DEPARTMENT OF TRANSPORTATION

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

Addendum 2

Date: April 3, 2024

To: Eric Peterson, Project Manager
Office of Bridges & Structures

From: Chelsey A. Brummer, Senior Engineer
Geotechnical Section

Chelsey Brummer
Digitally signed by Chelsey Brummer
Date: 2024.04.03 16:49:53 -05'00'

Concur: Joe Nietfeld, Principal Engineer
Geotechnical Section

Digitally signed by Joe Nietfeld
Date: 2024.04.03 16:38:31 -05'00'

Subject: S.P. 8825-1155 Metro Wide Overhead Signs
Foundations Analysis and Design Recommendation Report Addendum 2

This document replaces sections 3.1.2 and 4.0 of the Foundations Analysis and Design Recommendation (FADR) report dated March 25, 2024. The FADR was modified due to notification on April 3, 2024 that the final elevations of overhead sign OHI35E-312 were approximately 2.5 feet different then what was assumed in the original FADR.

3.1.2 Special Design Considerations- OH I35E-312

OH I35E-312 is a monotube sign that requires rock sockets due to the shallow CPT refusal and historic boring data suggesting shallow bedrock near elevation 795 (see attached historic boring log).

We performed a special design for OH I35E-312 due to loose sands, soft clay, and shallow bedrock encountered that **do not** meet the minimum requirements for unit weight based on standard plan 5-297.746. The sand and clay encountered unit weights between 115 and 120 pcf, and bedrock was encountered at approximately 11 feet, requiring a rock socket. MnDOT Bridge Office staff provided us service and extreme event limit state loads for the overhead sign below:

Table 2. OH I35E-312 loads.

Limit State	Vertical (kips)	Horizontal (kips)	Mx (ft-lbs)
Service Limit State	8.6	2.89	51,915
Extreme Event I	9.46	7.22	129,465

3.1.2.1 Geotechnical Strength Limit State with Extreme Event Limit State loads

We modeled the shaft in Lpile 2022.12.07 and used the Sand (Reese) p-y curve to model the upper 0-7 feet of loose sand, we used the Soft Clay (Matlock) to model 7-9 feet, Sand (Reese) to model the dense sand from 9-12 feet, and Strong Rock (Vuggy Limestone) to model the encountered bedrock. The Lpile analysis shows that a shaft length of 17’ feet is stable and the deflection curve is headed back towards zero. Also, after 17 feet an increase in shaft length does not decrease the deflection. Based on the historic information, we estimate competent bedrock will be encountered near 13 feet, **therefore we recommend a 2.5-foot rock socket**. A copy of the Bending Moment vs. Depth Graph is attached to this report.

3.1.2.2 Horizontal movement at the top of the shaft at the Service Limit State.

For the service limit state, we calculated the horizontal movement at the top of the shaft with a length of 18 feet to be less than 0.l in. which meets the maximum lateral movement criteria of 1 in. for this structure. A copy of the Top Deflection vs. Pile Length Graph is attached to this report.

4.0 Foundation Recommendations

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

1. The overhead signs be constructed in accordance with MnDOT standard plan 5-297.763 for design D signs and 5-297.746 for monotube signs.

2. **OH I35E-312 be constructed to a depth of 18 feet with the bottom 2.5 feet rock socketed into competent bedrock. We estimate competent bedrock will be encountered at elevation 793.**

3. OH I94-841 be constructed per MnDOT standard plan 5-297.763 but include a 6-foot permanent casing for signal service utility protection.

4. The contractor is notified of the subsurface conditions for this site, specifically the cobbles and boulders that will likely be encountered during drilled shaft excavation for OH I494-514, OH I494-516, OH I494-517, OH MN13-015, OH MN13-016, OH MN13-017, OH I35E-312, OH I94-836, and OH I94-837. At a minimum, this Foundation Analysis and Design Report should be included in the reference information documents (RID) for the project.

5. This office be contacted for revised foundation recommendations if the foundation soils or groundwater elevations differ from those described in this report.

Attachments: OHI35E-312 Cross Section View
LPile Top Deflection vs. Pile Length Graph
LPile Bending Moment vs Depth Graph

cc: Shelly Pederson (Metro District Soils Engineer)
Dave Van Deusen (Metro District Materials Engineer)
Lars Impola (Metro District Traffic Engineer)
Brad Skow (Geotechnical Unit Manager)
Jason Hedeen (Geotechnical Asset Manager)

SITE 13

OH I35E-312

WB E 12TH ST

STA 31+95

QUANTITIES

STRUCTURAL STEEL-MONOTUBE POSTS	3189 POUND
STRUCTURAL STEEL-MONOTUBE BEAM	4986 POUND
TOTAL STRUCTURAL STEEL	8175 POUND
CONCRETE FOOTINGS DESIGN SPECIAL (4)	1 EACH

GENERAL NOTES:

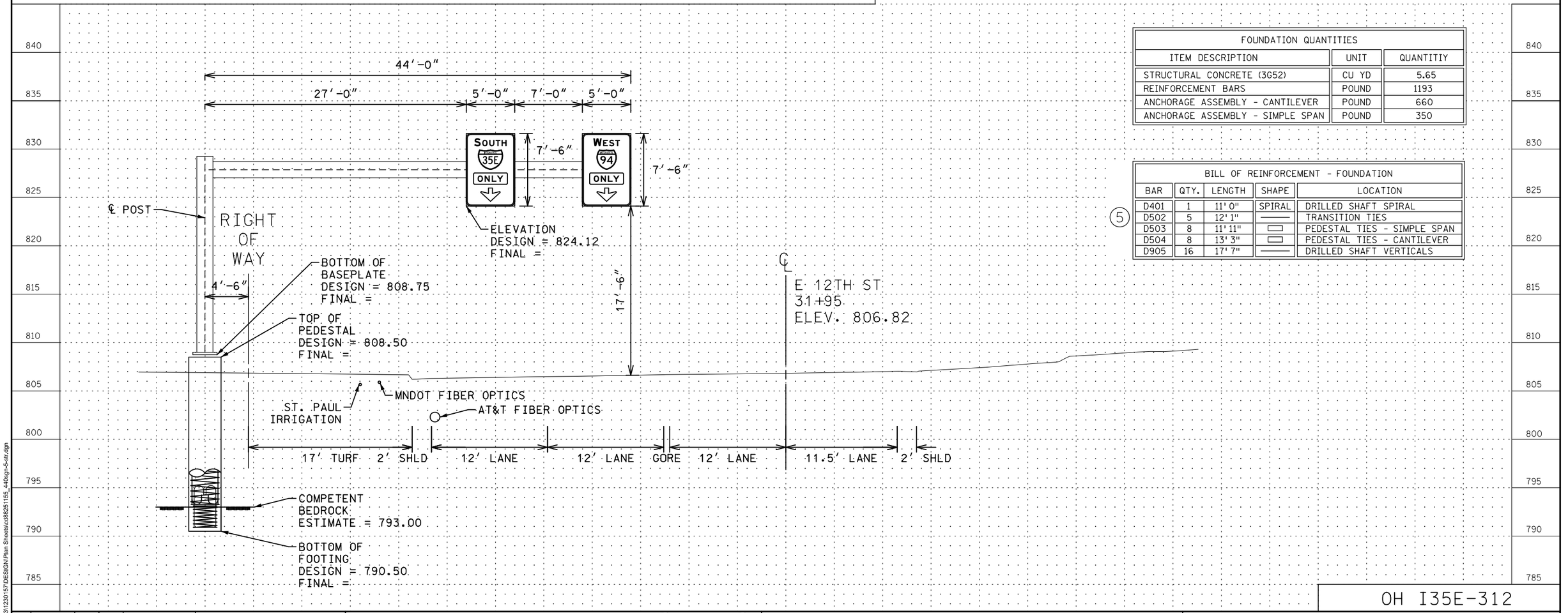
1. QUANTITIES ARE BASED ON DESIGN ELEVATIONS AND DIMENSIONS WHICH ARE APPROXIMATE. FABRICATION IS DEPENDENT ON THESE ELEVATIONS AND DIMENSIONS AND SHALL NOT BE STARTED UNTIL THE ENGINEER HAS MADE THE FINAL DETERMINATION IN THE FIELD.
2. SEE STANDARD PLAN 5-297.745 THROUGH 5-297.749 FOR STRUCTURAL DETAILS.
3. SEE STANDARD PLAN 5-297.733 FOR ROCK SOCKET FOUNDATION DETAILS.

(4) QUANTITY INCLUDES THE CONCRETE AND REINFORCEMENT BARS. SEE TABLES BELOW FOR CONCRETE, D401 DRILLED SHAFT SPIRAL, AND D905 DRILLED SHAFT VERTICAL REINFORCEMENT BARS FOR MODIFIED LENGTH OF THE DRILLED SHAFT FOUNDATION.

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

FOUNDATION QUANTITIES		
ITEM DESCRIPTION	UNIT	QUANTITIY
STRUCTURAL CONCRETE (3G52)	CU YD	5.65
REINFORCEMENT BARS	POUND	1193
ANCHORAGE ASSEMBLY - CANTILEVER	POUND	660
ANCHORAGE ASSEMBLY - SIMPLE SPAN	POUND	350

BILL OF REINFORCEMENT - FOUNDATION				
BAR	QTY.	LENGTH	SHAPE	LOCATION
D401	1	11' 0"	SPIRAL	DRILLED SHAFT SPIRAL
D502	5	12' 1"	——	TRANSITION TIES
D503	8	11' 11"	▭	PEDESTAL TIES - SIMPLE SPAN
D504	8	13' 3"	▭	PEDESTAL TIES - CANTILEVER
D905	16	17' 7"	——	DRILLED SHAFT VERTICALS



OH I35E-312

NO	DATE	DWN	CKD	REVISIONS

ALLIANT ENGINEERING

I HEREBY CERTIFY THAT THIS SHEET WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINT NAME: JUSTIN CYR

SIGNATURE: DRAFT COPY DRAFT COPY

DATE 04/10/2024 LICENSE # 50148

SIGNING PLANS

SP 8825-1155

SHEET NO. 198 OF 227 SHEETS

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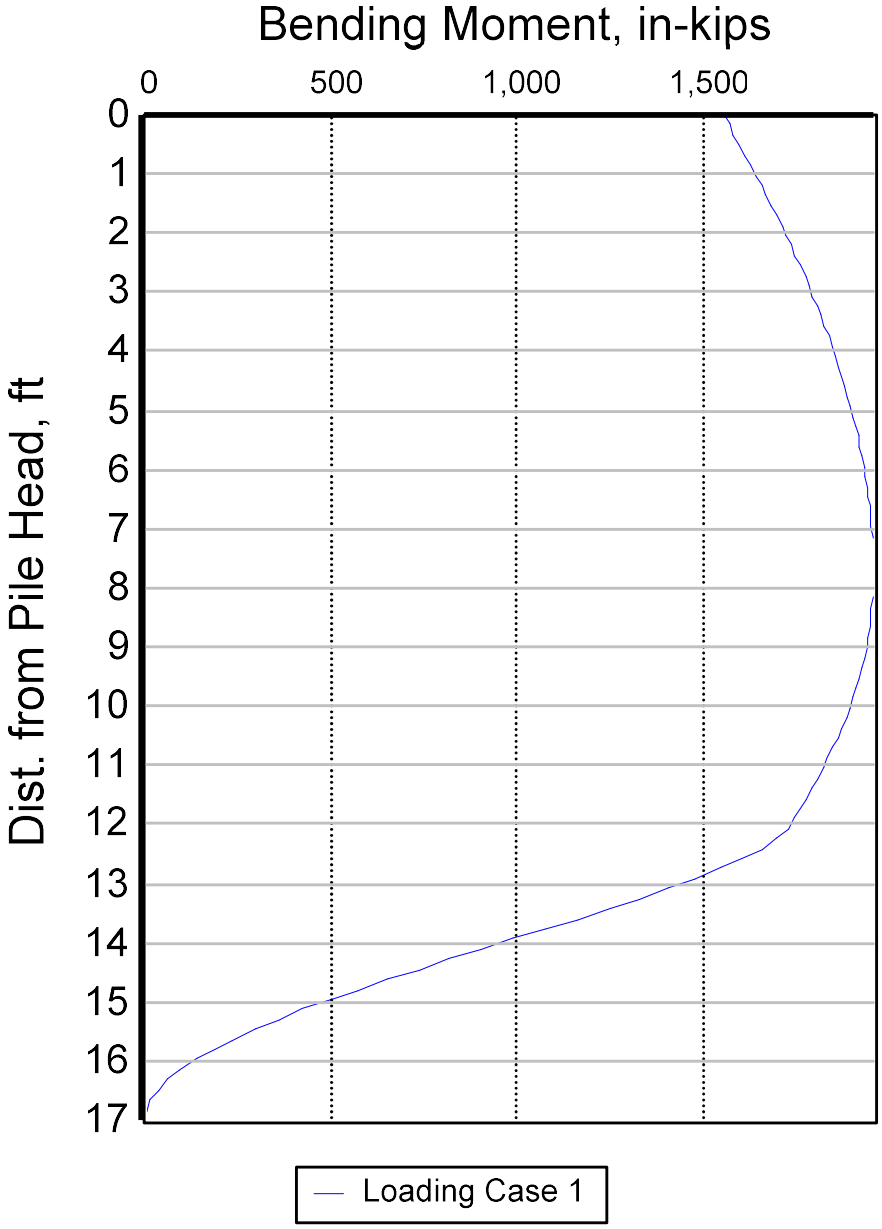
Bending Moment vs. Depth



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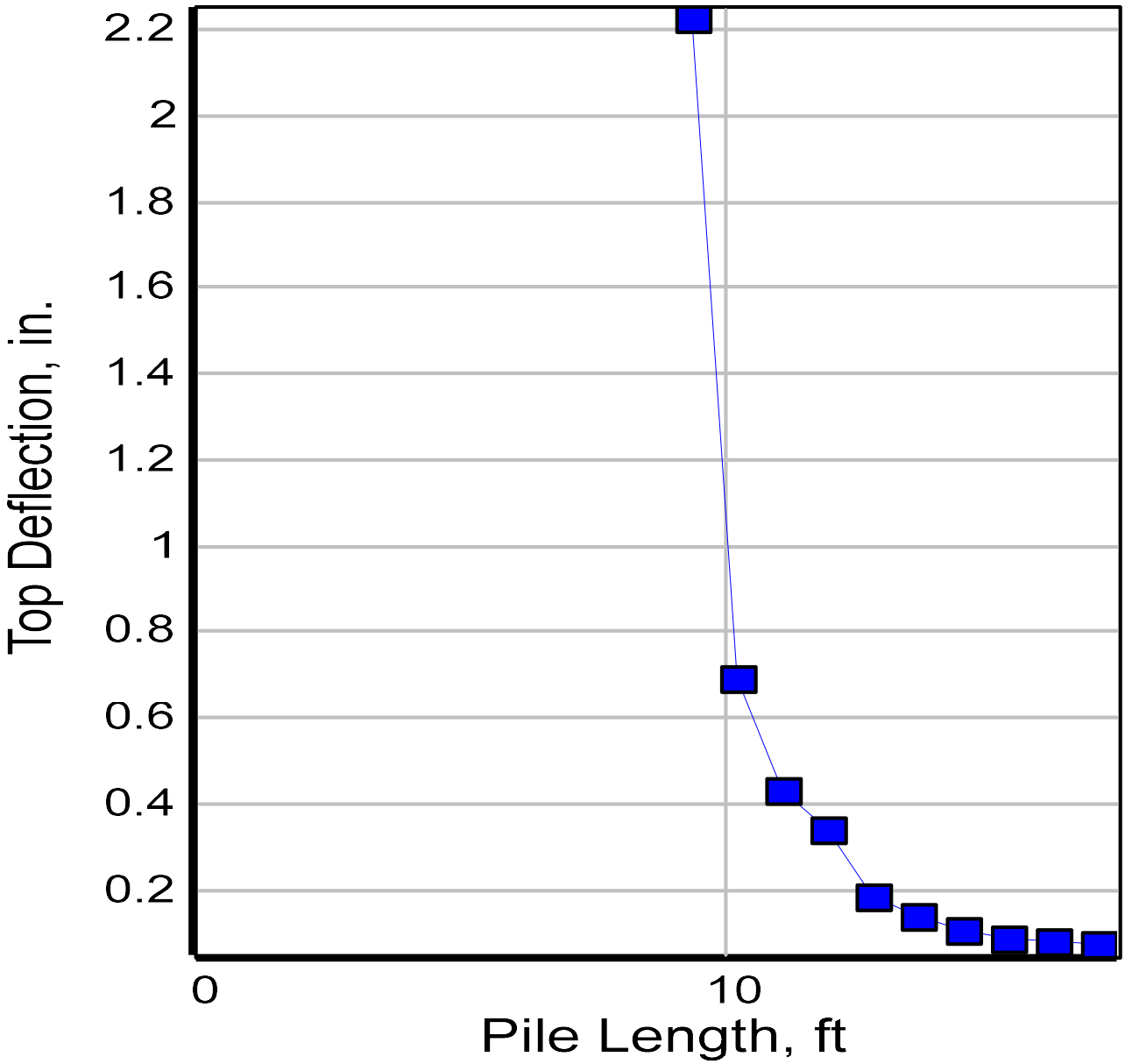
Top Deflection vs. Pile Length



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