

Memo

Date: December 3, 2018

To: Eric Peterson, Metro District Signing Engineer
Metro District

From: Daniel Freiburger, Graduate Engineer – Trainee
Geotechnical Engineering Section

Concur: Rich Lamb, Foundations Engineer
Geotechnical Engineering Section

Subject: State Project 8825-682 (Metro District)
Metrowide Overhead Sign Structure Replacement
Foundation Investigation and Recommendations

1.0 Project Information

State Project 8825-682 will replace a number of overhead sign structures on multiple trunk highways throughout the Twin Cities metro area. There are 23 sites with planned construction, 14 of which will require new foundations. Sign structure types will include both Sign Bridge and Sign Cantilevers, which are anticipated to be supported on drilled shaft foundations. This report details the subsurface investigation and recommendations for 13 of the sites where foundations will be constructed. Site 9 will require an additional SPT boring, and an addendum to this report will be issued with the findings and recommendations for this site when available.

2.0 Subsurface Investigation Summary

The MnDOT Foundations Unit conducted Cone Penetration Test (CPT) Soundings near most of the proposed sign structure foundations in October and November of 2018. At Site 9, the CPT Soundings met refusal at a shallow depth, so a Standard Penetration Test (SPT) boring will be completed there in the near future. Additionally, difficulty of access at Site 21 necessitated the reuse of a historic SPT bridge boring instead of a new CPT Sounding. Full details of the subsurface investigation can be found in the drawings and logs attached to this report. It should be noted that the included drawings are intended only to provide reference information for the geotechnical portion of the project. All field construction should be based on the contract plans and special provisions.

3.0 Foundation Analysis

MnDOT has developed a set of standard overhead sign support drawings (Interim Design B) that are to be used on this project. Drawing ST-3 details standard foundations based on the overhead structure pole type. These standard foundations include a rectangular spread footing and a circular drilled shaft option that can be selected for each overhead sign post size, as shown in Table 1. Geotechnical requirements for these footing types are stated in the notes on Drawing ST-3. According to this standard, the spread footing option has an allowable design bearing capacity of 1.25 tons per square foot, while the drilled shaft option has an allowable design

lateral bearing pressure of 250 pounds per square foot per foot of depth. Based on previous research, these requirements will be met in all but the weakest of soil layers. To determine the adequacy of the foundation soils at each overhead sign foundation location, the CPT soundings were interpreted for general soil behavior type (SBT) and blow count (N60). During CPT soundings, no soil samples are taken, so the interpreted SBT may not exactly match the in situ soil type. However, it should indicate how the soil behaves compared to standard soil types. The findings of this analysis are tabulated in the attached Table A1, and recommendations are detailed in Section 4 below.

Table 1. Standard Overhead Sign Structure Foundations

Post Type	Spread Footing Dimensions	Drilled Shaft Dimensions
1-4	9' x 14'	3' Diameter x 23' Length
5-7	12.5' x 18'	4' Diameter x 29' Length

4.0 Foundation Recommendations

Based on review of the existing subsurface conditions and proposed construction, it is recommended that:

- 1) The proposed overhead sign structures be supported on drilled shaft foundations as detailed in Drawing ST-3 for Standard Overhead Sign Interim Design B and described in the attached Table A1. Contact the Foundations Office to confirm the adequacy of the soils if spread footings are desired at any of the sites.
- 2) Any drilled shaft foundations constructed under the water table use temporary casing to protect nearby structures, utilities, and pavement. No permanent casing should be installed, and all temporary casing should be removed as concrete is placed.
- 3) Subsurface information from this investigation and report be provided to the bidding contractors so that the scope of foundation construction can be clearly understood prior to project letting.
- 4) The Foundations Office be contacted if the soils encountered during construction differ significantly from those described in this report.
- 5) The foundation design at Site 9 be determined based on the future addendum to this report. An SPT boring is planned to determine the foundation needs for the expected shallow bedrock.

5.0 Attachments

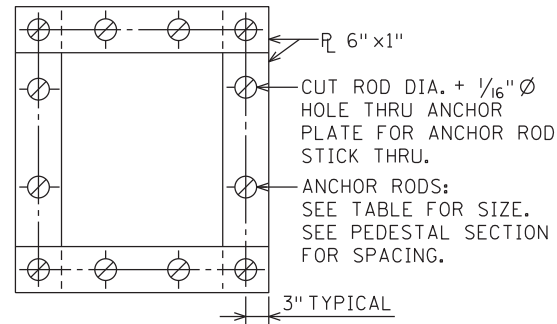
Standard Overhead Sign Supports Interim Design B Drawing ST-3
Table A1: Overhead Sign Foundation Recommendations
Plan View of Sign Locations and Subsurface Investigation Sites
Cross Section of Sign Locations and Subsurface Investigations
CPT Index Sheet
CPT Logs for Soundings c10a to c231 (Unique No. 83492 to 83508, 83540-83545)
SPT Index Sheet
SPT Log for Historic Boring T-4 (Unique Number 03604)

CC: Brad Skow, Chief Geotechnical Engineer
Tim Clyne, Metro District Materials Engineer
Michelle Waters, Office of Environmental Stewardship

PLOTTED/REVISED: 12/1/2015

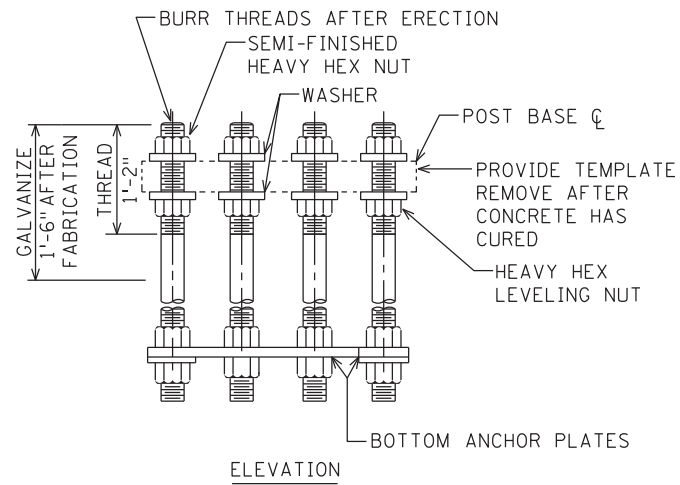
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REV. 10-2-2013



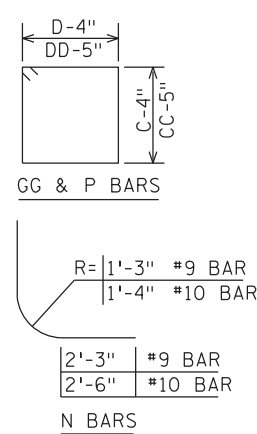
NOTE: ANCHOR PLATES SHOWN TYPICAL FOR ALL ANCHOR ROD SPACING.

ANCHOR PLATE PLAN



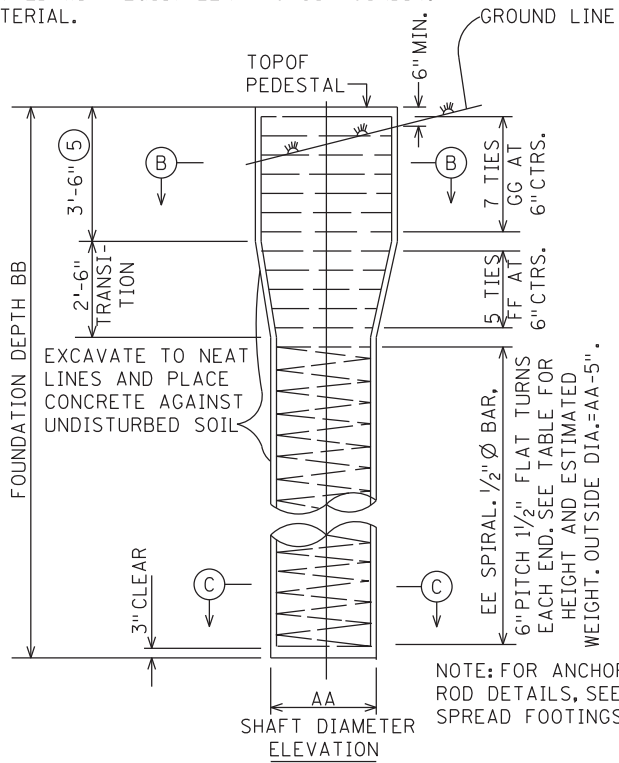
ELEVATION

ANCHOR ROD DETAILS

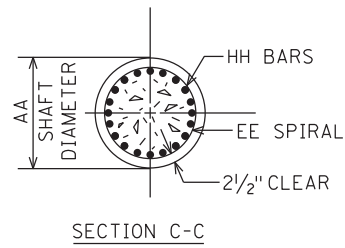
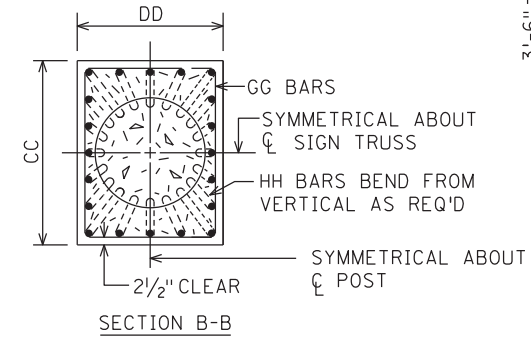


J, K, L, M, FF AND HH ARE STRAIGHT BARS
 BAR BENDING DIAGRAMS

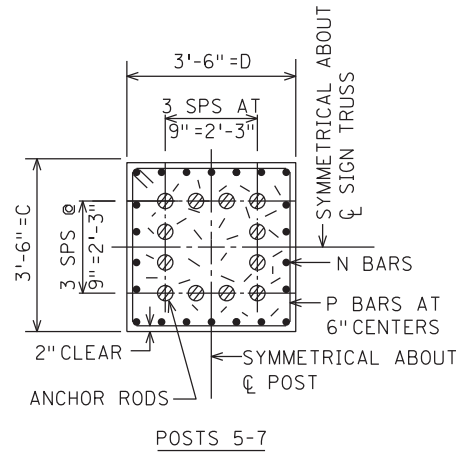
NOTE (5): MUST BE FORMED A MINIMUM OF 6" BELOW THE GROUND SURFACE. THE EXCAVATED AREA FOR FORMING SHALL BE BACKFILLED AND TAMPED WITH EQUIVALENT TO SURROUNDING MATERIAL.



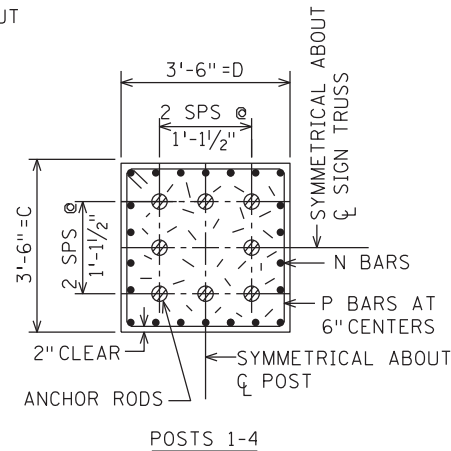
DRILLED SHAFT



SECTION C-C

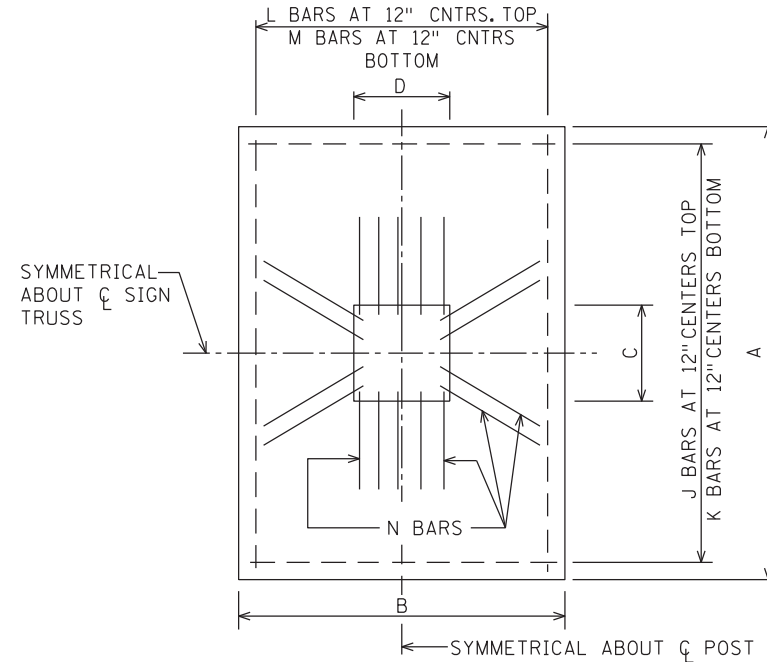


POSTS 5-7

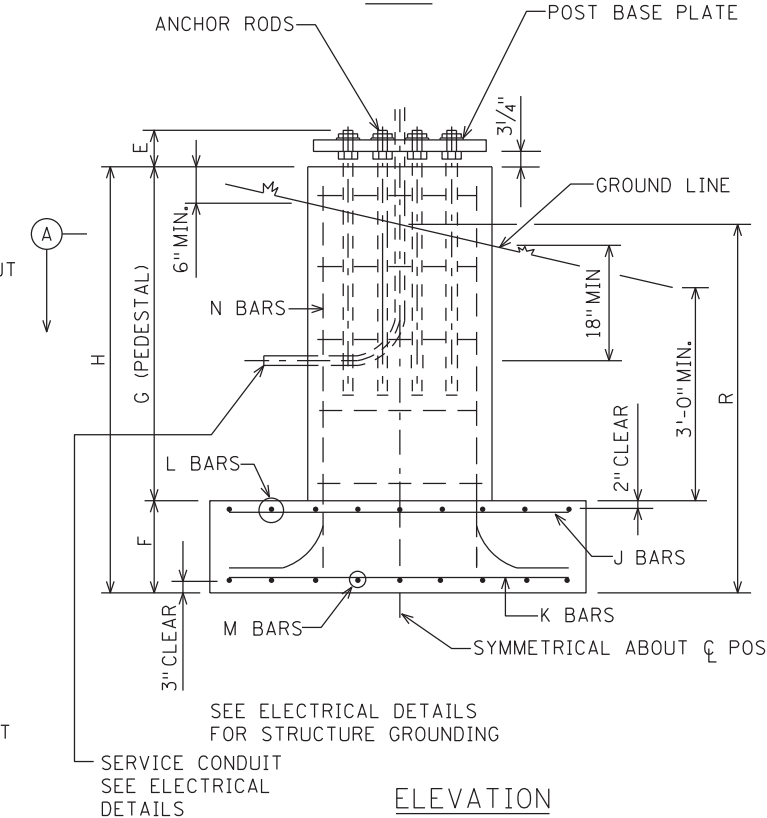


POSTS 1-4

PEDESTAL CROSS SECTIONS A-A



PLAN



ELEVATION
 SPREAD FOOTINGS

SPECIFIC NOTES:

- ① G IS IN FEET. ROUND UP TO WHOLE NUMBER. E.G. G=4.10/2G=8.2 NO. REQ'D=9.
- ② G AND R ARE IN FEET.
- ③ BEND AS REQUIRED TO FORM A CLOSED LOOP.
- ④ FOR STRUCTURE STEEL SEE SPREAD FOOTING.
- ⑤ MUST BE FORMED A MIN. OF 6" BELOW THE GROUND SURFACE. THE SOIL EXCAVATED FOR FORMING SHALL BE BACKFILLED AND TAMPED TO EQUIVALENT COMPACTION AS SURROUNDING MATERIAL.
- ⑥ SPECIAL LARGE RADIUS BENDS ARE REQUIRED. SEE "BAR BENDING DIAGRAMS" FOR SIZES OF RADII.

GENERAL NOTES:

1. SEE THE FORMAT SHEET FOR FOOTING LOCATIONS, POST DESIGNATIONS, TOP OF PEDESTAL ELEVATIONS AND BOTTOM OF FOOTING ELEVATIONS.
2. ALL CONCRETE SHALL CONFORM TO CONCRETE MIX 3Y43 (MNDOT 2461).
3. ALL BAR DIMENSIONS ARE OUT TO OUT OF BARS.
4. ALL SPREAD FOOTINGS HAVE AN ALLOWABLE DESIGN BEARING PRESSURE OF 1 1/4 T PER SQUARE FOOT.
5. DRILLED SHAFTS SHALL BE USED ONLY WHEN SPECIFIED IN THE CONTRACT PLANS.
6. THE DRILLED SHAFTS HAVE AN ALLOWABLE DESIGN LATERAL BEARING PRESSURE OF 250 LBS. PER SQ. FT. PER FOOT OF DEPTH.
7. UNLESS OTHERWISE NOTED, ALL REINFORCEMENT BARS SHALL BE EPOXY COATED IN ACCORDANCE WITH MNDOT3301. SPIRAL BARS AND J, K, L, & M BARS NEED NOT BE EPOXY COATED.
8. THE FOLLOWING TORQUE VALUES SHALL BE USED WHEN INSTALLING ALL ANCHOR NUTS FOR OVERHEAD SIGN STRUCTURES:

BOLT DIAMETER	TORQUE (FT./LBS.)
2 1/4"	375
2 1/2"	450

THE CONTRACTOR SHALL BURR THE THREADS OF THE ANCHOR BOLTS IN ACCORDANCE WITH MNDOT 2402.3H AFTER TORQUEING NUTS.

POST NO.	DIMENSIONS				REINFORCING BARS				ESTIMATED QUANTITIES (4)		SUMMARY OF ESTIMATED QUANTITIES			
	AA	BB	CC	DD	EE	FF (3)	GG	HH	CONCRETE CY	REIN. STEEL LBS.	CONCRETE CY (2)	REIN. STEEL LBS. (2)	ANCH. ASSM. LBS	ST. EXC. C.Y. (2)
1-4	3'-0" Ø	23'-0"	3'-6"	3'-6"	16'-6" x 197 LBS.	5 #5 x 14'-1"	7 #5 x 14'-1"	20 #9 x 22'-7"	6.9	1910	9.3 + 0.46 G	945 + 98G	781	7.4 R
5-7	4'-0" Ø	29'-0"	4'-0"	4'-0"	22'-6" x 362 LBS.	5 #5 x 16'-1"	7 #5 x 16'-1"	24 #10 x 28'-7"	14.1	3490	16.7 + 0.46 G	2333 + 133G	1320	12.1 R

POST NO.	SPREAD FOOTINGS																										
	A	B	C	D	E	F	ANCHOR RODS		J REIN. BARS		K REIN. BARS		L REIN. BARS		M REIN. BARS		(6) N REIN. BARS		P REIN. BARS (1)								
							NO. REQ'D	DIA.	LENGTH	NO. REQ'D	SIZE	LENGTH	NO. REQ'D	SIZE	LENGTH	NO. REQ'D	SIZE	LENGTH	NO. REQ'D	SIZE	LENGTH						
1-4	14'-0"	9'-0"	3'-6"	3'-6"	8 1/2"	2'-0"	8	2 1/4"	3'-10 1/2"	14	#4	8'-6"	14	#6	8'-6"	10	#5	13'-6"	10	#7	13'-6"	20	#9	H + 2'-6"	2G	#5	14'-3"
5-7	18'-0"	12'-6"	3'-6"	3'-6"	9"	2'-0"	12	2 1/2"	4'-0"	19	#4	12'-0"	19	#6	12'-0"	13	#6	17'-6"	13	#10	17'-6"	24	#10	H + 2'-9"	2G	#5	14'-3"

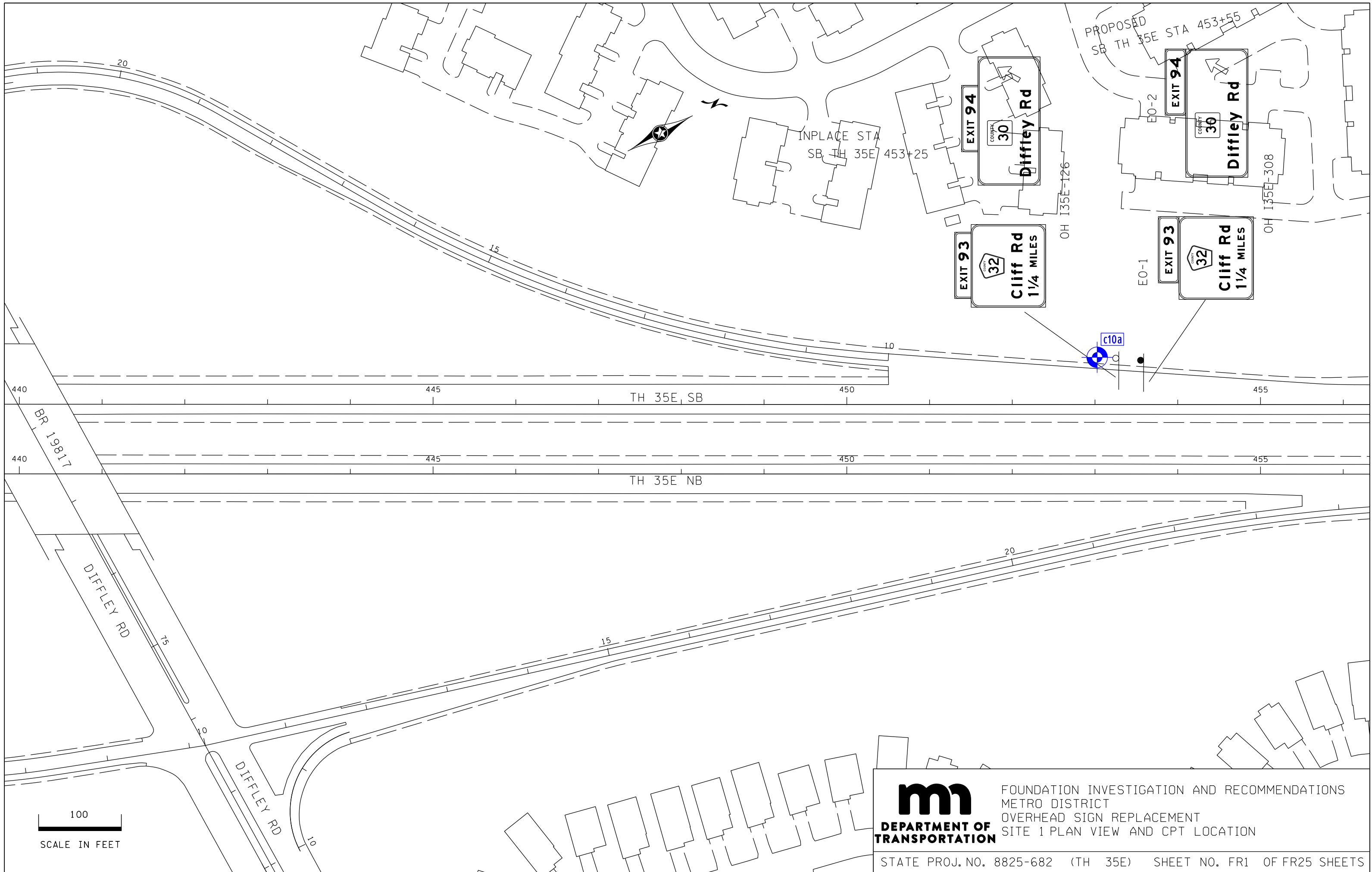
STANDARD OVERHEAD SIGN SUPPORTS
 INTERIM DESIGN B

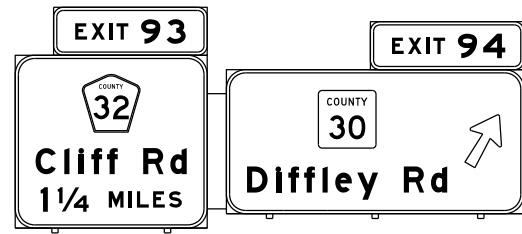
FOUNDATIONS AND
 ANCHOR RODS

DRAWING ST-3

Site Number	TH	Location Description	Foundations Plan Sheets	Exploration ID	Sign ID	Structure Type	Soil Description	Estimated* Groundwater	Drilled Shaft Foundation Recommendations
Site 1	35E SB	Diffley Rd.	FR1 - FR2	c10a	I35E-126	Cantilever	Layered sands, clays, and silts. Refusal at 38'. Average N60 > 10.	3'	Suitable for Standard Design (29'). Use temporary casing with head of fluid.
Site 6	94 EB	Plymouth Ave.	FR3-FR4	c60, c61	I94-265	Sign Bridge	15-25' of firm sand, followed by much weaker silts (N60 < 5).	15' (c60) 21' (c61)	Modify Drilled Shaft Design. Add 5' to standard length (34' Total). Use temporary casing with head of fluid.
Site 7	94 EB	Hennepin Ave. / Dunwoody Blvd.	FR5-FR6	c70	I94-266	Cantilever	Dense sands, with silt seam at 13'. Average N60 > 20.	Below 35'	Suitable for Standard Design (29').
Site 9	94 EB	33rd. / 34th Ave.	Not Included	c90a, c91, T92	I94-284	Sign Bridge	Sand above Shallow Bedrock. SPT Boring pending.		Recommendations to be issued in Addendum. Likely will require rock socket.
Site 10	94 WB	Plymouth Ave.	FR7-FR8	c100	I94-290	Cantilever	Dense sands, with clay at 38'. Average N60 = 30.	20'	Suitable for Standard Design (29'). Use temporary casing with head of fluid.
Site 12	94 WB	TH 494 / TH 694	FR9-FR10	c120	I94-373	Cantilever	Sand. Average N60 > 20.	2'	Suitable for Standard Design (23'). Use temporary casing with head of fluid.
Site 13	94 WB	TH 494 / TH 694 / Radio Dr.	FR11-FR12	c130, c131a	I94-375	Sign Bridge	10' of loose sand / silt at top of c130. Otherwise sand with average N60 > 20.	2' (c130) Below 40' (c131a)	Suitable for Standard Design (29'). Use temporary casing with head of fluid for right (North) post.
Site 14	94 WB	Radio Dr.	FR13-FR14	c140, c141	I94-377	Sign Bridge	Very dense sand / gravel. c140 refusal at 11', c141 at 26'. Bedrock estimated to be 35-40' deep.	5'	Suitable for Standard Design (29'). Use temporary casing with head of fluid. Anticipate rough drilling below 5'.
Site 15	94 EB	Dunwoody Blvd.	FR15-FR16	c150b	I94-407	Sign Bridge	Sand. Average N60 > 20.	26'	Suitable for Standard Design (23').
Site 17	94 EB	Concordia Ave. / Marion St. / Kellogg Blvd.	FR17-FR18	c170	I94-457	Cantilever	Medium dense sand from 0-7' (N60 ~10). Weak clay from 7-10.5' (N60 < 5). Then dense sand (N60 > 20).	Below 40'	Suitable for Standard Design (29').
Site 18	94 WB (694 WB)	Zane Ave.	FR19-FR20	c180	I94-543	Cantilever	12' of sand, followed by 13' of weak silts / clays, and 15' of sand. N60 of silts < 5.	13'	Modify Drilled Shaft Design. Add 5' to standard length (34' Total). Use temporary casing with head of fluid.
Site 21	36 WB	TH 61	FR21-FR22	T-4 (1967)	MN36-032	Cantilever	Embankment fill, followed by sand and gravel. Average N60 > 20.	50' (1967)	Suitable for Standard Design (29').
Site 22	5 EB	TH 494	FR23-FR24	c230, c231	MN5-028	Sign Bridge	Sand, with weak layer of silt around 25' depth. Sand Average N60 = 20 Silt Average N60 = 5	Below 40'	Suitable for Standard Design (29').
Site 23	5 WB	TH 494	FR23,FR25	c220a, c221	MN5-027	Sign Bridge	25-30' of sand, followed by silt. N60 variable, but typically > 15.	5'	Suitable for Standard Design (23'). Use temporary casing with head of fluid.

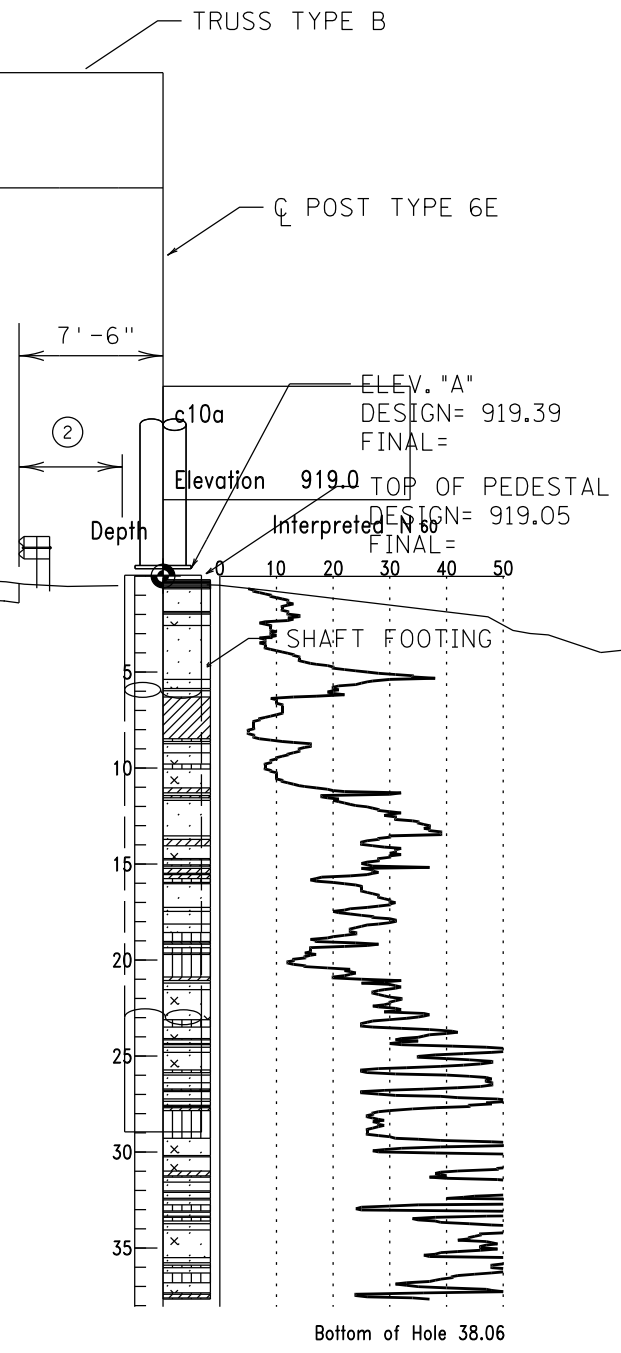
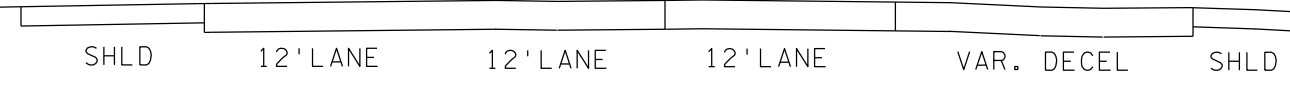
* Groundwater depth estimated from CPT Pore Pressure. Seasonal variability and local perched layers will likely differ from these estimates.



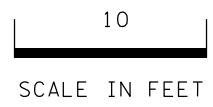


Low Steel = 937.97

SB TH 35E
 453+55.00
 EL. 919.26



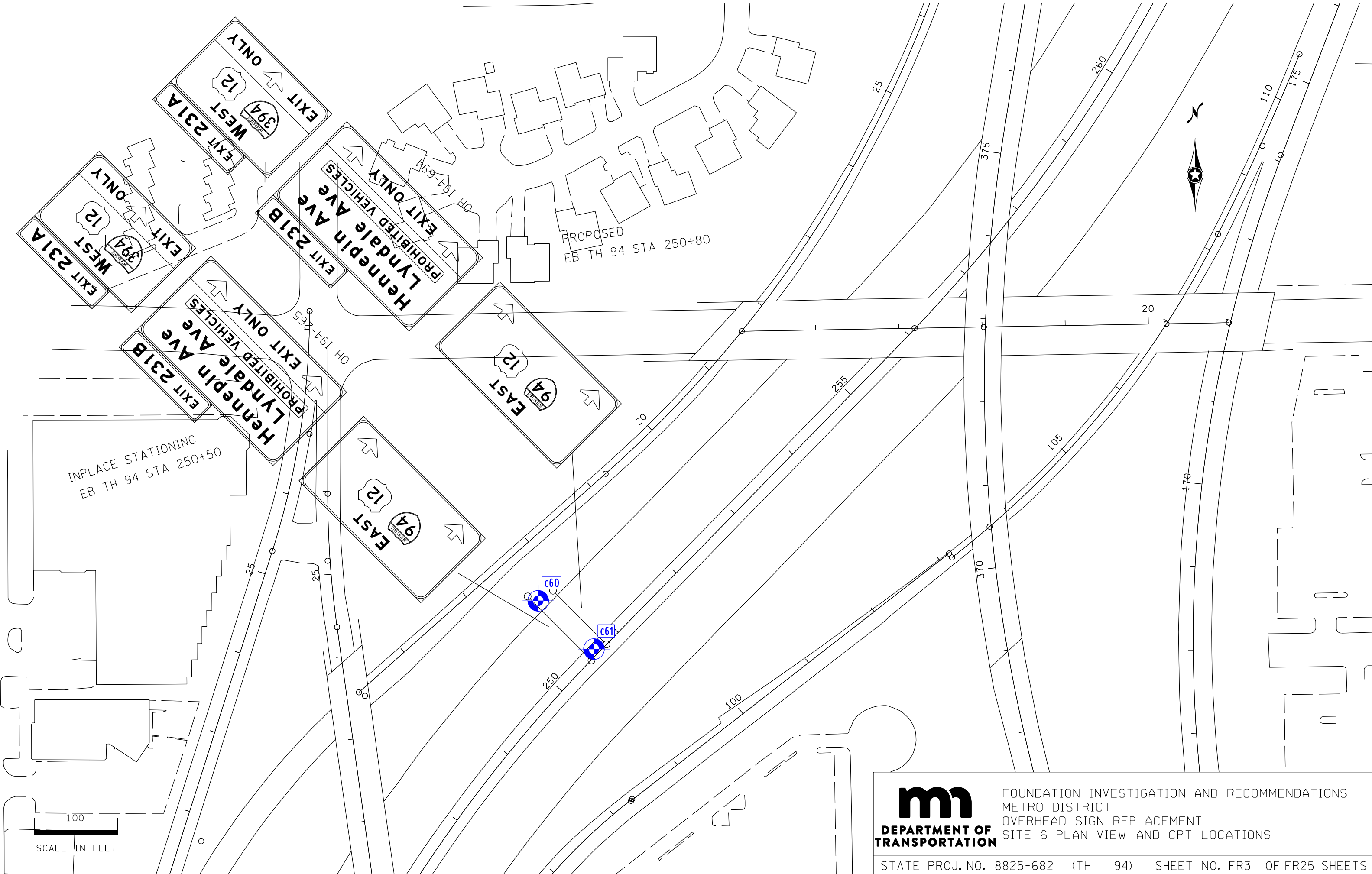
SITE 1



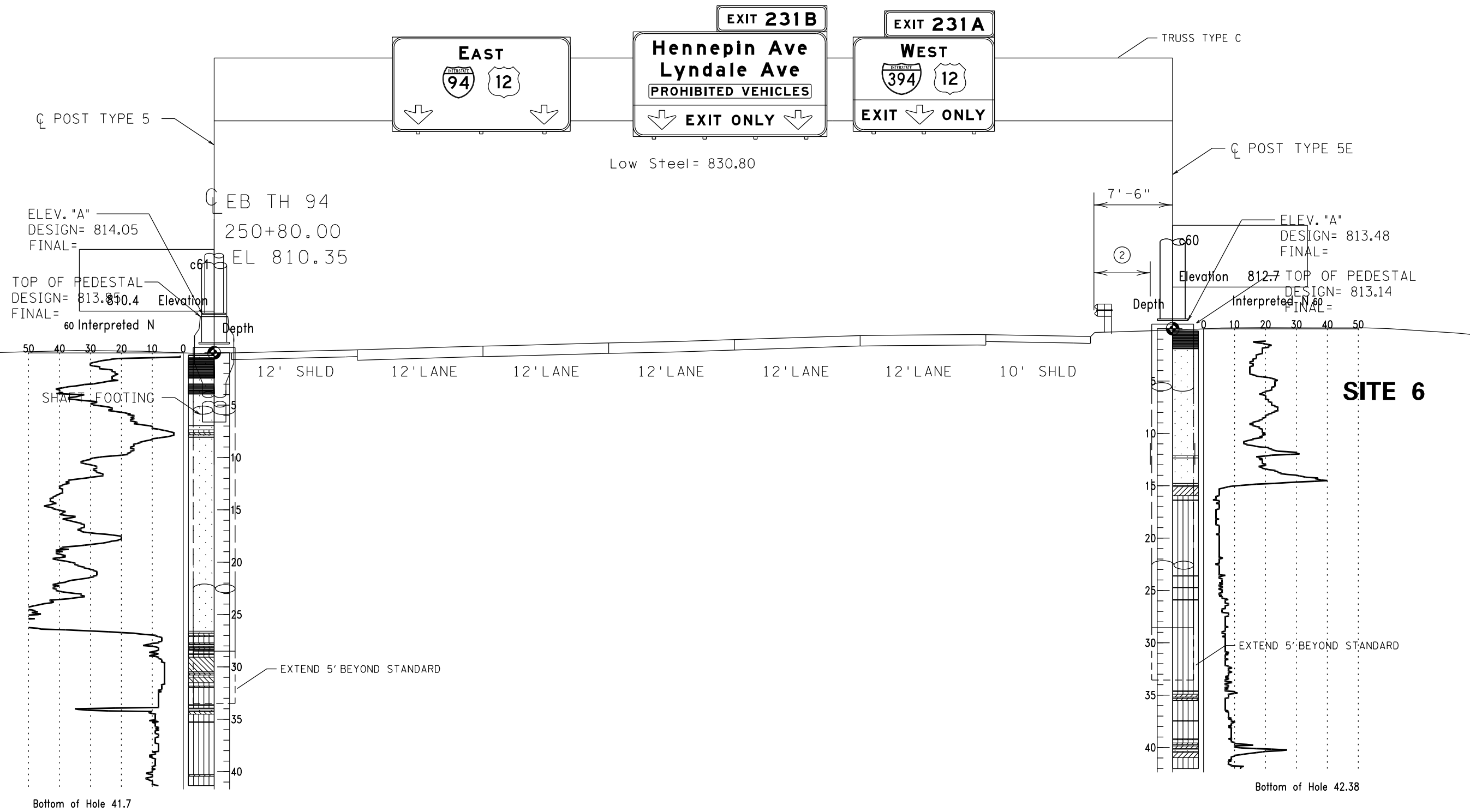
m FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 1 CROSS SECTION AND CPT SOUNDING

DEPARTMENT OF TRANSPORTATION

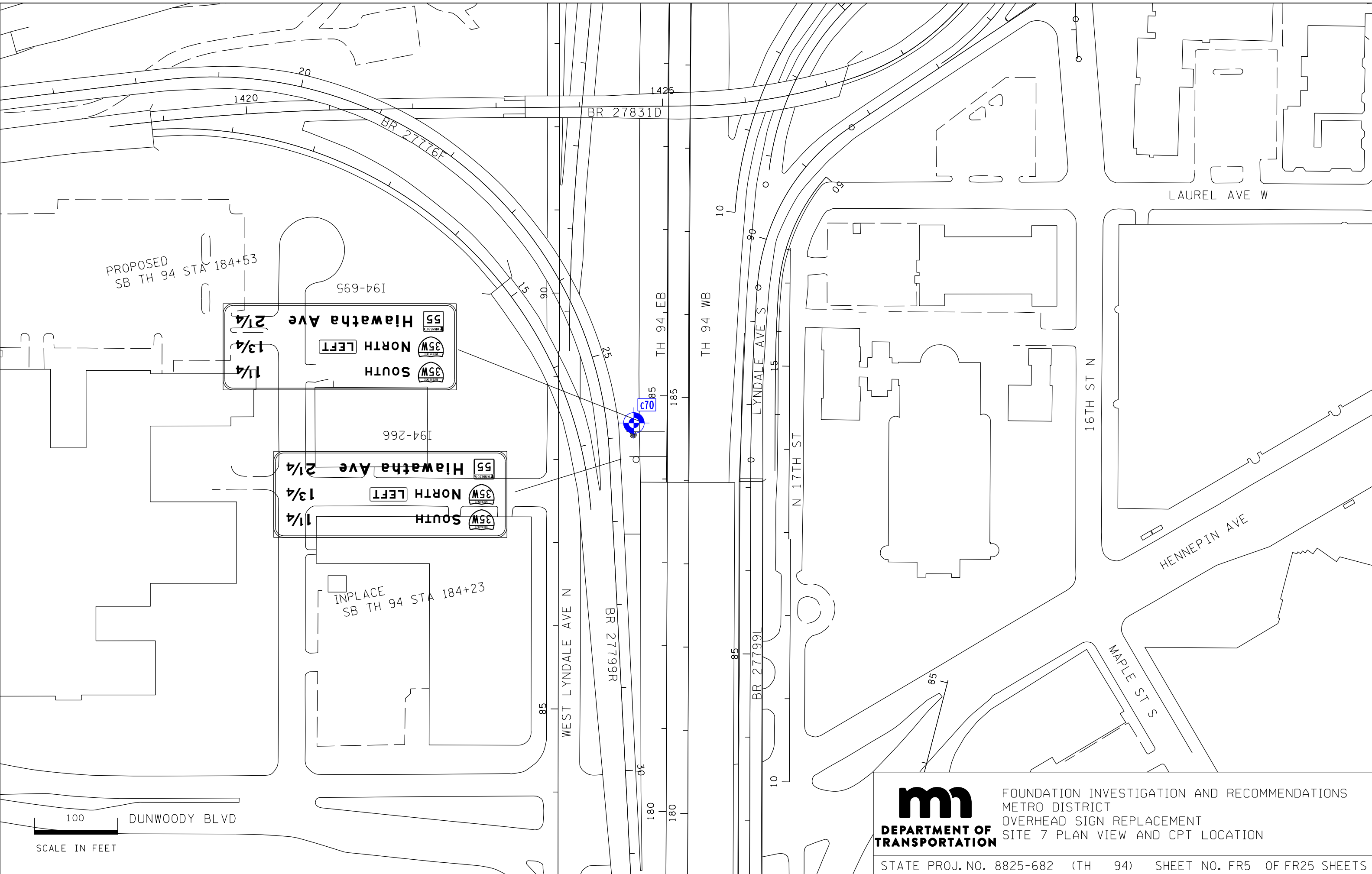
STATE PROJ. NO. 8825-682 (TH 35E) SHEET NO. FR2 OF FR25 SHEETS



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 6 PLAN VIEW AND CPT LOCATIONS



10
SCALE IN FEET



PROPOSED
SB TH 94 STA 184+53

194-695

194-266

INPLACE
SB TH 94 STA 184+23

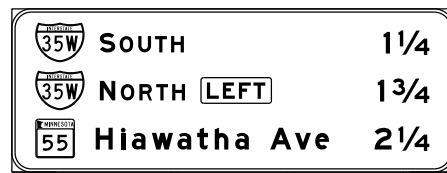
55
Hiawatha Ave 2 1/4
35W NORTH LEFT
35W SOUTH
1 1/4
1 3/4

55
Hiawatha Ave 2 1/4
35W NORTH LEFT
35W SOUTH
1 1/4
1 3/4

100
DUNWOODY BLVD
SCALE IN FEET



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 7 PLAN VIEW AND CPT LOCATION



Low Steel = 865.73

TRUSS TYPE A

CL POST TYPE 5E

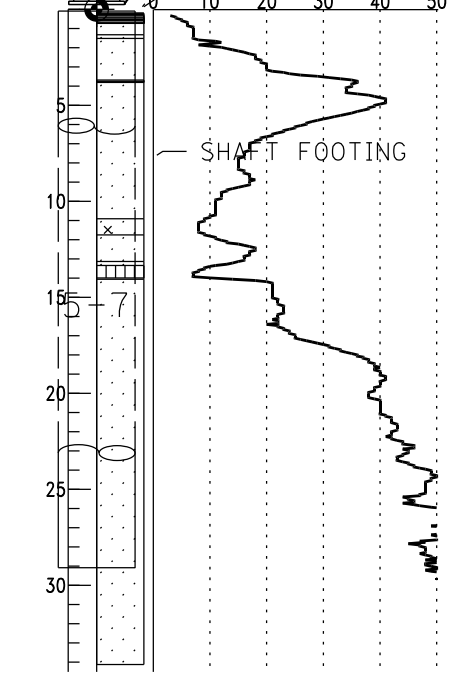
7'-6"

CL SB TH 94
184+53.00
EL. 844.11

13' SHLD 12' LANE 12' LANE 9' SHLD

ELEV. "A"
DESIGN = 844.66
FINAL =
Elevation 844.4
TOP OF PEDESTAL
DESIGN = 844.32
FINAL =

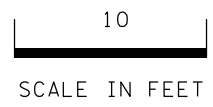
Depth 0 10 20 30 40 50
Interpreted No.



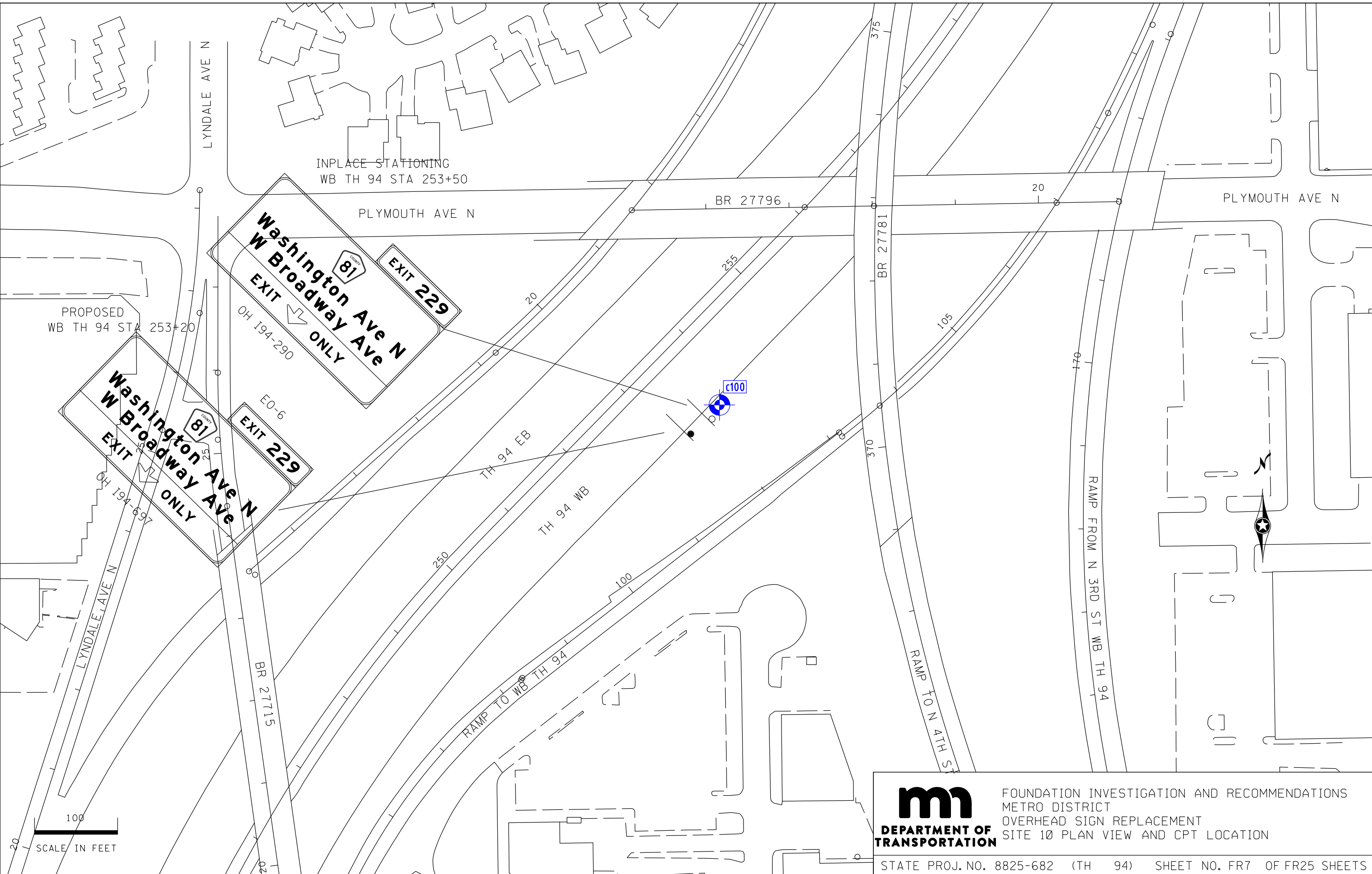
Bottom of Hole 34.51

SHAFT FOOTING

SITE 7



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 7 CROSS SECTION AND CPT SOUNDING



100
SCALE IN FEET

m
DEPARTMENT OF TRANSPORTATION

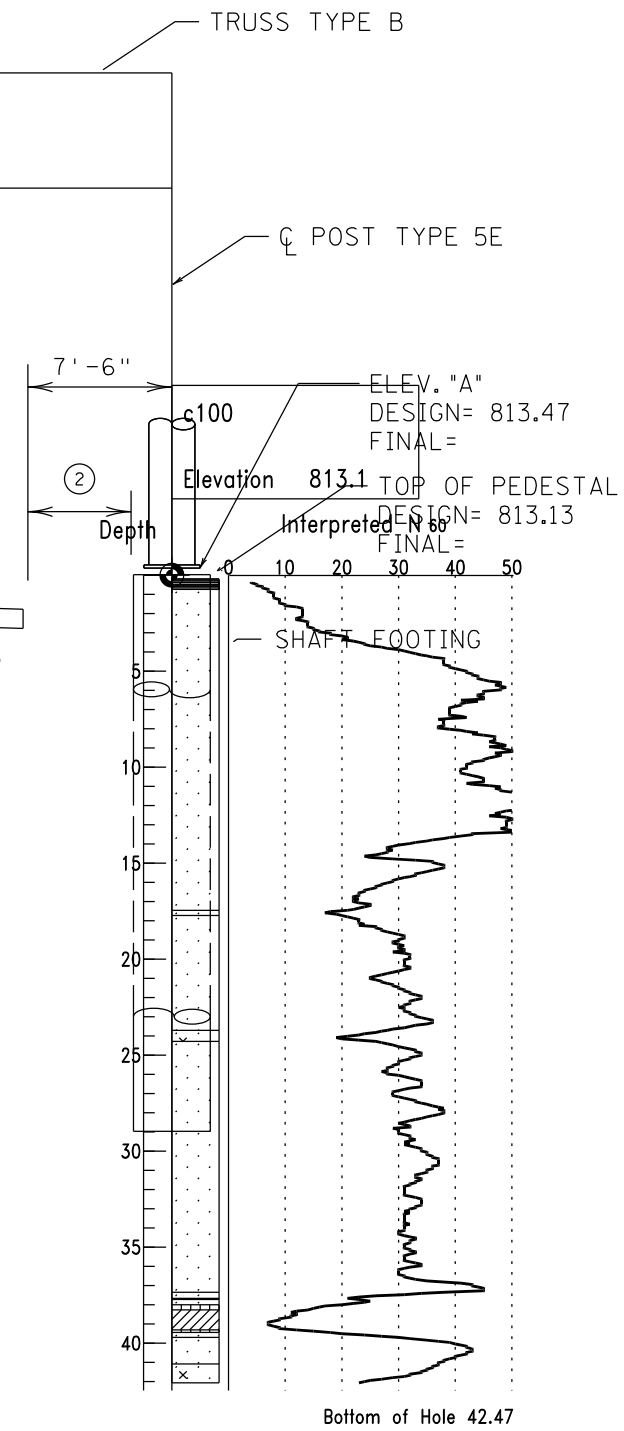
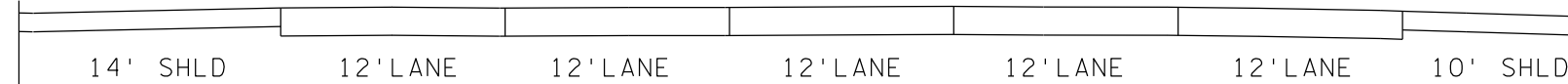
FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 10 PLAN VIEW AND CPT LOCATION

STATE PROJ. NO. 8825-682 (TH 94) SHEET NO. FR7 OF FR25 SHEETS

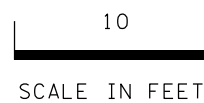


Low Steel = 830.51

CL TH 94
253+20.00
EL. 811.54



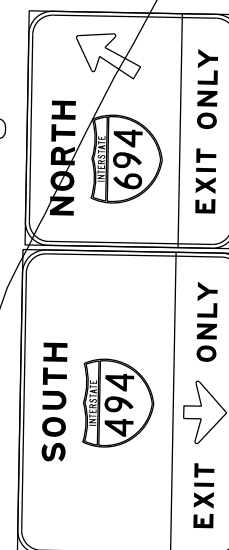
SITE 10



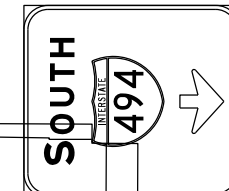
FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 10 CROSS SECTION AND CPT SOUNDING

PROPOSED STA
WB C-D RD STA 133+50

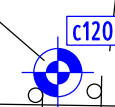
INPLACE STATIONING
WB C-D RD STA 133+20



OH 194-373



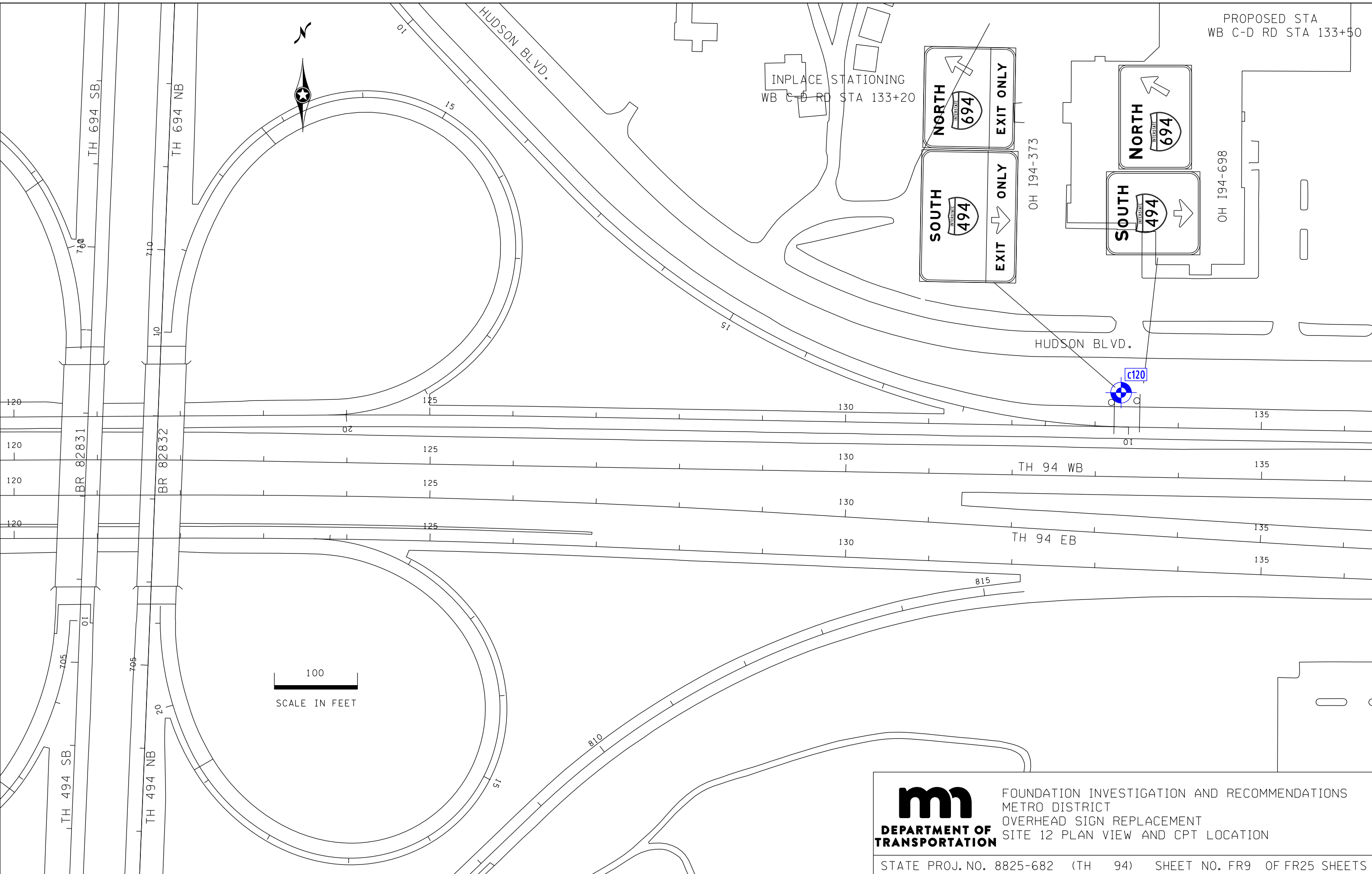
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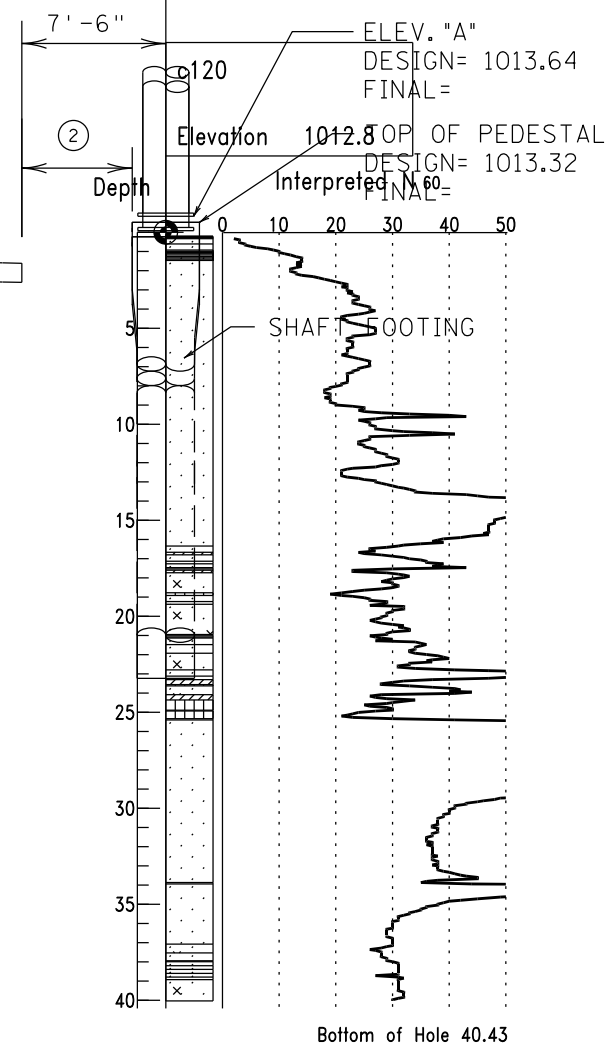
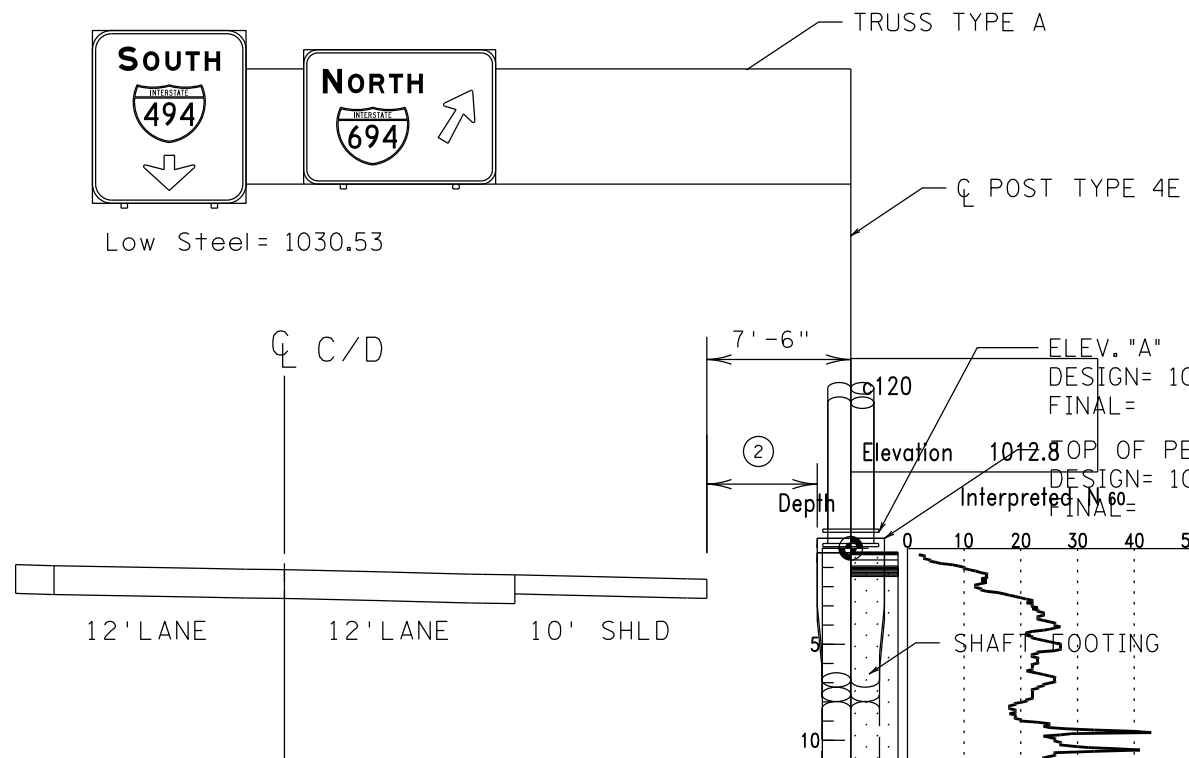
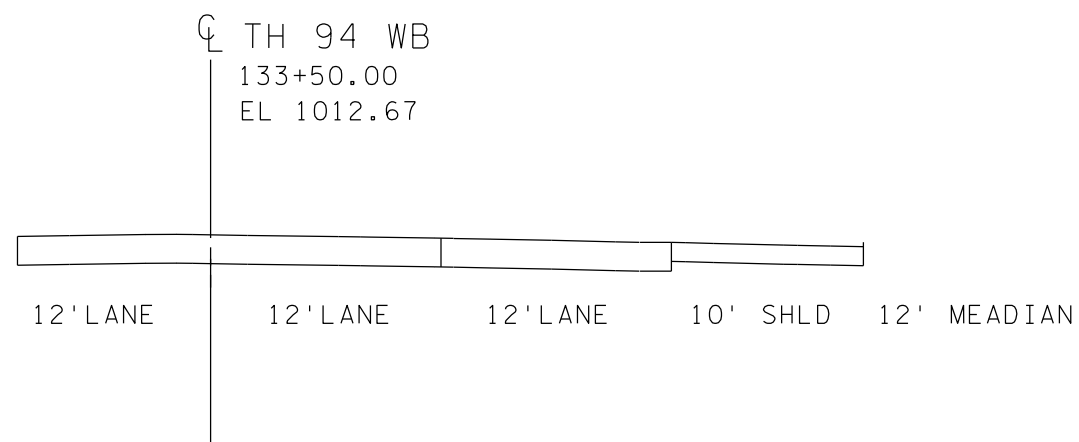


HUDSON BLVD.

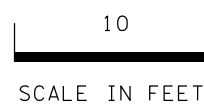


FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 12 PLAN VIEW AND CPT LOCATION

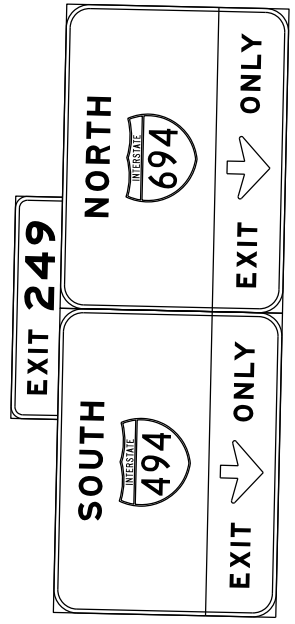




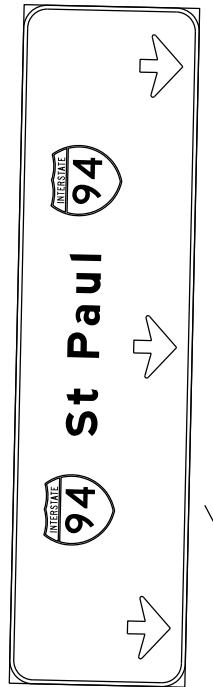
SITE 12



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 12 CROSS SECTION AND CPT SOUNDING

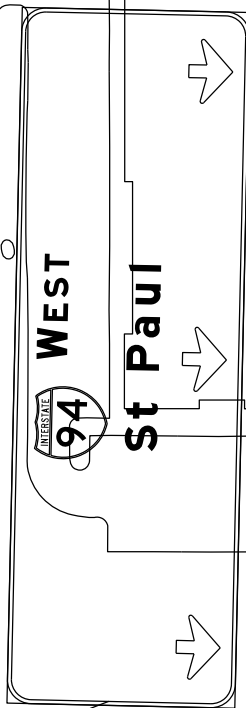
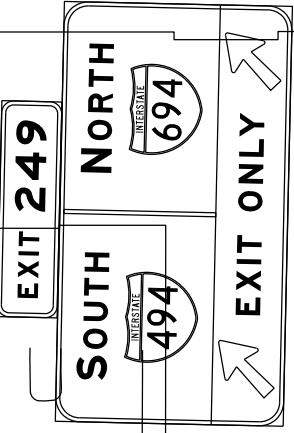


INPLACE
WB TH 94 STA 149+00



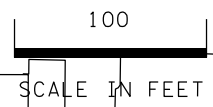
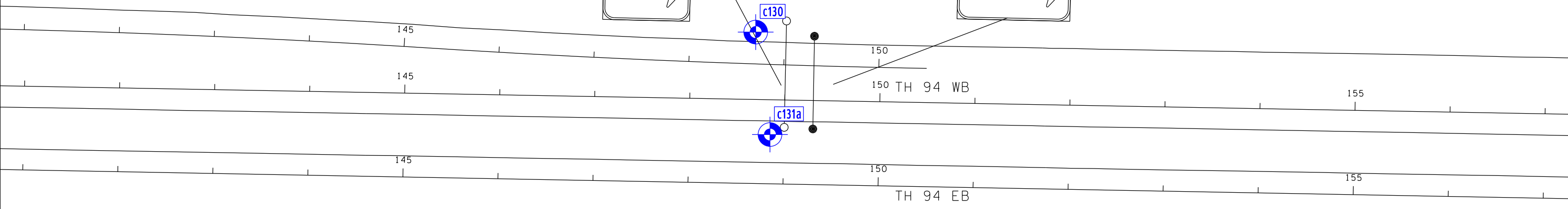
OH I94-375

PROPOSED
WB TH 94 STA 149+30

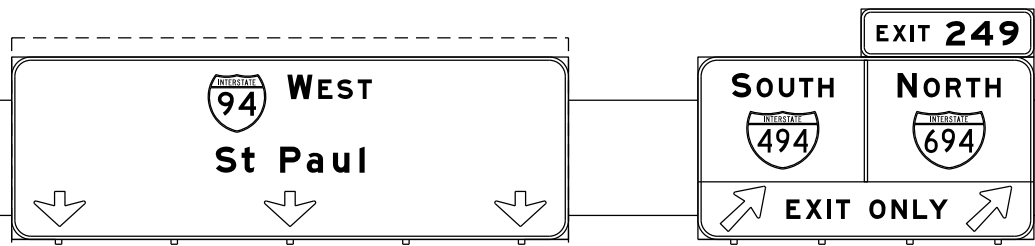


OH I94-699

IDEAL AVE. N.



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 13 PLAN VIEW AND CPT LOCATIONS



Low Steel = 1036.81

Future Low Steel = 1035.81

WB TH 94
149+30.00
EL. 1017.14

CL POST TYPE 6

TRUSS TYPE C

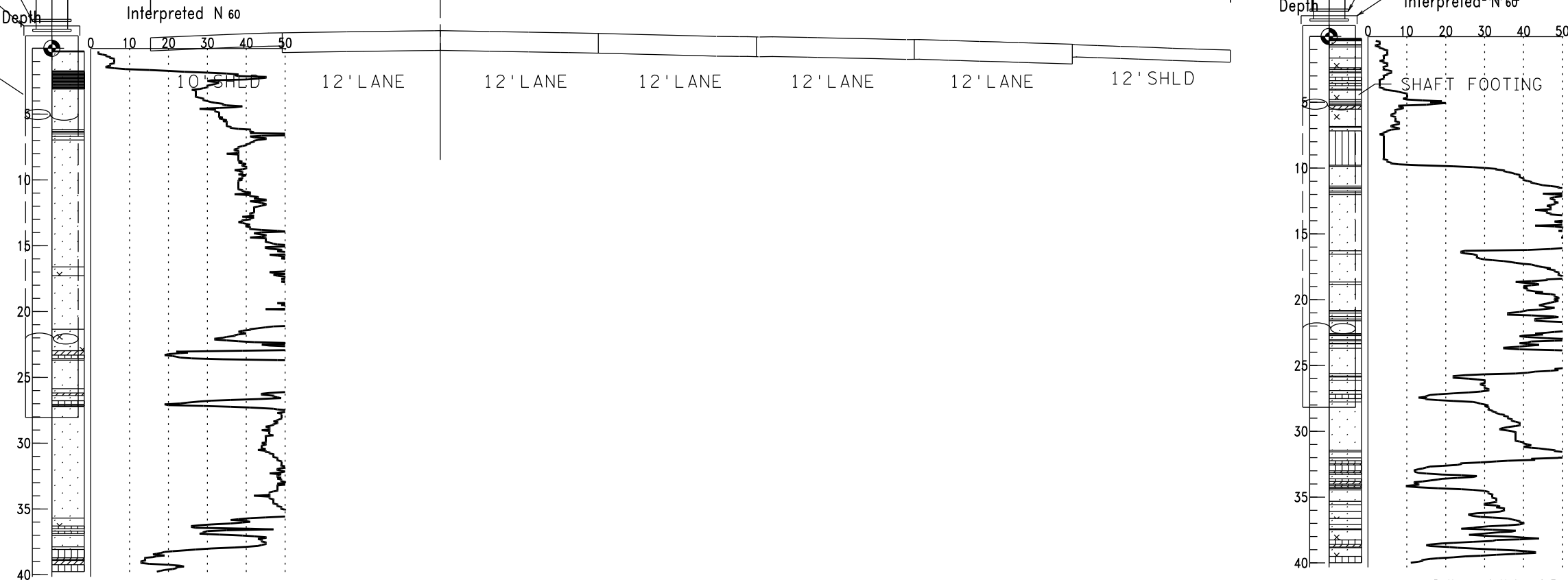
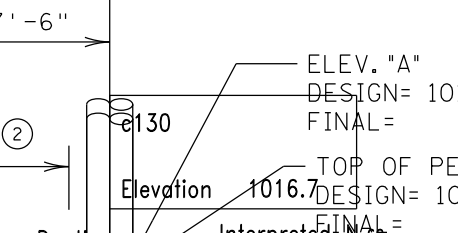
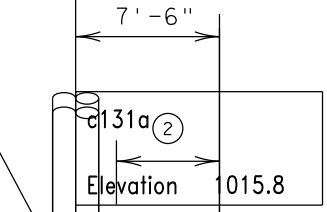
CL POST TYPE 6E

ELEV. "A"
DESIGN = 1017.84
FINAL =

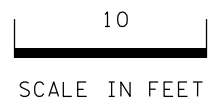
ELEV. "A"
DESIGN = 1018.61
FINAL =

TOP OF PEDESTAL
DESIGN = 1017.50
FINAL =

TOP OF PEDESTAL
DESIGN = 1018.27
FINAL =



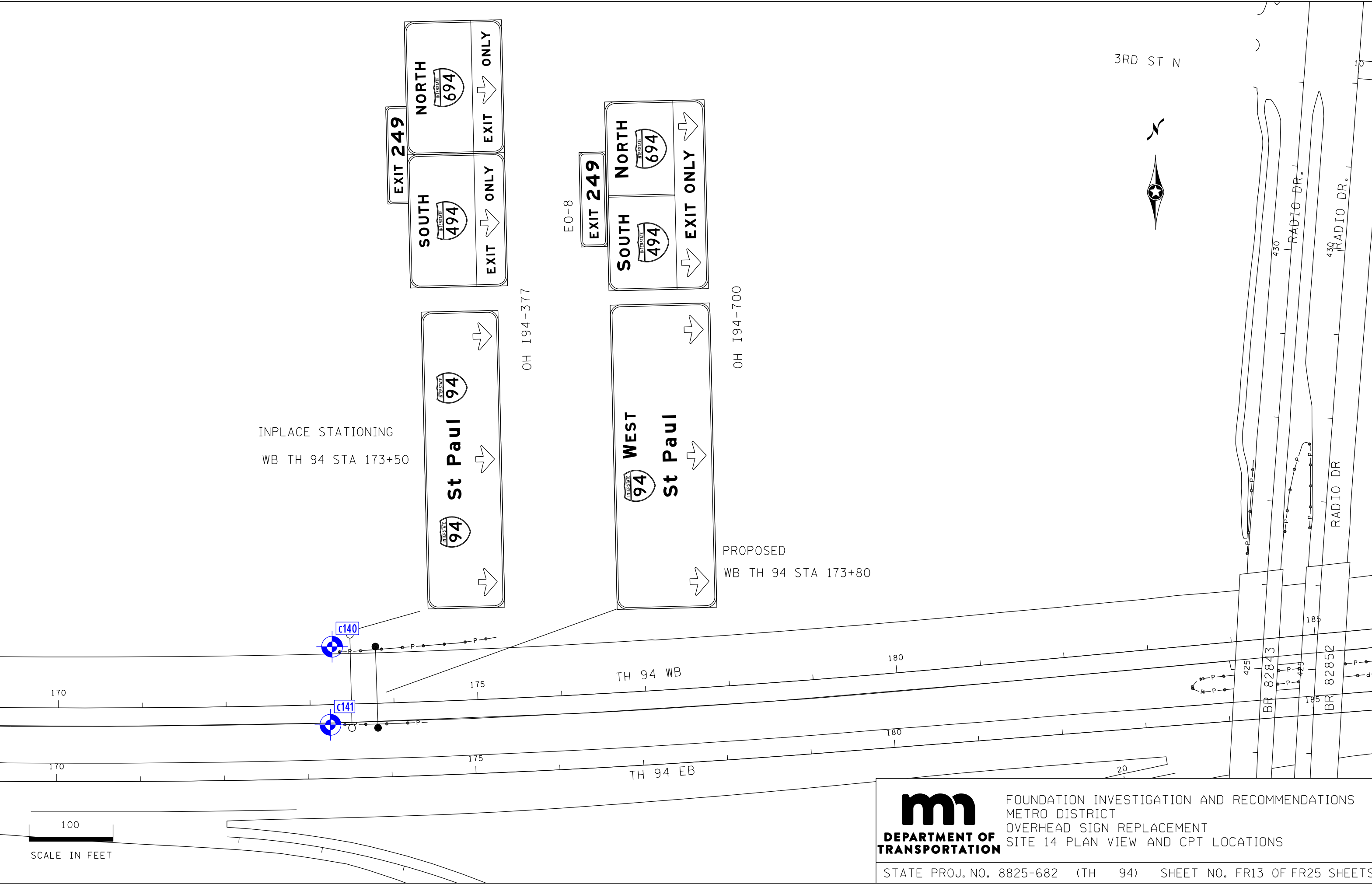
SITE 13



m FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 13 CROSS SECTION AND CPT SOUNDINGS

DEPARTMENT OF TRANSPORTATION

STATE PROJ. NO. 8825-682 (TH 94) SHEET NO. FR12 OF FR25 SHEETS



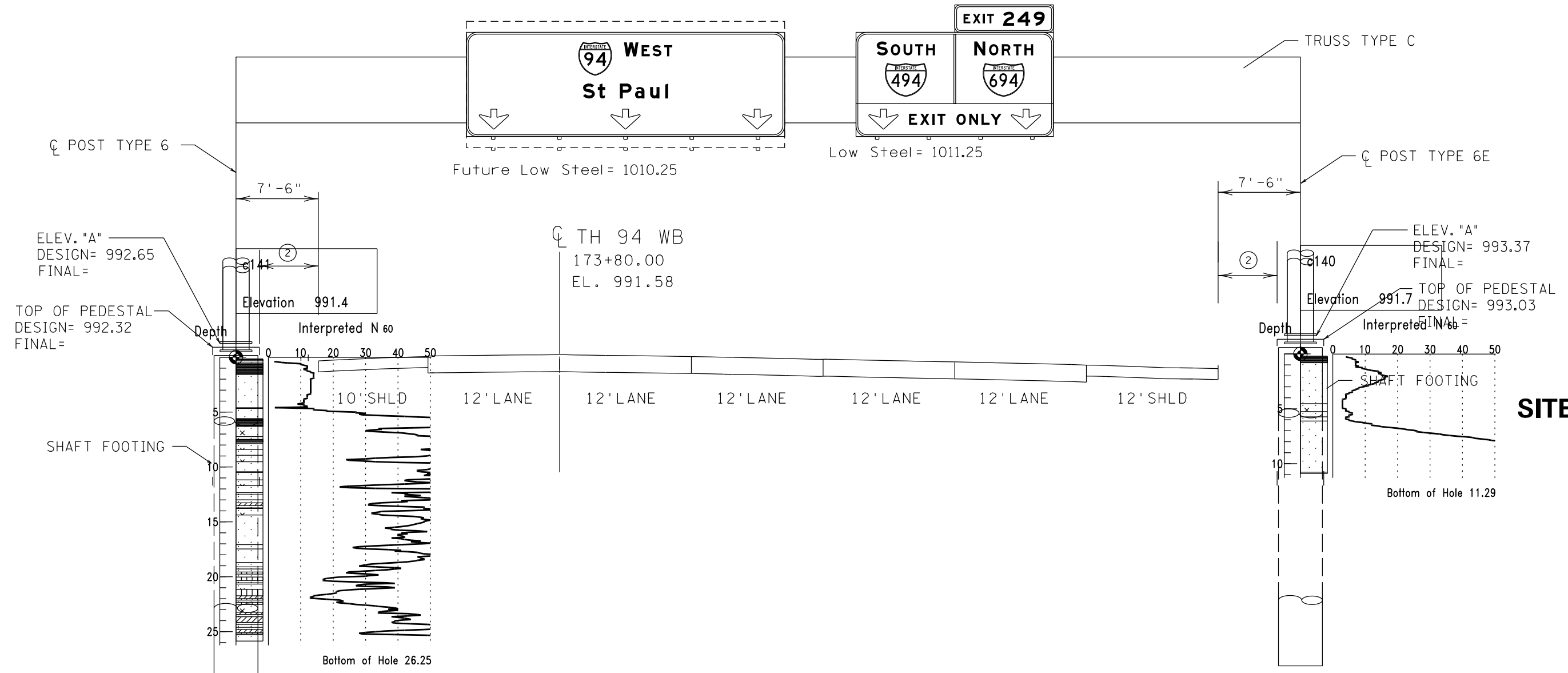
INPLACE STATIONING
WB TH 94 STA 173+50

PROPOSED
WB TH 94 STA 173+80

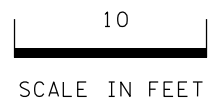
100
SCALE IN FEET

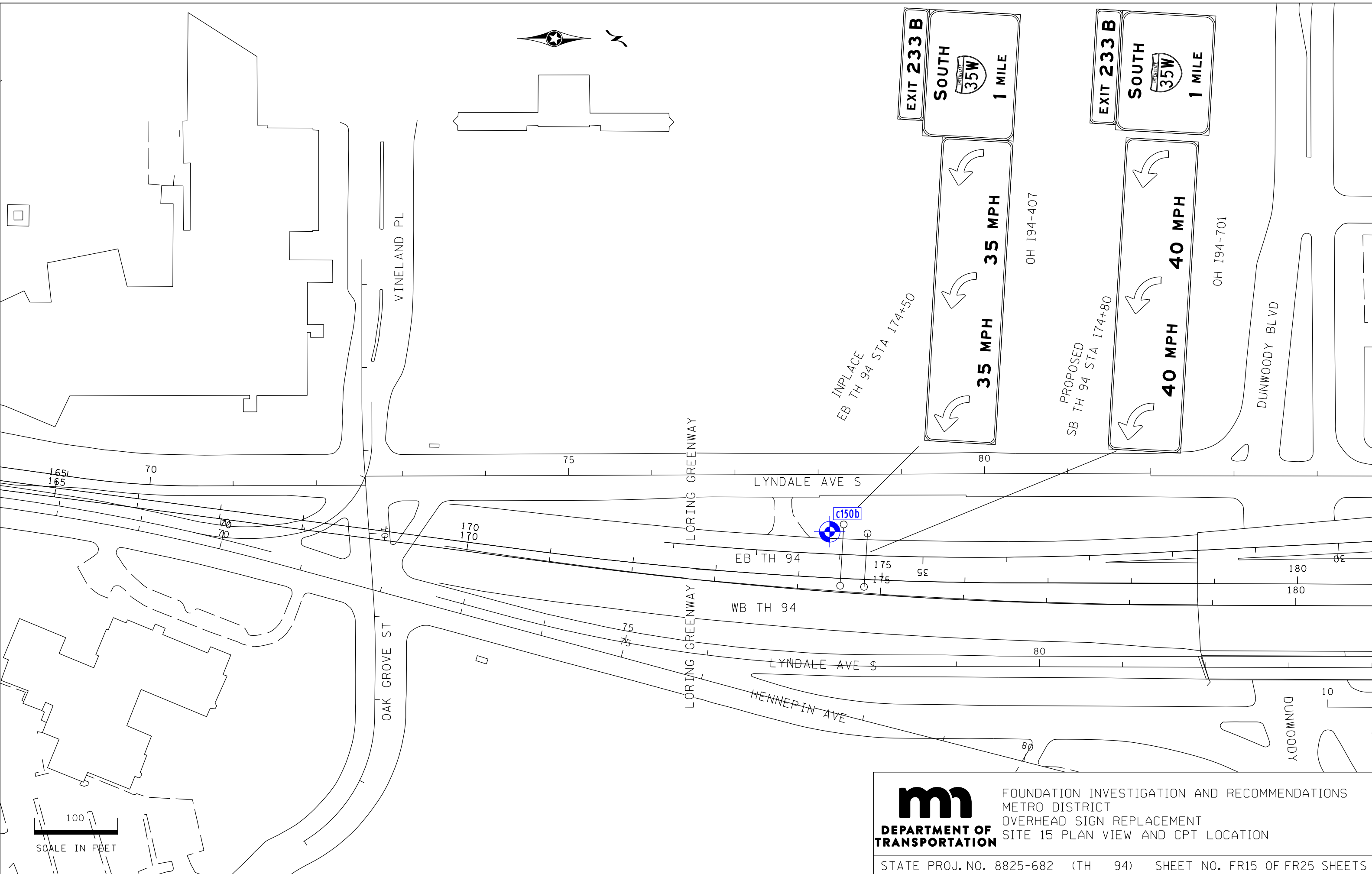


FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 14 PLAN VIEW AND CPT LOCATIONS



SITE 14

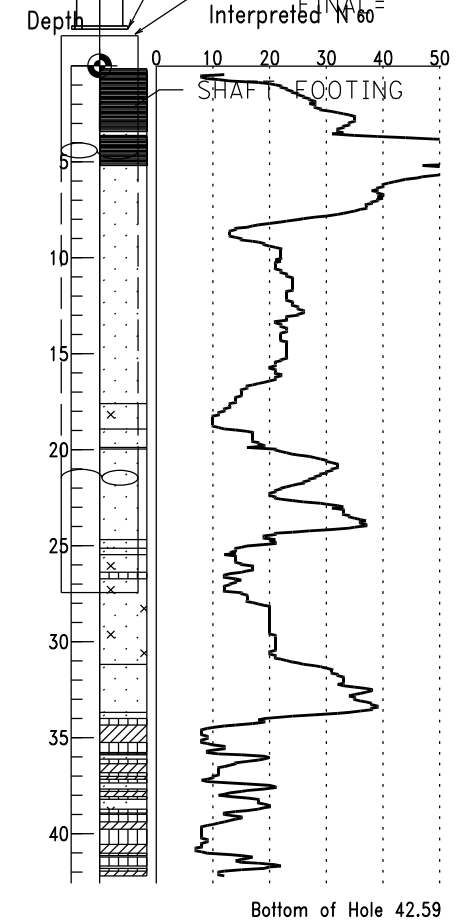
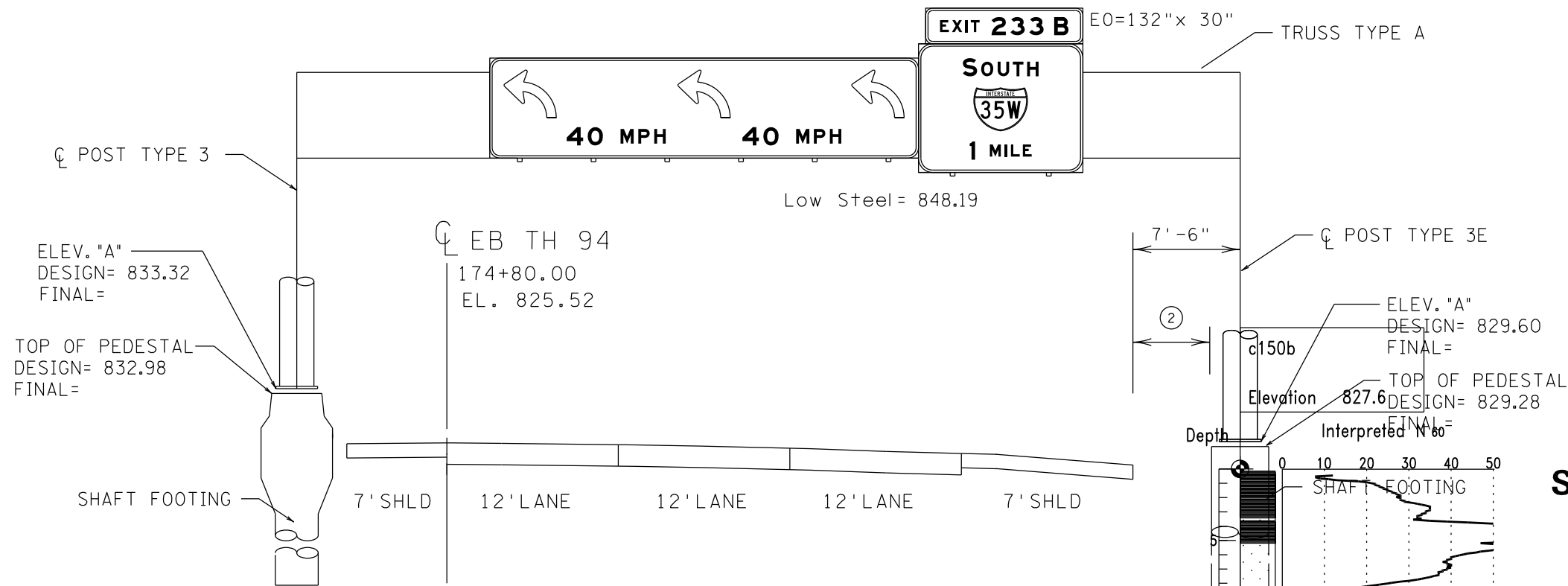




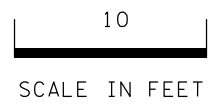
100
SCALE IN FEET



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 15 PLAN VIEW AND CPT LOCATION



SITE 15



ST ANTHONY AVE

ST ANTHONY AVE

280
280
280

285
285
285

TH 94 WB

10

TH 94 EB

15

MARION ST

BR 628718

BR 62880

CARROLL AVE

W CONCORDIA AVE

W KELLOGG BLVD

C170

PROPOSED
CANTILEVER 30' BEYOND IN PLACE FOUNDATION

Marion St

NORTH EAST
35E
94

TO SOUTH
35E
Kelloqg Blvd

OH 194-457

* PRIOR TO REMOVAL IN JAN 2018

* WAS LOCATED ON SOUTH FRONTAGE RD 380' WEST OF MARION ST

EAST
INTERSTATE
94
NORTH
35E
TO
SOUTH
35E

Marion St
STATE CAPITOL

NORTH EAST
35E
94

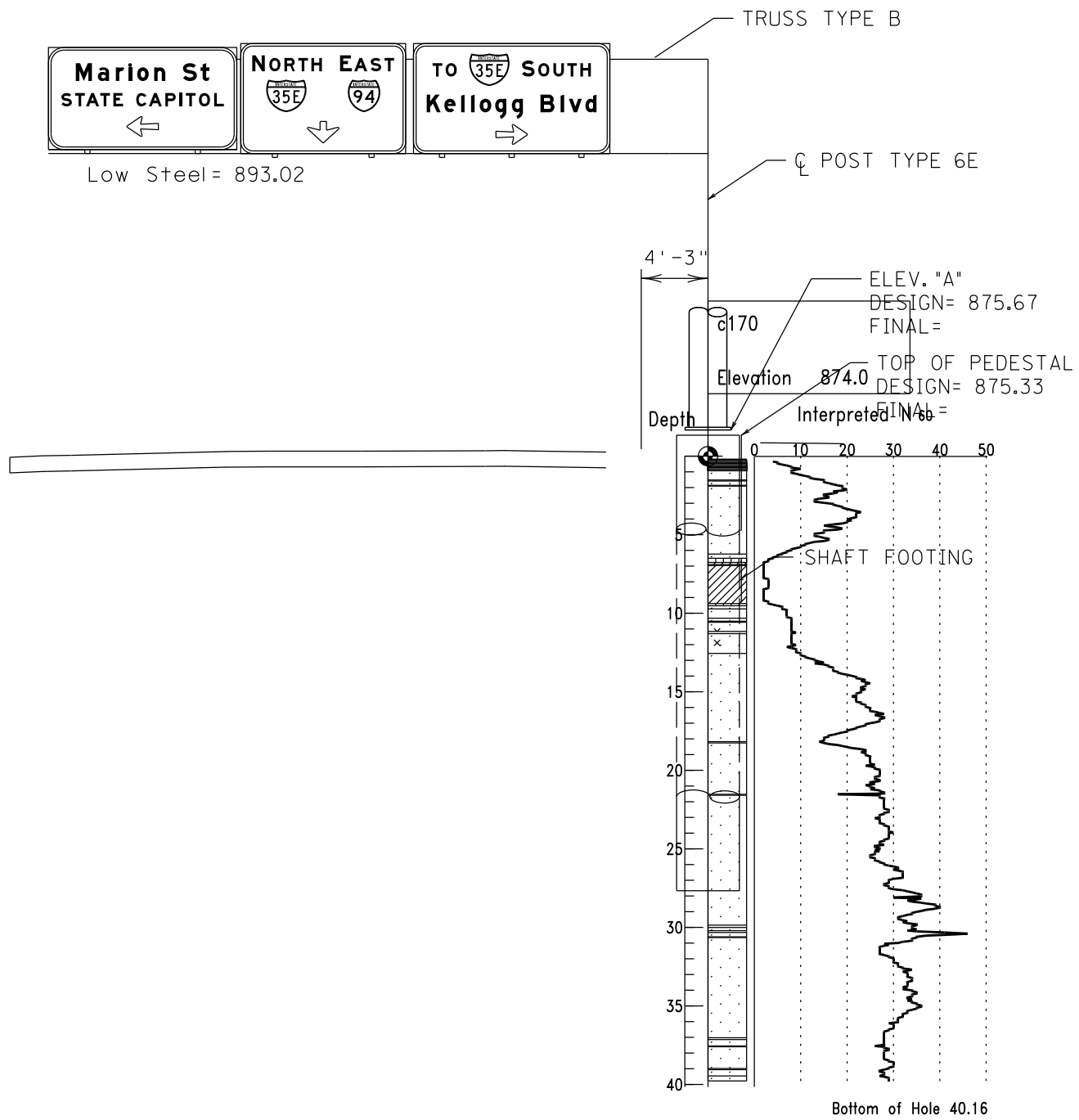
TO SOUTH
35E
Kelloqg Blvd



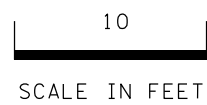
DEPARTMENT OF
TRANSPORTATION

FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 17 PLAN VIEW AND CPT LOCATION

SCALE IN FEET



SITE 17



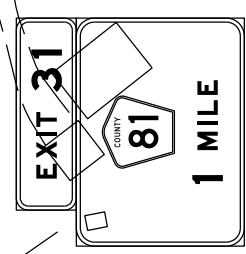
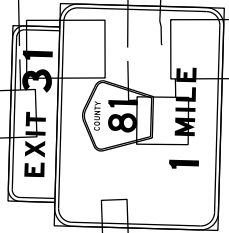


INPLACE STATIONING

PROPOSED

WB TH 94 STA 1114+75

WB TH 94 STA 1115+05



1110

1115

1120

TH 94 WB

1110

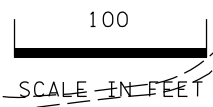
1115

1120

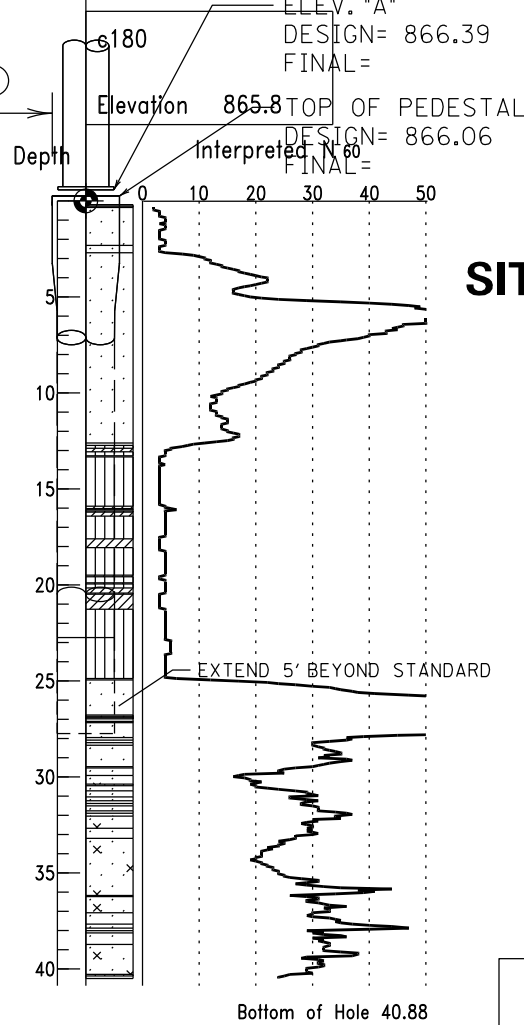
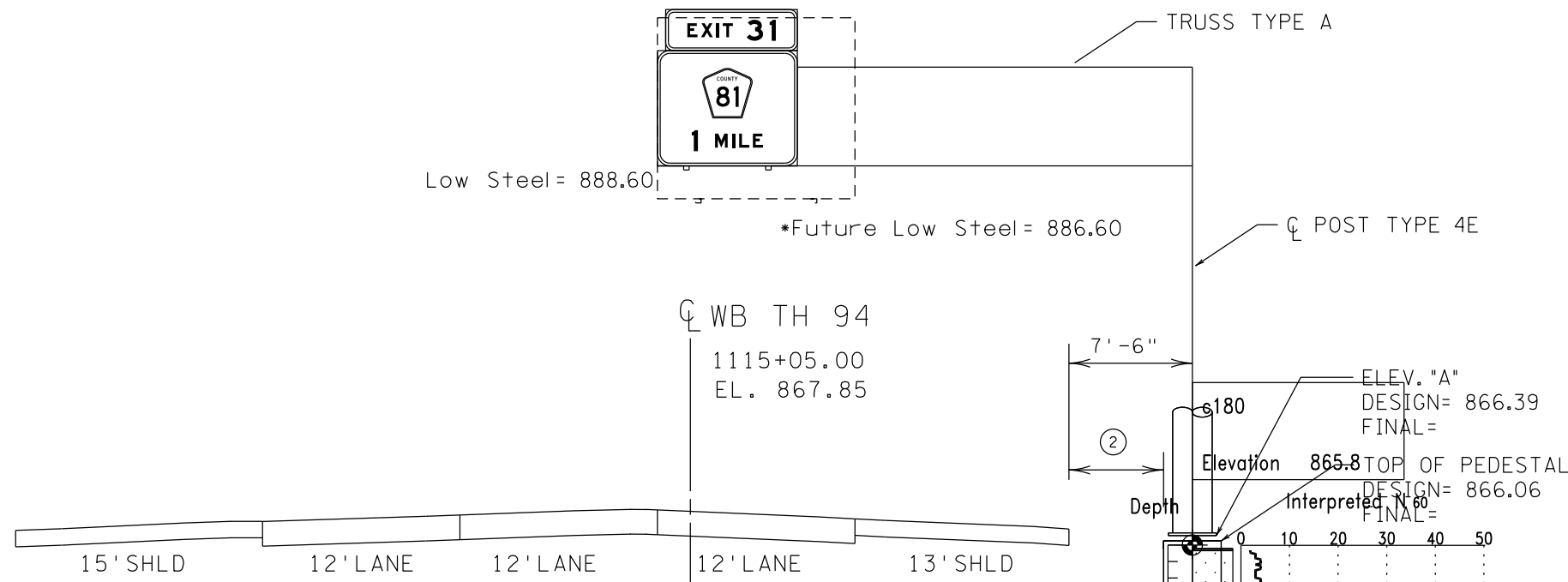
TH 94 EB

HOWE LN

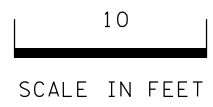
UNITY AVE N



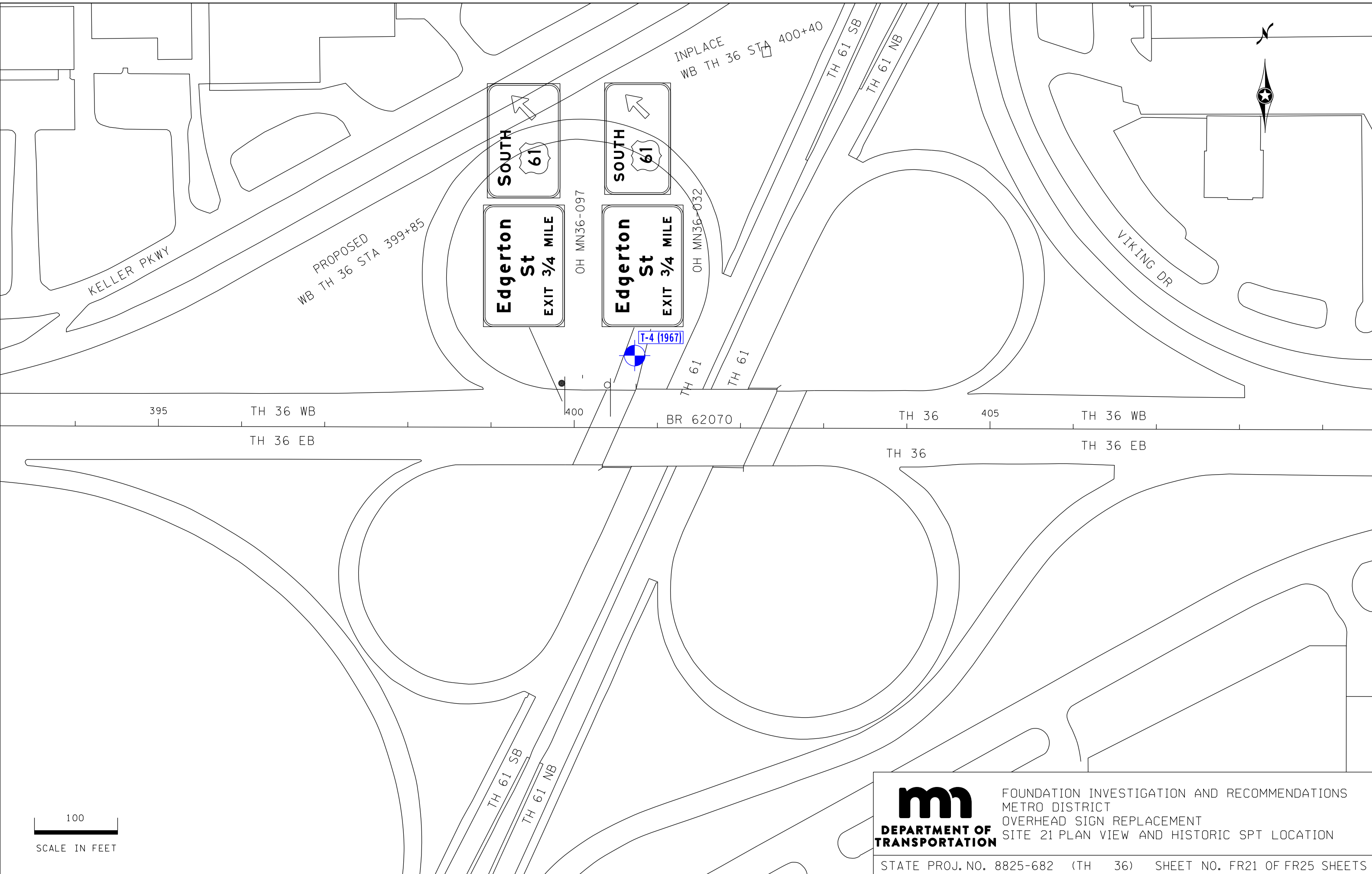
FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 18 PLAN VIEW AND CPT LOCATION



SITE 18



m FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 18 CROSS SECTION AND CPT SOUNDING
DEPARTMENT OF TRANSPORTATION



100
SCALE IN FEET

m
DEPARTMENT OF TRANSPORTATION

FOUNDATION INVESTIGATION AND RECOMMENDATIONS
 METRO DISTRICT
 OVERHEAD SIGN REPLACEMENT
 SITE 21 PLAN VIEW AND HISTORIC SPT LOCATION

STATE PROJ. NO. 8825-682 (TH 36) SHEET NO. FR21 OF FR25 SHEETS

*FUTURE E0 = 78"x 30"

*FUTURE E0 = 78"x 30"

Edgerton St
EXIT 3/4 MILE

SOUTH
61

TRUSS TYPE A

Low Steel= 903.56

CL POST TYPE 5E

CL TH 36

399+85.00
EL. 885.08

7'-6"

②

ELEV. "A"
DESIGN= 885.01
FINAL=

TOP OF PEDESTAL
DESIGN= 884.67
FINAL=

SHAFT FOOTING

5' SHLD 12' LANE 12' LANE 14' EXIT LANE 2' SHLD

SITE 21

T-4

Elevation 861.0

Coh (psf)

SPT N60

Plug Drilled (CL)

non. pl SiL, brn, moist

FS, brn, moist

S & FG, brn, moist

MS, brn, wet

S & G

15
30
32
20
28
22
34
16
18
22
10
11
11
8

▽



DEPARTMENT OF TRANSPORTATION

FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 21 CROSS SECTION AND HISTORIC SPT BORING

STATE PROJ. NO. 8825-682 (TH 36) SHEET NO. FR22 OF FR25 SHEETS

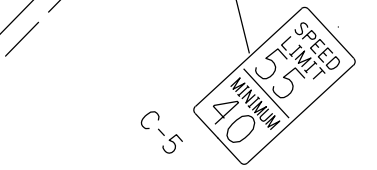
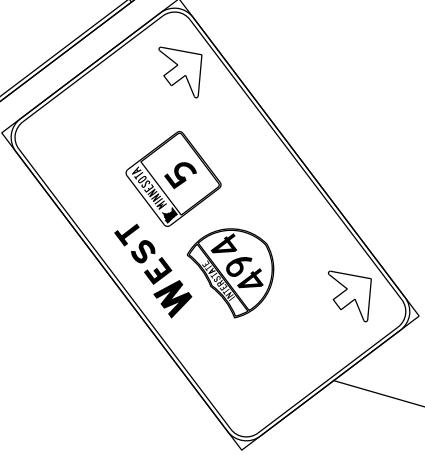
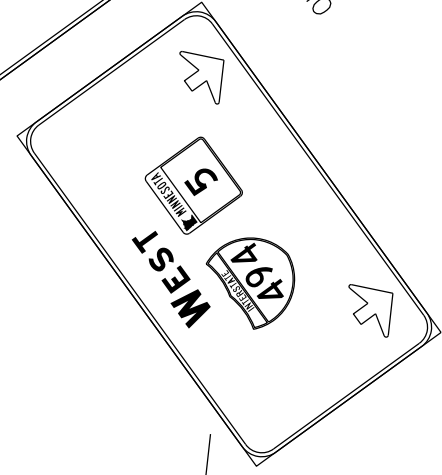
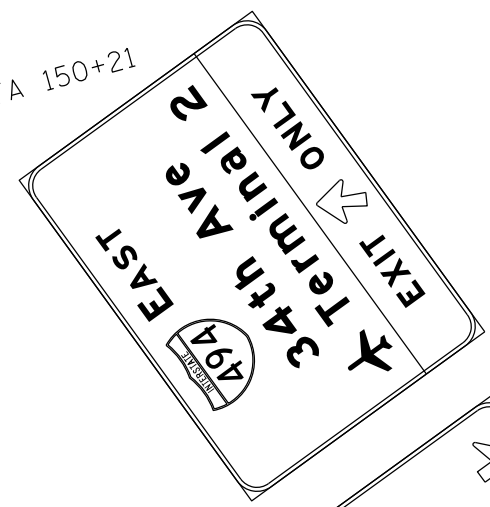
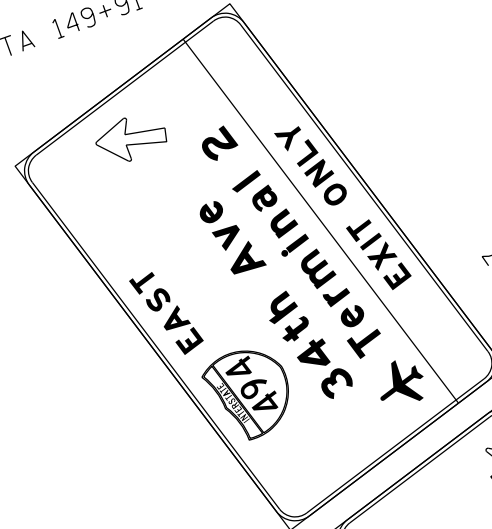
10

SCALE IN FEET

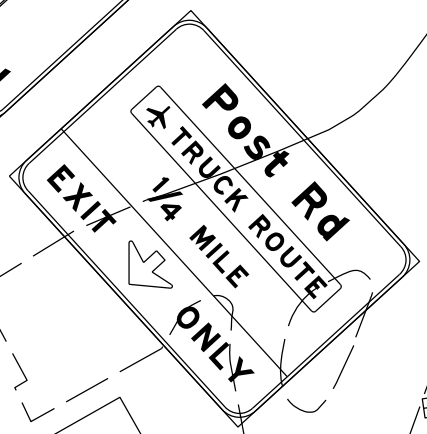
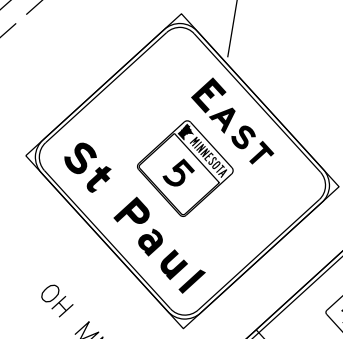
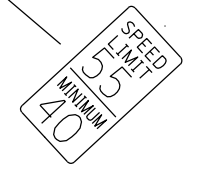
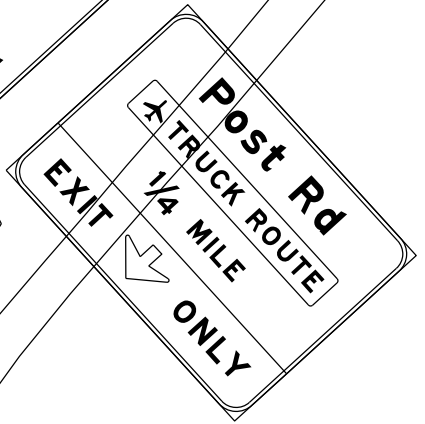
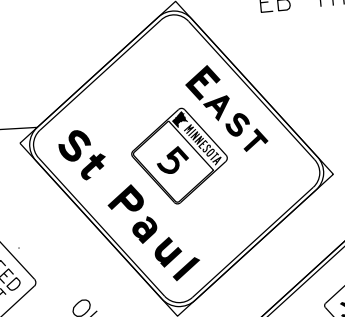


INPLACE
WB TH 5 STA 149+91

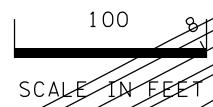
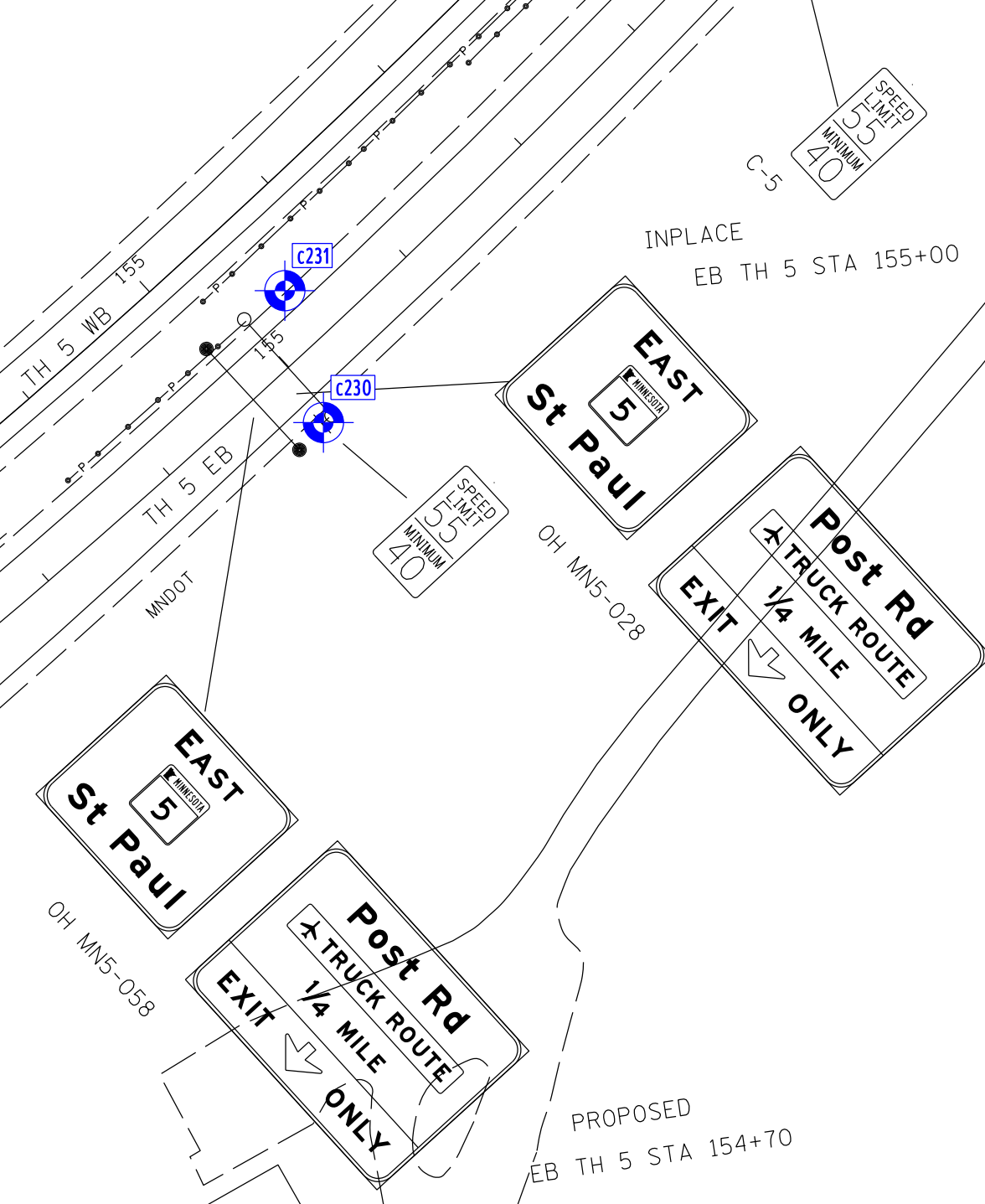
PROPOSED
WB TH 5 STA 150+21



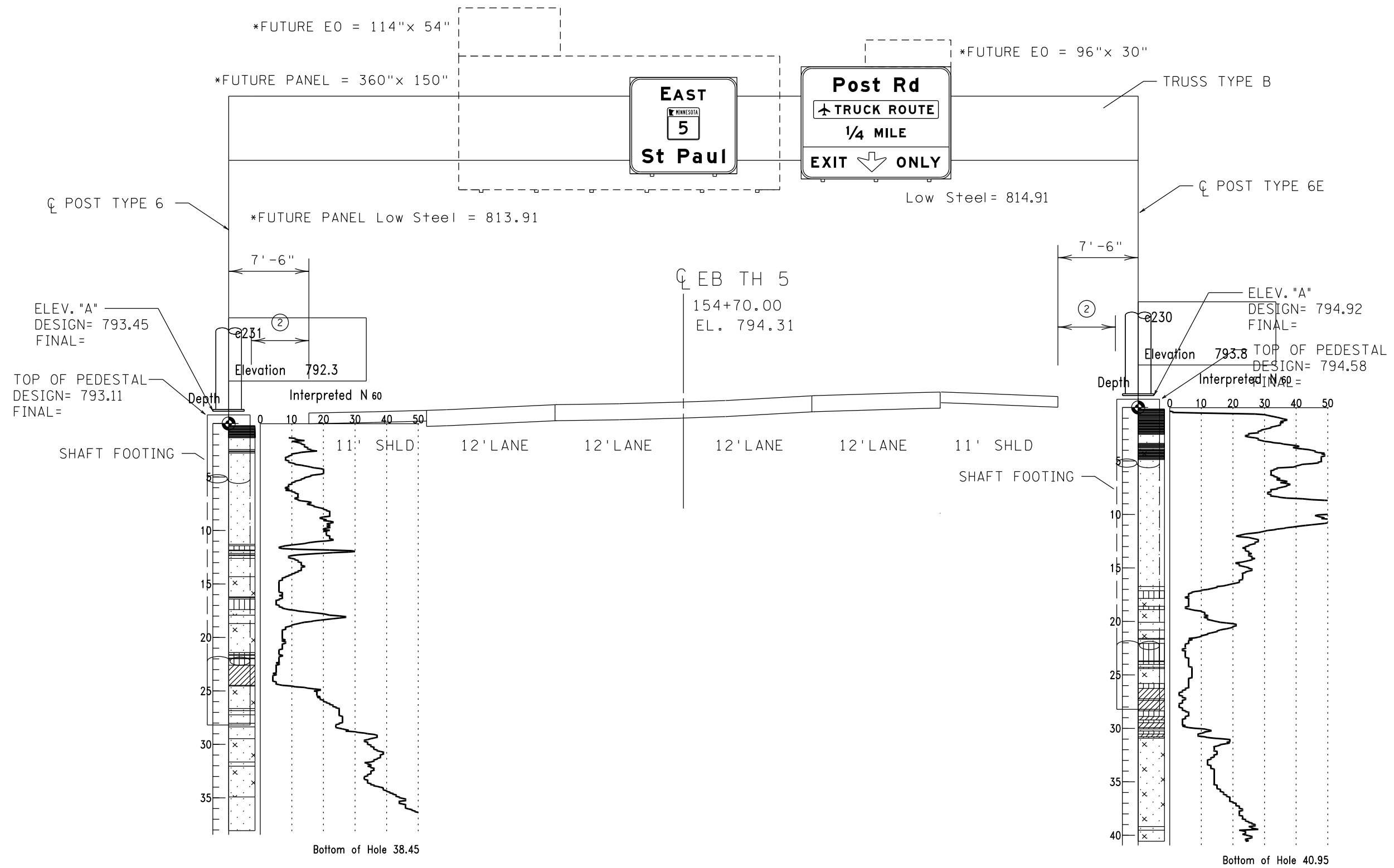
INPLACE
EB TH 5 STA 155+00



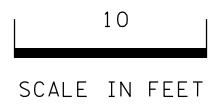
PROPOSED
EB TH 5 STA 154+70



FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITES 22-23 PLAN VIEW AND CPT LOCATIONS



SITE 22 (1)

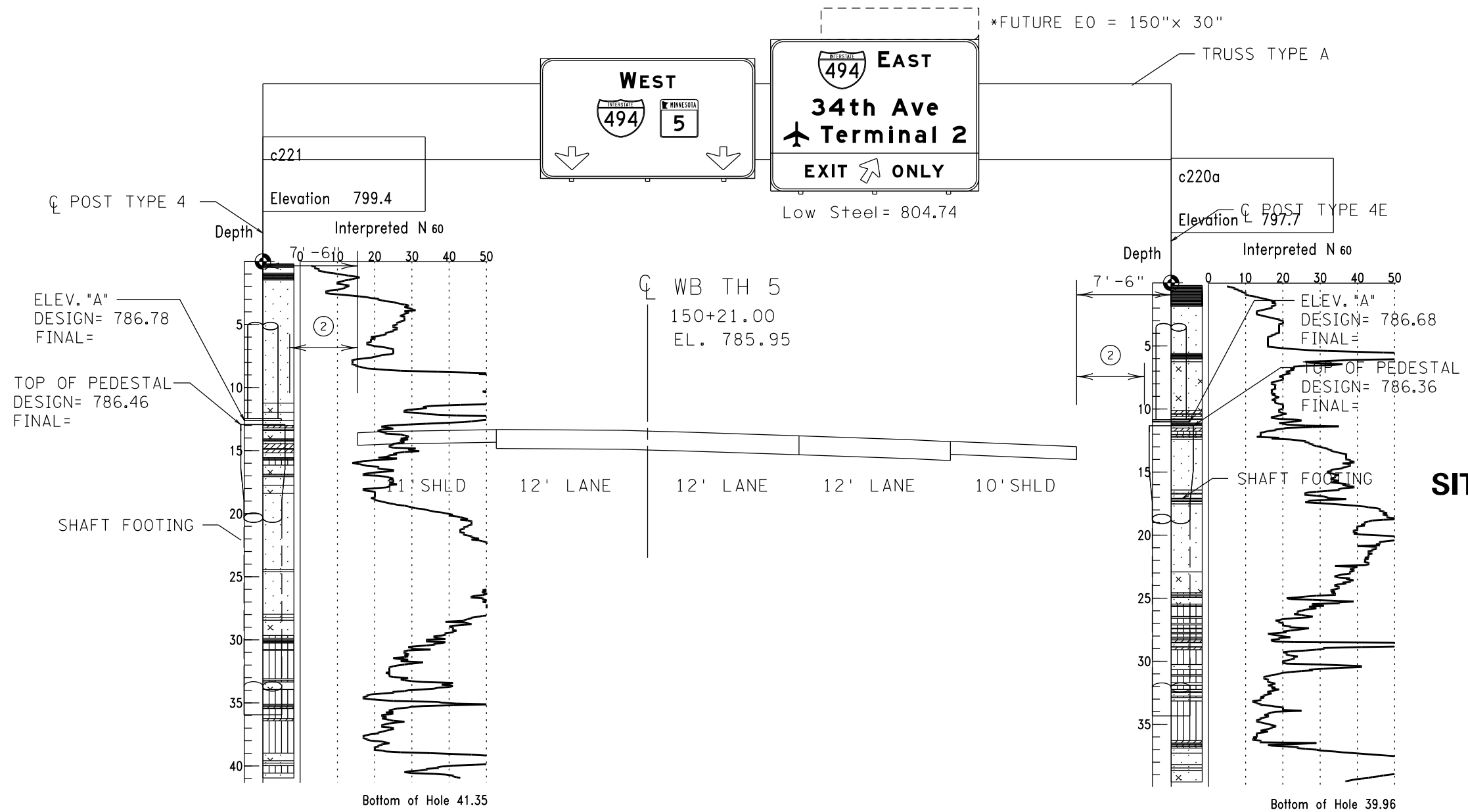


(1) INITIALLY NUMBERED AS SITE 23.
CPT SOUNDINGS SHOWN ARE CORRECT
FOR THIS SITE. SEE PLAN VIEW.

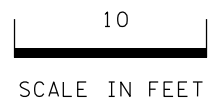
m FOUNDATION INVESTIGATION AND RECOMMENDATIONS
METRO DISTRICT
OVERHEAD SIGN REPLACEMENT
SITE 22 CROSS SECTION AND CPT SOUNDINGS

DEPARTMENT OF TRANSPORTATION

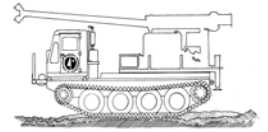
STATE PROJ. NO. 8825-682 (TH 5) SHEET NO. FR24 OF FR25 SHEETS



SITE 23 ①



① INITIALLY NUMBERED AS SITE 22.
CPT SOUNDINGS SHOWN ARE CORRECT
FOR THIS SITE. SEE PLAN VIEW.



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 cm² 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.

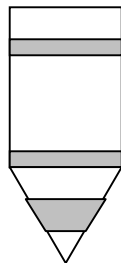
$$FR = f_s / q_t$$

V_s Shear Wave Velocity

A measure of the speed at which a seismic 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.



U2

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:

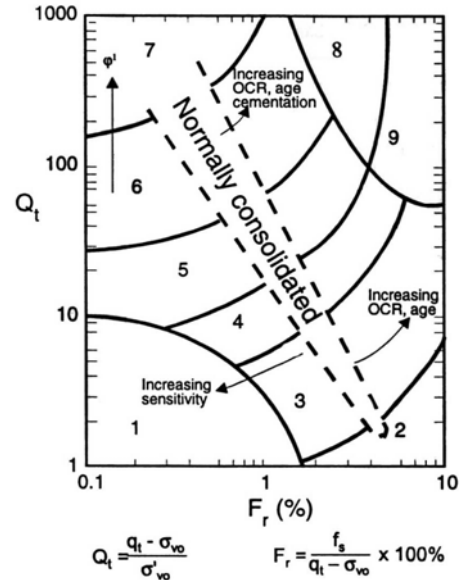
1. Sensitive, Fine Grained
2. Organic Soils - Peats
3. Clays - Clay to Silty Clay
4. Silt Mixtures - Clayey Silt to Silty Clay
5. Sand Mixtures - Silty Sand to Sandy Silt
6. Sands - Clean Sand to Silty Sand
7. Gravelly Sand to Sand
8. Very Stiff Sand to Clayey Sand
9. Very Stiff, Fine Grained

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.

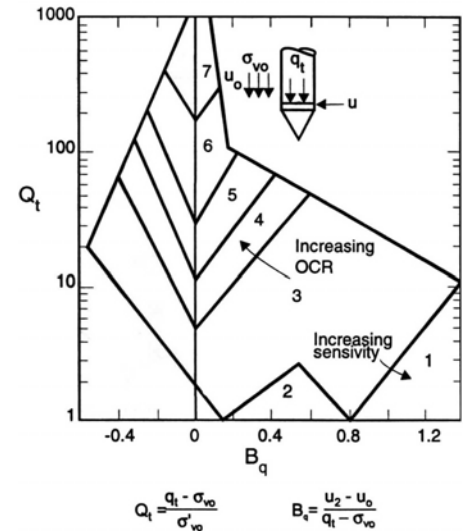
Robertson CPT 1990

Soil Behavior type based on friction ratio



Robertson CPTU 1990

Soil Behavior type based on pore pressure



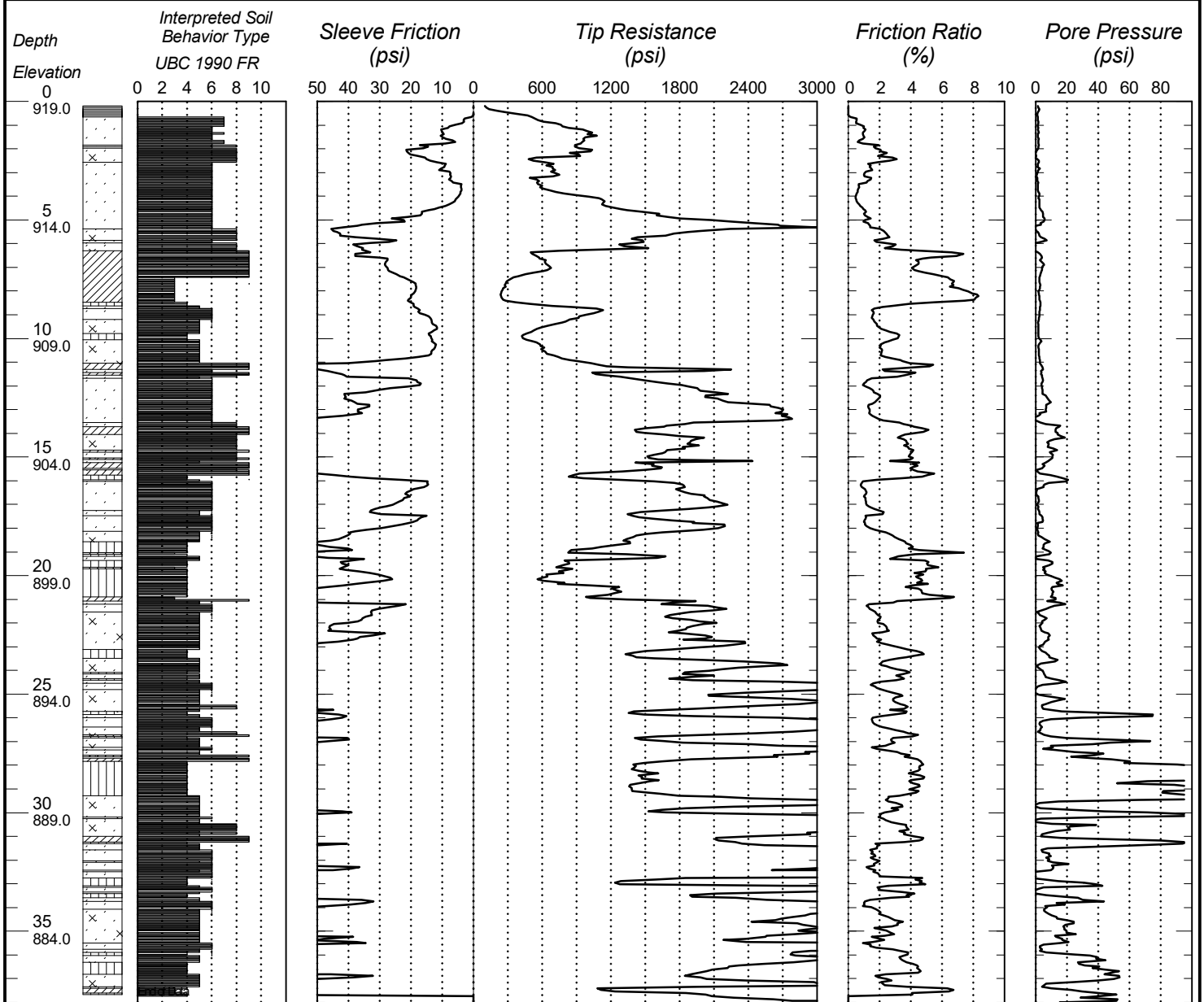
where ...

- 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
- u₂ measured pore pressure
- u₀ equilibrium pore pressure

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83504

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c10a	Ground Elevation 919.0 (GeoXH(DC))
Location Dakota County Coordinate System X=533255 Y=222427		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°48'27.58" Longitude (West)=93°11'18.76"		CPT Operator Dols, Darren	Date Completed 10/31/18	
		Hole Type CPT-STD		

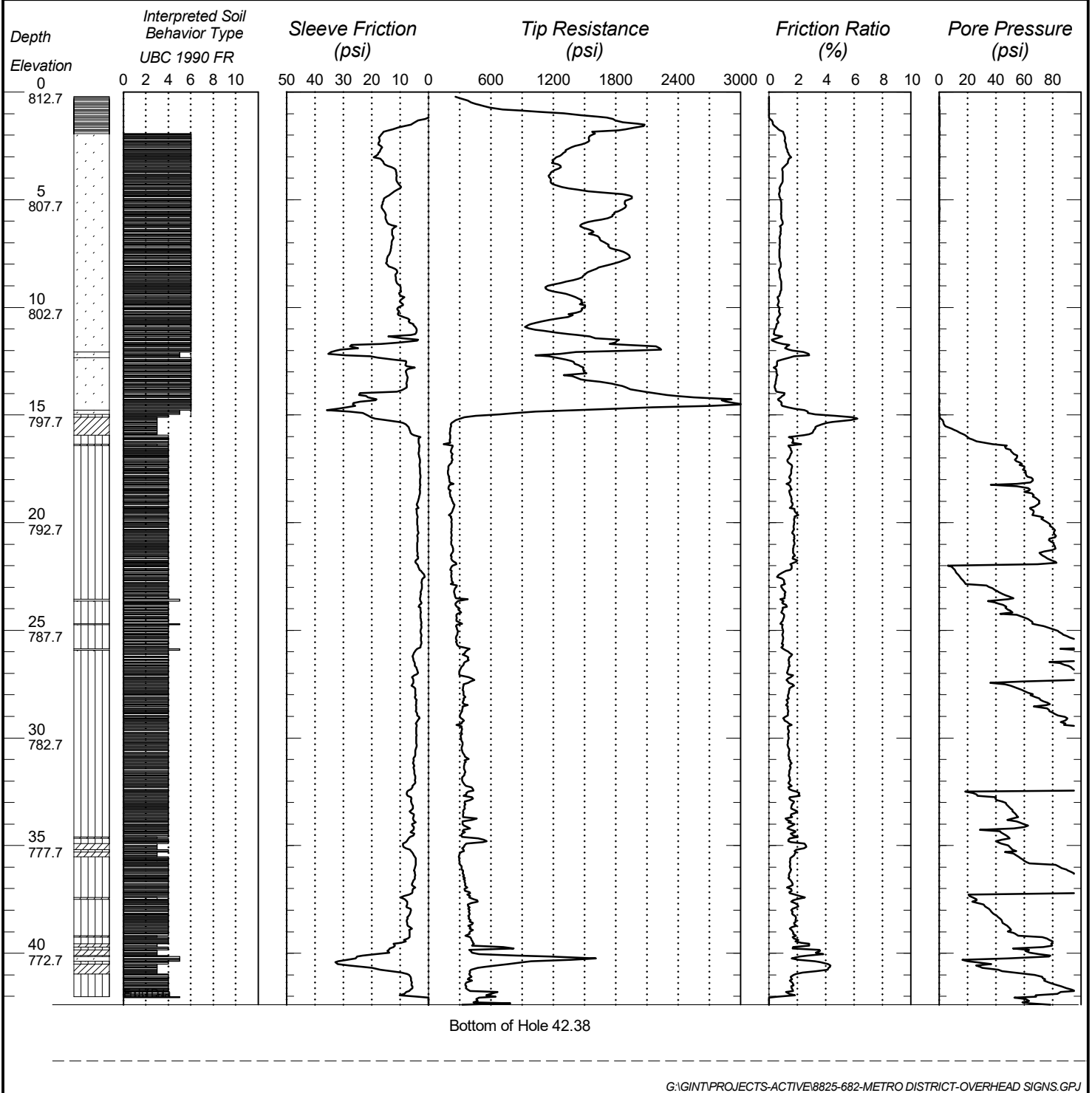


Bottom of Hole 38.06

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83494

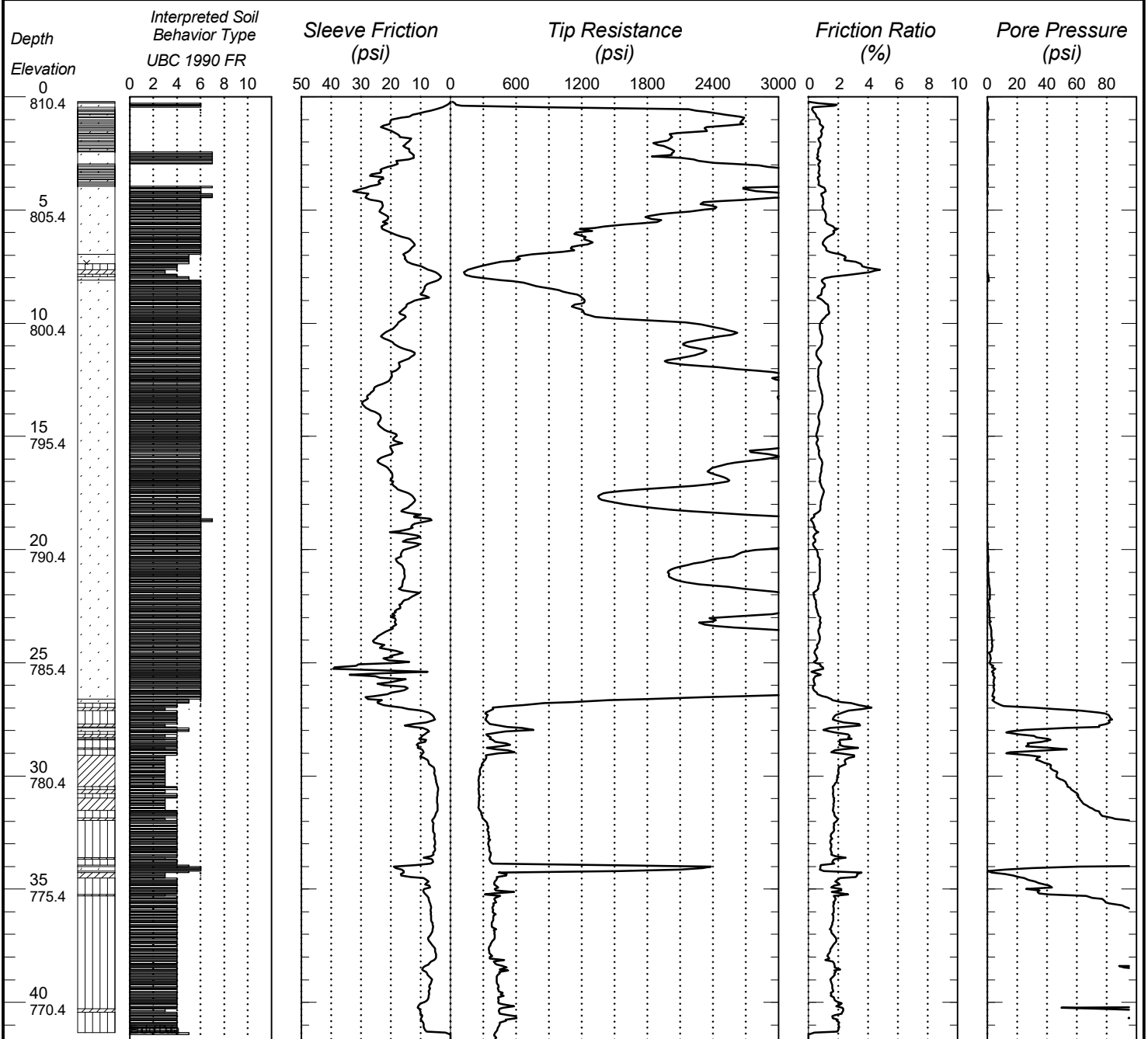
State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c60	Ground Elevation 812.7 (DTM)
Location Hennepin County Coordinate System X=524930 Y=172919		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°59'27.82" Longitude (West)=93°17'13.13"		CPT Operator O'Donnel	Date Completed 10/25/18	
		Hole Type CPT-STD		



CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83498

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c61	Ground Elevation 810.4 (DTM)
Location Hennepin County Coordinate System X=524997 Y=172861		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°59'27.24" Longitude (West)=93°17'12.2"		CPT Operator O'Donnel	Date Completed 10/29/18	
		Hole Type CPT-STD		

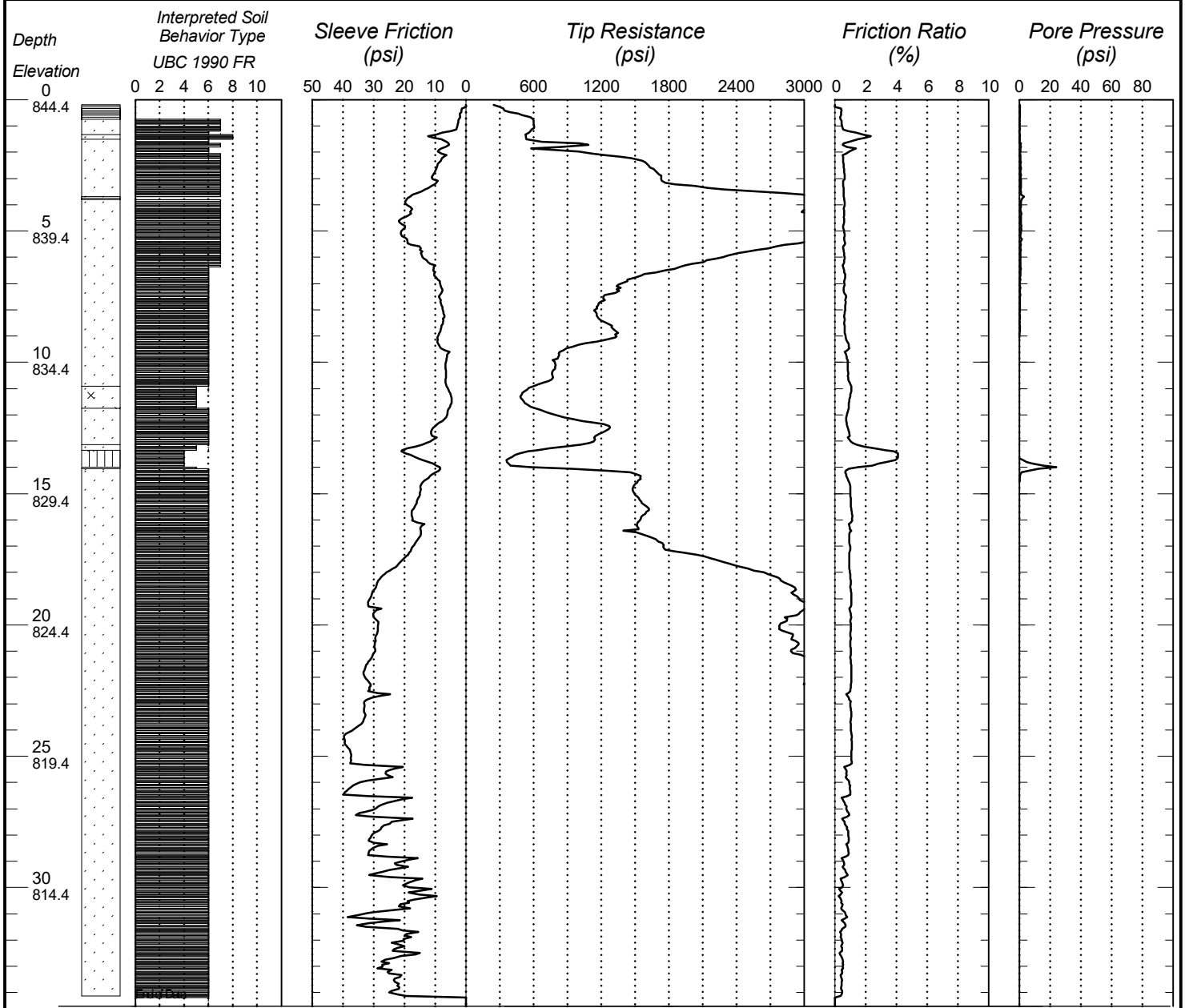


Bottom of Hole 41.7

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83495

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c70	Ground Elevation 844.4 (GeoXH(DC))
Location Hennepin County Coordinate System X=524754 Y=166421		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°58'23.66" Longitude (West)=93°17'15.68"		CPT Operator ODonnell	Date Completed 10/25/18	
		Hole Type CPT-STD		

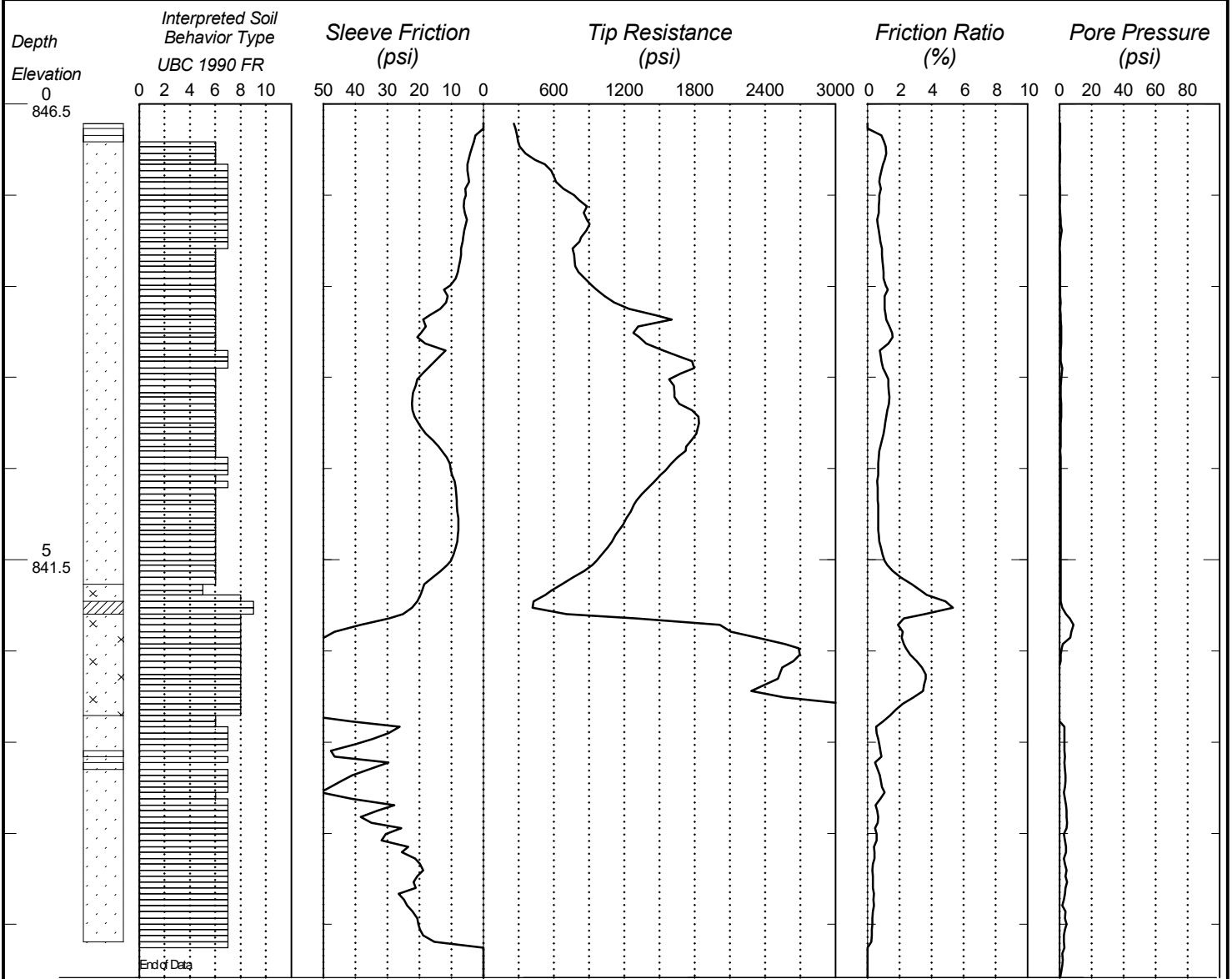


Bottom of Hole 34.51

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83502

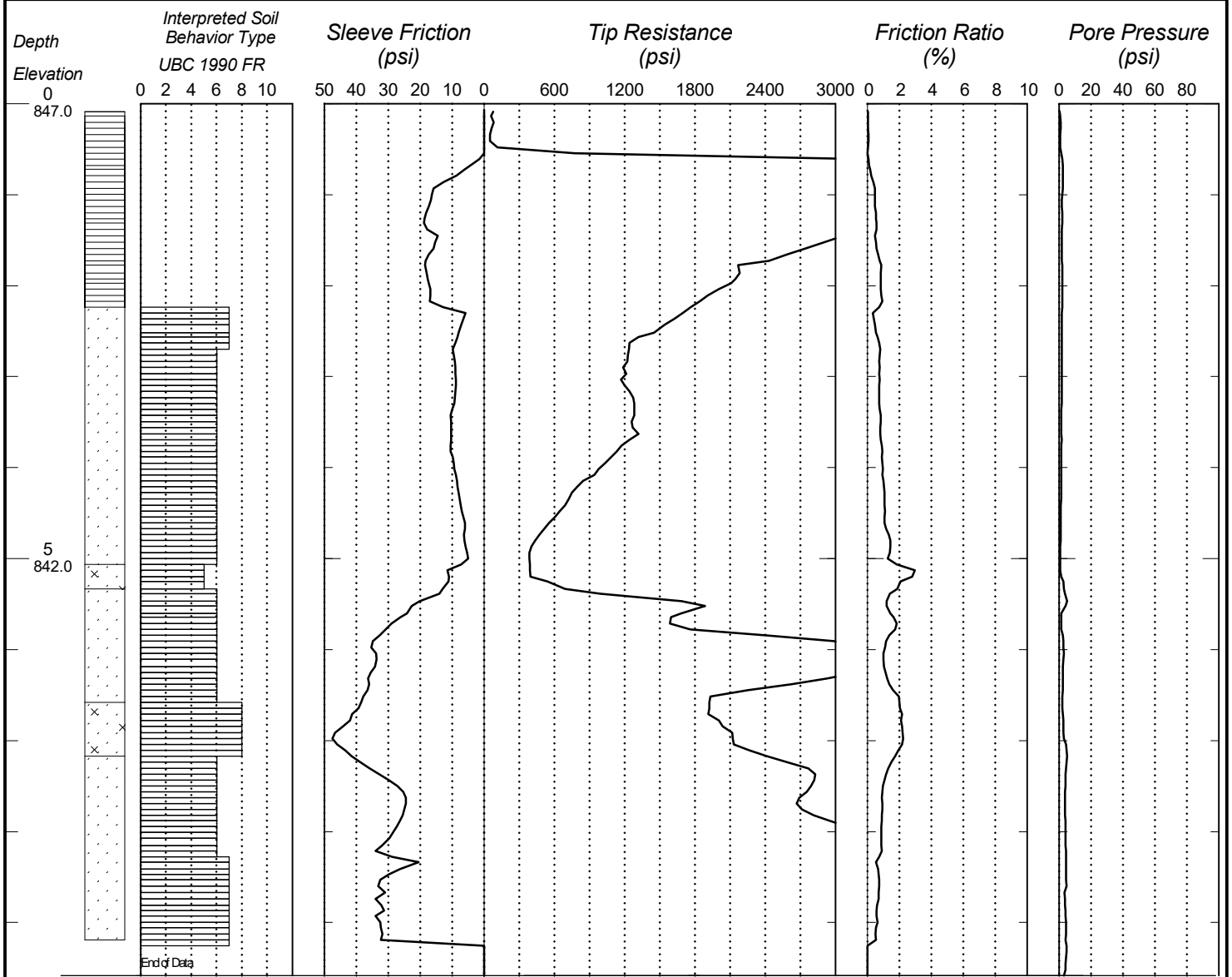
State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c90a	Ground Elevation 846.5 (GeoXH(DC))
Location Hennepin County Coordinate System X=525979 Y=181893		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=45°00'56.41" Longitude (West)=93°16'58.38"		CPT Operator Dusbabek	Date Completed 10/30/18	
		Hole Type CPT-STD		



CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83503

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c91	Ground Elevation 847.0 (GeoXH(DC))
Location Hennepin County Coordinate System X=526062 Y=181908		CPT Machine 203094	CPT Truck CPT Truck	SHEET 1 of 1
Latitude (North)=45°00'56.55" Longitude (West)=93°16'57.22"		CPT Operator Dusbabek	Hole Type CPT-STD	Date Completed 10/30/18

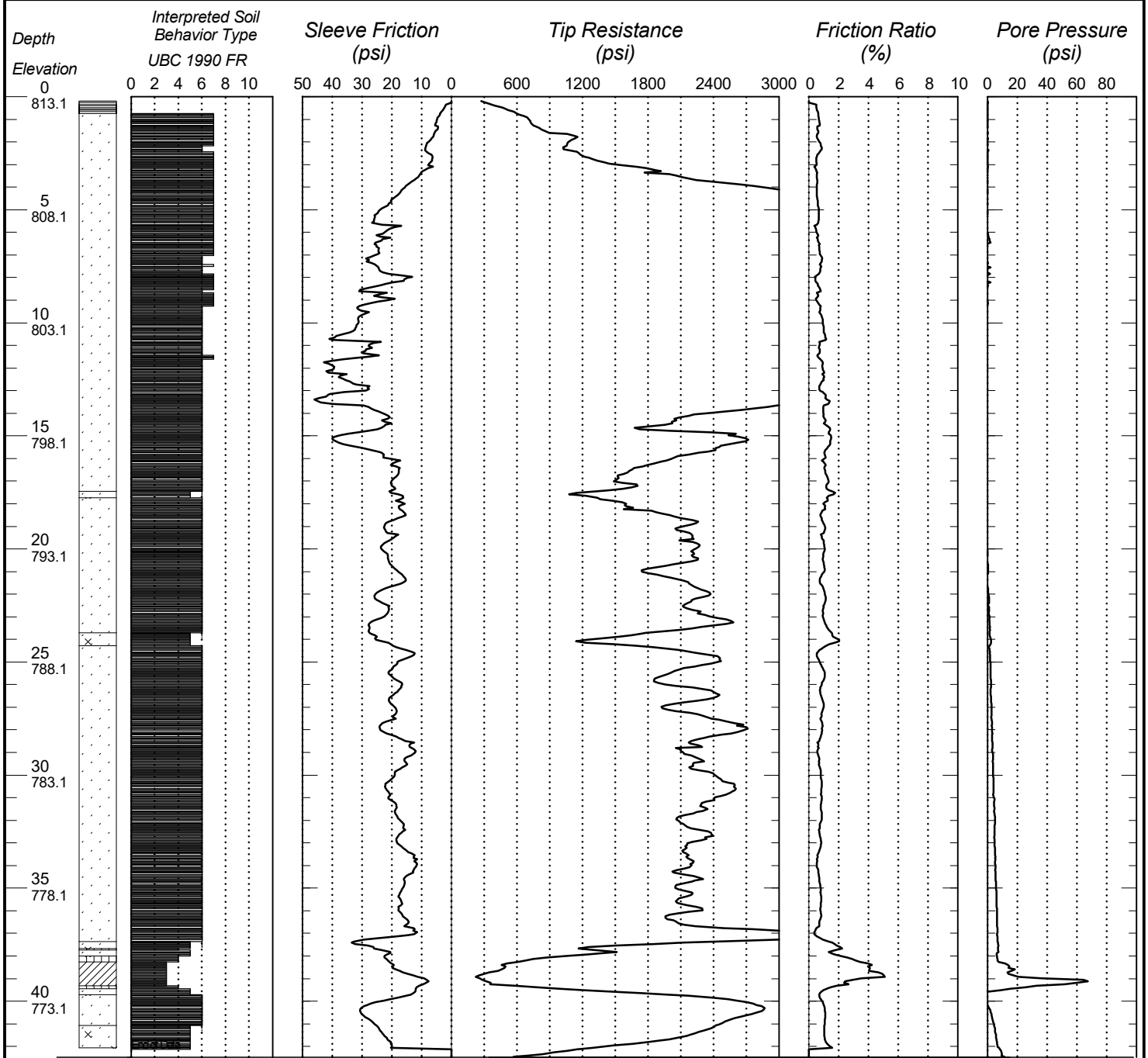


Bottom of Hole 9.58

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83492

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c100	Ground Elevation 813.1 (DTM)
Location Hennepin County Coordinate System X=525280 Y=173009		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°59'28.7" Longitude (West)=93°17'08.26"		CPT Operator ODonnell	Date Completed 10/25/18	
		Hole Type CPT-STD		

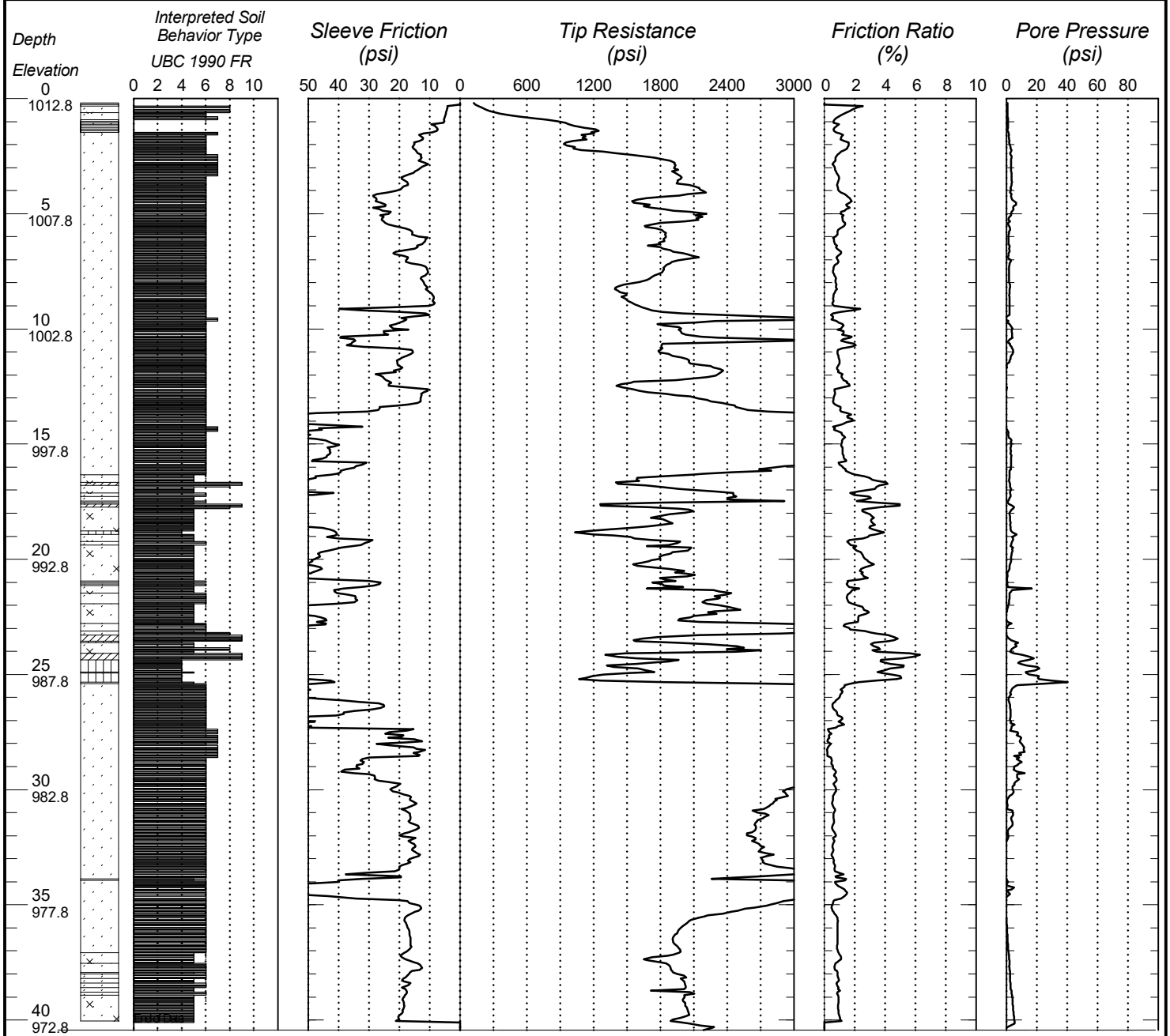


Bottom of Hole 42.47

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83540

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c120	Ground Elevation 1012.8(DTM)
Location Washington County Coordinate System X=468709 Y=174091		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°56'56.27" Longitude (West)=92°57'15.34"		CPT Operator Dols, Darren	Date Completed 11/1/18	
		Hole Type CPT-STD		

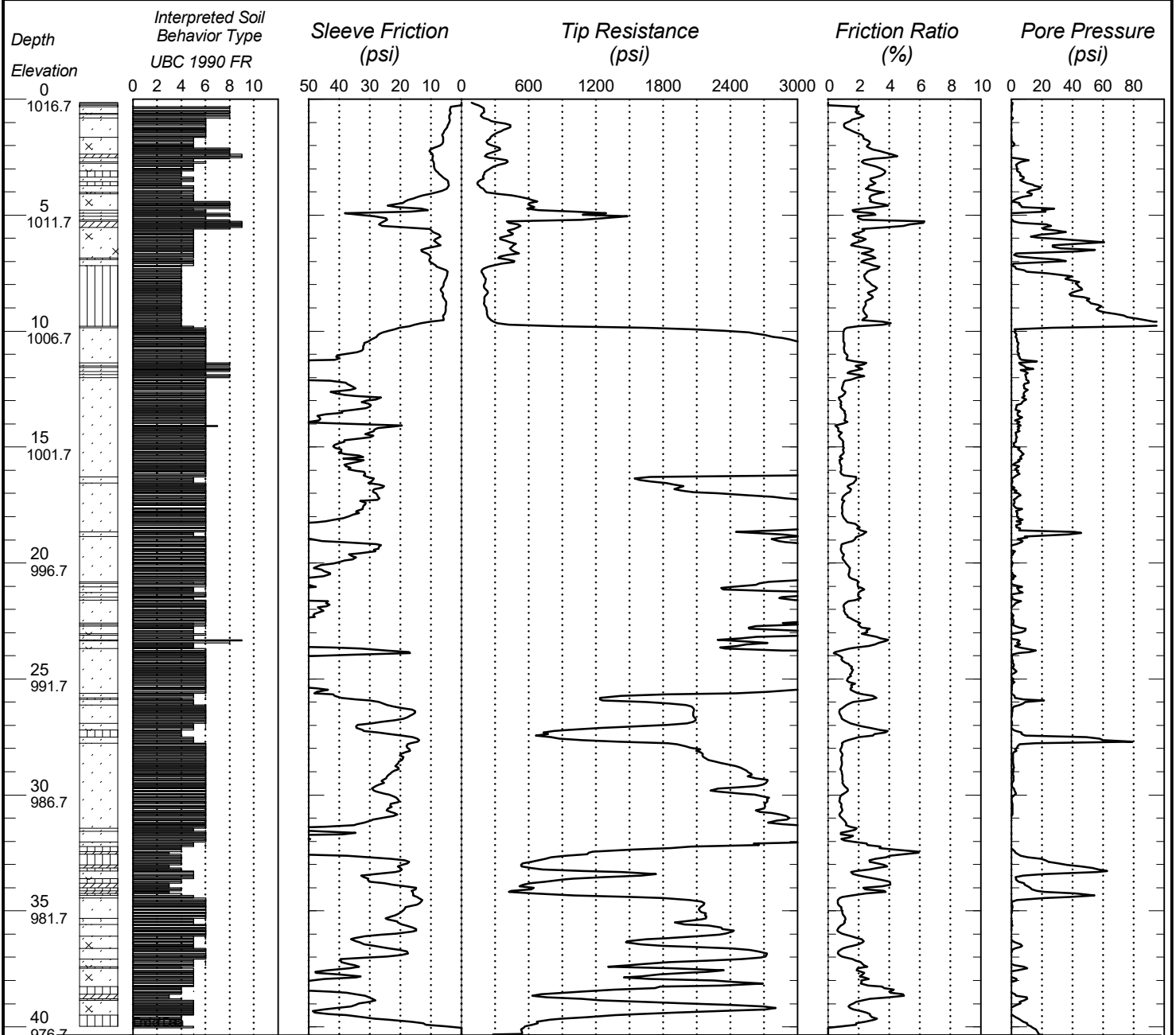


Bottom of Hole 40.43

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83541

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c130	Ground Elevation 1016.7 (DTM)
Location Washington County Coordinate System X=470247 Y=174033		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°56'55.72" Longitude (West)=92°56'53.95"		CPT Operator Dols, Darren	Date Completed	
		Hole Type CPT-STD	11/1/18	

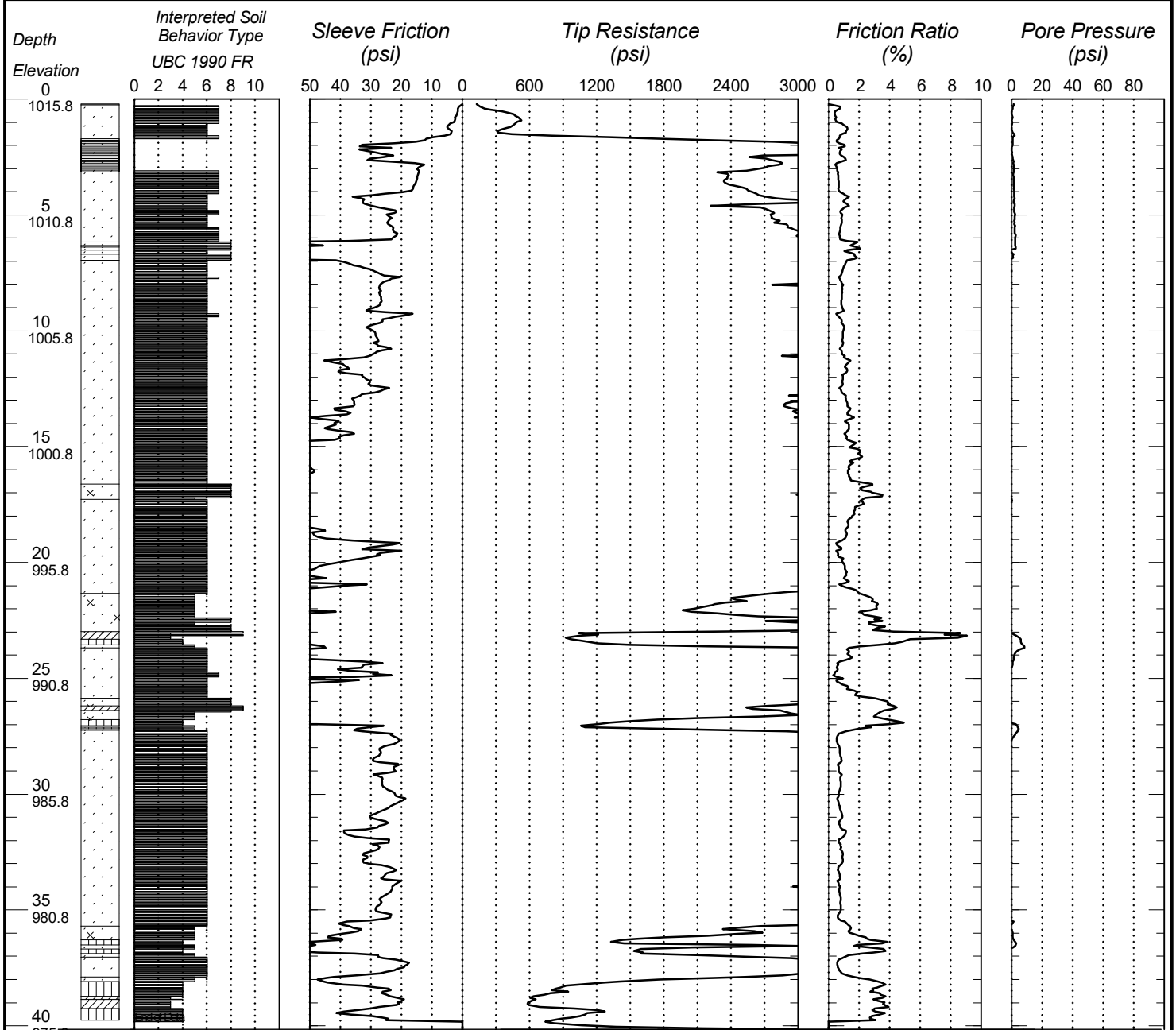


Bottom of Hole 40.34

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83542

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c131a	Ground Elevation 1015.8(DTM)
Location Washington County Coordinate System X=470262 Y=173925		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°56'54.66" Longitude (West)=92°56'53.75"		CPT Operator Dols, Darren	Date Completed	
		Hole Type CPT-STD	11/1/18	

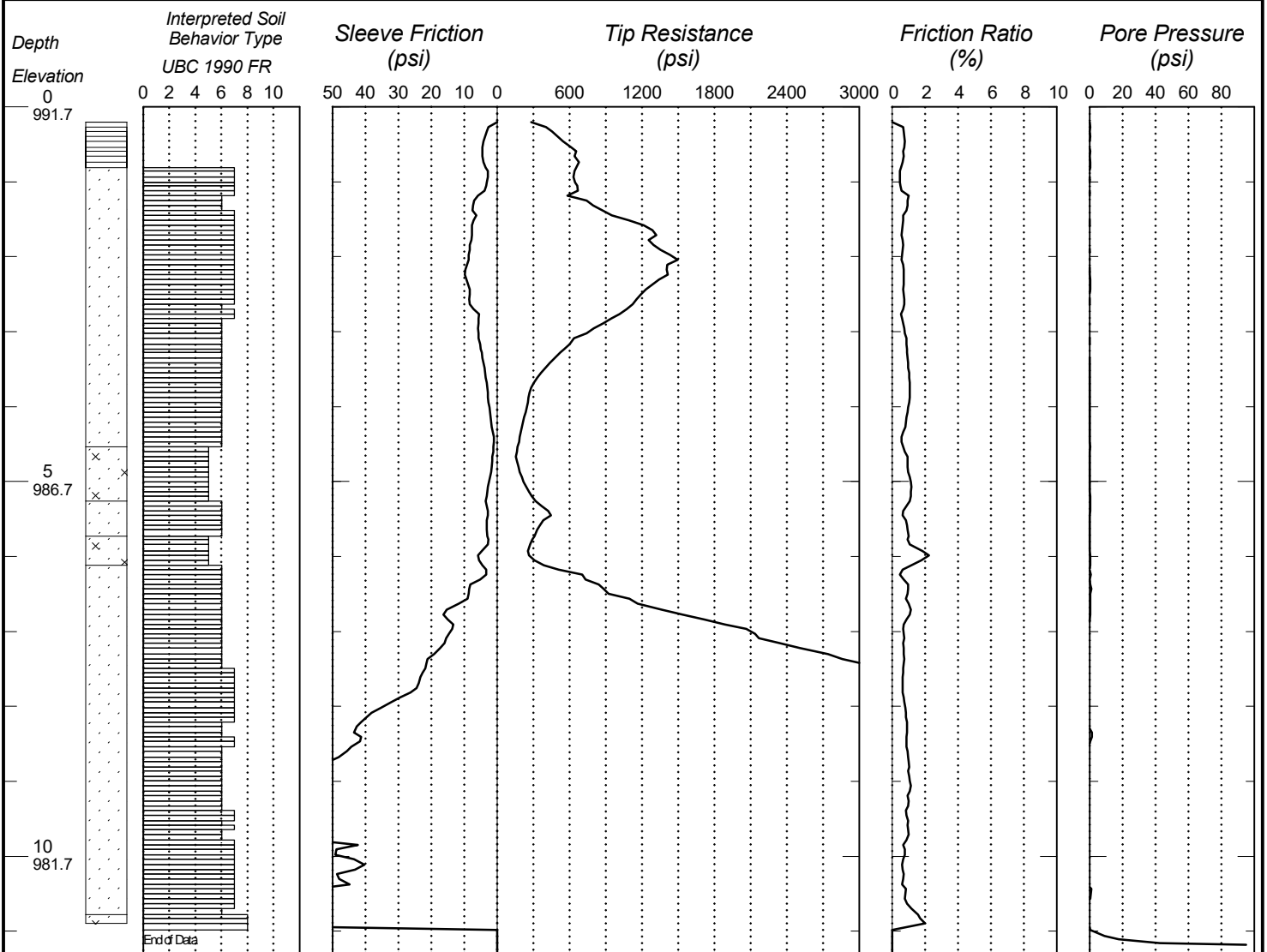


Bottom of Hole 40.16

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83543

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c140	Ground Elevation 991.7 (DTM)
Location Washington County Coordinate System X=472704 Y=173997		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°56'55.4" Longitude (West)=92°56'19.79"		CPT Operator Dols, Darren	Date Completed	
		Hole Type CPT-STD	11/1/18	

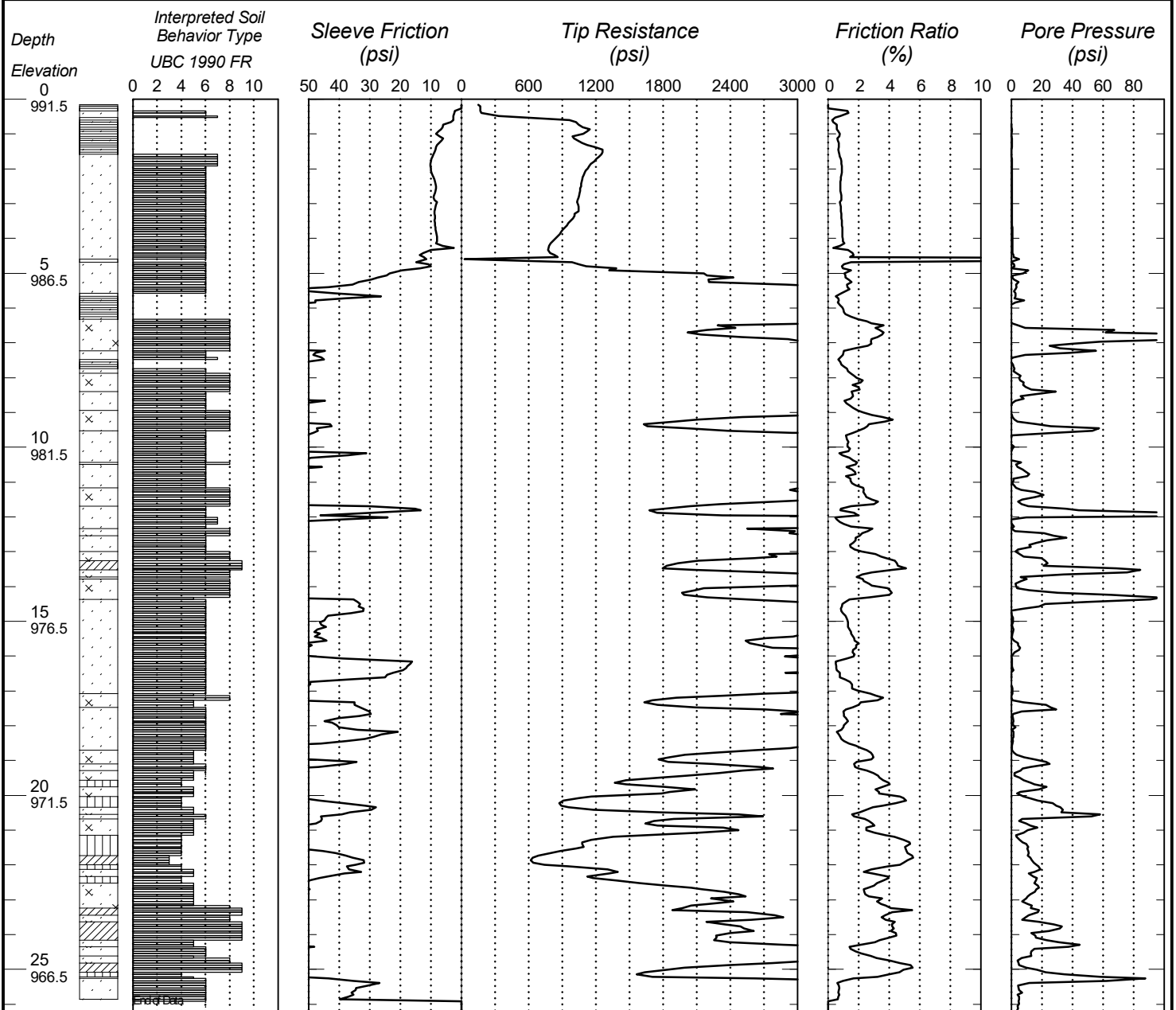


Bottom of Hole 11.29

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83544

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c141	Ground Elevation 991.5 (DTM)
Location Washington County Coordinate System X=472702 Y=173904		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°56'54.48" Longitude (West)=92°56'19.82"		CPT Operator Dols, Darren	Date Completed	
		Hole Type CPT-STD	11/1/18	

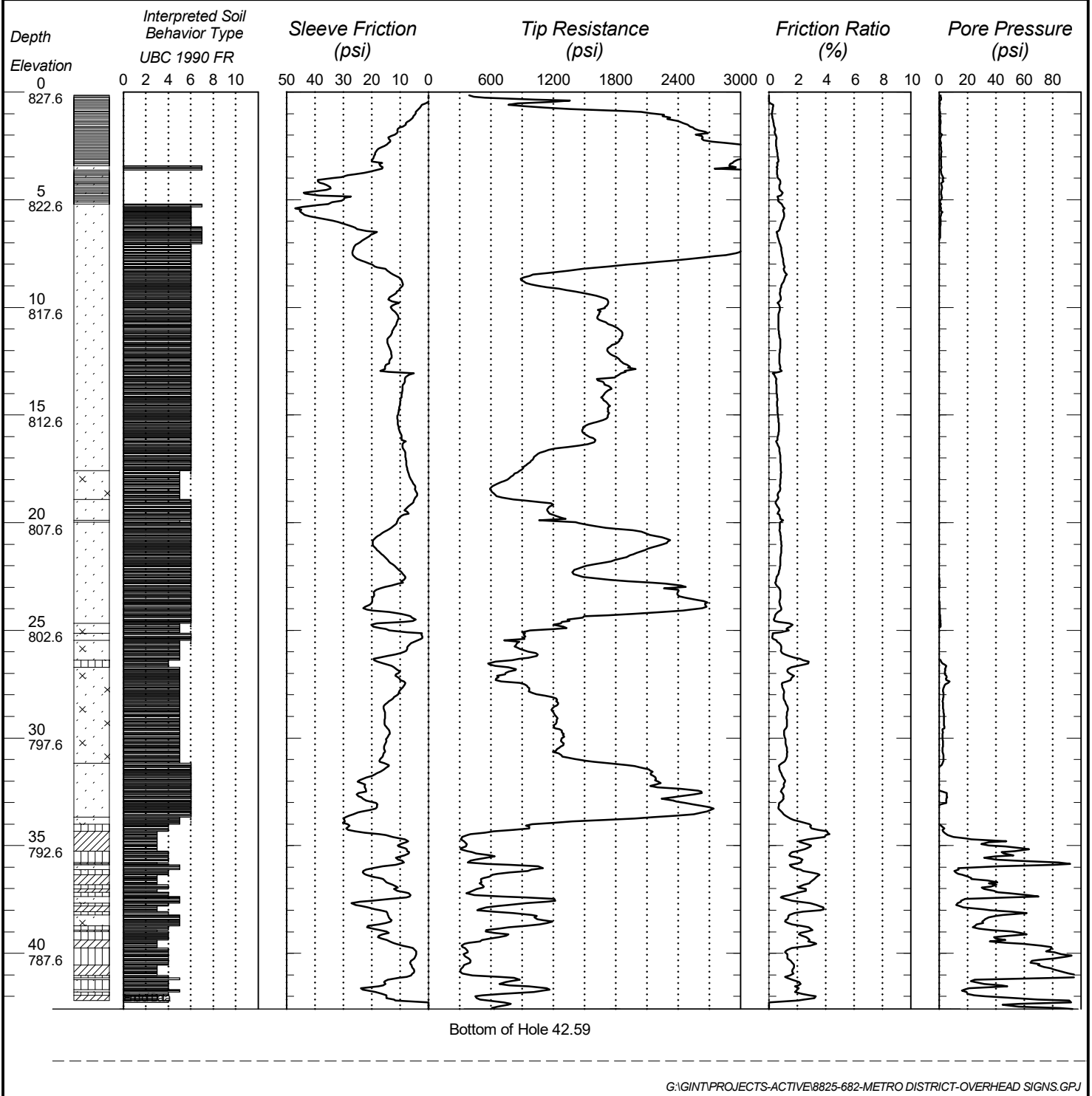


Bottom of Hole 26.25

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83493

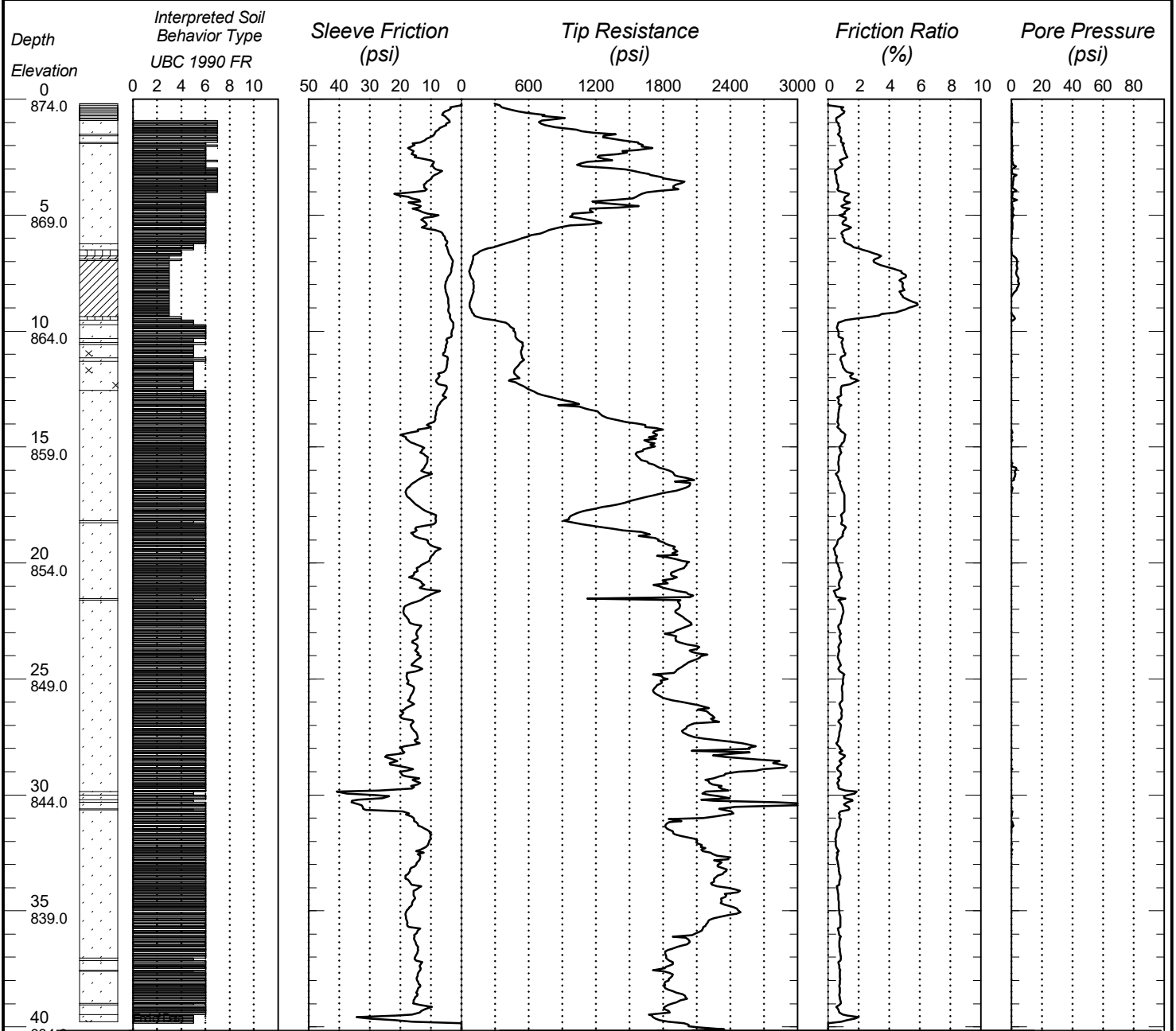
State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c150b	Ground Elevation 827.6 (DTM)
Location Hennepin County Coordinate System X=524730 Y=165391		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°58'13.49" Longitude (West)=93°17'16.03"		CPT Operator O'Donnel	Date Completed 10/25/18	
		Hole Type CPT-STD		



CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83545

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c170	Ground Elevation 874.0 (DTM)
Location Ramsey County Coordinate System X=570497 Y=158136		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°57'00.83" Longitude (West)=93°06'39.81"		CPT Operator Dols, Darren	Date Completed	
		Hole Type CPT-STD	11/1/18	

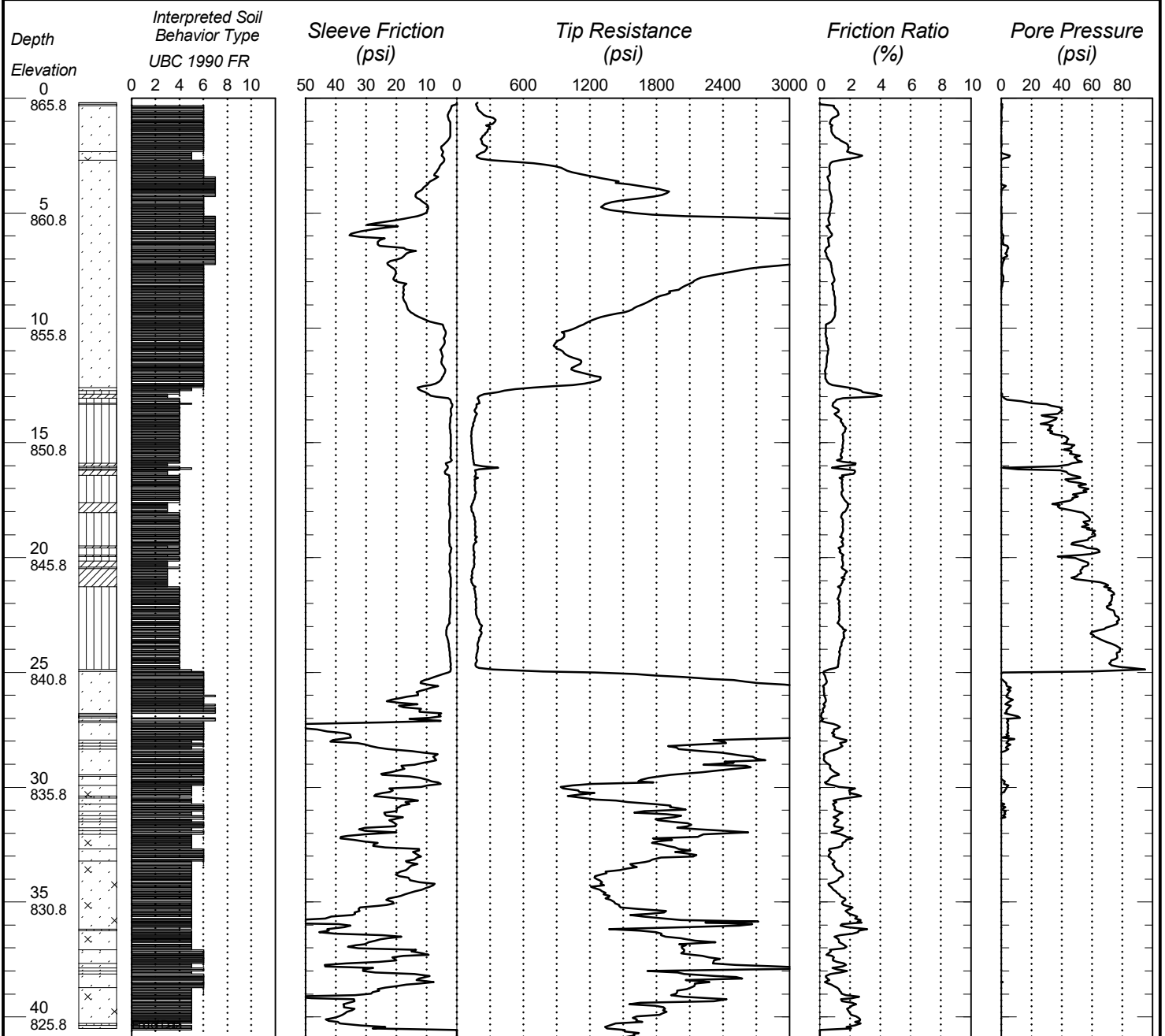


Bottom of Hole 40.16

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83497

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c180	Ground Elevation 865.8 (GeoXH (DC))
Location Hennepin County Coordinate System X=508930 Y=203987		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=45°04'34.68" Longitude (West)=93°20'55.56"		CPT Operator O'Donnell	Date Completed 10/29/18	
		Hole Type CPT-STD		

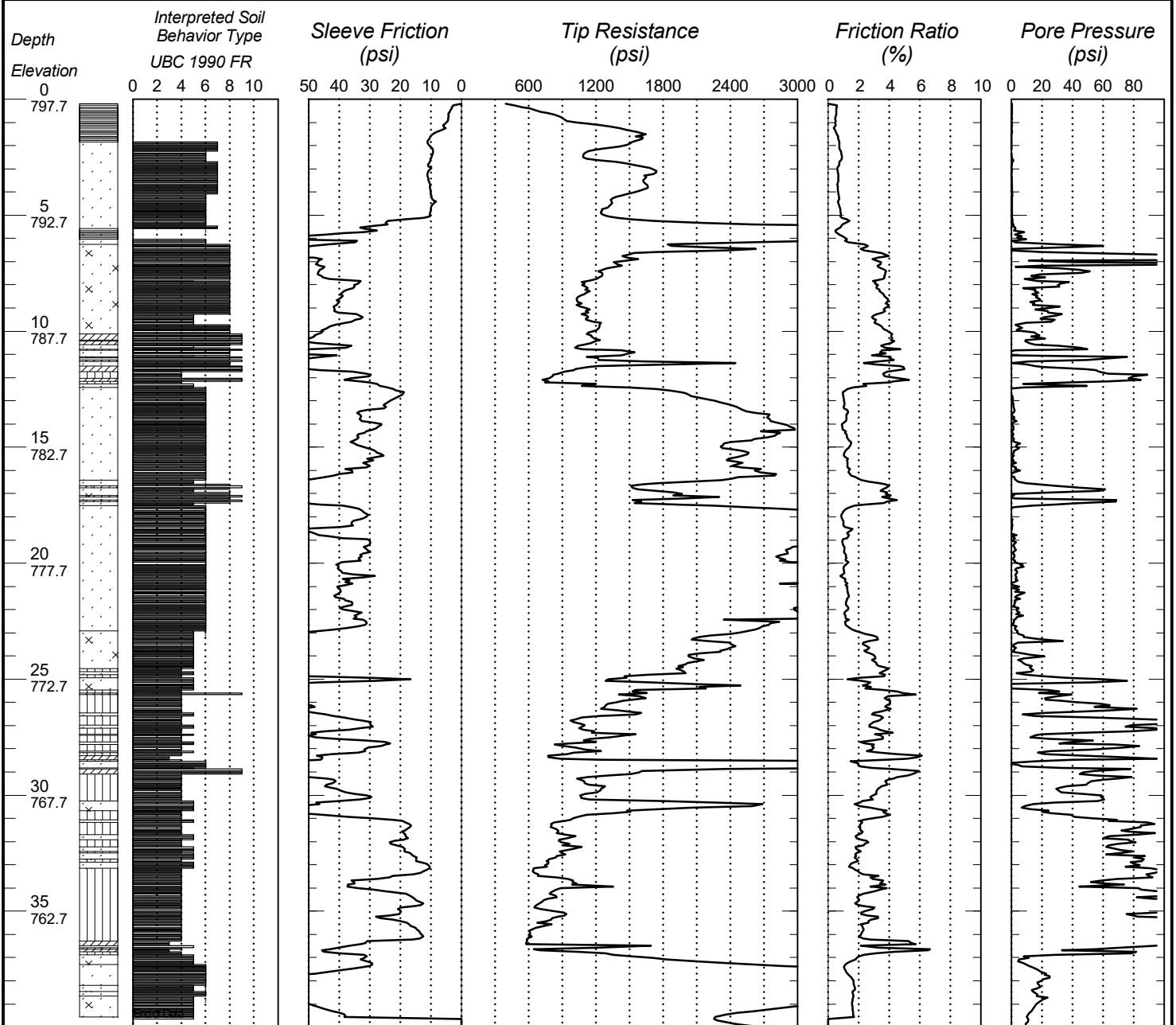


Bottom of Hole 40.88

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83505

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c220a	Ground Elevation 797.7 (GeoXH(DC))
Location Hennepin County Coordinate System X=546325 Y=127176		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°51'55.82" Longitude (West)=93°12'16.85"		CPT Operator Dols, Darren	Date Completed 10/31/18	
		Hole Type CPT-STD		

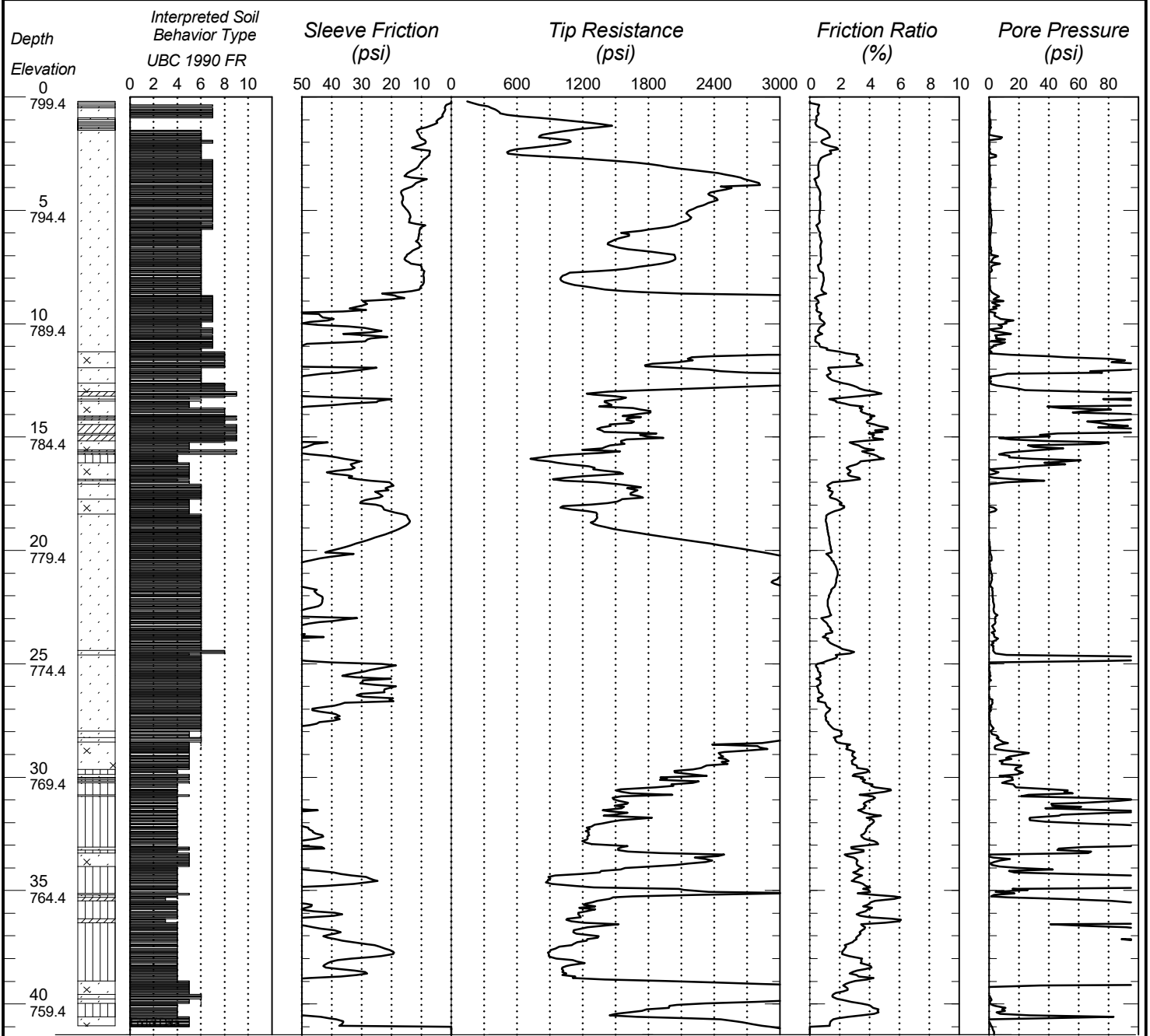


Bottom of Hole 39.96

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83506

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c221	Ground Elevation 799.4 (GeoXH(DC))
Location Hennepin County Coordinate System X=546329 Y=127103		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°51'55.1" Longitude (West)=93°12'16.79"		CPT Operator Dols, Darren	Date Completed 10/31/18	
		Hole Type CPT-STD		

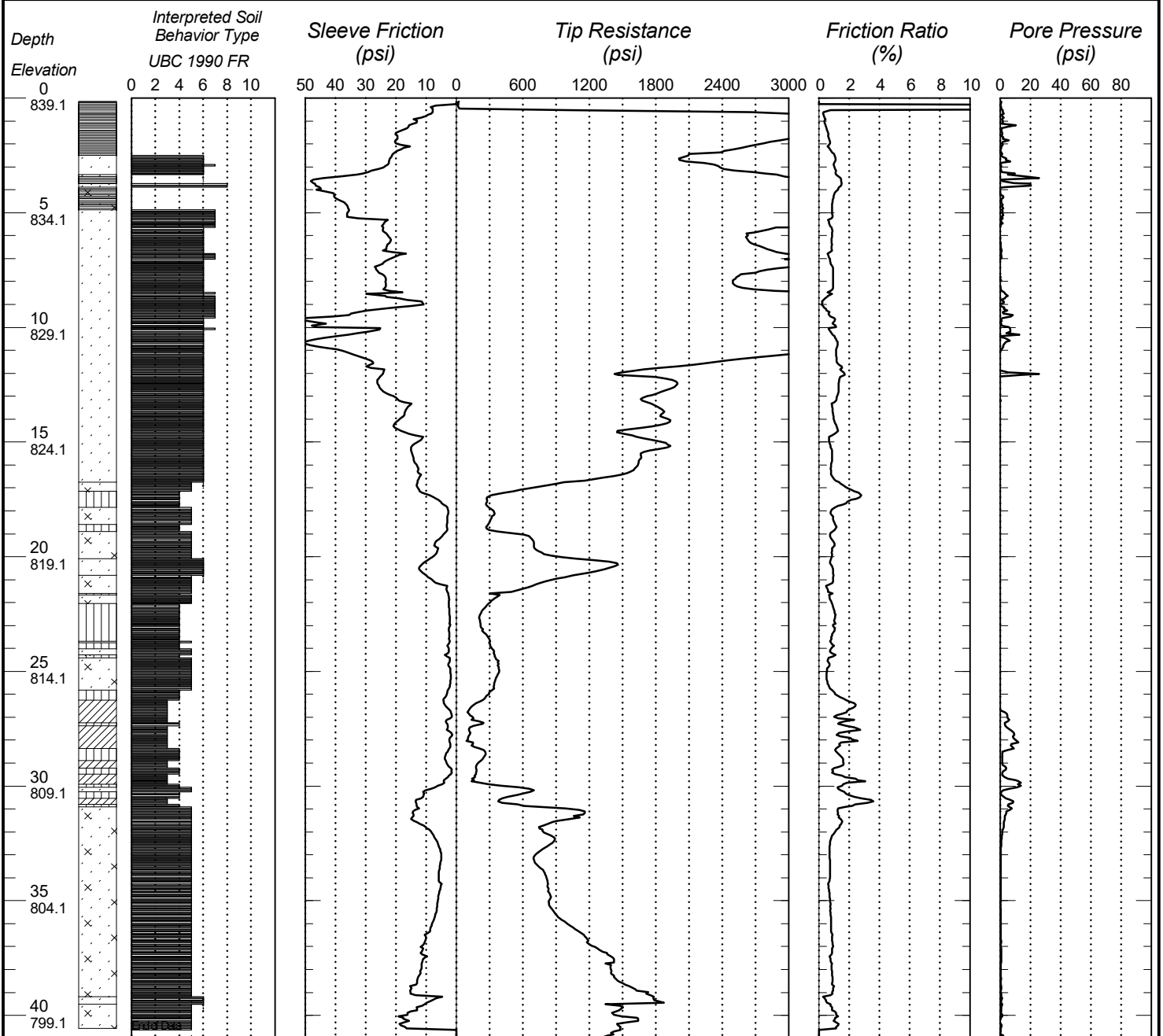


Bottom of Hole 41.35

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83507

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c230	Ground Elevation 839.1 (GeoXH(DC))
Location Hennepin County Coordinate System X=546846 Y=127387		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°51'57.89" Longitude (West)=93°12'09.61"		CPT Operator Dols, Darren	Date Completed 10/31/18	
		Hole Type CPT-STD		

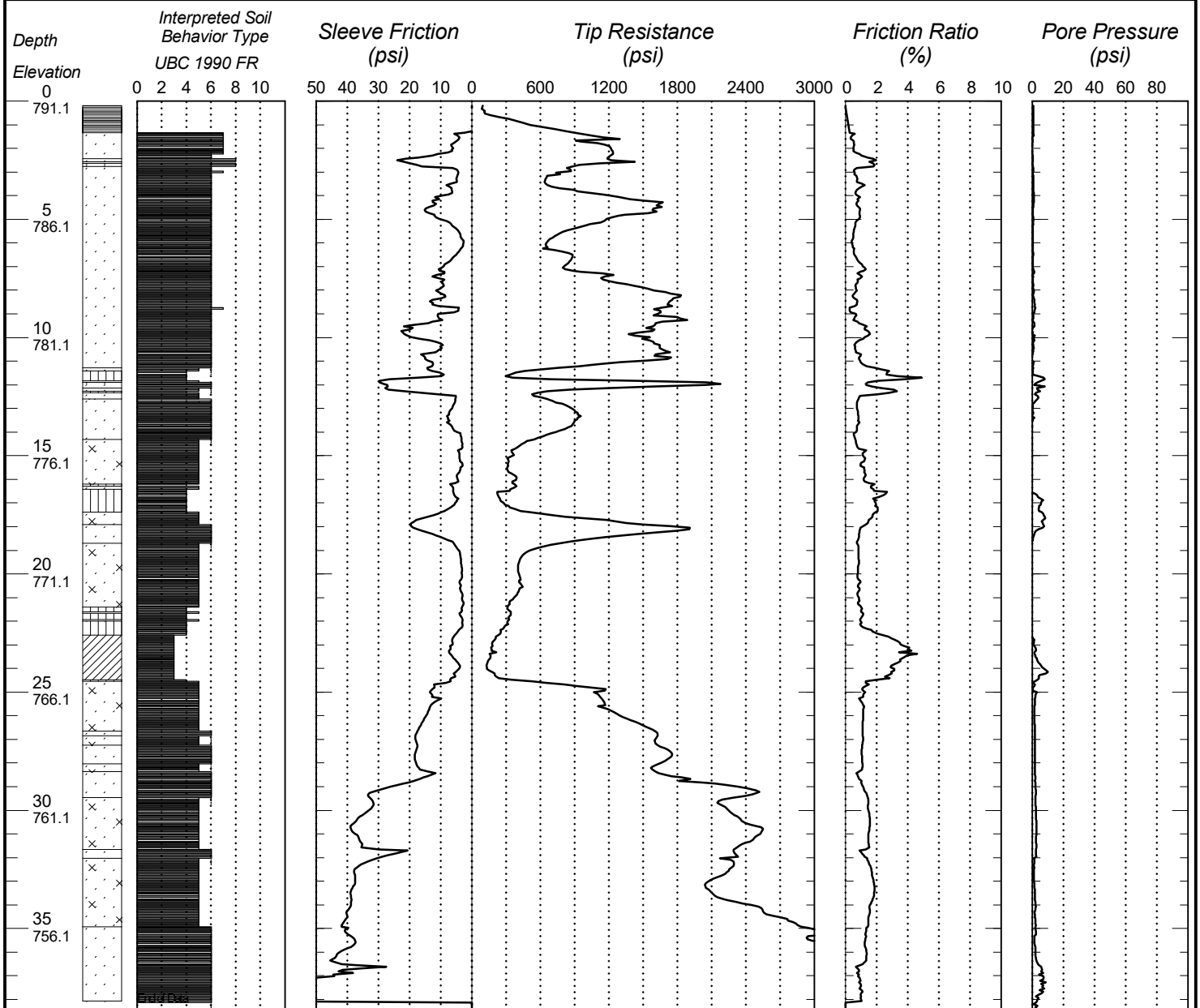


Bottom of Hole 40.95

CONE PENETRATION TEST RESULTS

UNIQUE NUMBER 83508

State Project 8825-682	Bridge No. or Job Desc. Overhead Signs	Trunk Highway/Location	Sounding No. c231	Ground Elevation 791.1 (GeoXH(DC))
Location Hennepin County Coordinate System X=546822 Y=127469		CPT Machine 203094 CPT Truck	SHEET 1 of 1	
Latitude (North)=44°51'58.7" Longitude (West)=93°12'09.93"		CPT Operator Dols, Darren	Date Completed 10/31/18	
		Hole Type CPT-STD		



Bottom of Hole 38.45

USER NOTES, ABBREVIATIONS AND DEFINITIONS – Additional information available in Geotechnical Manual

This boring was made by ordinary and conventional methods and with care deemed adequate for the Department's design purposes. Since this boring 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 boring.

Since subsurface conditions outside each borehole 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 boring 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 levels recorded on this log should be used with discretion since the use of drilling fluids in borings may seriously distort the true field conditions. Also, water levels in cohesive soils 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.

WATER MEASUREMENT

- AB After Bailing
- AC After Completion
- AF After Flushing
- wC with Casing
- wM With Mud
- WSD While Sampling/Drilling
- w /AUG With Hollow Stem Auger

DRILLING OPERATIONS

- AUG Augered
- CD Core Drilled
- DBD Disturbed by Drilling
- DBJ Disturbed by Jetting
- PD Plug Drilled
- ST Split Tube (SPT test)
- TW Thinwall (3" Shelby Tube)
- WS Wash Sample
- AB After Bailing
- NSR No Sample Retrieved
- WH Weight of Hammer
- WR Weight of Rod
- Mud Drilling Fluids in Sample
- CS Continuous Sample

MISCELLANEOUS

- NA Not Applicable
- w with
- w/o with out
- sat saturated

SOIL CORE TESTS

- SPT N₆₀ASTM D1586 Modified Blows per foot with 140 lb. hammer and a standard energy of 210 ft-lbs. This energy represents 60% of the potential energy of the system and is the average energy provided by a Rope & Cathead system.
- MC Moisture Content
- COH Cohesion (equivalent to 1/2 Unconfined Compression Strength)
- γ Sample Unit Weight
- LL Liquid Limit
- PI Plasticity Index
- φ Angle of Internal Friction
- REC Percent Core Recovered
- RQD Rock Quality Description (Percent of total core interval consisting of unbroken pieces 4 inches or longer)
- ACLAverage Core Length (Average length of core that is greater than 4 inches long)
- Core Breaks..... Number of natural core breaks per 2 foot interval.

DISCONTINUITY SPACING

- | | | |
|------------|--------------|-----------|
| Fractures | Distance | Bedding |
| Very Close | <2 inches | Very Thin |
| Close | 2-12 inches | Thin |
| Mod. Close | 12-36 inches | Medium |
| Wide | >36 inches | Thick |

RELATIVE DENSITY

- | | |
|-------------------------------------|------------|
| <u>Compactness – Granular Soils</u> | <u>BPF</u> |
| very loose | 0-4 |
| loose | 5-10 |
| medium dense | 11-24 |
| dense | 25-50 |
| very dense | > 50 |

Consistency – Cohesive Soils BPF

- | | |
|------------|-------|
| very soft | 0-1 |
| soft | 2-4 |
| firm | 5-8 |
| stiff | 9-15 |
| very stiff | 16-30 |
| hard | 31-60 |
| very hard | > 60 |

COLOR

- | | | | |
|------|--------------------|-----|--------|
| blk | Black | wht | White |
| brn | Brown | yel | Yellow |
| orng | Orange | lt | Light |
| grn | Green | dk | dark |
| IOS | Iron Oxide Stained | gr | Grey |












GRAIN SIZE /PLASTICITY

- | | | | |
|----|-----------|------|------------------|
| VF | Very Fine | pl | Plastic |
| F | Fine | slpl | Slightly Plastic |
| Cr | Coarse | | |

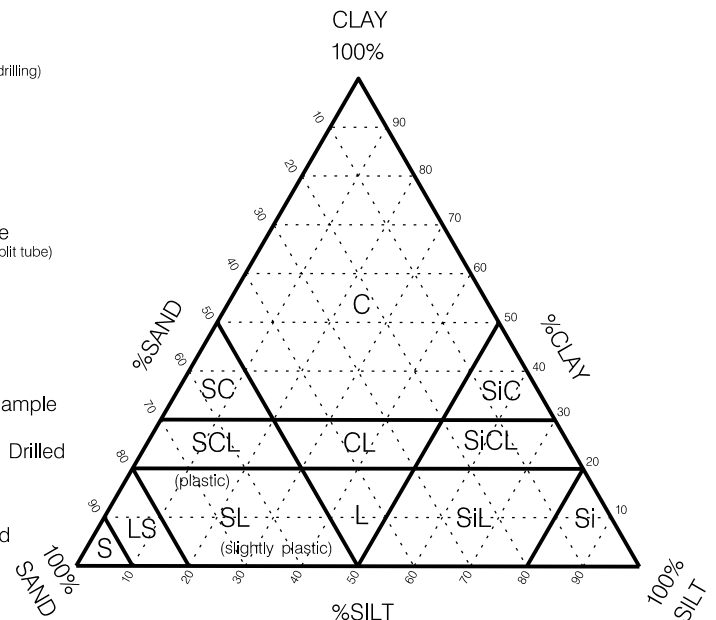
SOIL /ROCK TERMS

- | | | | |
|------|---|------|-----------|
| C | Clay | Lmst | Limestone |
| L | Loam | Sst | Sandstone |
| S | Sand | Dolo | Dolostone |
| Si | Silt | wx | weathered |
| G | Gravel (No. 10 Sieve to 3 in.) | | |
| Bldr | Boulder (over 3 inches dia.) | | |
| T | till (unsorted, nonstratified glacial deposits) | | |

DRILLING SYMBOLS

- | | |
|---|--|
|  | Vane Shear Test |
|  | Washed Sample (Collected during plug drilling) |
|  | Augered |
|  | Plug Drilled (Rotary drilled with fluid) |
|  | Split Tube Sample (SPT N ₆₀ with 2 inch split tube) |
|  | Thin Wall Sample (3 inch Shelby Tube) |
|  | Core Drilled (NV Core Barrel) |
|  | Continuous Soil Sample |
|  | Augered & Plug Drilled |
|  | Jetted |
|  | Augered & Jetted |

Mn/DOT Triangular Textural Classification System



UNIQUE NUMBER 03604

State Project 6211-17		Bridge No. or Job Desc. 62070		Trunk Highway/Location MN Trunk Highway 36			Boring No. T-4		Ground Elevation 861.0 ()	
Location Ramsey County Coordinate System X=584851 Y=180705 TH 61 SB, 80+50, 50' LT Latitude (North)=45°00'43.14" Longitude (West)=93°03'18.96"						Drill Machine 1 Hammer			SHEET 1 of 3 Drilling Completed 5/5/67	
DEPTH	Depth	Lithology	Classification	Drilling Operation	SPT	MC	COH	γ	Soil	Other Tests
	Elev.				N ₆₀	(%)	(psf)	(pcf)		Or Remarks
					REC	RQD	ACL	Core		Formation
					(%)	(%)	(ft)	Breaks		or Member
	3.0 858.0	Plug Drilled (CL)		PD						
5		non. pl SIL, brn, moist		X	15					
	8.0 853.0			X						
10		FS, brn, moist		X	32					
	13.0 848.0			X						
15		S & FG, brn, moist		X	28					
	20.0 841.0			X						
20		MS, brn, wet		X	22					
				X	34					
				X	16					
				X	18					
	25									

(Continued Next Page)

Field Crew Chief: R. Nelson Soil Class: Rock Class: Edit: Date: 11/30/18
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UNIQUE NUMBER 03604

Mn/DOT GEOTECHNICAL SECTION - LOG & TEST RESULTS							SHEET 2 of 3			
State Project 6211-17		Bridge No. or Job Desc. 62070 <small>TH 61 SB, 80+50, 50' LT</small>		Trunk Highway/Location MN Trunk Highway 36		Boring No. T-4	Ground Elevation 861.0 ()			
DEPTH	Depth	Lithology	Classification	Drilling Operation	SPT	MC	COH	γ	Soil	Other Tests
	Elev.				N ₆₀	(%)	(psf)	(pcf)		Or Remarks
					REC	RQD	ACL	Core	Rock	Formation
					(%)	(%)	(ft)	Breaks		or Member
			MS, brn, wet (continued)	X	22					
				X	10					
				X	11					
				X	11					
	35.0 826.0			X	8					
			S & G, brn, wet	X	14					
				X	9					
	44.0 817.0			X	13					
			sl.pl. SLT, brn	X	11					
				X	28					
	50									

(Continued Next Page)

Field Crew Chief: R. Nelson Soil Class: Rock Class: Edit: Date: 11/30/18
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UNIQUE NUMBER 03604

Mn/DOT GEOTECHNICAL SECTION - LOG & TEST RESULTS										SHEET 3 of 3	
State Project		Bridge No. or Job Desc.		Trunk Highway/Location			Boring No.		Ground Elevation		
6211-17		62070		MN Trunk Highway 36 <small>TH 61 SB, 80+50, 50' LT</small>			T-4		861.0 ()		
DEPTH	Depth	Lithology	Classification	Drilling Operation	SPT	MC	COH	γ	Soil	Other Tests	
	Elev.				N ₆₀	(%)	(psf)	(pcf)		Or Remarks	
					REC	RQD	ACL	Core	Rock	Formation	
					(%)	(%)	(ft)	Breaks		or Member	
	52.0 809.0	sl.pl. SLT, brn (continued)		X	40						
55		S & G, brn, wet		X	27						
60	62.0 799.0			X	45						
65		LS, brn, wet		X	34						
	67.5 793.5			X							