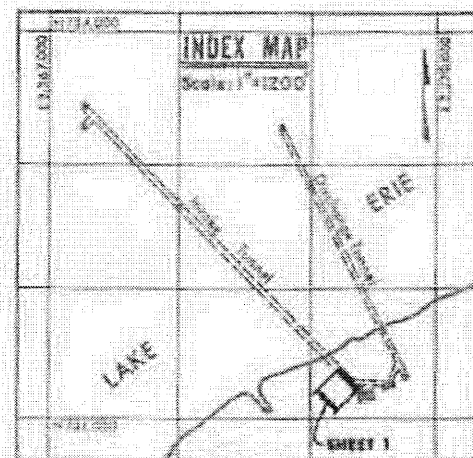
 **PERRY NUCLEAR POWER PLANT**

Location Map  
Perry Nuclear Power Plant

Figure 2D-1



**SYMBOLS**

(1/2)" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE

11/12-21" DISCONTINUOUS IRON BED

11/11" HARD, LIGHT GREY SANDY SHALE TO SILTSTONE BED

10/10-21" DISCONTINUOUS IRON BED WITHIN GREY BED

FRACTURE

FAULT

BEDDING PARTING

VERTICAL JOINT

INCLINED JOINT

BEDDING, STRIKE AND DIP

MOISTURE ALONG BEDDING PARTING

SEEPAGE FROM FEATURE

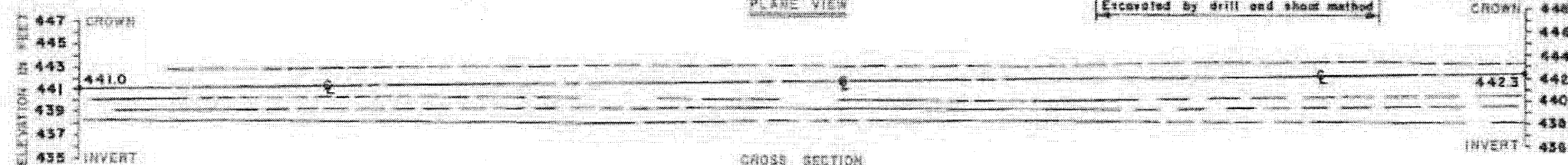
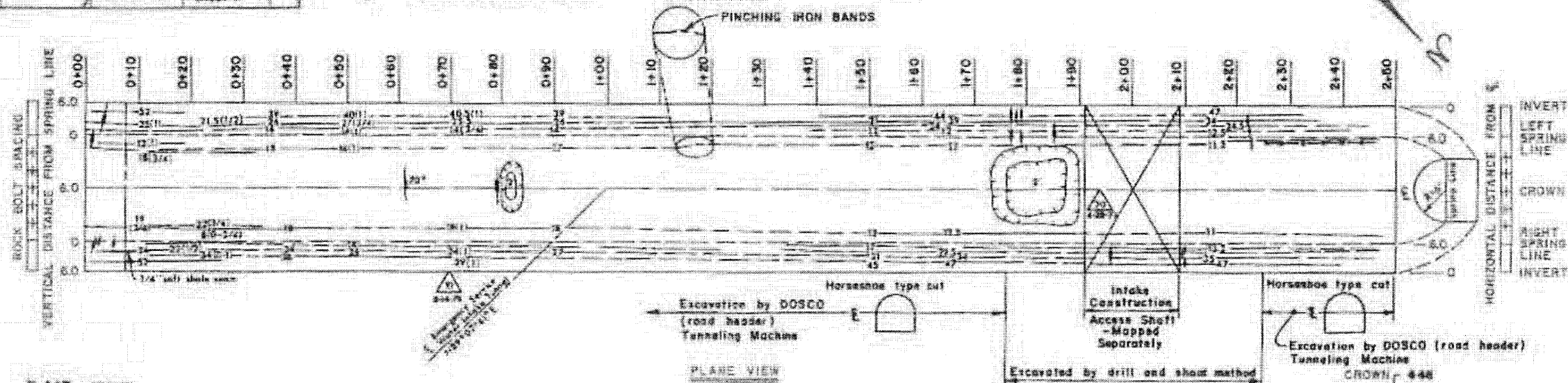
OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN

METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

\*Notes:

Number (v) in parentheses indicates bed thickness.

Number preceding parenthesis indicates inches above or below spring line of station of measurement.



Excavation Progress				Excavation Progress			
ESTIMATED ROCK CONDITION (TERZAGHI NO.)				ESTIMATED ROCK CONDITION (TERZAGHI NO.)			
TEMPORARY SUPPORT SYSTEM				TEMPORARY SUPPORT SYSTEM			
BEDDING SPACING				BEDDING SPACING			
FRACTURE SPACING				FRACTURE SPACING			
WATER CONDITION				WATER CONDITION			
DEPTH OF COVER				DEPTH OF COVER			

Excavation Progress

ESTIMATED ROCK CONDITION (TERZAGHI NO.)

TEMPORARY SUPPORT SYSTEM

BEDDING SPACING

FRACTURE SPACING

WATER CONDITION

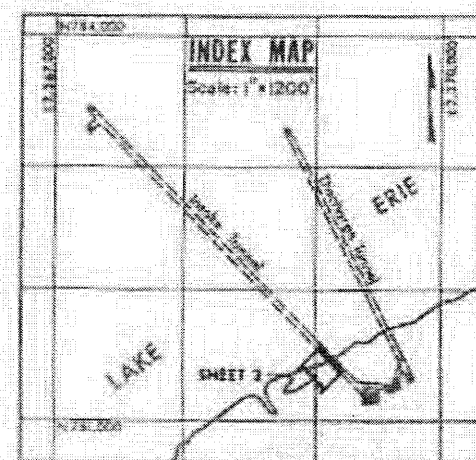
DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

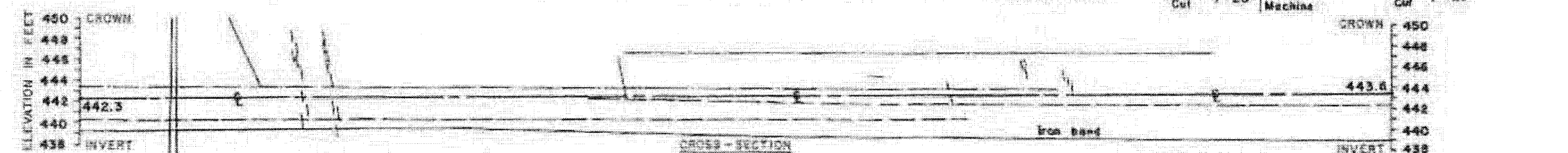
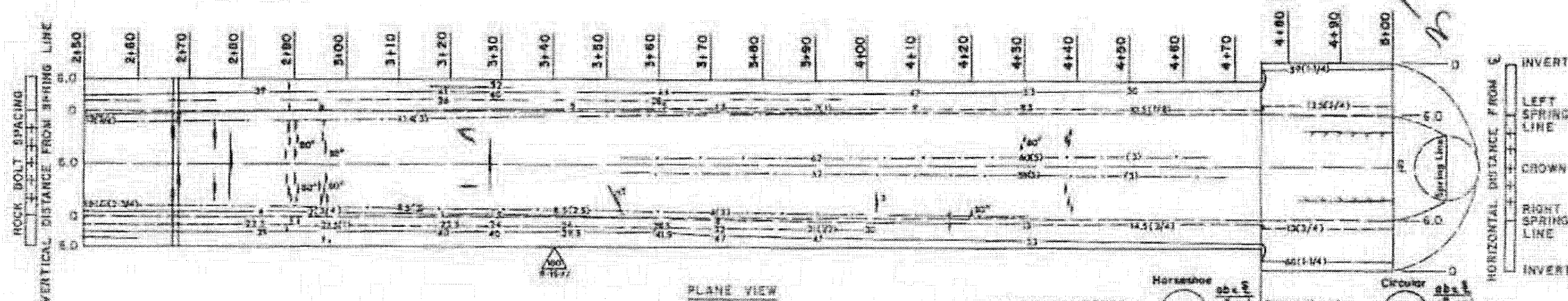
Geologic Map of  
Tunnel Excavations

Figure 2D-2 (Sheet 1 of 24)



- SYMBOLS**
- 1/4" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 1/10" DISCONTINUOUS IRON BED
  - 1/1" HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 1/100" DISCONTINUOUS IRON BED WITHIN GREY BED
  - 1/2" FRACTURE ZONE
  - 1/2" FAULT
  - 1/2" BEDDING PARTING
  - 1/2" VERTICAL JOINT
  - 1/2" INCLINED JOINT
  - 1/2" BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \*Note: Number(s) in parentheses indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line of station of measurement.



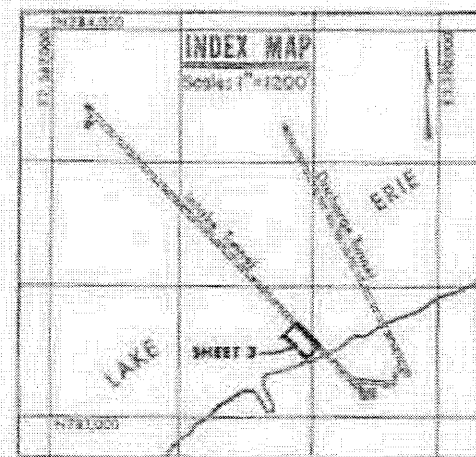
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1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"	1'-5"
1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"	1'-10"
Not pertinent																	
Not pertinent																	

EXCAVATION PROGRESS  
ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
TEMPORARY SUPPORT SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER

(Rev. 12 1/03)  
**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations  
Figure 20-2 (Sheet 2 of 24)

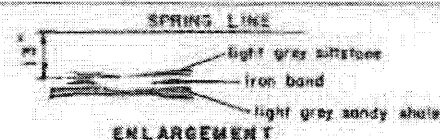
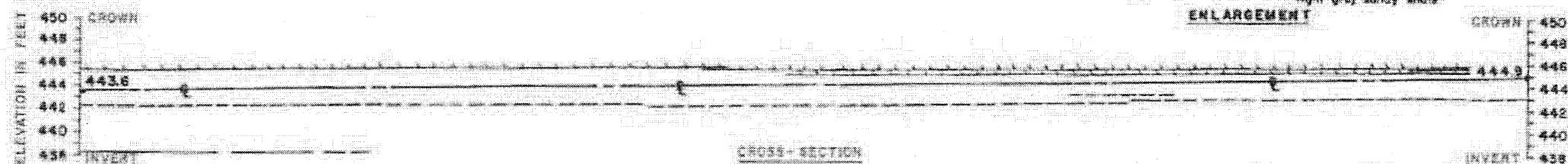
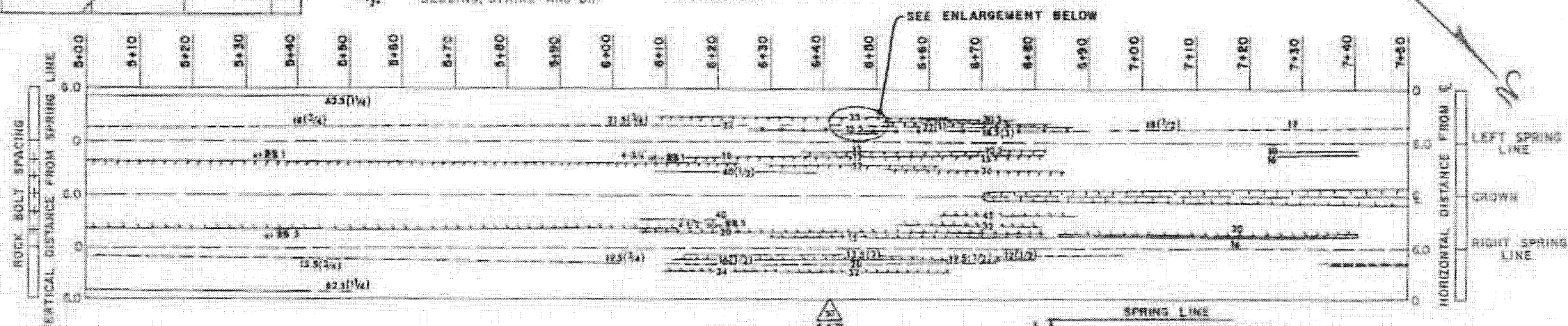




- SYMBOLS**
- $\frac{1}{2}$  HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - $\frac{1}{2}$  DISCONTINUOUS IRON BED
  - $\frac{1}{2}$  HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - $\frac{1}{2}$  DISCONTINUOUS IRON BED WITHIN GREY BED
  - $\frac{1}{2}$  FRACTURE
  - $\frac{1}{2}$  FAULT
  - $\frac{1}{2}$  BEDDING PARTING
  - $\frac{1}{2}$  VERTICAL JOINT
  - $\frac{1}{2}$  INCLINED JOINT
  - $\frac{1}{2}$  BEDDING, STRIKE AND DIP

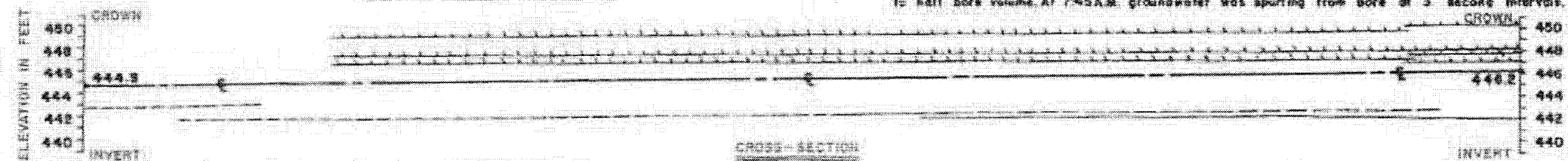
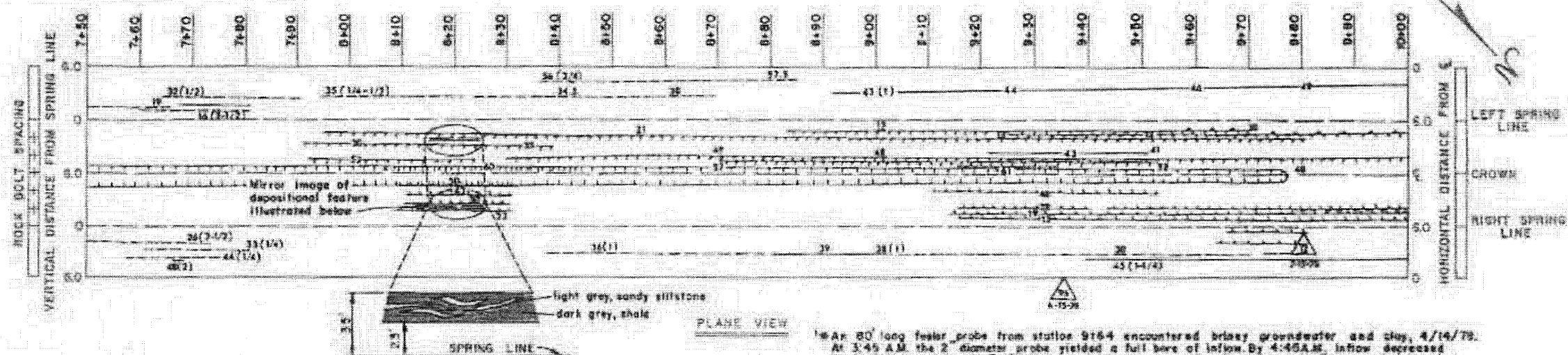
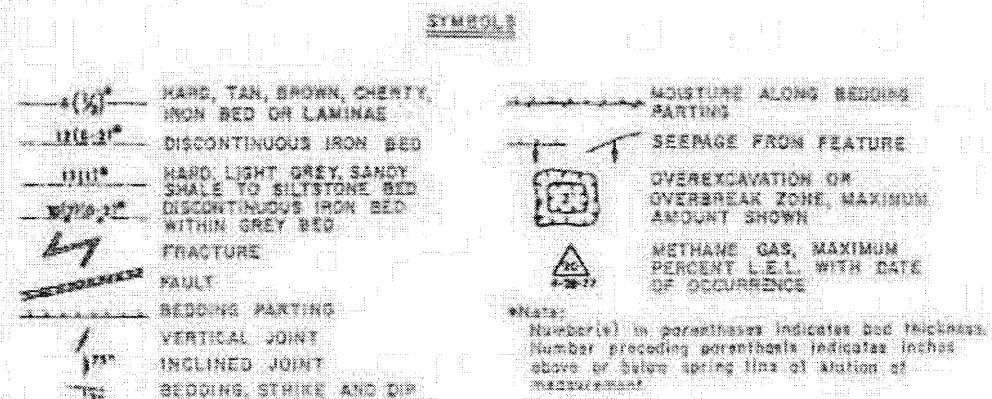
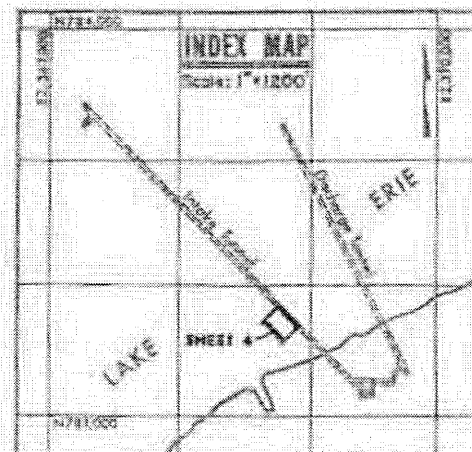
- $\frac{1}{2}$  MOISTURE ALONG BEDDING PARTING
- $\frac{1}{2}$  SEEPAGE FROM FEATURE
- $\frac{1}{2}$  OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- $\frac{1}{2}$  METHANE GAS, MAXIMUM PERCENT (L.E.L. WITH DATE OF OCCURRENCE)

**Notes:**  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
No. 4							—No. 4— Spilling off main bed fracture starting on sta. 5170
5 back holes of 2" centers in 1/2" spaced, 2-3.5" apart covered by wire mesh							
1" x 4"							
Bedding fractures only							
No inflow							Slight moisture in known along bedding fractures
3 back holes of 2" centers in 1/2" spaced, 2-3.5" apart covered by wire mesh							5' water
1/2" x 4"							170' subhorizontal shale

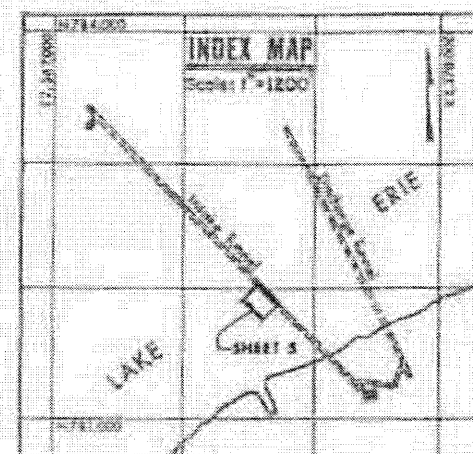




1'-4"	1'-7"	1'-8"	1'-10"
Excavation progress			
ESTIMATED ROCK CONDITION (TERZAGHI NO.)			
TEMPORARY SUPPORT SYSTEM			
BEDDING SPACING			
FRACTURE SPACING			
WATER CONDITION			
DEPTH OF COVER			

**PERRY NUCLEAR POWER PLANT**

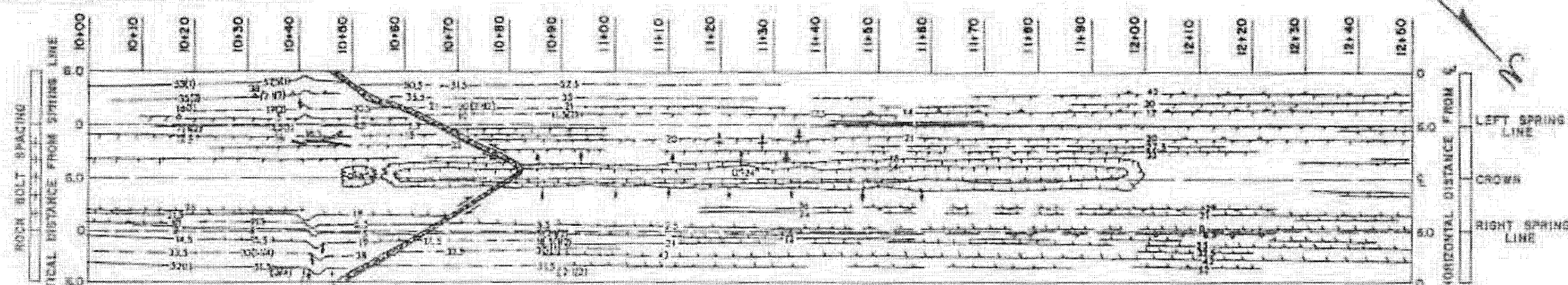
Geologic Map of  
Tunnel Excavations  
Figure 2D-2 (Sheet 4 of 24)



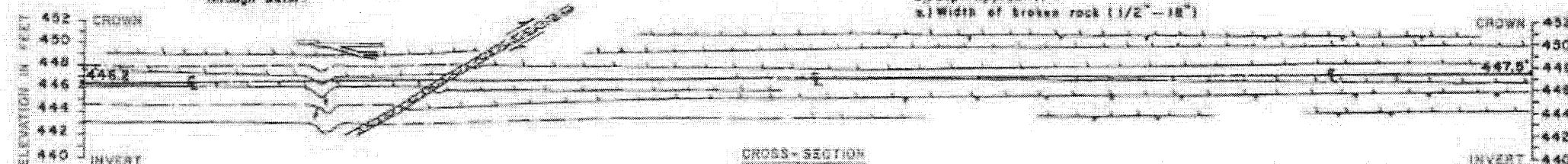
- SYMBOLS**
- 1 1/2" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 10-12" DISCONTINUOUS IRON BED
  - 12-14" HARD, LIGHT GREY SANDY SHALE TO SILTSTONE BED
  - 10-12" DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT (with sense of motion)
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- METHANE GAS, MAXIMUM PERCENT I.E.L. WITH DATE OF OCCURRENCE

\* Note:  
Number(s) in parentheses indicates bed thickness.  
Number preceding parenthesis indicates inches above or below spring line at station of measurement.



- FAULT SEOMETRY**
- a.) Apparent displacement - 22"
  - b.) Actual vertical displacement - 12"
  - c.) Strike - N 47° E
  - d.) Dip - approx 17°
  - e.) Width of broken rock (1 1/2" - 18")



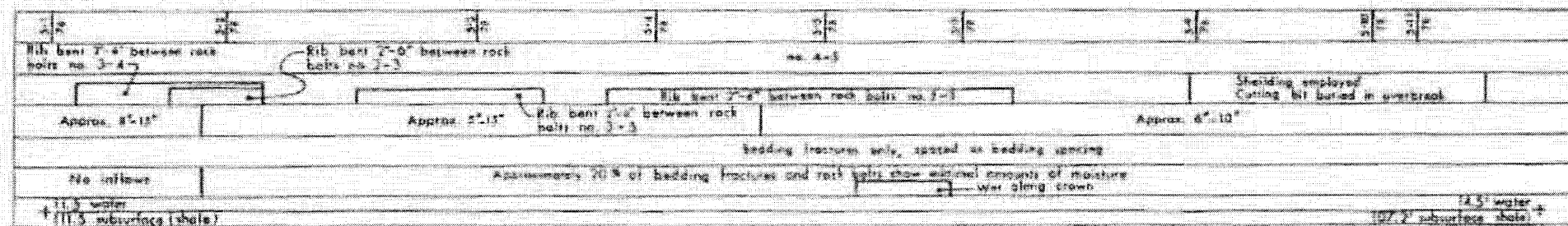
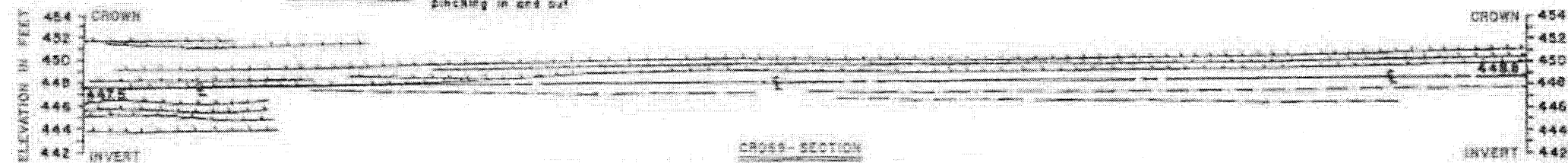
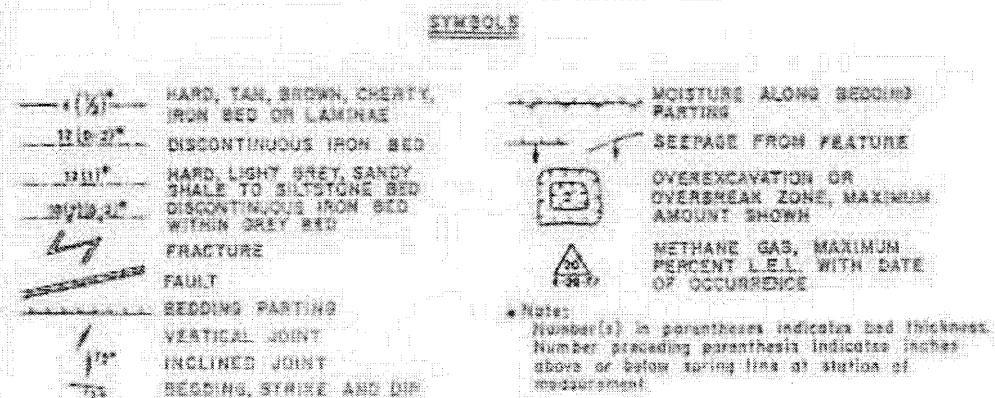
No. 5-6		No. 7-8		No. 9-10		No. 11-12		No. 13-14	
5 rock bolts at 2' centers in steel ribs at 3-3.5' centers		0-24" of overbreak between rock bolt no 2-4		5 rock bolts at 2' centers in steel ribs at 3-3.5' centers spanned by wire mesh		full chauling		5 rock bolts at 2' centers in ribs at 3.5' centers spanned by wire mesh	
7'-10"		7'-8"		2'-2"		approx. 6'-14"		8'-15"	
No inflows		Bedding fractures 1/2 to 1/8" thick highly fractured fault zone w/ gouge		No inflows		Bedding fractures only, spaced as above		Slight inflow from rock bolts	
11.7' water (photo)		water dripping from chauling		2' inflows at approx. 1 gal/min		Slight moisture along approx. 20% of bedding fractures and rock bolts		10.3' water (photo)	

EXCAVATION PROGRESS  
ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
TEMPORARY SUPPORT SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER

(Rev. 12/1/03)  
**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations  
Figure 2D-2 (Sheet 5 of 24)





EXCAVATION PROGRESS	
ESTIMATED ROCK	
CONDITION (TERZAGHI NO.)	
TEMPORARY SUPPORT	
SYSTEM	
NEEDING SPACING	
FRACTURE SPACING	
WATER CONDITION	
DEPTH OF COVER	

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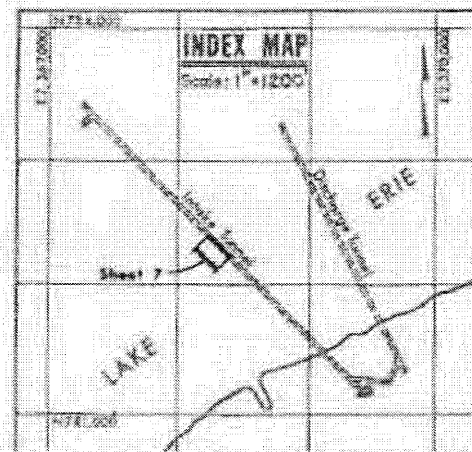


PERRY NUCLEAR POWER PLANT

## Geologic Map of Tunnel Excavations

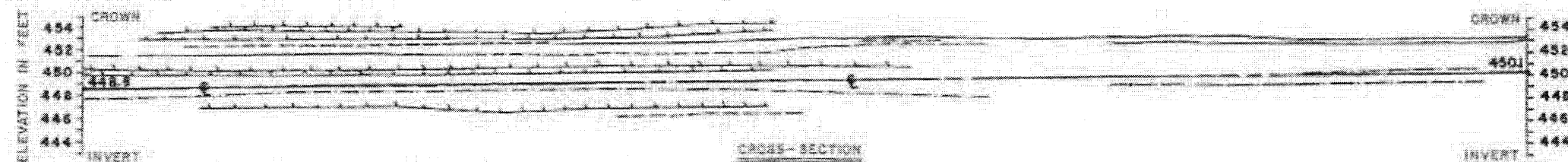
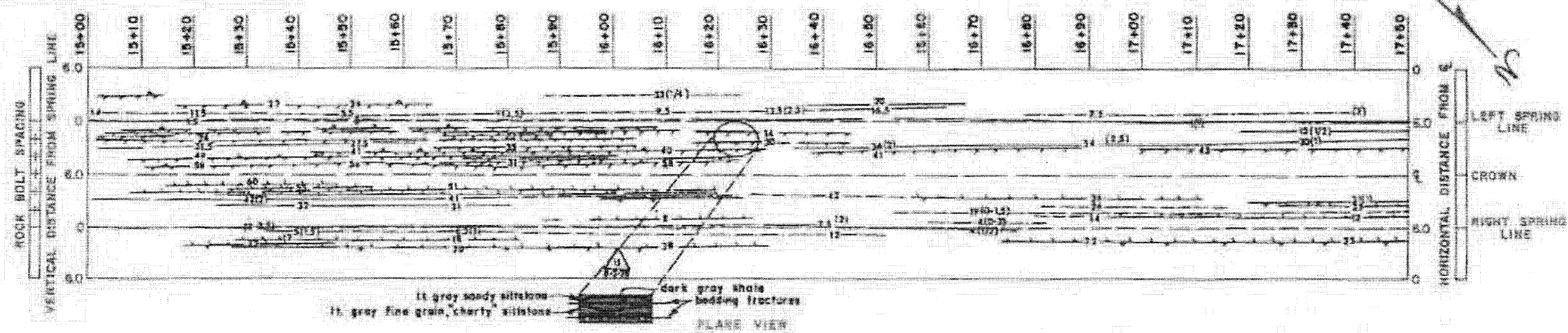
Figure 2D-2 (Sheet 6 of 24)





- SYMBOLS**
- $\frac{1}{2}$ " HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 12(2-3)" DISCONTINUOUS IRON BED
  - 17(1)" HARD, LIGHT GRAY, SANDY SHALE TO SILTSTONE BED
  - 25(12-2)" DISCONTINUOUS IRON BED WITHIN GRAY BED
  - ⚡ FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - 30 OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - 40 METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \* Note: Number(s) in parentheses indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line at station of measurement.



5-15 78	5-16 78	5-17 78	5-18 78	5-19 78
NO. 4-5	Slight scaling from crown along entire length of excavation (0-2" overbreak)			NO. 4-5
2 rock bolts at 7' centers in steel ribs or 3.5' to 4.0' centers, spaced by wire mesh				
Approx. 6"-10"	8"-9"		6"-10"	
Bedding fractures only				
Approx. 20% of bedding fractures show minimal moisture			Approx. 10% of bedding fractures show moisture	
14.5' water 107.2' subsurface (shale)			10.3' water 103.9' subsurface (shale)	

EXCAVATION PROGRESS  
ESTIMATED ROCK  
CONDITION (TERZAGHI NO. 1)  
TEMPORARY SUPPORT  
SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER

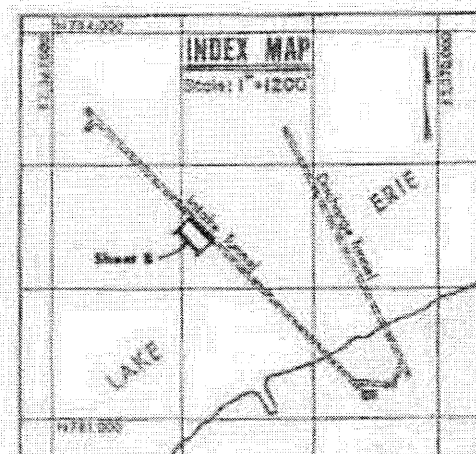
(Rev. 12 1/03)



PERRY NUCLEAR POWER PLANT

Geologic Map of  
Tunnel Excavations

Figure 2D-2 (Sheet 7 of 24)

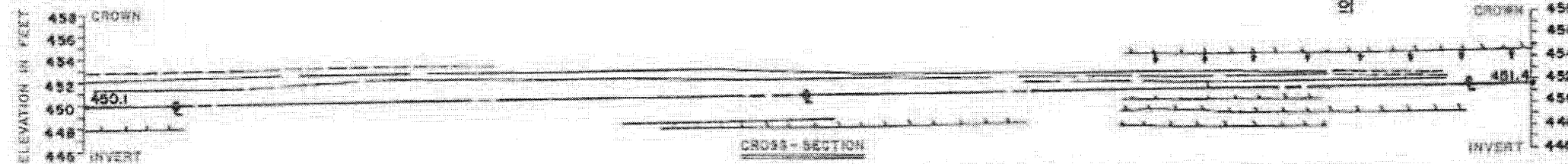
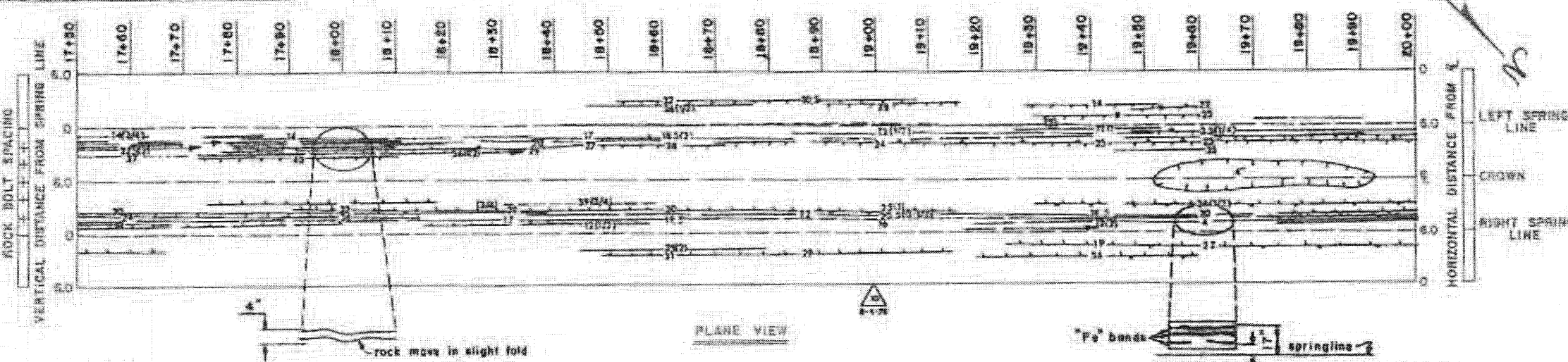


**SYMBOLS**

(X) HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE  
 12 10 37 DISCONTINUOUS IRON BED  
 12 11 HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED  
 12 12 20 DISCONTINUOUS IRON BED WITHIN GREY BED  
 12 13 FRACTURE  
 12 14 FAULT  
 12 15 BEDDING PARTING  
 12 16 VERTICAL JOINT  
 12 17 INCLINED JOINT  
 12 18 BEDDING, STRIKE AND DIP

MOISTURE ALONG BEDDING PARTING  
 SEEPAGE FROM FEATURE  
 OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN  
 METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

\*Note:  
 Number(s) in parenthesis indicates bed thickness  
 Number preceding parenthesis indicates inches above or below spring line of station of measurement.



12 17	12 18	12 19	12 20	12 21
as 4	Slight scaling along crown for series length (between rock bolt 2 & 4)		Slight scaling from roof (0'-4')	as 4
	3 rock bolts at 2.0' centers in steel ribs at 2.5' to 4.0' centers, spanned by wire mesh		Some ribs at 4.0' centers	
	Approx. 8"	Approx. 4" to 10"	4" to 8"	
	Bedding fractures only			
	Traces of moisture along a couple bedding fractures			
			Slight moisture on approx. 60% of the excavation	
11.5' water			11.5' water	
101.5' subsurface (shale)			101.5' subsurface (shale)	

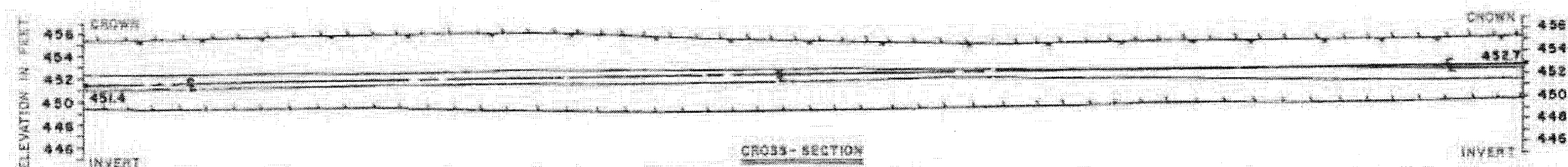
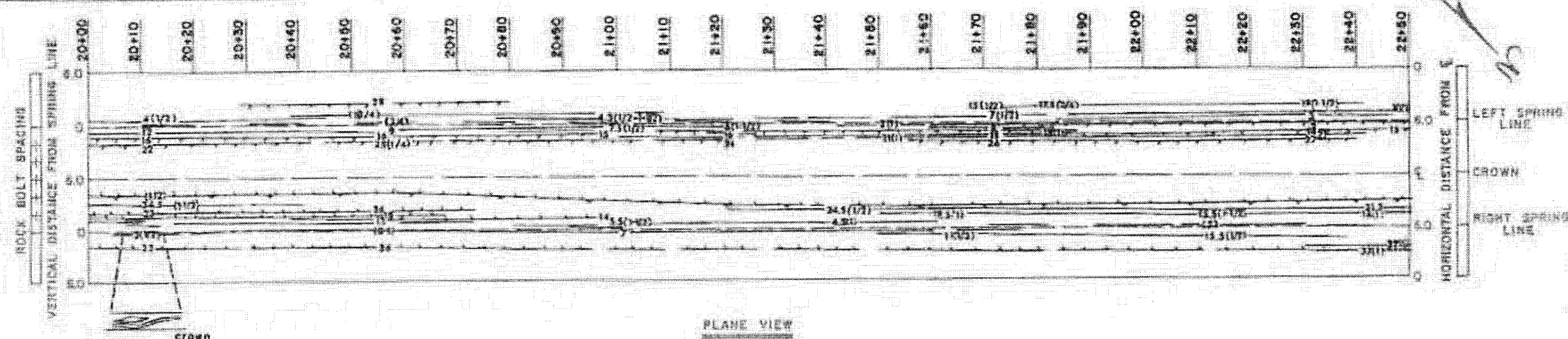
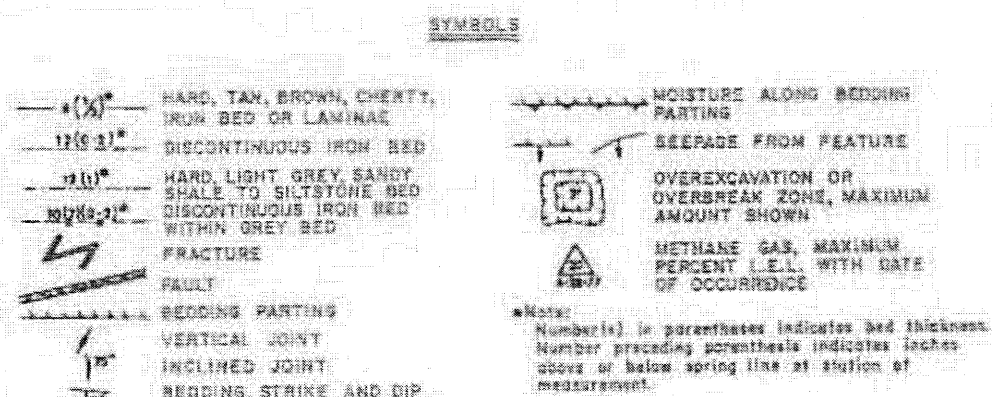
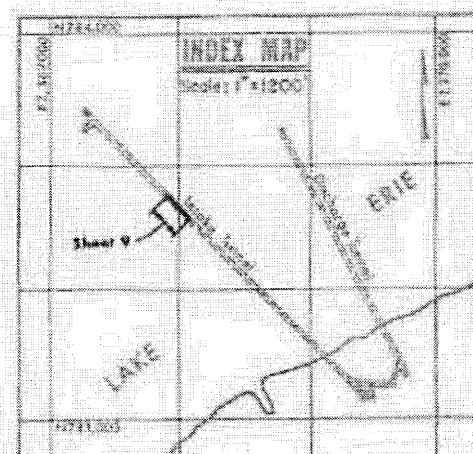
EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2D-2 (Sheet 8 of 24)



17.5"	191.8"	17.5"	191.8"	17.5"	191.8"	17.5"	191.8"	17.5"	191.8"
No. 1					No. 2				
3 rock bolts at 2' centers in steel ribs at 4' centers supported by wire mesh					3 rock bolts at 2' centers in steel ribs at 2.5'-4.0' centers supported by wire mesh				
5'-8"					4'-8"				
Bedding fractures only									
Slight moisture from open parting along west wall for entire length									
17.5" water					17.5" water				
191.8" subsurface (shale)					191.8" subsurface (shale)				

EXCAVATION PROGRESS  
ESTIMATED ROCK  
CONDITION (TERZAGHI NO.)  
TEMPORARY SUPPORT  
SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER

(Rev. 12 1/03)

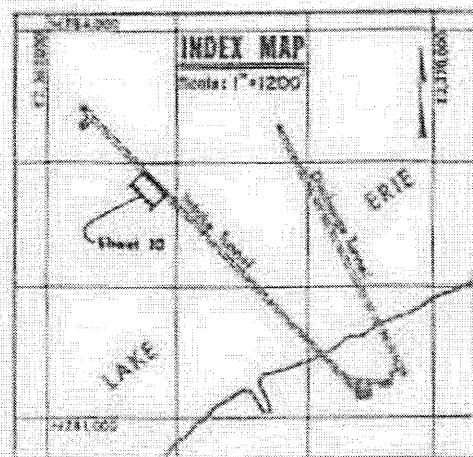


**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations

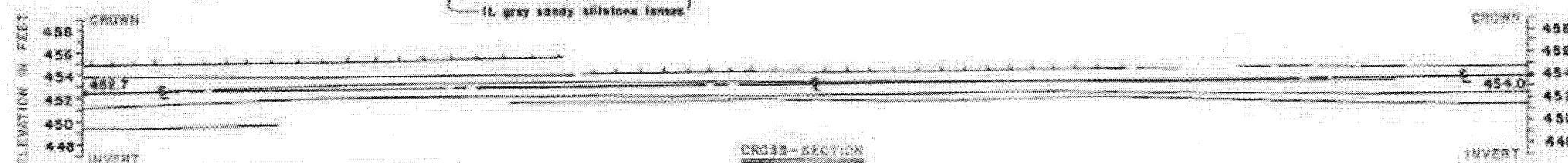
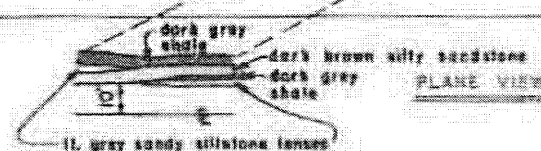
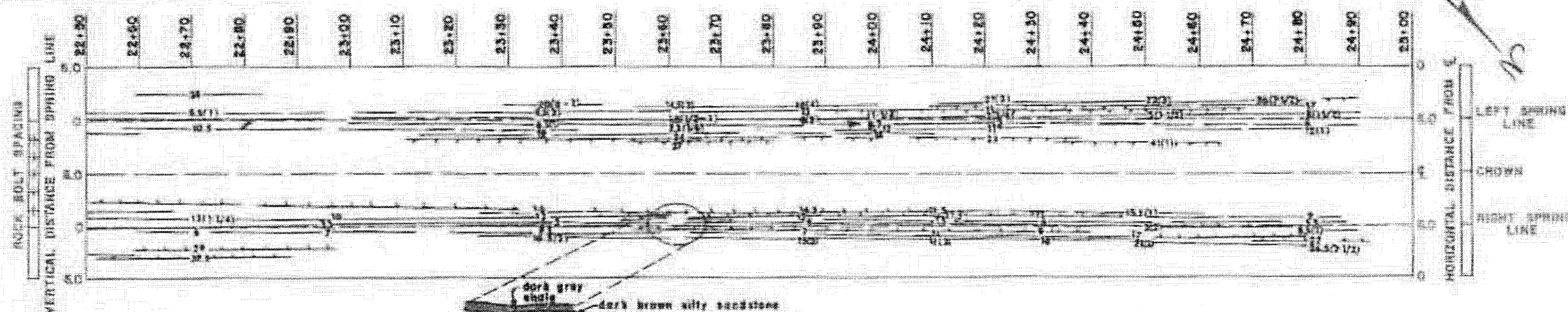
Figure 20-2 (Sheet 9 of 24)





- SYMBOLS**
- (1/2)— HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - (12/2-21)— DISCONTINUOUS IRON BED
  - (12/1)— HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - (10/20,2)— DISCONTINUOUS IRON BED WITHIN GREY BED
  - (1/2)— FRACTURE
  - (1/2)— FAULT
  - (1/2)— BEDDING PARTING
  - (1/2)— VERTICAL JOINT
  - (1/2)— INCLINED JOINT
  - (1/2)— BEDDING, STRIKE AND DIP

- (1/2)— MOISTURE ALONG BEDDING PARTING
  - (1/2)— SEEPAGE FROM FEATURE
  - (1/2)— OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - (1/2)— METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- Note:**  
Number(s) in parentheses indicates bed thickness.  
Number preceding parenthesis indicates inches above or below spring line at station of measurement.



No. 4		No. 4	
Slightly weathered between rail bolt nos. 7 & 8, 10'-0" deep (max 24")		Slightly weathered between rail bolt nos. 7 & 8, 10'-0" deep (max 24")	
Track bolts in 7' centers in steel ribs at 1.5' to 4.0' centers, supported by wire mesh		Track bolts in 7' centers in steel ribs at 1.5' to 4.0' centers, supported by wire mesh	
3'-7"		1'-8"	
Bedding fractures only, located as above		No seepage	
Most bedding fractures, above springline along east wall		No seepage	
1.5' water		1.5' water	
K&S Substation (shown)		K&S Substation (shown)	

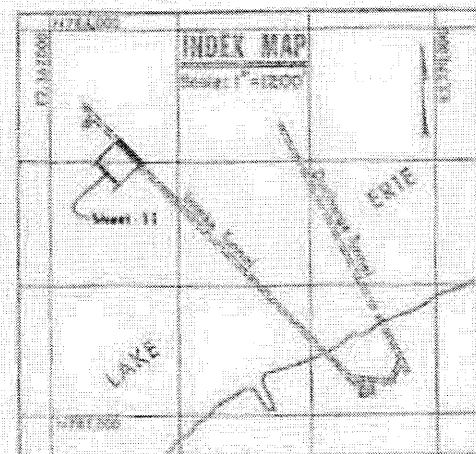
EXCAVATION PROGRESS  
ESTIMATED ROCK  
CONDITION (TERZAGHI NO. 1)  
TEMPORARY SUPPORT  
SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER



PERRY NUCLEAR POWER PLANT

Geologic Map of  
Tunnel Excavations

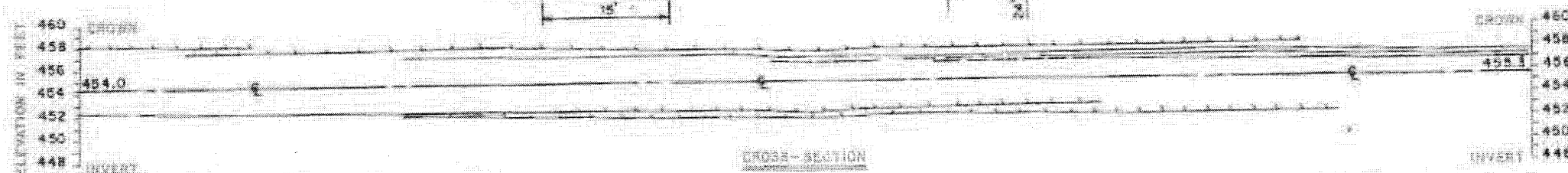
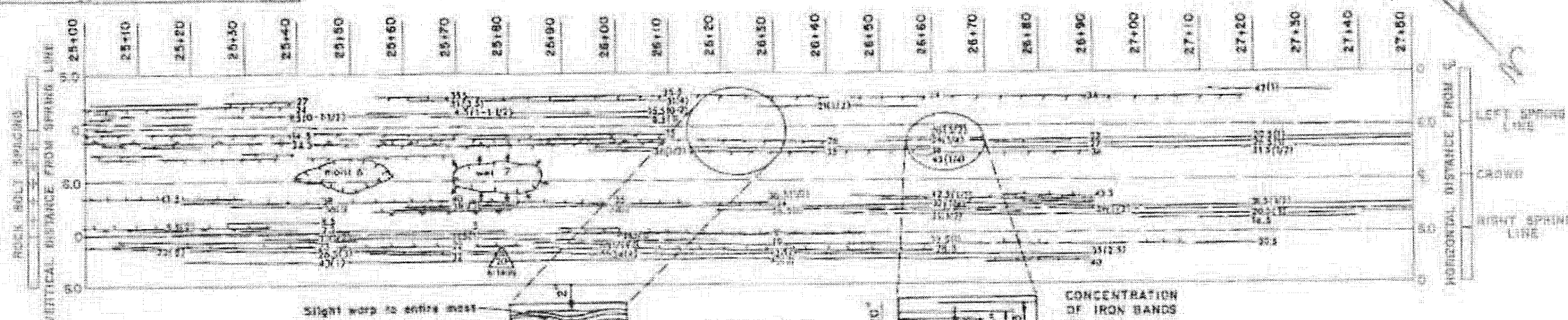
Figure 2D-2 (Sheet 13 of 24)



- SYMBOLS**
- 1/2" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 1/2" DISCONTINUOUS IRON BED
  - 1/2" HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 1/2" DISCONTINUOUS IRON BED WITHIN GREY BED
  - 1/2" FRACTURE
  - 1/2" FAULT
  - 1/2" BEDDING PARTING
  - 1/2" VERTICAL JOINT
  - 1/2" INCLINED JOINT
  - 1/2" BEDDING, STRIKE AND DIP

- 1/2" MOISTURE ALONG BEDDING PARTING
- 1/2" BEARING FROM FEATURE
- 1/2" OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- 1/2" METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

\* Note:  
Numerals in parentheses indicates bed thickness  
Number preceding parentheses indicates inches above or below spring line of station of measurement



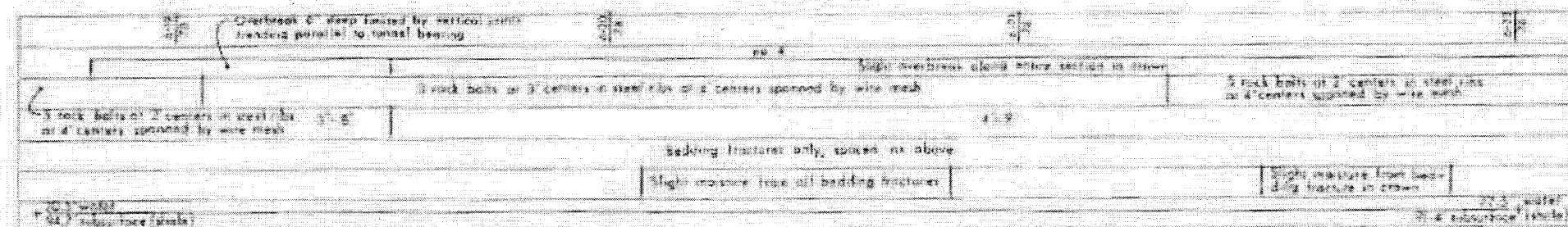
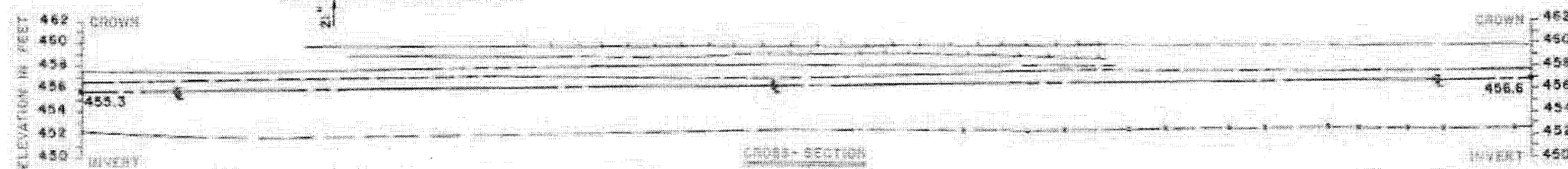
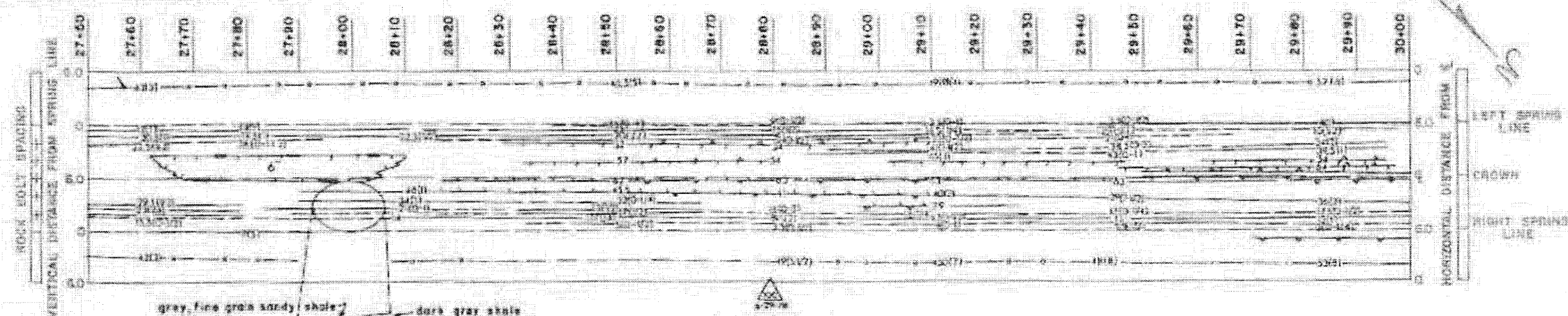
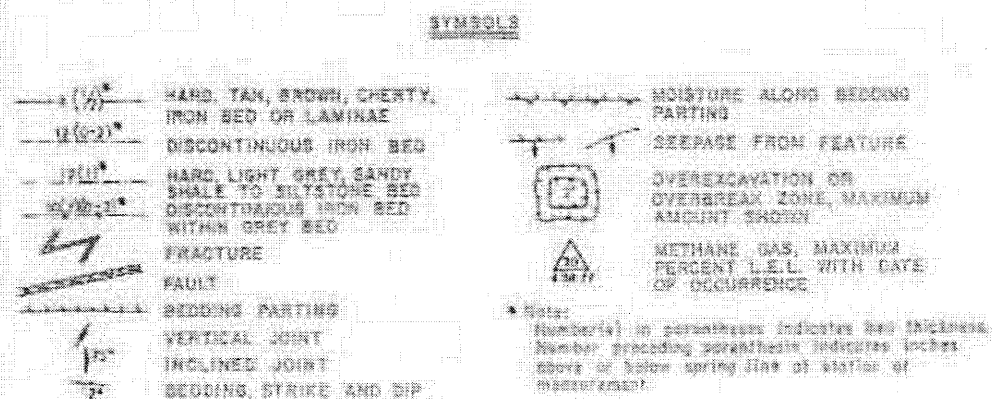
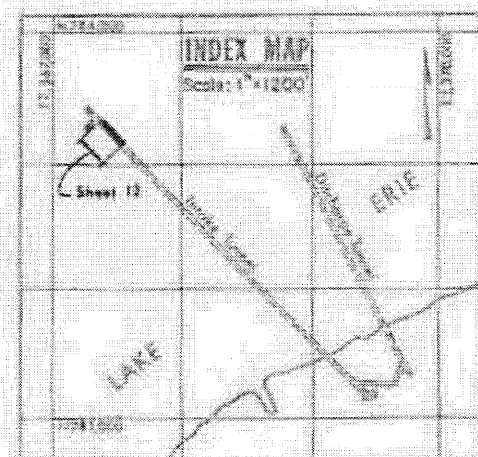
Slight overbreak along entire section 0' - 6' deep max 2'		Slight overbreak along entire section 0' - 6'		Slight overbreak along entire section 0' - 6'	
16' - 0' overbreak in crown max 1'	1' - 7'	1' - 7'	1' - 7'	1' - 7'	1' - 7'
Additional rock bolts and ribs added to prohibit additional overbreaks		Additional rock bolts and ribs added to prohibit additional overbreaks		Additional rock bolts and ribs added to prohibit additional overbreaks	
Bedding fractures only, spaced at 4' max		Bedding fractures only, spaced at 4' max		Bedding fractures only, spaced at 4' max	
Slight dip from overbreak in crown		Slight moisture along bedding fractures		No seepage	
3' - 5' water		3' - 5' water		3' - 5' water	
140' surface (thole)		140' surface (thole)		140' surface (thole)	

EXCAVATION PROGRESS  
ESTIMATED ROCK CONDITION (VERTICAL RD.)  
TEMPORARY SUPPORT SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER

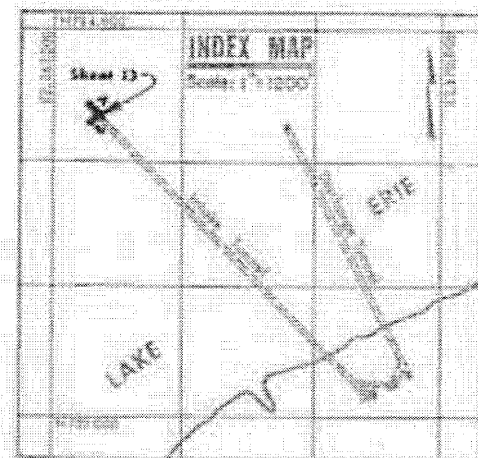
(Rev. 12 1/03)  
**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations

Figure 2D-2 (Sheet 11 of 24)





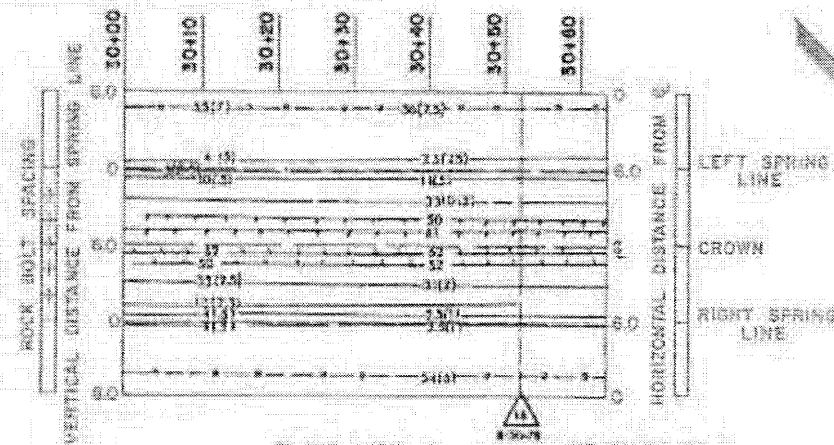


**SYMBOLS**

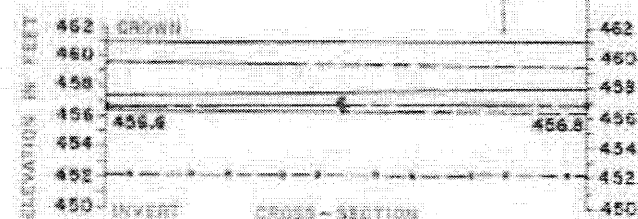
1/2" = 1' HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE  
 1/2" = 1' DISCONTINUOUS IRON BED  
 1/2" = 1' HARD, LIGHT GREY, SANDY SHALE TO SLTSTONE BED  
 1/2" = 1' DISCONTINUOUS IRON BED WITHIN GREY BED  
 1/2" = 1' FRACTURE  
 1/2" = 1' FAULT  
 1/2" = 1' BEDDING PARTING  
 1/2" = 1' VERTICAL JOINT  
 1/2" = 1' INCLINED JOINT  
 1/2" = 1' BEDDING, STRIKE AND DIP

MOISTURE ALONG BEDDING PARTING  
 SEEPAGE FROM FEATURE  
 OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN  
 METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

\*Note:  
 Numbers in parentheses indicate bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



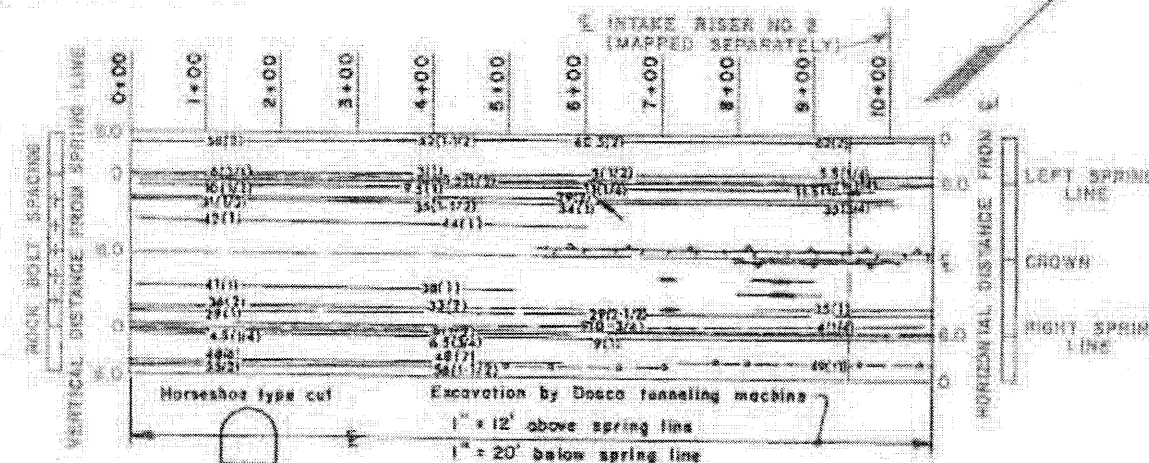
PLANE VIEW A



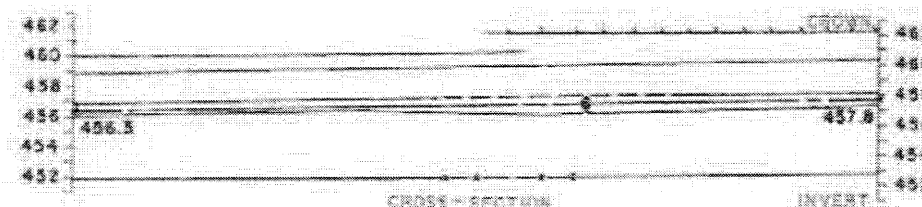
CROSS-SECTION A

EXCAVATION PROGRESS	ESTIMATED ROCK CONDITION (TERZAGHI NO.)
1-4	1-4
Slight overbreak along entire section	1-4
3 rock bolts at 2' centers in steel ribs at 4' centers spaced by wire mesh	1-4
4'-6"	1-4
Bedding fractures only, spaced as above	1-4
Slight moisture along all bedding fractures	1-4
22.5' water	22.5'
91.5' subsurface (scale)	91.5'

TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER



PLANE VIEW B



CROSS-SECTION B

EXCAVATION PROGRESS	ESTIMATED ROCK CONDITION (TERZAGHI NO.)
1-4	1-4
Slight overbreak along entire section	1-4
3 rock bolts at 2' centers in steel ribs at 4'-6.5' centers, spaced by wire mesh	1-4
3'-8"	1-4
Bedding fractures only, spaced as above	1-4
Slight moisture along all bedding fractures	1-4
22.5' water	22.5'
91.5' subsurface (scale)	91.5'

TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(Rev. 12 1/83)

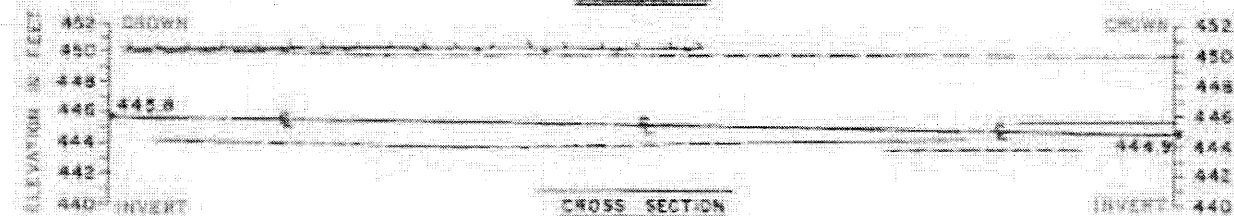
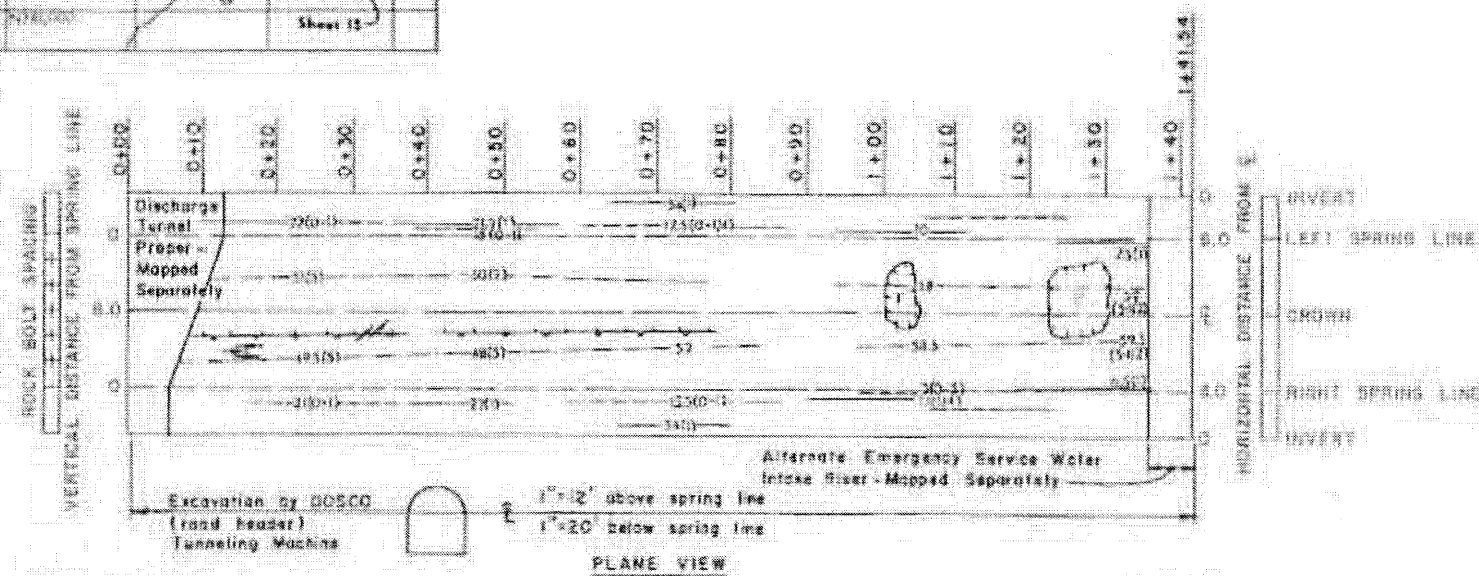
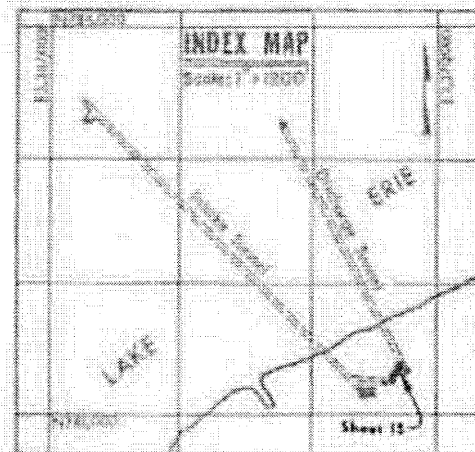


PERRY NUCLEAR POWER PLANT

Geologic Map of  
 Tunnel Excavations

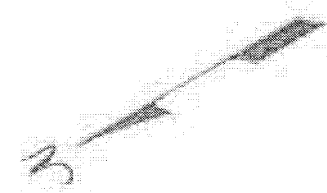
Figure 20-2 (Sheet 13 of 24)





1'	2'	3'	4'
rock			
3 rock bolts at 3' centers in steel ribs at 10'-11' centers, spanned by wire mesh			
1/2" x 1/2"	3" x 2"	1" x 2"	Approx. 1" x 1" openings
3" x 2"	Bedding fractures only, spaced as above		
Slight seepage from bedding parting along west wall		No inflows	
Approx. 31.5' limestone 27.5' granite sill		Approx. 27.5' limestone 27.5' granite sill	
11.7' shale		11.2' shale	

EXCAVATION PROGRESS  
ESTIMATED ROCK CONDITION (TERZAGHI NO. 1)  
TEMPORARY SUPPORT SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER



- SYMBOLS**
- (1/2)" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - (1/2)" DISCONTINUOUS IRON BED
  - (1/2)" HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - (1/2)" DISCONTINUOUS IRON BED WITH GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
  - MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - (5) OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN

Notes:  
Number(s) in parentheses indicate bed thickness.  
Number preceding parentheses indicates inches above or below spring line at station of measurement.

(Rev. 12 1/03)



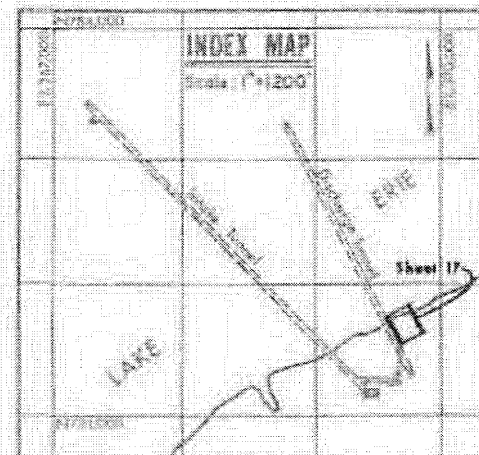
**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations

Figure 2D-2 (Sheet 15 of 24)



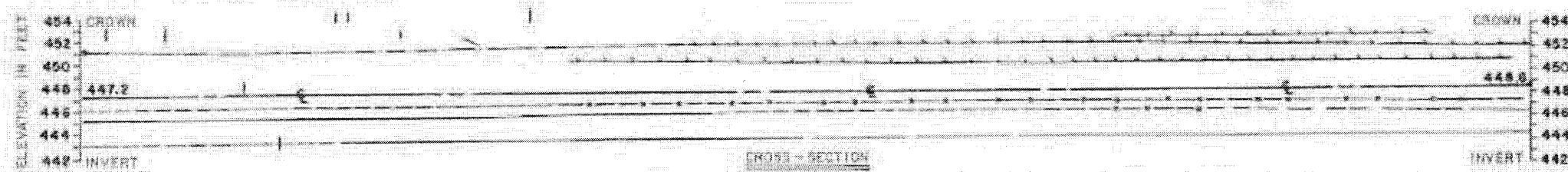
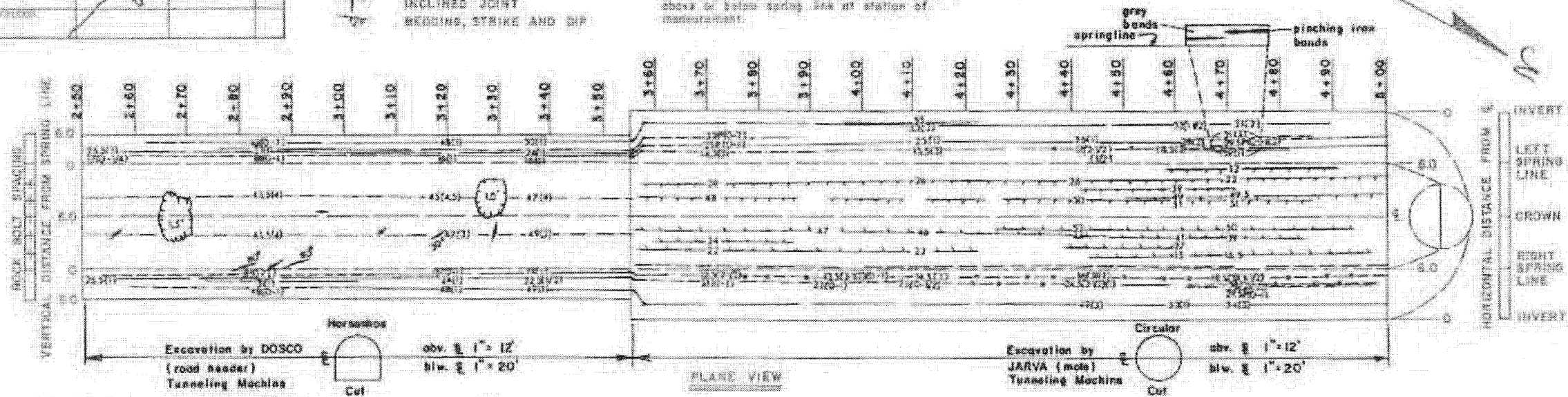




- SYMBOLS**
- 14' HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 12(5-2)' DISCONTINUOUS IRON BED
  - 12(1)' HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 15(1/2-2)' DISCONTINUOUS IRON BED WITHIN GREY BED
  - 15' FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN

\* Note: Number(s) in parentheses indicates bed thickness. Number preceding parentheses indicates inches above or below spring line of station of measurement.



No. 4					
3 inch bolts at 2' centers in steel ribs at 30'±3.5' centers, spanned by wire mesh					
1'-4"	1'-5"	1'-6"	5'-8"	4'-8"	5'-11"
Approx. 5'±0"	Approx. 8'	Approx. 11'	Jointing less apparent in smooth circular bore excavation	Bedding fractures only, spaced as above	
No inflow					
Approx. 24' limestone & 14' glacial till + 11.8' shale			Approx. 2' of bench + 11.2' of shale		

- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

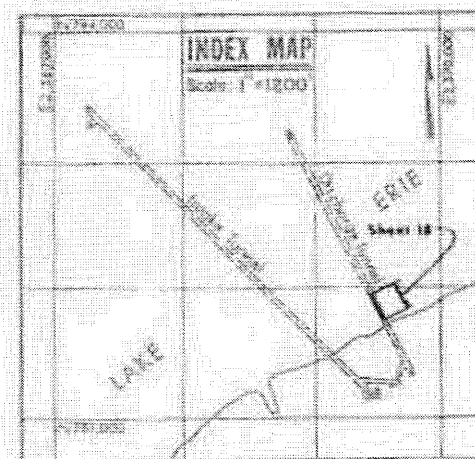
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations

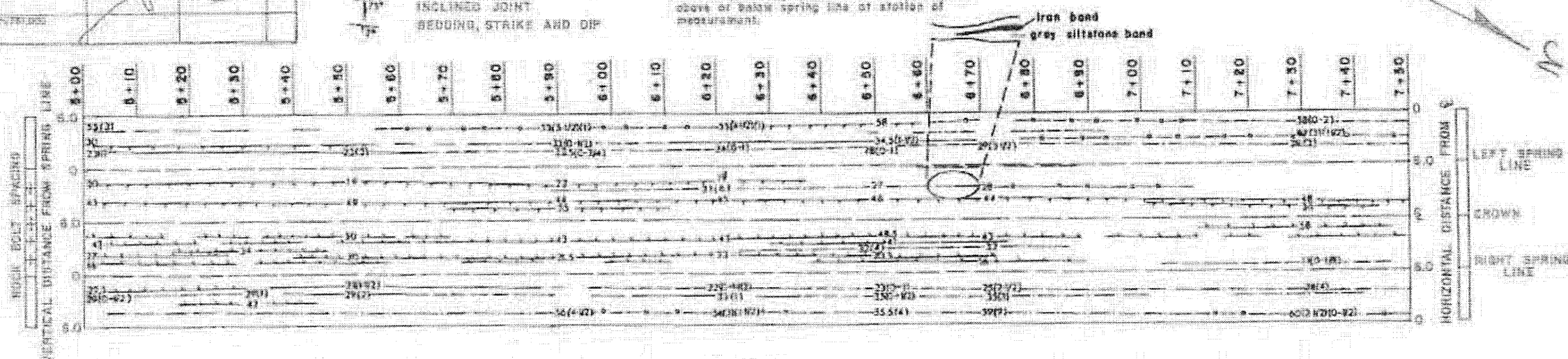
Figure 2D-2 (Sheet 17 of 24)



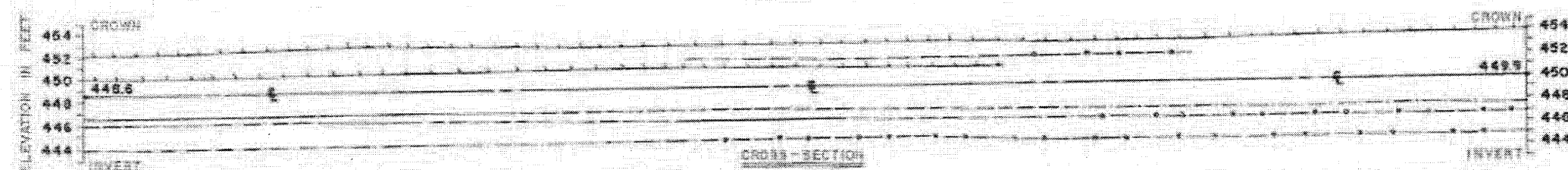
- SYMBOLS**
- $\frac{1}{2}$ " HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - $\frac{1}{2}$ "-2" DISCONTINUOUS IRON BED
  - $\frac{1}{2}$ "-2" HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - $\frac{1}{2}$ "-2" DISCONTINUOUS IRON BED WITHIN GREY BED
  - $\frac{1}{2}$ " FRACTURE
  - $\frac{1}{2}$ " FAULT
  - $\frac{1}{2}$ " BEDDING PARTING
  - $\frac{1}{2}$ " VERTICAL JOINT
  - $\frac{1}{2}$ " INCLINED JOINT
  - $\frac{1}{2}$ " BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

Note: Numerical in parentheses indicates bed thickness. Number preceding parentheses indicates inches above or below spring line at station of measurement.



PLANE VIEW



CROSS-SECTION

No. 4		No. 4	
3 rock bolts w/3 centers in steel ribs at 3.5'-4.0' centers spaced by wire mesh		Steel ribs at 3.5'-4.0' centers	
5'-11"		7'-12"	
Bedding fractures only, spaced as above		Bedding fractures only, spaced as above	
No inflows		No inflows	
Approx. 1' bench		2.5' bench	
10' 9" subsurface (drain)		10' 9" subsurface (drain)	

- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

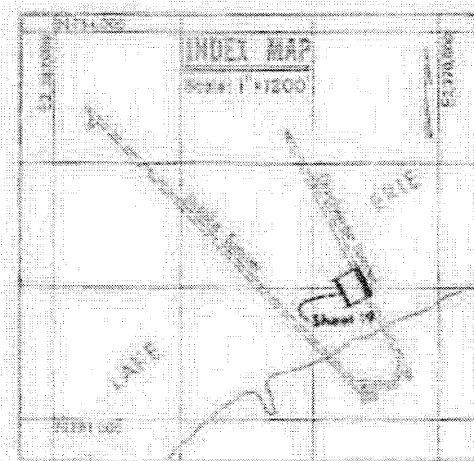
(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
Tunnel Excavations

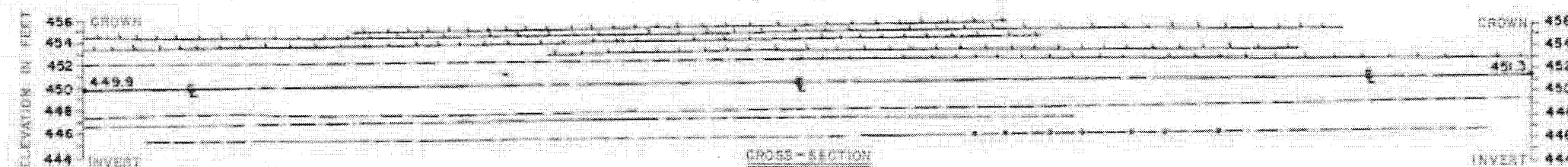
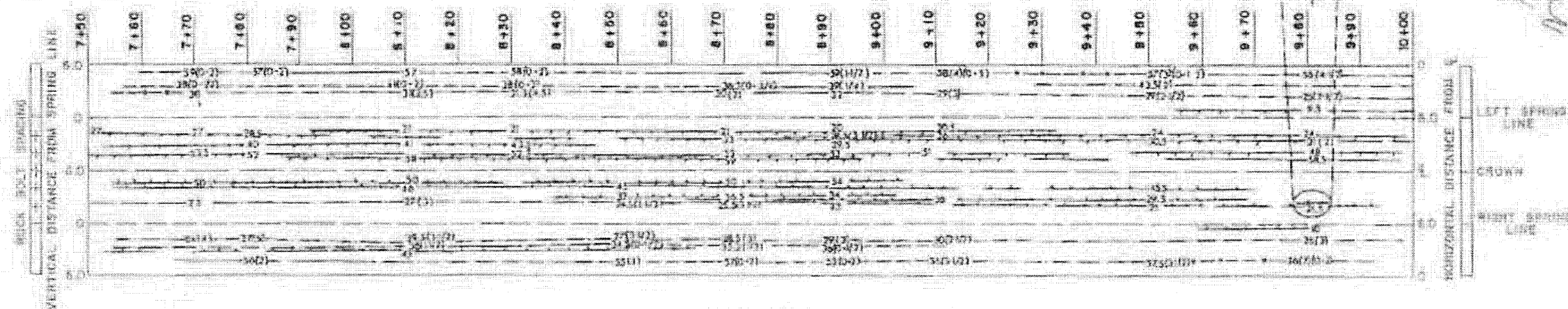
Figure 2D-2 (Sheet 18 of 24)





- SYMBOLS**
- 4(1/2)" HARD, TAN, BROWN, CHERTY IRON BED OR LAMINAE
  - 12(2-4)" DISCONTINUOUS IRON BED
  - 12(3)" HARD LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 12(20-24)" DISCONTINUOUS IRON BED WITHIN GREY BED
  - 4" FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- NOTES:**  
 Numerical in parentheses indicates bed thickness.  
 Number preceding parentheses indicates inches above or below spring line at station of measurement.



456	CROWN	456
454		454
452		452
450		450
448		448
446		446
444	INVERT	444
No. 4		
Stack bolts at 2' centers in steel ribs at 1'-6" centers, covered by wire mesh		
4" x 12"		
Bedding fractures only, spaced as above		
No inflow		
45' deep water		7.5' deep water
116.1' subsurface (hole)		111.7' subsurface (hole)

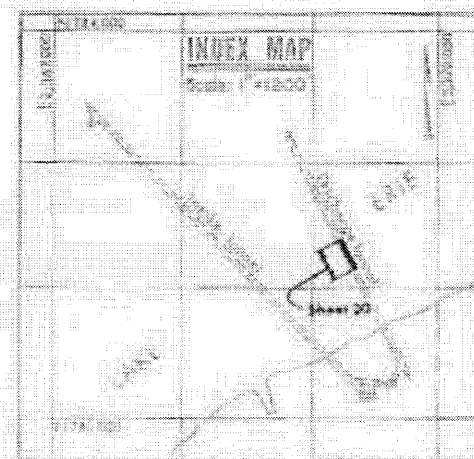
EXCAVATION PROGRESS  
 ESTIMATED ROCK  
 CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT  
 SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(Rev. 12 1/63)

**PERRY NUCLEAR POWER PLANT**

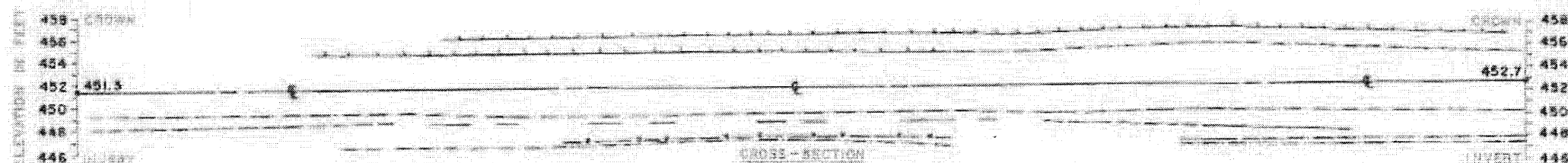
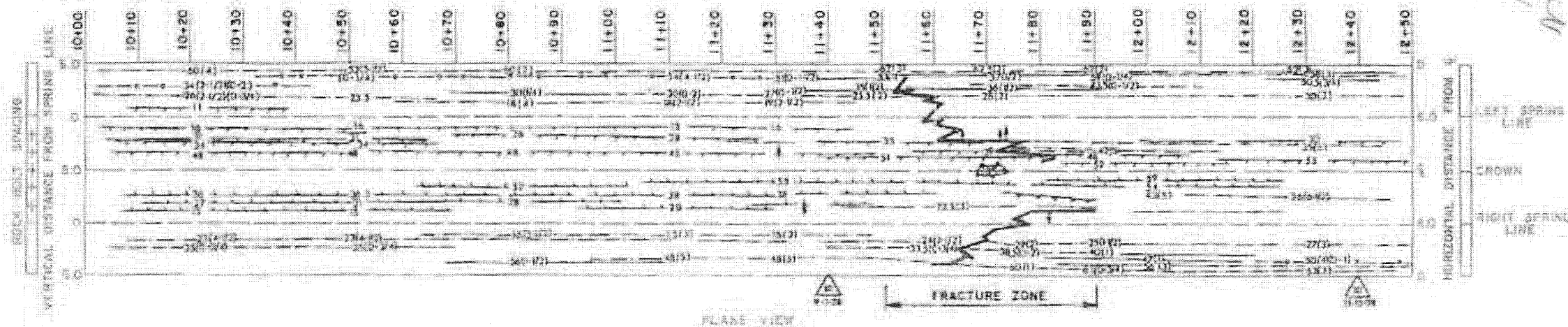
Geologic Map of  
 Tunnel Excavations

Figure 20-2 (Sheet 19 of 24)



- SYMBOLS**
- $1/2$ " HARD, TAN, BROWN, CHESTY, IRON BED OR LAMINAE
  - $1/2$ " DISCONTINUOUS IRON BED
  - $1/2$ " HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - $1/2$ " DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - POINT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING STRIKE AND DIP

- MISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURES
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.B.L. WITH DEPTH OF OCCURRENCE
- Notes:  
 Numbers in parentheses indicate bed thickness.  
 Numbers preceding parentheses indicate inches above or below spring line at station of overbreak.



No. 4 0" x 4" at overbreak, starting from crown			
3 rock bolts at 2' centers in steel ribs at 4.0' x 4.5' centers, spanned by wire mesh			
3" x 10"	6" x 6"		3" x 9"
Bedding fractures only, spaced as above		Bedding fractures only, spaced as above	
No inflows		Seepage from rock bolts	Seepage from bedding partings in fracture zone
No inflows		No inflows	
4.5' water (111.7' substructure (photo))		8.5' water (107.7' substructure (photo))	

EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

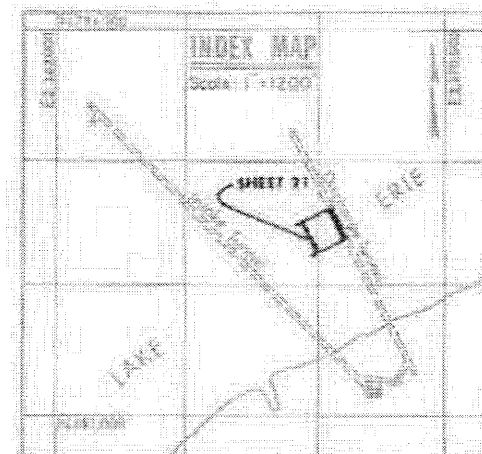
(Rev. 12 1/03)



PERRY NUCLEAR POWER PLANT

Geologic Map of  
 Tunnel Excavations

Figure 2D-2 (Sheet 20 of 24)

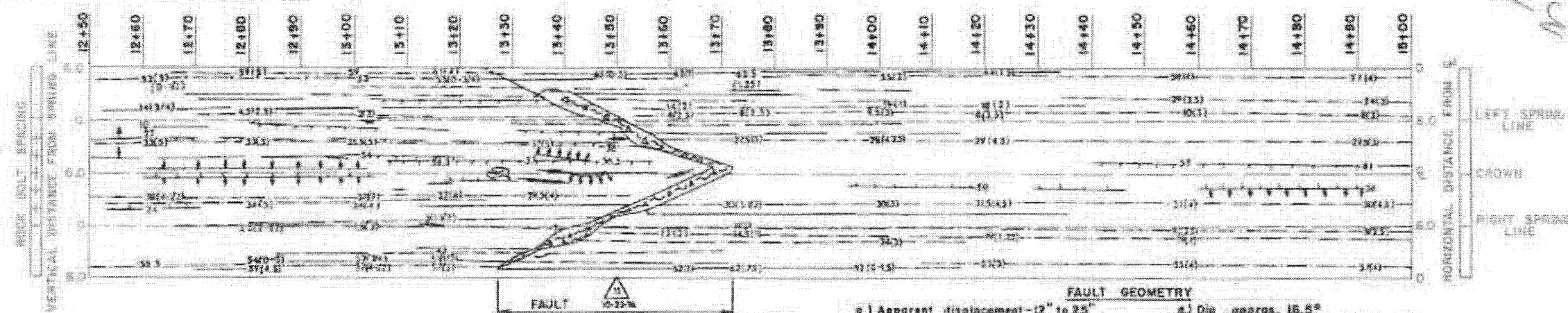


1/2" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE  
 12 1/2" DISCONTINUOUS IRON BED  
 12 1/2" HARD LIGHT GREY SANDY SHALE TO SILTYSTONE BED  
 12 1/2" DISCONTINUOUS IRON BED WITHIN GREY BED  
 FRACTURE  
 FAULT (with sense of motion)  
 BEDDING PARTING  
 VERTICAL JOINT  
 INCLINED JOINT  
 BEDDING STRIKE AND DIP

#### SYMBOLS

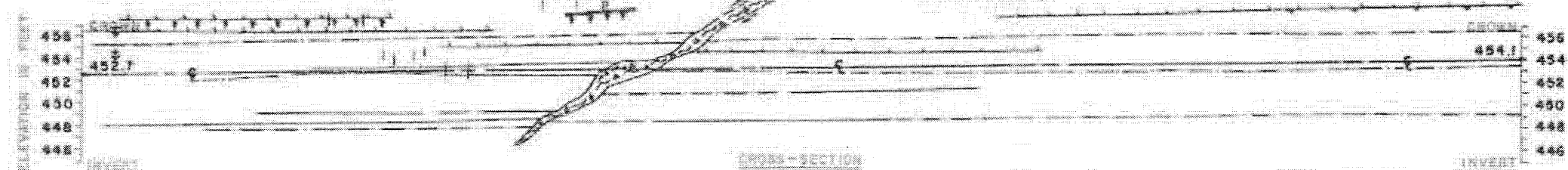
MOISTURE ALONG BEDDING PARTING  
 SEEPAGE FROM FEATURE  
 OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN  
 METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

\*Note:  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line of station of measurement.



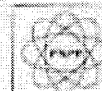
#### FAULT GEOMETRY

a.) Apparent displacement - 12" to 25" d.) Dip approx. 15.5°  
 b.) Actual vertical displacement - 8 1/2" to 11 1/2" e.) Width of broken rock (1 1/2" to 24")  
 c.) Strike - N66°E



no. 4		no. 4-a		no. 5	
5 rock bolts at 2' centers in steel ribs at 3.5' - 4' centers, spanned by wire mesh		Full shielding employed		5 rock bolts at 2' centers in steel ribs at 3.5' - 4' centers spanned by wire mesh	
Bedding fractures spaced as above, joints widely spaced		Ribs at 2' centers		Bedding fractures only, spaced as above	
Most bedding fractures where indicated		Several minor inflows in fractured areas		Several dripping flows along shielding	
8.5' water		101.9' subsurface (shale)		14.5' water	

EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

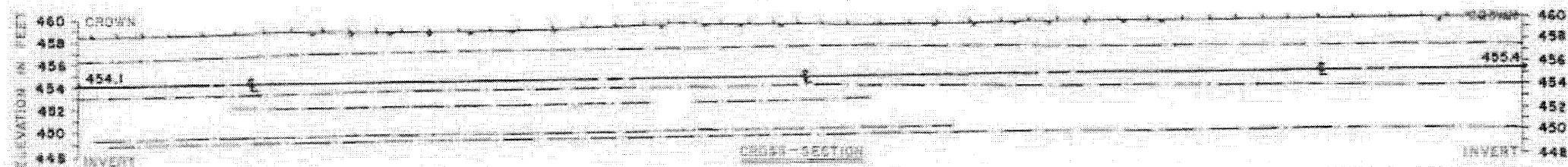
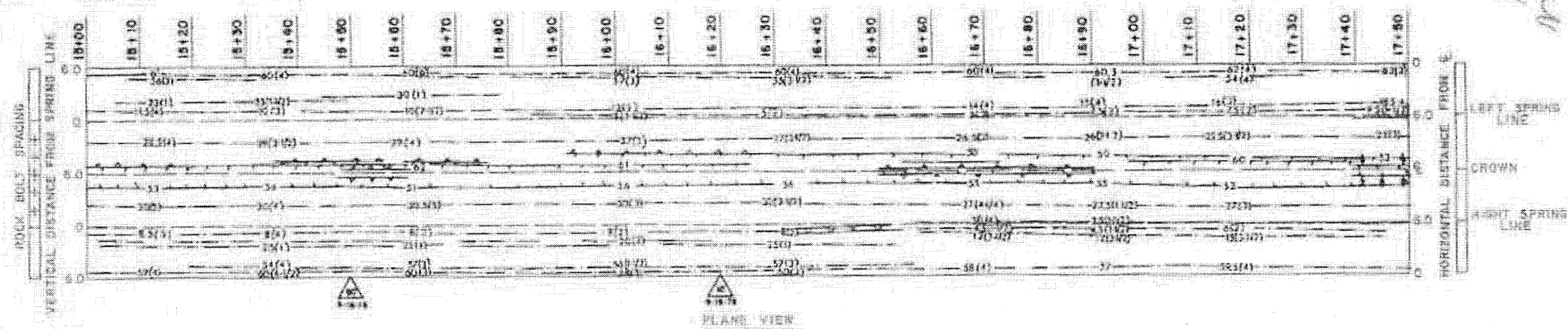
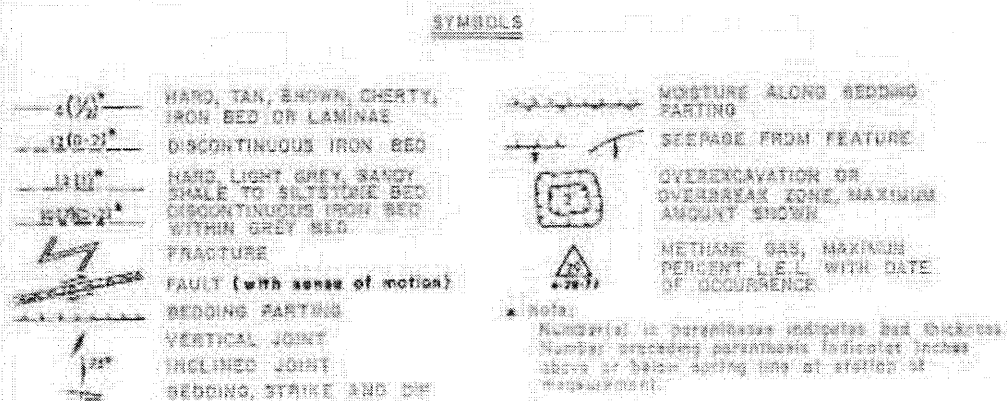
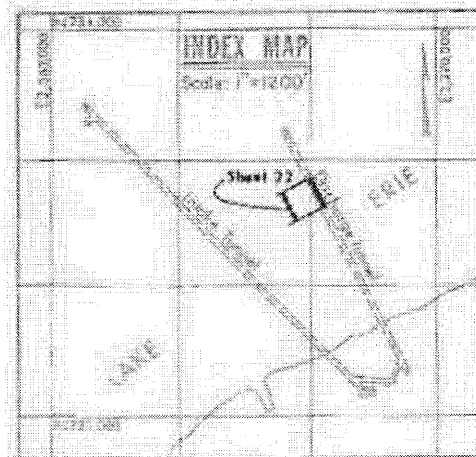


PERRY NUCLEAR POWER PLANT

Geologic Map of  
Tunnel Excavations

Figure 20-2 (Sheet 21 of 24)





Slight overbreak along entire excavation (0'-6")				ea. 4
3 rock bolts at 2' centers in steel ribs or 40'-42" centers spanned by wire mesh				
3'-9"	4'-2"		1'-10"	
Bedding fractures only, spaced at above				
Moisture from bedding parting	Moisture from bedding parting	Moisture from bedding parting	Moisture from bedding parting	Moisture from bedding parting
15.5' water	10.5' water	15.5' water	15.5' water	15.5' water
10.5' subsurface (shale)				15.5' water

EXCAVATION PROGRESS  
ESTIMATED ROCK  
CONDITION (TERZAGHI HDI)  
TEMPORARY SUPPORT  
SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER

(Rev. 12 1/03)

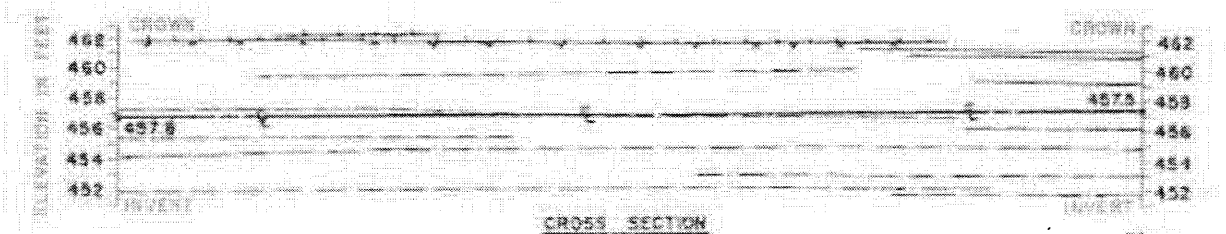
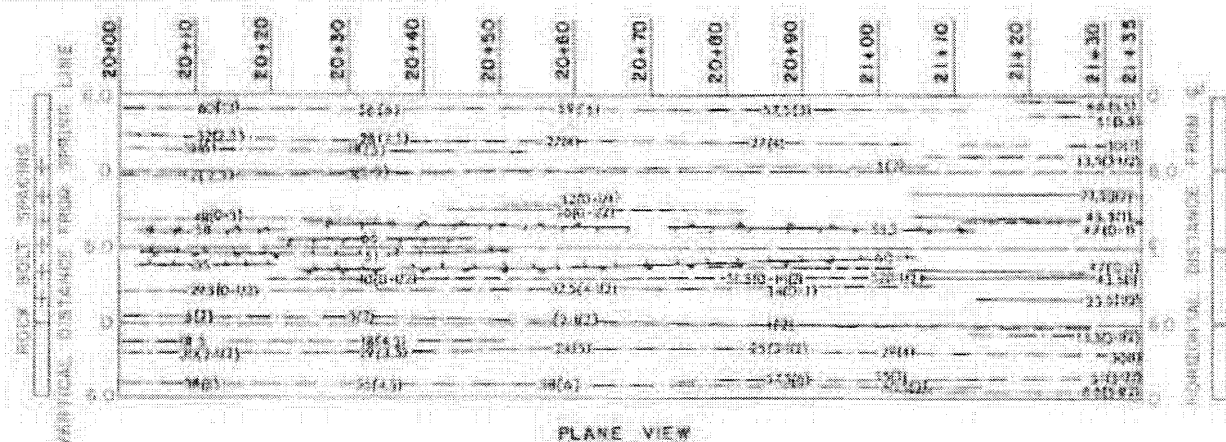
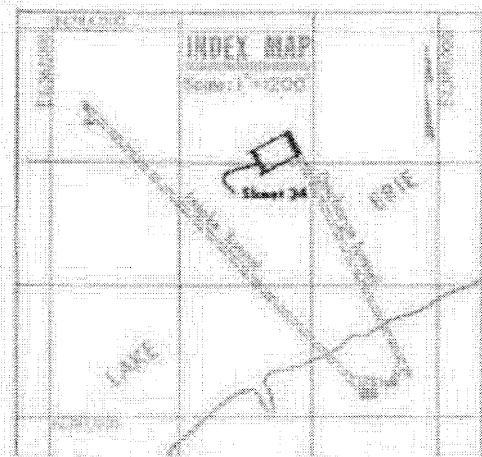


PERRY NUCLEAR POWER PLANT

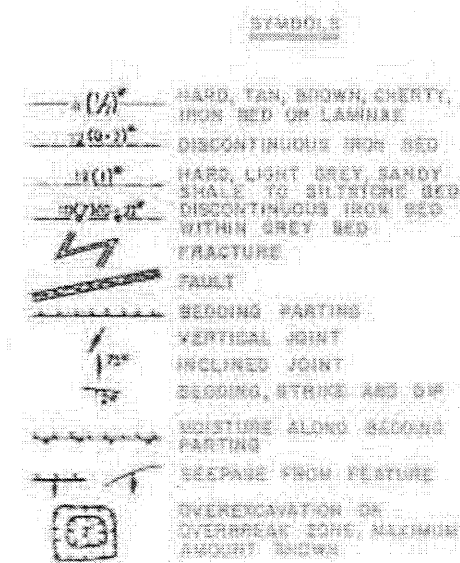
Geologic Map of  
Tunnel Excavations

Figure 2D-2 (Sheet 22 of 24)





Excavation Progress	
ESTIMATED ROCK CONDITION (TERMINAL AND)	
TEMPORARY SUPPORT SYSTEM	
BEDDING SPACING	
FRACTURE SPACING	
WATER CONDITION	
DEPTH OF COVER	
18.5' water	21.5' water
2.5' subsurface (shale)	2.5' subsurface (shale)



Note:  
 Number(s) in parentheses indicates feet (meters).  
 Number preceding parentheses indicates inches.  
 above or below spring line at station of measurement.

Rev. 12 1/83

**PERRY NUCLEAR POWER PLANT**

Geologic Map of  
 Tunnel Excavations

Figure 20-2 (Sheet 24 of 24)