STRUCTURE GEOTECHNICAL REPORT
INTERSTATE 55 BRIDGE OVER JOLIET ROAD
SN 099-0028, SECTION (29-R1HP)99R-4
WILL COUNTY, ILLINOIS

For
Lin Engineering, Ltd.
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Submitted by
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11. Abstract

The existing Interstate 55 bridge over Joliet Road will be widened in both northbound and southbound directions. The existing structure has a total back-to-back abutment length of 210.6 feet and out-to-out widths of 119.3 and 123.5 feet for the west abutment and east abutment, respectively. The approach embankments are estimated to have side slopes graded at 1:4 (V:H) to 1:2 (V:H). The profile grade along the I-55 will not be changed and new maximum fill height at widened embankments will be about 2 feet. This report provides geotechnical recommendations for the design and construction of the proposed bridge widening and approach embankments.

The lithologic profile includes up to 7.5 feet of stiff to hard, black, blue, gray, and green silty clay to clay loam fill. Beneath the fill, the borings encountered up to 50.3 feet of stiff to hard, brown and gray clay, silty clay to silty clay loam over medium dense to very dense, brown and gray sandy loam, silt to silty loam. Groundwater was observed at depths of 3.5 to 9.75 feet bgs in three borings drilled along southbound.

The approach embankments will undergo an estimated 0.2 inches or less of long-term settlement. Downdrag load allowances are not required for the abutment piles. The approach embankments with side slopes graded at 1:2 (V: H) to 1:4 (V:H) and will adequate factor of safety against global instability.

The bridge abutments could be supported on metal-shell or H-piles. Selected driven MSP or steel H-piles will provide 50 to 318 kips of factored resistance for piles driven to lengths of 10 to 63 feet. The piers will be supported by shallow foundations with estimated base elevations of 725.1 feet for Pier 1 (west pier) and 724.9 feet for Pier 2 (east pier). We recommend a factored bearing resistance of 5,000 psf be used for the design of the pier footings.

Temporary sheet piling is feasible except for the west abutment where a temporary soil retention system should be planned due to hard soil conditions.

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WILL COUNTY, ILLINOIS
FOR
LIN ENGINEERING, LTD.

1.0 INTRODUCTION

This report presents the results of the subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations for the widening of the Interstate 55 (I-55) dual structure Bridge over Joliet Road in Will County, Illinois. A *Site Location Map* is presented as Exhibit 1.

1.1 Proposed Structure

Based on the most recent *General Plan and Elevation* (GPE) sheets provided by Graef on November 17, 2020, and information provided by Lin Engineering, Ltd. (Lin), Wang Engineering, Inc. (Wang) understands the improvements to the 3-span dual structure bridge include superstructure replacement and widening of the substructures in both the northbound and southbound bridges. The bridge deck will be widened along the northbound lanes by 6′-7″ and since the bridge has 61.13 degree skew, the abutments and piers of the northbound bridge need to be widened by about 13.6 feet. The southbound bridge widening includes 13.0 feet at the west abutment and then it tapers down to 7.8 feet at the east abutment. The profile grade along the I-55 will not be changed and new maximum fill height at widened embankments will be about 2 feet.

Wang prepared a Structure Geotechnical Report (SGR) for initially proposed northbound widening. This updated SGR supersedes previously submitted SGR and includes both northbound and southbound widenings.

1.2 Existing Structure and Land Use

The original three-span dual structure was built in 1955 and repaired and widened in 1976, 1987, 1996 2002, 2009, and 2016. The structure has total back-to-back abutment length of 210.6 feet and out-to-out widths of 119.3 feet at west abutment and 123.5 feet at east abutment. The stub abutments are supported on two rows of concrete piles, one vertical and one batter. From the 1955 design

drawings, the pile length is estimated to be 15 feet with 30 tons capacity. Pier 1 and Per 2 are supported on shallow foundation. Shallow foundations were used at Pier 1 at elevation of about 725.1 feet and Pier 2 at elevation of about 724.9 feet.

The purpose of this investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of the proposed bridge widening foundations.

2.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations performed by Wang.

2.1 Field Investigation

The initial subsurface investigation consisted of four structure borings for northbound bridge widening, designated as SB-01 through SB-04, drilled by Wang from April 20 to 23, of 2020. The borings were drilled from elevations of 748.90 and 752.04 feet along the I-55 shoulders and from elevations of 730.96 to 731.62 feet along Joliet Road. The borings were advanced to depths of 48 to 80 feet bgs.

The latest subsurface investigation included four structure borings for southbound bridge widening, designated as SB-05 through SB-08, drilled by Wang from October 16 to 20, 2020. Borings SB-05 and SB-08 were drilled from elevations 750.80 and 753.33 feet from I-55 shoulders and advanced to depths of 78.9 and 79.0 feet bgs. Borings SB-06 and SB-07 were drilled from elevations of 733.04 and 733.62 feet from Joliet Road and advanced to depths of 59.0 to 59.9 feet bgs.

As-drilled northings and eastings were surveyed by Wang and elevations, stations, and offsets were provided by Lin. Boring location data are presented in the *Boring Logs* (Appendix A) and the as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 2).

A truck-mounted drilling rig, equipped with mud rotary equipment or hollow stem augers, was used to advance and maintain open boreholes. Soil sampling was performed according to AASHTO T206, *"Penetration Test and Split Barrel Sampling of Soils."* The soil was sampled at 2.5-foot intervals to 30 feet bgs and at 5-foot intervals to the boring termination depths.

Field boring logs, prepared and maintained by a Wang field engineer, included lithological descriptions, visual-manual soil classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, and results of Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration. Groundwater levels were measured while drilling and at completion of each boring.

The boreholes were backfilled upon completion with grout and/or bentonite chips and the surfaces were restored as much as possible to its original conditions.

2.2 Laboratory Testing

The soil samples were tested in the laboratory for moisture content (AASHTO T265). Atterberg limits (AASHTO T89 and T90) and particle size analysis (AASHTO T88) tests were performed on selected samples. Field visual descriptions of the soil samples were verified in the laboratory and index tested soils were classified according to the IDH Soil Classification System. The laboratory test results are shown in the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

3.0 INVESTIGATION RESULTS

Detailed description of the soil condition encountered during the subsurface investigation is presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profiles* (Exhibits 3-1 and 3-2). Please note that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

3.1 Lithological Profile

At the surface, the borings drilled along northbound I-55 encountered 1-inch thick asphalt pavement over 11-inch thick concrete and 12-inch thick asphalt pavement. The borings drilled along southbound I-55 revealed 12-inch thick asphalt pavement. The borings drilled along Joliet Road encountered 11 and 12-inch thick concrete. Underneath the pavements, the borings encountered 3- to 54-inch thick sandy gravel aggregate base. In descending order, the general lithologic succession encountered beneath the pavements includes: 1) man-made ground (fill); 2) stiff to hard clay, silty clay to silty clay loam; and 3) medium dense to very dense sandy loam, silt to silty loam.

1) Man-made ground (fill)

Beneath the pavements, the borings encountered up to 7.5 feet of mostly cohesive fill. The cohesive fill consists of stiff to hard, brown, black, blue, green, and gray silty clay to clay loam fill material with unconfined compressive strength (Q_u) values of 1.5 to 6.5 tsf and moisture content values of 13 to 27%. Boring SB-05 encountered 1.3 feet of medium dense, brown sandy gravel with N value of 20 blows per foot and moisture content value of 11%.

2) Stiff to hard clay, silty clay to silty clay loam

Beneath the fill or the pavement, at elevations of 728.1 to 749.6 feet, the borings augured through up to 50.3 feet of stiff to hard, brown to gray clay, silty clay to silty clay loam interbedded with silty loam. At elevations of 723.1 to 746.6 feet, Borings SB-05 through SB-07 encountered 0.8 to 1.5 feet interbedded damp to saturated silty loam layers with sand lens. This unit is characterized by Q_u values of 1.2 to 6.2 tsf and moisture content values of 10 to 24%. Laboratory index testing on samples of the silty clay loam show liquid limit (L_L) values of 27 to 33% and plastic limit (P_L) values of 15 to 16%.

3) Medium dense to very dense sandy loam, silt to silty loam

At elevations of 699.0 to 706.8 feet to boring termination depths, the borings revealed medium dense to very dense, brown and gray sandy loam, silt to silty loam. This soil unit has N-values of 23 to 99 blows per foot and moisture content values of 6 to 18%. Hard drilling conditions and samples refusals below 700 feet elevations, indicating the presence of cobbles and boulders, were observed throughout the layer to boring termination depths.

3.2 Groundwater Conditions

The groundwater was observed during drilling at elevations of 723 to 741 feet (3.5 to 9.75 feet bgs) in Borings SB-05 through SB-07. Borings SB-02 and SB-06 were advanced with hollow stem augers and found to be dry upon completion of drilling. Since the remaining borings were advanced using mud rotary techniques from 10 feet bgs, the groundwater measurement in the borehole upon completion of drilling was not possible. It should be noted that groundwater levels might vary with seasonal rainfall patterns and long-term climate fluctuations or be influenced by local site conditions.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the approach embankments and substructure foundations are included in the following sections. Based on information provided by Graef, we

understand that LRFD criteria should be used since the abutment extensions and the pier extensions are being design with LRFD.

4.1 Seismic Design Considerations

The seismic site class was determined in accordance with the IDOT *All Geotechnical Manual Users (AGMU) 9.1* (2009) method of analysis. The soils within the top 100 feet have a weighted average S_u value of 2.78 ksf (AASHTO; Method C controlling), and the results classify the site in the Seismic Site Class C.

The project location belongs to the Seismic Performance Zone 1. The seismic spectral acceleration parameters recommended for design in accordance with AASHTO *LRFD Bridge Design Specifications* (2009) are summarized in Table 1. According to the IDOT *Bridge Manual* (2012), liquefaction analysis is not required for sites in Seismic Performance Zone 1.

Table 1: Recommended Seismic Design Parameters

Spectral Acceleration Period (sec)	Spectral Acceleration Coefficient[1)] (% g)	Site Factors	Design Spectrum for Site Class C[2)] (% g)
0.0	PGA= 4.8	F_{pga}= 1.2	**A_s= 5.8**
0.2	S_s= 10.2	F_a= 1.2	**S_{DS}= 12.2**
1.0	S_1= 3.8	F_v= 1.7	**S_{D1}= 6.5**

1) Spectral acceleration coefficients based on Site Class C

2) Site Class C Spectrum to be included on plans; $A_s = PGA*F_{pga}$; $S_{DS}= S_s*F_a$; $S_{D1}= S_1*F_v$

4.2 Approach Embankments

Wang has performed evaluations of the settlement and global stability for the widened portion of the approach embankments. We understand the proposed side slopes will be graded at 1:4 (V:H) to 1:2 (V:H).

4.2.1 Settlement

Along the northbound lanes, the bridge abutments and embankments will be widened by about 6′-7″ feet and since the bridge has about 61 degree skew, the abutments need to be widened by about 13.6

feet. Settlement estimates have been made based on correlations to measured index properties. Based on the soil conditions, we estimate the new widening area will undergo approximately 0.2 inches of long-term consolidation settlement under the applied load resulting from 2 feet of fill material.

Along the southbound bridge widening, the west abutment will be widened by about 13.0 feet and the east abutment will be widened by about 7.8 feet. New fill will be about 1.5 feet high and placed on the existing embankment slope. Based on encountered soil conditions, we estimate the new widening area will undergo long-term settlement of 0.2 inches or less.

According to IDOT Bridge Manual (2012), downdrag occurs when soil against a pile moves downward more than 0.4 inches after driving. We estimate settlement of less than 0.4 inch, therefore downdrag losses for the piles are not considered.

4.2.2 Global Stability

The global stability of the approach embankments was analyzed based on the soil profile described in Section 3.1 and the cross section drawing provided by Lin. The side slope at the east abutment of northbound bridge widening is estimated to be graded at 1:2 (V: H). The minimum required FOS for both short (undrained) and long-term (drained) conditions is 1.5 (IDOT 2012). *Slide v9.0* evaluation exhibits employing the Bishop Simplified method of analysis are shown in Appendix C and we estimate the slopes have a minimum undrained factor of safety (FOS) of 9.3 (Appendix C-1) and a drained FOS of 3.3 (Appendix C-2). The FOS meets the minimum requirement. Both FOSs are greater than the minimum IDOT required FOS of 1.5.

Based on the encountered soil profile, proposed side slope grades, and new fill height along the existing slope at the southbound widenings are similar to the northbound widenings. Therefore, we do not anticipate global stability concerns.

4.3 Structure Foundations

According to information provided by Graef, we understand the northbound and southbound bridges will be widened in-kind. Based on the drawings of the existing structure, the proposed west and east abutment pile cap base elevations are estimated at 741.5 and 743.4 feet, respectively. The existing piers are supported by shallow foundations with estimated base elevations of 725.1 for Pier 1 (west pier), and 724.90 feet for Pier 2 (east pier).

4.3.1 Driven Piles

IDOT specifies the maximum nominal required bearing (R_{NMAX}) for each pile and states the factored resistance available (R_F) for steel H-piles should be based on a geotechnical resistance factor (Φ_G) of 0.55 (2012). Nominal tip and side resistance were estimated using the methods and empirical equations presented in *AGMU Memorandum 10.2 – Geotechnical Pile Design* (IDOT 2011). The R_F estimates are governed by the relationship $R_F = \phi_G R_N - \phi_G(DD_R+S_C+L_{iq})I_G - (\gamma_p)(\lambda_{IS})DD_L$ (IDOT 2012).

The existing stub abutments are supported on 14″x14″ concrete piles foundations. We understand the widening portion of the abutments will be supported on either steel H-Piles or Metal Shell Piles (MSP). Based on information provided by Graef, the west abutment will have a total preliminary service load of 214 kips and a factored load of 299 kips and the east abutment will have a total preliminary service load of 153 kips and a factored load of 221 kips. The widened pier (west) will have a total preliminary service load of 304 kips and a factored load of 421 kips while the widened pier (east) will have a total preliminary service load of 268 kips and a factored load of 375 kips. The R_F, R_N, estimated pile tip elevations, and pile lengths for 12-inch diameter MSP with 0.25-inch thick walls, 14-inch diameter MSP with 0.312-inch thick walls, HP12x53, and HP14x73 are summarized in Tables 2 through Table 5. The lengths shown in the table assume a 1-foot pile embedment into the pile cap.

We estimate the widened portions of the embankments will settle less than 0.4 inches, therefore downdrag losses for the piles are not considered. Hard drilling conditions with possible cobbles and boulders were encountered below 700 feet elevation. The pile should be installed with metal shoes if driven at or below elevation 700 feet.

Table 2: Estimated Pile Lengths and Tip Elevations for 12-inch Diameter w/.25″ walls MSP

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment Northbound SB-01	741.53	91	0	0	50	12	731
		182	0	0	100	22	721

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		273	0	0	150	33	710
		364	0	0	200	40	703
West Abutment Southbound SB-05	741.53	91	0	0	50	10	733
		182	0	0	100	21	722
		273	0	0	150	34	709
		364	0	0	200	36	707
East Abutment Northbound SB-04	743.37	91	0	0	50	13	731
		182	0	0	100	20	724
		273	0	0	150	32	712
		364	0	0	200	44	700
East Abutment Southbound SB-08	743.37	91	0	0	50	14	730
		182	0	0	100	25	719
		273	0	0	150	43	701
		364	0	0	200	45	699

Table 3: Estimated Pile Lengths and Tip Elevations for 14-inch Diameter w/.312″ walls MSP

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment Northbound SB-01	741.53	182	0	0	100	19	724
		273	0	0	150	28	715
		364	0	0	200	35	708
		455	0	0	250	40	703
West Abutment Southbound SB-05	741.53	182	0	0	100	15	728
		273	0	0	150	28	715
		364	0	0	200	35	708
		455	0	0	250	36	707
East Abutment Northbound SB-04	743.37	182	0	0	100	18	726
		273	0	0	150	27	717
		364	0	0	200	39	705
		455	0	0	250	44	700
East Abutment, Southbound SB-08	743.37	182	0	0	100	19	725
		273	0	0	150	34	710
		364	0	0	200	44	700
		455	0	0	250	44	700

Table 4: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H Piles

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment Northbound SB-01	741.53	91	0	0	50	12	731
		182	0	0	100	22	721
		273	0	0	150	35	708
		364	0	0	200	44	699[(1)]
		418	0	0	230	48	695[(1)]
West Abutment Southbound SB-05	741.53	91	0	0	50	11	732
		182	0	0	100	24	719
		273	0	0	150	36	707
		364	0	0	200	49	694
		418	0	0	230	51	692
East Abutment Northbound SB-04	743.37	91	0	0	50	12	732
		182	0	0	100	27	717
		273	0	0	150	42	702
		364	0	0	200	44	700[(1)]
		418	0	0	230	49	695[(1)]
East Abutment, Southbound SB-08	743.37	91	0	0	50	15	729
		182	0	0	100	30	714

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		273	0	0	150	44	700(1)
		364	0	0	200	54	690(1)
		418	0	0	230	58	686(1)

(1) Pile shoe is required at or below this depth

Table 5: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H Piles

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
West Abutment Northbound SB-01	741.53	182	0	0	100	19	724
		273	0	0	150	31	712
		364	0	0	200	42	701
		455	0	0	250	44	699(1)
		545	0	0	300	49	694(1)
		578	0	0	318	53	690(1)
West Abutment Southbound SB-05	741.53	182	0	0	100	18	725
		273	0	0	150	30	713
		364	0	0	200	38	705
		455	0	0	250	47	696(1)
		545	0	0	300	62	681(1)

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Nominal Required Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		578	0	0	318	63	680[(1)]
East Abutment Northbound SB-04	743.37	182	0	0	100	20	724
		273	0	0	150	34	710
		364	0	0	200	42	702
		455	0	0	250	45	699[(1)]
		545	0	0	300	52	692[(1)]
		578	0	0	318	59	685[(1)]
East Abutment Southbound SB-08	743.37	182	0	0	100	23	721
		273	0	0	150	43	701
		364	0	0	200	45	699[(1)]
		455	0	0	250	54	690[(1)]
		545	0	0	300	59	685[(1)]
		578	0	0	318	61	683[(1)]

[(1)] Pile shoe is required at or below this depth

4.3.2 Cast-in-Place Pier Foundations

The existing piers are supported by shallow foundations with estimated base elevations of 725.1 feet for Pier 1 (west pier) and 724.9 feet for Pier 2 (east pier). We understand the widening portion of the piers will be supported on in-kind cast-in-place shallow foundations. Given the geometry and subsurface soil conditions, a cast-in-place foundation is feasible.

Based on our subsurface investigation, we anticipate very stiff silty clay at the proposed footing elevations at about 6.5 and 6.1 feet below the ground elevation at the northbound widening and at about 8.0 and 8.8 feet below the ground elevation at the southbound widening. We recommend a factored bearing resistance of 5,000 psf be used for the design of the pier footings. The estimated friction angle between the base and underlying soil is 19°, and the corresponding friction coefficient is 0.35 (NAVFAC, 1986). The friction coefficient can be increased to 0.55 if the top 12 inches of foundation soil is replaced by aggregate or crushed stone layer. Cast-in-place concrete structures are designed based on AASHTO geotechnical sliding resistance factor of 0.85 for structure placed on clayey soils and 0.8 for structure placed on aggregate (2020).

4.3.3 Lateral Loading

Lateral loads on the piles should be analyzed for maximum moments and lateral deflections. Recommended lateral soil modulus and strain parameters required for analysis via the p-y curve method are included in Tables 6 through 9. Once the lateral loads are determined, the pile groups should be checked for maximum moments and lateral deflections.

Table 6: Recommended Soil Parameters for Lateral Load Analysis for West Abutment-Northbound
Reference Boring: SB-01

Elevation (feet) Soil Type	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, φ (Degree)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
Stiff to Hard CLAY to SILTY CLAY FILL Pile Cap Base to 740.1	120	2500	0	1000	0.5
Very Stiff CLAY to SILTY CLAY EL 740.1 to 735.9	120	3900	0	1000	0.5
Medium Dense SILTY LOAM EL 735.9 to 733.4	115	0	30	90	--
V Stiff to Hard SILTY CLAY EL 733.4 to 707.1	120	3100	0	1000	0.5
Hard CLAY EL 707.1 to 702.1	120	6200	0	2000	0.4
M Dense to V Dense SILT to SILTY LOAM EL 702.1 to 682.9	120	0	33	225	--
V Dense GRAVELLY SILTY LOAM EL 682.9 to 668.9 (Boring End)	125	0	35	225	--

Table 7: Recommended Soil Parameters for Lateral Load Analysis for West Abutment-Southbound
Reference Boring: SB-05

Elevation (feet) Soil Type	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, φ (Degree)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
SILTY LOAM Pile Cap Base to 740.3	115	0	29	30	--
Stiff to Hard CLAY to SILTY CLAY FILL EL 740.3 to 706.8	120	2900	0	1000	0.5
M Dense to V Dense SILTY LOAM EL 706.8 to 679.1	120	0	33	225	--
V Dense GRAVELLY SILTY LOAM EL 679.1 to 671.9 (Boring End)	125	0	35	225	--

Table 8: Recommended Soil Parameters for Lateral Load Analysis for East Abutment-Northbound
Reference Boring: SB-04

Elevation (feet) Soil Type	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, φ (Degree)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
Stiff to Hard SILTY CLAY to SILTY CLAY LOAM Pile Cap Base to 700.0	120	3000	0	1000	0.5
Very Dense SILTY LOAM EL 700.0 to 685.0	120	0	33	225	--
Very Dense SANDY LOAM EL 685.0 to 680.8	120	0	34	225	--
Very Dense SILTY LOAM EL 680.8 to 678.0	120	0	33	225	--
V Dense GRAVELLY SILTY LOAM EL 678.0 to 672.0 (Boring End)	125	0	35	225	--

Table 9: Recommended Soil Parameters for Lateral Load Analysis for East Abutment-Southbound
Reference Boring: SB-08

Elevation (feet) Soil Type	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, φ (Degree)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
Stiff to V Stiff SILTY CLAY Pile Cap Base to 729.8	120	1800	0	500	0.7
V Stiff to Hard SILTY CLAY EL 729.8 to 699.3	120	2600	0	1000	0.5
Dense to V Dense SILTY LOAM EL 699.3 to 686.6	125	0	33	225	--
V Dense GRAVELLY SILTY LOAM EL 686.6 to 674.3 (Boring End)	125	0	35	225	--

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

Vegetation, surface topsoil, and debris should be cleared and stripped where the structure will be placed. If unstable or unsuitable materials are exposed during excavation, they should be removed and replaced with compacted structural fill as described in Section 5.4.

5.2 Excavation, Dewatering, and Utilities

Excavations should be performed in accordance with local, state, and federal regulations. The potential effect of ground movements upon nearby utilities should be considered during construction. Temporary excavations for construction of the bridges should be sloped at no steeper than 1:1.5 (V: H) or properly shored.

Groundwater was observed in southbound borings during drilling. We do not anticipate the need of special dewatering systems. However, water that does accumulate in open excavations by seepage or runoff should be immediately removed by sump pump.

The Contractor should ensure proper surface grading to prevent the pooling of water and runoff into open excavations. Water that does accumulate into open excavations by seepage or runoff should be

immediately removed by sump pump. Any soils allowed to soften under standing water should be removed and replaced with compacted fill as described in Section 5.4.

5.3 Stage Construction

The TSL plan shows the bridge construction occurring in three stages. Temporary sheet piling designed according to IDOT Design Guide 3.13.1 (2012) is feasible to accommodate the stage construction of east abutment, Pier 1, and Pier 2 for both northbound and southbound widenings. However, temporary sheet piling is not feasible to accommodate the stage construction for west abutment due to the hard soil conditions encountered in Borings SB-01 and SB-05. Therefore, the pay item Temporary Soil Retention System should be included and designed by the Contractor to be approved by IDOT prior to construction of west abutments at the northbound and southbound widenings. Hard drilling conditions, very dense silty loam to sandy loam with cobbles and boulders were encountered below 700 feet elevations. We recommend sheet piles should not be driven below 700 feet elevations.

It should be noted that the construction of the foundation would require open cut excavation into the existing soil with temporary sheet piling. Our preliminary evaluations indicate temporary steel sheet piling is feasible. The sheet piling should be designed based on Design Guide for temporary sheet piling design (IDOT 2015).

5.4 Filling and Backfilling

Fill material used to attain the final design elevations should be as per IDOT Standard Specifications. The fill material should be free of organic matter and debris and should be placed in lifts and compacted according to IDOT Section 205, Embankment (IDOT, 2016). All backfill materials must be as per IDOT Standard Specifications.

Backfill materials for the abutments must be pre-approved by the Resident Engineer. To backfill the abutments, we recommend porous granular material conforming to the requirements specified in the IDOT Special Provision No.76, Granular Backfill for Structures. Backfill material should be placed and compacted in accordance with the Special Provision. For new fill to be placed on existing slopes, we recommend benching the slopes according to IDOT embankment construction details.

5.5 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Moisture and traffic will cause deterioration of exposed subgrade soils. Precautions should be taken by the Contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion.

Earth moving operations should be scheduled to not coincide with excessive cold or wet weather (early spring, late fall or winter). Any soil allowed to freeze or soften due to the standing water should be removed. Wet weather can cause problems with subgrade compaction.

It is recommended that an experienced geotechnical engineer be retained to inspect the exposed subgrade, monitor earthwork operations, and provide material inspection services during the construction phase of this project.

5.6 Pile Installation

The driven piles shall be furnished and installed according to the requirements of IDOT Section 512, *Piling* (2016). Wang recommends performing one test pile at each abutment of bridge widening location. The test piles shall be driven to 110 percent of the nominal required bearing indicated in the tables throughout Section 4.3. Since hard driving is expected, the pile should be installed with metal shoes if driven at or below elevation 700 feet.

6.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 2. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design and/or location of the structure are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Lin Engineering, Ltd. and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

Andri Kurnia, P.E.
Project Manager

Nesam S. Balakumaran, P.Eng.
Project Geotechnical Engineer

Corina T. Farez, P.E., P.G.
QA/QC Reviewer

REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (2020) "AASHTO LRFD Bridge Design Specifications." United States Depart of Transportation, Washington, D.C.

IDOT (2009) "All Geotechnical Manual Users Memorandum 09.1 - Seismic Site Class Definition." Illinois Department of Transportation.

IDOT (2011) "All Geotechnical Manual Users Memorandum 10.2 - Static Method of Estimating Pile Length." Illinois Department of Transportation.

IDOT (2012) *Bridge Manual.* Illinois Department of Transportation.

IDOT (2016) *Standard Specifications for Road and Bridge Construction.* Illinois Department of Transportation. 1098 pp.

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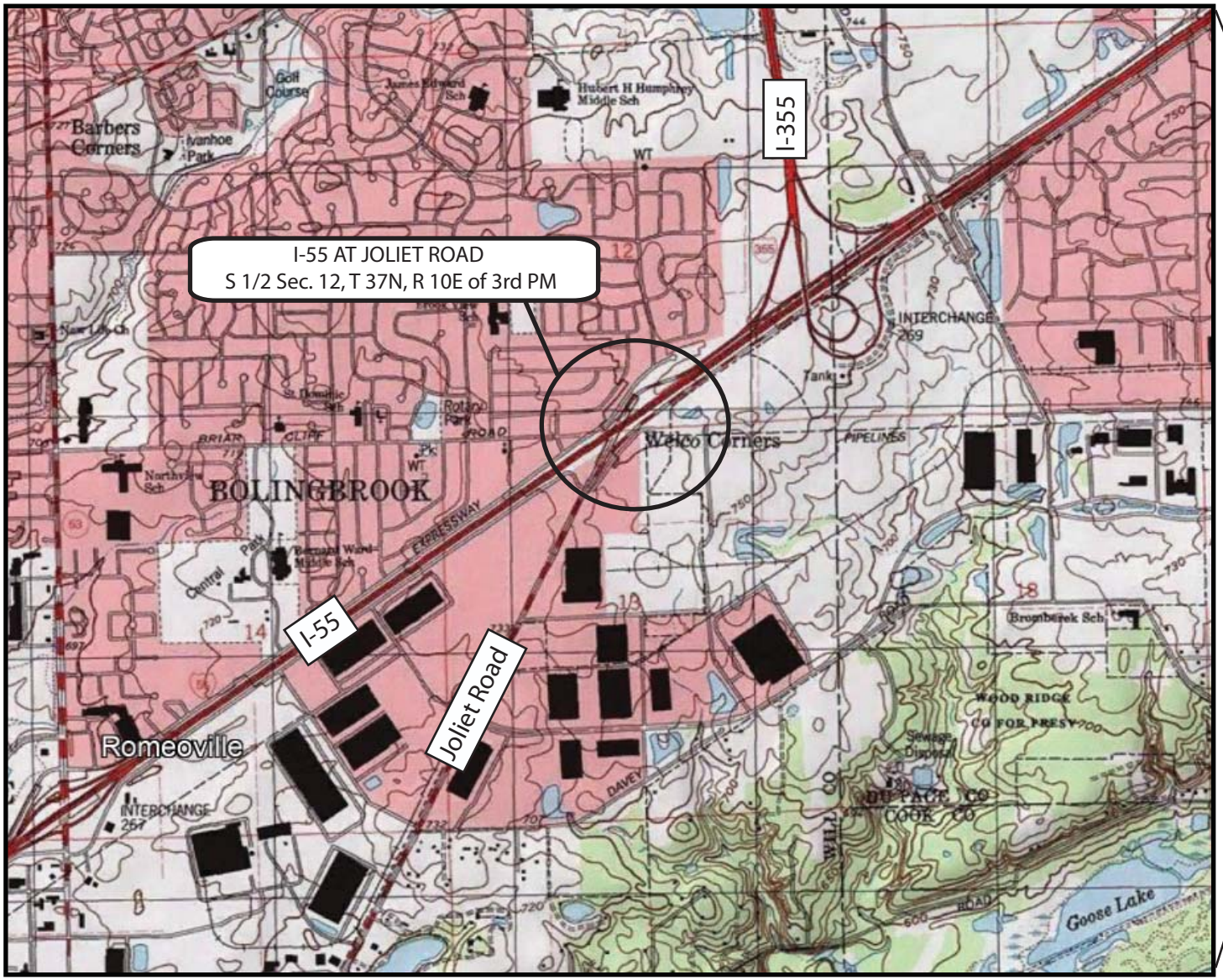
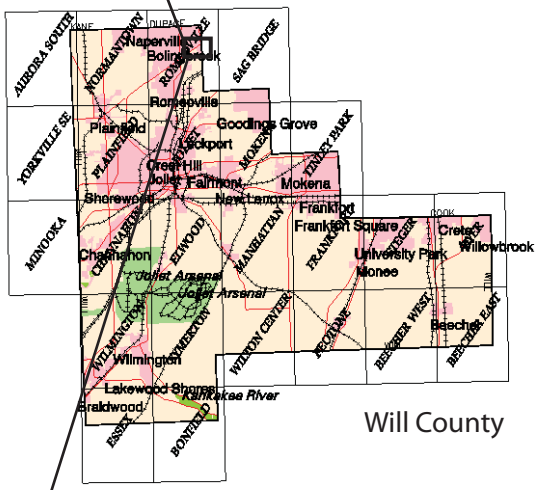
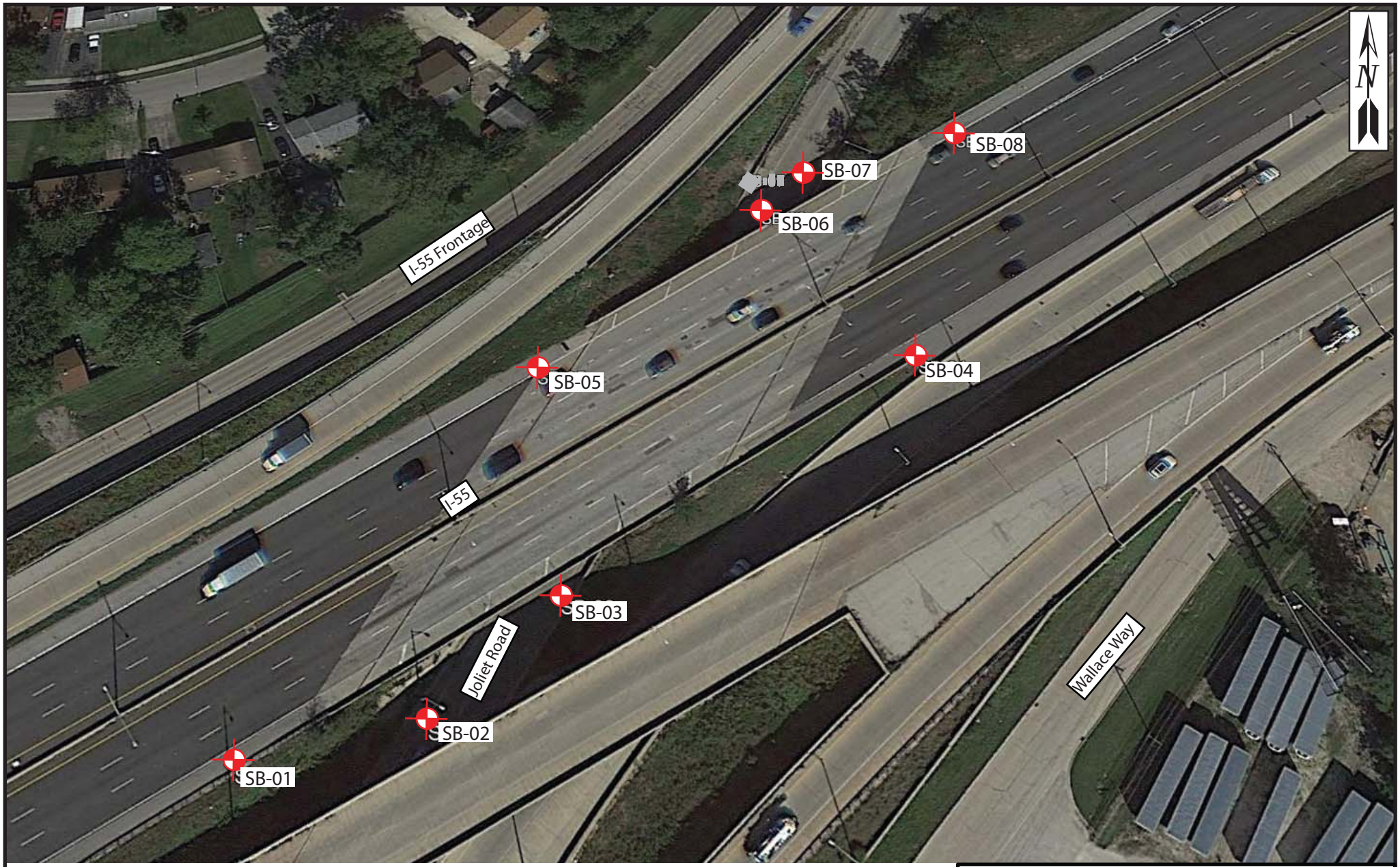
EXHIBITS





SITE LOCATION MAP:INTERSTATE 55 BRIDGE OVER JOLIET ROAD, SN. 099-0028, WILL COUNTY, ILLINOIS		
SCALE: GRAPHIC AL	EXHIBIT 1	DRAWN BY: J. Bensen CHECKED BY: A. Kurnia
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR LIN ENGINEERING, LTD.		498-01-03



0 100 200 Feet

Legend

Soil Boring

BORING LOCATION PLAN: INTERSTATE 55 BRIDGE OVER JOLIET ROAD, SN. 099-0028, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: N. Balakumaran CHECKED BY: A. Kurnia

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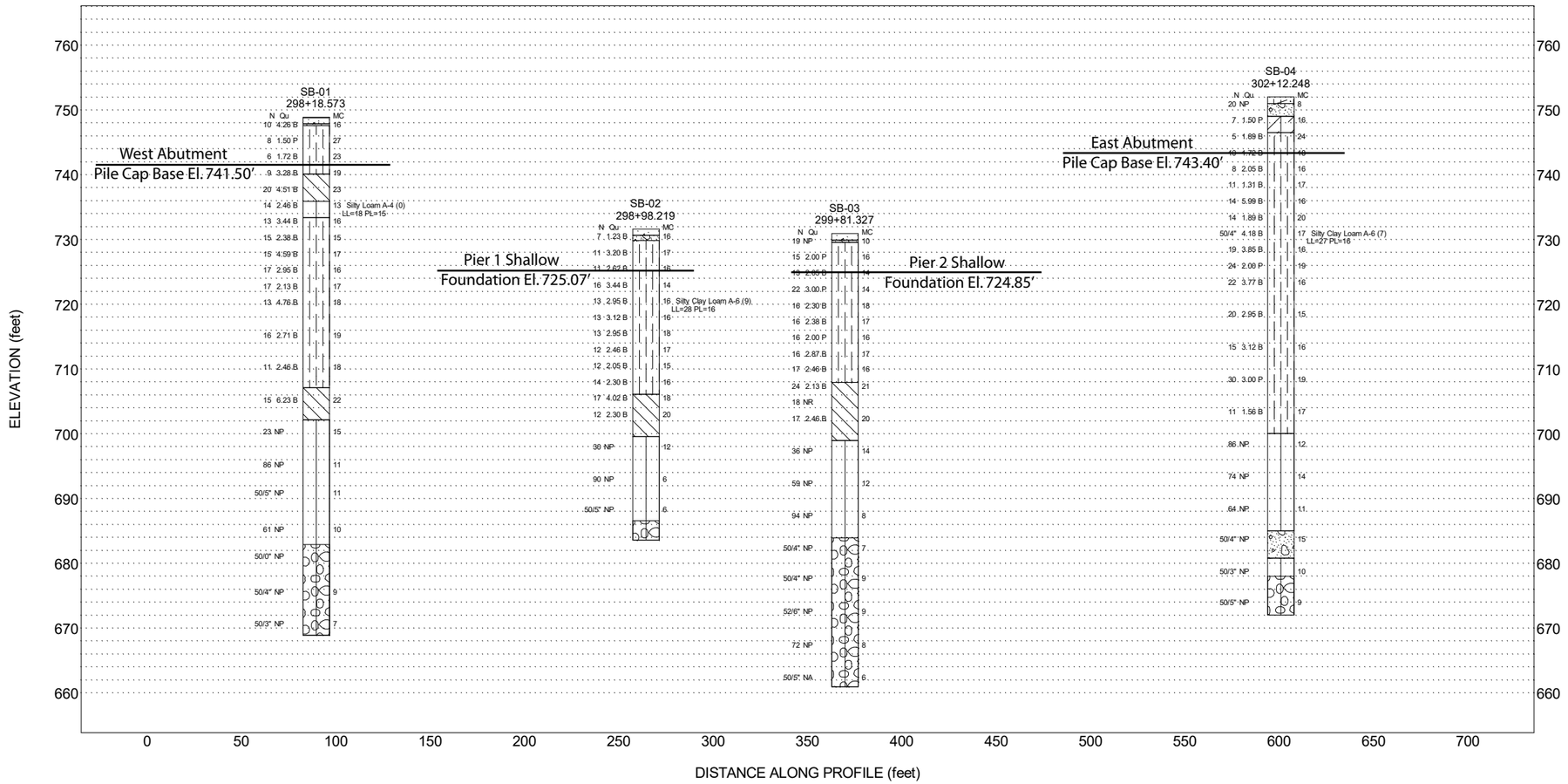
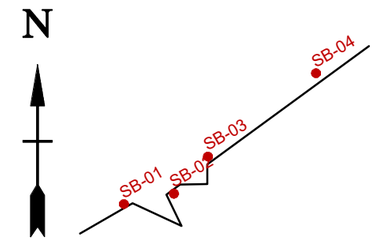


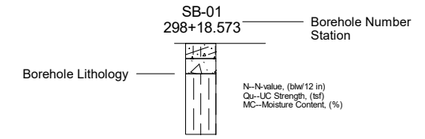
Lithology Graphics

- Pavement
- Concrete
- Crushed stone
- IDH Silty Clay, Silty Clay Loam
- IDH Clay
- IDH Silt, Silty Loam
- Gravel
- Gravelly sand, sandy gravel
- IDH Clay Loam

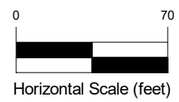


Site Map Scale 1 inch equals 255 feet

Explanation:



- Water Level Reading at time of drilling.
- Water Level Reading 24-hr after drilling or at end of drilling



Vertical Exaggeration: 3.5x

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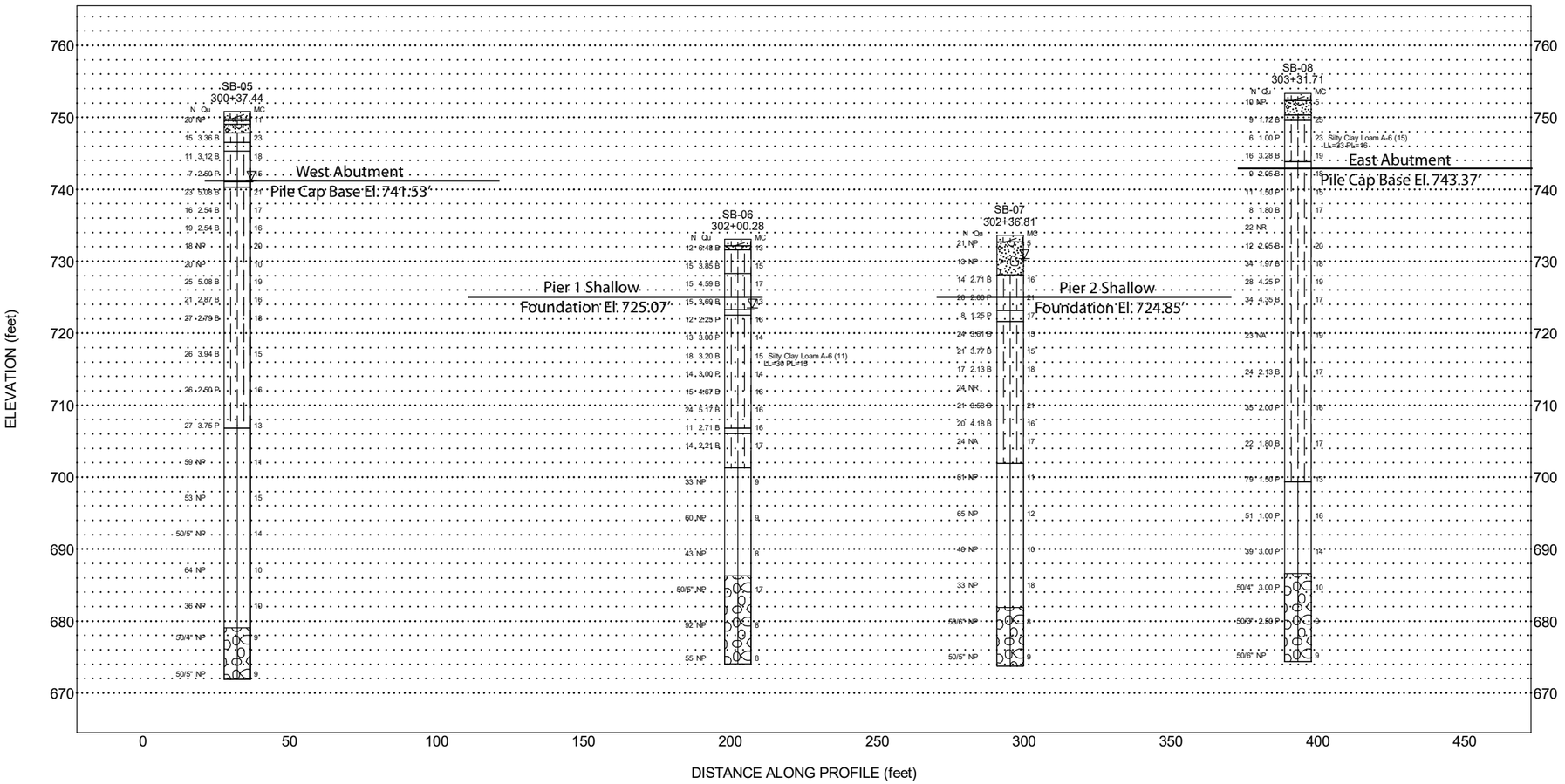
Subsurface Data Profile
I-55 Bridge over Joliet Road, SN 099-0028, Northbound Widening

I-55 Bridge over Joliet Road
Will County, Illinois

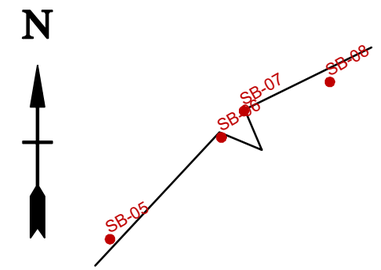
JOB NUMBER	PLATE NUMBER
498-01-01	EXHIBIT 3-1

WEI 11X17 4980101.GPJ WANGENG.GDT 5/22/20



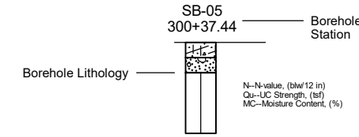
Lithology Graphics

- Pavement
- Gravelly sand, sandy gravel
- IDH Silty Clay, Silty Clay Loam
- IDH Silt, Silty Loam
- Gravel



Site Map Scale 1 inch equals 165 feet

Explanation:



- Water Level Reading at time of drilling.
- Water Level Reading 24-hr after drilling or at end of drilling

0 — 45

Horizontal Scale (feet)

Vertical Exaggeration: 2.5x

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Soil Profile
I-55 Bridge over Joliet Road, SN 099-0028
Southbound Widening

WEI SINCE 1982

I-55 at Joliet Supplement
Bolingbrook IL

JOB NUMBER	PLATE NUMBER
498-01-03	EXHIBIT 3-2

WEI 11X17 4980103.GPJ BEARING-TRIAL.GDT 12/2/20

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APPENDIX A

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BORING LOG LEGEND

Relative Drilling Resistance		
RDR	**Term**	**Criterion**
1	Very Easy	No chatter, very little resistance, very fast and steady drill advance
2	Easy	No chatter, some resistance, fast and steady drill advance rate
3	Moderate	Some chatter, firm drill resistance, moderate advance
4	Hard	Frequent chatter, variable drill resistance, slow advance rate
5	Very Hard	Constant chatter, variable and very slow drill advance, nearly refusal

Coarse Gradation (mm) (ASTM D2488)	
Gravel	4.75 to 75
Cobbles	75 to 300
Boulders	> 300

Proportional Terms (%) (ASTM D2488)	
Trace	< 5
Few	5 to 10
Little	15 to 25
Some	30 to 45
Mostly	50 to 100

Relative Density of Non-Cohesive Soils (ASTM D1586)	
No. of Blows/ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

Soil Moisture Conditions	
Term	**Appearance and Feel**
Dry	Soil sample looks and feels powdery or dusty; no indication of moisture. Free-running granular soils.
Damp	Cohesive soils cannot be molded easily without adding water. Granular soil may not flow very easily.
Moist	Soil is near the optimum moisture content. Cohesive soils are near the plastic limit. Soil changes color slightly when exposed to air for a short period.
Wet	One may feel a high degree of moisture, yet no free water is visible. Water may become visible if the sample is squeezed. Cohesive soil appears weak and sticks to and/or stains hands. Granular soils tend to cohere.
Saturated	Applied to granular soils that have free surface water; water drains freely from the sample.

Consistency of Cohesive Soils (ASTM D1586)	
Qu (tsf)	Consistency
< 0.25	Very Soft
0.25 - 0.50	Soft
0.50 - 1.00	Medium Stiff
1.00 - 2.00	Stiff
2.00 - 4.00	Very Stiff
> 4.00	Hard

Rock Quality Designation (ASTM D6032)	
RQD (%)	Classification
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Sample Type Symbols


Split Spoon


Shelby Tube


No Recovery (NR)


Pitcher


Auger Cuttings


Rock Core

Drill Rig:

17 D50 A [87%]

- 17 → Calibration Year
- D50 → Rig Model
- A → Rig Type (A or T)
- [87%] → SPT Hammer Efficiency

A = All Terrain Vehicle Rig
T = Truck Mounted Rig

SPT = Standard Penetration Test
Q_u = Unconfined Compressive Strength Test
P = Pocket Penetrometer
S = Shear failure (Rimac)
B = Bulge failure (Rimac)
SSA = Solid Stem Auger
HSA = Hollow Stem Auger

03/12/2019

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BORING LOG SB-01

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 748.90 ft
North: 1832980.20 ft
East: 1064050.57 ft
Station: 298+18.573
Offset: 47.079' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	748.8	1-inch thick ASPHALT --PAVEMENT--						
	747.9	11-inch thick CONCRETE						
	747.6	Brown SANDY GRAVEL; dry --AGGREGATE BASE--						
		Stiff to hard, black, blue, gray and green, SILTY CLAY, trace gravel; damp						
		--FILL--						
		--RDR 2--			1	5 4 6	4.26 B	16
			5		2	5 4 4	1.50 P	27
					3	2 3 3	1.72 B	23
	740.1	Very stiff to hard, brown and gray CLAY to SILTY CLAY, trace gravel; damp	10		4	2 3 6	3.28 B	19
		--RDR 2--			5	4 7 13	4.51 B	23
	735.9	Very stiff, brown and gray SILTY LOAM, little gravel; damp						
		--RDR 2--			6	4 7 7	2.46 B	13
		--L_L(%)=18 P_L(%)=15--	15					
		--%Gravel=13.3--						
	733.4	--%Sand=27.3--						
		--%Silt=49.5--						
		--%Clay=9.9--						
		--A-4 (0)--			7	4 6 7	3.44 B	16
		Very stiff to hard, gray SILTY CLAY, trace gravel; damp						
		--RDR 2--						
			20		8	5 7 8	2.38 B	15
			25		9	4 7 8	4.59 B	17
					10	5 8 9	2.95 B	16
					11	5 8 9	2.13 B	17
			30		12	6 6 7	4.76 B	18
			35		13	5 7 9	2.71 B	19
			40		14	5 5 6	2.46 B	18

GENERAL NOTES

Begin Drilling: **04-20-2020** Complete Drilling: **04-21-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
Drilling Method: **3.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Mud in borehole**
At Completion of Drilling: **Mud in borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-01

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 748.90 ft
North: 1832980.20 ft
East: 1064050.57 ft
Station: 298+18.573
Offset: 47.079' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	707.1							
		Hard, gray CLAY, trace gravel; damp						
		--RDR 2--						
			45		15	6 7 8	6.23 B	22
	702.1							
		Medium dense to very dense, gray SILT to SILTY LOAM, trace to some gravel and cobbles; damp						
		--RDR 2 to 3--						
			50		16	4 12 11	NP	15
			55		17	31 41 45	NP	11
			60		18	50/5"	NP	11
		--RDR 3 to 4--						
		--frequent rig chatter, 62 to 80 feet--			19	16 34 27	NP	10
		--possible cobbles--	65					
		--Gravelly SILTY LOAM--						
		--possible boulder, about 3.5 feet thick --			20	50/0"	NP	
			70					
		--cave-in--						
		--rock fragments--						
		--RDR 4--			21	31 50/4"	NP	9
			75					
		--hard drilling, 76.5 to 80 feet--						
		--possible cobbles and boulders--						
		--cave-in--			22	41 50/3"	NP	7
	668.9		80					
		Boring terminated at 80.00 ft						

GENERAL NOTES

Begin Drilling: **04-20-2020** Complete Drilling: **04-21-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
Drilling Method: **3.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Mud in borehole**
At Completion of Drilling: **Mud in borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-02

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 731.62 ft
North: 1832997.85 ft
East: 1064135.27 ft
Station: 298+98.219
Offset: 80.885' RT

Depth (ft)	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	730.7	11-inch thick CONCRETE					
	729.9	Loose, gray, SANDY GRAVEL; moist to wet					
		--BASE COURSE--					
		--FILL--					
		Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp					
		--RDR 2--					
5				1	4 4 3	1.23 B	16
				2	2 5 6	3.20 B	17
				3	4 5 6	2.62 B	16
		--silt seams--		4	4 8 8	3.44 B	14
10							
		--L_L(%)=28, P_L(%)=16--		5	3 5 8	2.95 B	16
		--%Gravel=2.9--					
		--%Sand=10.7--					
		--%Silt=62.2--					
		--%Clay=24.3--					
		--A-6 (9)--		6	5 5 8	3.12 B	16
15							
				7	4 5 8	2.95 B	18
				8	3 5 7	2.46 B	17
20							
25				9	3 4 8	2.05 B	15
				10	5 7 7	2.30 B	16
	706.1	Very stiff to hard, gray CLAY to SILTY CLAY; damp					
		--RDR 2--		11	4 7 10	4.02 B	18
30				12	4 6 6	2.30 B	20
	699.6	Medium dense to very dense, gray SILT to SILTY LOAM, trace to some gravel; dry					
		--RDR 2--		13	10 12 18	NP	12
35							
				14	16 47 43	NP	6
40							

GENERAL NOTES

Begin Drilling: **04-22-2020** Complete Drilling: **04-22-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
Drilling Method: **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **DRY**
At Completion of Drilling: **DRY**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-02

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 731.62 ft
North: 1832997.85 ft
East: 1064135.27 ft
Station: 298+98.219
Offset: 80.885' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--RDR 2 to 4--						
		--frequent rig chatter, 42 to 48 feet--						
		--possible cobbles--						
		--rock fragments--			15	47 50/5"	NP	6
			45					
		--very hard, steady drilling--						
		--possible cobbles and boulders--						
	683.6							
		Boring terminated at 48.00 ft						
			50					
			55					
			60					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)

GENERAL NOTES

Begin Drilling: **04-22-2020** Complete Drilling: **04-22-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
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WATER LEVEL DATA

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At Completion of Drilling: **DRY**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-03

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 730.96 ft
North: 1833060.63 ft
East: 1064192.86 ft
Station: 299+81.327
Offset: 62.156' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	730.0	12-inch thick CONCRETE						
	729.6	Medium dense, gray, well-graded SANDY GRAVEL; dry --BASE COURSE--			1	13 12 7	NP	10
		Very stiff, gray SILTY CLAY, trace gravel --RDR 2--	5		2	4 7 8	2.00 P	16
					3	4 6 7	2.05 B	14
			10		4	5 10 12	3.00 P	14
					5	3 8 8	2.30 B	18
		--L_L(%)=26, P_L(%)=15-- --%Gravel=3.4-- --%Sand=10.8-- --%Silt=63.9-- --%Clay=21.9-- --A-6 (7)--	15		6	4 7 9	2.38 B	17
					7	5 7 9	2.00 P	16
			20		8	5 8 8	2.87 B	17
		--frequent rig chatter, 20.5 to 25 feet-- --possible cobbles--			9	7 8 9	2.46 B	16
	708.0	Very stiff, gray CLAY to SILTY CLAY, trace gravel; damp --RDR 2 to 3--	25		10	6 9 15	2.13 B	21
					11	9 9 9	NR	
			30		12	5 9 8	2.46 B	20
	699.0	Dense to very dense, gray SILT to SILTY LOAM, trace to some gravel; damp --RDR 2 to 3--			13	14 17 19	NP	14
			35					
			40		14	21 19 40	NP	12

GENERAL NOTES

Begin Drilling: **04-23-2020** Complete Drilling: **04-24-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
Drilling Method: **3.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **DRY**
At Completion of Drilling: **Mud in borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-03

WEI Job No.: 498-01-01

Client **Lin Engineering**
Project **I-55 Bridge over Joliet Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 730.96 ft
North: 1833060.63 ft
East: 1064192.86 ft
Station: 299+81.327
Offset: 62.156' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--frequent rig chatter, 42 to 70 feet--						
		--possible cobbles--						
			45		15	32 45 49	NP	8
		--hard drilling, 47 to 70 feet--						
		--cave-in--						
		--possible cobbles and boulders--						
		--RDR 3 to 4--						
			50		16	24 30 50/4"	NP	7
			55		17	48 50/4"	NP	9
		--possible cobbles--						
			60		18	37 52/6"	NP	9
		--cave-in--						
		--possible cobbles--	65		19	23 32 40	NP	8
		--possible cobbles--						
	661.0		70		20	31 50/5"		6
		Boring terminated at 70.00 ft						
			75					
			80					

GENERAL NOTES

Begin Drilling **04-23-2020** Complete Drilling **04-24-2020**
Drilling Contractor **Wang Testing Services** Drill Rig **B57 TMR [100%]**
Driller **N&K** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **3.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **DRY**
At Completion of Drilling ▼ **Mud in borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-04

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 752.04 ft
North: 1833201.92 ft
East: 1064375.89 ft
Station: 302+12.248
Offset: 50.472' RT

Depth (ft)	Elevation (ft)	Profile	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
0	751.0		12-inch thick ASPHALT --PAVEMENT--					
			Medium dense, brown, well-graded SANDY GRAVEL; dry to damp --BASE COURSE--		1	6 9 11	NP	8
	749.0		--FILL-- --RDR 2--					
5			Stiff, black, brown, green, and gray CLAY LOAM, trace gravel; damp --FILL--		2	5 4 3	1.50 P	16
	746.5		--RDR 2--					
			Stiff to hard, brown and gray to gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp --RDR 2 to 3--		3	1 2 3	1.89 B	24
10					4	3 5 5	1.72 B	18
					5	4 4 4	2.05 B	16
15			--RDR 3--		6	4 5 6	1.31 B	17
					7	5 5 9	5.99 B	16
20					8	4 5 9	1.89 B	20
25			--L_L(%)=27, P_L(%)=16-- --%Gravel=7.3-- --%Sand=12.1-- --%Silt=56.6-- --%Clay=24.0-- --A-6 (7)--		9	4 14 50/4"	4.18 B	17
					10	7 8 11	3.85 B	16
					11	6 12 12	2.00 P	19
30					12	6 10 12	3.77 B	16
35					13	6 8 12	2.95 B	15
40					14	6 6 9	3.12 B	16

GENERAL NOTES

Begin Drilling: **04-21-2020** Complete Drilling: **04-21-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
Drilling Method: **3.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Mud in borehole**
At Completion of Drilling: **Mud in borehole, cave-in at 27 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-04

WEI Job No.: 498-01-01

Client: **Lin Engineering**
Project: **I-55 Bridge over Joliet Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 752.04 ft
North: 1833201.92 ft
East: 1064375.89 ft
Station: 302+12.248
Offset: 50.472' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	700.0	--frequent rig chatter, at 52 feet-- --possible cobbles-- Very dense, gray SILTY LOAM, trace gravel and cobbles; damp --RDR 2 to 3--	45		15	8 15 15	3.00 P	19
			50		16	4 4 7	1.56 B	17
			55		17	29 40 46	NP	12
			60		18	25 35 39	NP	14
	685.0	Very dense, gray SANDY LOAM, few gravel; damp --RDR 3-- --frequent rig chatter, 67 to 80 feet-- --possible cobbles--	65		19	21 29 35	NP	11
			70		20	30 50/4"	NP	15
	680.8	Very dense, gray SILTY LOAM, little to some garvel; damp to moist --rock fragments-- --RDR 3 to 4-- --very hard, steady drilling-- --possible cobbles and boulders--	75		21	49 50/3"	NP	10
					22	50/5"	NP	9
	672.0	Boring terminated at 80.00 ft	80					

GENERAL NOTES

Begin Drilling: **04-21-2020** Complete Drilling: **04-21-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **B57 TMR [100%]**
Driller: **N&K** Logger: **M. Sadowski** Checked by: **C. Marin**
Drilling Method: **3.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Mud in borehole**
At Completion of Drilling: **Mud in borehole, cave-in at 27 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-05

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 750.80 ft
North: 1833190.15 ft
East: 1064171.34 ft
Station: 300+37.44
Offset: 56.50' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	749.8	12-inch thick ASPHALT --PAVEMENT--						
	749.6	Gray SANDY GRAVEL; damp						
	749.1	--AGGREGATE BASE--						
		Hard, brown and black SILTY CLAY, trace gravel			1	6 6 14	NP	11
	747.8	--FILL--						
		Medium dense, brown SANDY GRAVEL; damp						
	746.6	--FILL-- -- RDR 2 --	5		2	8 6 9	3.36 B	23
	745.3	Very stiff, brown SILTY CLAY, trace gravel						
		-- RDR 2--			3	4 4 7	3.12 B	18
		Brown SILTY LOAM; damp -- RDR 2--						
		Very stiff, brown SILTY CLAY, trace gravel -- RDR 2--			4	4 3 4	2.50 P	15
	741.1	Brown SILTY LOAM	10					
	740.3	--saturated sand lens--						
		Very stiff to hard, gray SILTY CLAY, trace gravel -- RDR 2 to 3--			5	7 10 13	5.08 B	21
			15		6	6 7 9	2.54 B	17
					7	7 9 10	2.54 B	16
			20		8	7 7 11	NP	20
		--rig chatter, possible cobbles-- --gravels in spoon--			9	10 11 9	3.00 P	10
			25		10	8 11 14	5.08 B	19
					11	10 9 12	2.87 B	16
			30		12	8 10 17	2.79 B	18
			35		13	8 11 15	3.94 B	15
			40		14	8 10 16	2.50 P	16

GENERAL NOTES

Begin Drilling: **11-18-2020** Complete Drilling: **11-19-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & M** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **9.75 ft**
At Completion of Drilling: **Mud**
Time After Drilling: **NA**
Depth to Water: **NA**

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BORING LOG SB-05

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 750.80 ft
North: 1833190.15 ft
East: 1064171.34 ft
Station: 300+37.44
Offset: 56.50' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	706.8							
		Medium dense to very dense, gray SILTY LOAM, trace gravel; damp	45		15	7 14 13	3.75 P	13
		-- RDR 2 to 3--						
		--rig chatter, possible cobbles--						
			50		16	39 30 29	NP	11
		--rig chatter, possible cobbles--	55		17	23 25 28	NP	15
			60		18	27 25 50/5"	NP	14
	671.9	Boring terminated at 78.92 ft						
		--rig chatter, possible cobbles--	65		19	38 30 34	NP	10
			70		20	20 22 14	NP	10
		--rig chatter, possible cobbles--	75		21	50/4"	NP	9
			80		22	50/5"	NP	9

GENERAL NOTES

Begin Drilling: **11-18-2020** Complete Drilling: **11-19-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & M** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **9.75 ft**
At Completion of Drilling: **Mud**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-06

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 733.04 ft
North: 1833300.96 ft
East: 1064292.65 ft
Station: 302+00.28
Offset: 78.35' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		11-inch thick CONCRETE --PAVEMENT--						
	732.1							
	731.6	Gray SANDY GRAVEL; damp --AGGREGATE BASE--						
		Very stiff to hard, gray SILTY CLAY, trace gravel --FILL-- --RDR 2 to 3--			1	9 5 7	6.48 B	13
					2	5 6 9	3.85 B	15
	728.3		5					
		Very stiff to hard, gray SILTY CLAY, trace gravel --RDR 2 to 3--			3	5 6 9	4.59 B	17
					4	5 6 9	3.69 B	13
	723.3		10					
		Gray SILTY LOAM, trace gravel;						
	722.5	wet to saturated --RDR 2--						
		Very stiff to hard, gray SILTY CLAY, trace gravel --RDR 2--			5	4 4 8	2.25 P	16
					6	4 6 7	3.00 P	14
			15					
		--L_L(%)=30, P_L(%)=15-- --%Gravel=3.3-- --%Sand=9.9-- --%Silt=58.6-- --%Clay=28.3--			7	14 8 10	3.20 B	15
					8	5 7 7	3.00 P	14
			20					
			25		9	5 6 9	4.67 B	16
					10	8 11 13	5.17 B	16
	706.8							
		Medium dense, gray SILTY LOAM, trace gravel; moist			11	4 3 8	2.71 B	16
	706.0	Very stiff, gray SILTY CLAY, trace gravel --RDR 2--						
			30		12	5 6 8	2.21 B	17
	701.3							
		Dense to very dense, gray SILTY LOAM, trace gravel; damp --RDR 2 to 4--			13	14 16 17	NP	9
			35					
		--rig chatter, possible cobbles--			14	32 29 31	NP	9
			40					

GENERAL NOTES

Begin Drilling: **11-19-2020** Complete Drilling: **11-20-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & M** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **9.75 ft**
At Completion of Drilling: **DRY**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-06

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 733.04 ft
North: 1833300.96 ft
East: 1064292.65 ft
Station: 302+00.28
Offset: 78.35' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--rig chatter, possible cobbles--	45		15	30 22 21	NP	8
		--hard drilling, rig chatter, possible cobbles--	50		16	19 20 50/5"	NP	17
		--hard drilling, rig chatter, possible cobbles--	55		17	39 46 46	NP	8
	674.0	--hard drilling, rig chatter, possible cobbles--			18	55	NP	8
		Boring terminated at 59.00 ft	60					

GENERAL NOTES

Begin Drilling: **11-19-2020** Complete Drilling: **11-20-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & M** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **9.75 ft**
At Completion of Drilling: **DRY**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-07

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 733.62 ft
North: 1833329.65 ft
East: 1064317.19 ft
Station: 302+36.81
Offset: 87.92' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		11-inch thick CONCRETE --PAVEMENT--						
	732.7	Medium dense, gray SANDY GRAVEL; damp --AGGREGATE BASE-- -- RDR 2--			1	10 10 11	NP	5
			5		2	8 5 8	NP	
	728.1	Very stiff, gray SILTY CLAY, trace gravel --RDR 2--			3	4 5 9	2.71 B	16
			10		4	7 9 11	2.00 P	21
	723.1	Gray SILTY LOAM; moist			5	4 3 5	1.25 P	17
	721.6	Very stiff to hard, gray SILTY CLAY, trace gravel --RDR 2--			6	6 8 16	3.61 B	15
			15		7	5 8 13	3.77 B	15
			20		8	5 6 11	2.13 B	18
			25		9	7 11 13	NR	
					10	6 7 14	3.53 B	21
			30		11	5 7 13	4.18 B	16
					12	6 8 16	NA	17
	701.9	Dense to very dense, gray SILTY LOAM, trace gravel; damp --RDR 3 to 4--	35		13	26 32 29	NP	11
			40		14	31 32 33	NP	12

GENERAL NOTES

Begin Drilling: **11-17-2020** Complete Drilling: **11-18-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & M** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **3.50 ft**
At Completion of Drilling: **Mud**
Time After Drilling: **NA**
Depth to Water: **NA**

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BORING LOG SB-07

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 733.62 ft
North: 1833329.65 ft
East: 1064317.19 ft
Station: 302+36.81
Offset: 87.92' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--rig chatter, possible cobbles--	45		15	29 25 23	NP	10
		--rig chatter, possible cobbles--	50		16	11 13 20	NP	18
		--rig chatter, possible cobbles--	55		17	30 45 50/6"	NP	8
	673.7	--rig chatter, possible cobbles--	60		18	38 37 50/5"	NP	9
		Boring terminated at 59.91 ft						

GENERAL NOTES

Begin Drilling: **11-17-2020** Complete Drilling: **11-18-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & M** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **3.50 ft**
At Completion of Drilling: **Mud**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-08

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 753.33 ft
North: 1833361.31 ft
East: 1064410.74 ft
Station: 303+31.71
Offset: 60.59' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	752.3	12-inch thick ASPHALT --SHOULDER PAVEMENT--						
		Medium dense, gray SANDY GRAVEL; damp --AGGREGATE BASE--			1	9 6 4	NP	5
	750.3	Very stiff, black SILTY CLAY --FILL--						
	749.6	--RDR 2 to 3--			2	4 4 5	1.72 B	25
		Stiff to very stiff, brown and gray SILTY CLAY to SILTY CLAY LOAM	5					
		--RDR 2-- --L_L(%)=33, P_L(%)=16-- --%Gravel=0.0-- --%Sand=6.6-- --%Silt=71.8-- --%Clay=21.6--			3	2 2 4	1.00 P	23
	743.8				4	4 7 9	3.28 B	19
		Brown SILTY LOAM; damp to moist	10					
	742.8	--RDR 2--						
		Stiff to hard, gray SILTY CLAY, trace to some gravel --RDR 2 to 3--			5	3 4 5	2.05 B	18
			15		6	4 5 6	1.50 P	15
					7	3 3 5	1.80 B	17
					8	5 7 15	NR	
			20					
		-rig chatter, possible cobbles--	25		9	4 5 7	2.05 B	20
					10	16 19 15	1.97 B	18
					11	9 13 15	4.25 P	19
			30		12	9 16 18	4.35 B	17
			35		13	8 11 12	NA	19
			40		14	8 10 14	2.13 B	17

GENERAL NOTES

Begin Drilling: **11-16-2020** Complete Drilling: **11-16-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & G** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **DRY**
At Completion of Drilling: **Mud**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 4980103.GPJ WANGENG.GDT 12/4/20

Wang Engineering
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Telephone: 6309539928
Fax: 6309539938

BORING LOG SB-08

WEI Job No.: 498-01-03

Client: **Lin Engineering**
Project: **I-55 at Joliet Supplement**
Location: **Bolingbrook IL**

Datum: NAVD 88
Elevation: 753.33 ft
North: 1833361.31 ft
East: 1064410.74 ft
Station: 303+31.71
Offset: 60.59' LT

Depth (ft)	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
45				15	18 16 19	2.00 P	16
50		-rig chatter, possible cobbles--		16	8 10 12	1.80 B	17
	699.3						
55		Dense to very dense, gray SILT to SILTY LOAM, trace gravel; damp to moist --RDR 2 to 4--		17	12 35 44	1.50 P	13
60		-rig chatter, possible cobbles--		18	21 23 28	1.00 P	16
65		--sand seams, wet--		19	25 23 16	3.00 P	14
70				20	23 40 50/4"	3.00 P	10
75		-hard drilling, rig chatter, possible cobbles--		21	34 50/3"	2.50 P	9
	674.3						
80		Boring terminated at 79.00 ft		22	50/6"	NP	9

GENERAL NOTES

Begin Drilling: **11-16-2020** Complete Drilling: **11-16-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **CME55 TMR [85%]**
Driller: **R & G** Logger: **E. Yim** Checked by: **NSB**
Drilling Method: **2.25" ID HSA; mud rotary after 10 feet; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **DRY**
At Completion of Drilling: **Mud**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 4980103.GPJ WANGENG.GDT 12/4/20

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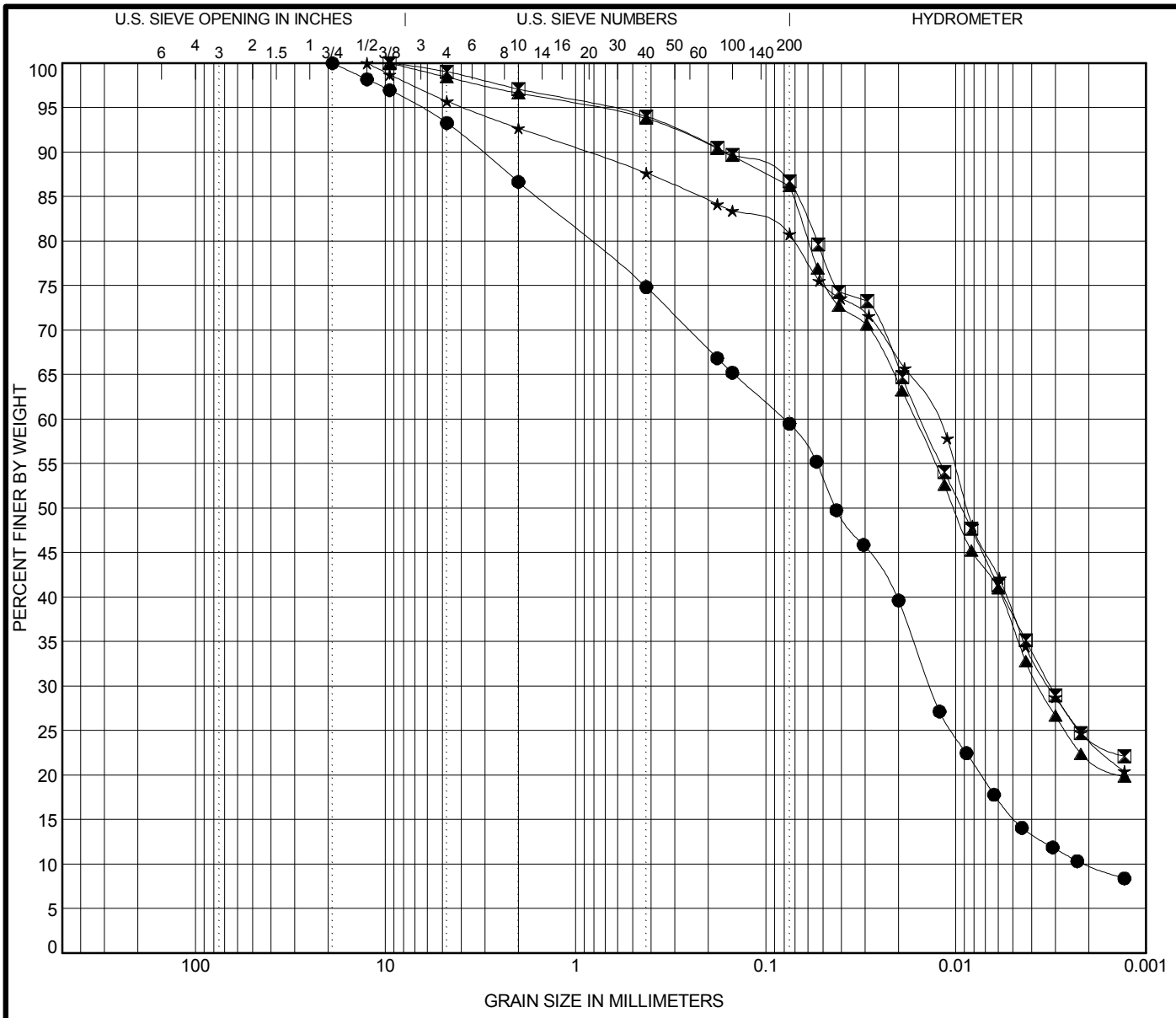
APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	SB-01#6	13.5 ft	**Silty Loam**	**18**	**15**	**3**	**1.12**	**38.16**
⊠	SB-02#5	11.0 ft	**Silty Clay Loam**	**28**	**16**	**12**		
▲	SB-03#	13.0 ft	**Silty Clay Loam**	**26**	**15**	**11**		
★	SB-04#9	21.0 ft	**Silty Clay Loam**	**27**	**16**	**11**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	SB-01#6	13.5 ft	**19**	**0.08**	**0.014**	**0.002**	**13.3**	**27.3**	**49.5**	**9.9**
⊠	SB-02#5	11.0 ft	**9.5**	**0.015**	**0.003**		**2.9**	**10.7**	**62.2**	**24.3**
▲	SB-03#	13.0 ft	**9.5**	**0.016**	**0.004**		**3.4**	**10.8**	**63.9**	**21.9**
★	SB-04#9	21.0 ft	**12.5**	**0.013**	**0.003**		**7.3**	**12.1**	**56.6**	**24.0**

WEI SINCE 1982
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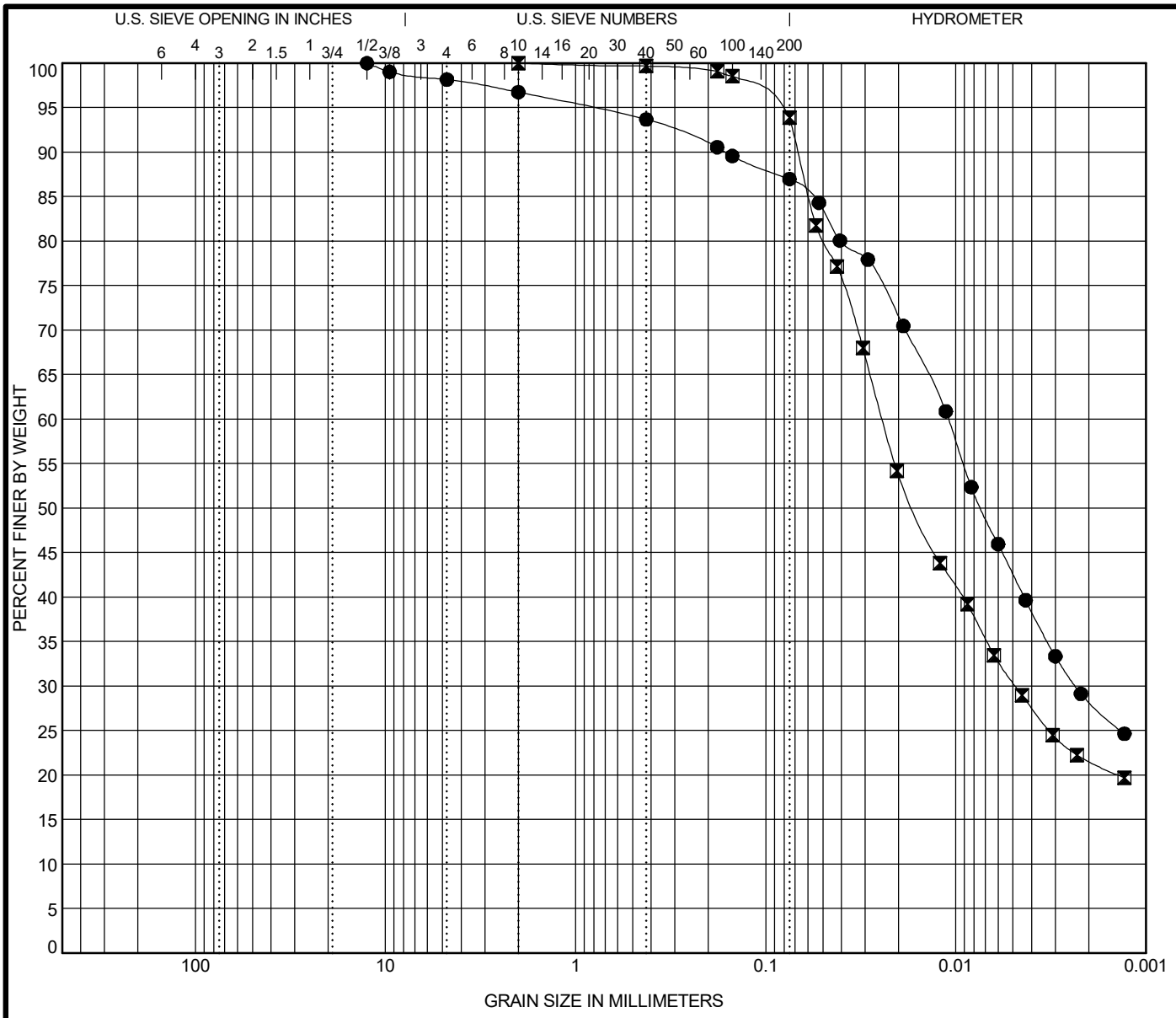
GRAIN SIZE DISTRIBUTION

Project: I-55 Bridge over Joliet Road

Location: Will County, Illinois

Number: 498-01-01

WEI_GRAIN_SIZE_IDH_4980101.GPJ_US_LAB.GDT 5/7/20



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	SB-06#7	16.0 ft	**Silty Clay Loam**	**30**	**15**	**15**		
⊠	SB-08#3	6.0 ft	**Silty Clay Loam**	**33**	**16**	**17**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	SB-06#7	16.0 ft	**12.5**	**0.011**	**0.002**		**3.3**	**9.9**	**58.6**	**28.3**
⊠	SB-08#3	6.0 ft	**2**	**0.024**	**0.005**		**0.0**	**6.6**	**71.8**	**21.6**

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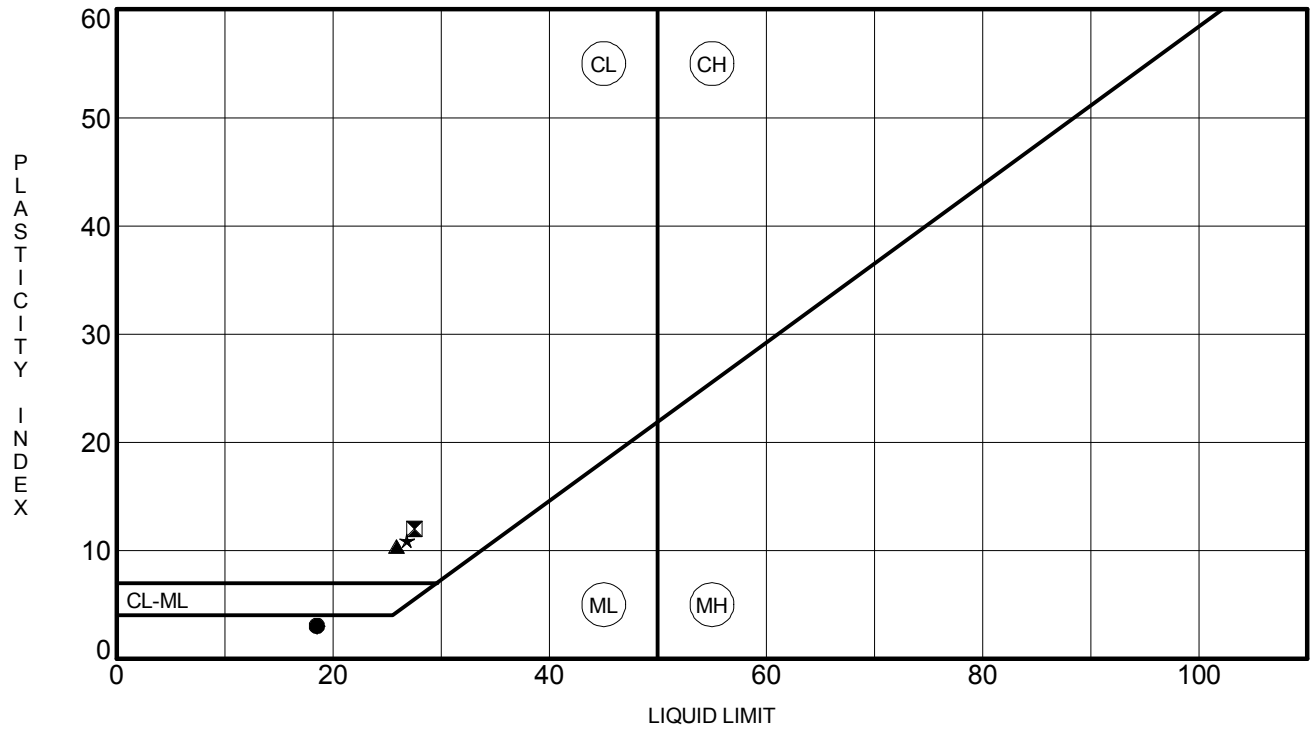
GRAIN SIZE DISTRIBUTION

Project: I-55 at Joliet Supplement

Location: Bolingbrook IL

Number: 498-01-03

WEI GRAIN SIZE IDH 4980103.GPJ US LAB.GDT 12/2/20



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	SB-01#6	13.5 ft	18	15	3	59	**Silty Loam**
⧓	SB-02#5	11.0 ft	28	16	12	87	**Silty Clay Loam**
▲	SB-03#	13.0 ft	26	15	11	86	**Silty Clay Loam**
★	SB-04#9	21.0 ft	27	16	11	81	**Silty Clay Loam**

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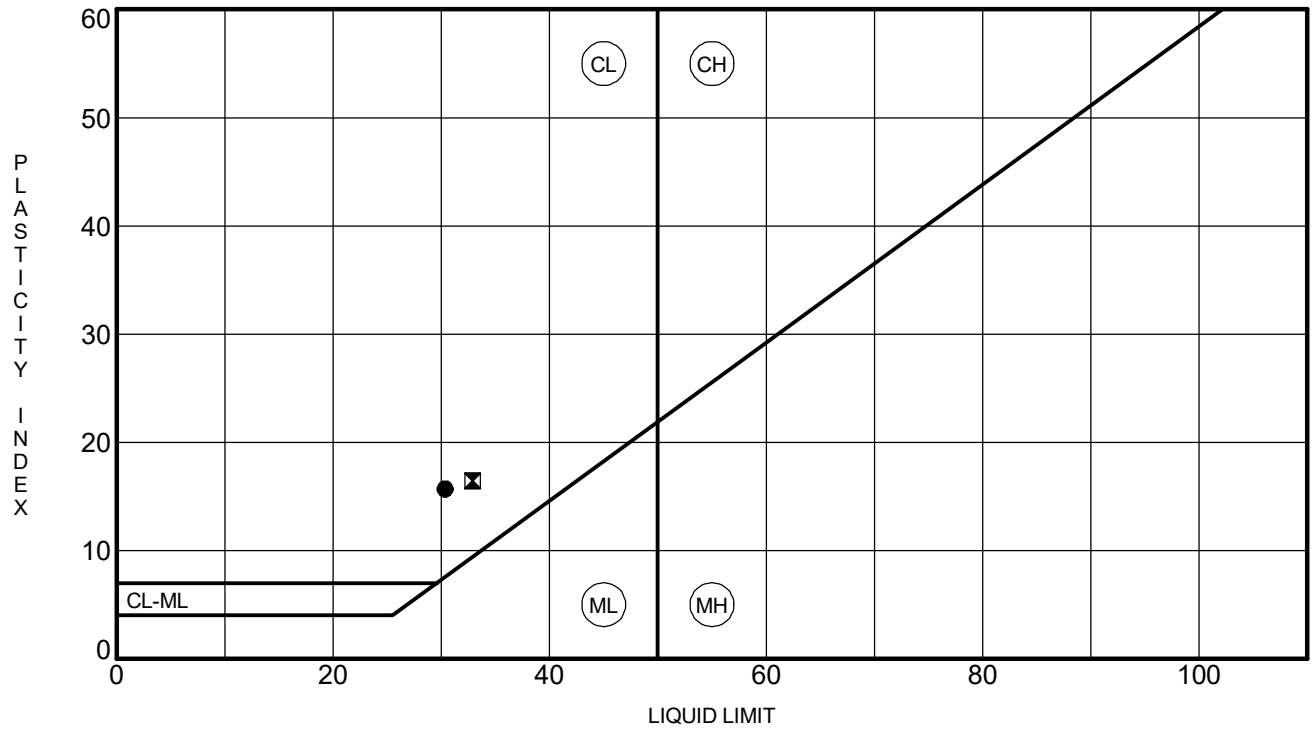
ATTERBERG LIMITS' RESULTS

Project: I-55 Bridge over Joliet Road

Location: Will County, Illinois

Number: 498-01-01

WEI_ATTERBERG_LIMITS IDH 4980101.GPJ US_LAB.GDT 5/7/20



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	**SB-06#7**	**16.0 ft**	**30**	**15**	**15**	**87**	**Silty Clay Loam**
⊠	**SB-08#3**	**6.0 ft**	**33**	**16**	**17**	**94**	**Silty Clay Loam**

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ATTERBERG LIMITS' RESULTS

Project: I-55 at Joliet Supplement

Location: Bolingbrook IL

Number: 498-01-03

WEI ATTERBERG LIMITS IDH 4980103.GPJ US LAB.GDT 12/2/20

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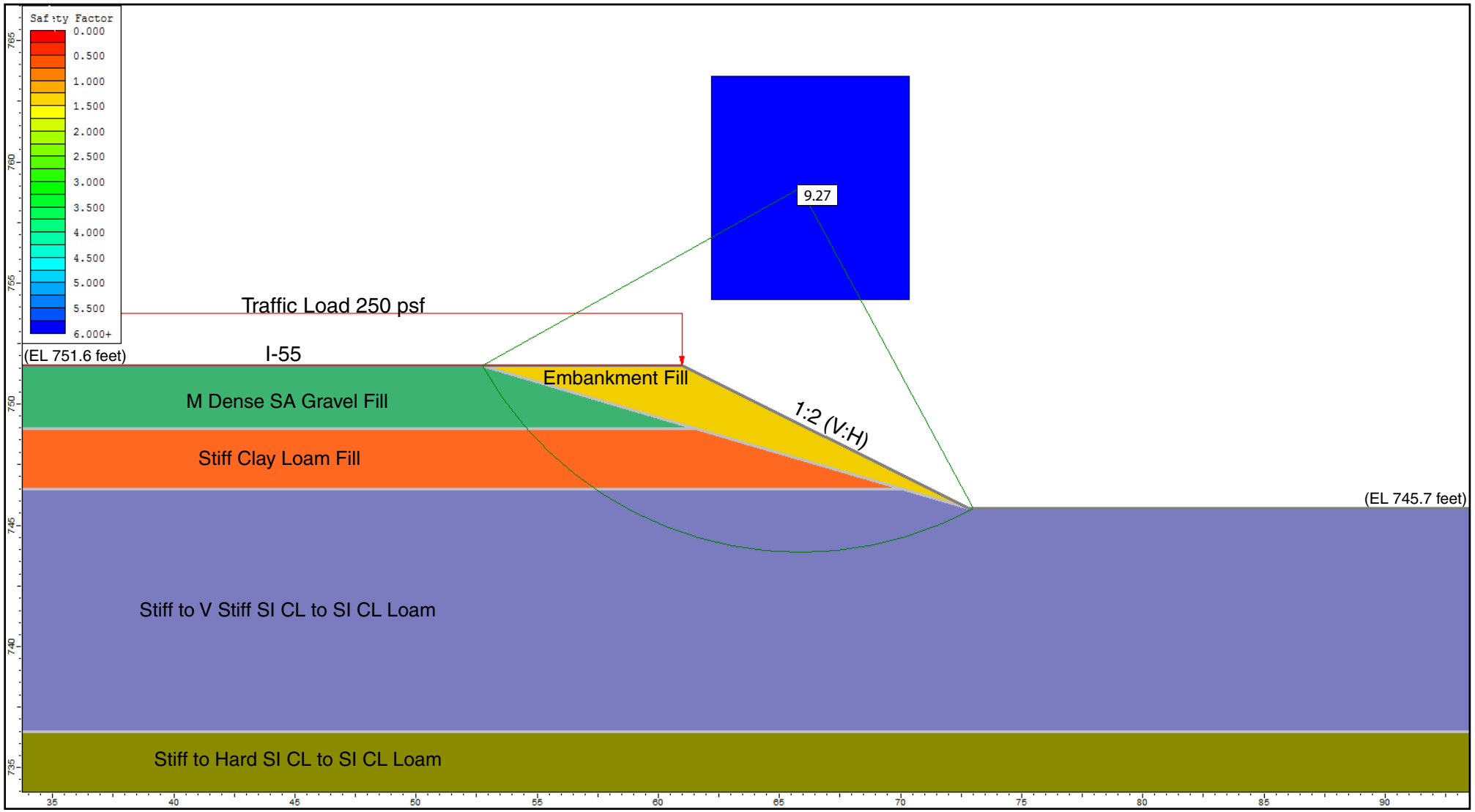
APPENDIX C



Undrained Analysis, SN. 099-0028 , Sta. 301+00.00, Ref Boring: SB-04

Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Embankment Fill	125	1000	0
2	M Dense SA Gravel Fill	115	0	30
3	Stiff Clay Loam Fill	120	1500	0
4	Stiff to V Stiff SI CL to SI CL Loam	120	1700	0
5	Stiff to Hard SI CL to SI CL Loam	120	3200	0

GLOBAL STABILITY ANALYSIS: INTERSTATE 55 BRIDGE OVER JOLIET ROAD, SN. 099-0028, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL | APPENDIX C-1 | DRAWN BY: RKC | CHECKED BY: A. Kurnia

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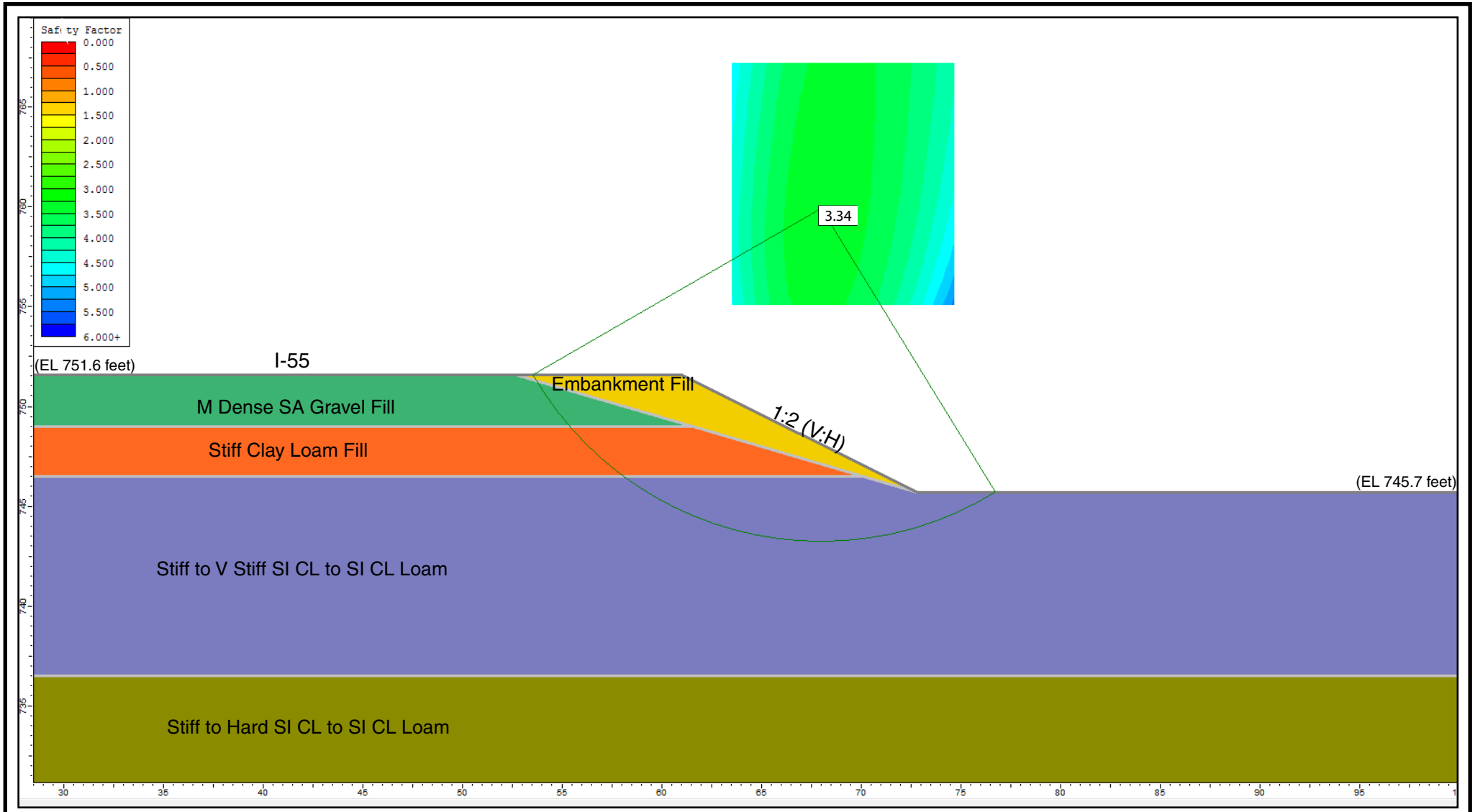
FOR LIN ENGINEERING, LTD. | 498-01-01



Drained Analysis, SN. 099-0028 , Sta. 301+00.00, Ref Boring: SB-04

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	Embankment Fill	125	100	30
2	M Dense SA Gravel Fill	115	0	30
3	Stiff Clay Loam Fill	120	100	31
4	Stiff to V Stiff SI CL to SI CL Loam	120	100	32
5	Stiff to Hard SI CL to SI CL Loam	120	100	32

GLOBAL STABILITY ANALYSIS:INTERSTATE 55 BRIDGE OVER JOLIET ROAD, SN. 099-0028, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL | APPENDIX C-2 | DRAWN BY: RKC | CHECKED BY: A. Kurnia

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FOR LIN ENGINEERING, LTD. | 498-01-01

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APPENDIX D

Bench Mark: BM #3. "□" Cut on top at the west end of the northern parapet wall of bridge of I-55 over Joliet Rd.
Elev. 753.835

Existing Structures: Structure Number 099-0028 was originally constructed in 1955 as IN 187(5), FA Rt.34 (US 66) over US66A (North Ramp), Section 29R1-HB, at Station 684+80.6. Structure was widened in 1976 and 1987. The existing structure is comprised of a three span, non-composite, continuous 36" steel wide flange beams on stub abutments founded on concrete piles. the Piers are multi-column piers rectangular concrete pier substructure units on spread footings. The structure is skewed 61*08' left advanced. The overall length measures 210'-8" back to back of abutment with an out to out bridge width varies from 119'-2 7/8" to 123-6 18". Traffic shall be maintained utilizing stage construction.

No Salvage

SCOPE OF WORK

1. Widen embankment cone at abutments on NB & SB sides.
2. Remove and replace existing bridge superstructure to accommodate the new bridge width.
3. Remove and Replace underpass lighting over existing Joliet Road.
4. Widen existing piers & abutments on NB & SB sides.
5. Construct bearing pedestals and complete substructure repairs at existing piers.
6. Replace existing bearing with elastomeric.
7. Remove and replace existing approach slabs.
8. Replace bridge deck expansion joints.

HIGHWAY CLASSIFICATION

F.A.I. RTE. 55 (I-55)
Functional Class: Interstate
ADT:92,600 (2019); 234,005 (2032)
ADTT:14,816 (2019); 37,440 (2032)
DHV: 23,401 (2032)
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic

F.A.U. RTE 378 (JOLIET RD)
Functional Class: Arterial
ADT:29,500 (2019); 18,104 (2032)
ADTT:6,195 (2019); 3,802 (2032)
DHV: 1,811 (2032)
Design Speed: 50 m.p.h.
Posted Speed: 45 m.p.h.
One-Way Traffic

LOADING HL-93

No future wearing surface will be allowed due to the capacity of the original (1955) substructure. Proposed superstructure was designed to allow for 25#/sf future wearing surface.

DESIGN SPECIFICATIONS

New Construction:

2020 AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 9th Edition

DESIGN STRESSES

FIELD UNITS (New Construction)

f'c = 3,500 psi (Substructure)
f'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

FIELD UNITS (Existing Construction)

f'c = 4,000 psi (Substructure)
fy = 60,000 psi (Reinforcement)

SEISMIC DATA

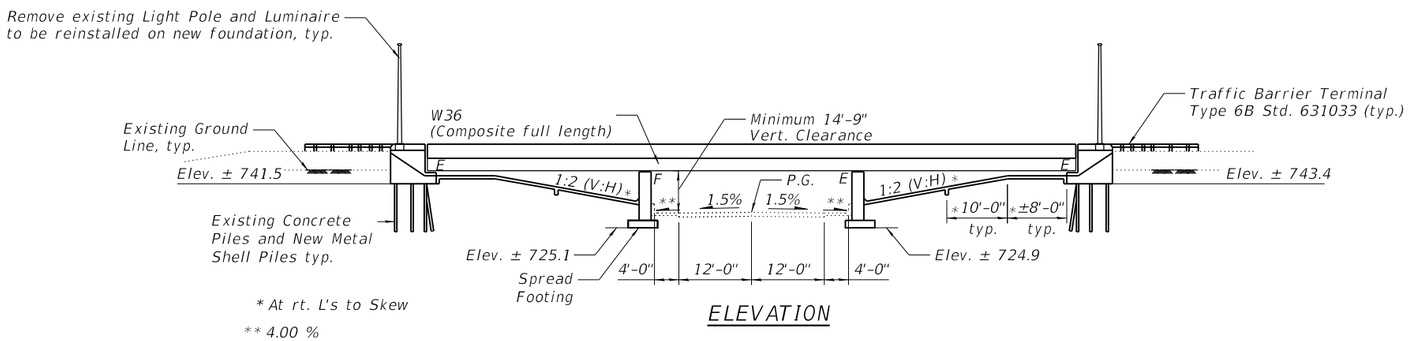
New Construction:

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (S_{D1}) = 0.065 g
Design Spectral Acceleration at 0.2 sec. (S_{DS}) = 0.122 g
Soil Site Class = C

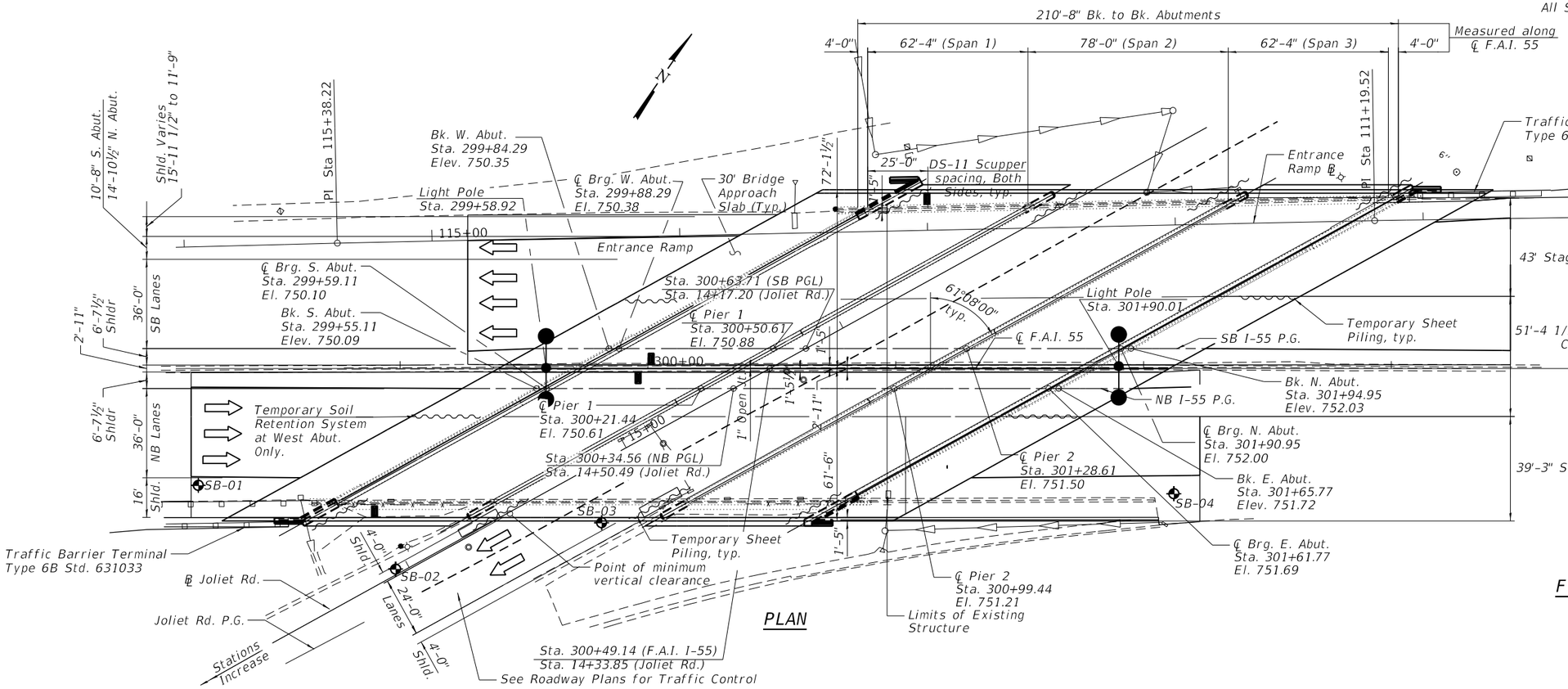
NOTES:

Up to ¼ inch may be ground off the bridge deck and the bridge approach slabs. The profile grade shows the final elevations after grinding.

All Structural steel shall be hot dipped galvanized.



ELEVATION



PLAN

LOCATION SKETCH

GENERAL PLAN & ELEVATION
I-55 OVER JOLIET ROAD
F.A.I. RTE. 55 - SEC. (29-R1HP)99R-4
WILL COUNTY
STATION 300+49.14
STRUCTURE NO. SN 099-0028

MODEL: $MODELNAME$
FILE NAME: $FILE$

$DATE$ $TIME$

GRAEF
8501 W. Higgins Road; Suite 280
Chicago, Illinois 60631; (773) 399-0112

USER NAME =	DESIGNED - HA	REVISED -	
	CHECKED - KGW	REVISED -	
PLOT SCALE =	DRAWN - WAR	REVISED -	
PLOT DATE =	CHECKED - JAZ	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN
SN 099-0028
SHEET 1 OF 3 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
55	(29-R1HB)99R-4	WILL		
		CONTRACT NO. 62H03		
	ILLINOIS FED. AID PROJECT			