Minnesota Department of Transportation
Office of Materials & Road Research
1400 Gervais Avenue, Maplewood, MN 55109

Memo

Date: September 9th, 2019

To: Eric Peterson, Project Manager
Metro Traffic

From: Hossana Teklyes, Asist. Foundation Engineer
Office of Materials and Road Research HWT

Concur: Rich Lamb, Foundations Engineer
Office of Materials and Road Research RAL

Subject: SP 8825-706, (Metro District)
21 Overhead Signs replacement in metro
Foundations Investigation and Recommendations

1.0 Project Description
This report provides a Foundations Investigation and Recommendations for 18 overhead signs in the Metro area.

Table 1: Overhead Sign Types & Locations

Site #	Sign #	Structure Type	Sounding	Roadway & Direction	Station
1	OH I35E-309	Cantilever	C01	TH 35E SB	187+60
2	OH I35E-310	Sign Bridge	C02B & c02C	TH 35E NB	658+90
3	OH I494-507	Cantilever	C03B	TH494 NB	156+00
5	OH 694-202	Cantilever	C05	TH694 WB	337+25
6*	OH I694-203	Cantilever	C06	TH694 WB	321+25
7*	OH I94-708	Cantilever	C07a	TH94 EB	626+50
8**	OH I94-715	Cantilever	No CPT taken (access problem) old borings used	TH94 EB	227+75
10(*)**	OH I94-710	Cantilever	C10	TH 94 EB	48+00

12	OH I94-716	Cantilever	C12	TH 94 WB	508+00
13**	OH I94-712	Cantilever	C13	TH 94 WB	589+60
14 & 15**	OH I94-713	Bridge	C14 & C14a	TH 94 WB	622+31
16	OH US52-120	Cantilever	C16	TH 52 NB	343+50
17	OH MN51-016	Bridge	C17 & C17a	TH51 NB	215+42
19	OH US12-045	Bridge	C19 & c19a	TH12 EB	903+00
20	OH US12-XXX	Bridge	C20 (One of the OH foundations was not accessible for the CPT)	TH94 EB	852+00
22*	OH I94-714	Cantilever	C22a	TH 94 EB	181+90
23	OH I494-509	Cantilever	C23	TH494 NB	721+94
24	OH I694-204	Cantilever	C24	TH694 EB	329+44

*** CPT not taken at the exact OH sign locations due to access problem. Old borings were used at some of these locations.**

**** Groundwater Contamination Zones. These locations were provided by the district.**

2.0 Field Investigation and Foundation Conditions

Twenty one Cone Penetration Test (CPT) were advanced in July and August of 2019 by MnDOT close to the overhead sign posts. Copies of the CPT Sounding logs are included with this report.

3.0 Foundation Analysis

The overhead sign locations were determined from plans provided by Metro District. The sign location is shown on the attached boring plan. Based on Standard Plans (developed in 2019) for overhead signs (Standard Plan 5-297.763), the options for the overhead sign foundations consist of spread footings and drilled shafts to be used based on post type. Based on post type, two different sizes for each foundation type is listed in the standard plan as shown below.

- **Drilled shafts:** **3.5 ft. diameter & 23 ft. deep**
  4.25 ft. diameter & 29 ft. deep
- **Spread Footings:** **9 ft. x 14 ft.**
  12.5 ft. x 18 ft.

The required values and/or conditions listed in the Standard Plan (5-297.763) had to be met to use the

standard plans. Based on our analysis, only **the drilled shaft option** meets all the requirements listed in the standard plan.

4.0 Foundation Recommendations

Based on the existing conditions along with an analysis of the project soils, we recommend the following:

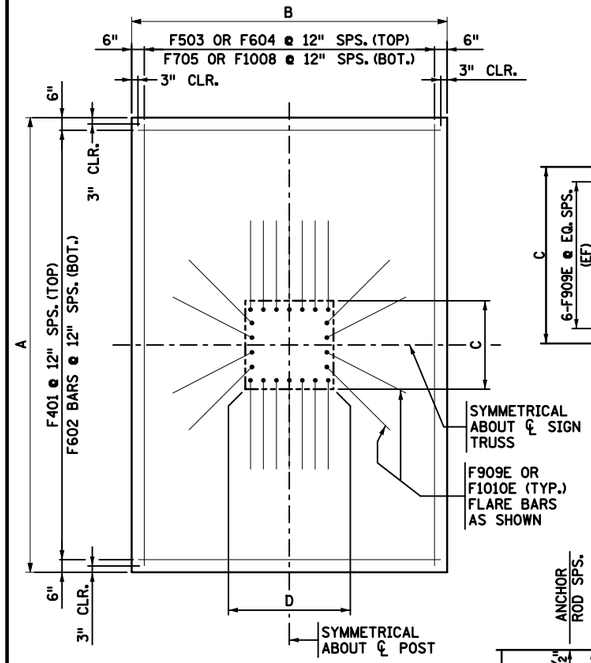
1. Topsoil and other organic material be removed from areas where new fill is to be placed.

2. Based on the soils at the overhead sign base locations, the overhead signs be supported on **drilled shaft** according to the Standard Plan 5-297.763.

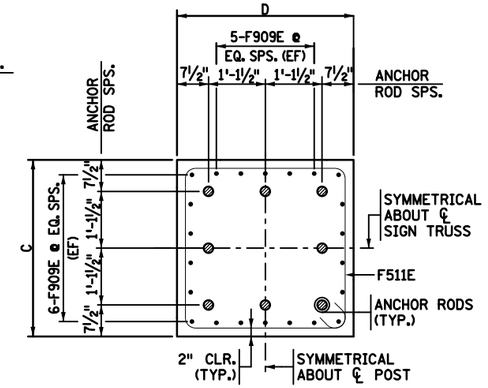
Attachments: Standard Plan 5-297-763
Overhead Sign Layout Plans/Profiles
CPT Logs (C01-C24) unique # (84274-84293)

cc: B. Skow
M. Wagner
B. Hager
B. Barrett

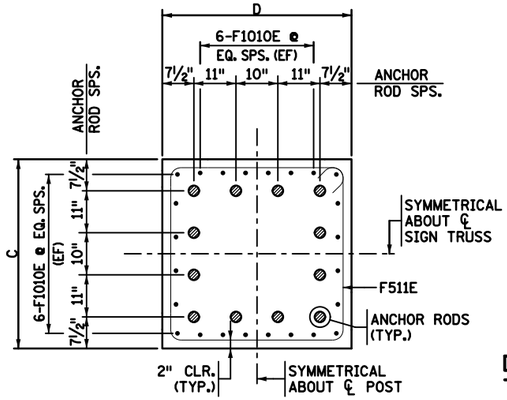
File



SPREAD FOOTING PLAN

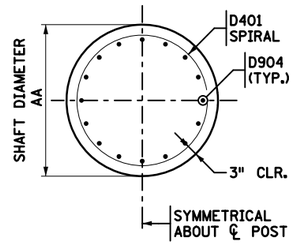


POST TYPE 1 THRU 4



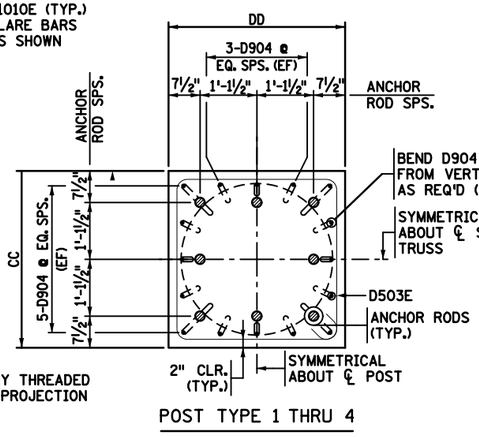
POST TYPE 5 THRU 6

SPREAD FOOTING SECTION A-A

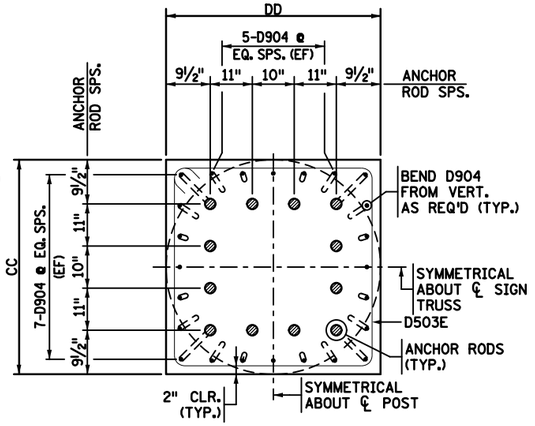


DRILLED SHAFT SECTION C-C

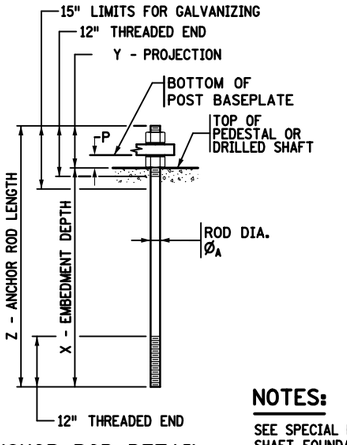
(SECTION FOR POST TYPE 1-4 SHOWN)
(SECTION FOR POST TYPE 5-6 SIMILAR)



POST TYPE 1 THRU 4

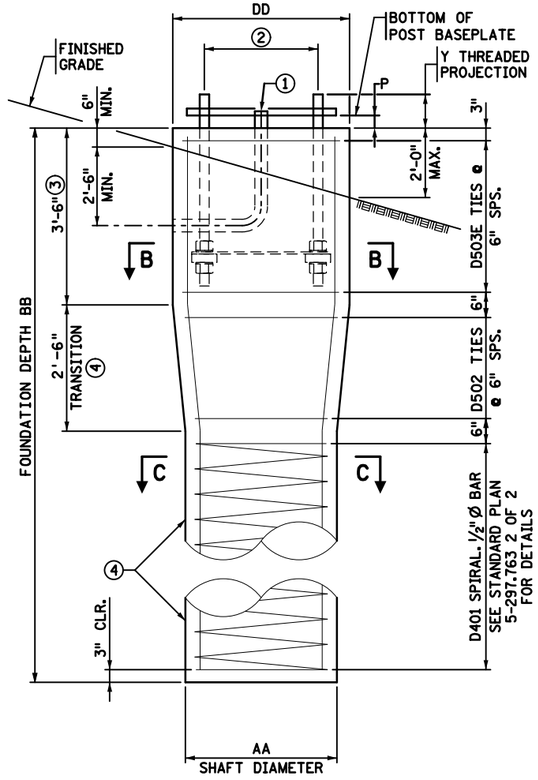


POST TYPE 5 THRU 6

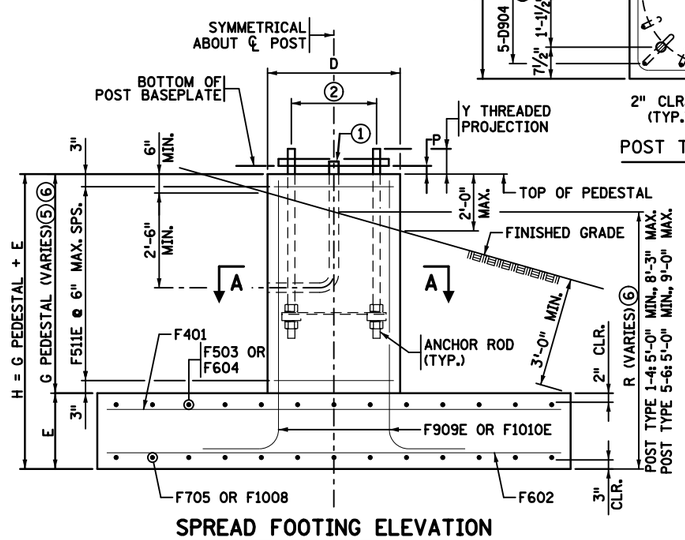


ANCHOR ROD DETAIL

(ROD MATERIAL IS SPEC. 3385 TYPE B)



DRILLED SHAFT ELEVATION



SPREAD FOOTING ELEVATION

DRILLED SHAFT SECTION B-B

FOUNDATION DATA														
POST TYPE	SPREAD FOOTING DIMENSIONS					DRILLED SHAFT DIMENSIONS				ANCHOR RODS				
	A	B	C	D	E	AA	BB	CC	DD	P	X	Y	Z	ROD DIA. Ø$_A$
1-4	14'-0"	9'-0"	3'-6"	3'-6"	2'-0"	3'-6"	23'-0"	3'-6"	3'-6"	3.875"	38.5"	9.5"	48.0"	2.25"
5-6	18'-0"	12'-6"	3'-11"	3'-11"	2'-0"	4'-3"	29'-0"	4'-3"	4'-3"	4.125"	37.0"	11.0"	48.0"	2.50"

SOIL PARAMETERS:

A SUBSURFACE INVESTIGATION SHOULD BE PERFORMED WITHIN 30 FT. HORIZONTALLY FROM EACH POST FOUNDATION. THE SOIL BORING OR CONE SOUNDING SHOULD PENETRATE A MINIMUM DEPTH OF 35 FT.

FOR SPREAD FOOTINGS, THE WATER TABLE SHALL BE AT THE BOTTOM OF FOOTING ELEVATION OR LOWER.

FOR DRILLED SHAFTS, THE WATER TABLE SHALL BE 1.5 FT. BELOW FINISHED GRADE OR LOWER.

THE FOUNDATION DIMENSIONS SHOWN ON THIS SHEET HAVE BEEN DESIGNED WITH THE FOLLOWING ASSUMED SOIL PROPERTIES:

DRILLED SHAFTS:

COHESIVE SOILS:
- MIN. SHEAR STRENGTH: C = 1.0 ksf
- UNIT WEIGHT OF SOIL: γ = 125±10 pcf

GRANULAR SOILS:
- MIN. ANGLE OF FRICTION: Ø = 30°
- UNIT WEIGHT OF SOIL: γ = 125 pcf
- MAX. COEFFICIENT OF FRICTION: μ = 0.70

SPREAD FOOTINGS:

SERVICE LIMIT STATE:
- MAXIMUM BEARING PRESSURE: 2.50 KSF
- BEARING RESISTANCE FACTOR: 1.0
- MAXIMUM SETTLEMENT: 1.0 INCH

STRENGTH LIMIT STATE:
- MAXIMUM BEARING PRESSURE: 5.55 KSF
- BEARING RESISTANCE FACTOR: 0.45

A SPECIAL FOUNDATION DESIGN IS REQUIRED IN CASES WHERE THE REQUIRED VALUES AND/OR CONDITIONS LISTED ABOVE ARE NOT MET.

NOTES:

SEE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION REGARDING DRILLED SHAFT FOUNDATIONS.

PERMANENT CASINGS ARE NOT ALLOWED FOR DRILLED SHAFT FOUNDATIONS.

USE PREFORMED JOINT FILLER BETWEEN THE FOUNDATION AND SIDEWALK OR OTHER CONCRETE AREAS.

COLD CONCRETE CONSTRUCTION JOINTS ARE NOT PERMITTED.

CURE CONCRETE FOUNDATIONS A MINIMUM OF SEVEN DAYS PRIOR TO PLACING POST AND TRUSS.

ALL CONCRETE SHALL CONFORM TO CONCRETE MIX 3G52 (SPEC. 2461).

(EF) DENOTES EACH FACE.

① 1½" AND 3" SERVICE CONDUITS. HOWEVER, IF DMS IS MOUNTED ON THE SPAN, F&I CONDUIT PER PLAN.

② SEE STANDARD PLAN 5-297.763 2 OF 2 FOR ANCHOR ROD ASSEMBLY DETAIL. GALVANIZE ANCHOR RODS IN ACCORDANCE WITH SPEC. 3392.

③ FORM A MINIMUM OF 6" BELOW THE GROUND SURFACE. BACKFILL AND TAMP THE EXCAVATIONS REQUIRED FOR FORMING PER SPEC. 2105.3.F.2. BACKFILL MATERIAL AND COMPACTION TO BE EQUIVALENT TO THE SURROUNDING MATERIAL.

④ EXCAVATE TO NEAT LINES AND PLACE CONCRETE AGAINST UNDISTURBED SOIL.

⑤ POST TYPE 1-4: 3'-6" MIN., 7'-6" MAX.
POST TYPE 5-6: 3'-6" MIN., 8'-3" MAX.

⑥ THE FINISHED GRADE SLOPE MAY VARY FROM LEVEL TO THAT GENERATED BY THE COMBINATION OF 6" MINIMUM AND 24" MAXIMUM PEDESTAL PROJECTIONS. AS SUCH, DIMENSIONS G AND R WILL VARY. DETERMINE G AND R DIMENSIONS FOR A SPECIFIC SITE BY INTERPOLATING BETWEEN THE MINIMUM AND MAXIMUM VALUES PROVIDED FOR THE ACTUAL SLOPE CONDITION.

REVISION: MAY 28, 2019

APPROVED: MAY 1, 2019
KEVIN WESTERN
STATE BRIDGE ENGINEER

MINNESOTA DEPARTMENT OF TRANSPORTATION

STANDARD PLAN 5-297.763 | 1 OF 2

APPROVED: 5-1-2019
REVISED: 5-28-2019
THOMAS STYRBICKI
STATE DESIGN ENGINEER

STANDARD OVERHEAD SIGN STRUCTURES – DESIGN D
FOUNDATION DETAILS

STATE PROJ. NO. (T.H.) SHEET NO. OF SHEETS

BILL OF REINFORCEMENT - SPREAD FOOTING						
BAR	POST TYPE 1-4		POST TYPE 5-6		SHAPE	LOCATION
	QTY.	LENGTH	QTY.	LENGTH		
F401	14	8'-6"	18	12'-0"	——	FOOTING TOP TRANSVERSE
F602	14	8'-6"	18	12'-0"	——	FOOTING BOTTOM TRANSVERSE
F503	9	13'-6"	-	-	——	FOOTING TOP LONGITUDINAL
F604	-	-	13	17'-6"	——	FOOTING TOP LONGITUDINAL
F705	9	13'-6"	-	-	——	FOOTING BOTTOM LONGITUDINAL
F1008	-	-	13	17'-6"	——	FOOTING BOTTOM LONGITUDINAL
(1) F909E	22	H + 23"	-	-	⌊	PEDESTAL VERTICAL
(1) F1010E	-	-	24	H + 26"	⌊	PEDESTAL VERTICAL
(1)(3) F511E	2G	13'-7"	2G	15'-3"	▭	PEDESTAL TIES

BILL OF REINFORCEMENT - DRILLED SHAFTS						
BAR	POST TYPE 1-4		POST TYPE 5-6		SHAPE	LOCATION
	QTY.	LENGTH	QTY.	LENGTH		
D401	1	16'-6"	1	22'-6"	SPIRAL	DRILLED SHAFT SPIRAL
(2) D502	5	14'-1"	5	17'-1"	——	TRANSITION TIES
D503E	7	13'-7"	7	16'-7"	▭	PEDESTAL TIES
D904	16	22'-7"	24	28'-7"	——	DRILLED SHAFT VERTICALS

REINFORCEMENT NOTES:

BARS MARKED WITH THE SUFFIX "E" SHALL BE EPOXY COATED IN ACCORDANCE WITH SPEC. 3301.

(1) G AND H ARE IN FEET.

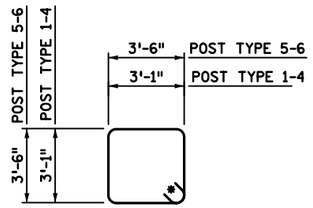
(2) BEND AS REQUIRED TO FORM A CLOSED LOOP.

(3) TO DETERMINE QUANTITY, ROUND G DIMENSION UP TO THE NEAREST WHOLE NUMBER. FOR EXAMPLE: IF G = 4.10 FT.; 2(G) = 8.2; QTY. REQ'D = 9.

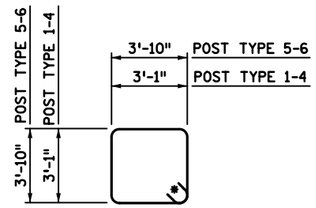
BAR BENDING DIAGRAMS

BENT BAR DIMENSIONS GIVEN ARE OUT-TO-OUT. DETERMINE ACTUAL BAR LENGTHS BASED ON THE DETAIL DIMENSIONS SHOWN IN THE BAR BENDING DIAGRAMS.

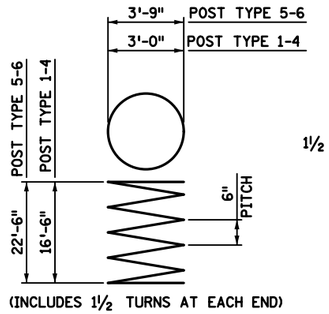
* DENOTES STANDARD STIRRUP HOOK.



F511E

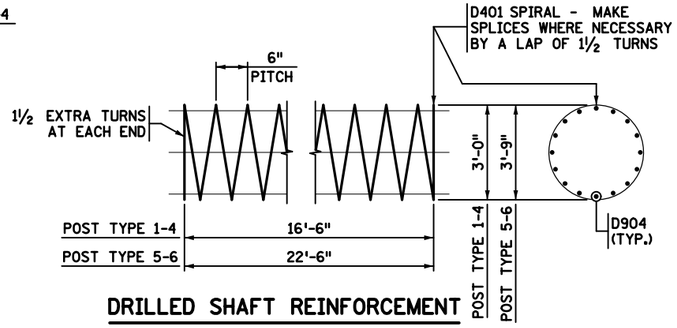


D503E

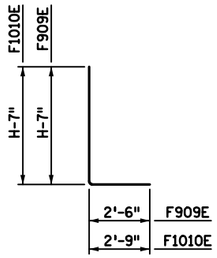


(INCLUDES 1½ TURNS AT EACH END)

D401



DRILLED SHAFT REINFORCEMENT



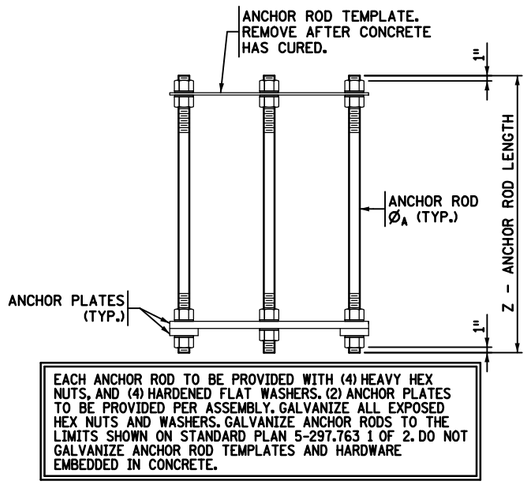
F909E & F1010E

SUMMARY OF ESTIMATED QUANTITIES - SPREAD FOOTING			
ITEM DESCRIPTION	UNIT	QUANTITIY	
		POST TYPE 1-4	POST TYPE 5-6
(4) STRUCTURAL CONCRETE (3G52)	CU YD	9.3 + 0.46G	16.7 + 0.57G
(4) REINFORCEMENT BARS	POUND	930 + 103G	2220 + 134G
ANCHORAGE ASSEMBLY	POUND	799	1392
(4) STRUCTURE EXCAVATION	CU YD	7.4R	12.1R

SUMMARY OF ESTIMATED QUANTITIES - DRILLED SHAFTS			
ITEM DESCRIPTION	UNIT	QUANTITIY	
		POST TYPE 1-4	POST TYPE 5-6
STRUCTURAL CONCRETE (3G52)	CU YD	9.1	15.9
REINFORCEMENT BARS	POUND	1660	2940
ANCHORAGE ASSEMBLY	POUND	799	1392

QUANTITY NOTE:

(4) G AND R ARE IN FEET. SEE STANDARD PLAN 5-297.763 1 OF 2 FOR DETAILS.

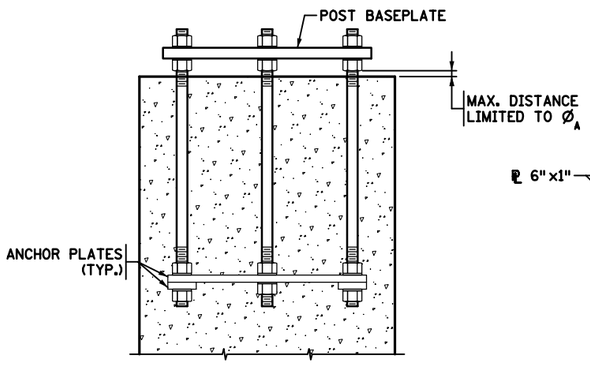


EACH ANCHOR ROD TO BE PROVIDED WITH (4) HEAVY HEX NUTS, AND (4) HARDENED FLAT WASHERS. (2) ANCHOR PLATES TO BE PROVIDED PER ASSEMBLY. GALVANIZE ALL EXPOSED HEX NUTS AND WASHERS. GALVANIZE ANCHOR RODS TO THE LIMITS SHOWN ON STANDARD PLAN 5-297.763 1 OF 2. DO NOT GALVANIZE ANCHOR ROD TEMPLATES AND HARDWARE EMBEDDED IN CONCRETE.

ANCHOR ROD ASSEMBLY

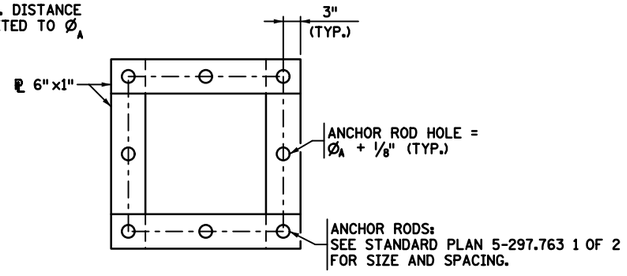
(ROD MATERIAL IS SPEC. 3385 TYPE B)

REMOVE ANCHOR ROD TEMPLATE IN PREPARATION FOR THE POST PLACEMENT. PLACE POST BASE PLATE LEVEL. TIGHTEN HEX NUTS PER THE SPECIAL PROVISIONS.



PARTIAL ELEVATION

(SHOWING BASE PLATE & ANCHOR ROD ASSEMBLY)



ANCHOR PLATE PLAN

(ANCHOR PLATE SHOWN SIMILAR FOR ALL ANCHOR ROD SPACING)

ANCHOR ROD DETAILS

REVISION: MAY 28, 2019

APPROVED: MAY 1, 2019

Kevin Western

KEVIN WESTERN
STATE BRIDGE ENGINEER

MINNESOTA DEPARTMENT OF TRANSPORTATION

THOMAS STYRBICKI
STATE DESIGN ENGINEER

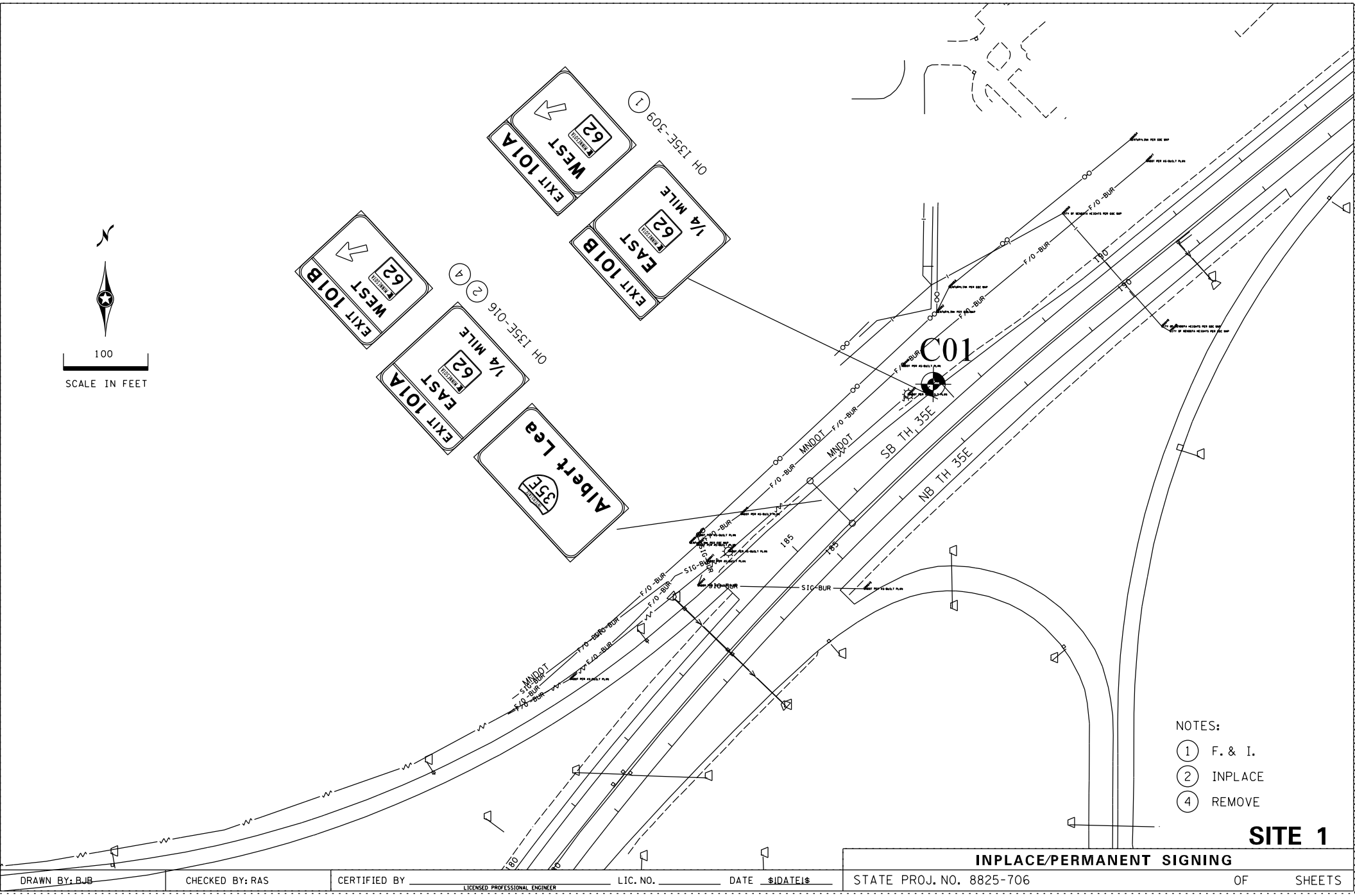
STANDARD PLAN 5-297.763 | 2 OF 2

APPROVED: 5-1-2019
REVISED: 5-28-2019

STATE PROJ. NO. (T.H.) SHEET NO. OF SHEETS

STANDARD OVERHEAD SIGN STRUCTURES - DESIGN D

FOUNDATION DETAILS



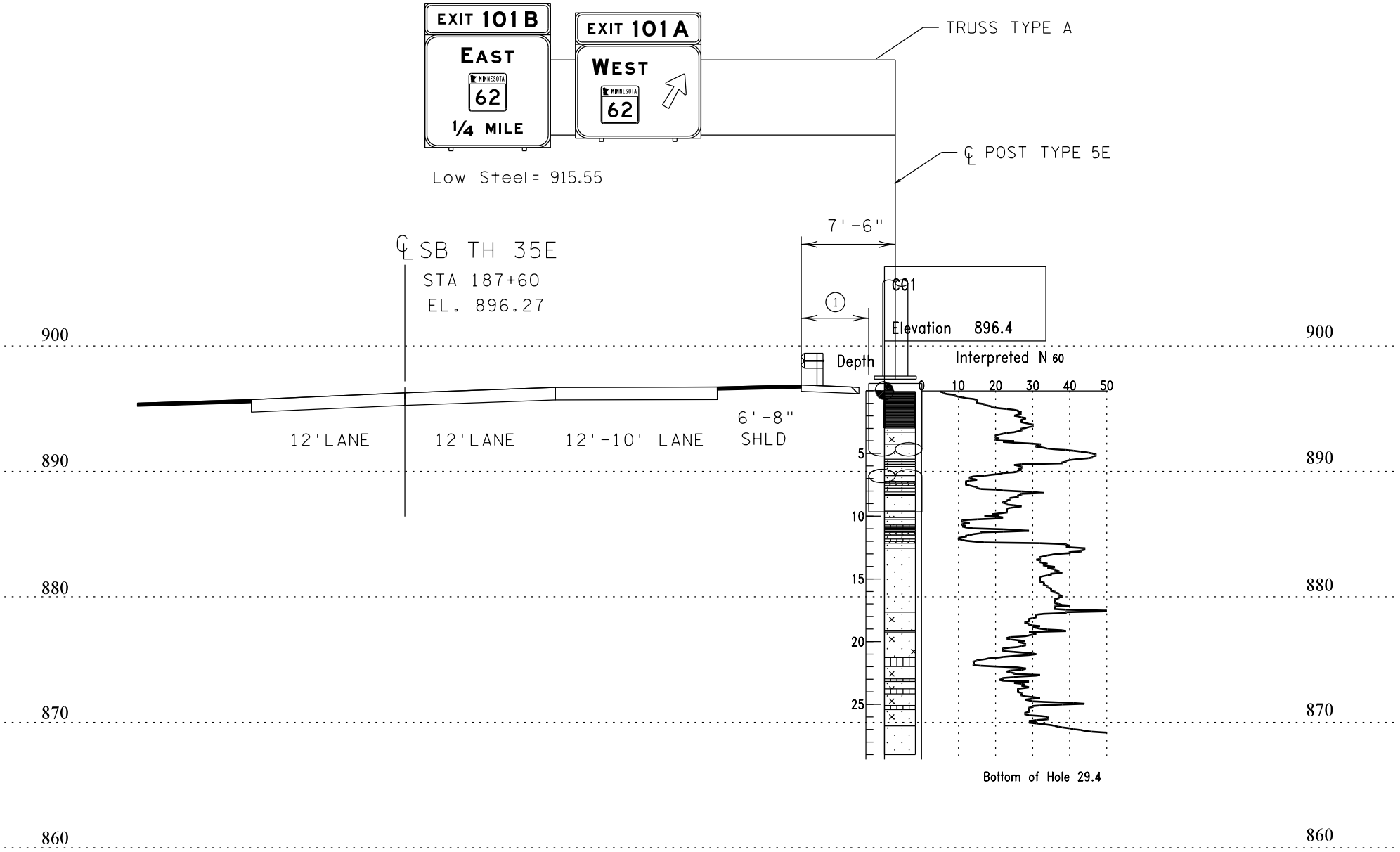
NOTES:

1. F. & I.
2. INPLACE
4. REMOVE

SITE 1

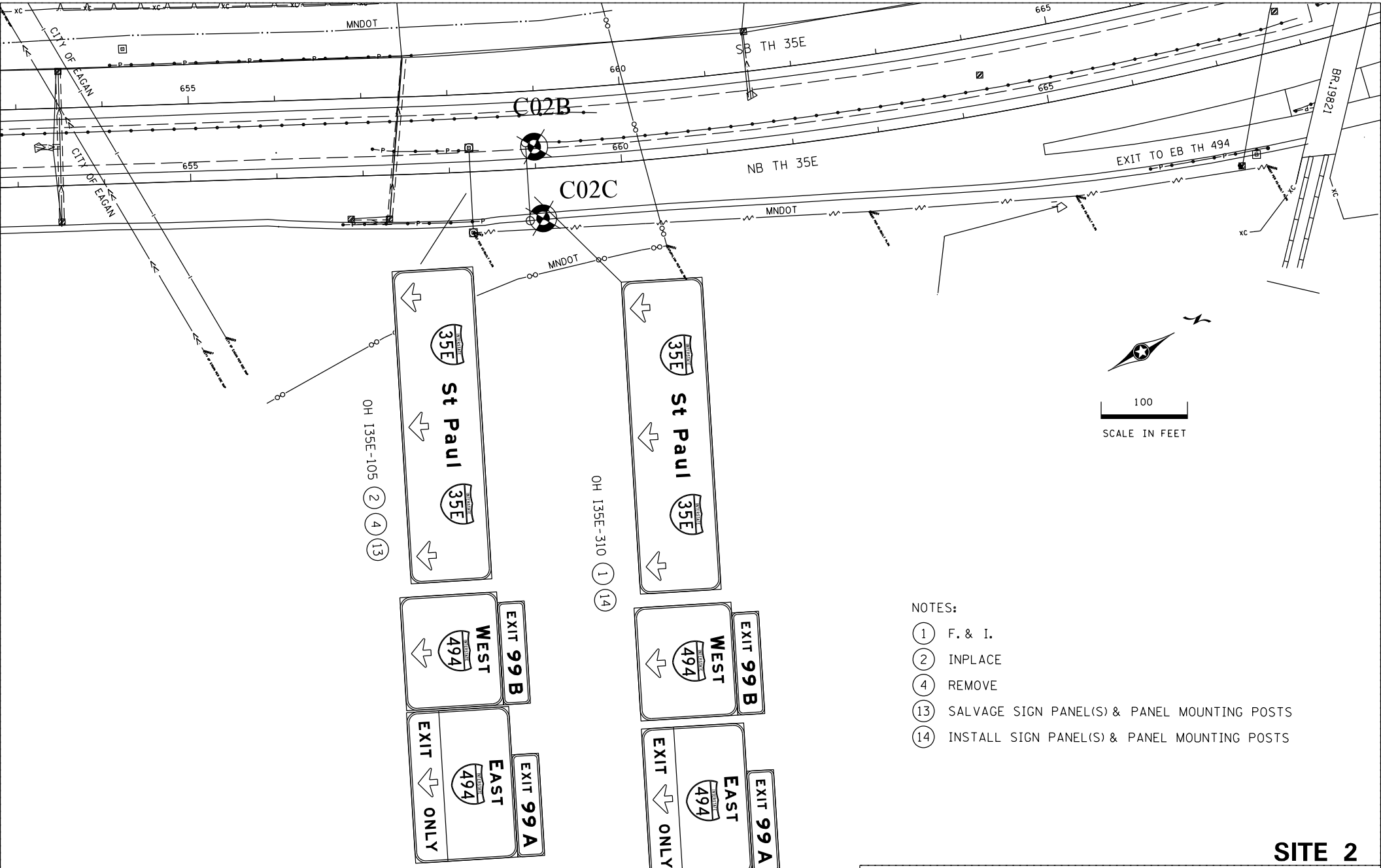
INPLACE/PERMANENT SIGNING

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE|$	STATE PROJ. NO. 8825-706 OF SHEETS



OH I35E-309

SITE 1



NOTES:

(1) F. & I.

(2) INPLACE

(4) REMOVE

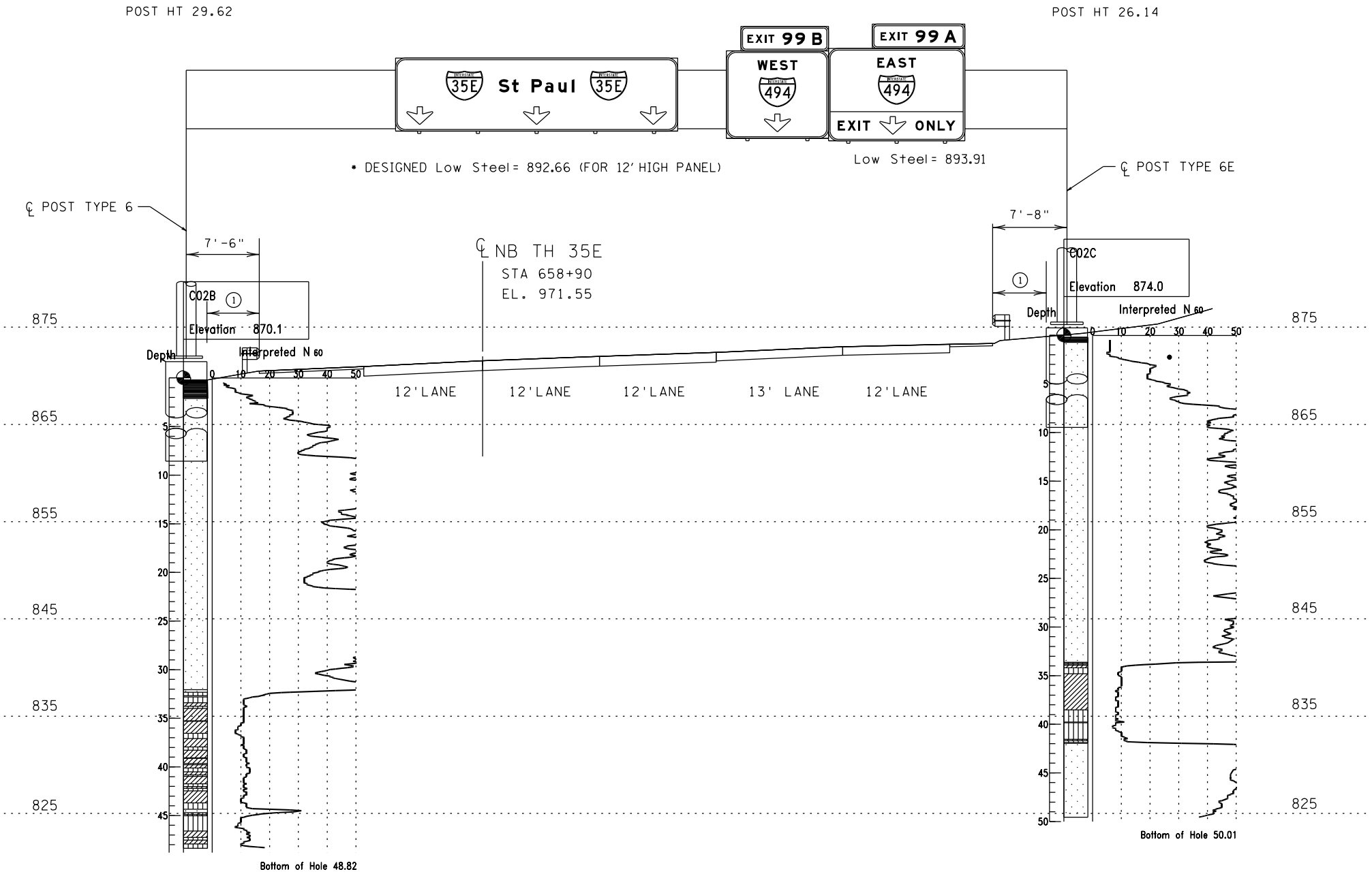
(13) SALVAGE SIGN PANEL(S) & PANEL MOUNTING POSTS

(14) INSTALL SIGN PANEL(S) & PANEL MOUNTING POSTS

SITE 2

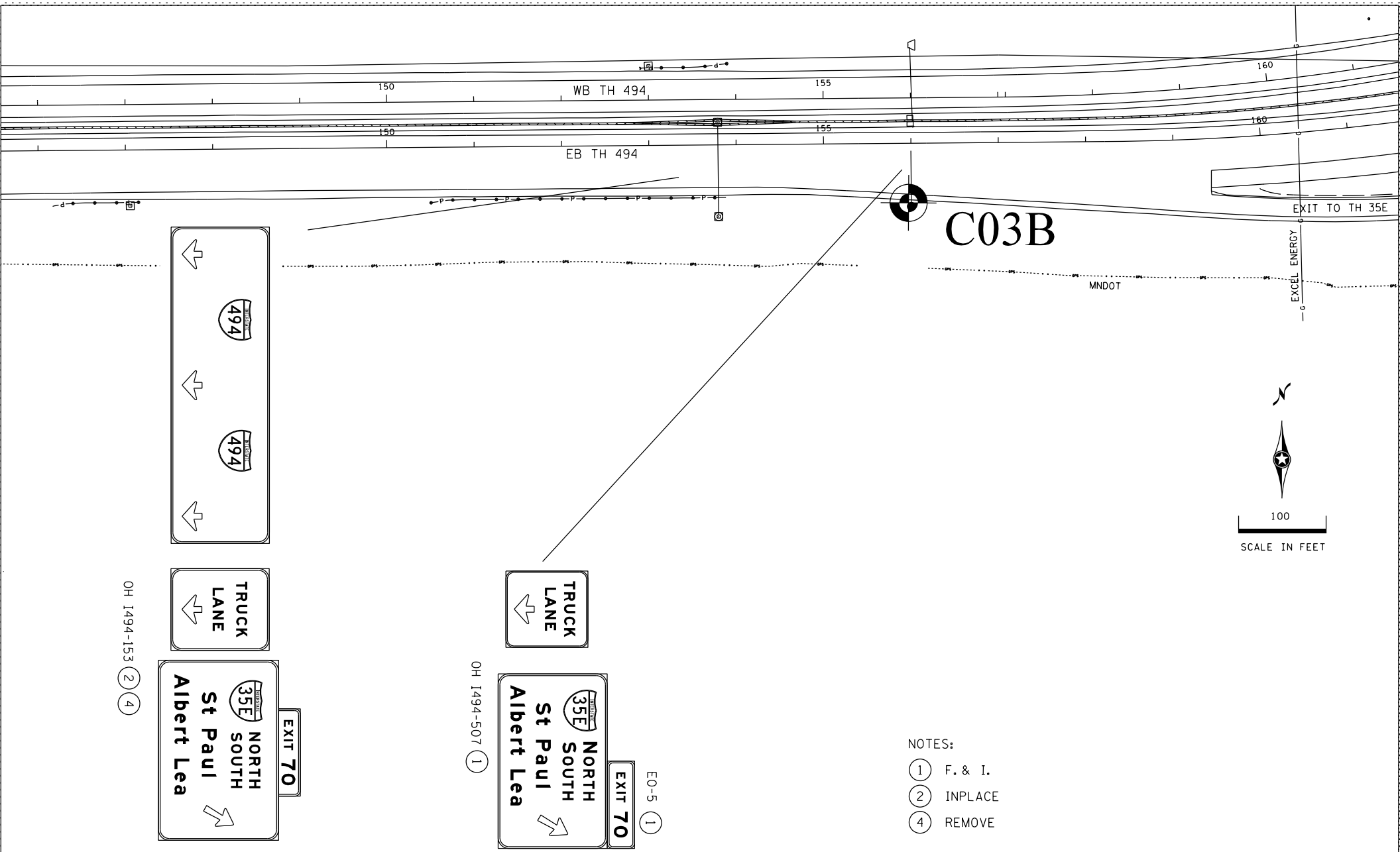
SIGNING-INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706 OF SHEETS



OH I35E-310

SITE 2



NOTES:

(1) F. & I.

(2) INPLACE

(4) REMOVE

SITE 3

SIGNING-INPLACE/PERMANENT

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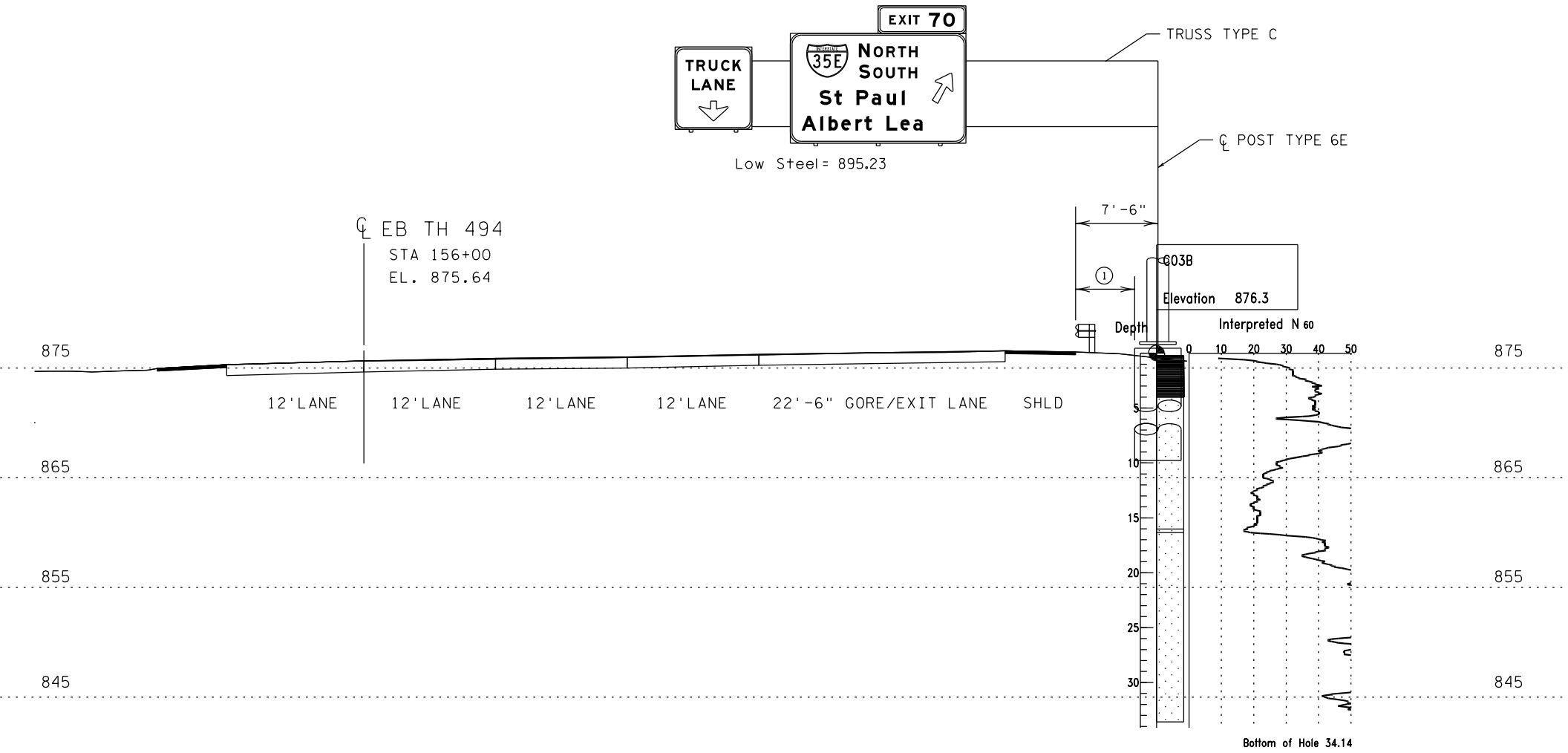
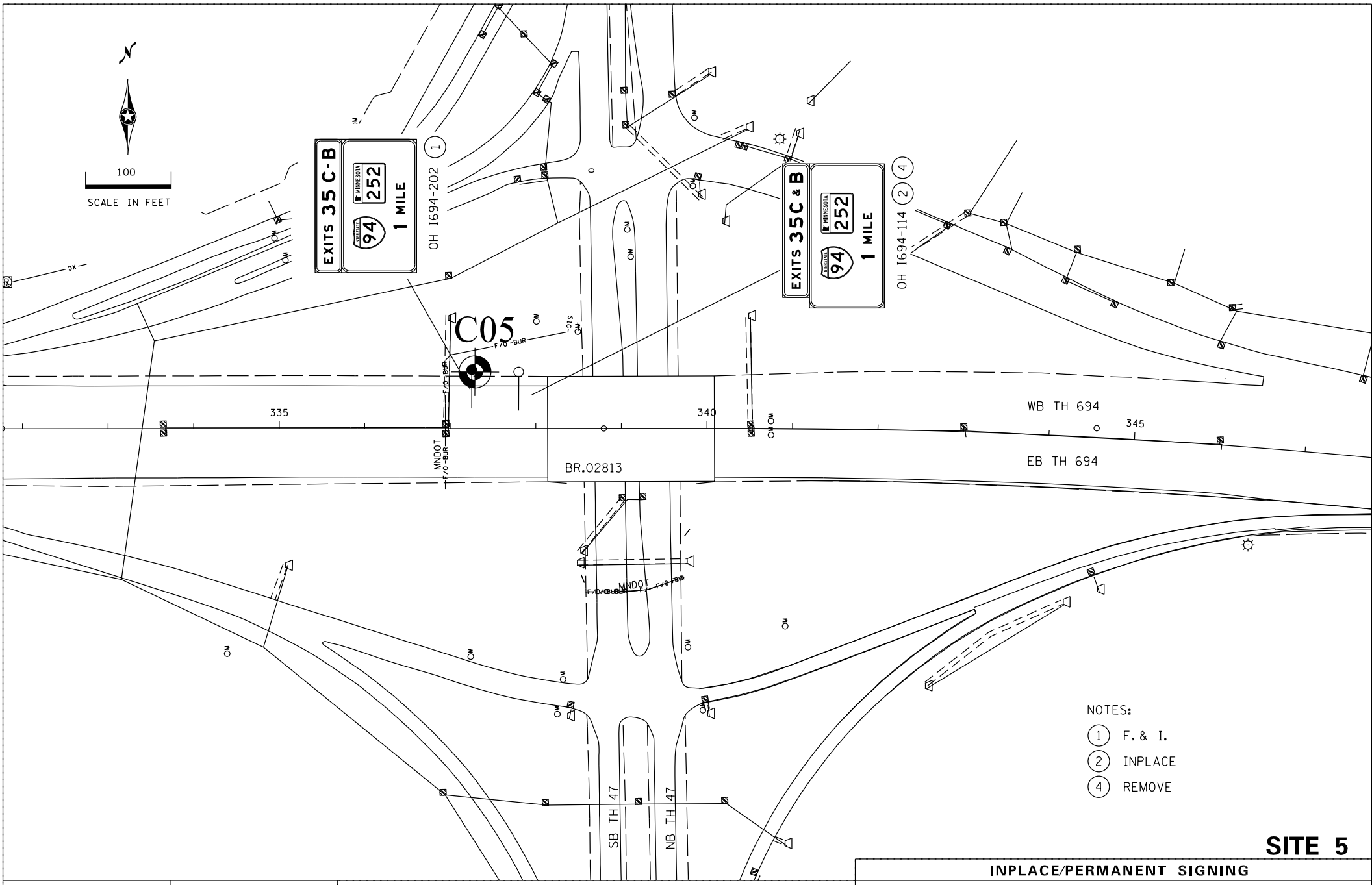


OH I494-507

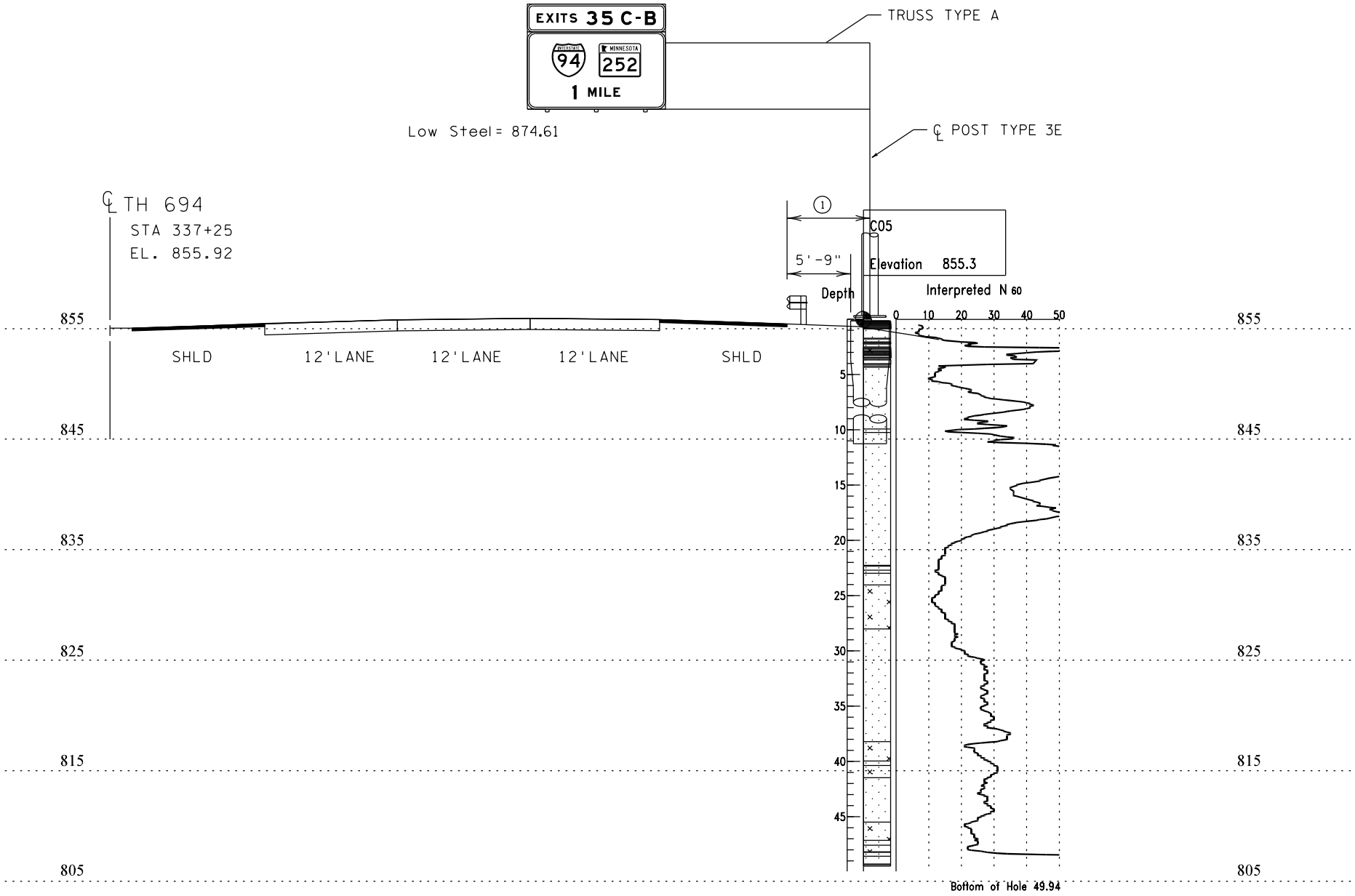
SITE 3



SITE 5

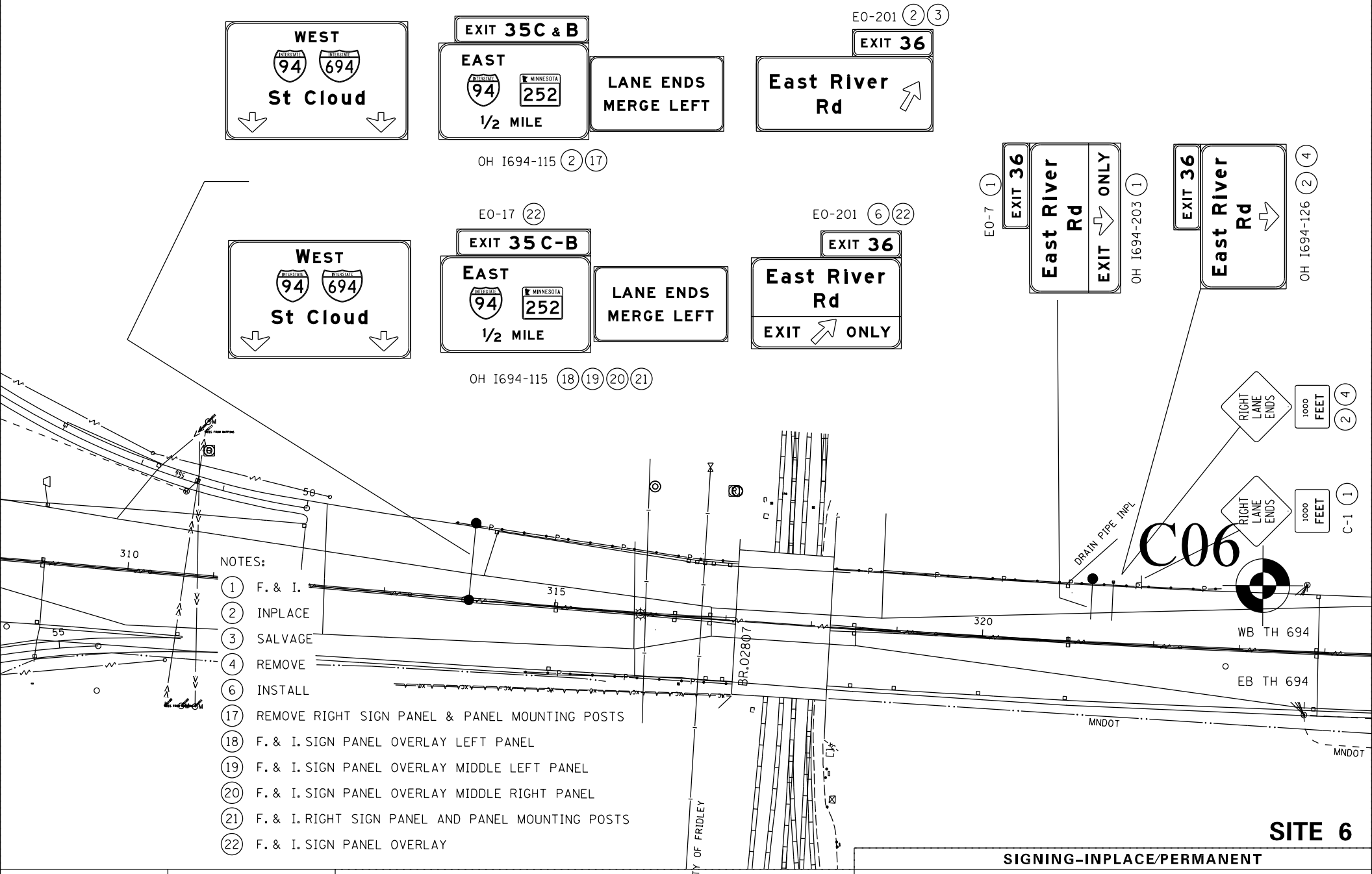
INPLACE/PERMANENT SIGNING

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE|$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I694-202

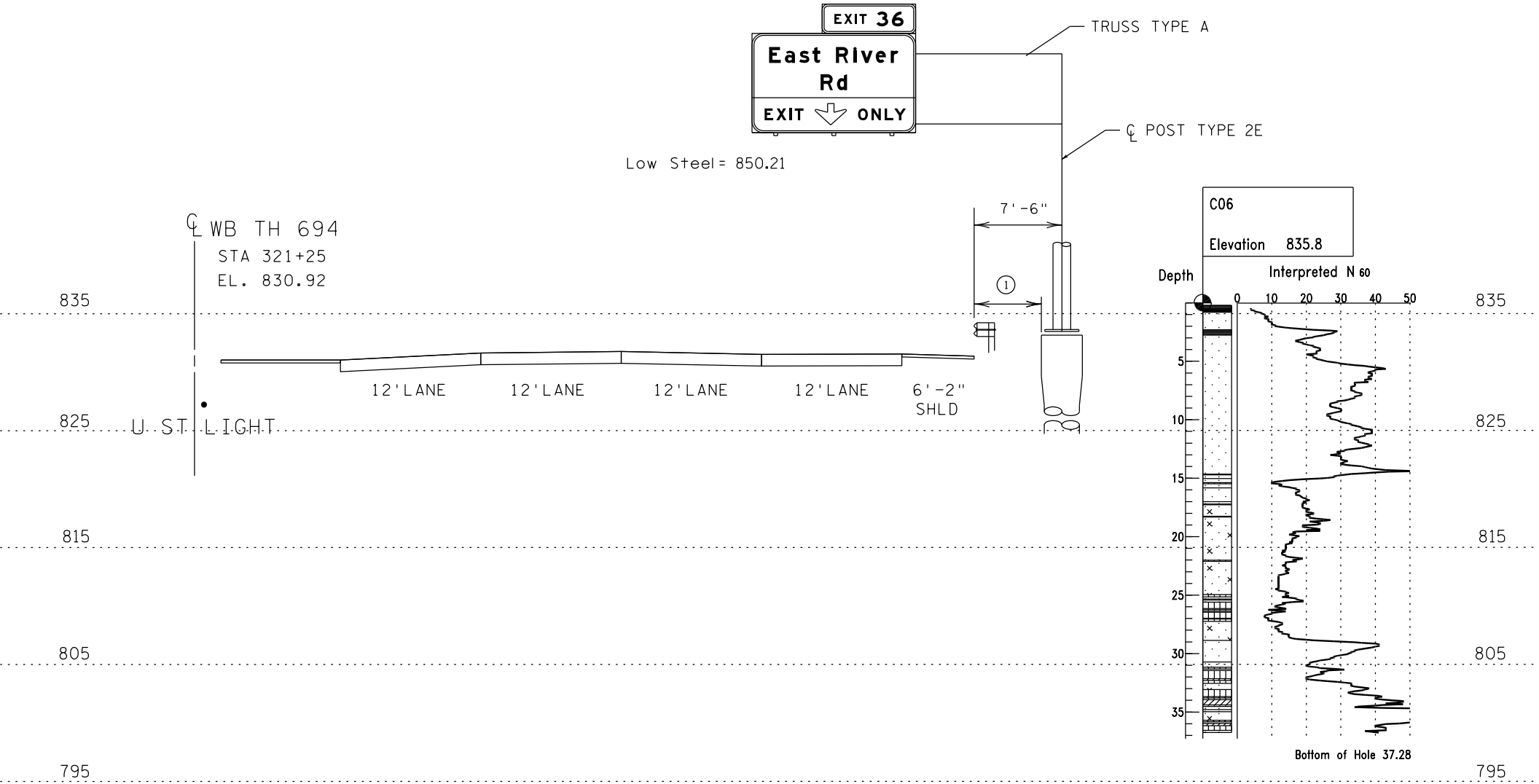
SITE 5



SITE 6

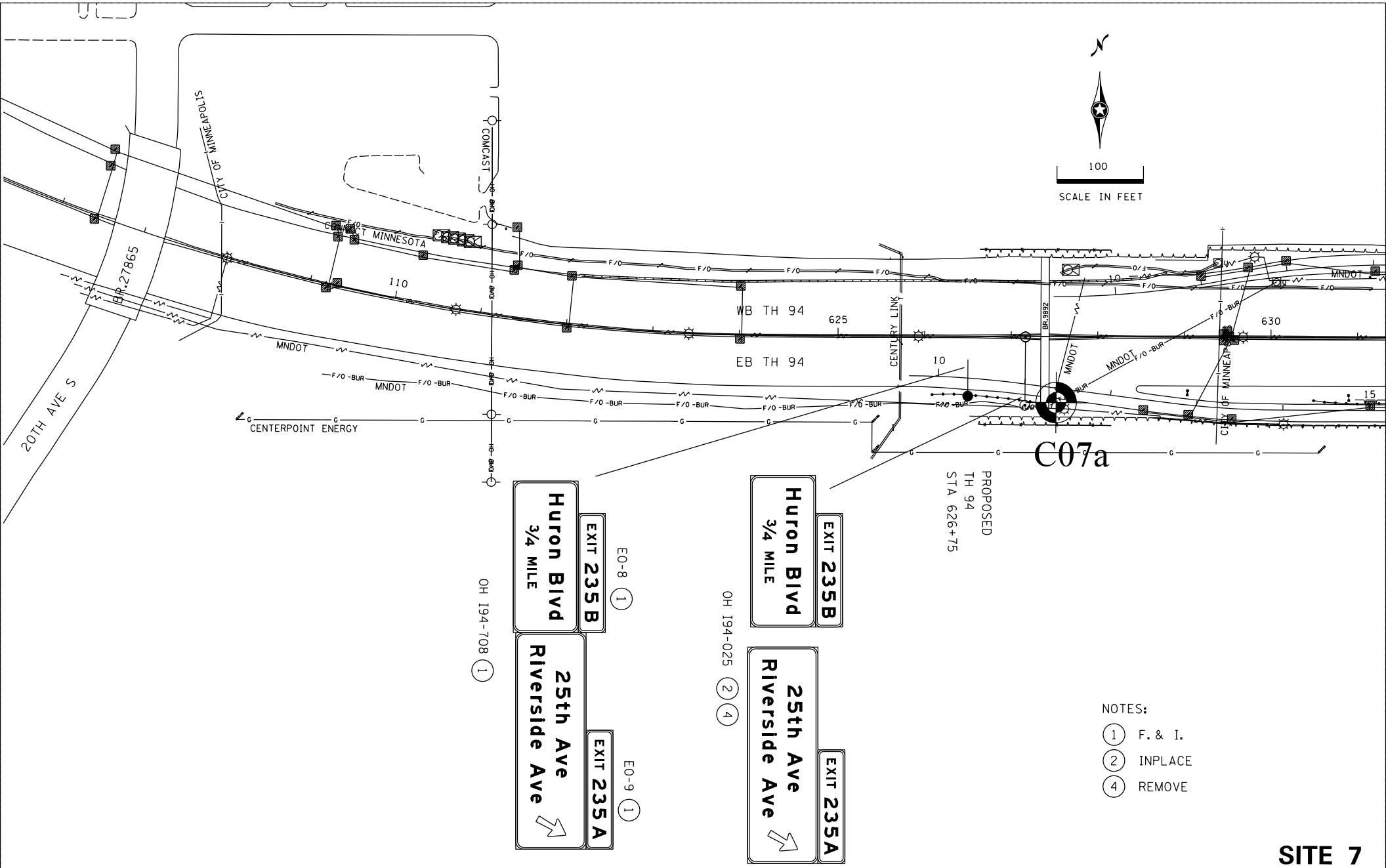
SIGNING–INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I694-203

SITE 6



NOTES:

(1) F. & I.

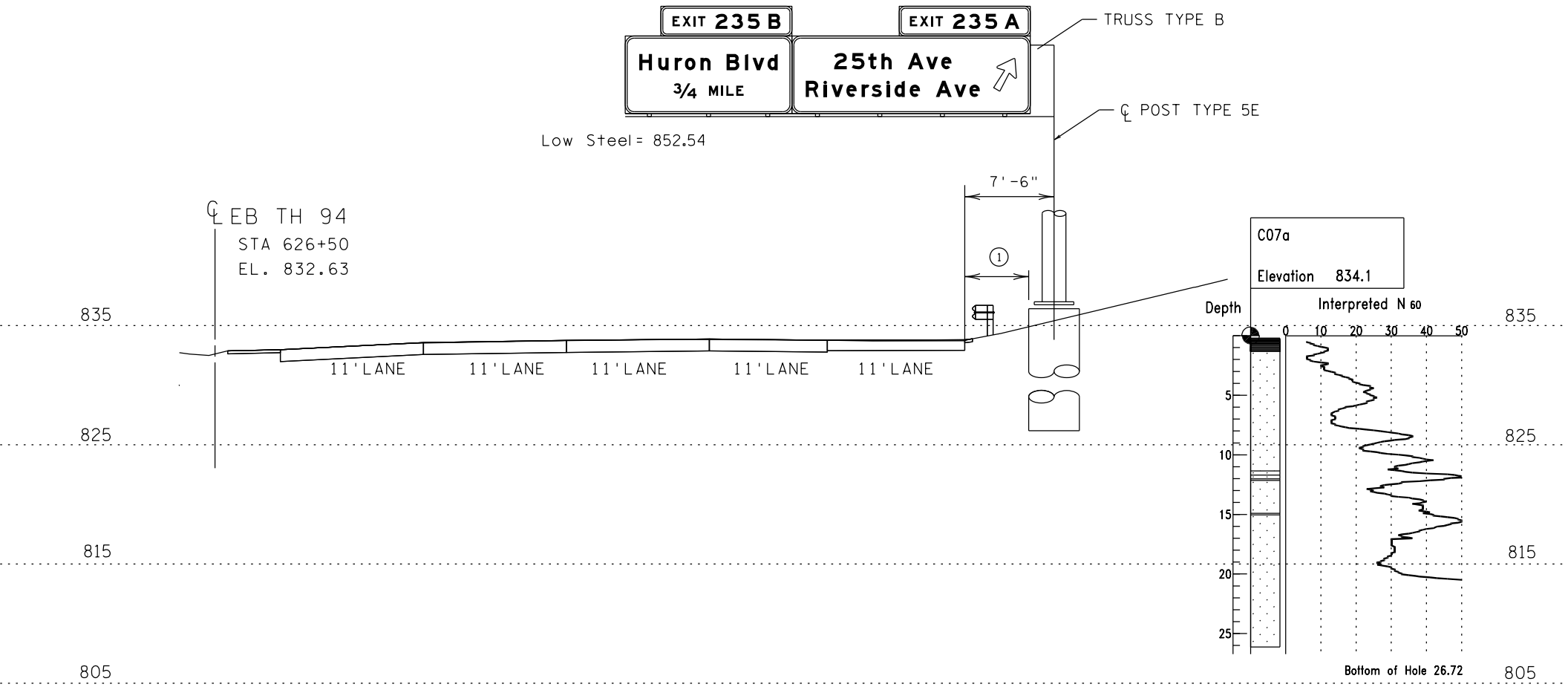
(2) INPLACE

(4) REMOVE

SITE 7

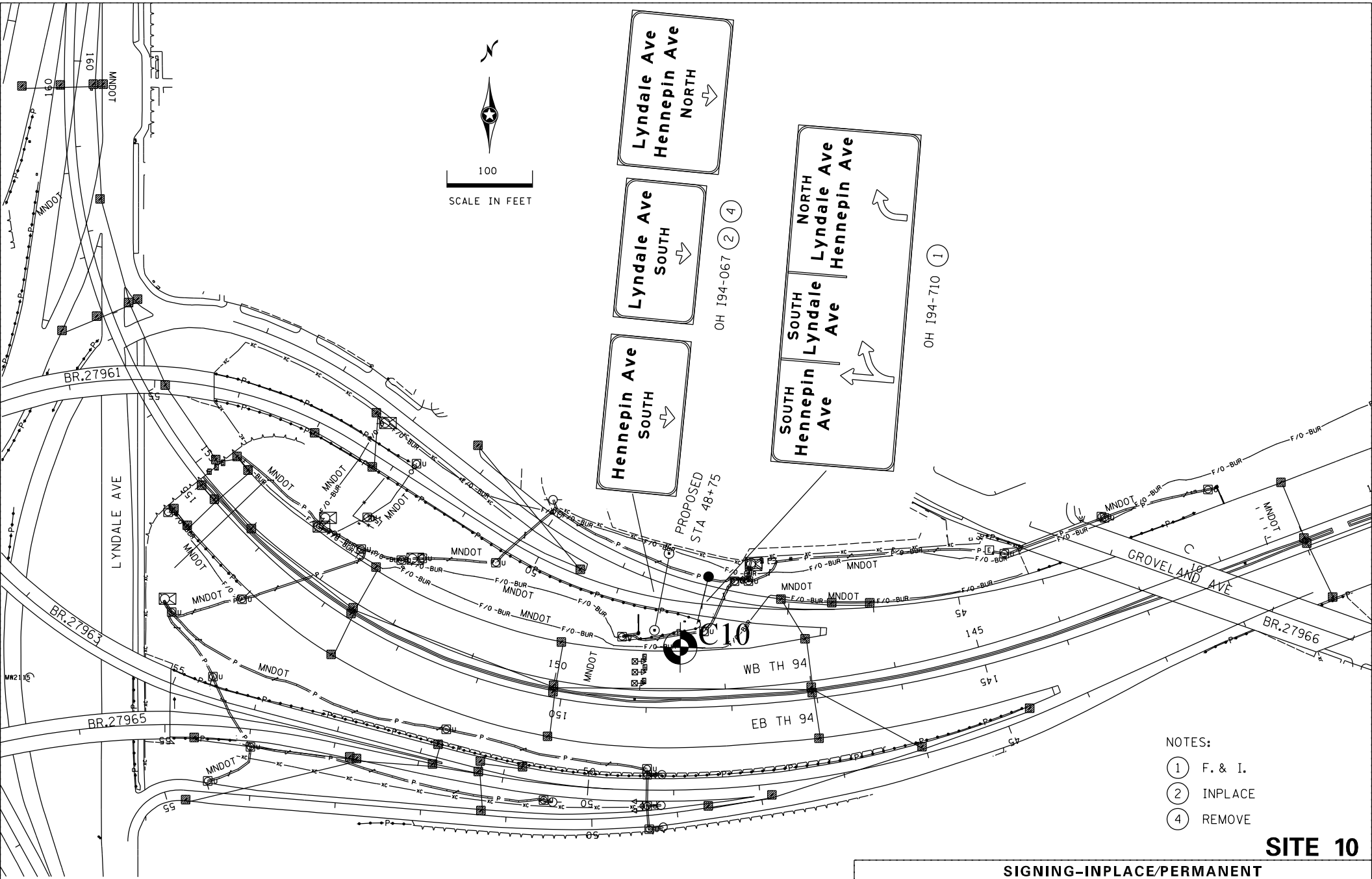
SIGNING-INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE|$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I94-708

SITE 7



NOTES:

(1) F. & I.

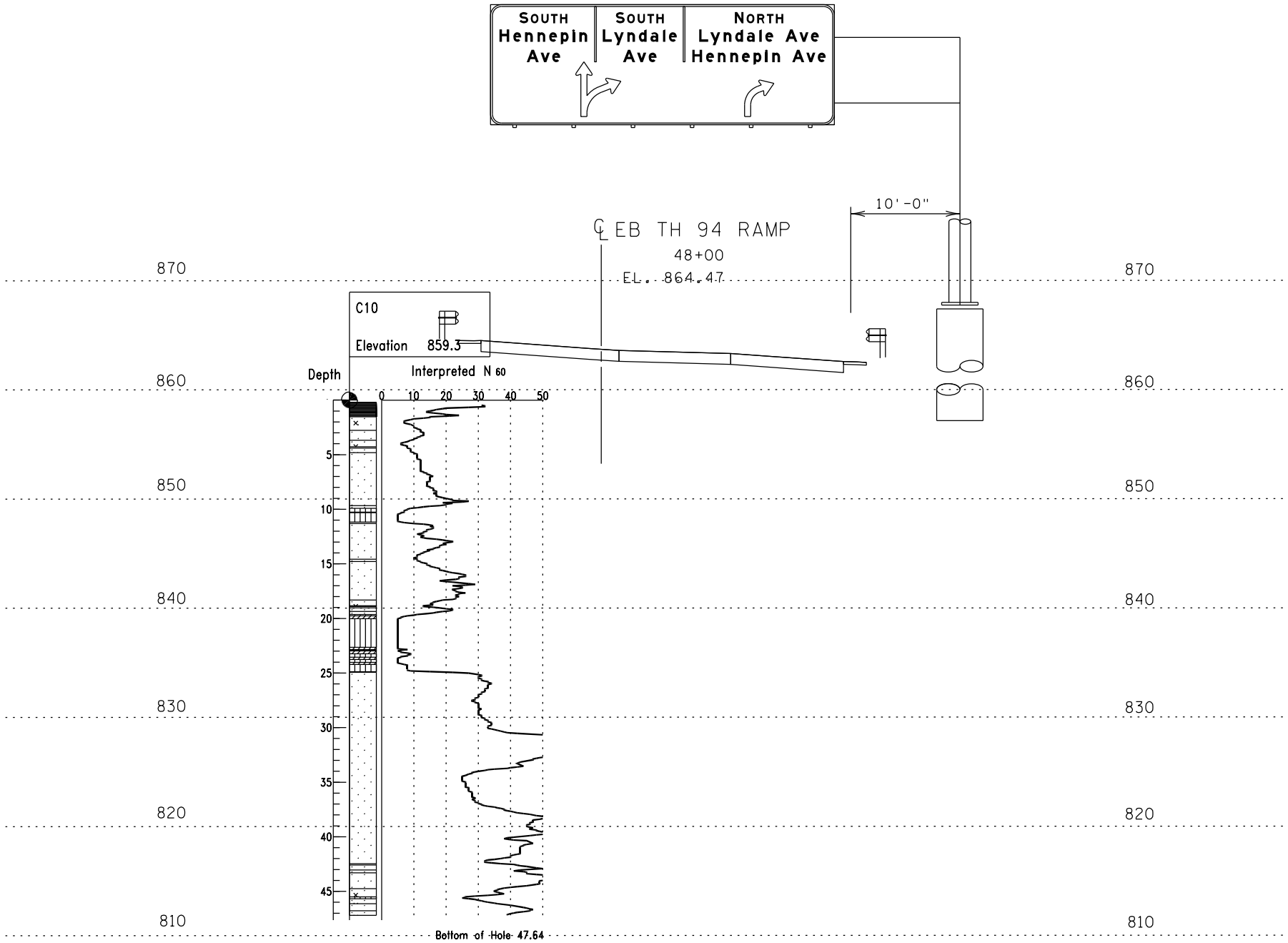
(2) INPLACE

(4) REMOVE

SITE 10

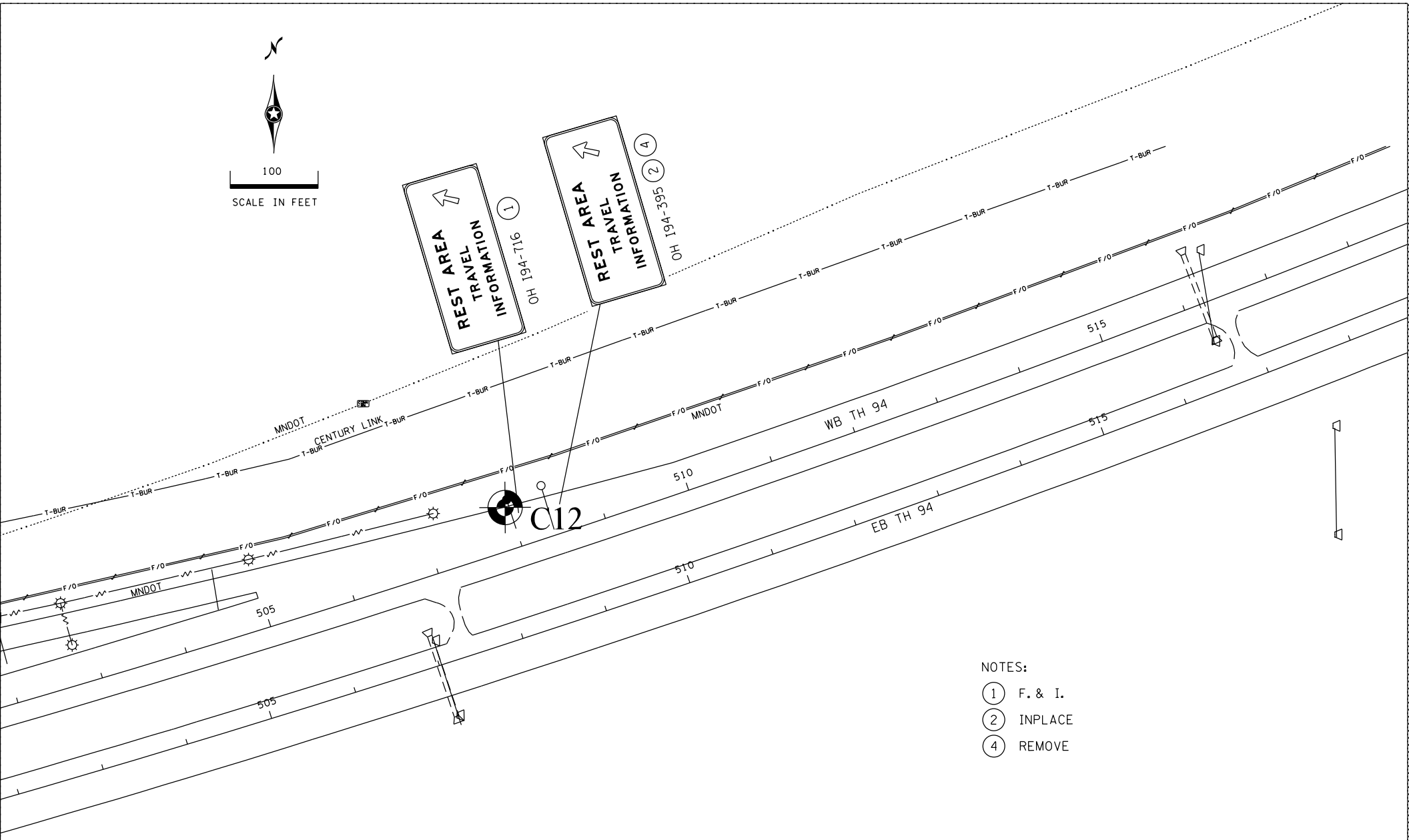
SIGNING–INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I94-710

SITE 10



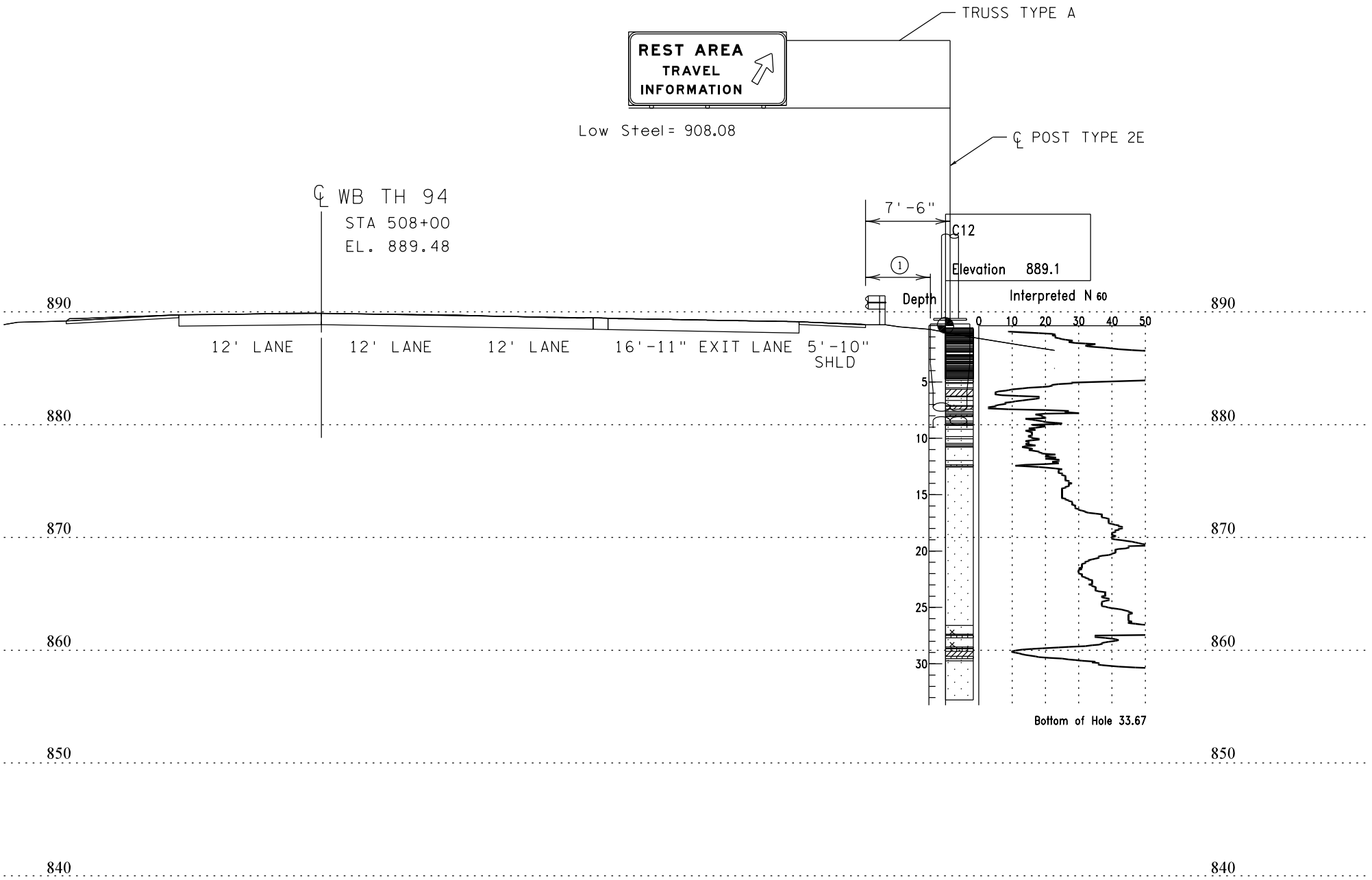
NOTES:

1. F. & I.
2. INPLACE
4. REMOVE

SITE 12

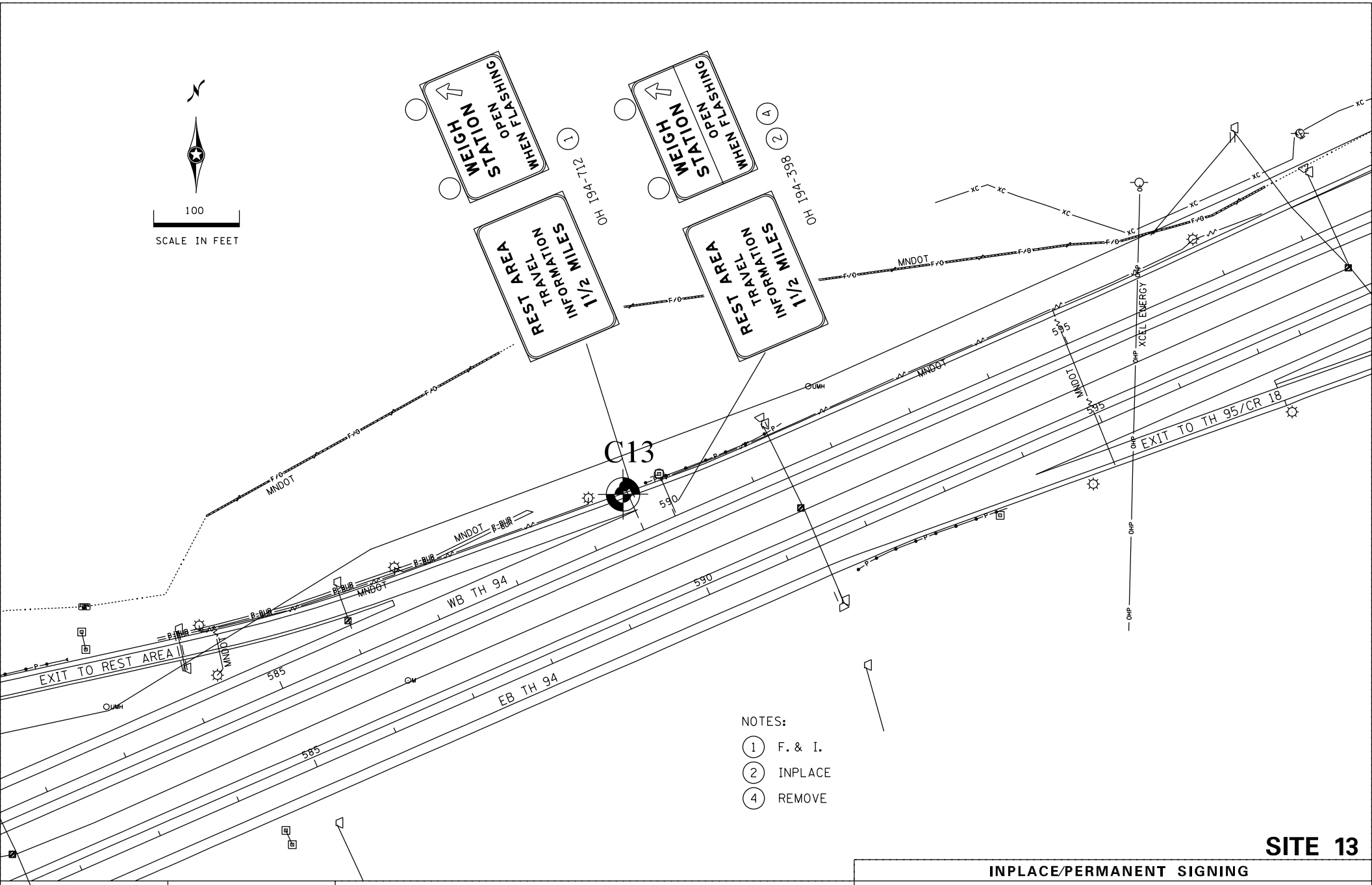
INPLACE/PERMANENT SIGNING

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE|$	STATE PROJ. NO. 8825-706 OF SHEETS



OH I94-716

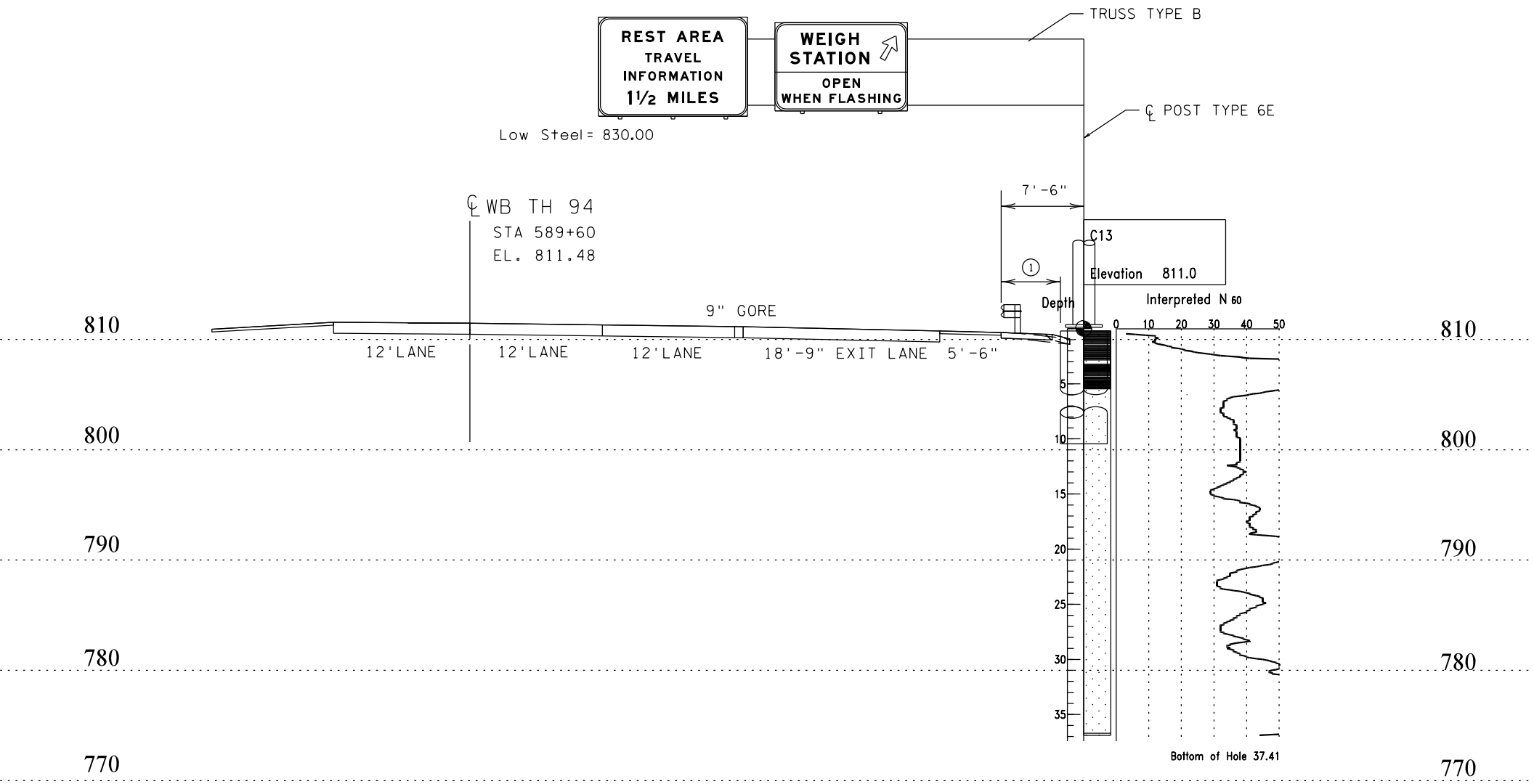
SITE 12



SITE 13

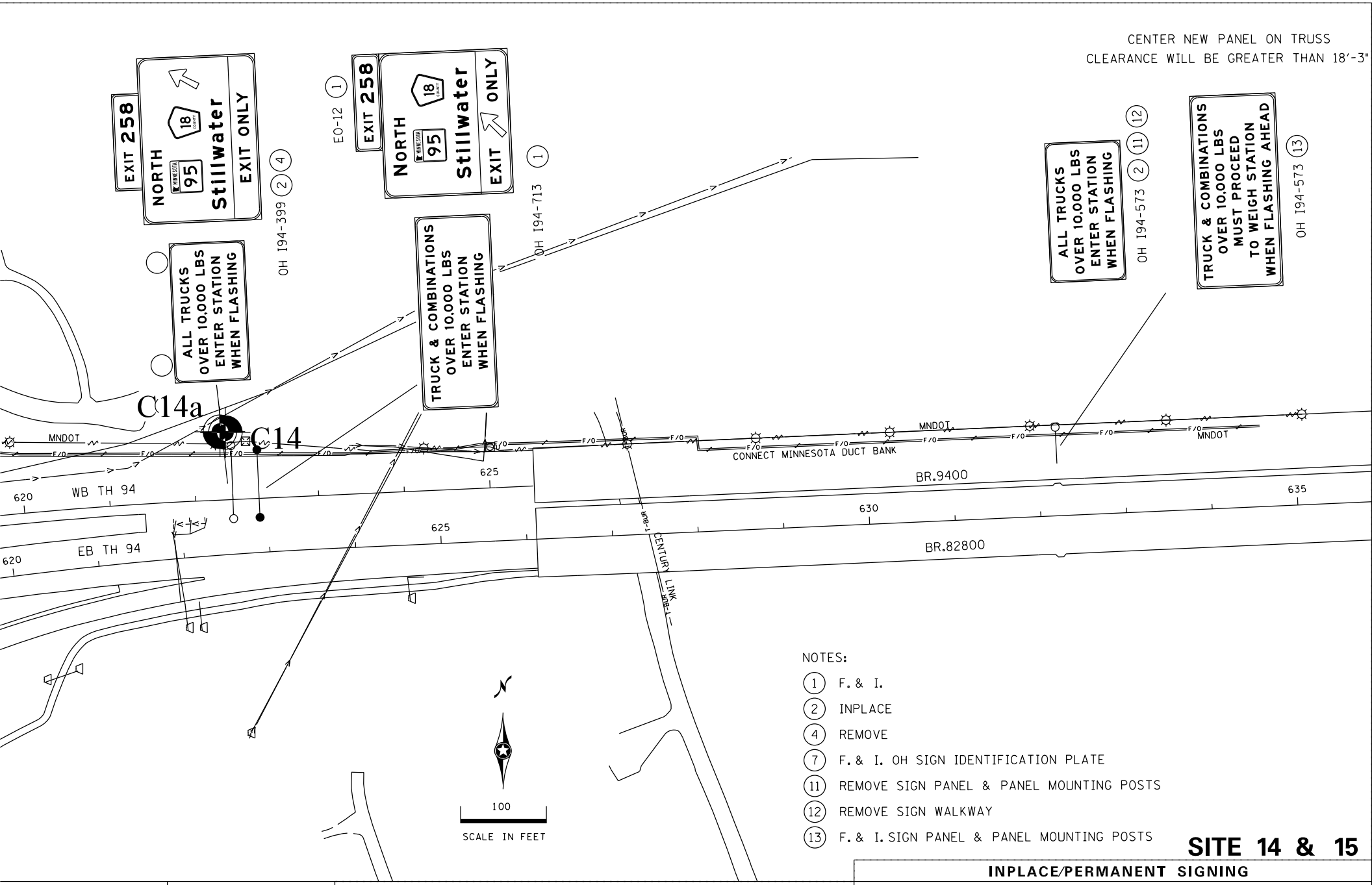
INPLACE/PERMANENT SIGNING

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I94-712

SITE 13



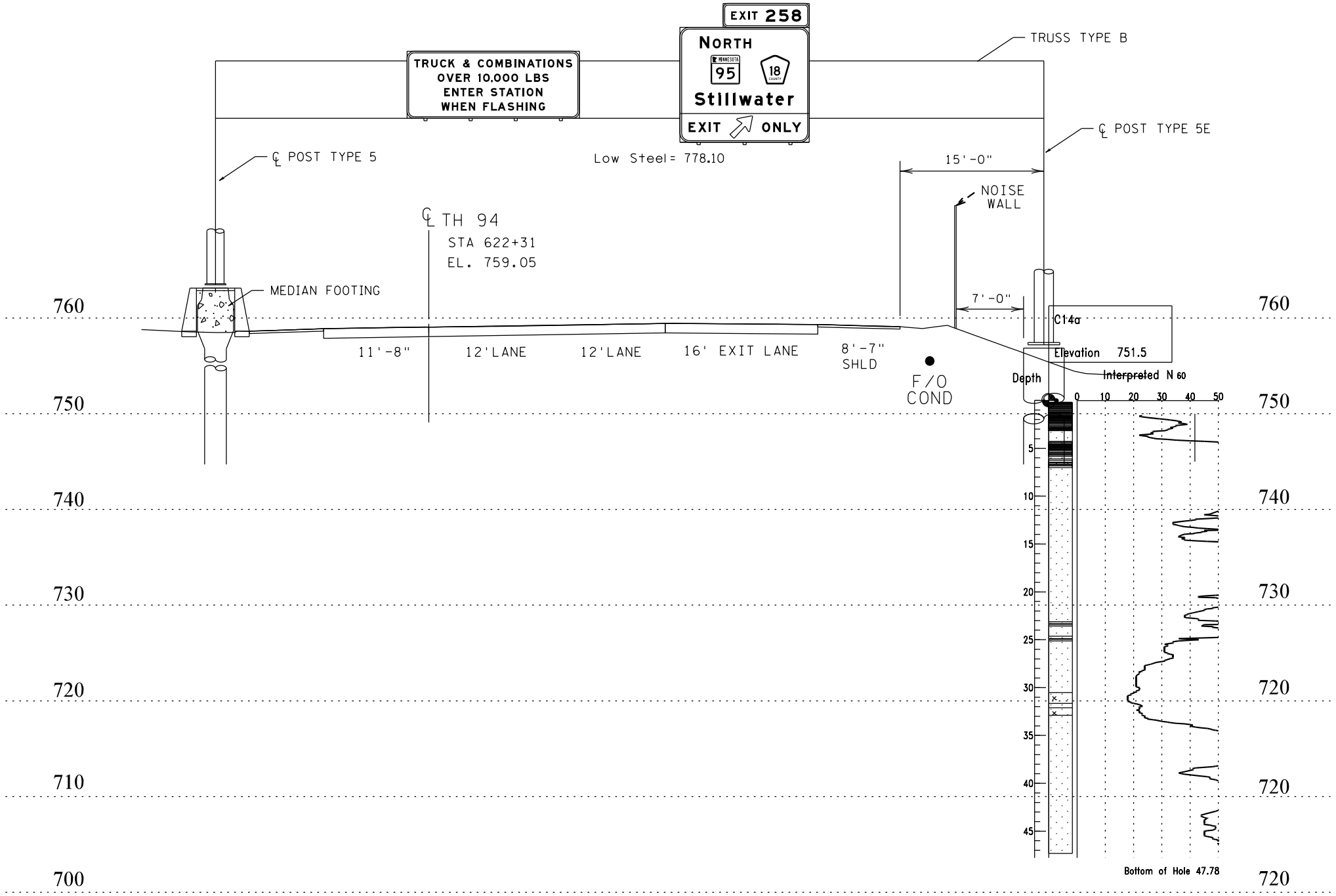
NOTES:

(1) F. & I.
(2) INPLACE
(4) REMOVE
(7) F. & I. OH SIGN IDENTIFICATION PLATE
(11) REMOVE SIGN PANEL & PANEL MOUNTING POSTS
(12) REMOVE SIGN WALKWAY
(13) F. & I. SIGN PANEL & PANEL MOUNTING POSTS

SITE 14 & 15

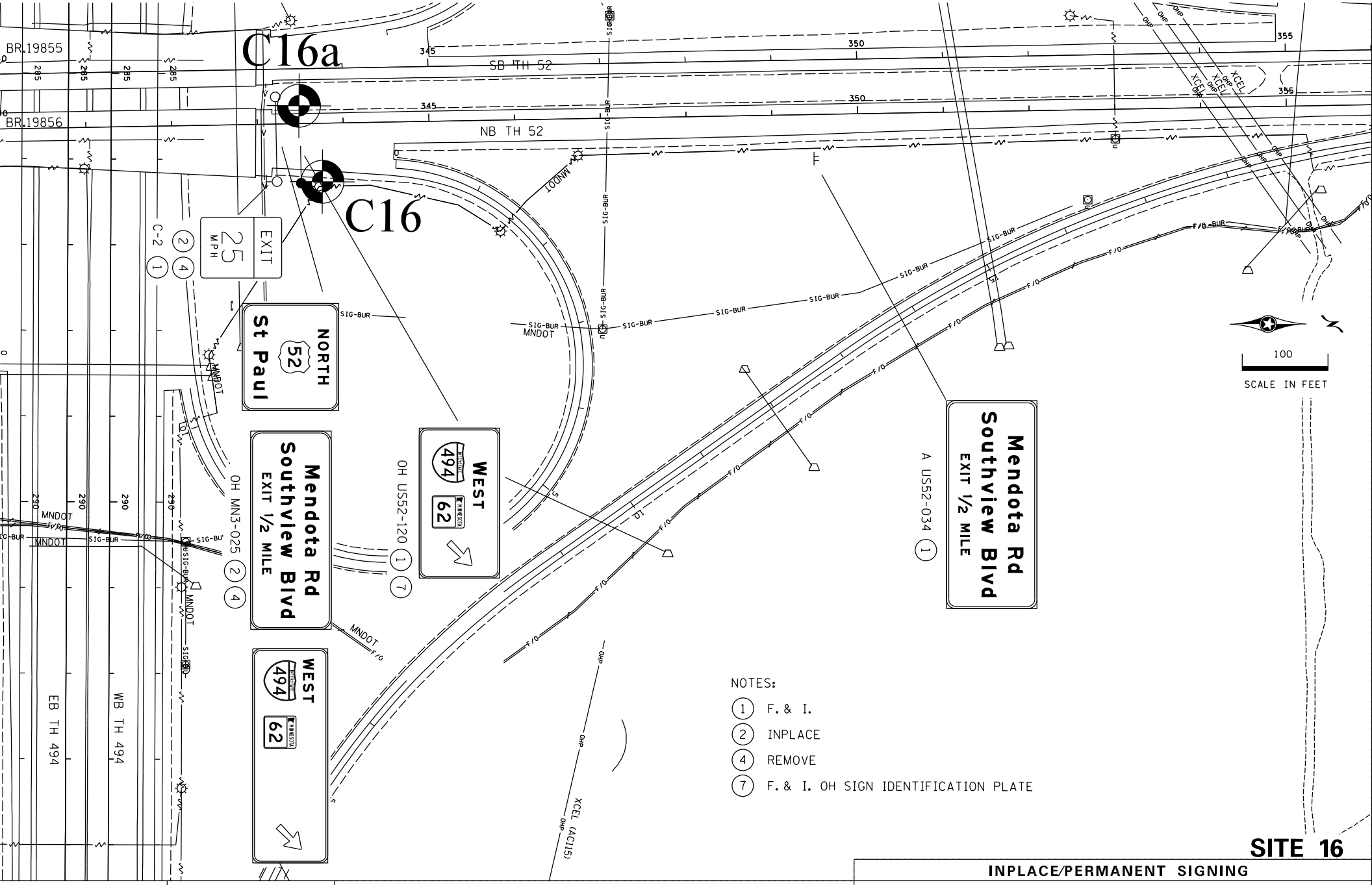
INPLACE/PERMANENT SIGNING

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $!DATE!$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I94-713

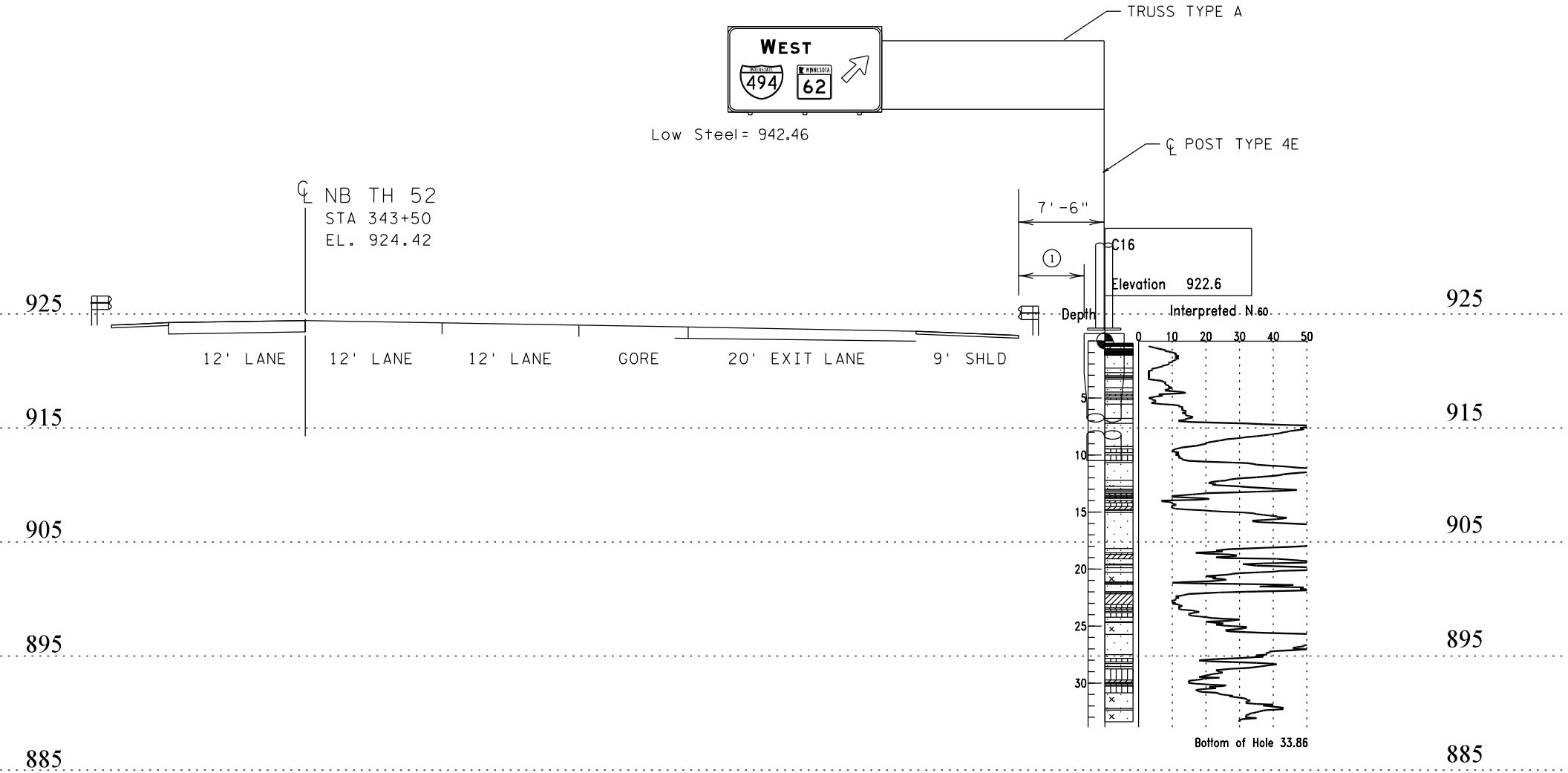
SITE 14



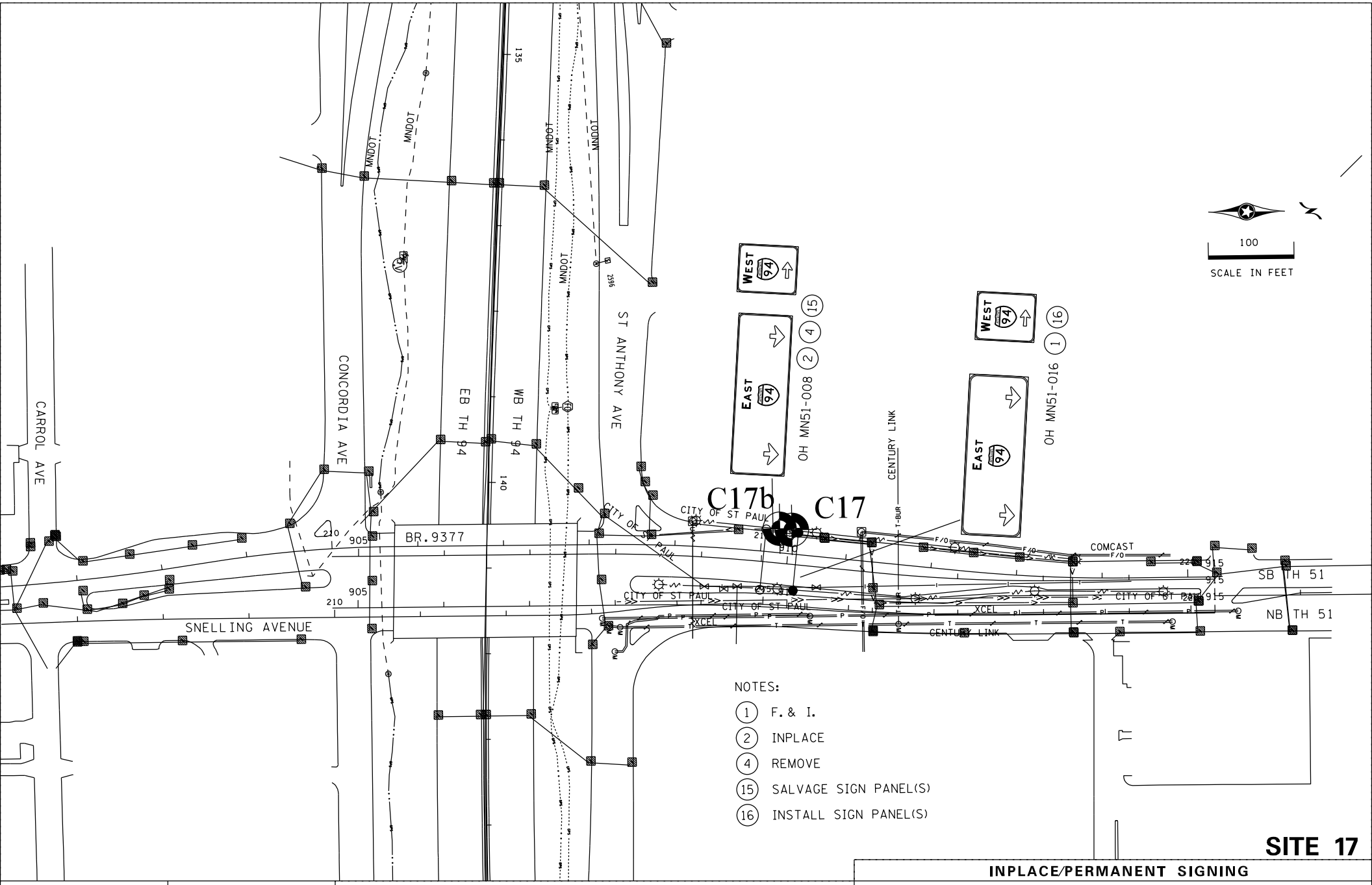
SITE 16

INPLACE/PERMANENT SIGNING

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE|$	STATE PROJ. NO. 8825-706	OF SHEETS



OH US52-120
SITE 16

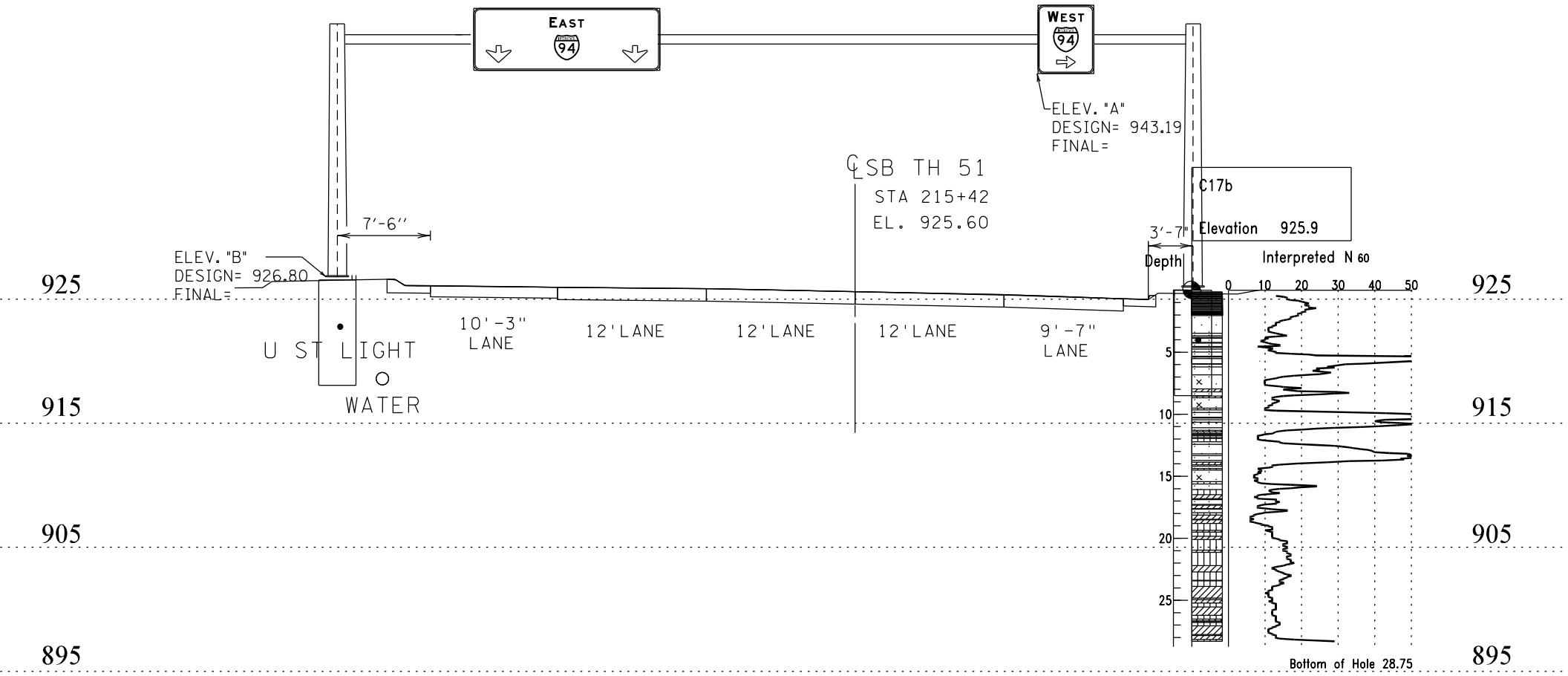


SITE 17

INPLACE/PERMANENT SIGNING

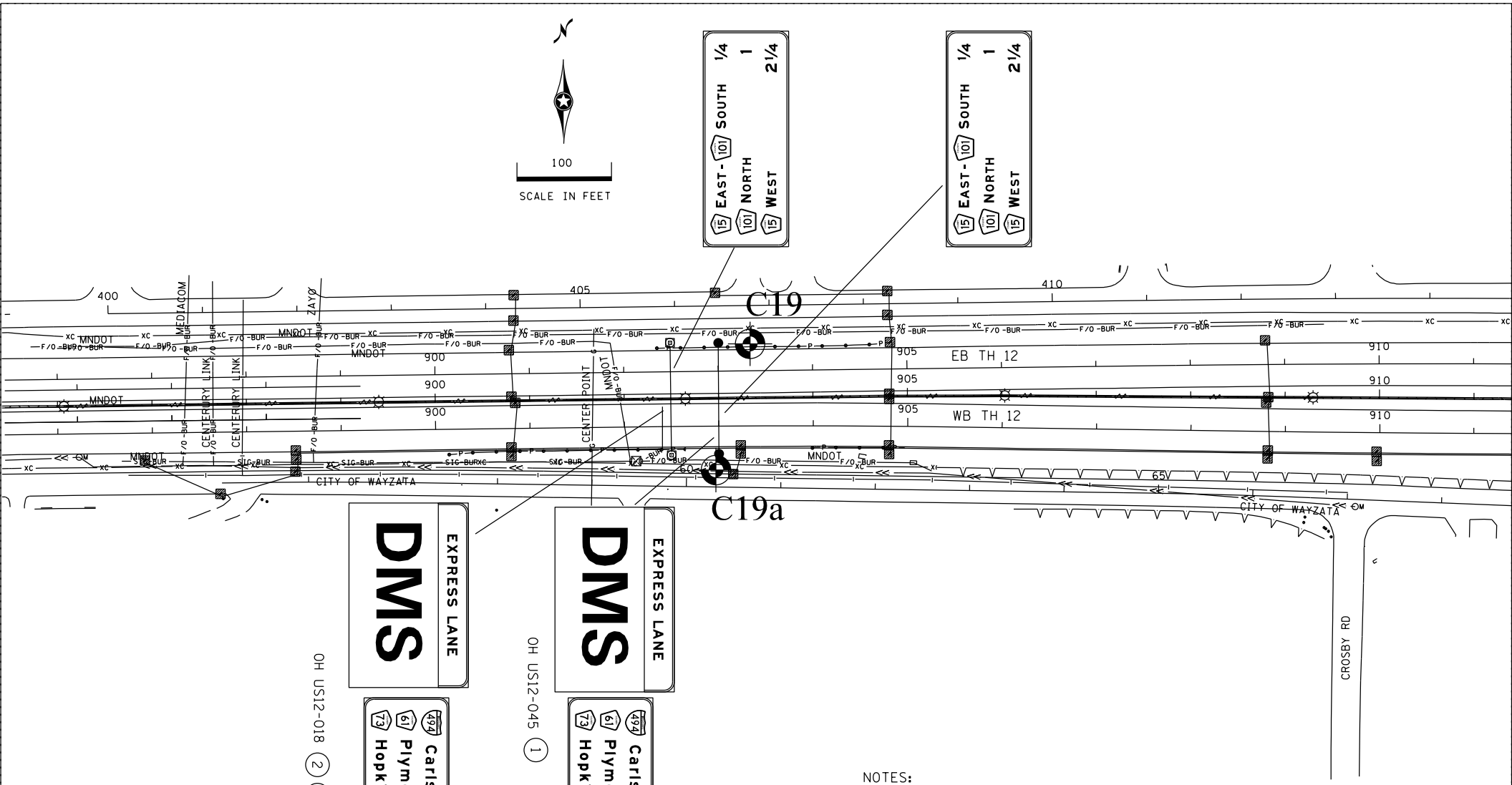
DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER	LIC. NO. _____	DATE $!DATE!$

STATE PROJ. NO. 8825-706 OF SHEETS



OH MN 51-01

SITE 17



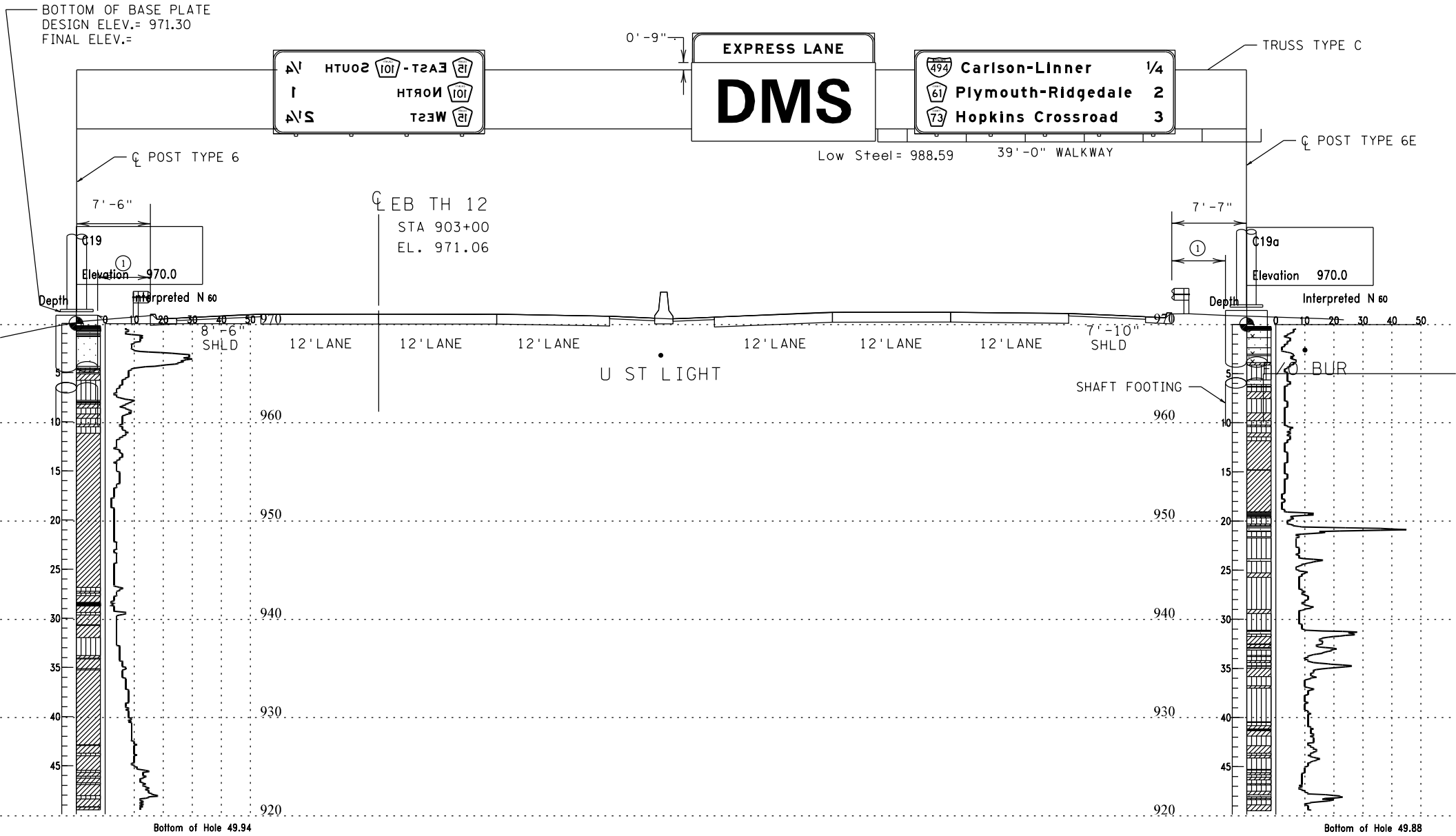
NOTES:

1. F. & I.
2. INPLACE
4. REMOVE

SITE 19

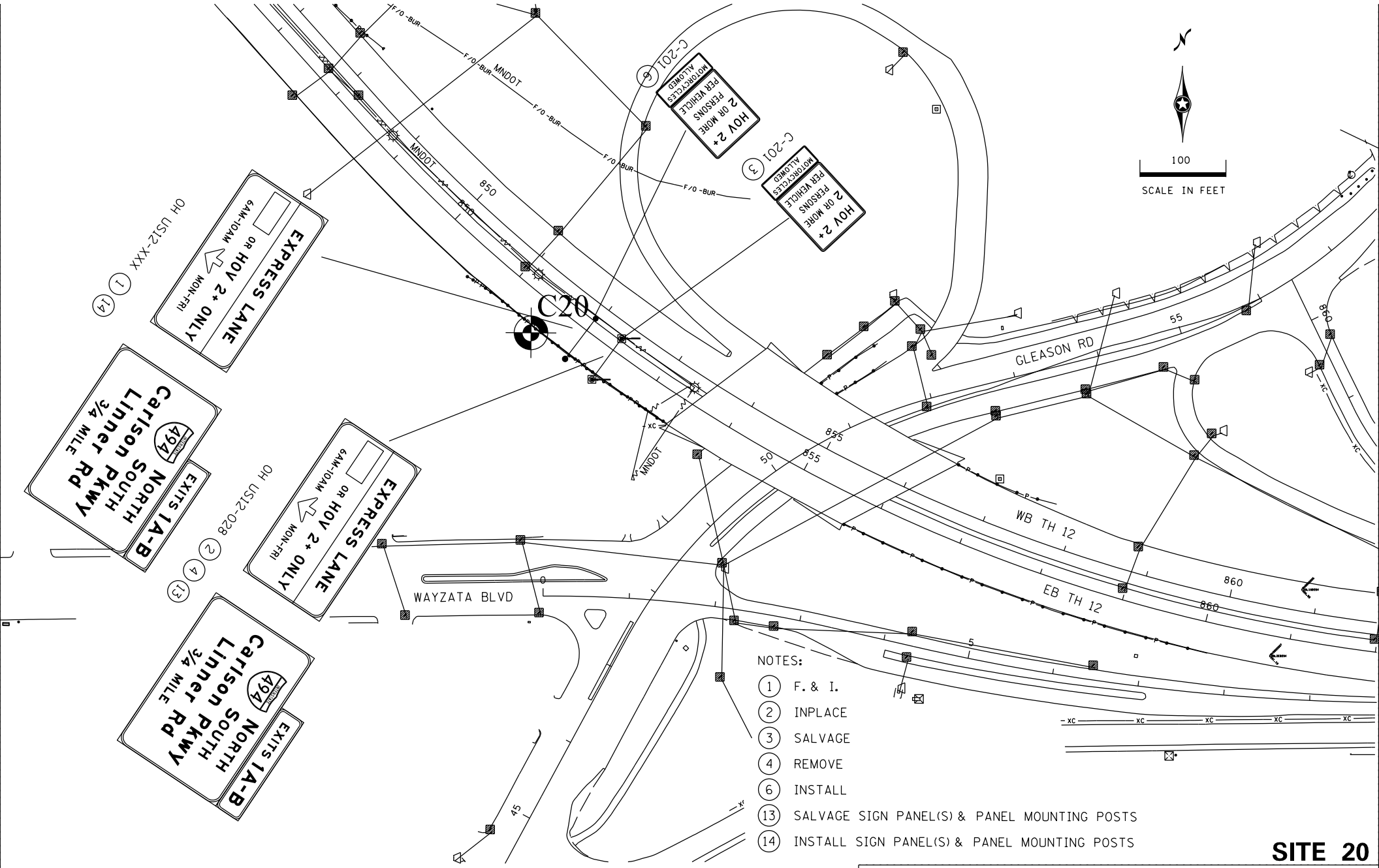
SIGNING-INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $!DATE!$	STATE PROJ. NO. 8825-706	OF SHEETS



OH US12-018

SITE 19



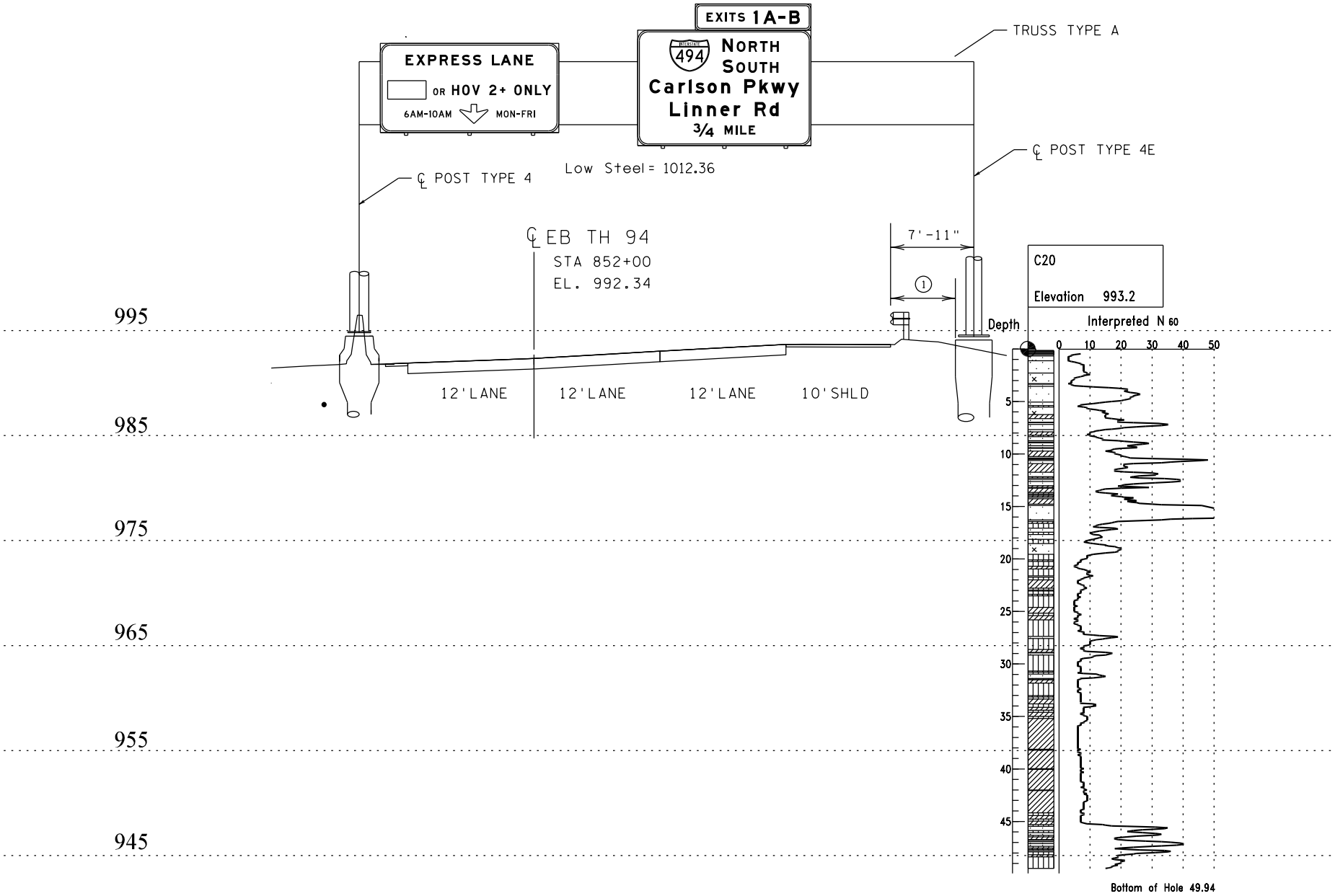
NOTES:

1. F. & I.
2. INPLACE
3. SALVAGE
4. REMOVE
6. INSTALL
13. SALVAGE SIGN PANEL(S) & PANEL MOUNTING POSTS
14. INSTALL SIGN PANEL(S) & PANEL MOUNTING POSTS

SITE 20

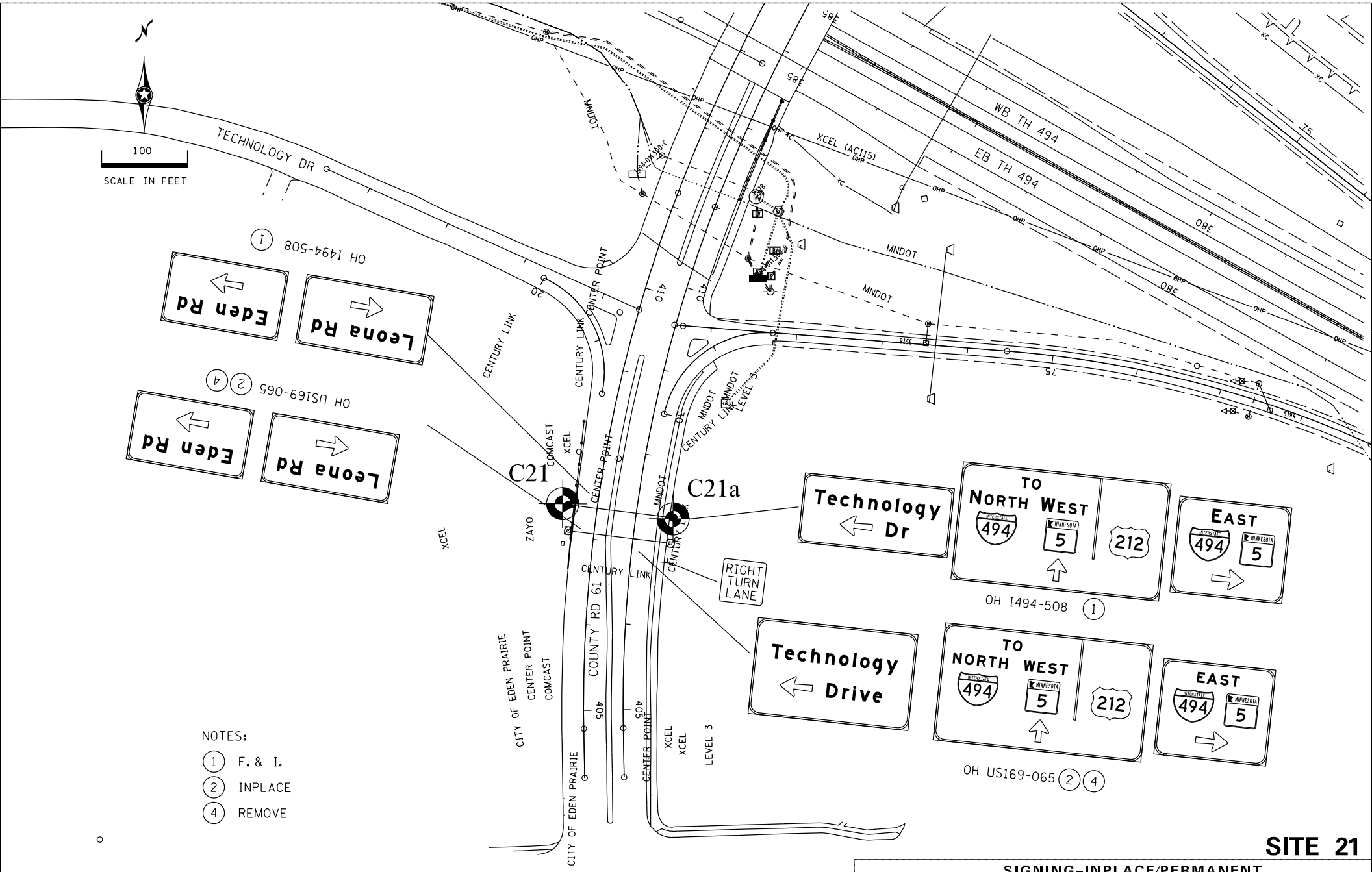
SIGNING–INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $\$DATE\$$	STATE PROJ. NO. 8825-706	OF SHEETS



OH US12-XXX

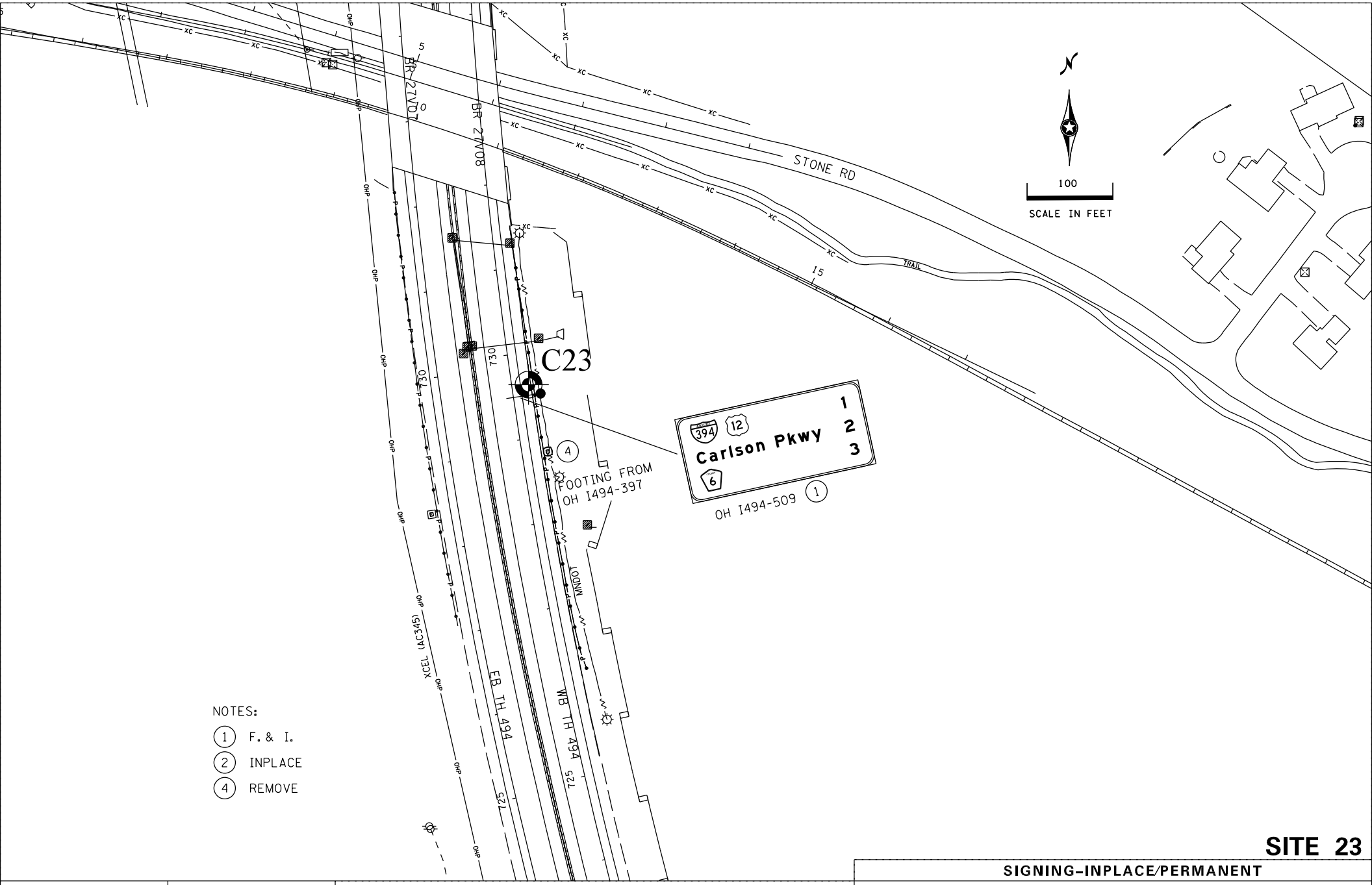
SITE 20



SITE 21

SIGNING–INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706	OF SHEETS



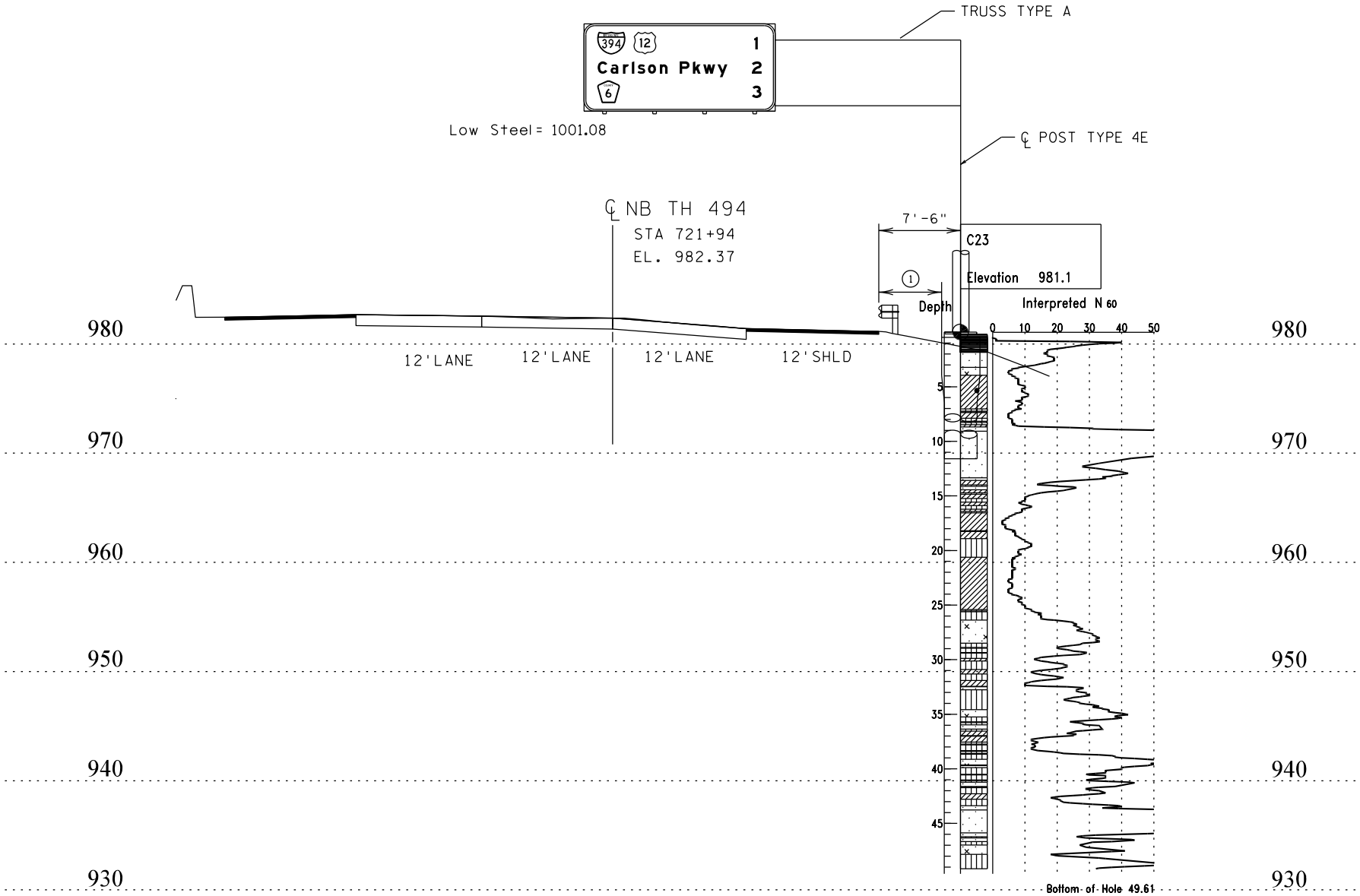
NOTES:

1. F. & I.
2. INPLACE
4. REMOVE

SITE 23

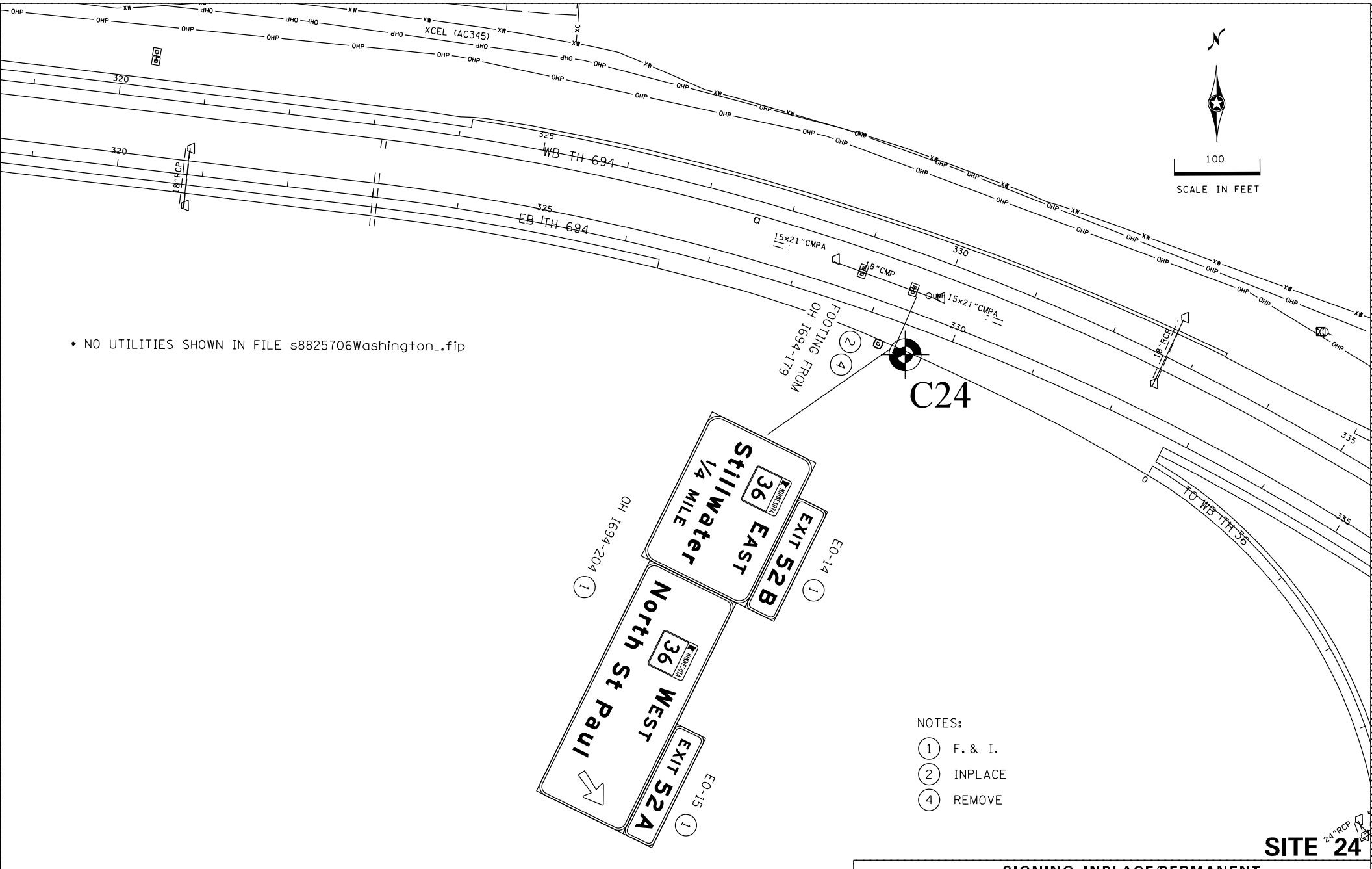
SIGNING–INPLACE/PERMANENT

DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I494-509

SITE 23



* NO UTILITIES SHOWN IN FILE s8825706Washington_.fip

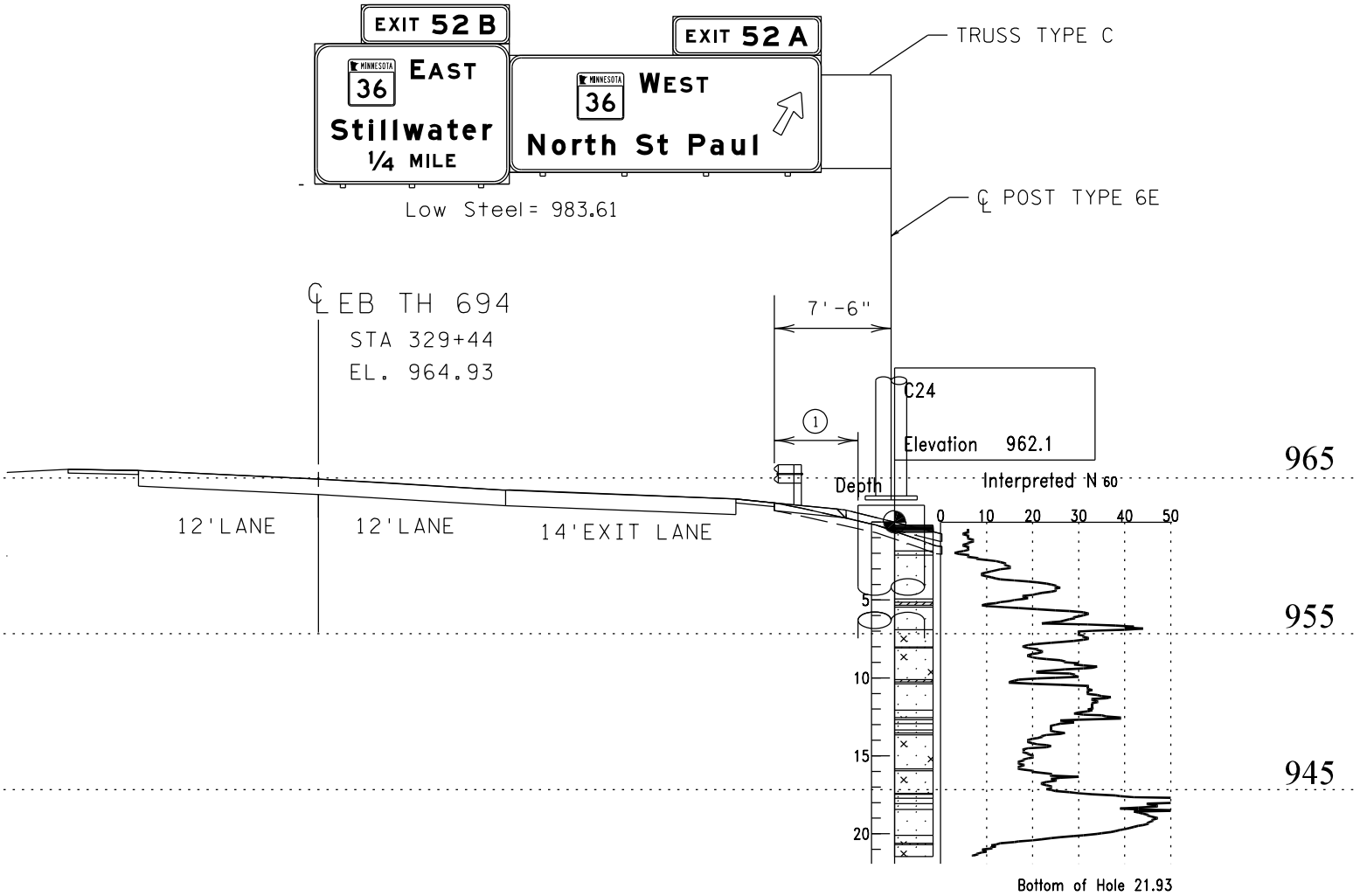
NOTES:

1. F. & I.
2. INPLACE
4. REMOVE

SITE 24

SIGNING-INPLACE/PERMANENT

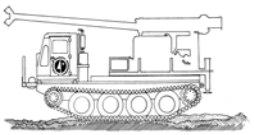
DRAWN BY: BJB	CHECKED BY: RAS	CERTIFIED BY _____ LICENSED PROFESSIONAL ENGINEER LIC. NO. _____ DATE $IDATE1$	STATE PROJ. NO. 8825-706	OF SHEETS



OH I694-204

SITE 24

Minnesota Department of Transportation
Geotechnical Section
Cone Penetration Test Index Sheet 1.0 (CPT 1.0)



USER NOTES, ABBREVIATIONS AND DEFINITIONS

This Index sheet accompanies Cone Penetration Test Data. Please refer to the Boring Log Descriptive Terminology Sheet for information relevant to conventional boring logs.

This Cone Penetration Test (CPT) Sounding follows ASTM D 5778 and was made by ordinary and conventional methods and with care deemed adequate for the Department's design purposes. Since this sounding was not taken to gather information relating to the construction of the project, the data noted in the field and recorded may not necessarily be the same as that which a contractor would desire. While the Department believes that the information as to the conditions and materials reported is accurate, it does not warrant that the information is necessarily complete. This information has been edited or abridged and may not reveal all the information which might be useful or of interest to the contractor. Consequently, the Department will make available at its offices, the field logs relating to this sounding.

Since subsurface conditions outside each CPT Sounding are unknown, and soil, rock and water conditions cannot be relied upon to be consistent or uniform, no warrant is made that conditions adjacent to this sounding will necessarily be the same as or similar to those shown on this log. Furthermore, the Department will not be responsible for any interpretations, assumptions, projections or interpolations made by contractors, or other users of this log.

Water pressure measurements and subsequent interpreted water levels shown on this log should be used with discretion since they represent dynamic conditions. Dynamic Pore water pressure measurements may deviate substantially from hydrostatic conditions, especially in cohesive soils. In cohesive soils, water pressures often take extended periods of time to reach equilibrium and thus reflect their true field level. Water levels can be expected to vary both seasonally and yearly. The absence of notations on this log regarding water does not necessarily mean that this boring was dry or that the contractor will not encounter subsurface water during the course of construction.

CPT Terminology

CPT ..... Cone Penetration Test
CPTU..... Cone Penetration Test with Pore Pressure measurements
SCPTU..... Cone Penetration Test with Pore Pressure and Seismic measurements
Piezocone...Common name for CPTU test

(Note: This test is not related to the Dynamic Cone Penetrometer DCP)

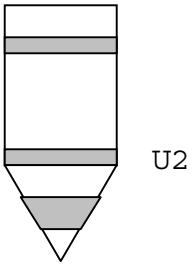
q_T TIP RESISTANCE
The resistance at the cone corrected for water pressure. Data is from cone with 60 degree apex angle and a 10 cm^2 end area.

f_s SLEEVE FRICTION RESISTANCE
The resistance along the sleeve of the penetrometer.

FR Friction Ratio
Ratio of sleeve friction over corrected tip resistance.
FR = fs/qt

V_s Shear Wave Velocity
A measure of the speed at which a siesmic wave travels through soil/rock.

PORE WATER MEASUREMENTS
Pore water measurements reported on CPT Log are representative of water pressures measured at the U2 location, just behind the cone tip, prior to the sleeve, as shown in the figure below. These measurements are considered to be dynamic water pressures due to the local disturbance caused by the cone tip. Dynamic water pressure decay and Static water pressure measurements are reported on a Pore Water Pressure Dissipation Graph.



SBT SOIL BEHAVIOR TYPE
Soil Classification methods for the Cone Penetration Test are based on correlation charts developed from observations of CPT data and conventional borings. Please note that these classification charts are meant to provide a guide to Soil Behavior Type and should not be used to infer a soil classification based on grain size distribution.

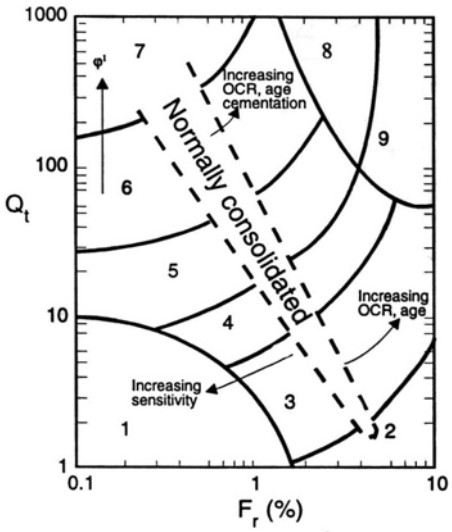
The numbers corresponding to different regions on the charts represent the following soil behavior types:

1. Sensitive, Fine Grained
2. Organic Soils - Peats
3. Clays - Clay to Silty Clay
4. Silt Mixtures - Clayey Silt to Silty Clay
5. Sand Mixtures - Silty Sand to Sandy Silt
6. Sands - Clean Sand to Silty Sand
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff, Fine Grained

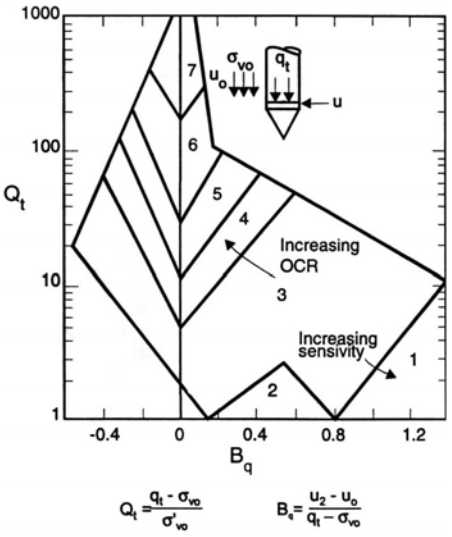
Note that engineering judgment, and comparison with conventional borings is especially important in the proper interpretation of CPT data in certain geo-materials.

The following charts are used to provide a Soil Behavior Type for the CPT Data.

Robertson CPT 1990
Soil Behavior type based on friction ratio



Robertson CPTU 1990
Soil Behavior type based on pore pressure



where ...
Q_T ..... normalized cone resistance
B_q ..... pore pressure ratio
F_r ..... Normalized friction ratio
σ_{vo} ..... overburden pressure
σ'_{vo} ..... effective over burden pressure
u_2 ..... measured pore pressure
u_0 ..... equilibrium pore pressure

DEPARTMENT OF TRANSPORTATION

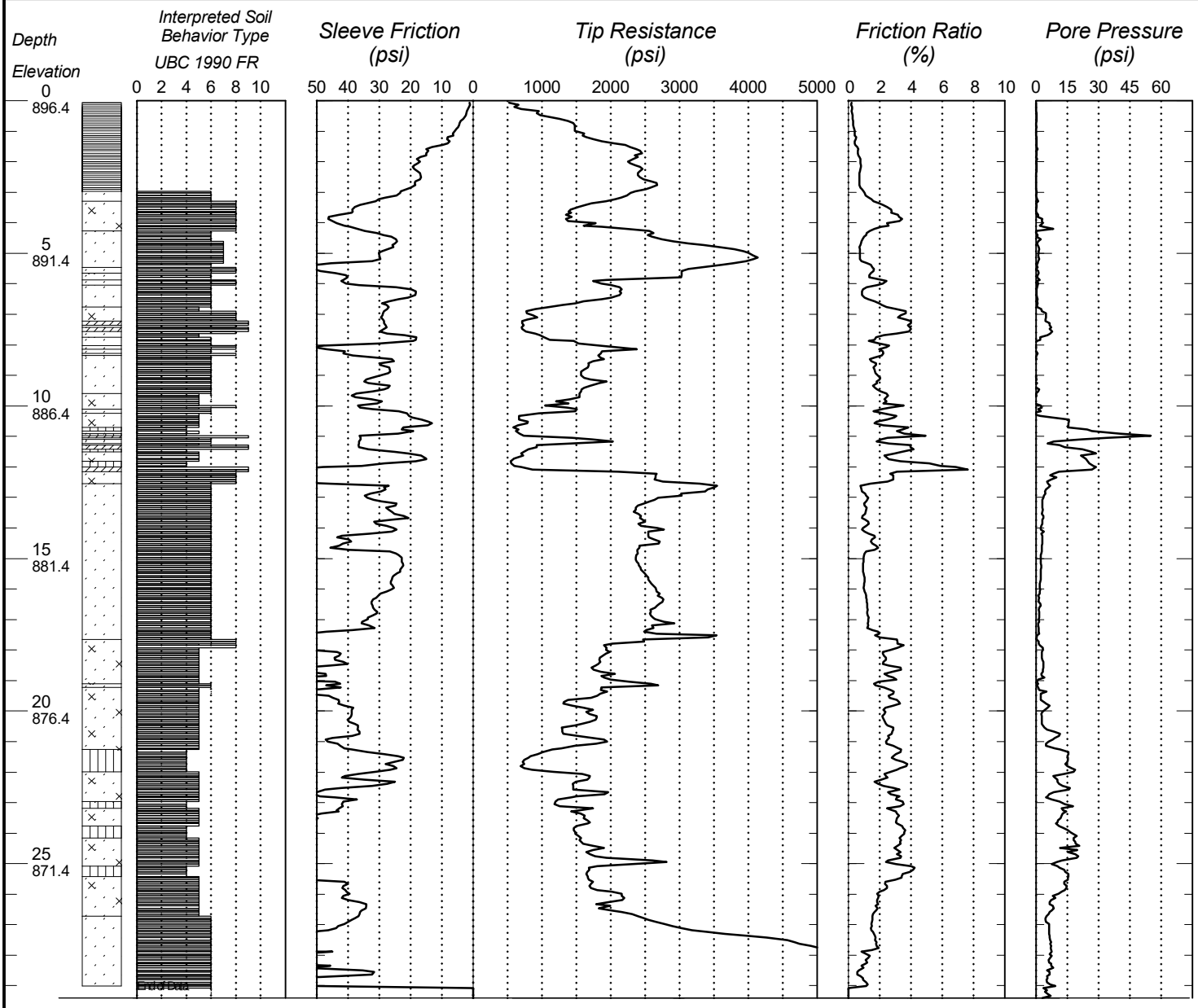
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84274

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C01**	**896.4** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**205146 CPT Truck (H)**	
X=546689 Y=250863	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°53'08.09" *Longitude (West)=93°08'11.56"*	Hole Type **CPT-STD**	**7/24/19**



Bottom of Hole 29.4

DEPARTMENT OF TRANSPORTATION

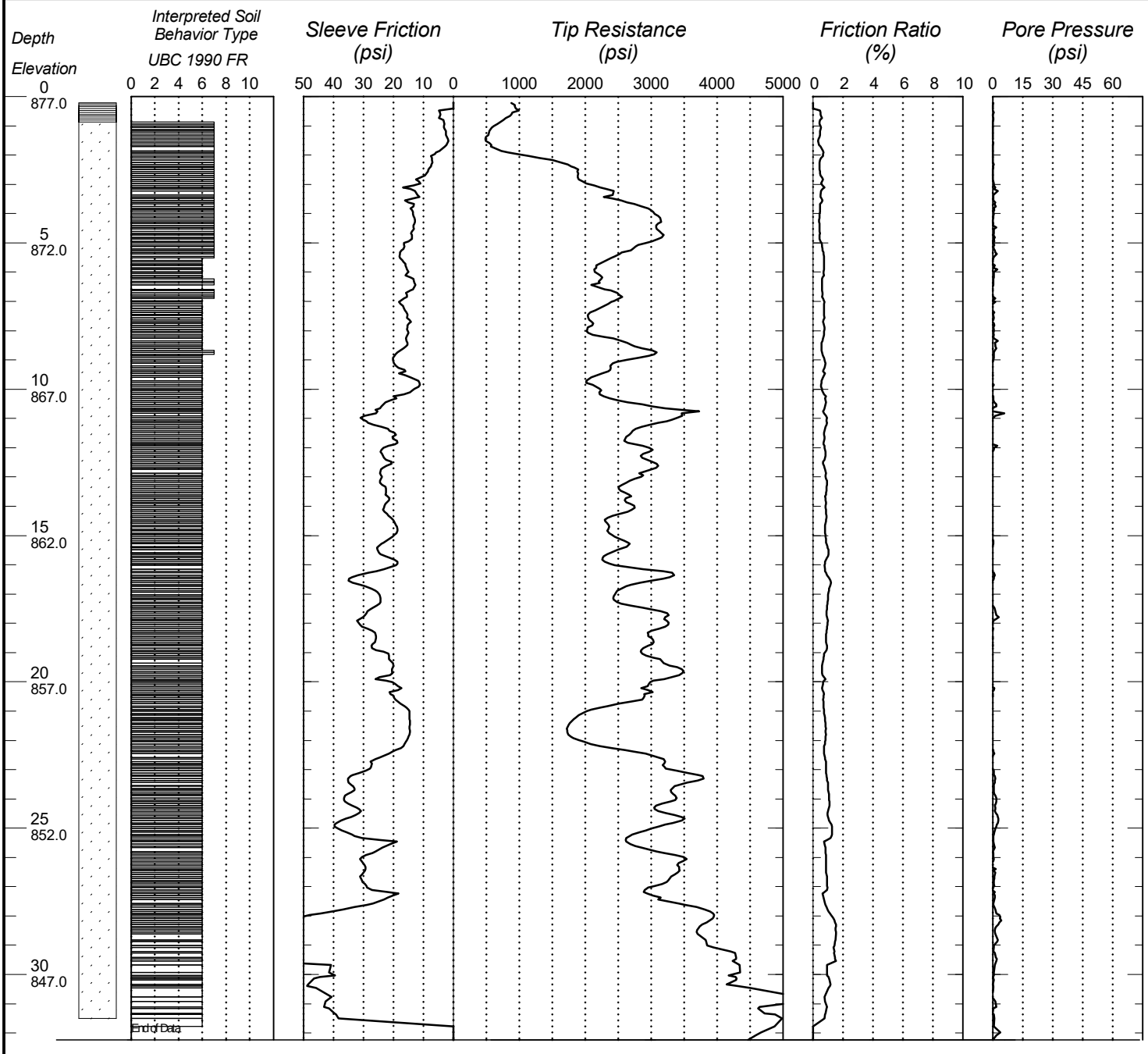
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84275

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C02**	**877.0** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**205146 CPT Truck (H)**	
X=543850 Y=239611	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°51'17.05" *Longitude (West)=93°08'51.32"*	Hole Type **CPT-STD**	**7/24/19**



Bottom of Hole 32.23

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DEPARTMENT OF TRANSPORTATION

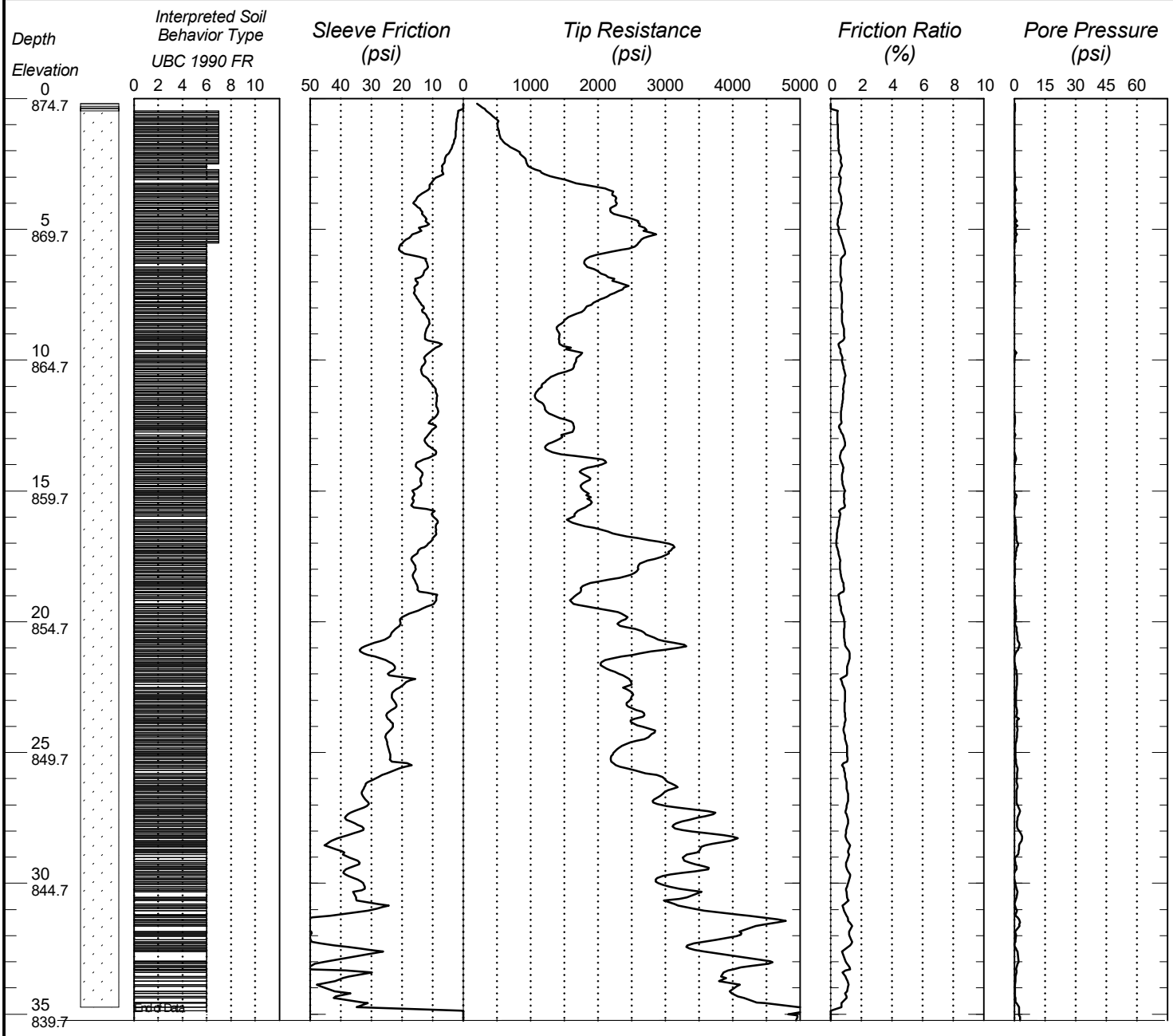
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84276

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C02A**	**874.7** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**205146 CPT Truck (H)**	
X=543781 Y=239650	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°51'17.44" *Longitude (West)=93°08'52.27"*	Hole Type **CPT-STD**	**7/24/19**



Bottom of Hole 35.24

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DEPARTMENT OF TRANSPORTATION

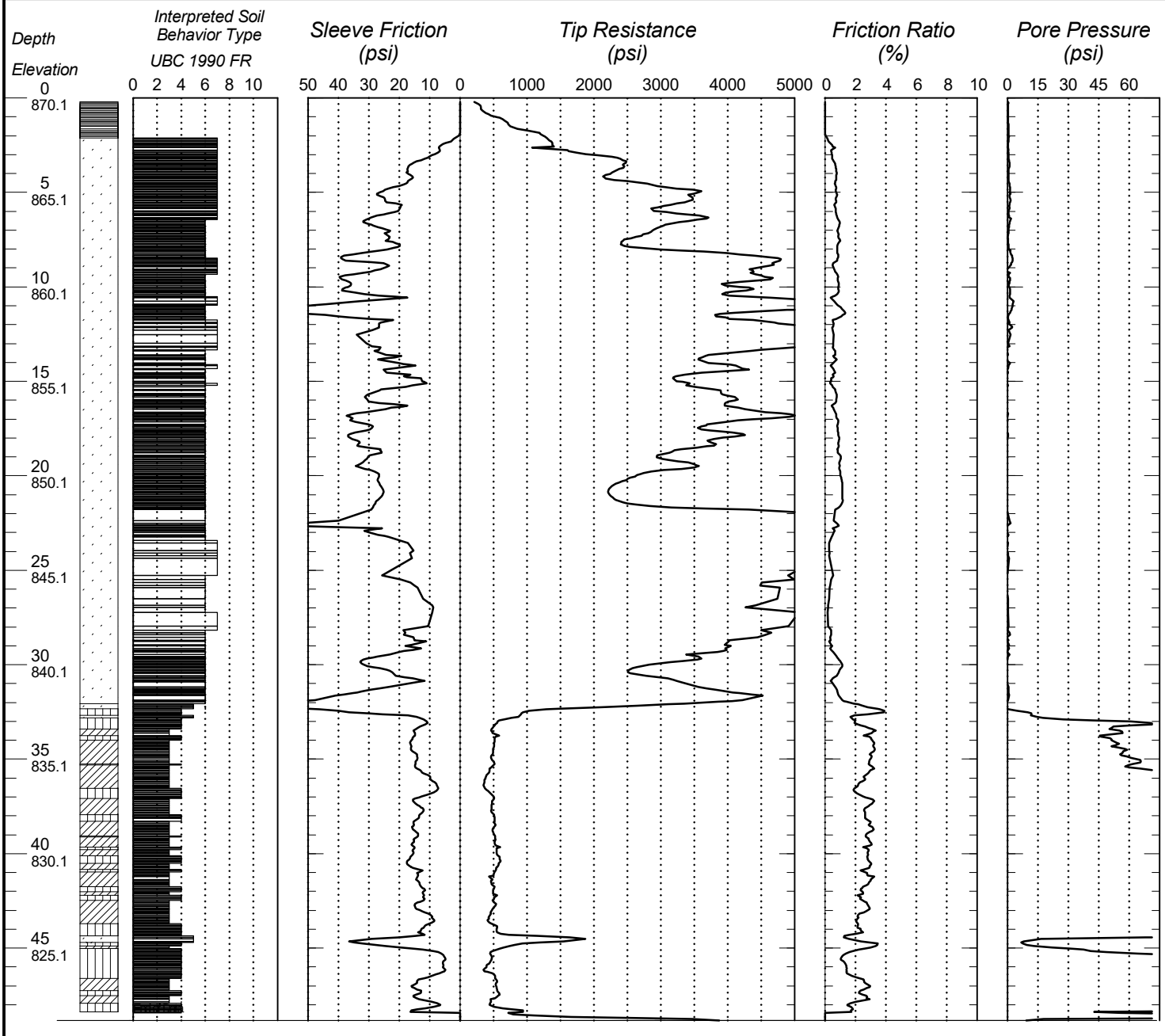
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84481

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C02B**	**870.1** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**203094 CPT Truck**	
X=543915 Y=239908	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°51'19.98" *Longitude (West)=93°08'50.4"*	Hole Type **CPT-STD**	**9/4/19**



Bottom of Hole 48.82

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DEPARTMENT OF TRANSPORTATION

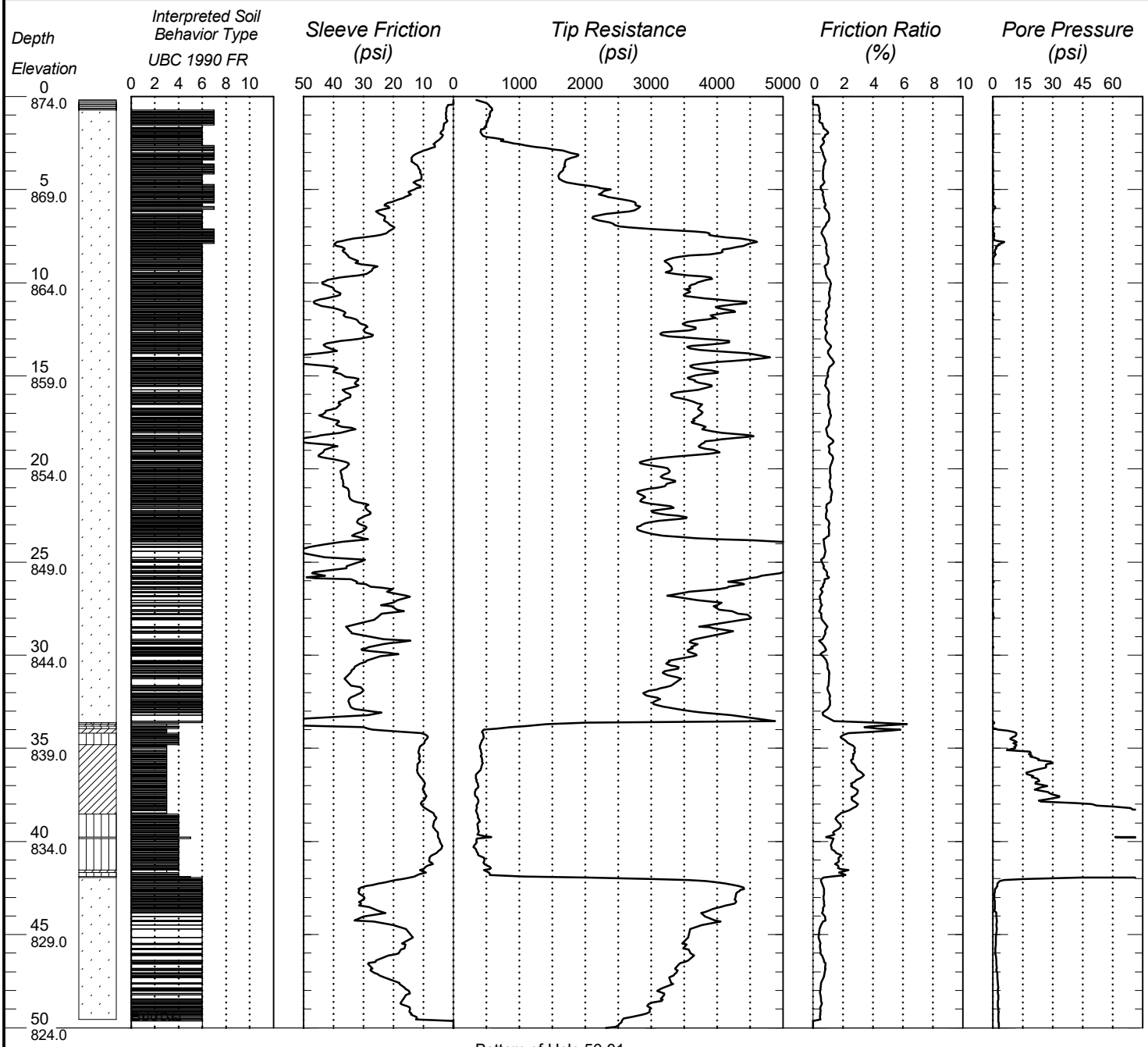
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84482

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C02C**	**874.0** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**203094 CPT Truck**	
X=543993 Y=239875	*CPT Operator* **Buhl**	*Date Completed*
Latitude (North)=44°51'19.66" *Longitude (West)=93°08'49.33"*	*Hole Type* **CPT-STD**	**9/4/19**



Bottom of Hole 50.01

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DEPARTMENT OF TRANSPORTATION

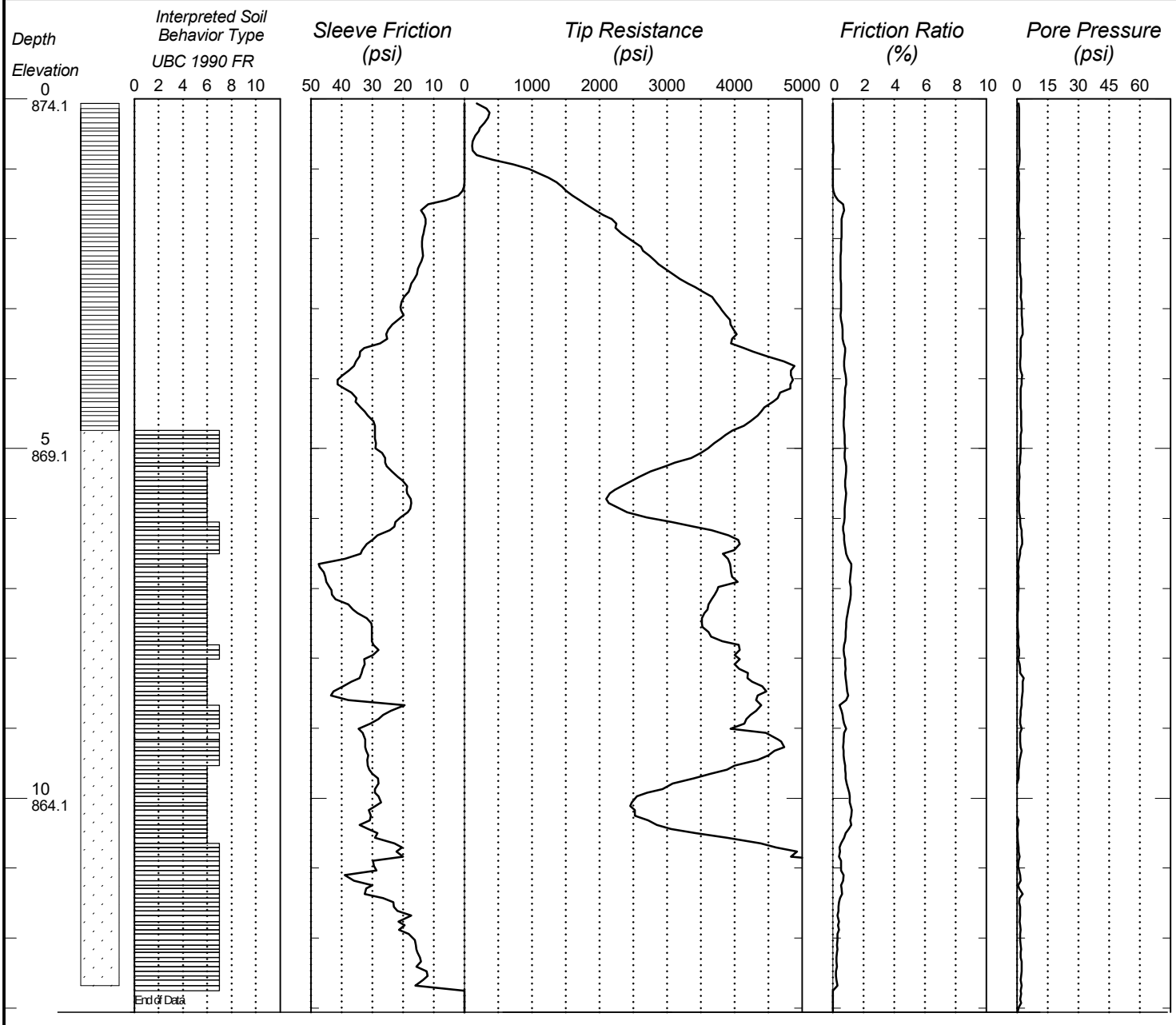
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84277

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C03**	**874.1** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**205146 CPT Truck (H)**	
X=544722 Y=242357	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°51'44.15" *Longitude (West)=93°08'39.13"*	Hole Type **CPT-STD**	**7/24/19**



Bottom of Hole 13.06

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DEPARTMENT OF TRANSPORTATION

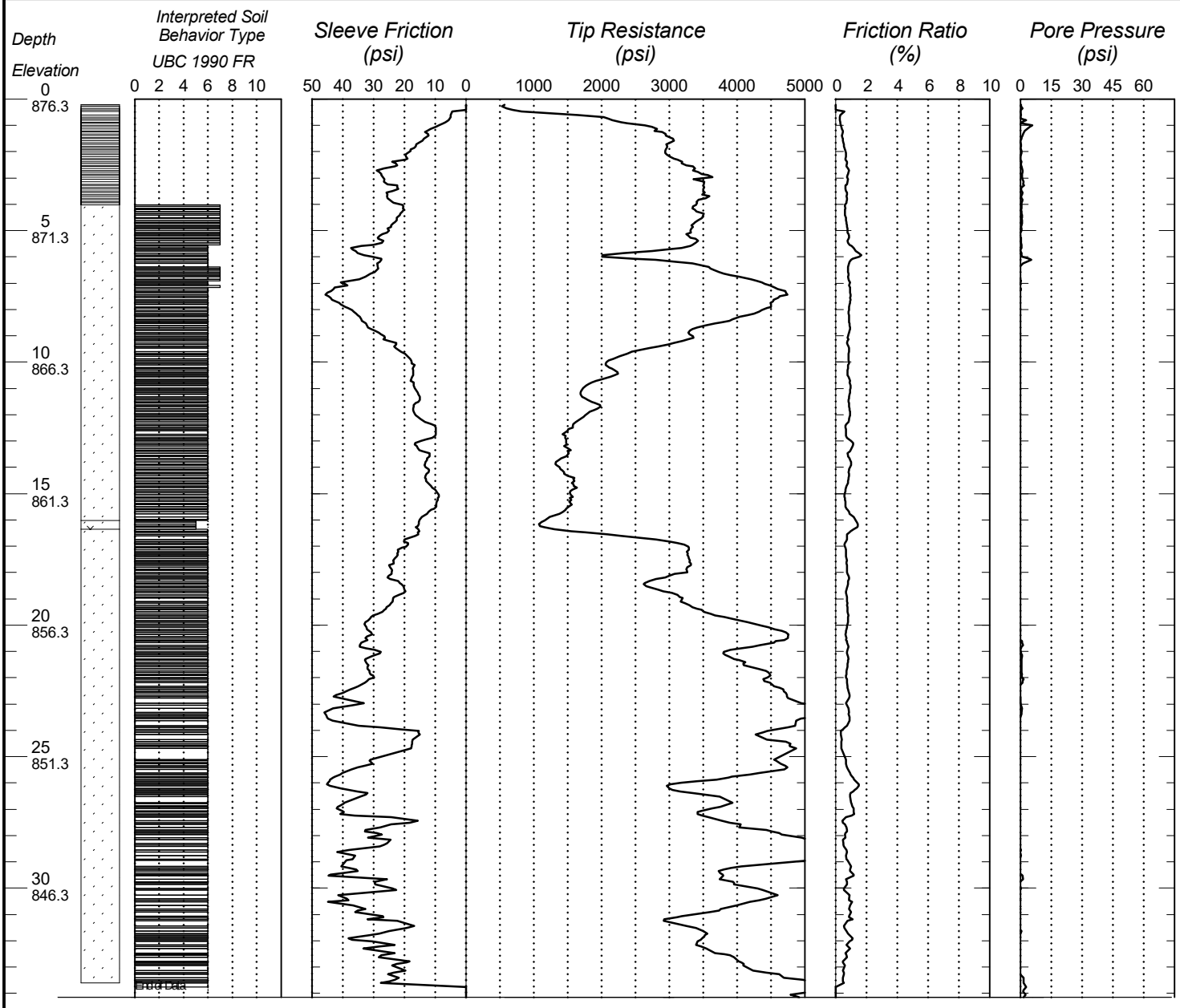
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84483

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C03B**	**876.3** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**203094 CPT Truck**	
X=541758 Y=241886	*CPT Operator* **Buhl**	*Date Completed*
Latitude (North)=44°51'39.56" *Longitude (West)=93°09'20.3"*	*Hole Type* **CPT-STD**	**9/4/19**



Bottom of Hole 34.14

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DEPARTMENT OF TRANSPORTATION

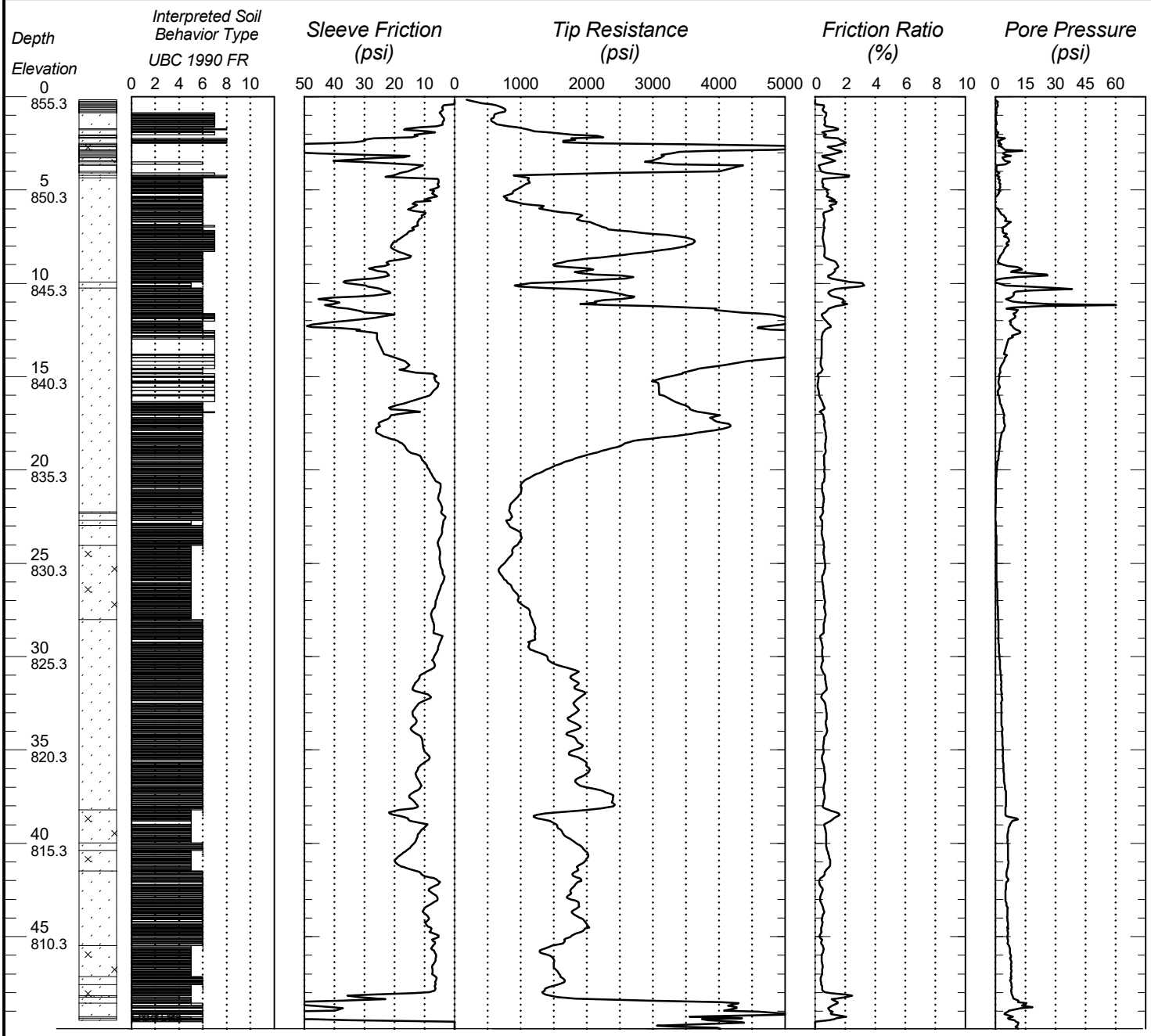
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84294

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C05**	**855.3** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Anoka County Coordinate System	**203094 CPT Truck**	
X=500671 Y=112268	CPT Operator **ODonnel**	Date Completed
Latitude (North)=45°04'08.12" Longitude (West)=93°15'50.65"	Hole Type **CPT-STD**	**8/31/19**



Bottom of Hole 49.94

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DEPARTMENT OF TRANSPORTATION

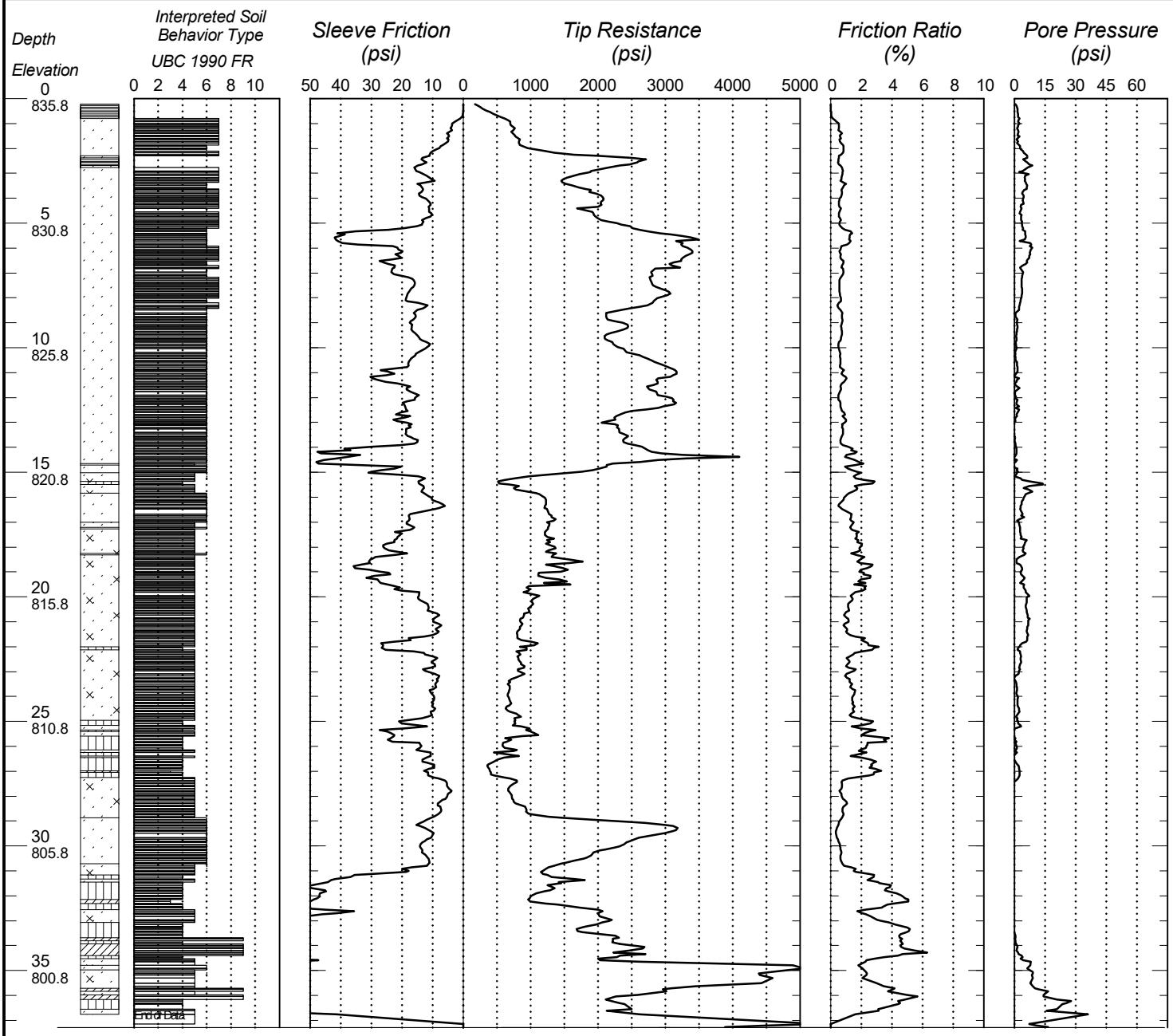
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84295

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C06**	**835.8** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Anoka County Coordinate System	**203094 CPT Truck**	
X=499270 Y=112292	*CPT Operator* **ODonnel**	*Date Completed*
Latitude (North)=45°04'08.36" Longitude (West)=93°16'10.17"	*Hole Type* **CPT-STD**	**8/31/19**



Bottom of Hole 37.28

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DEPARTMENT OF TRANSPORTATION

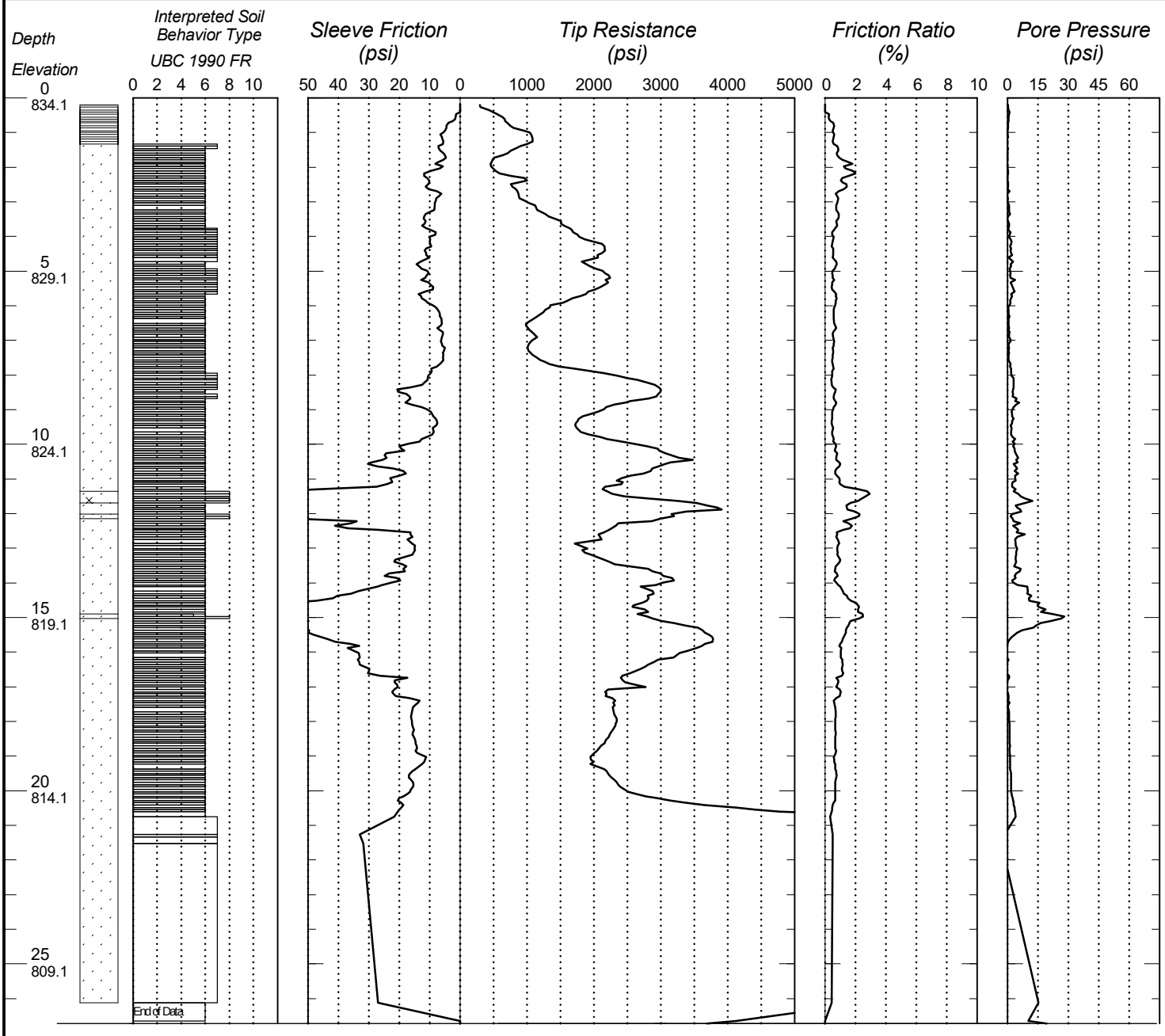
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84278

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C07a**	**834.1** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System **X=537083 Y=163111** *Latitude (North)=44°57'50.8"* *Longitude (West)=93°14'24.28"*	**203094 CPT Truck** CPT Operator **ODonnel** Hole Type **CPT-STD**	Date Completed **8/1/19**



Bottom of Hole 26.72

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DEPARTMENT OF TRANSPORTATION

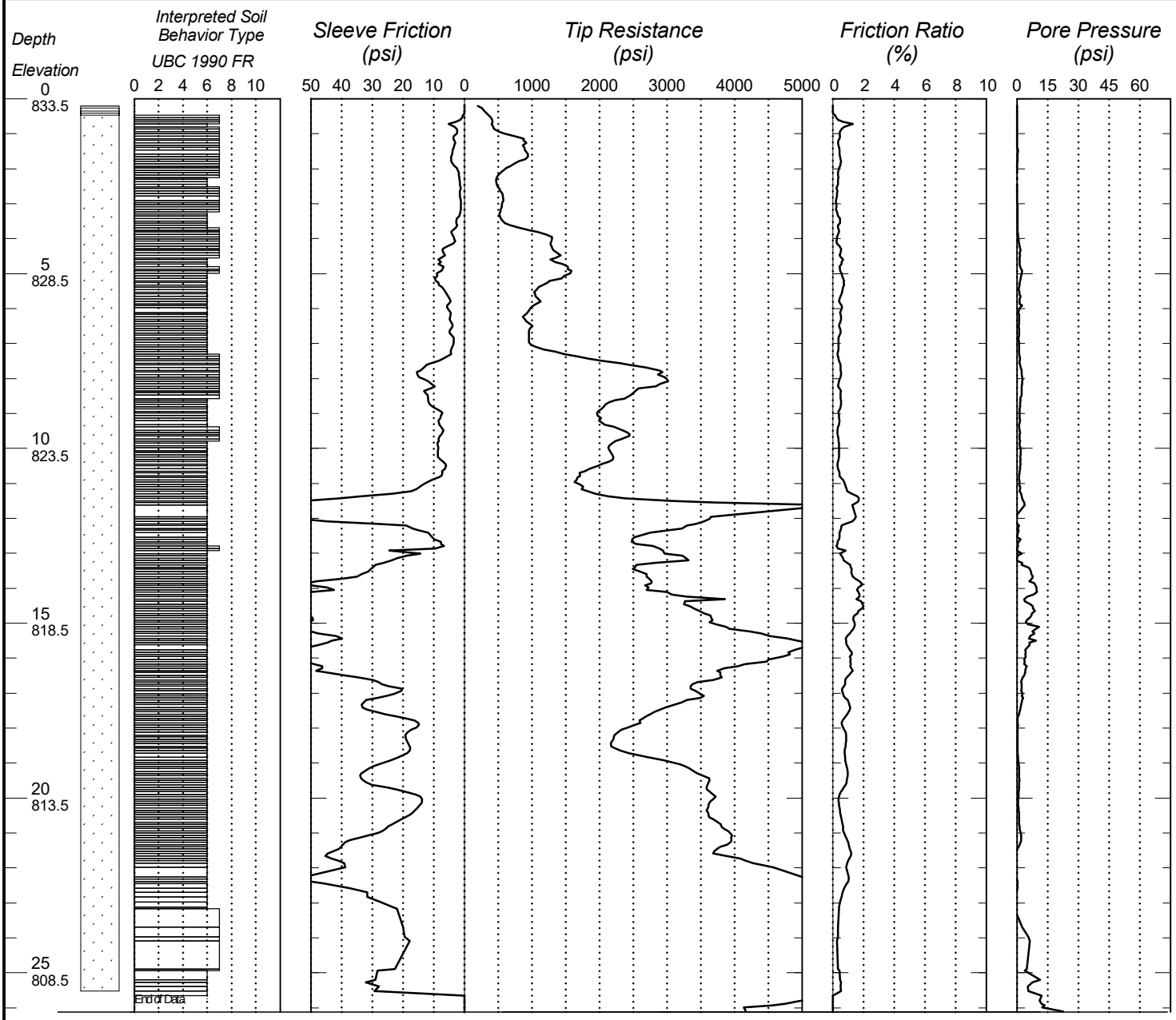
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84484

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C07B**	**833.5** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=537092 Y=163112	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°57'50.81" *Longitude (West)=93°14'24.15"*	Hole Type **CPT-STD**	**8/29/19**



Bottom of Hole 26.12

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DEPARTMENT OF TRANSPORTATION

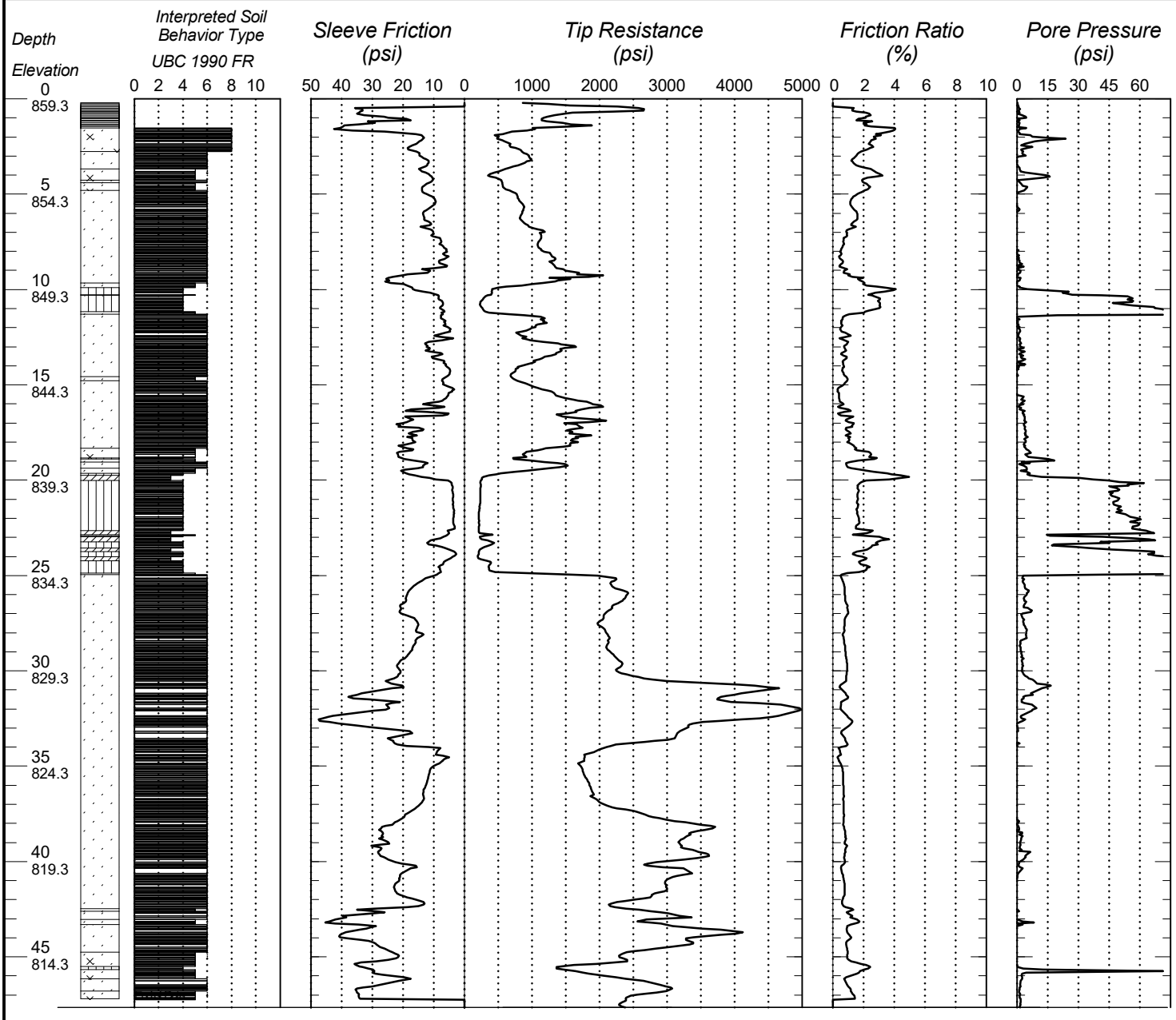
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84279

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C10**	**859.3** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=525343 Y=163281	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'52.65" *Longitude (West)=93°17'07.54"*	Hole Type **CPT-STD**	**7/31/19**



Bottom of Hole 47.64

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DEPARTMENT OF TRANSPORTATION

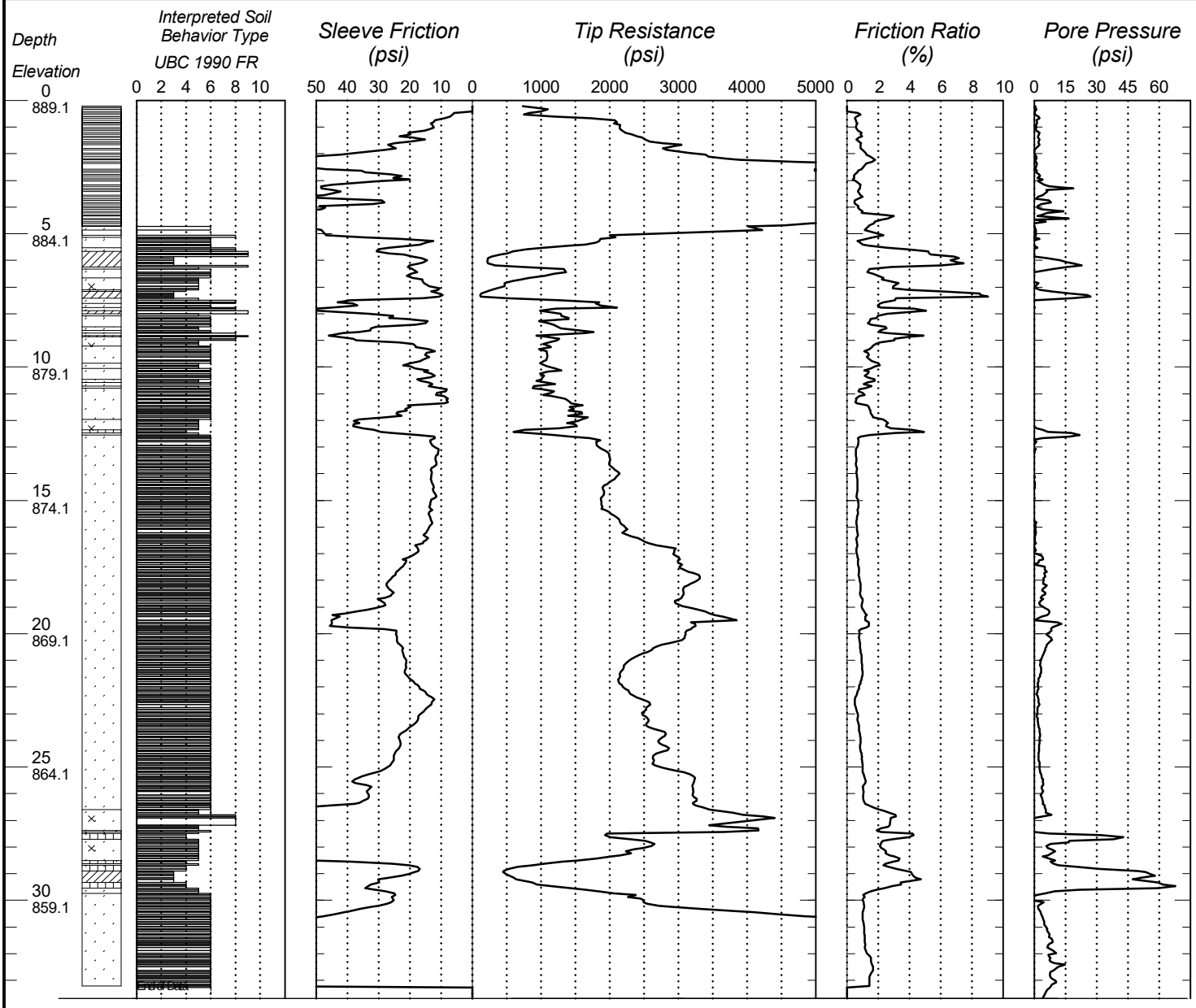
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84264

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C12**	**889.1** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Washington County Coordinate System	**205146 CPT Truck (H)**	
X=506060 Y=174881	CPT Operator **Buhl**	Date Completed
Latitude (North)=44°57'04.29" *Longitude (West)=92°48'36.02"*	Hole Type **CPT-STD**	**7/17/19**



Bottom of Hole 33.67

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DEPARTMENT OF TRANSPORTATION

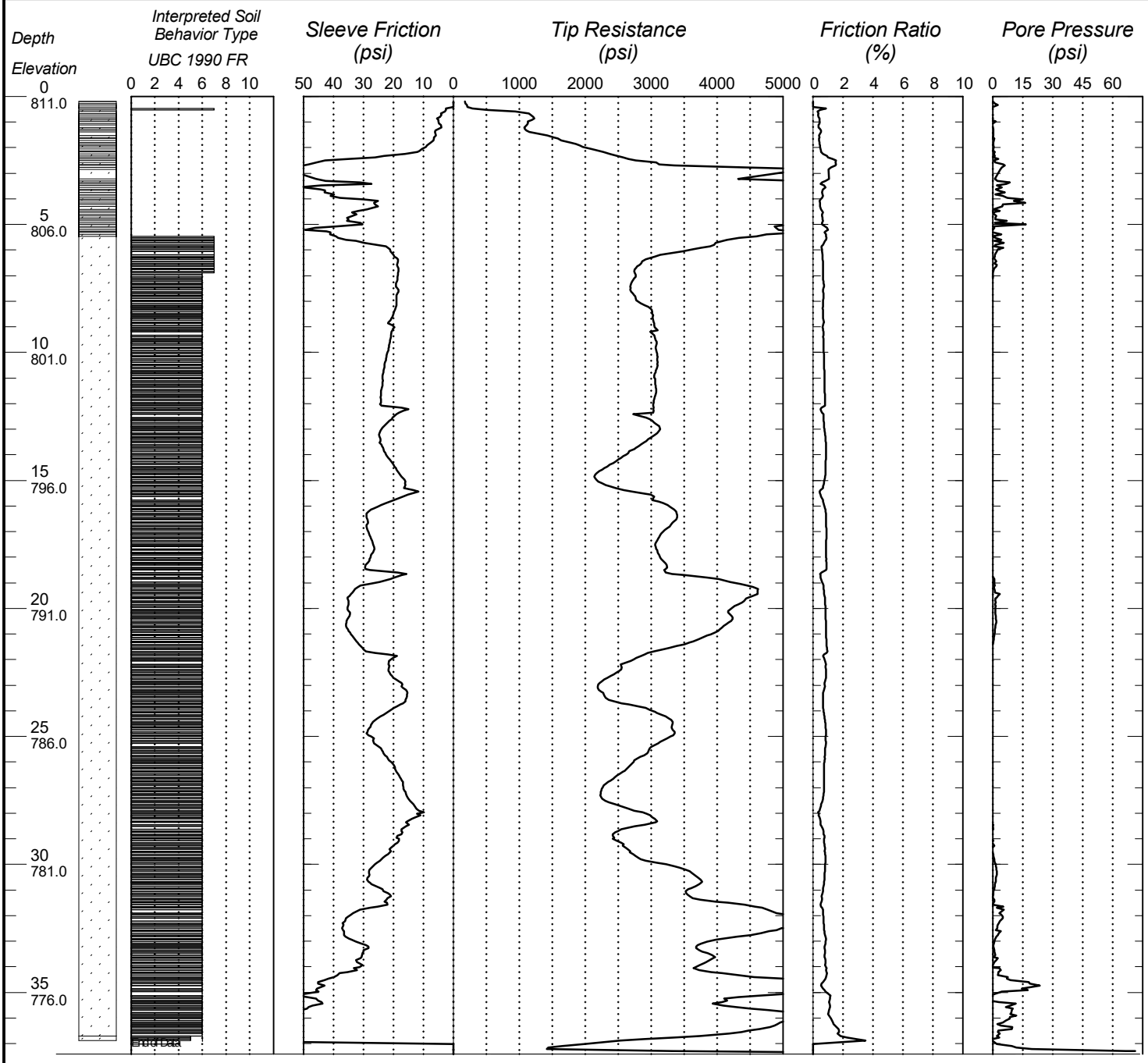
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84265

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C13**	**811.0** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Washington County Coordinate System	**205146 CPT Truck (H)**	
X=513527 Y=178048	*CPT Operator* **Buhl**	*Date Completed*
Latitude (North)=44°57'35.53" *Longitude (West)=92°46'52.17"*	*Hole Type* **CPT-STD**	**7/17/19**



Bottom of Hole 37.41

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DEPARTMENT OF TRANSPORTATION

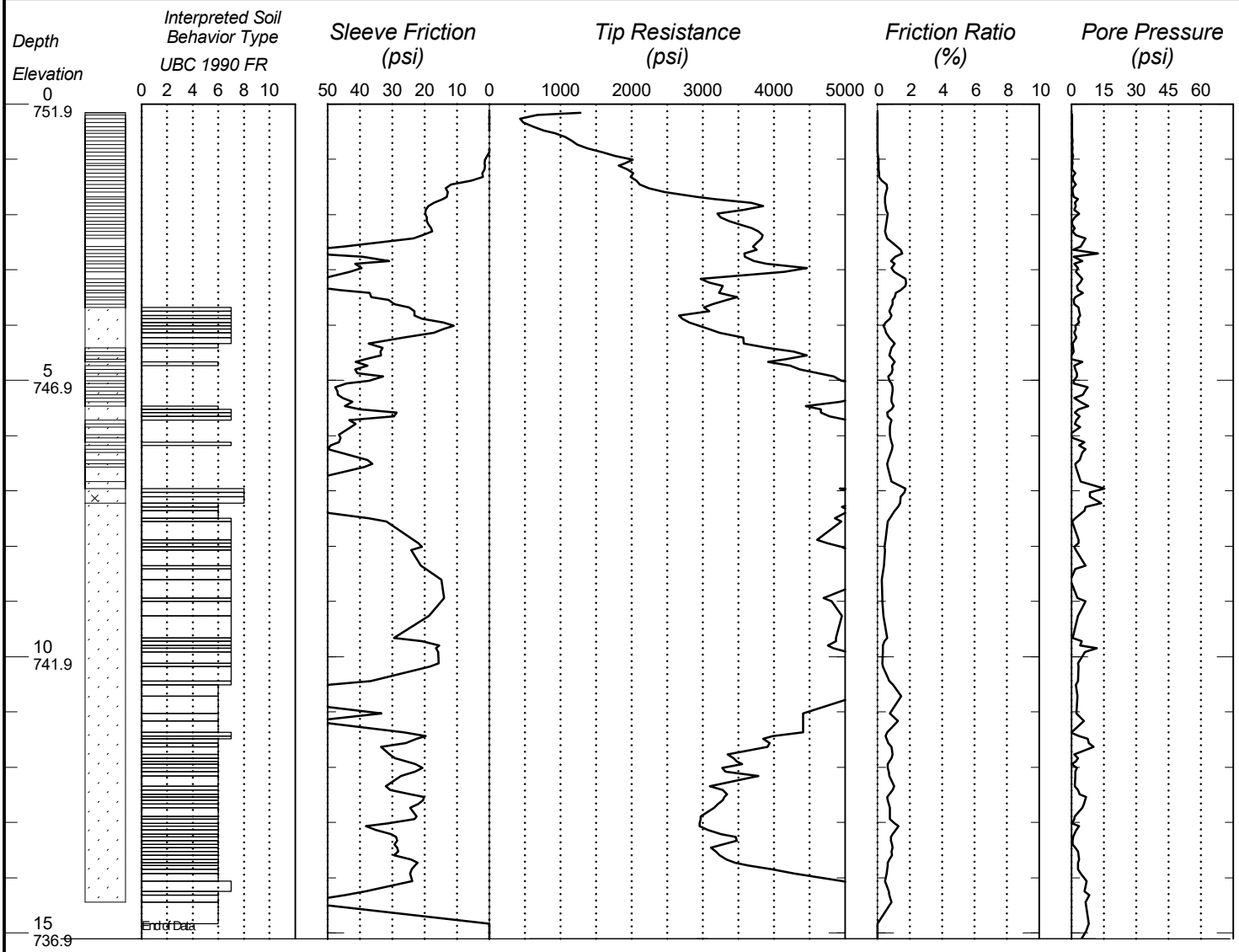
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84280

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C14**	**751.9** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Washington County Coordinate System	**203094 CPT Truck**	
X=516643 Y=179087	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'45.77" *Longitude (West)=92°46'08.82"*	Hole Type **CPT-STD**	**8/1/19**



Bottom of Hole 15.1

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DEPARTMENT OF TRANSPORTATION

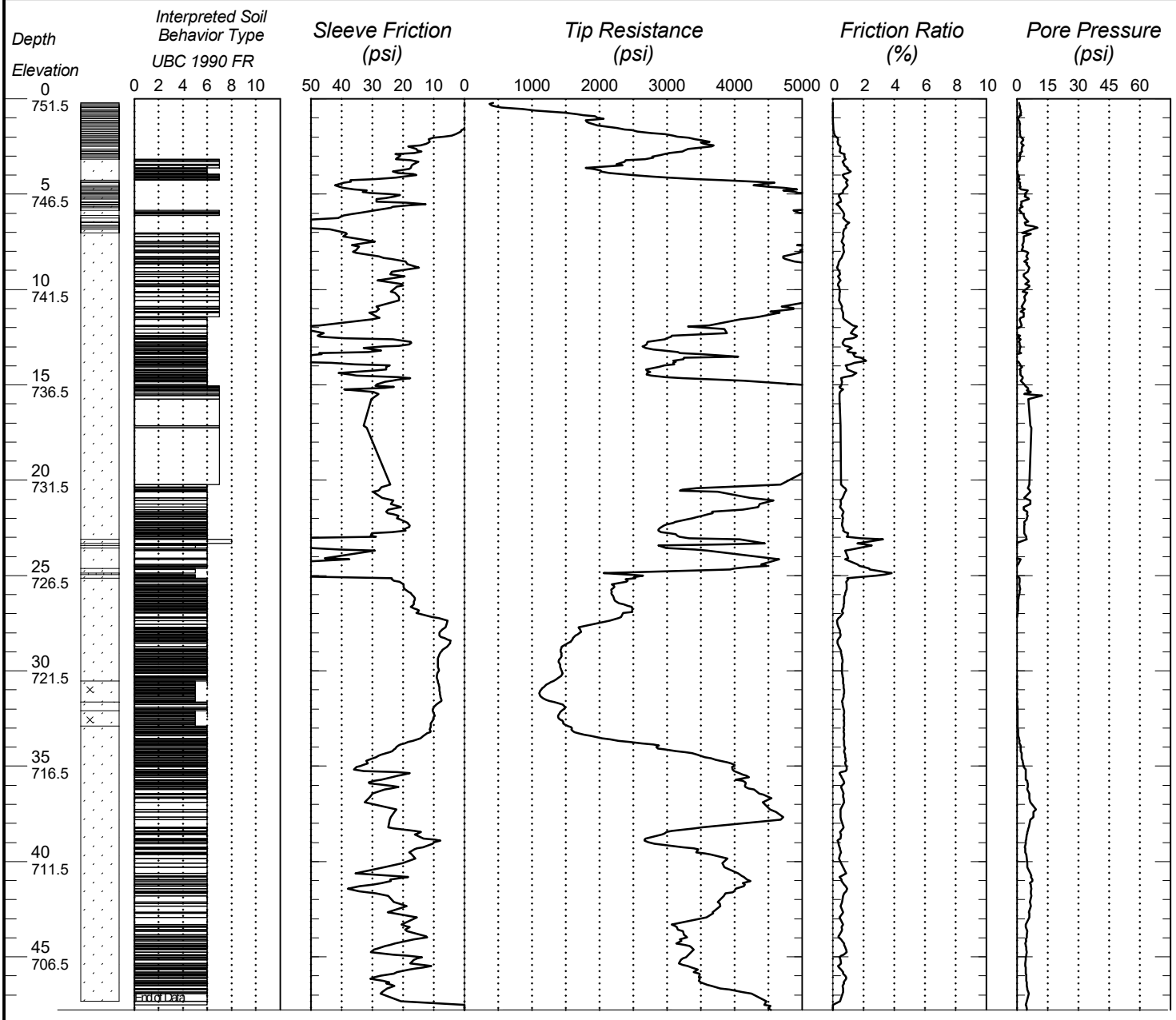
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84281

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C14a**	**751.5** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Washington County Coordinate System	**203094 CPT Truck**	
X=516637 Y=179088	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'45.78" *Longitude (West)=92°46'08.91"*	Hole Type **CPT-STD**	**8/1/19**



Bottom of Hole 47.78

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DEPARTMENT OF TRANSPORTATION

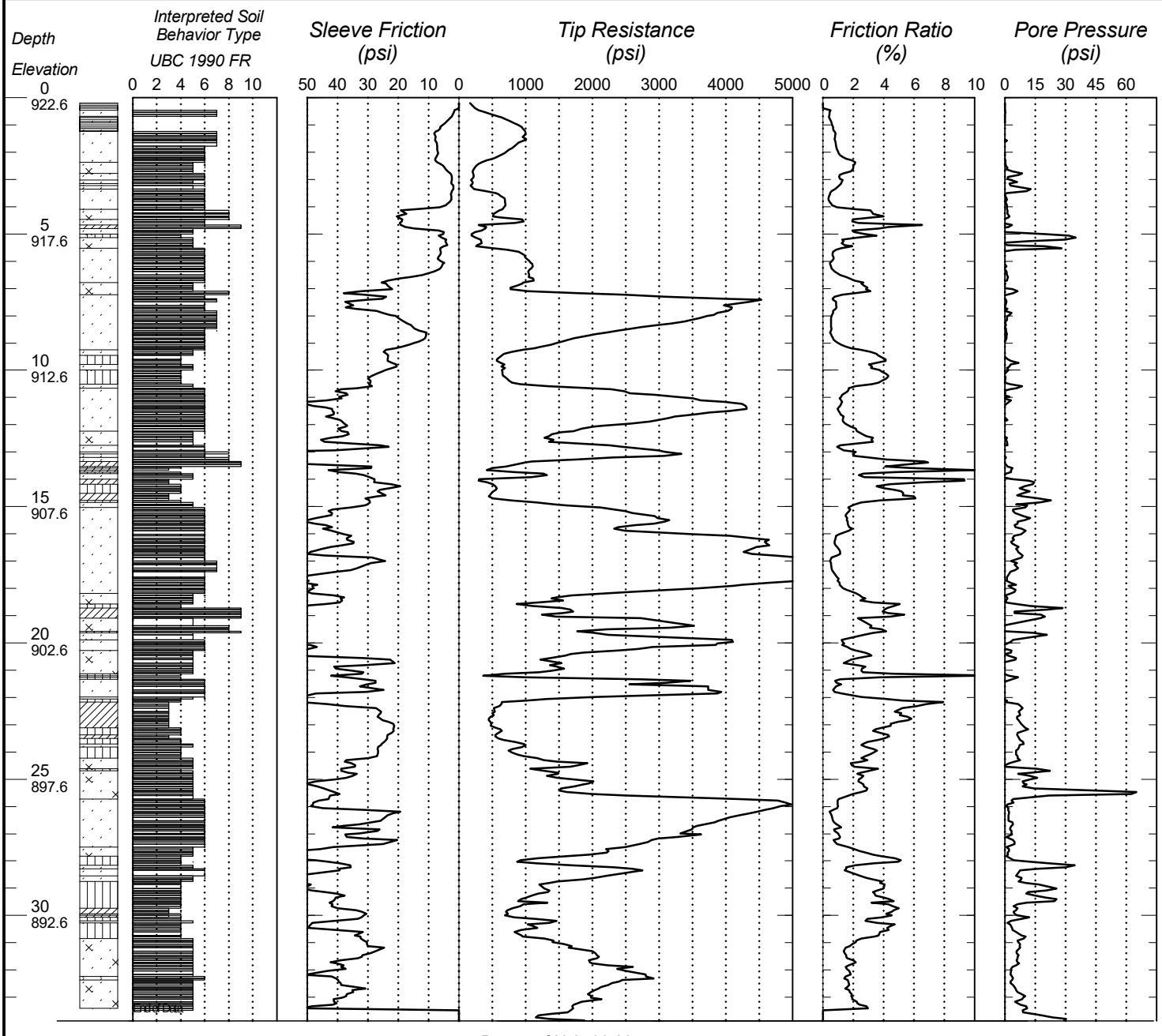
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84282

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C16**	**922.6** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**203094 CPT Truck**	
X=566454 Y=247242	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°52'31.81" *Longitude (West)=93°03'37.22"*	Hole Type **CPT-STD**	**7/30/19**



Bottom of Hole 33.86

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DEPARTMENT OF TRANSPORTATION

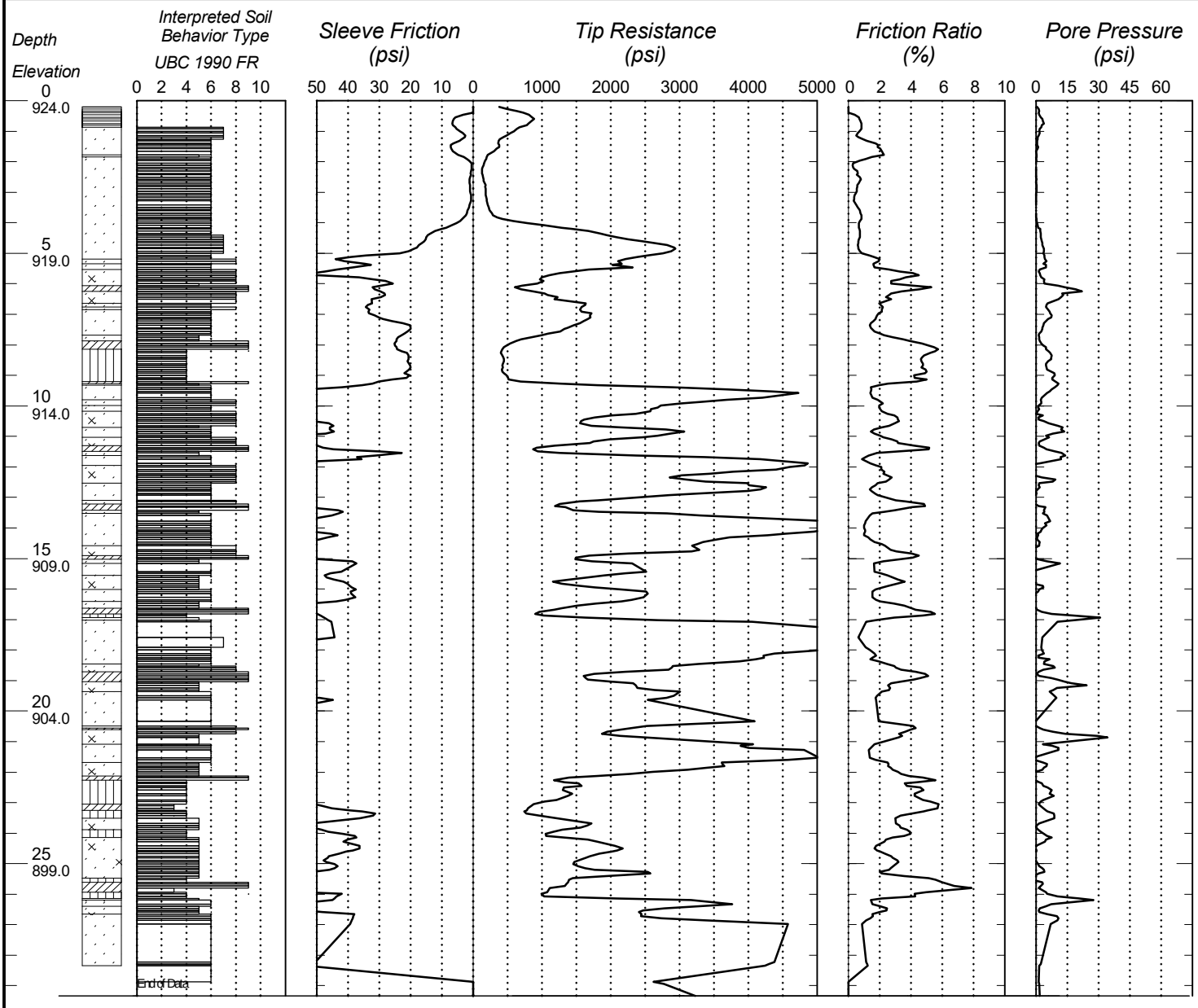
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84283

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C16a**	**924.0** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Dakota County Coordinate System	**203094 CPT Truck**	
X=566365 Y=247214	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°52'31.54" *Longitude (West)=93°03'38.45"*	Hole Type **CPT-STD**	**7/30/19**



Bottom of Hole 29.34

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DEPARTMENT OF TRANSPORTATION

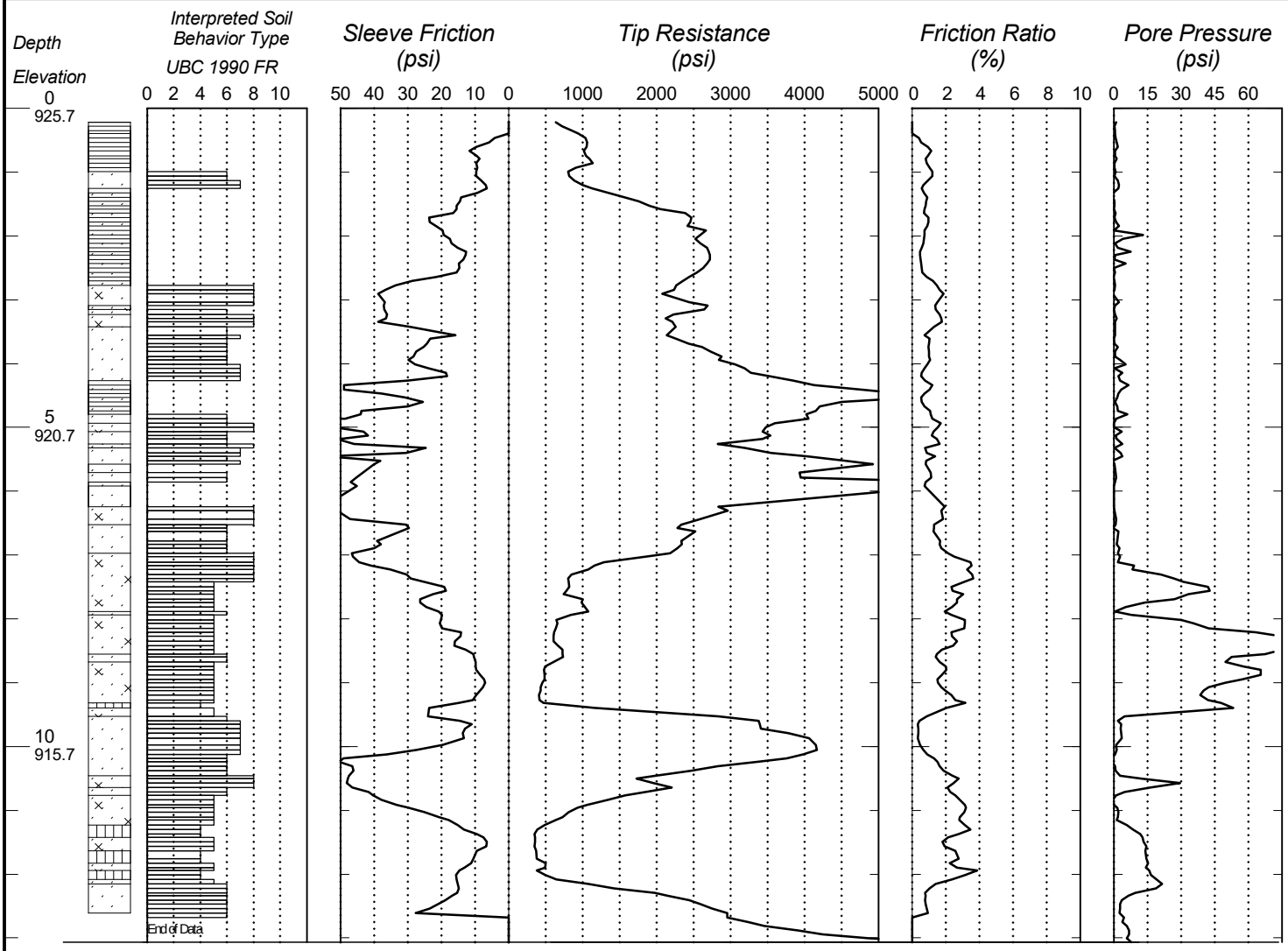
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84284

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C17**	**925.7** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Ramsey County Coordinate System	**203094 CPT Truck**	
X=555930 Y=158972	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'09.52" *Longitude (West)=93°10'02.31"*	Hole Type **CPT-STD**	**8/1/19**



Bottom of Hole 13.07

DEPARTMENT OF TRANSPORTATION

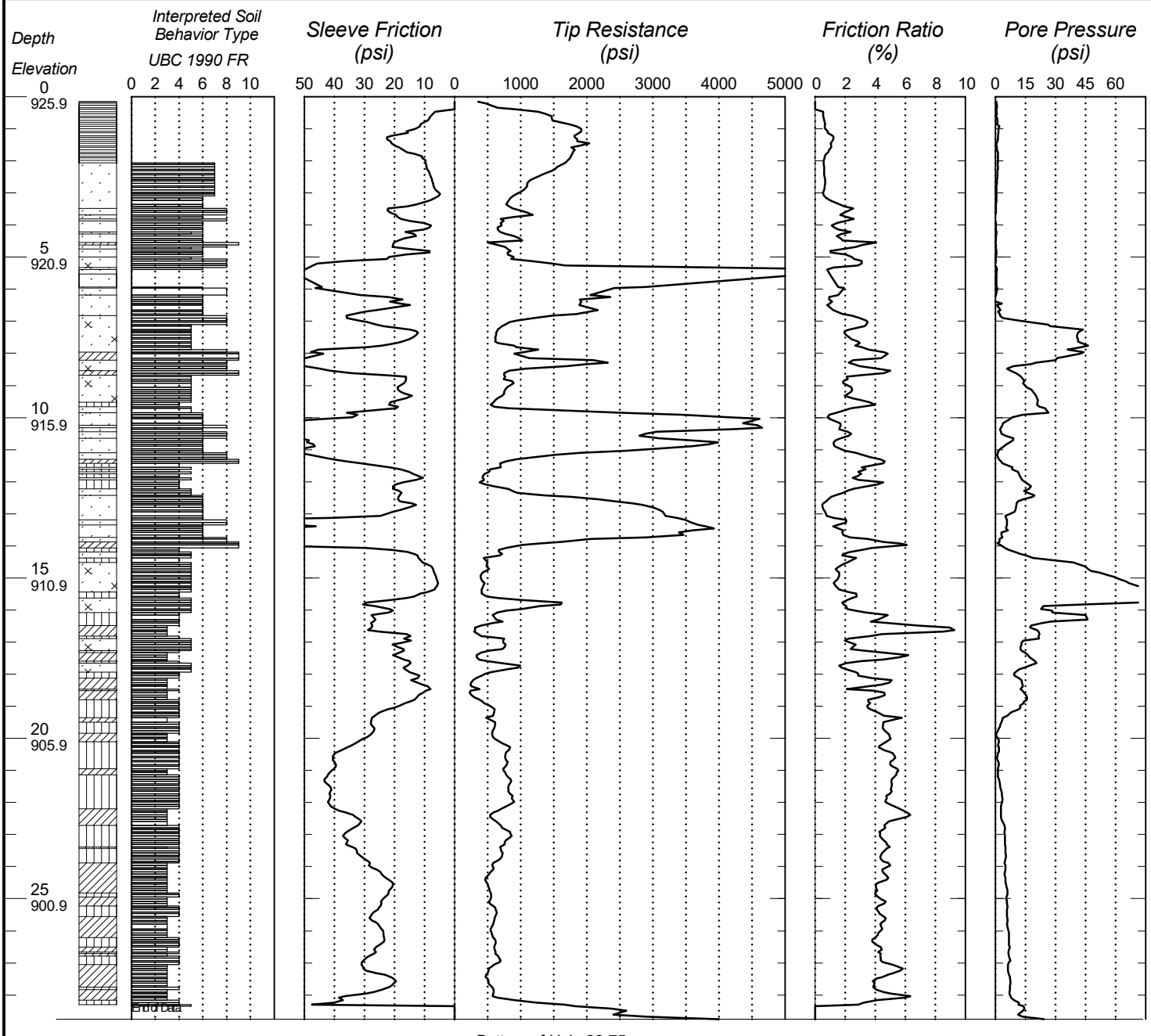
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84285

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C17b**	**925.9** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Ramsey County Coordinate System	**203094 CPT Truck**	
X=555929 Y=158958	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'09.38" *Longitude (West)=93°10'02.33"*	Hole Type **CPT-STD**	**8/1/19**



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DEPARTMENT OF TRANSPORTATION

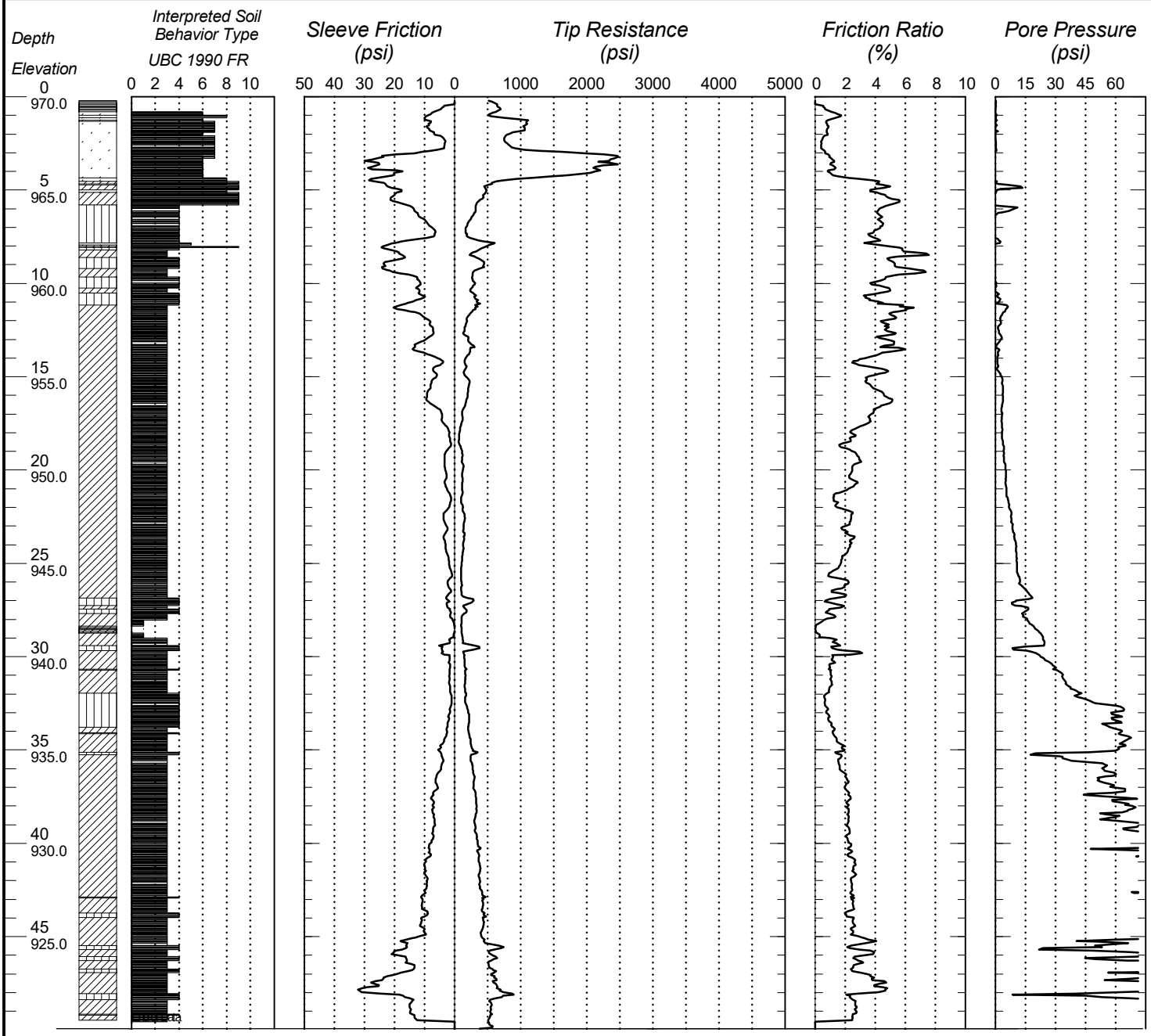
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84286

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C19**	**970.0** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=473891 Y=165671	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°58'16.24" *Longitude (West)=93°29'03.15"*	Hole Type **CPT-STD**	**7/31/19**



Bottom of Hole 49.94

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DEPARTMENT OF TRANSPORTATION

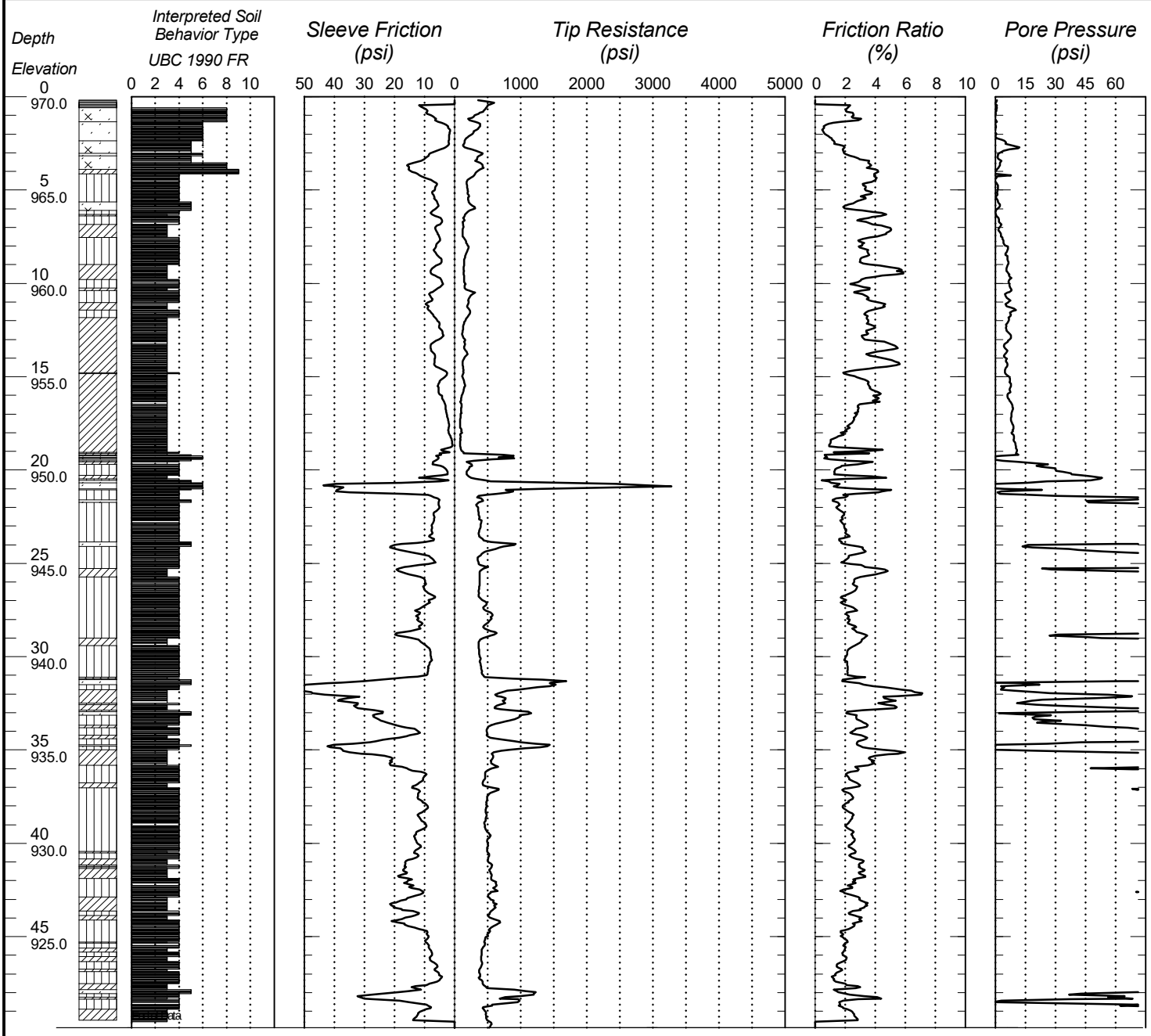
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84287

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C19a**	**970.0** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=473855 Y=165537	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°58'14.92" Longitude (West)=93°29'03.65"	Hole Type **CPT-STD**	**7/31/19**



Bottom of Hole 49.88

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DEPARTMENT OF TRANSPORTATION

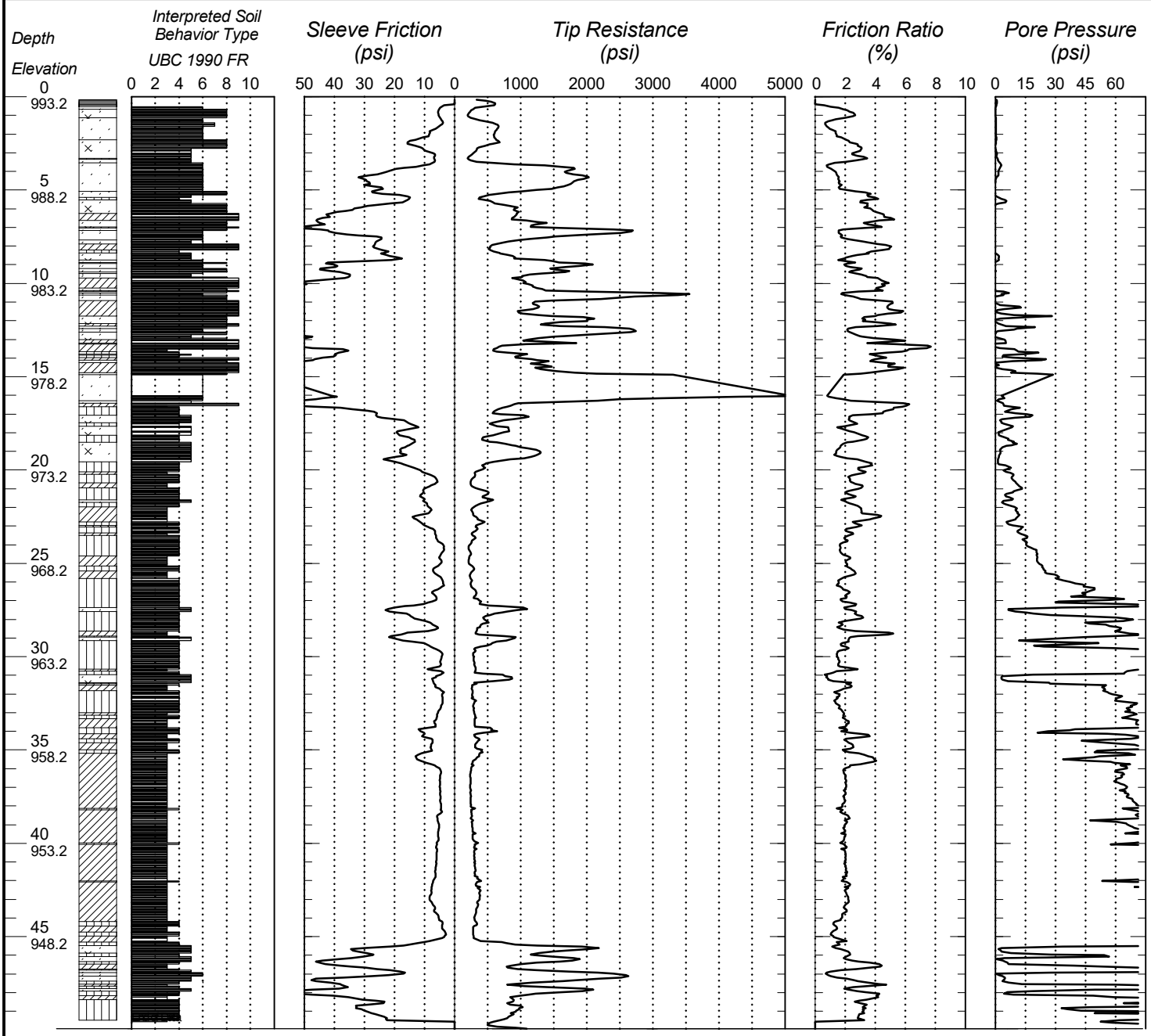
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84288

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C20**	**993.2** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=471298 Y=165971	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°58'19.17" *Longitude (West)=93°29'39.22"*	Hole Type **CPT-STD**	**7/30/19**



Bottom of Hole 49.94

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DEPARTMENT OF TRANSPORTATION

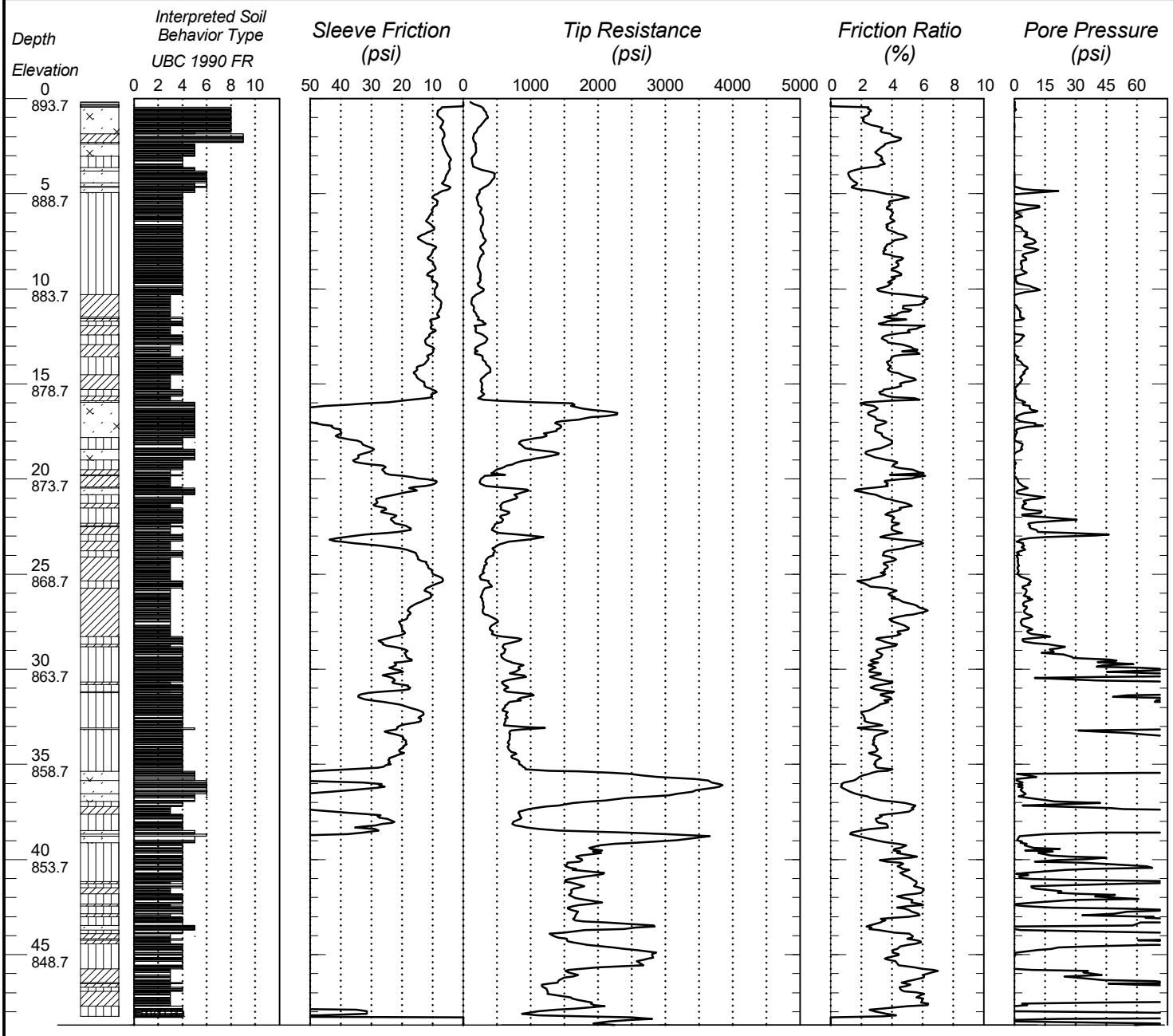
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84289

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C21**	**893.7** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Scott County Coordinate System	**203094 CPT Truck**	
X=471657 Y=241862	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°51'39.54" *Longitude (West)=93°25'33.48"*	Hole Type **CPT-STD**	**7/30/19**



Bottom of Hole 48.69

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DEPARTMENT OF TRANSPORTATION

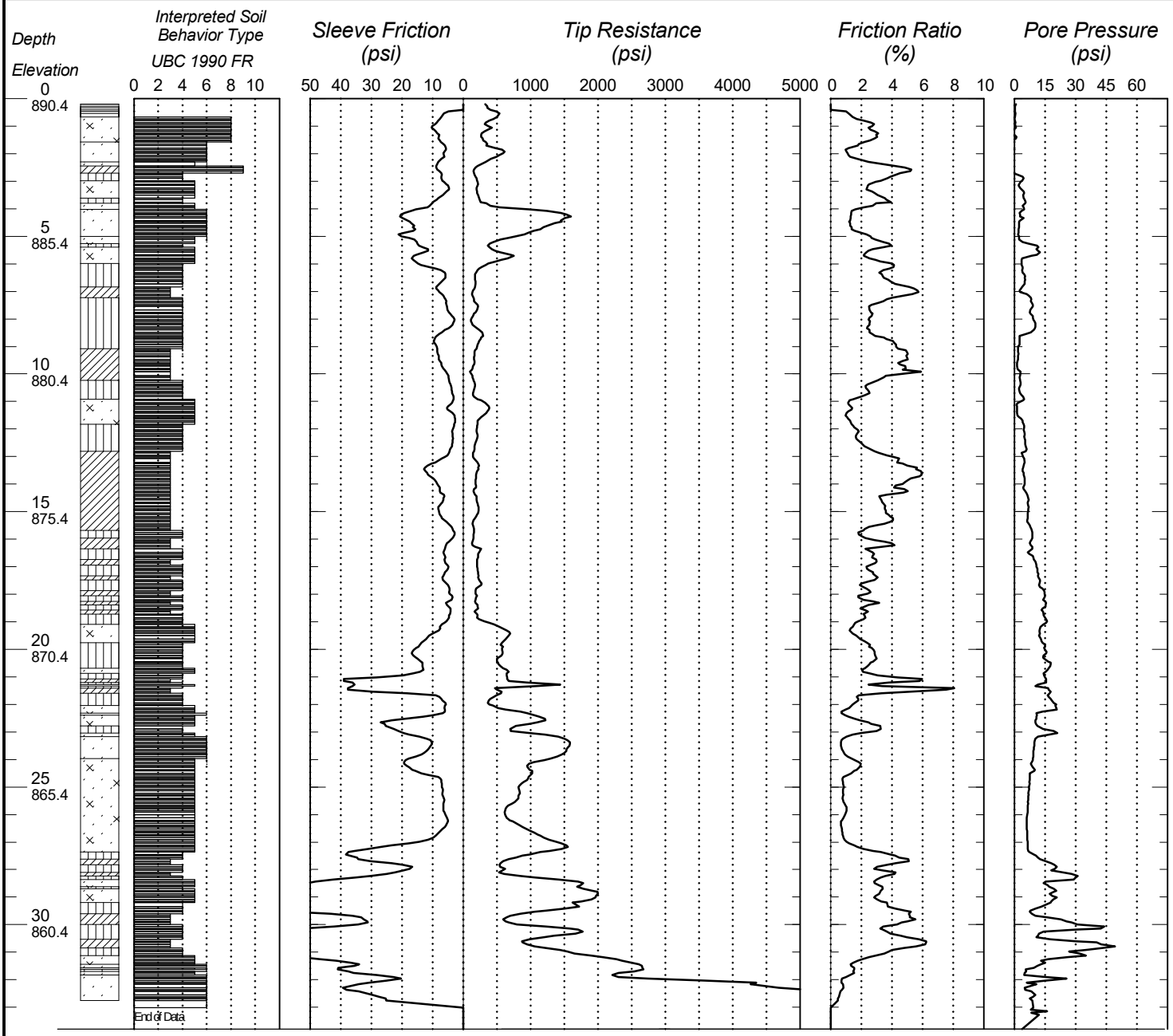
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84290

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C21a**	**890.4** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Scott County Coordinate System	**203094 CPT Truck**	
X=471785 Y=241845	*CPT Operator* **ODonnel**	*Date Completed*
Latitude (North)=44°51'39.37" *Longitude (West)=93°25'31.69"*	*Hole Type* **CPT-STD**	**7/30/19**



Bottom of Hole 33.79

DEPARTMENT OF TRANSPORTATION

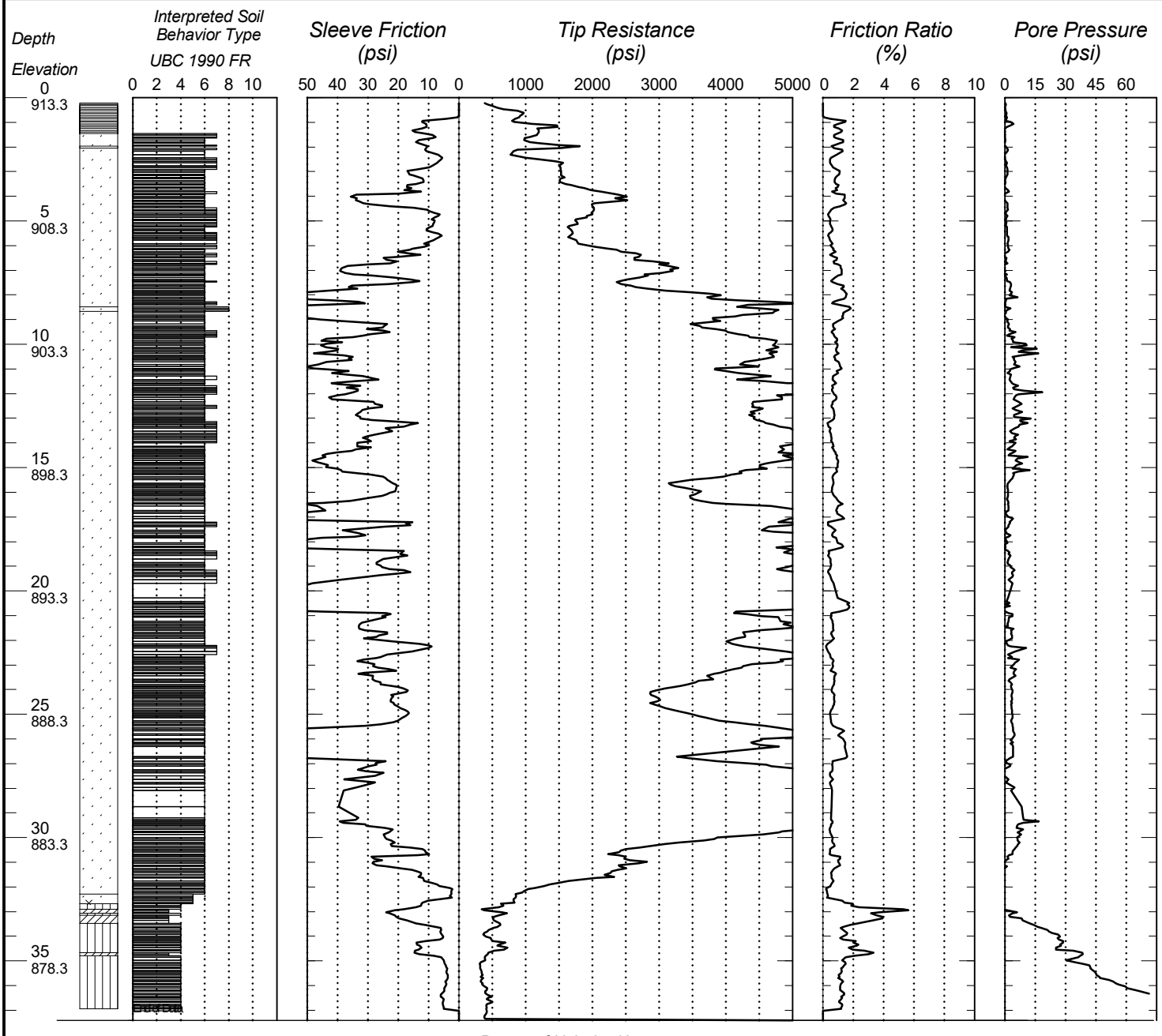
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84291

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C22a**	**913.3** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Ramsey County Coordinate System	**203094 CPT Truck**	
X=559954 Y=158736	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'07.08" *Longitude (West)=93°09'06.38"*	Hole Type **CPT-STD**	**7/31/19**



Bottom of Hole 37.42

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DEPARTMENT OF TRANSPORTATION

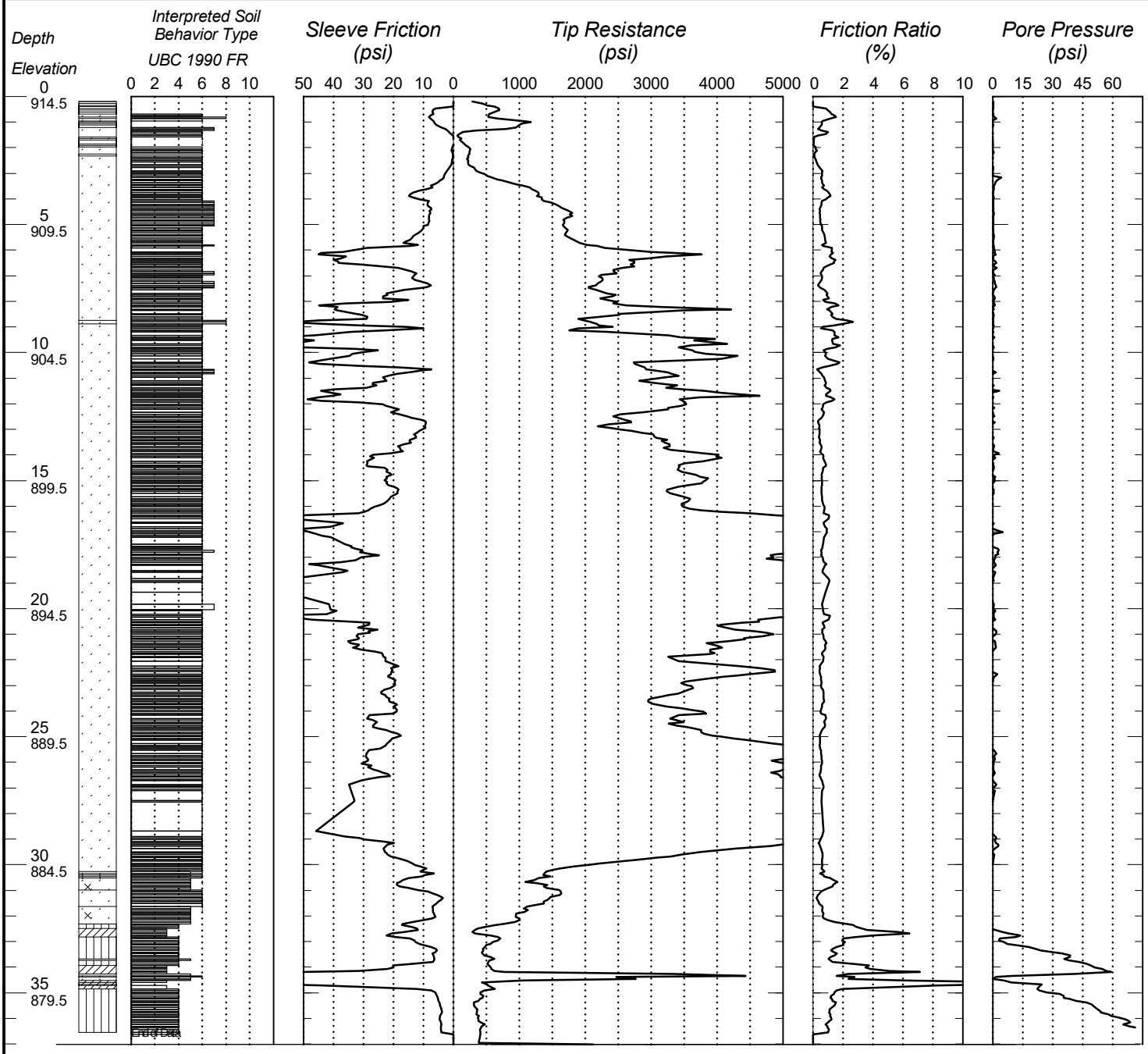
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84485

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C22B**	**914.5** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Ramsey County Coordinate System	**203094 CPT Truck**	
X=559849 Y=158742	*CPT Operator* **Buhl**	*Date Completed*
Latitude (North)=44°57'07.14" *Longitude (West)=93°09'07.84"*	*Hole Type* **CPT-STD**	**8/29/19**



Bottom of Hole 37.01

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DEPARTMENT OF TRANSPORTATION

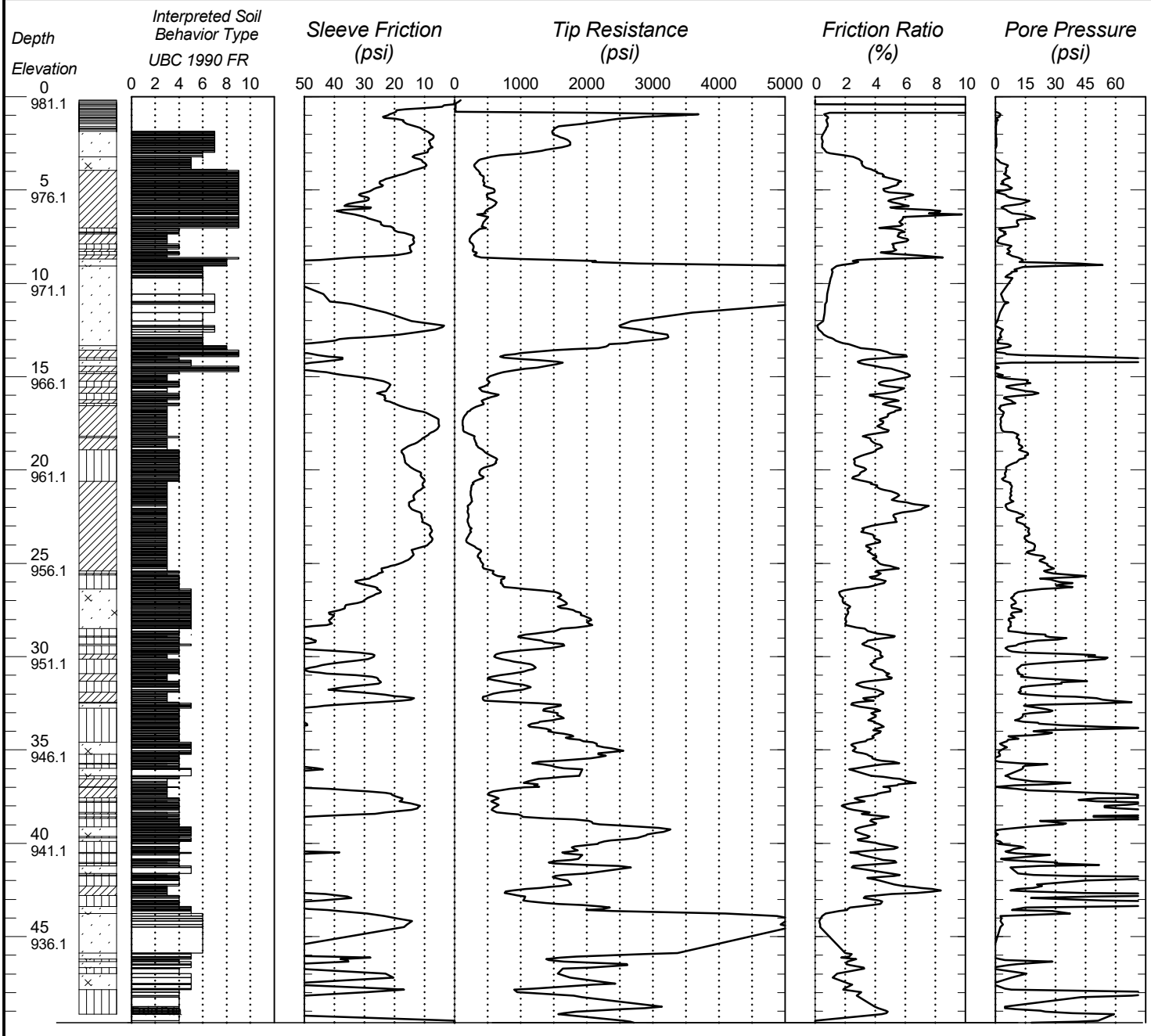
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84292

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C23**	**981.1** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=480382 Y=158557	CPT Operator **ODonnel**	Date Completed
Latitude (North)=44°57'06.07" *Longitude (West)=93°27'32.78"*	Hole Type **CPT-STD**	**7/31/19**



Bottom of Hole 49.61

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DEPARTMENT OF TRANSPORTATION

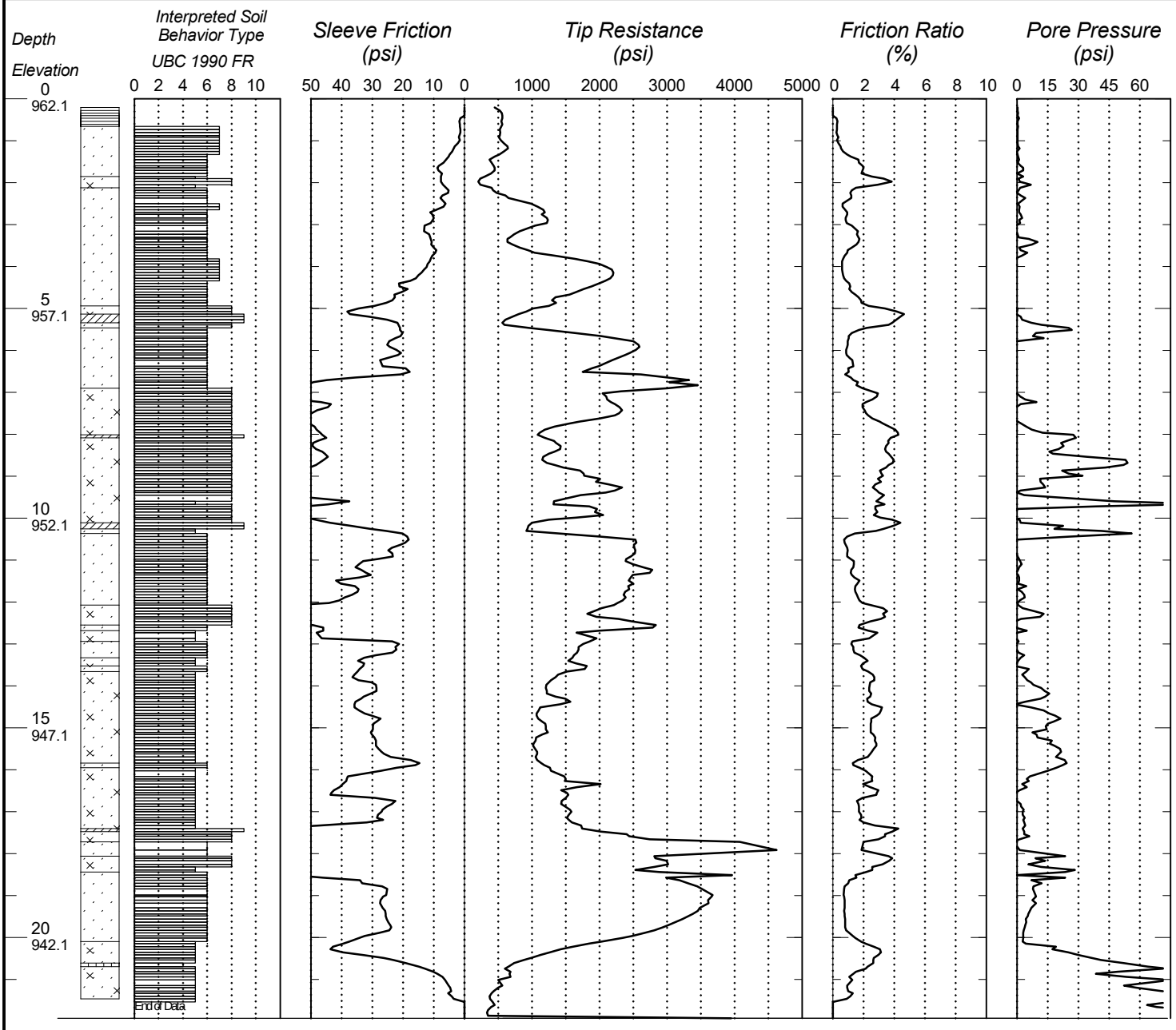
MINNESOTA DEPARTMENT OF TRANSPORTATION - GEOTECHNICAL SECTION

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 84293

State Project	Bridge No. or Job Desc.	Trunk Highway/Location	Sounding No.	Ground Elevation
8825-706	**Overhead Sign**		**C24**	**962.1** *(DTM)*

Location	CPT Machine	SHEET 1 of 1
Hennepin County Coordinate System	**203094 CPT Truck**	
X=607627 Y=188155	CPT Operator **ODonnel**	Date Completed
Latitude (North)=45°01'55.66" Longitude (West)=92°58'01.42"	Hole Type **CPT-STD**	**8/1/19**



Bottom of Hole 21.93

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