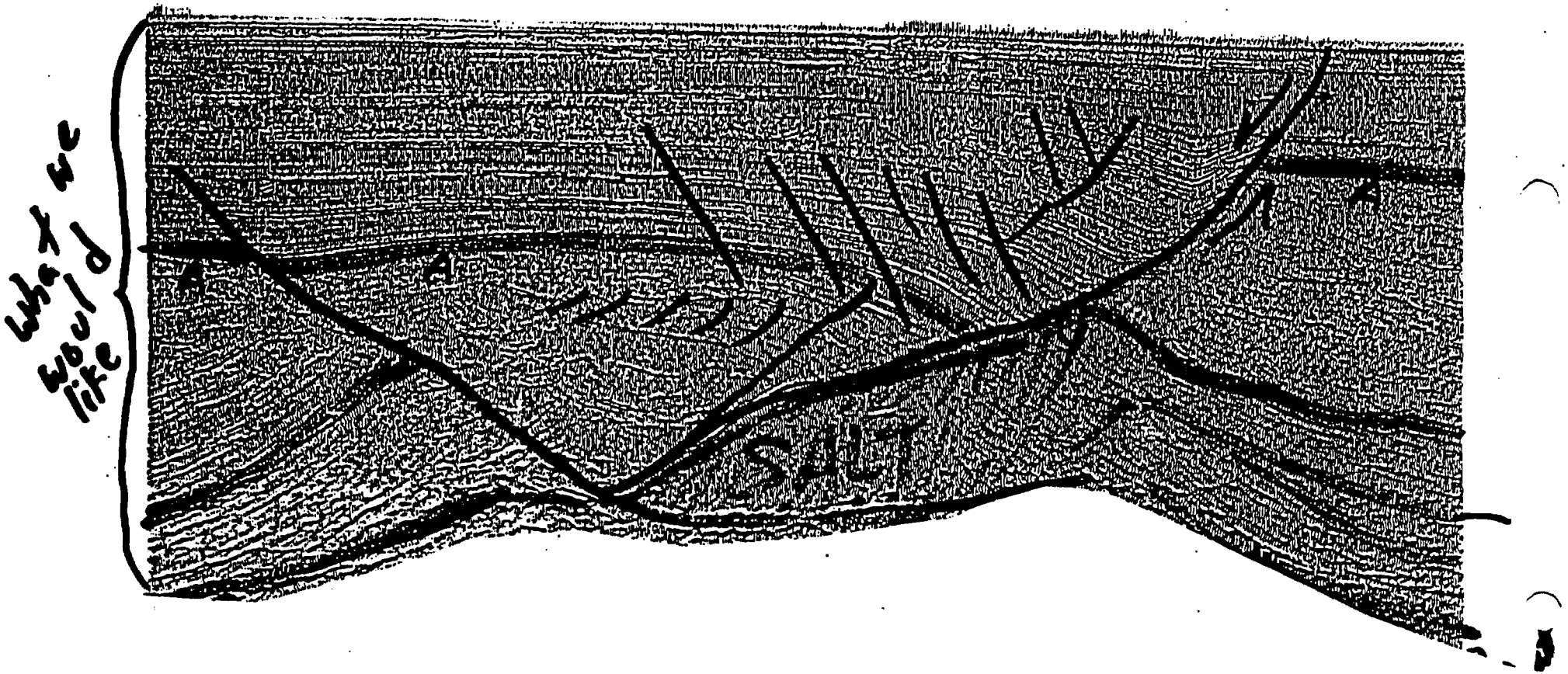
Mark C. Tynan
DOE Staff, Assistant Manager Scientific Programs

June 3, 1996

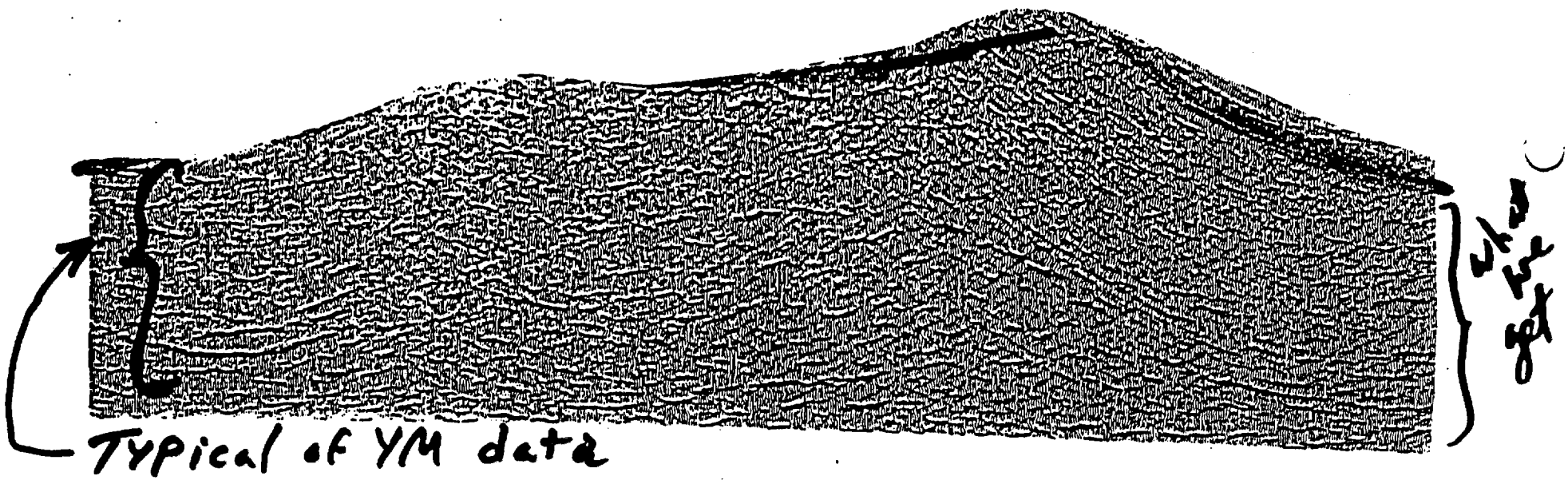
U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

ATTACHMENT 5

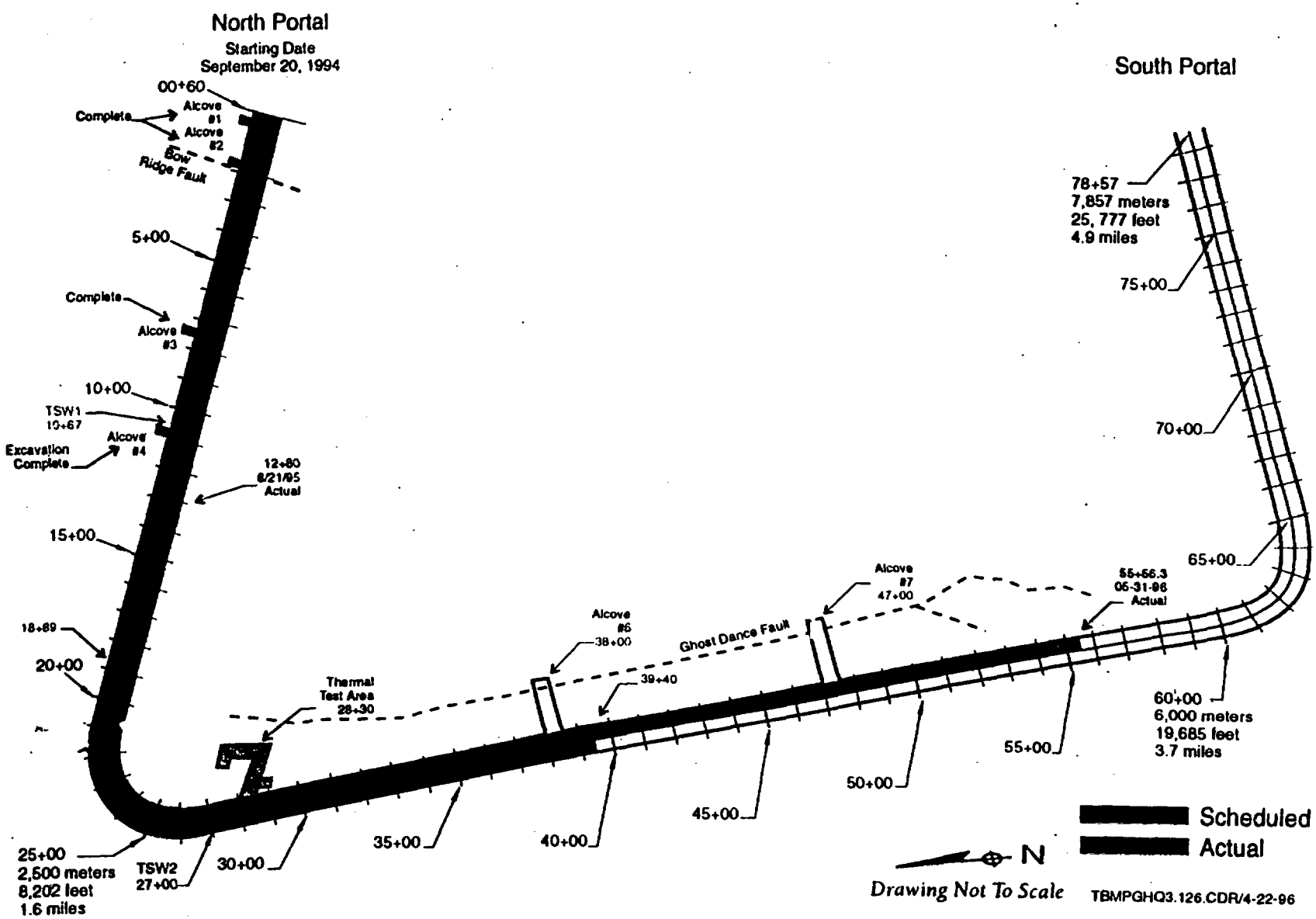
SEISMIC REFLECTION DATA QUALITY AT YUCCA MOUNTAIN



SEISMIC REFLECTION DATA QUALITY AT YUCCA MOUNTAIN



TUNNEL BORING MACHINE PROGRESS



DOE / NRC TECHNICAL MEETING: GOALS AND STATUS OF FRACTURE AND FAULT DATA

ESF MAPPING STATUS

4:00PM, 5/31/96
TBM at Station 55+58.36

Full Periphery Mapping completed to Sta. 54+58

Detailed Line Survey completed to Sta. 54+74

Stereophotography completed to Sta. 54+80

RQD Classification completed to Sta: 54+50

Q&RMR completed to Sta 53+55

Consolidated Sampling: samples collected as required

DOE / NRC TECHNICAL MEETING: GOALS AND STATUS OF FRACTURE AND FAULT DATA

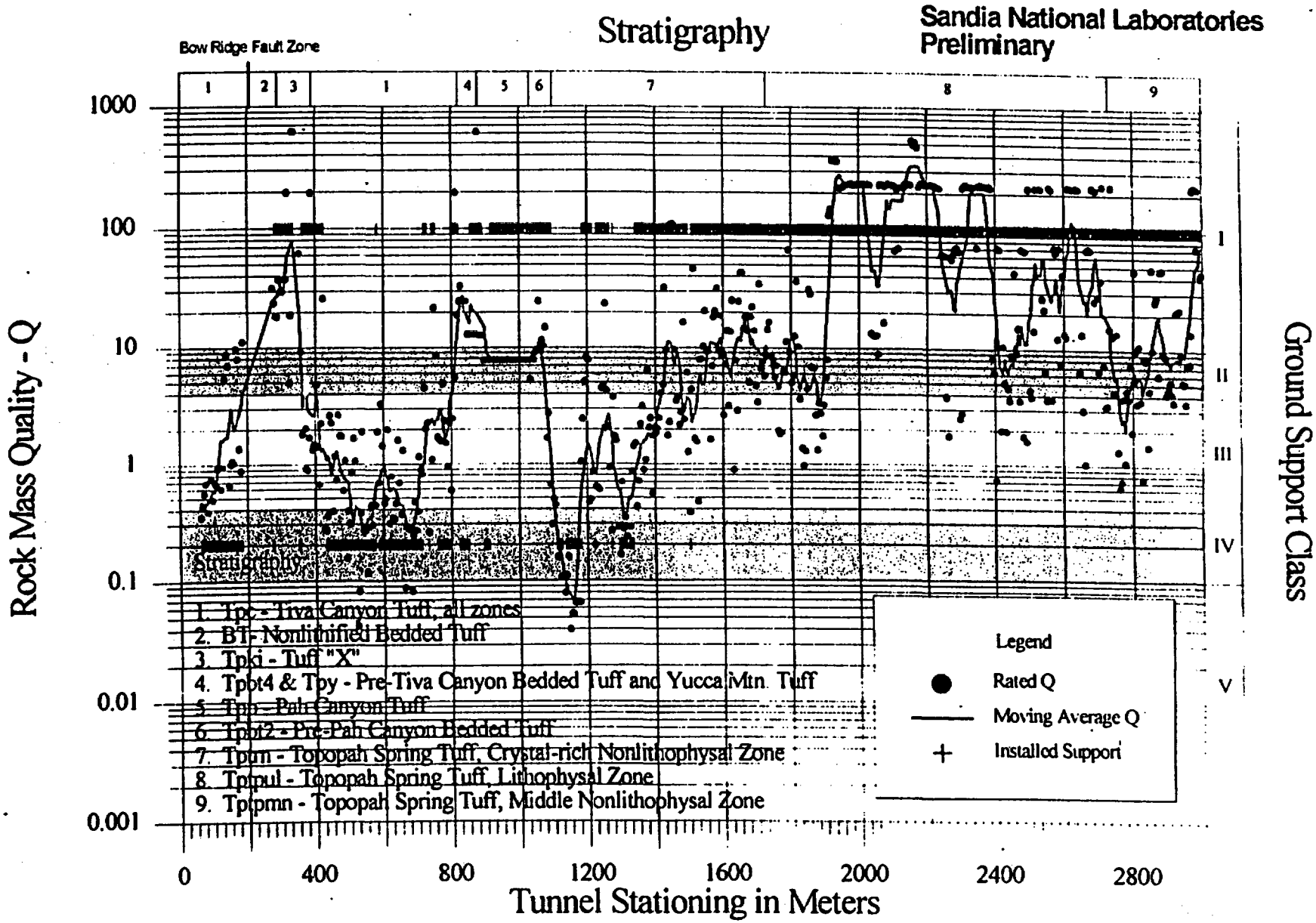
ESF MAPPING STATUS

4:00PM, 5/31/96
TBM at Station 55+58.36

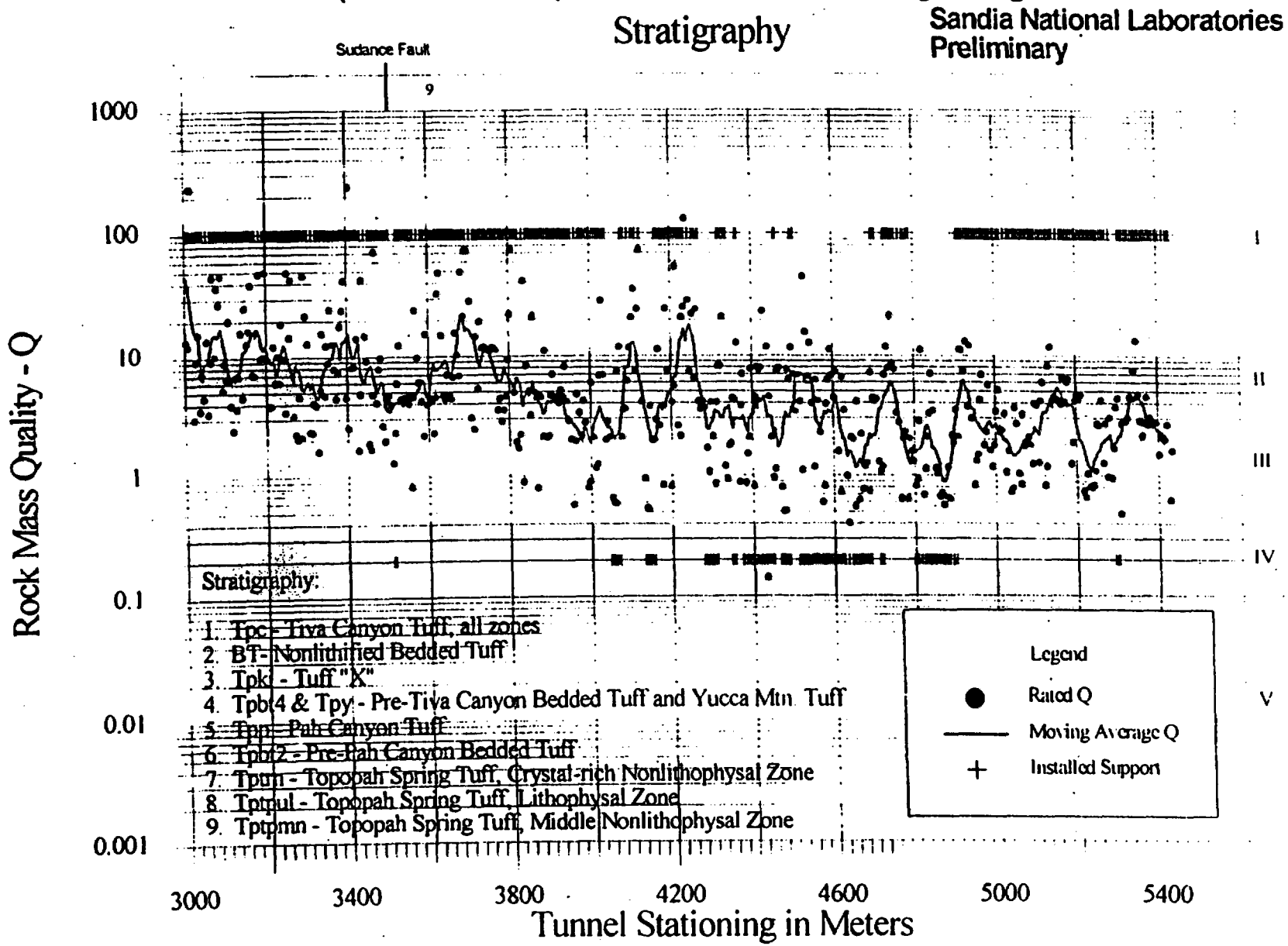
Thermal Alcove Access/Observation Drift (Alcove 5), at 1+13m, at starty of work 5/31/96

Northern Ghost Dance Alcove (Alcove 6) has not progressed beyond 11.4m in to date; status same for past 3 weeks

Station (00+60 to 30+00 m) versus Rated Q and Q Moving Average in the Main Drift.



Station (30+00 to 54+35 m) versus Rated Q and Q Moving Average in the Main Drift.



GROUND SUPPORT CLASS	RANGE OF NGI Q VALUE	EXPLORATORY STUDIES FACILITY GROUND SUPPORT RECOMMENDATION
I	>10	CLASS I: ROCKBOLTS NOMINAL 1500 x 1500 mm SPACING WITH WELDED WIRE FABRIC OR INTERLOCKING STEEL MESH. SPOT BOLT AS NECESSARY. PINS AND CHANNEL (C10) MAY BE USED TO SECURE MESH AS NEEDED. CLASS I-A: ALTERNATIVE: W6 STEEL SETS ** SPACED 1220 mm TO 1800 mm WITH WWF.
II	4.0 TO 10.0	CLASS II: ROCKBOLTS NOMINAL 1000 X 1000 mm SPACING WITH WWF. SPOT BOLT AS NECESSARY. PINS AND CHANNEL (C10) MAY BE USED TO SECURE MESH AS NEEDED. CLASS II-A: ALTERNATIVE: W6 STEEL SETS SPACED 1220 mm WITH WWF; ALTERNATIVE GROUND SUPPORT FOR PTn: W8 STEEL SETS FOR ALL CLASSES.
III	0.4 TO 4.0	CLASS III: ROCKBOLTS NOMINAL 1000 X 1000 mm SPACING WITH WWF. SPOT BOLT AS NECESSARY. PLUS 100-150 mm SHOTCRETE. CLASS III-A: ALTERNATIVE: W6 STEEL SETS** SPACED 1220 mm WITH WWF AND/OR LAGGING AS NEEDED.
IV	0.1 TO 0.4	CLASS IV: W8 STEEL SETS SPACED 610-1220 mm WITH WWF AND/OR LAGGING AS NECESSARY
V	0.01 TO 0.1	CLASS V: W8 STEEL SETS SPACED 610 mm WITH FULL LAGGING.

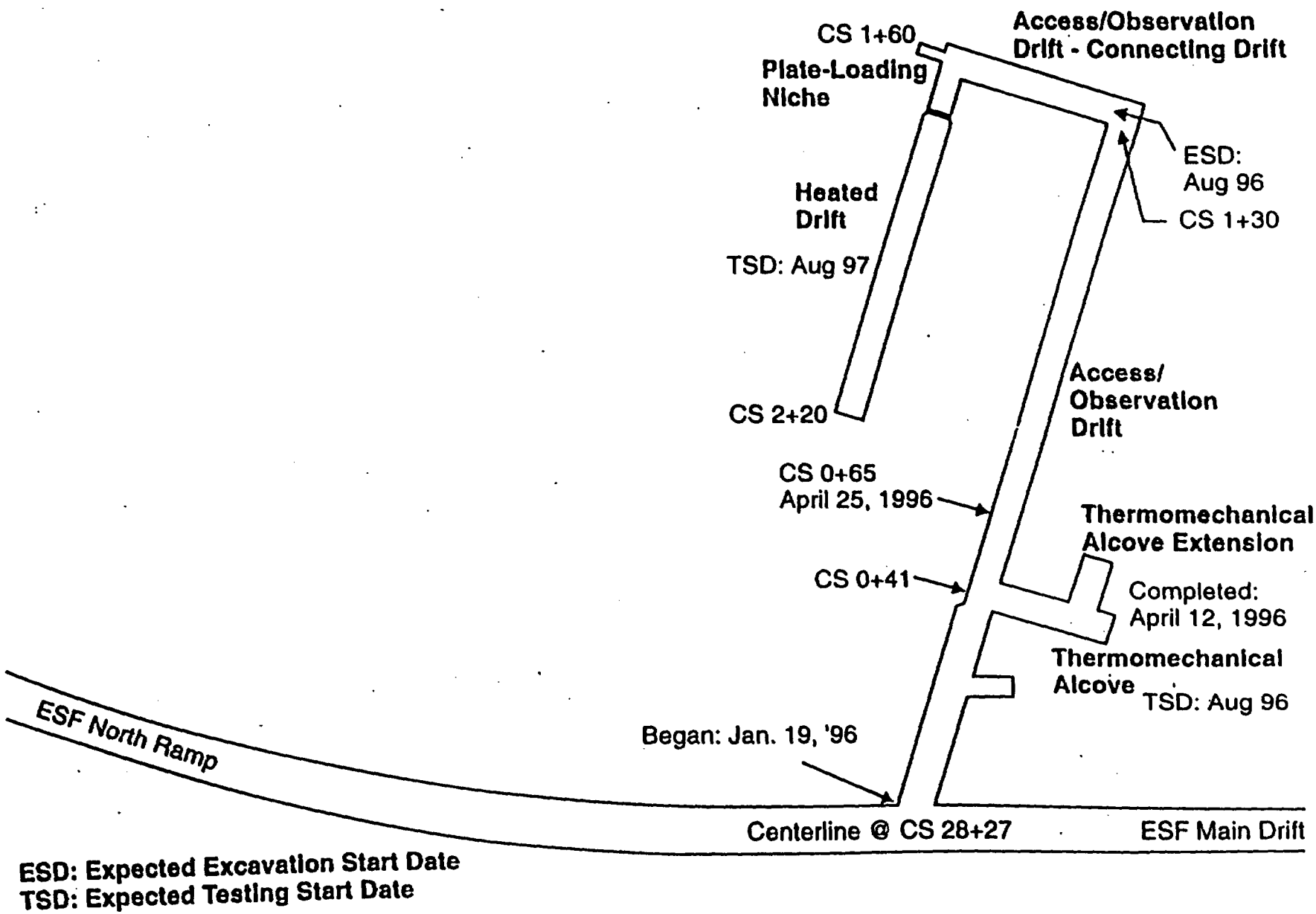


Figure 1-4. Plan View of FETT Facility.

ESFTT CDR 123/5-14 96

Set of three prints showing various levels of detail for zone of closely spaced fractured rock at station 47+65.6; potential repository host sequence; photos YM11737, YM 11739, YM11742.

The upper portion of the potential repository host rock unit (the Topopah Spring crystal poor middle non-lithophysal unit) extends from station 27+20 to cutter face of TBM (currently at, station 55+27, but extends beyond) in the ESF. Fracture density was very low within the northern portion of the N/S main drift excavation. As the TBM proceeded southward, a zone of relatively intense fracturing was encountered; the zone extends from about station 42+00 to 52+50. Within this subject fracture zone, average fracture orientation differs from areas to north, fracture spacing is reduced, fracture intensity is increased. Fractures are fairly continuous, smooth, planar, and steeply dipping; fracture apertures are generally smooth and closed. Manganese oxide coatings are common on the fracture surfaces.

The predominant orientation (70-90% of thousands measured) of the fractures is N40W to N70 W, dipping at 75-85°SW. Fracture strike rotates slightly to SW from north to south. A second fracture set has been identified with NE/SW orientations. This results in wedge development within limited areas of the ESF.

The planar nature of these fractures is suggestive of genesis related to cooling phenomenon, i.e., non-tectonic cooling fracture sets; this remains an important subject for investigation. Some tectonic overprint is possible, but the early nature of the fracturing is suggested by several lines of evidence: 1) The main fracture set (NW/SE orientation) is cut by the younger fracture (NE/SW orientation) set. The NE/SW fracture set appears to be decidedly a cooling related characteristic. Since the latter are apparently younger and likely a cooling joint system, that implies at least syngenesis for the two fracture systems. The smooth planar fractures are often characteristic of cooling joint systems rather than fractures resulting from tectonic disruption. Additionally, the fractures appear to be strata-bound as indicated by examination of borehole video logs from neighboring coreholes. The stratabound characteristic provides additional support to the theory that the fractures are early cooling features, and not tectonic in origin. It is less likely that these "unique" fracture systems would be stratabound if tectonic in origin.

The characteristics of fractures and fracturing within the zone have not been previously observed in the ESF, nor in surface outcrops. The intensity and orientation was "unexpected" in the sense that the extensive zone of intense fracturing (close spacing and orientation) was not anticipated given the interpretations of available borehole and surface mapping data.. For this reason, DOE elected to issue a report of "reportable geologic condition" with respect to the fracture zone encountered between stations 42+00 and 52+50. Impacts on construction have been minimal to date. Category IV ground support was installated for a portion of the subject stretch of ESF construction, but portions were supported with category I support.

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Studies

DOE Response to NRC December 14, 1995 Letter

Presented to:
DOE-NRC ESF Technical Meeting

Presented by:
Thomas Geer, Management and Operating Contractor

June 3, 1996

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

ATTACHMENT 6

Overview

- Background
- NRC December 14, 1995 Letter
- DOE's response letter
- Additional information in response letter
- Summary

Background

- October 13, 1994 letter, NRC to DOE
  - Lack of effective QA program, especially for design control
- March 14 and August 13, 1995 letter, DOE to NRC
  - Regulatory Compliance Review Report (RCRR)
- October 25, 1995 letter, DOE to NRC
  - DOE committed to make two changes:
    - » Update QAP-3-9 design analysis procedure
    - » Update requirements document
- December 14, 1995 letter, NRC to DOE
  - NRC response to RCRR

NRC December 14, 1995 Letter

- NRC review of the RCRR concluded:
  - DOE identified applicable 10CFR60 requirements
  - These requirements are included in the ESF design package 2C
  - There are a few cases where NRC had questions or comments about DOE's interpretation of 10CFR60 requirements
- Two actions to close open items from the in-field verification
  - Provide a sample design package using the revised design procedure
  - Provide revised version of requirements documents

NRC December 14, 1995 Letter

(continued)

- Three recommendations from in-field verification
  - Expand numerical modeling of rock bolts to all pertinent types and applications
  - Clarify AP-6.14 procedure on reportable conditions
  - Re-evaluate the Q classification of the pre-cast inverts

DOE Response to NRC letter

- DOE response letter includes:
  - Response to each case where the NRC had a comment on the interpretation in the RCRR
  - Example design package (Tunnel Ground Support), developed under the revised QAP-3-9 procedure
  - Updated ESFDR document (revision 2)
  - Modified Ground Support Analysis, includes rock mass categories and Swellex types of rock bolts
  - YAP-30.27, which replaces AP-6.14 for reportable geologic conditions
  - A re-evaluation of the design basis of the pre-cast inverts

Additional Information Contained in DOE Letter

- Updates to the DOE interpretation/application of 10CFR60 requirements are provided
  - Developed after the RCRR submitted to NRC
  - Incorporated in the ESFDR
  - No changes to ESF design, minor editorial updates for traceability
- Rationale to close SCA open item 130
  - DOE letter addresses 28 of the 30 10CFR Part 60 Requirements
  - 10CFR Part 60.151 and 152 met through the QA Program

Additional Information Contained in DOE Letter

(continued)

- We have concluded that the RCRR will not need to be updated for each design package because of ESFDR changes
  - Detailed interpretation of 10CFR60 requirements
  - Allocation of requirements to specific configuration items
- Only provided a copy of the ESFDR document because:
  - ESFDR controls the design of the ESF
  - New hierarchy is still under development
  - RDRD and EBDRD revisions are still on hold

Summary

- Addressed all NRC comments on 10CFR60 requirements
- Completed actions to provide a design package produced under the revised procedure
- Provided a copy of the revised ESFDR
- Completed all action from the in-field verification
  - Expanded rockbolt modeling
  - Replaced AP-6.14 with YAP-30.27
  - Changes to the design basis of the inverts was not warranted
- Recommendation to close SCA 130 based upon RCRR and this letter

YUCCA MOUNTAIN PROJECT

Studies

Initial Discussion of Design Detail at License Application Development of Engineering Schedules Methodology of Prioritizing Work (Binning)

Presented to:
DOE-NRC ESF Technical Exchange

Presented by:
Richard D. Snell,
Management and Operating Contractor

June 3, 1996

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

ATTACHMENT 7

Development of Engineering Schedules

- Engineering schedules under development to support a revised OCRWM Program Plan (under review)
  - Viability Assessment (1998)
  - License Application (2002)
- Viability Assessment
  - Performance Assessment (TSPA)
  - Design consistent with TSPA
  - Cost estimate
  - Plan for path to License Application (LA)
- License Application
  - Design sufficient for docketable LA

Development of Engineering Schedules

(Continued)

- Engineering schedule basis for the above
  - "One Pass" design plan through VA to LA
  - Resolution of major design performance issues and relevant technical uncertainties by VA
  - Resolution of remaining technical issues sufficient to satisfy NRC needs for docketing by LA

Methodology of Prioritizing Work (Binning)

- Fundamental engineering planning guidelines
  - "One Pass" design plan through VA to LA
  - Resolution of engineering/design issues essential to understanding repository performance for VA is early priority
  - Systems, structures, and components which are important to safety and waste isolation, and for which there is little or no regulatory precedent, are expected to require the most detail to support the LA
  - Maximum benefit will be gained from prior licensing experience and lessons learned from commercial nuclear power facilities
  - Maximum use will be made of existing regulatory guidelines
- "Binning" is the Project response reflecting our understanding of NRC expectations for the content of a docketable LA

Methodology of Prioritizing Work (Binning)

(Continued)

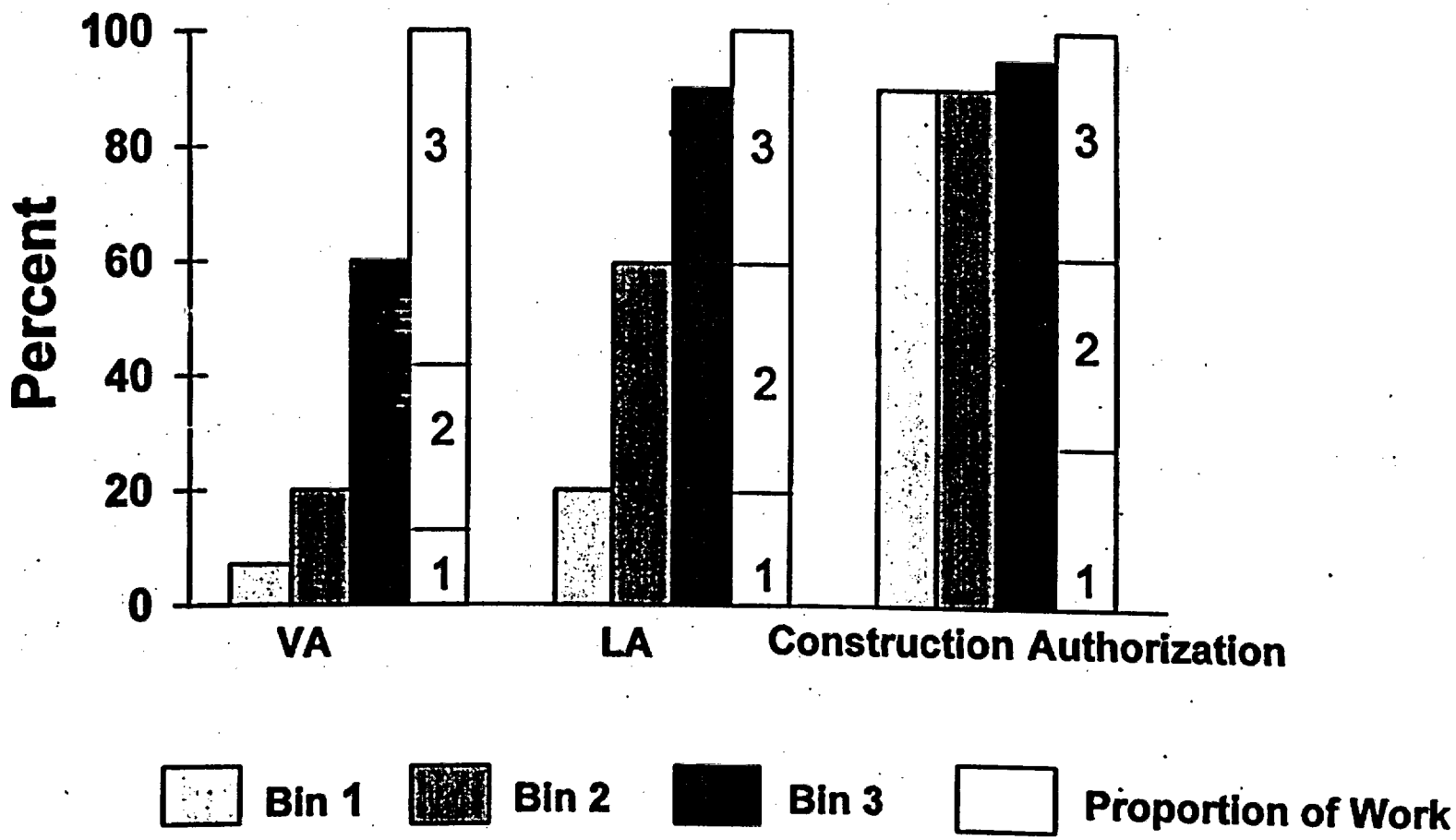
- **Bin 3 Items**
  - Those important to safety and/or waste isolation
  - Those with little or no regulatory precedent
  - Design necessary to understand and review item function, performance and class of construction - approx. 90% complete at LA
- **Bin 2 Items**
  - Those important to safety and/or waste isolation
  - Those with well established regulatory precedent
  - Design necessary to understand and review item function, performance, and class of construction - approx. 60% complete at LA

Methodology of Prioritizing Work (Binning)

(Continued)

- **Bin 1 Items**
  - Balance of plant items
  - Design to illustrate and/or describe item function, performance, construction - approx. 20% complete at LA

Comparisons of Binning and Percent Completion Over Time



Methodology of Prioritizing Work (Binning)

(Continued)

- Steps which precede binning
  - Identification, description, and requirements definition of systems (CIs)
  - Determination of Importance Evaluations to establish appropriate classification of systems (CIs)
  - Proposed rule changes to 10 CFR 60 do not affect the binning process
- Assignment of bin number (3, 2, or 1) based on above
- Steps which precede design of binned items
  - Establishment of regulatory baseline and interpretations (e.g., 10 CFR 60)
  - Identification of relevant regulatory guides for use in engineering and design (e.g., reg. guides, SRPs, STPs, SPs)
  - Development of design guides incorporating the above

Methodology of Prioritizing Work (Binning)

(Continued)

- Design Follow On Activities:
- Prioritize SSC development to:
  - Develop "viability" design solutions
  - Develop generic regulatory solutions
  - Identify regulatory precedent
  - Develop safety cases
- Generation of discrete designs will be issued to develop license application
  - Design uncertainties will be identified along with specific plans for resolution
  - Uncertainties will have to do with implementation options, feasibility of options will have been established

Bin 3

- Has radiological safety significance, or
- Has significant radiological safety system interaction, and
- Has no regulatory precedent, or
- Identified as impacting other regulatory products

Bin 3 Design Products at LA

- Infrastructure Tools
  - Commodity Design Guides
  - System Design Guides
- Conceptual Design Documents
  - General Arrangements
  - P&IDs
  - Electrical one lines
  - Logics
  - Handling Drawings
  - Equipment Outlines
  - System Descriptions
  - Tech Specs
  - Test Plans
- Physical Design Documents
  - Analyses
  - Calculations
  - Specifications
  - Drawings
- Estimating Basis for Completion 90%
  - Fully dimensioned
  - TBVs limited
  - Rev. 0 level (ready for issue)

Bin 2

- Has radiological safety significance, or
- Has significant radiological safety interaction, but
- Has regulatory precedent

Bin 2 Design Products at LA

- Conceptual Design Documents
  - General Arrangements
  - P&IDs
  - Electrical one lines
  - Logics
  - Handling Drawings
  - Equipment Outlines
  - System Descriptions
- Physical Design Documents
  - Analyses
  - Calculations
  - Specifications
  - Drawings
- Estimating Basis for Completion 60%
  - Largely dimensioned
  - Rev. A level (internal review)

Bin 1

- No DBE involvement, and
- Little or no radiological safety significance, and
- Little or no radiological safety interaction

Bin 1 Design Products at LA

- Conceptual Design Documents
  - General Arrangements
  - P&IDs
  - Electrical one lines
  - System Descriptions
- Estimating Basis for Completion 20%
  - Partially dimensioned
  - Not at Rev. A level

Bin 3 Supplemental

- Analyses of Source Terms
- Detailed design description and definition of the licensing basis
- Demonstration of success path for unprecedented design
- High level of confidence needed for scientific or Performance Assessment findings

Bin 2 Supplemental

- Plans for coping with radiological emergencies at any time prior to permanent closure
- Principal Design Criteria and their relationship to any performance objectives promulgated by the NRC
- The Design Bases and the relation of the design bases to the principle design criteria
- Construction Materials (including general arrangement and approximate dimensions)

Bin 2 Supplemental

(Continued)

- DBE involvement probability of occurrence of events
- Source Terms and analyses of radiation fields encountered by workers
- ALARA considerations
- Schedules for inspection, tests, and maintenance of SSCs

Bin 1 Supplemental

- Description of system including quality classification operational description
  - Purpose/function
  - Back-up systems, if any
- Interfaces with other systems
  - Physical
  - Operational
  - Boundaries with other systems
- Interface/Interaction with safety (QA-A, QA-2) systems
- Description of operation in various facility operational modes, various facility emergency modes, repository modes

Bin 1 Supplemental

(Continued)

- P&ID
- Power sources, distribution and emergency, as applicable
- Controls systems description
  - Normal mode
  - Automatic and emergency control actions
- Industry standards
  - Design
  - Construction
- Licensing Standards applicable acceptance criteria