STRUCTURE GEOTECHNICAL REPORT

I-74 over Stony Creek

Existing S.N. 092-0001 (EB) / 092-0002 (WB)
Proposed S.N. 092-0210 (EB) / 092-0211 (WB)

F.A.I. RTE. 74
SECTION (92-9)BR
VERMILION COUNTY, ILLINOIS
JOB NO. P-95-029-22
PTB 206-033
KEG NO. 23-1015.00

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Authored By:
Christoph Opperman, P.E. &
Ty Harden, E.I.
copperman@kaskaskiaeng.com
(618) 233-5877

Prepared For:
Epstein
600 West Fulton Street
Chicago, IL 60661

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Kaskaskia
Engineering Group, LLC

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EXHIBITS

1.0 PROJECT DESCRIPTION AND SCOPE

1.1 Introduction

The geotechnical study summarized in this report was performed by Kaskaskia Engineering Group, LLC (KEG) for proposed dual bridge replacements carrying I-74 over Stony Creek. The project is located in Vermilion County, Illinois. The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and present design and construction recommendations for the proposed structures.

1.2 Project Description

The project consists of the removal and replacement of two three-span bridges (SN 092-0001 (EB) and 092-0002 (WB)) carrying I-74 over Stony Creek. The existing structure was built in 1959. It has a total length of 154'-7 7/8" from back-to-back of abutments and a width of 34'. The general location of the proposed structure is shown on a Location Map, Exhibit A. The project is located around 12 miles west of Danville, IL. The site lies within the limits of the Second Principal Meridian (T. 19N, R. 13W, Section 8), within the Bloomington Ridged Plain of the Till Plains section of the Central Lowland Province.

1.3 Proposed Structure Information

The proposed structures (SN 092-0210 (EB) and SN 092-0211 (WB)) will consist of three-span bridges, which will be built over Stony Creek. Each structure will provide two 12' wide driving lanes, a 10' wide outer shoulder, and a 6' wide inner shoulder, for a total bridge width of 42' 10" out to out. Each structure will measure 168' 6 5/8" back-to-back of abutments. A Type, Size, and Location Plan (TS&L) is included in Exhibit C.

Further substructure details will be based on the findings of this SGR.

2.0 FIELD EXPLORATION

2.1 Subsurface Exploration and Testing

KEG developed and completed the site exploration plan. Four standard penetration test (SPT) borings designated SB-01 through SB-04 were drilled between August 21 and 24, 2023. The boring locations were chosen based on challenging accessibility issues due to the slopes, vegetation, and creek. The drilling was performed using 3.75-inch I.D. hollow-stem augers. Standard penetration tests (SPTs) were conducted on 2.5-ft. intervals to 30 ft., followed by 5.0-ft. intervals to termination. Modified SPT samples were taken on the shale layers. The field testing consisted of Rimac strength tests on all intact cohesive samples, as well as a pocket penetrometer. The boring locations are shown on the Boring Plan, Exhibit B. Detailed information regarding the nature and thickness of the soils encountered and the results of the field sampling and laboratory testing are shown on the Boring Logs, Exhibit D. The soil profile for the above-mentioned borings, can be found on the Subsurface Profile, Exhibit E.

2.2 Subsurface Conditions

The profiles at the four (4) boring locations exhibited layers of clays, sands, loams, and tills. The four borings were advanced to shale followed by 20 and 25 ft of MSPT sample penetration into

the shales. The bedrock consisted of shale with sporadic layers of coal. Table 2.2.1 shows a summary of the depth of drilling, the top of the rock, and the ground surface elevation (GSE) of the borings. Table 2.2.2 describes the general condition of the subsurface.

Table 2.2.1 - Boring Information Summary

Designation	Depth (ft)	Top of Rock Elevation (ft.)	GSE (ft.)
SB-01	60	605.6	639.14
SB-02	60	609.3	642.79
SB-03	30	629.0	635.00
SB-04	45	614.5	632.97

Table 2.2.2 – Subsurface Profile Summary

Soil Type	N-Values (bpf)	Q_u (tsf)	WC (%)	Boring
Clay Loam	9 to 11	1.1 to 1.5	15 to 18	SB-01
Clayey Sand	4 to 87	-	10 to 15	SB-02
Loam	8 to 19	0.3 to 2.4	12 to 14	SB-02
Sandy Clay	4 to 29	0.3 to 1.8	15 to 28	SB-01, SB-03, SB-04
Sandy Clay Loam Till	13 to 66	4.6	8 to 17	SB-02
Sandy Loam	13 to 63	0.5 to 2.4	10 to 19	SB-01
Silty Clay	9 to 50	1.5 to 4.5	6 to 27	All
Silty Clay Loam	6 to 10	1.9 to 4.3	12	SB-01
Silty Clay Loam Till	18 to 35	3.7 to 7.7	17 to 21	SB-01
Silty Clay Till	6 to 48	0.8 to 3.1	17 to 21	SB-04

2.3 Groundwater

Groundwater was encountered at the time of drilling on borings SB-01 and SB-02. For Boring SB-01, groundwater was encountered at El. 619.1 (20 ft. below GSE) and for Boring SB-02, was encountered at El 626.8 (16 ft. below GSE). It should be further noted that the groundwater level is subject to seasonal and climatic variations, including the level of adjacent affluents.

3.0 GEOTECHNICAL EVALUATIONS

3.1 Settlement

Since no significant grading or changes to the existing embankments other than cutting of the existing slopes are expected at the proposed structure, it is estimated that the existing embankments will experience no settlement. Therefore, no settlement calculations were performed for the proposed structure.

3.2 Slope Stability

Stability analysis using SLOPE/W was performed using the proposed structure geometry on the TS&L. Three conditions were modeled for each scenario: end-of-construction, long-term, and seismic stability. A critical factor of safety (FOS) was calculated for each condition. According to the current standard of practice, the target FOS is 1.5 for end-of-construction and long-term slope stability and 1.1 for Seismic stability.

Full cohesion and a friction angle of 0 degrees were assumed to model the end-of-construction condition. Nominal values for cohesion were used with the full friction angle to model the long-term condition and analyze the theoretical condition where pore water pressure has dissipated. Nominal values for the cohesive soils were between 50 and 150 psf, with friction angles between 26 and 30 degrees.

The Bishop Circular Method, which generates circular-shaped failure surfaces, was used to calculate the critical failure surfaces and FOS for the proposed conditions. The FOS obtained in the analysis is shown in Table 3.2.1. SLOPE/W program output from this analysis can be found in SLOPE/W Slope Stability Analysis, Exhibit F.

Table 3.2.1 – Slope Stability Critical FOS

Location (1V:2H Slope)	Critical FOS		
	End-of Construction	Long Term	Seismic
Western Abutments (SB-01)	15.9	2.4	12.5
Eastern Abutments (SB-02)	14.8	2.6	13.4

As both bridge abutments on either end of the bridge are at approximately the same elevation and utilize the same Borings for analysis, separate analysis for each bridge as an individual is considered redundant. Furthermore, the results of the analysis conclude that the likelihood of slope stability failure is very low under the proposed conditions.

3.3 Seismic Considerations

The determination of Seismic Site Class was based on the method described by IDOT AGMU Memo 09.1 - Seismic Site Class Definition and the IDOT provided spreadsheet titled: *Seismic Site Class Determination*. Using these resources, the controlling global site class for this project is Soil Site Class C.

Additional seismic parameters were calculated for use in the design of the structure. Published information and mapping from the USGS, including software directly applicable to the AASHTO Guide Specifications for LRFD Seismic Bridge Design, were used to develop the parameters for the bridge location. The values, based on Soil Site Class C, are summarized below.

Table 3.3.1 - Summary of Seismic Parameters

Parameter	Value
Soil Site Class	C
Spectral Response Acceleration, 0.2 Sec, S_{DS}	0.173 g
Spectral Response Acceleration, 1.0 Sec, S_{D1}	0.094 g
Seismic Performance Zone	1

As indicated in the table above, the Seismic Performance Zone is 1, based on S_{D1} and Table 3.15.2-1 in the IDOT Bridge Manual, the Soil Site Class C, and Figure 2.3.10-2 in the IDOT Bridge Manual.

3.4 Scour

The design scour elevations for the proposed structure were developed by Epstein and are included below in Table 3.4.1

Table 3.4.1 – Design Scour Elevations
S.N. 092-0210 (E.B.)

Event/Limit State	Design Scour Elevation (ft.)				Item 113
	West Abutment	Pier 1	Pier 2	East Abutment	
Q_{100}	642.00	625.0	625.0	641.53	5
Q_{200}	642.00	624.7	624.7	641.53	
Design	642.00	625.0	625.0	641.53	
Check	642.00	624.7	624.7	641.53	

S.N. 092-0211 (W.B)

Event/Limit State	Design Scour Elevation (ft.)				Item 113
	West Abutment	Pier 1	Pier 2	East Abutment	
Q_{100}	641.92	625.0	625.0	641.48	5
Q_{200}	641.92	624.7	624.7	641.48	
Design	641.92	625.0	625.0	641.48	
Check	641.92	624.7	624.7	641.48	

4.0 FOUNDATION EVALUATIONS AND DESIGN RECOMMENDATIONS

4.1 Driven Piles

The foundations supporting the proposed bridge must provide sufficient support to resist dead and live loads. The IDOT Static Method uses the LRFD Pile Design Guide Procedure to estimate the pile lengths (Pile Length/Pile Type, Exhibit G). The factored reactions and the preliminary design loads, as provided by Quigg Engineering, are presented in Table 4.1.1.

The estimated pile lengths for applicable H-pile types are shown in Tables 4.1.2 through 4.1.11 below. The Nominal Required Bearing (R_N) represents the resistance the pile will experience during driving and will assist the contractor in selecting a proper hammer size. The Factored

Resistance Available (R_F) documents the net long-term axial factored pile capacity available at the top of the pile to support factored substructure loadings.

Table 4.1.1 - Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
Abutments	1,278.4

Table 4.1.2 - Estimated Pile Lengths for HP 10x42 Steel H-Piles (S.N. 092-0210 (E.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	335	184	38	643.54
West Abutment (SB-01)	335	184	41	643.88

Table 4.1.3 - Estimated Pile Lengths for HP 12x53 Steel H-Piles (S.N. 092-0210 (E.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	418	230	37	643.54
West Abutment (SB-01)	418	230	41	643.88

Table 4.1.4 - Estimated Pile Lengths for HP 12x63 Steel H-Piles (S.N. 092-0210 (E.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	497	273	38	643.54
West Abutment (SB-01)	497	273	43	643.88

Table 4.1.5 - Estimated Pile Lengths for HP 14x73 Steel H-Piles (S.N. 092-0210 (E.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	578	318	38	643.54
West Abutment (SB-01)	578	318	42	643.88

Table 4.1.6 – Estimated Pile Lengths for HP 14x89 Steel H-Piles (S.N. 092-0210 (E.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	705	388	40	643.54
West Abutment (SB-01)	705	388	44	643.88

Table 4.1.7 - Estimated Pile Lengths for HP 10x42 Steel H-Piles (S.N. 092-0211 (W.B)

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	335	184	37	643.37
West Abutment (SB-01)	335	184	44	643.92

Table 4.1.8 - Estimated Pile Lengths for HP 12x53 Steel H-Piles (S.N. 092-0211 (W.B)

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	418	230	37	643.37
West Abutment (SB-01)	418	230	43	643.92

Table 4.1.9 - Estimated Pile Lengths for HP 12x63 Steel H-Piles (S.N. 092-0211 (W.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	497	273	38	643.37
West Abutment (SB-01)	497	273	45	643.92

Table 4.1.10 - Estimated Pile Lengths for HP 14x73 Steel H-Piles (S.N. 092-0211 (W.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	578	318	37	643.37
West Abutment (SB-01)	578	318	44	643.92

Table 4.1.11 – Estimated Pile Lengths for HP 14x89 Steel H-Piles (S.N. 092-0211 (W.B.))

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (SB-02)	705	388	40	643.37
West Abutment (SB-01)	705	388	46	643.92

As shown in Pile Length/Pile Type, Exhibit G, scour has been included in the pile estimates, but liquefaction and downdrag have not been included at the substructure locations.

KEG recommends performing at least one test pile. A test pile is performed prior to production driving, allowing for the collection of actual, on-site field data to determine the project's pile driving requirements. This is also the manner in which the contractor’s proposed equipment and methodologies, as identified in their Pile Installation Plan, can be assessed.

The abutment piles should be precored to 10ft below the bottom of the abutment caps and void backfilled with bentonite due to the soils encountered in borings SB-01 and SB-02.

4.2 Piles Set in Rock

As the rock at the boring locations of piers 1 and 2 for both bounds is shallow, the piles in these locations will not be driven; instead, the pier's piles will be installed through precoring. Piers 1 and 2 for the EB Structure will be precored through approximately 13 ft of soil before getting into the rock. Piers 1 and 2 for the WB Structure will have about 1.5 feet of soil before coring into rock.

Tables 4.2.1 and 4.2.2 provide factored side resistance and end-bearing values for piles set into rock at the piers in the underlying shale. A resistance factor of 0.7 was used for the piles set in rock. The socket diameter should be in 0.5-foot increments and be just large enough to allow the pile to be placed inside the socket, as well as to accommodate concrete placement that will fully encase the pile. The lateral load capacity should be checked once the minimum socket length and diameter are determined to ensure it can carry the axial load. If necessary, the socket length can be increased. The axial capacity of the piles will be controlled by the lesser of the geotechnical axial capacity of the rock sockets and the yield stress by cross sectional area of the pile times the resistance factor. As stated in the IDOT Geotechnical Manual, the voids will be required to be backfilled using loose, dry sand.

Table 4.2.1 – Design Parameters for Piles Set in Rock (EB Structure)

Substructure Unit	Pile Type and Size	Material type	Factored Side Resistance (kips)	Factored Tip Resistance (kips)	Top of Rock Elevation (ft)	Rock Socket Diameter (in)	Rock Socket Depth (ft)
Pier 1	10x42 H-Pile	Shale	182.1	59.4	614.5	18	5
	12x53 H-Pile	Shale	219.0	85.8	614.5	24	5
	12x63 H-Pile	Shale	290.5	87.2	614.5	24	7
	14x73 H-Pile	Shale	300.4	120.3	614.5	24	6
	14x89 H-Pile	Shale	386.4	122.9	614.5	24	8
Pier 2	10x42 H-Pile	Shale	182.1	59.4	614.5	18	5
	12x53 H-Pile	Shale	219.0	85.8	614.5	24	5
	12x63 H-Pile	Shale	290.5	87.2	614.5	24	7
	14x73 H-Pile	Shale	300.4	120.3	614.5	24	6
	14x89 H-Pile	Shale	386.4	122.9	614.5	24	8

Table 4.2.2 – Design Parameters for Piles Set in Rock (WB Structure)

Substructure Unit	Pile Type and Size	Material Type	Side Resistance (kips)	Tip Resistance (kips)	Top of Rock Elevation (ft)	Rock Socket Diameter (in)	Rock Socket Depth (ft)
Pier 1	10x42 H-Pile	Shale	201.4	59.4	629.0	18	7
	12x53 H-Pile	Shale	207.6	85.8	629.0	24	6
	12x63 H-Pile	Shale	278.9	87.2	629.0	24	8
	14x73 H-Pile	Shale	286.9	120.3	629.0	24	7
	14x89 H-Pile	Shale	372.8	122.9	629.0	24	9
Pier 2	10x42 H-Pile	Shale	201.4	59.4	629.0	18	7
	12x53 H-Pile	Shale	207.6	85.8	629.0	24	6
	12x63 H-Pile	Shale	278.9	87.2	629.0	24	8
	14x73 H-Pile	Shale	286.9	120.3	629.0	24	7
	14x89 H-Pile	Shale	372.8	122.9	629.0	24	9

4.3 Lateral Pile Response

Generally, the geotechnical engineer provides soil parameters to the structural engineer so that an L-Pile program or other approved software can be used for the lateral or displacement analysis of the foundations. Table 4.3.1 is included for the structural engineer's use in estimating lateral pile response.

Table 4.3.1 - Soil Parameters for Lateral Pile Load Analysis

Boring	Soil Description	Bot Layer Elev (ft.)	γ (pcf)	Short Term		Long Term		N Value (Ave.)	Assumed% Fines < #200	K (pci)	ε50
				c (psf)	Φ (deg.)	c (psf)	Φ (deg.)				
SB-01	Silty Clay	633.1	120	4000	0	150	26	26	65	1000	0.005
	Clay Loam	628.1	120	1300	0	100	26	10	65	500	0.007
	Silty Clay Loam	623.1	120	3100	0	100	28	8	65	1000	0.005
	Sandy Loam	618.1	120	-	30	-	30	38	35	225	-
	Silty Clay Loam Till	609.6	125	5800	0	150	30	27	65	2000	0.004
	Sandy Clay	605.6	120	1800	0	150	30	29	45	500	0.007
	Shale	599.6	135	1300	0	150	12	59	0	-	-
	Coal	595.6	94	6900	0	150	0	100	0	-	-
	Shale	579.1	135	5000	0	150	12	100	0	-	-

Boring	Soil Description	Bot Layer Elev (ft.)	γ (pcf)	Short Term		Long Term		N Value (Ave.)	Assumed% Fines < #200	K (pci)	ε50
				c (psf)	Φ (deg.)	c (psf)	Φ (deg.)				
SB-02	Silty Clay	638.3	120	4500	0	150	26	22	65	2000	0.004
	Loam	626.8	120	1660	26	-	26	12	25	90	-
	Sandy Loam Till	623.8	125	0	30	-	30	66	35	125	-
	Clayey Sand	621.8	120	0	30	-	30	87	25	125	-
	Sandy Loam Till	619.3	125	4600	30	-	30	13	35	60	-
	Shale	616.8	135	1800	0	150	12	28	0	-	-
	Silty Clay	609.3	120	3100	0	100	26	15	65	1000	0.005
	Shale	582.8	145	5000	0	150	12	100	0	-	-
SB-03	Silty Clay	631.5	120	1800	0	100	26	9	65	500	0.007
	Clayey Sand	630.5	120	300	28	-	28	4	25	25	-
	Sandy Clay	629	120	1000	0	100	30	4	45	100	0.004
	Shale	616.5	135	3000	0	150	12	100	0	-	-
	Silty Clay Till	611.5	125	3000	0	100	30	20	65	1000	0.005
	Shale	605	145	4500	0	150	12	100	0	-	-
SB-04	Silty Clay	631.5	120	1500	0	100	26	11	65	500	0.007
	Sandy Clay	631.2	120	1500	0	100	30	11	45	500	0.007
	Silty Clay Till	627	125	800	0	100	30	6	65	100	0.01
	Silty Clay	622	120	2000	0	150	26	40	65	500	0.004
	Silty Clay Till	614.5	125	2800	0	150	30	23	65	1000	0.005
	Shale	588	145	4500	0	150	12	100	0	-	-

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Construction Activities

Construction activities should be performed in accordance with the current IDOT Standard Specifications for Road and Bridge Construction and any pertinent Special Provisions or Policies.

Should any design considerations assumed by KEG change, KEG should be contacted to determine if the recommendations stated in this report still apply.

5.2 Temporary Sheeting and Soil Retention

Temporary shoring or soil retention may be required at various stages of this project due to the proposed staged-construction layout shown in the TS&L. If necessary, an Illinois-licensed Structural Engineer must design and seal the design of the Temporary Soil Retention System.

5.3 Site and Soil Conditions

Provisions of the Standard Specifications should adequately address site and soil conditions.

5.4 Cofferdams and Seal Coats

Cofferdams will be required at the proposed pier locations. The Estimated Water Surface Elevation (E.W.S.E.) is listed as EL. 633.25 ft. and would put the E.W.S.E. less than six feet above the top of the lower pier, calling for a Type I Cofferdam. All cofferdams are required to be dewatered. A seal coat will reduce the potential for water to seep beneath the sheet piling in the dewatered cofferdam. As per the 2023 IDOT Bridge Manual, General Note 28 shall be added to the plans if a seal coat is specified.

The contractor is required to retain an Illinois-licensed structural engineer to design the cofferdams. Per the Bridge Manual, the plans and computations shall be submitted to the Bureau of Bridges and Structures for review and final approval before beginning any work on the structure.

6.0 COMPUTATIONS

Computations and analyses for specific circumstances, if any, are included as exhibits. Please refer to each section of the report for the exhibit containing any such calculations or analyses used.

7.0 GEOTECHNICAL DATA

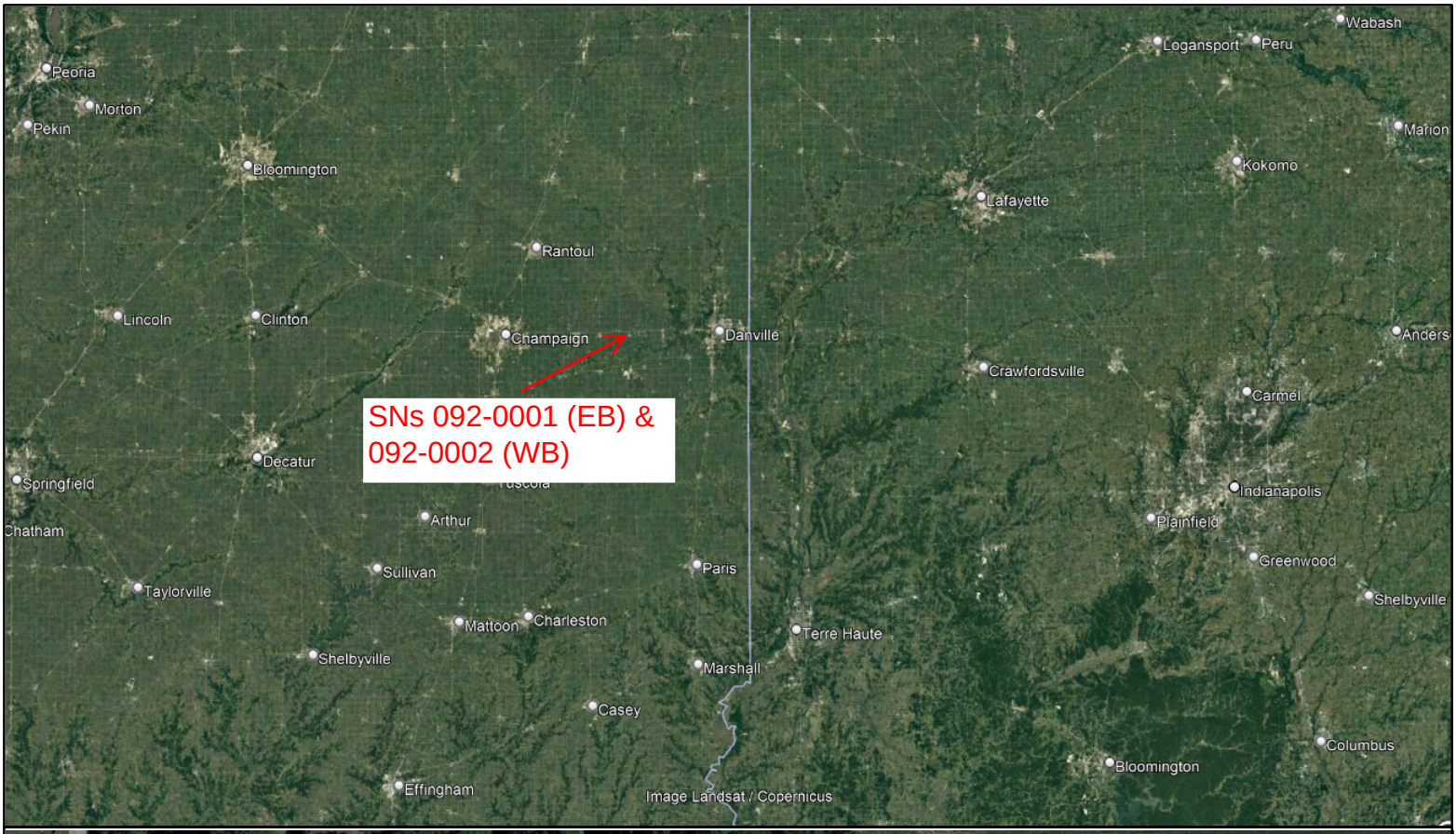
Soil boring logs can be found in Exhibit D. The Subsurface Profile can be found in Exhibit E**.** Pile Design Tables can be found in Exhibit G, and Drilled Shaft Tables in Exhibit H.

8.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of Epstein, Quigg Engineering, and the Illinois Department of Transportation (IDOT) District 5. They are specific only to the project described. They are based on the subsurface information obtained by KEG at four boring locations within the structure areas, KEG's understanding of the project as described herein, and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. KEG should be contacted if conditions encountered during construction are not consistent with those described.

EXHIBIT A

LOCATION MAP



Kaskaskia Engineering Group, LLC

LOCATION MAP

I-74 over Stony Creek
Existing SNs: 092-0001(EB)/092-0002(WB)
Proposed SNs: 092-0210(EB)/092-0211(WB)
Vermilion County, IL

Exhibit No.

A

KEG JOB #23-1015.00

EXHIBIT B

BORING PLAN

Kaskaskia Engineering Group, LLC

BORING PLAN

I-74 over Stony Creek
Oakwood Township
Vermilion County, IL

Exhibit No.

B

KEG JOB #23-1015.00

EXHIBIT C

TYPE, SIZE, AND LOCATION PLAN (TS&L)

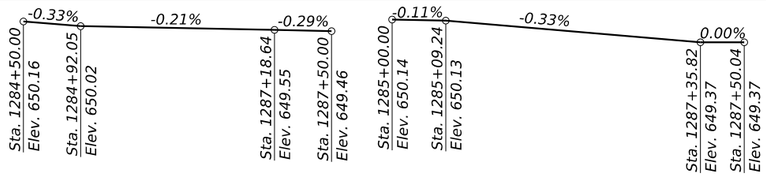
BENCHMARK: Point #2712 - Chiseled "□" on top of SE abutment end wall of SN 092-0002 (WB), Station 1286+92.00, Offset 11.29' Lt., Elevation 648.42

EXISTING STRUCTURE: Structure Numbers 092-0001 (EB) and 092-0002 (WB) were originally built in 1959 as FAI 5, Section 92-9B, Station 1286+17. In 1989 the curb and metal rail were removed and replaced with a Type F parapet. The bituminous surface course and membrane waterproofing system were removed and replaced in 1989 and 2011. The existing dual structures each consist of three simple span PPC I-Beam and non-composite reinforced concrete deck superstructue with hammerhead piers and pile bent spill-thru abutments. Overall length is 154'-7⅞" and clear roadway width is 34'-0". Traffic to be maintained using staged construction.

SALVAGE: None

① Est. Top of Rock
Elev. 614.5 (EB)
Elev. 629.0 (WB)

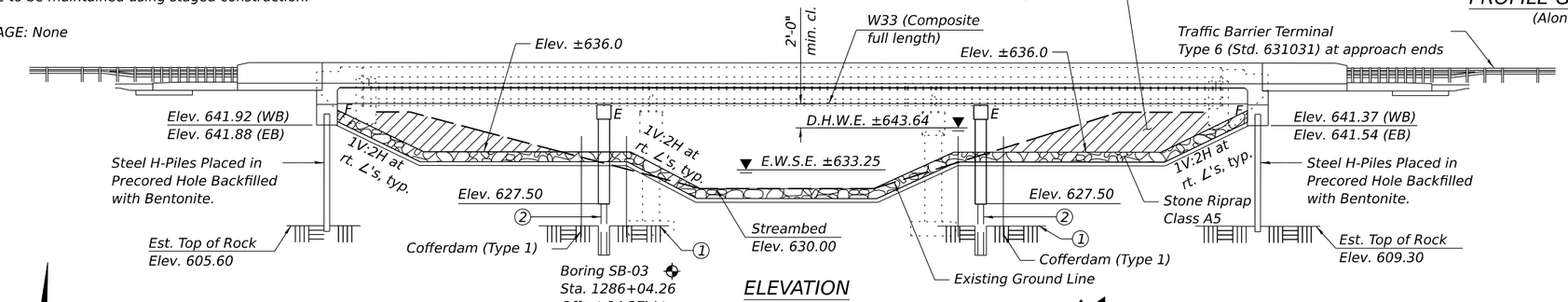
② Steel H-piles set in rock.



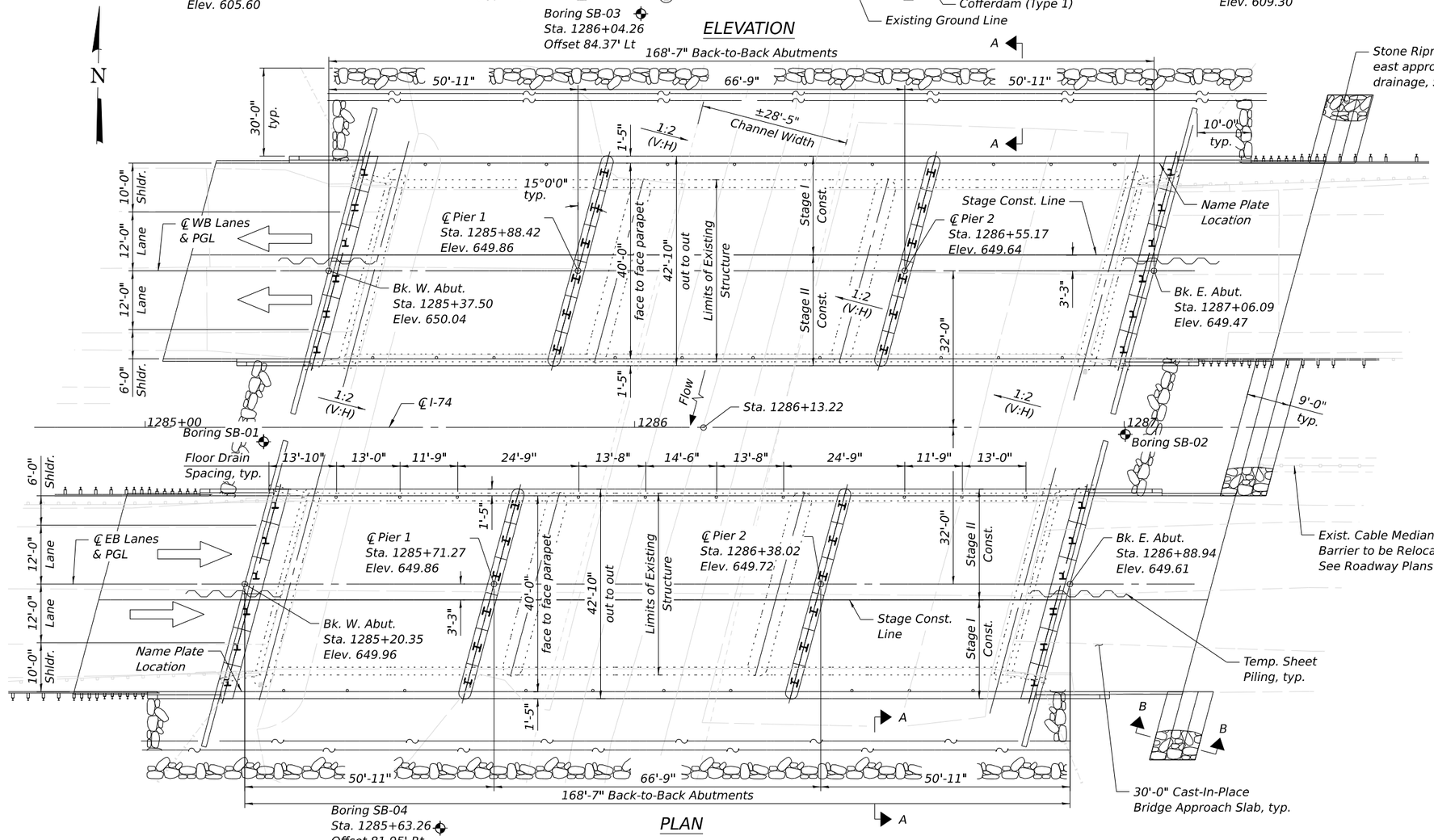
PROFILE GRADE - I-74 (EB)
(Along ℄ EB Lanes)

PROFILE GRADE - I-74 (WB)
(Along ℄ WB Lanes)

The Profile Grades show the final grade after grinding.



ELEVATION



PLAN

Stone Riprap Class A4, typ. east approach for surface drainage, See Roadway Plans

Note:
Up to ¼" to be ground off the bridge deck and approach slabs.
Elevations shown in Plan represent elevations after grinding.
For Section A-A and Section B-B, see sheet S-2.

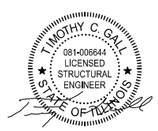
DESIGN SPECIFICATIONS
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL-93
Allow 50#/sq. ft. for future wearing surface.

DESIGN STRESSES
FIELD UNITS

f'_c = 3,500 psi
f'_c = 4,000 psi (Superstructure)
f_y = 60,000 psi (Reinforcement)
f_y = 50,000 psi (structural steel) (M270 Grade 50)
All Structural Steel shall be galvanized

SEISMIC DATA
Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.094g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.173g
Soil Site Class = C



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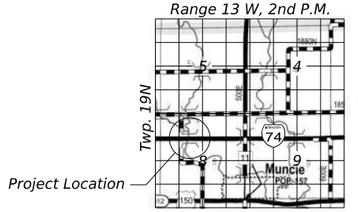
Date: 5/1/2025



LOCATION SKETCH

GENERAL PLAN & ELEVATION
I-74 OVER STONY CREEK
F.A.I. ROUTE 74 - SECTION (92-9)BR
VERMILION COUNTY
STATION 1286+13.22
STRUCTURE NO. 092-0210 (E.B.)
STRUCTURE NO. 092-0211 (W.B.)

MODEL: Default
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EPSTEIN

USER NAME = asharghi	DESIGNED - AS	REVISED -	
	CHECKED - TCG	REVISED -	
PLOT SCALE = 25.000 ' / in.	DRAWN - AS	REVISED -	
PLOT DATE = 6/24/2025	CHECKED - TCG	REVISED -	

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN AND ELEVATION
STRUCTURE NO. 092-0210 (E.B.) & 092-0211 (W.B.)
SHEET S-1 OF S-40 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(92-9)BR	VERMILION	87	34
		CONTRACT NO. 70D66		
	ILLINOIS	FED. AID PROJECT		

GENERAL NOTES

1. All structural steel shall be galvanized. See Special Provision for "Hot Dip Galvanizing for Structural Steel".

2. Calculated weight of Structural Steel = 327,580 lbs. (M270 Grade 50)
   = 43,290 lbs. (M270 Grade 36)

3. No field welding is permitted except as specified in the contract documents.

4. Fasteners shall be ASTM F 3125 Grade A325 Type 1. Fasteners shall be hot dip galvanized. See Special Provision for "Hot Dip Galvanizing for Structural Steel." Bolts $\frac{7}{8}$ in. diameter, holes $\frac{15}{16}$ in. diameter, unless otherwise noted.

5. Reinforcement bars designated (E) shall be epoxy coated.

6. If the Contractor elects to use cantilever forming brackets on the exterior beams or girders, the brackets shall be placed at the same locations as required for the hardwood blocks in Article 503.06(b) of the Standard Specifications. If additional cantilever forming brackets are required, hardwood blocking shall be wedged between the exterior and first interior beam at each of these additional bracket locations.

7. Bearing seat surfaces shall be constructed or adjusted to the designated elevations within a tolerance of $\frac{1}{8}$ in. (0.01 ft.). Adjustment shall be made either by grinding the surface or by shimming the bearings.

8. Layout of the slope protection system may be varied to suit ground conditions in the field as directed by the Engineer.

INDEX OF SHEETS

TOTAL BILL OF MATERIAL

ITEM	UNIT	SUPER	SUB	TOTAL
Stone Riprap, Class A5	Sq Yd		3,673	3,673
Filter Fabric	Sq Yd		3,744	3,744
Removal Of Existing Structures No. 1	Each	1		1
Removal Of Existing Structures No. 2	Each	1		1
Structure Excavation	Cu Yd		520	520
Cofferdam Excavation	Cu Yd		675	675
Rock Excavation For Structure	Cu Yd		60	60
Cofferdam (Type 1) (Location-1)	Each		1	1
Cofferdam (Type 1) (Location-2)	Each		1	1
Cofferdam (Type 1) (Location-3)	Each		1	1
Cofferdam (Type 1) (Location-4)	Each		1	1
Floor Drains	Each	40		40
Concrete Structures	Cu Yd		439.7	439.7
Concrete Superstructure	Cu Yd	473.9		473.9
Protective Coat	Sq Yd	2,402		2,402
Concrete Superstructure (Approach Slab)	Cu Yd	236.8		236.8
Furnishing And Erecting Structural Steel	L Sum	1		1
Stud Shear Connectors	Each	10,404		10,404
Reinforcement Bars, Epoxy Coated	Pound	239,300	41,260	280,560
Bar Splicers	Each	1,640	384	2,024
Furnishing Steel Piles HP12x53	Foot		863	863
Furnishing Steel Piles HP14x73	Foot		674	674
Driving Piles	Foot		863	863
Test Pile Steel HP12x53	Each		2	2
Drilling And Setting Piles (In Soil)	Cu Ft		491	491
Drilling And Setting Piles (In Rock)	Cu Ft		434	434
Name Plates	Each	2		2
Anchor Bolts, 1"	Each	96		96
Temporary Sheet Piling	Sq Ft		4,464	4,464
Granular Backfill For Structures	Cu Yd		276	276
Geocomposite Wall Drain	Sq Yd		134	134
Pipe Underdrains For Structures, 4"	Foot		382	382
Bridge Deck Grooving (Longitudinal)	Sq Yd	1,209		1,209
Bar Terminators	Each	188	864	1,052
Diamond Grinding (Bridge Section)	Sq Yd	1,829		1,829

WATERWAY INFORMATION

Existing Overtopping Elev. 648.96 @ Sta. 1290+73.0
Drainage Area = 45.8 sq. mi. Proposed Overtopping Elev. 648.96 @ Sta. 1290+73.0

Flood	Freq. Yr.	Discharge C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Natural H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
Ten-Year	10	2,960	621	780	642.08	0.15	0.0	642.23	642.08
Design	50	4,710	799	974	643.64	0.33	0.12	643.97	643.76
Base	100	5,480	872	1,050	644.21	0.43	0.19	644.64	644.40
Overtopping	200	5,948	915	1,093	644.53	0.49	0.24	645.02	644.77
Max. Calc.	500	7,350	1,027	1,213	645.42	0.74	0.35	646.16	645.77

10-Year Velocity through Existing Structure = 3.16 fps
10-Year Velocity through Proposed Structure = 2.92 fps

DESIGN SCOUR ELEVATION TABLE

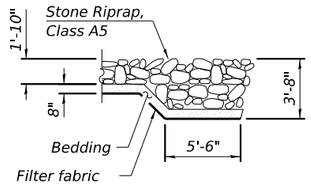
S.N. 092-0210 (E.B.)

Event / Limit State	Design Scour Elevations (ft.) W. Abut.	Pier 1	Pier 2	E. Abut.	Item 113
Q100	642.00	625.0	625.0	641.53	
Q200	642.00	624.7	624.7	641.53	5
Design	642.00	625.0	625.0	641.53	
Check	642.00	624.7	624.7	641.53	

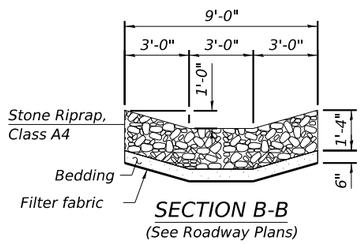
DESIGN SCOUR ELEVATION TABLE

S.N. 092-0211 (W.B.)

Event / Limit State	Design Scour Elevations (ft.) W. Abut.	Pier 1	Pier 2	E. Abut.	Item 113
Q100	641.92	625.0	625.0	641.48	
Q200	641.92	624.7	624.7	641.48	5
Design	641.92	625.0	625.0	641.48	
Check	641.92	624.7	624.7	641.48	



SECTION A-A

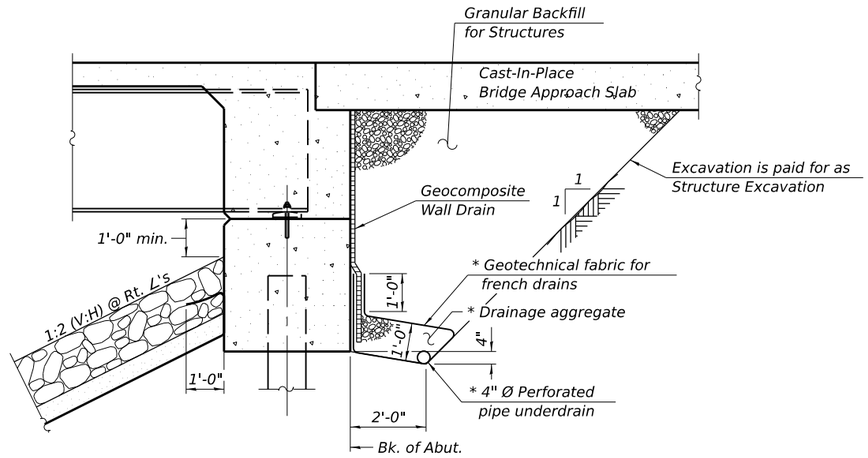


SECTION B-B
(See Roadway Plans)

STA. 1286+04.65
BUILT 20 BY
STATE OF ILLINOIS
F.A.I. RT. 74 -SEC. (92-9)BR
LOADING HL-93
STR. NO. 092-0210

STA. 1286+21.80
BUILT 20 BY
STATE OF ILLINOIS
F.A.I. RT. 74 -SEC. (92-9)BR
LOADING HL-93
STR. NO. 092-0211

NAME PLATES
See Std. 515001



SECTION THRU INTEGRAL ABUTMENT
(Horiz. dim. at Rt. ∠'s)
*Included in the cost of Pipe Underdrains for Structures.

Note:
All drainage system components shall extend to 2'-0" from the end of each wingwall except an outlet pipe shall extend until intersecting with the side slopes. The pipes shall drain into concrete headwalls. (See Article 601.05 of the Standard Specifications and Highway Standard 601101).

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EPSTEIN

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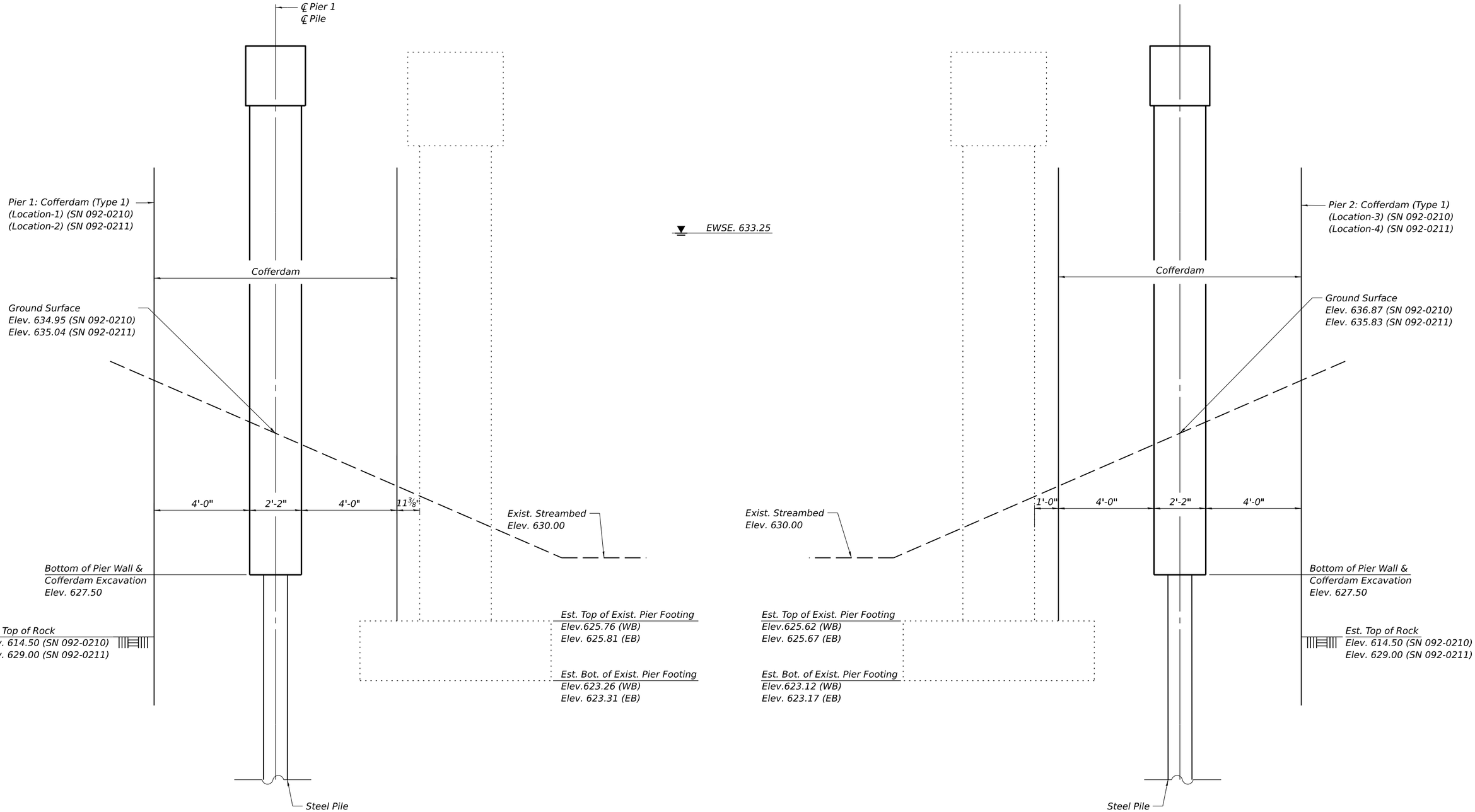
	CHECKED - TCG	REVISED -	
PLOT SCALE = 0.167 ' / in.	DRAWN - AS	REVISED -	
PLOT DATE = 6/24/2025	CHECKED - TCG	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL DATA
STRUCTURE NO. 092-0210 (E.B.) & 092-0211 (W.B.)
SHEET S-2 OF S-40 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(92-9)BR	VERMILION	87	35
		CONTRACT NO. 70D66		
	ILLINOIS	FED. AID PROJECT		



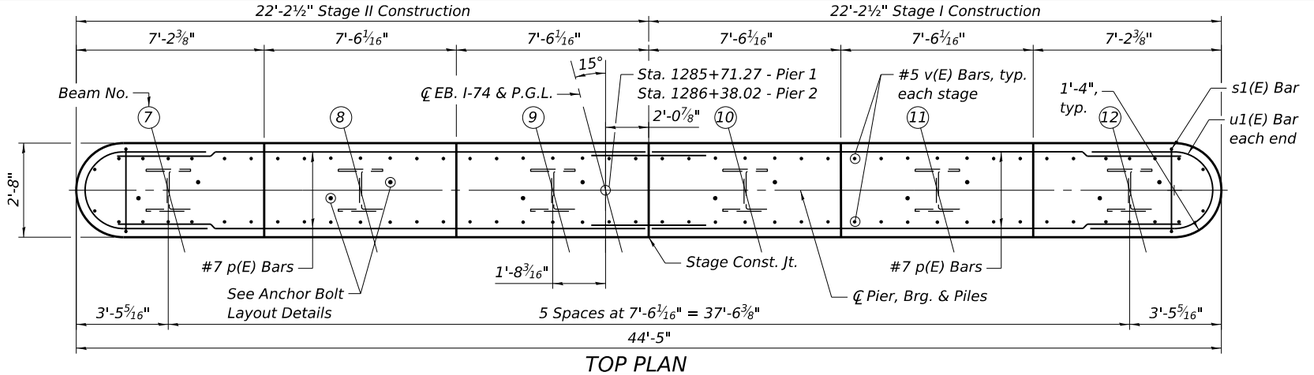
SECTION THRU COFFERDAM

EPSTEIN

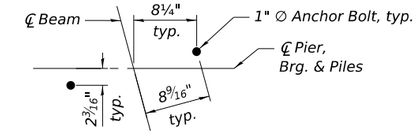
USER NAME = asharghi	DESIGNED - AS	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	COFFERDAM DETAILS STRUCTURE NO. 092-0210 (E.B.) & 092-0211 (W.B.)	
	CHECKED - TCG	REVISED -			
PLOT SCALE = 4.000 ' / in.	DRAWN - AS	REVISED -			
PLOT DATE = 6/24/2025	CHECKED - TCG	REVISED -		SHEET S-5 OF S-40 SHEETS	

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(92-9)BR	VERMILION	87	38
		CONTRACT NO. 70D66		
	ILLINOIS	FED. AID PROJECT		

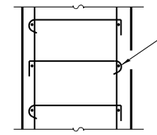
Notes:
Space reinforcement in cap to miss anchor bolts.
Pour steps monolithically with cap.
For pile details see sheet S-35.
For cofferdam details see sheet S-5 .
Hook s(E) bar around h(E) & v(E) bars.



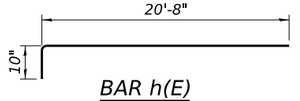
TOP PLAN



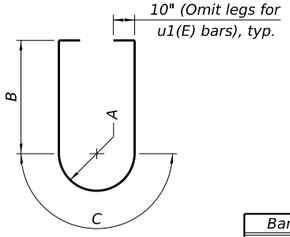
ANCHOR BOLT LAYOUT



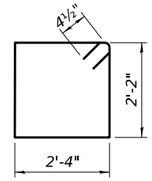
SECTION B-B



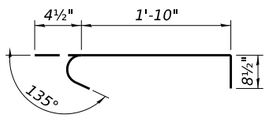
BAR h(E)



BAR u(E) or u1(E)



BAR s1(E)



BAR s(E)

TABLE OF ELEVATIONS

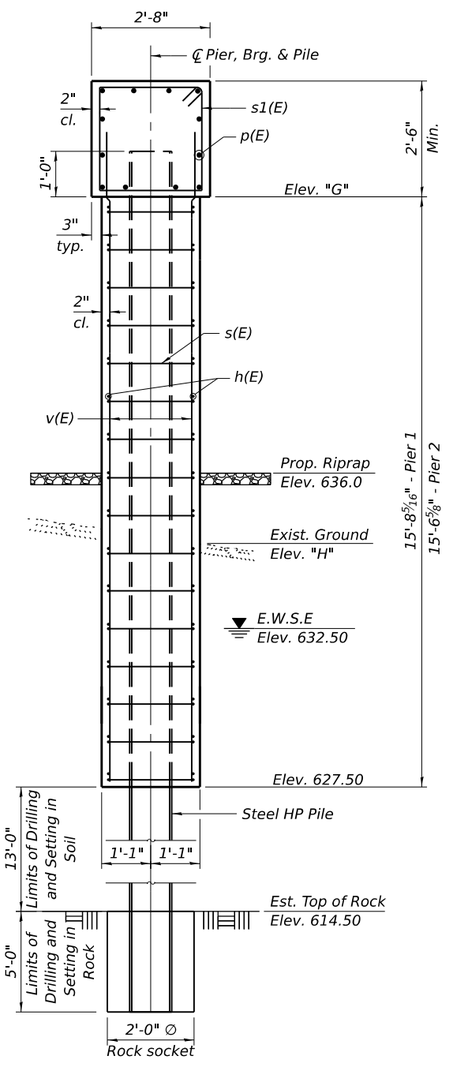
	Pier 1	Pier 2
Elev. "A"	645.75	645.62
Elev. "B"	645.89	645.75
Elev. "C"	645.95	645.81
Elev. "D"	645.95	645.81
Elev. "E"	645.84	645.70
Elev. "F"	645.69	645.55
Elev. "G"	643.19	643.05
Elev. "H"	634.95	636.87

A, B & C DIMENSIONS

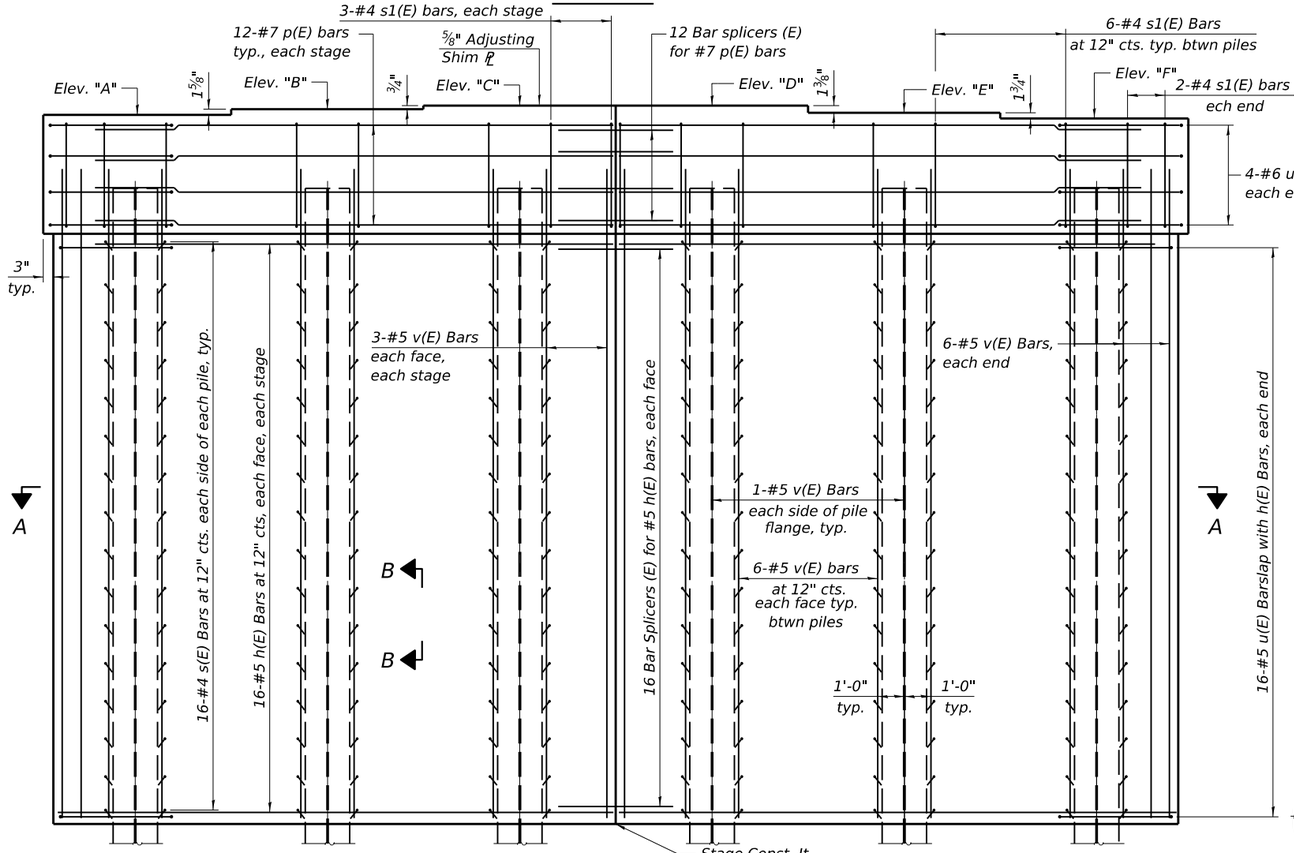
Bar	A	B	C
u(E)	11"	1'-7"	2'-11"
u1(E)	1'-2"	2'-6"	3'-8"

TWO PIERS BILL OF MATERIAL

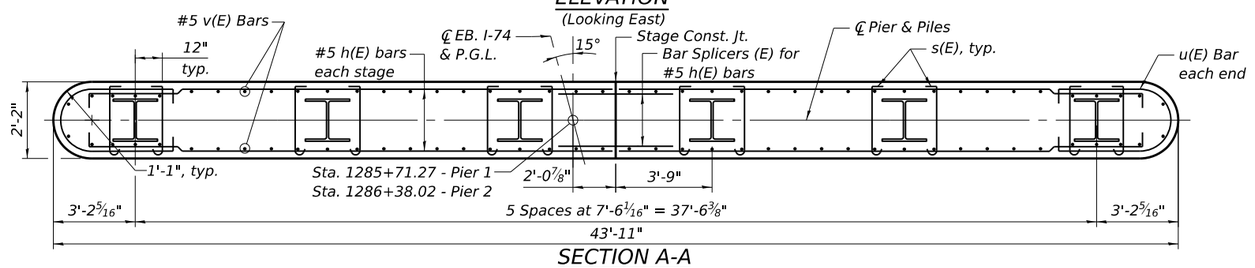
Bar	No.	Size	Length	Shape
h(E)	128	#5	21'-6"	
p(E)	48	#7	20'-9"	
s(E)	384	#4	2'-11"	
s1(E)	68	#4	9'-9"	
u(E)	64	#5	7'-9"	
u1(E)	16	#6	8'-8"	
v(E)	168	#5	17'-0"	
Cofferdam Excavation		Cu. Yd.	415	
Cofferdam (Type 1) (Location-1)		Each	1	
Cofferdam (Type 1) (Location-3)		Each	1	
Concrete Structures		Cu. Yd.	133.1	
Reinforcement Bars, Epoxy Coated		Pound	9,810	
Furnishing Steel Piles HP 14X73		Foot	415	
Drilling and Setting Piles (in Soil)		Cu. Ft.	490	
Drilling and Setting Piles (in Rock)		Cu. Ft.	189	



END VIEW



ELEVATION
(Looking East)



SECTION A-A

PILE DATA - PIER 1

Type: HP14X73
Nominal Required Bearing: Set in Rock
Factored Resistance Available: 405 kips
Est. Length: 34'-8"
No. Production Piles: 6

PILE DATA - PIER 2

Type: HP14X73
Nominal Required Bearing: Set in Rock
Factored Resistance Available: 405 kips
Est. Length: 34'-6"
No. Production Piles: 6

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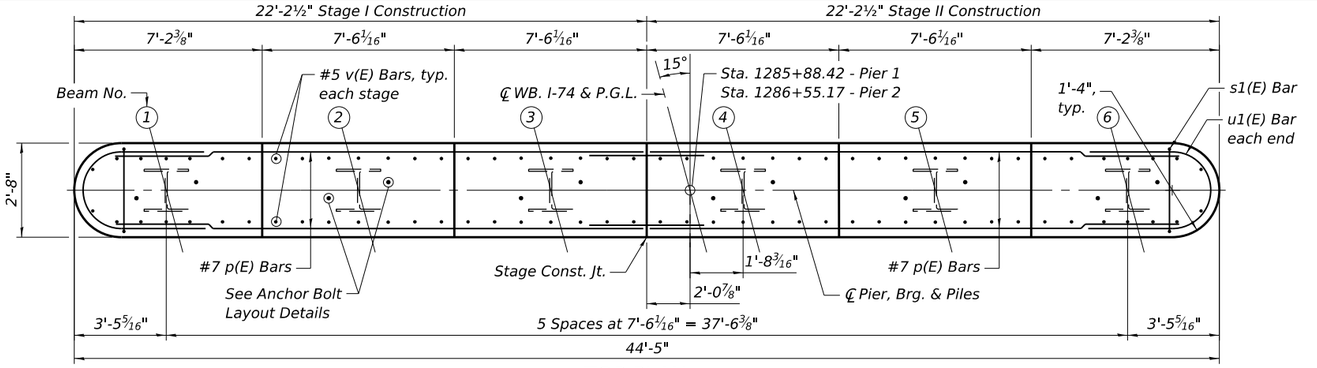
EPSTEIN

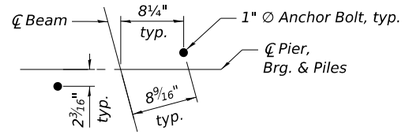
USER NAME = asharghi	DESIGNED - AS	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	PIER DETAILS STRUCTURE NO. 092-0210
	CHECKED - TCG	REVISED -		
PLOT SCALE = 0.167 ' / in.	DRAWN - AS	REVISED -		SHEET S-33 OF S-40 SHEETS
PLOT DATE = 6/24/2025	CHECKED - TCG	REVISED -		

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(92-9)BR	VERMILION	87	66
		CONTRACT NO. 70D66		
	ILLINOIS	FED. AID PROJECT		

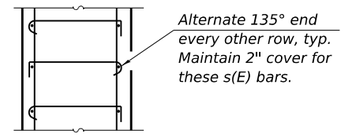
Notes:
Space reinforcement in cap to miss anchor bolts.
Pour steps monolithically with cap.
For pile details see sheet S-35.
For cofferdam details see sheet S-5 .
Hook s(E) bar around h(E) & v(E) bars.
Due to the varying difference in estimated rock elevations indicated on the soil borings, if competent rock is encountered before the bottom of concrete wall stem elevation, the rock socket may be raised with approval of the Engineer.



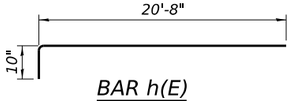
TOP PLAN



ANCHOR BOLT LAYOUT



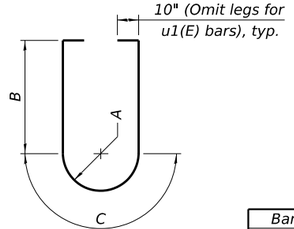
SECTION B-B



BAR h(E)

TABLE OF ELEVATIONS

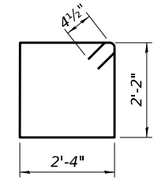
	Pier 1	Pier 2
Elev. "A"	645.67	645.45
Elev. "B"	645.83	645.60
Elev. "C"	645.95	645.72
Elev. "D"	646.01	645.79
Elev. "E"	645.91	645.69
Elev. "F"	645.79	645.56
Elev. "G"	643.17	642.95
Elev. "H"	635.04	635.83



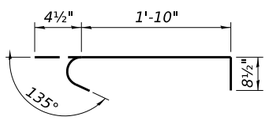
BAR u(E) or u1(E)

A, B & C DIMENSIONS

Bar	A	B	C
u(E)	11"	1'-7"	2'-11"
u1(E)	1'-2"	2'-6"	3'-8"



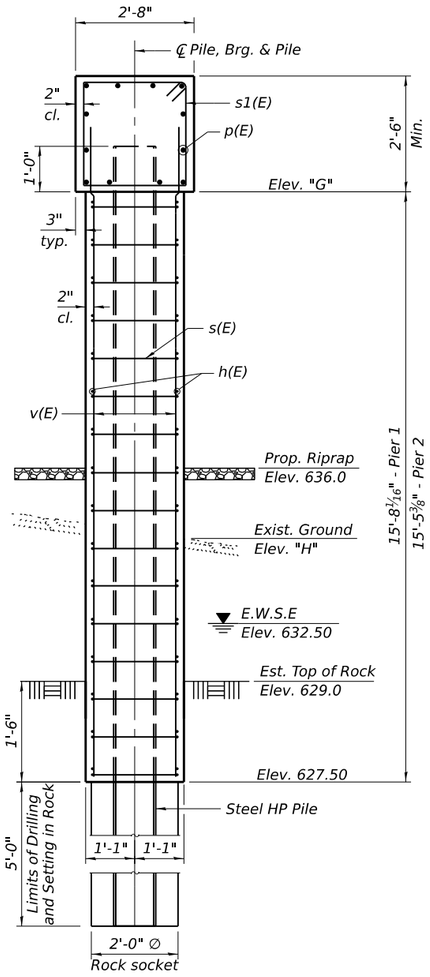
BAR s1(E)



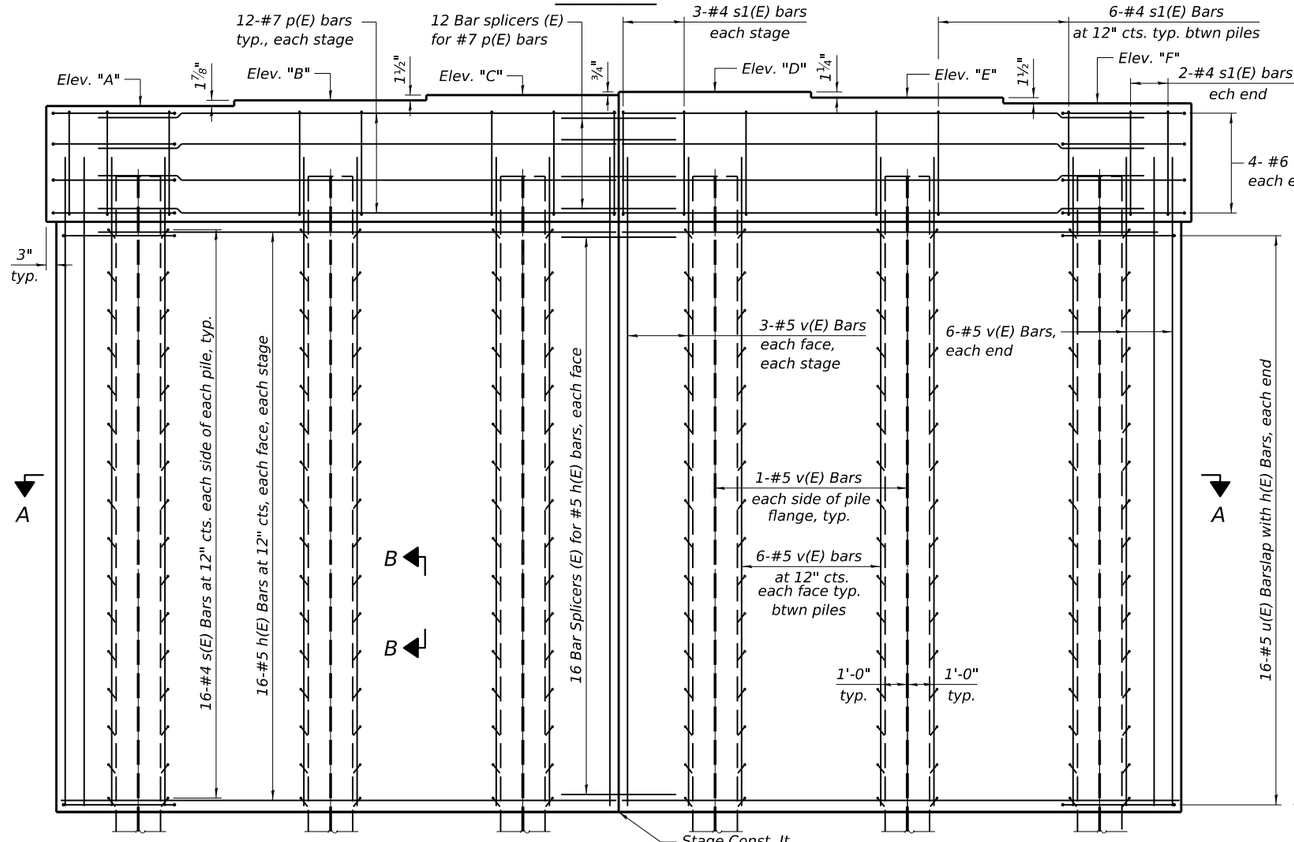
BAR s(E)

TWO PIERS BILL OF MATERIAL

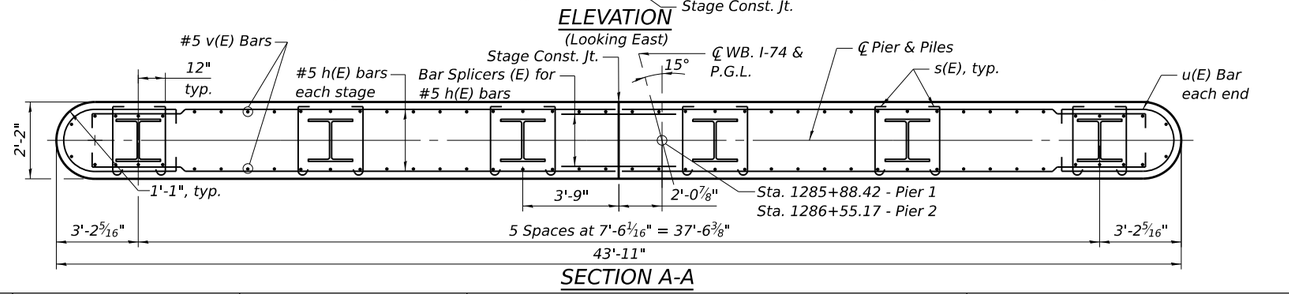
Bar	No.	Size	Length	Shape
h(E)	128	#5	21'-6"	
p(E)	48	#7	20'-9"	
s(E)	384	#4	2'-11"	
s1(E)	68	#4	9'-9"	
u(E)	64	#5	7'-9"	
u1(E)	16	#6	8'-8"	
v(E)	168	#5	17'-0"	
Cofferdam Excavation			Cu. Yd.	250
Rock Excavation for Structure			Cu. Yd.	225
Cofferdam (Type 1) (Location-2)			Each	1
Cofferdam (Type 1) (Location-4)			Each	1
Concrete Structures			Cu. Yd.	133.0
Reinforcement Bars, Epoxy Coated			Pound	9,810
Furnishing Steel Piles HP 14X73			Foot	259
Drilling and Setting Piles (in Rock)			Cu. Ft.	245



END VIEW



ELEVATION
(Looking East)



SECTION A-A

PILE DATA - PIER 1

Type: HP14X73
Nominal Required Bearing: Set in Rock
Factored Resistance Available: 405 kips
Est. Length: 21'-8"
No. Production Piles: 6

PILE DATA - PIER 2

Type: HP14X73
Nominal Required Bearing: Set in Rock
Factored Resistance Available: 405 kips
Est. Length: 21'-5"
No. Production Piles: 6

MODEL: Default
FILE NAME: P:\Projects\22000\22351IC_DESIGN\01_Discipline\a_Civil\Working\Sheets\Bridge\D5_70D66_Pier-WB.dgn
6/24/2025 11:43:31 AM

EPSTEIN

USER NAME = asharghi	DESIGNED - AS	REVISED -			
	CHECKED - TCG	REVISED -			
PLOT SCALE = 0.167 ' / in.	DRAWN - AS	REVISED -			
PLOT DATE = 6/24/2025	CHECKED - TCG	REVISED -			

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PIER DETAILS
STRUCTURE NO. 092-0211
SHEET S-34 OF S-40 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(92-9)BR	VERMILION	87	67
		CONTRACT NO. 70D66		
	ILLINOIS	FED. AID PROJECT		

EXHIBIT D

BORING LOGS

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/21/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12434939° N, 87.85757603° W

COUNTY Vermilion **DRILLING METHOD** HSA + Rotary Wash at 25' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-01
Station 1285+27.54
Offset 2.9 ft RT
Ground Surface Elev. 639.14 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 619.1 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				SILTY CLAY - Brown, w/ Gravel, Very Stiff
	8			
	20	4.0	10	
	22	P		
				Becomes Stiff
	3			
	4	-		
-5	6			
633.1				
	3			CLAY LOAM - Dark Brown, Stiff
	4	1.1	18	
	7	B		Sand = 33.8%, Silt = 45.2%, Clay = 21.0%
				Becomes Dark Brown and Gray
	3			
	4	1.5	15	
-10	5	B		
628.1				
	4			SILTY CLAY LOAM - Gray, Stiff, w/ Gravel
	4	1.9	12	
	6	B		
				Becomes Medium Stiff
	4			
	2	4.3	12	
-15	4	P		
623.1				
	1			SANDY LOAM - Gray, Loose
	2	0.5	19	
	11	P		Sand = 54.6%, Silt = 29.4%, Clay = 16.0%
				Becomes Brown, Hard, w/ Gravel, Wet
	24			
	30	2.4	10	
▼-20	33	S		
618.1				
	19			SILTY CLAY LOAM TILL - Dark Gray, Hard
	16	7.7	17	
	19	B		
	8			
	11	5.2	18	
-25	17	B		
	5			LL = 40.1, PL = 14.8, PI = 25.4
	9	3.7	21	
	9	B		
	12			
609.6				
	13	1.8	28	SANDY CLAY - Greenish Gray, Stiff
-30	16	S		
605.6				
	18			CLAYEY SHALE - Brown and Gray, Soft
	32	1.3	17	
-35	27	S		
	100/15.5"			MSPT Start
599.6		6.9	25	
-40				COAL

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/21/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12434939° N, 87.85757603° W

COUNTY Vermilion **DRILLING METHOD** HSA + Rotary Wash at 25' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-01
Station 1285+27.54
Offset 2.9 ft RT
Ground Surface Elev. 639.14 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 619.1 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
COAL *(continued)*				
595.6				
CLAYEY SHALE - Gray, Soft		60/18"		
			1.4	16
	-45			
		100/3.7"		
			45.5	15
	-50			
		100/15.2"		
			2.5	17
	-55			
Becomes Dark Red		100/8.8"		
			5.0	12
579.1	-60			

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation

Modified SPT Log

Route: FAI 74 (I-74) Structure No.: 92-001/00 (Exist.) (Prop.) Date: 8/21/23 Page: 3 of 3

Section: (92-9) BR Description: I-74 over Stony Creek

County: Vermilion Logged by: KEG Sampler Tube Length: 24 in.

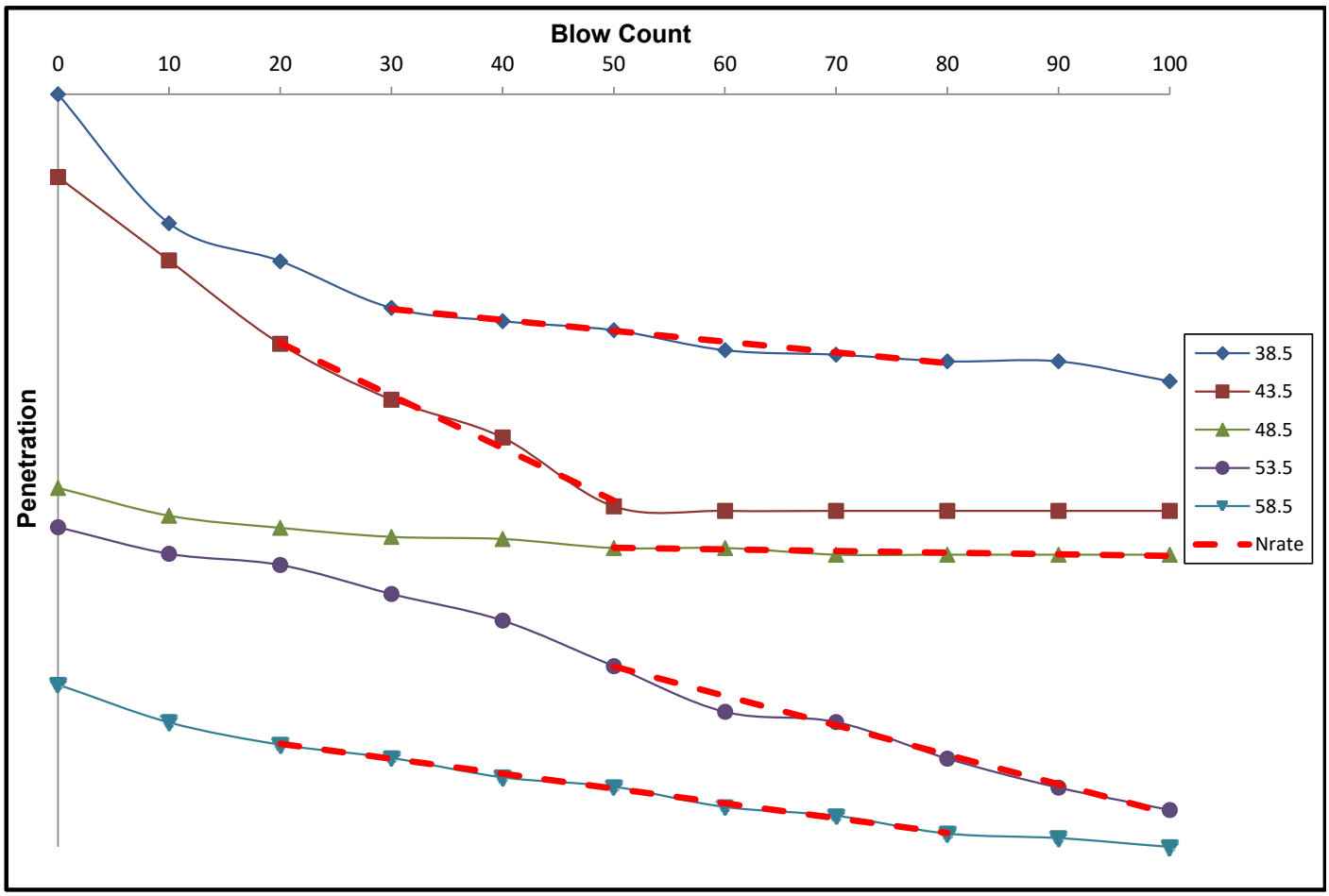
Boring No.: SB-01 Station: 1285+32 Offset: 7' RT Latitude: 40.1243494 Longitude: -87.857021

Drill Rig: D-50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 639.14

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$	q_u	Young's Modulus
Test Elevation	0	10	20	30	40	50	60	70	80	90	100	(bpf)	(ksf)	(ksi)
38.50	1.5	0.92	0.75	***0.54***	***0.48***	***0.44***	0.35	***0.33***	***0.3***	0.3	0.21	160.0	15.4	3.47
43.50	1.5	1.13	***0.75***	***0.5***	***0.33***	***0.02***	0					33.0	3.2	0.78
48.50	1.5	1.38	1.32	1.28	1.27	***1.23***	***1.23***	1.2	***1.2***	***1.2***	***1.2***	1062	102	34.26
53.50	1.5	1.38	1.33	1.2	1.08	***0.88***	0.67	***0.63***	***0.46***	***0.33***	***0.23***	58.9	5.7	1.36
58.50	1.5	1.33	***1.23***	***1.17***	1.08	***1.04***	***0.95***	***0.91***	***0.83***	0.81	0.77	116.5	11.2	2.57

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/22/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12436139° N, 87.85695006° W

COUNTY Vermilion **DRILLING METHOD** HSA + Mud Rotary Wash at 20' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-02
Station 1287+02.64
Offset 1.1 ft RT
Ground Surface Elev. 642.79 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 626.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY - Brown, Hard
	3			LL = 26.9, PL = 14.6, PI = 12.3
	8	>4.5	13	
	14	P		
	3			
638.3				
	5	3.8	12	LOAM - Brown, Stiff, w/ Gravel
-5	6	P		
	3			Becomes Medium Stiff
	4	1.0	14	Sand = 43.7%, Silt = 43.3%, Clay = 13.0%
	4	B		
	2			
	4	0.8	14	
-10	5	B		
	3			w/ Clay Pockets
	6	0.3	14	
	8	B		
	4			Becomes Very Stiff
	9	2.4	12	
-15	10	B		
626.8 ▼				
	25			SANDY CLAY LOAM TILL - Brownish Gray, Hard, w/ Gravel, Wet
	30	-	8	
	36			
623.8				
	21			CLAYEY SAND - Brown, Fine, Dense
	40	-	10	
-20	47			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAYEY SAND - Brown, Fine, Dense *(continued)*
621.8				
	8			SANDY CLAY LOAM TILL - Gray, Very Stiff, w/ Gravel
	2	4.6	17	
	11	B		Sand = 7.0%, Silt = 53.0%, Clay = 40.0%
619.3				
	2			CLAYEY SHALE - Brownish Gray, Stiff
	11	1.8	20	
-25	17	S		
616.8				
	6			SILTY CLAY - Dark Gray, Very Stiff
	7	4.2	18	
	9	B		
	5			LL = 47.1, PL = 18.1, PI = 29.0
	6	2.0	22	
-30	8	B		
609.3				
	40			SHALE - Gray, Brittle
	50/5"	3.1	15	
-35	-	S		
	40/20"			MSPT Start
		-	19	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/22/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12436139° N, 87.85695006° W

COUNTY Vermilion **DRILLING METHOD** HSA + Mud Rotary Wash at 20' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-02
Station 1287+02.64
Offset 1.1 ft RT
Ground Surface Elev. 642.79 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 626.8 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SHALE - Gray, Brittle *(continued)*				
		60/19"		
			1.8	18
	-45			
Poor Recovery		100/3.8"		
			18.8	49
	-50			
		100/11.8"		
			4.6	15
	-55			
		100/14.8"		
Becomes Red			2.8	15
582.8	-60			

End of Boring

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation

Modified SPT Log

Route: FAI 74 (I-74) Structure No.: 92-001/00 (Exist.) (Prop.) Date: 8/22/23 Page: 3 of 3

Section: (92-9) BR Description: I-74 over Stony Creek

County: Vermilion Logged by: KEG Sampler Tube Length: 24 in.

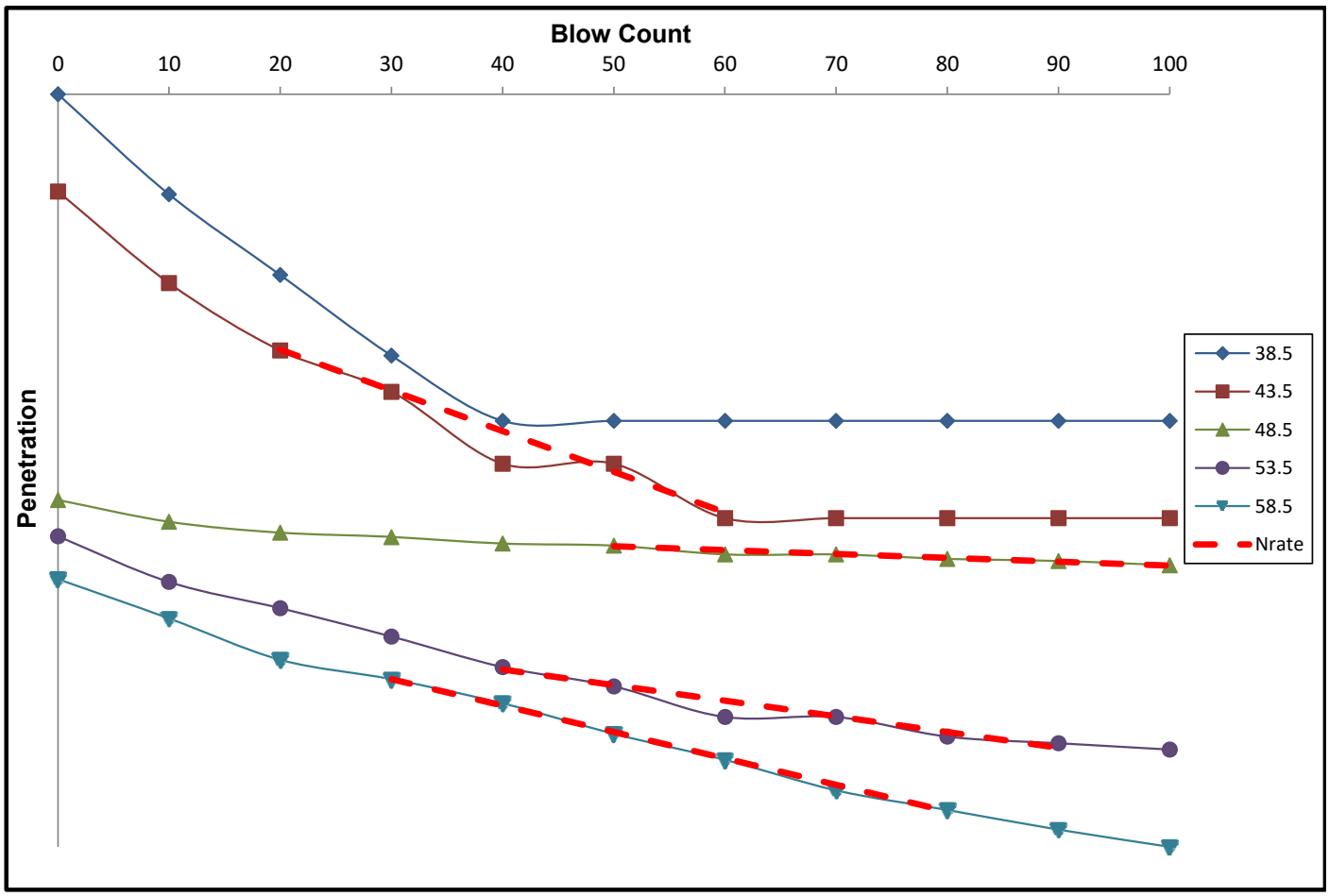
Boring No.: SB-02 Station: 1287+13 Offset: 60' RT Latitude: 40.1243614 Longitude: -87.85695

Drill Rig: D-50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 642.79

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
Test Elevation	0	10	20	30	40	50	60	70	80	90	100			
38.50	1.5	1.04	0.67	0.3	0							#N/A	#N/A	#N/A
43.50	1.5	1.08	***0.77***	***0.58***	0.25	***0.25***	***0***					41.6	4.0	0.97
48.50	1.5	1.4	1.35	1.33	1.3	***1.29***	1.25	***1.25***	***1.23***	***1.22***	***1.2***	439.4	42.2	10.13
53.50	1.5	1.29	1.17	1.04	***0.9***	***0.81***	0.67	***0.67***	***0.58***	***0.55***	0.52	108.2	10.4	2.40
58.50	1.5	1.32	1.13	***1.04***	***0.93***	***0.79***	***0.67***	0.53	***0.44***	0.35	0.27	64.2	6.2	1.47

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/24/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12459200° N, 87.85730636° W

COUNTY Vermilion **DRILLING METHOD** HSA + Mud Rotary Wash at 10' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-03
Station 1286+04.26
Offset 84.4 ft LT
Ground Surface Elev. 635.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				SILTY CLAY - Brown, Stiff, w/ Some Organics
	3			LL = 26.9, PL = 15.5, PI = 11.4
	4	1.8	9	
	5	P		
631.5				
	1			CLAYEY SAND - Gray, Well Sorted, Loose
630.5	2	0.3	15	Sand = 61.6%, Silt = 21.4%, Clay = 17.0%
-5	2	P		
629.0				SANDY CLAY - Gray, Soft, w/ Coal and Sanstones Pockets
	25			SHALE - Highly Weathered
	50	-	5	
	100/13.8"			MSPT Start
		3.4	5	
-10				
	80/18"			Becomes Unweathered, w/ Some Gravel
		2.2	9	
-15				
616.5				
	20/17"			SILTY CLAY TILL - Stiff
		-	22	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				SILTY CLAY TILL - Stiff *(continued)*
611.5				
	100/17.4"			SHALE - Gray, Hard, Unweathered
		2.8	15	
-25				
	100/7.6"			
		6.2	35	
605.0				
-30				End of Boring
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation

Modified SPT Log

Route: FAI 74 (I-74) Structure No.: 92-001/00 (Exist.) (Prop.) Date: 8/24/23 Page: 2 of 2

Section: (92-9) BR Description: I-74 over Stony Creek

County: Vermilion Logged by: KEG Sampler Tube Length: 24 in.

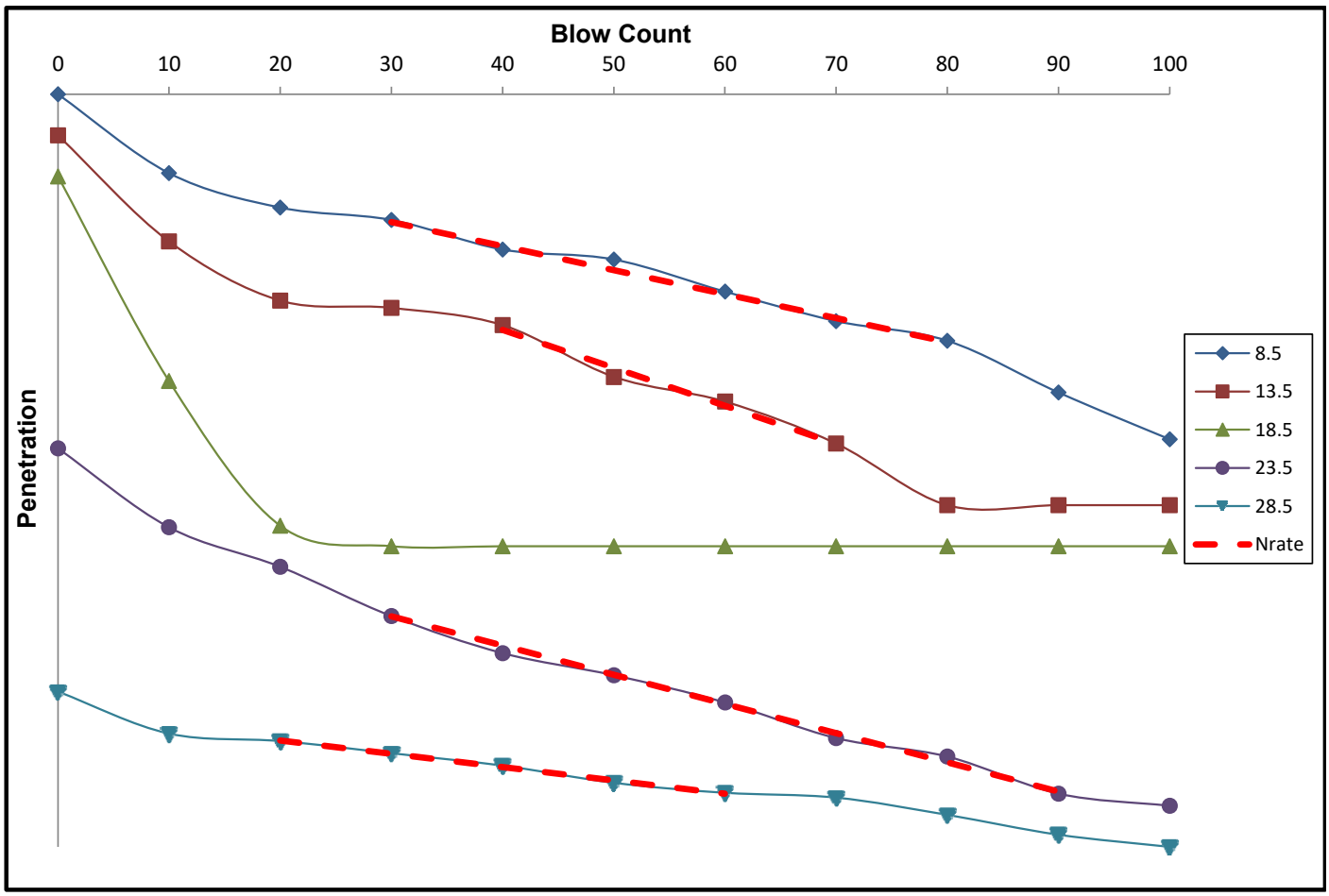
Boring No.: SB-03 Station: 1285+88 Offset: 81.0' RT Latitude: 40.124592 Longitude: -87.857306

Drill Rig: D-50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 635.00

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
	0	10	20	30	40	50	60	70	80	90	100			
Test Elevation														
8.50	1.5	1.18	1.04	***0.99***	***0.87***	0.83	***0.7***	***0.58***	***0.5***	0.29	0.1	79.9	7.7	1.81
13.50	1.5	1.07	0.83	0.8	***0.73***	***0.52***	***0.42***	***0.25***	0			50.5	4.9	1.17
18.50	1.5	0.67	0.083									#N/A	#N/A	#N/A
23.50	1.5	1.18	1.02	***0.82***	0.67	***0.58***	***0.47***	***0.33***	***0.25***	***0.1***	0.05	65.7	6.3	1.50
28.50	1.5	1.33	***1.3***	***1.25***	***1.2***	***1.13***	***1.09***	1.07	1	0.92	0.87	144.0	13.8	3.12

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/23/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12413381° N, 87.85744411° W

COUNTY Vermilion **DRILLING METHOD** HSA + Mud Rotary Wash at 10' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-04
Station 1285+63.26
Offset 82.0 ft RT
Ground Surface Elev. 632.97 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY - Brown, Stiff
631.5	2			
631.2	5	1.5	27	SANDY CLAY - Stiff
	6	P		SILTY CLAY - Brown, Medium Stiff
629.5	1			SILTY CLAY TILL - Dark Brown, Medium Stiff
	2	0.8	23	LL = 36.0, PL = 19.6, PI = 16.4
-5	4	B		
627.0	12			SILTY CLAY - Brown, Brittle, Hard
	20	-	7	
	30			
	24			
	20	-	6	
-10	11			
622.0	6			SILTY CLAY TILL - Gray, Stiff
	6	3.1	19	
	8	B		
	2			
	3	3.1	21	
-15	5	B		
	16			LL = 25.1, PL = 23.8, PI = 1.3
	20	1.7	17	
	28	S		
614.5	6			SHALE - Greenish Gray, Soft, Highly Weathered
	21	-	17	
-20	31			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SHALE - Greenish Gray, Soft, Highly Weathered *(continued)*
	100/17.5"			Becomes Brown, MSPT start
-25		2.7	17	
	50/20"			Becomes Gray
-30		1.3	19	
	100/12"			Becomes Unweathered, Hard
-35		7.5	19	
	100/1.3"			Poor Recovery
-40		79.5	30	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 8/23/23

ROUTE FAI 74 (I-74) **DESCRIPTION** I-74 over Stony Creek **LOGGED BY** KEG

SECTION (92-9)BR **LOCATION** Oakwood Township, IL - 40.12413381° N, 87.85744411° W

COUNTY Vermilion **DRILLING METHOD** HSA + Mud Rotary Wash at 10' **HAMMER TYPE** AUTO

STRUCT. NO. 092-001/002 (EX)
Station 1286+17

BORING NO. SB-04
Station 1285+63.26
Offset 82.0 ft RT
Ground Surface Elev. 632.97 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter _____ ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SHALE - Greenish Gray, Soft, Highly Weathered *(continued)*				
		100/13.6"		
			4.5	17
588.0	-45			
End of Boring				
	-50			
	-55			
	-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation

Modified SPT Log

Route: FAI 74 (I-74) Structure No.: 92-001/00 (Exist.) (Prop.) Date: 8/23/23 Page: 3 of 3

Section: (92-9) BR Description: I-74 over Stony Creek

County: Vermilion Logged by: KEG Sampler Tube Length: 24 in.

Boring No.: SB-04 Station: 1285+90 Offset: 90.0' RT Latitude: 40.1241338 Longitude: -87.857444

Drill Rig: D-50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 632.97

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$	q_u	Young's Modulus
Test Elevation	0	10	20	30	40	50	60	70	80	90	100	(bpf)	(ksf)	(ksi)
23.50	1.5	1.3	1.07	0.97	***0.77***	***0.67***	***0.5***	0.33	***0.25***	***0.17***	***0.04***	63.3	6.1	1.45
28.50	1.5	1.03	***0.75***	***0.42***	***0.15***	***0***						30.9	3.0	0.73
33.50	1.5	1.1	0.875	***0.73***	0.72	***0.65***	***0.6***	***0.54***	***0.52***	0.51	0.5	176.6	16.9	3.79
38.50	1.5	1.43	1.42	1.42	1.42	***1.42***	1.41	***1.41***	***1.41***	***1.4***	***1.4***	1857	178	223.54
43.50	1.5	1.18	1.03	0.975	0.77	***0.75***	***0.69***	0.68	***0.55***	***0.48***	***0.37***	105.0	10.1	2.33

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.

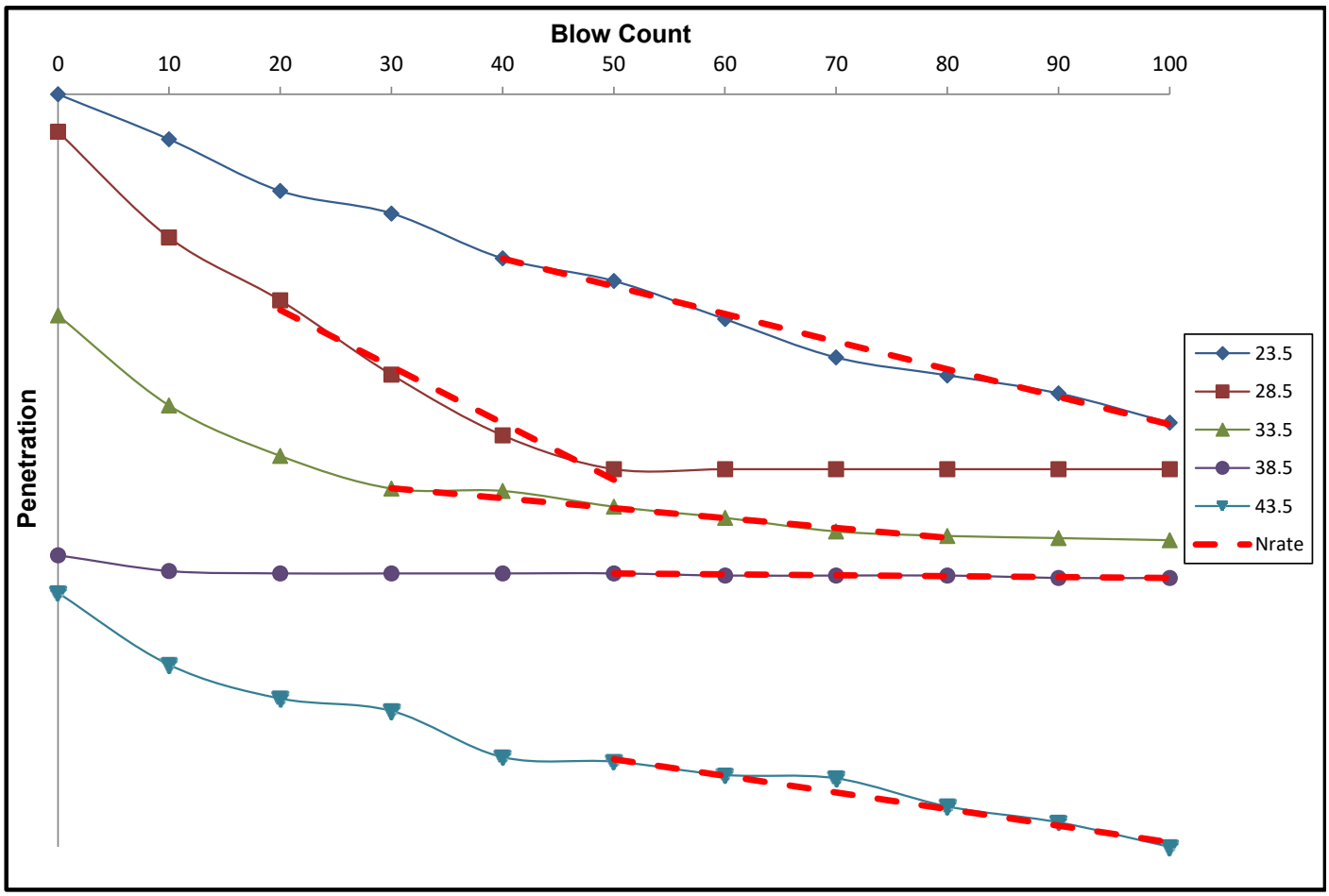


EXHIBIT E

SUBSURFACE PROFILE

Elevation (ft)

640 630 620 610 600 590 580

SB-01
1285+32
7.0 ft RT
639.14

N	Qu	w%	
42	4.0	10	SILTY CLAY - Brown, w/ Gravel, Very Stiff
P			
10	-		
11	1.1	18	CLAY LOAM - Dark Brown, Stiff
B			
9	1.5	15	Sand = 33.8%, Silt = 45.2%, Clay = 21.0%
B			
10	1.9	12	SILTY CLAY LOAM - Gray, Stiff, w/ Gravel
B			
6	4.3	12	
P			
13	0.5	19	SANDY LOAM - Gray, Loose
P			
63	2.4	10	Sand = 54.6%, Silt = 29.4%, Clay = 16.0%
S			
35	7.7	17	SILTY CLAY LOAM TILL - Dark Gray, Hard
B			
28	5.2	18	
B			
18	3.7	21	
B			
29	1.8	28	SANDY CLAY - Greenish Gray, Stiff
S			
59	1.3	17	CLAYEY SHALE - Brown and Gray, Soft
S			
6.9		25	COAL
1.4		16	
45.5		15	CLAYEY SHALE - Gray, Soft
2.5		17	
5.0		12	579.1

SB-03
1285+88
81.0 ft LT
635

N	Qu	w%	
9	1.8	9	SILTY CLAY - Brown, Stiff, w/ Some Organics
P			
4	0.3	15	CLAYEY SAND - Gray, Well Sorted, Loose
P			Sand = 61.6%, Silt = 21.4%, Clay = 17.0%
-		5	SANDY CLAY - Gray, Soft, w/ Coal and Sanstones Pockets
3.4		5	
			SHALE - Highly Weathered
2.2		9	
-		22	SILTY CLAY TILL - Stiff
2.8		15	
			SHALE - Gray, Hard, Unweathered
6.2		35	605.0

SB-04
1285+90
90.0 ft RT
632.97

N	Qu	w%	
			SILTY CLAY - Brown, Stiff
11	1.5	27	SANDY CLAY - Stiff
P			SILTY CLAY - Brown, Medium Stiff
6	0.8	23	SILTY CLAY TILL - Dark Brown, Medium Stiff
B			LL = 36.0, PL = 19.6, PI = 16.4
50	-	7	
31	-	6	SILTY CLAY - Brown, Brittle, Hard
14	3.1	19	
B			
8	3.1	21	SILTY CLAY TILL - Gray, Stiff
B			
48	1.7	17	
S			
52	-	17	
2.7		17	
1.3		19	SHALE - Greenish Gray, Soft, Highly Weathered
7.5		19	
79.5		30	
4.5		17	588.0

SB-02
1287+13
60.0 ft RT
642.79

N	Qu	w%	
22	>4.5	13	SILTY CLAY - Brown, Hard
P			
11	3.8	12	
P			
8	1.0	14	
B			
9	0.8	14	LOAM - Brown, Stiff, w/ Gravel
B			
14	0.3	14	
B			
19	2.4	12	
B			
66	-	8	SANDY CLAY LOAM TILL - Brownish Gray, Hard, w/ Gravel, Wet
87	-	10	CLAYEY SAND - Brown, Fine, Dense
13	4.6	17	SANDY CLAY LOAM TILL - Gray, Very Stiff, w/ Gravel
B			
28	1.8	20	Sand = 7.0%, Silt = 53.0%, Clay = 40.0%
S			CLAYEY SHALE - Brownish Gray, Stiff
16	4.2	18	
B			
14	2.0	22	SILTY CLAY - Dark Gray, Very Stiff
B			
-	3.1	15	
S			
-		19	
1.8		18	SHALE - Gray, Brittle
18.8		49	
4.6		15	
2.8		15	582.8

PRINTERMOD2 11X17 23-1015.00 I-74 OVER STONEY CREEK.GPJ IL_DOT.GDT 10/4/23

Kaskaskia Engineering Group, LLC
208 E. Main St., Suite 100
Belleville, Illinois 62220
618.233.5877 phone
618.233.5977 fax
www.kaskaskiaeng.com

PROFESSIONAL REGISTRATIONS	LICENSE NO.
Illinois Professional Design Firm	184.004773
Professional Engineering Group	20-5080586

NOT TO HORIZONTAL SCALE

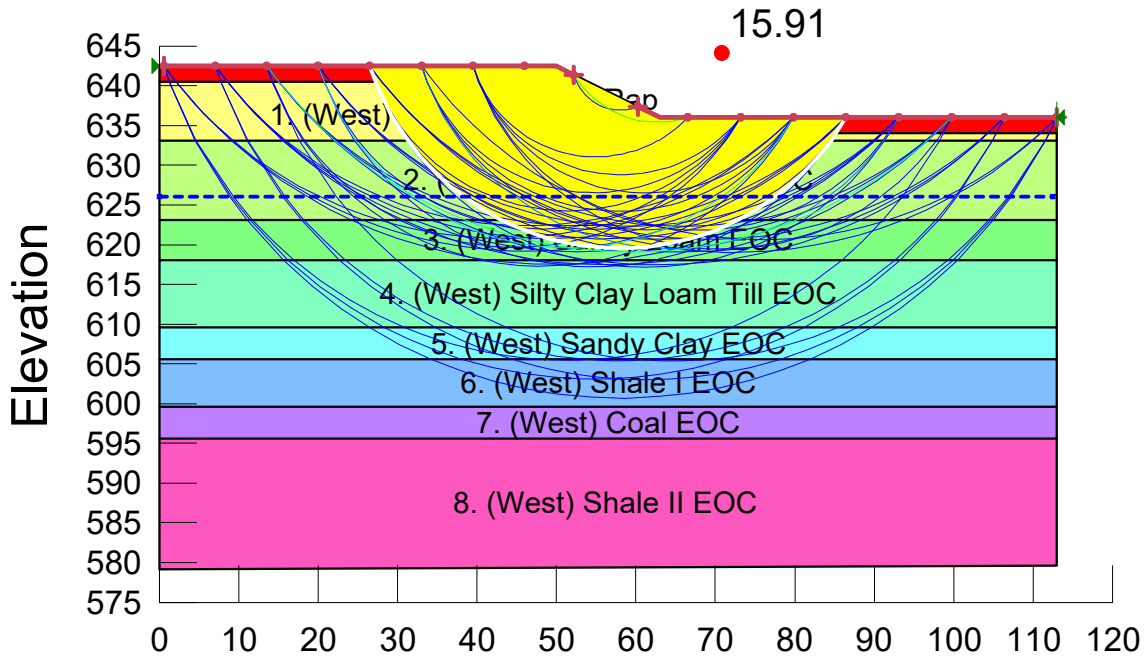
SUBSURFACE PROFILE

Route: FAI 74 (I-74)
Section: (92-9)BR
County: Vermilion

EXHIBIT F

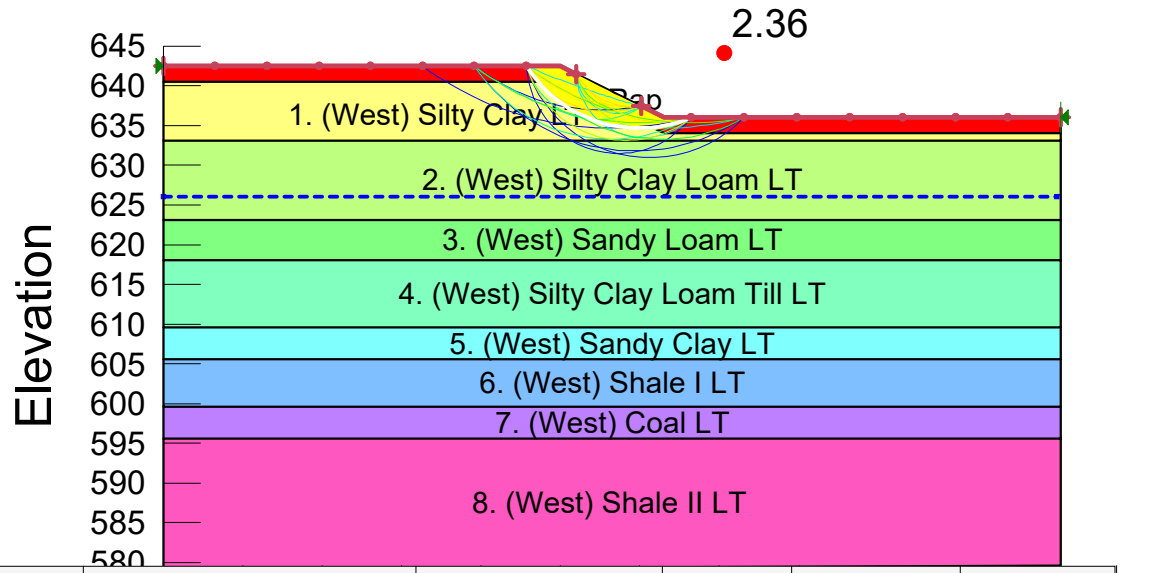
SLOPE W SLOPE STABILITY ANALYSIS

I-74 Over Stony Creek Bridge Replacement - Western Abutments
Boring SB-01
End-of-Construction (Undrained Analysis)



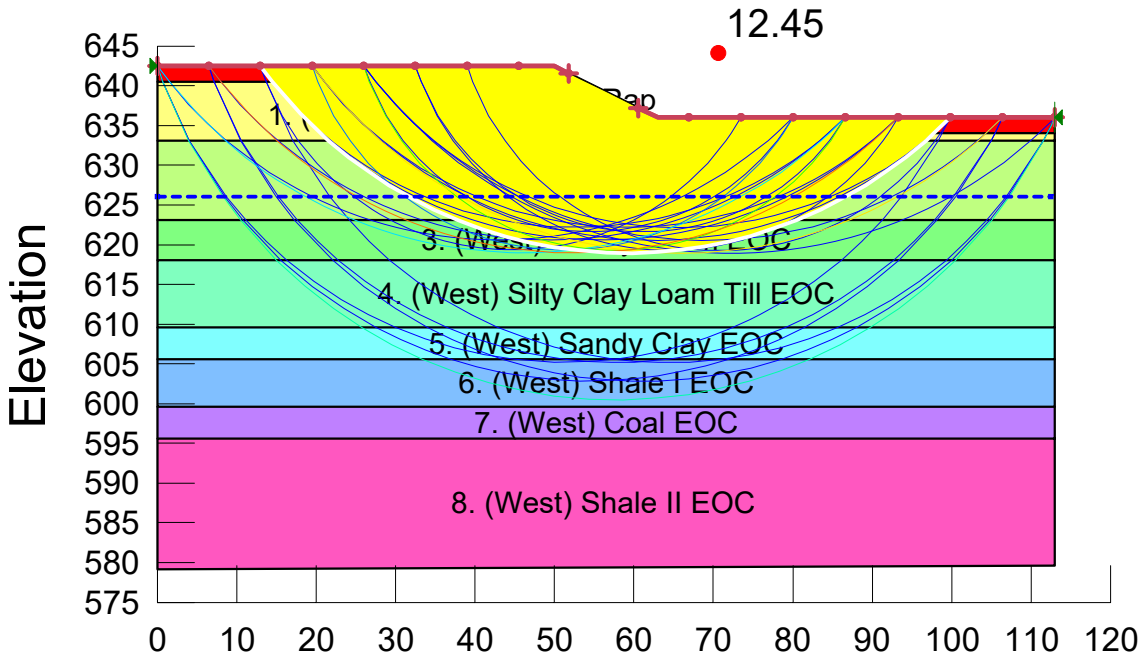
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. (West) Silty Clay EOC	Mohr-Coulomb	120	4,000	0
	2. (West) Silty Clay Loam EOC	Mohr-Coulomb	120	3,100	0
	3. (West) Sandy Loam EOC	Mohr-Coulomb	120	0	30
	4. (West) Silty Clay Loam Till EOC	Mohr-Coulomb	125	5,800	0
	5. (West) Sandy Clay EOC	Mohr-Coulomb	120	1,800	0
	6. (West) Shale I EOC	Mohr-Coulomb	135	1,300	0
	7. (West) Coal EOC	Mohr-Coulomb	94	6,900	0
	8. (West) Shale II EOC	Mohr-Coulomb	135	5,000	0
	RipRap	Mohr-Coulomb	145	0	48

I-74 Over Stony Creek Bridge Replacement - Western Abutments
Boring SB-01
Long Term (Drained Analysis)



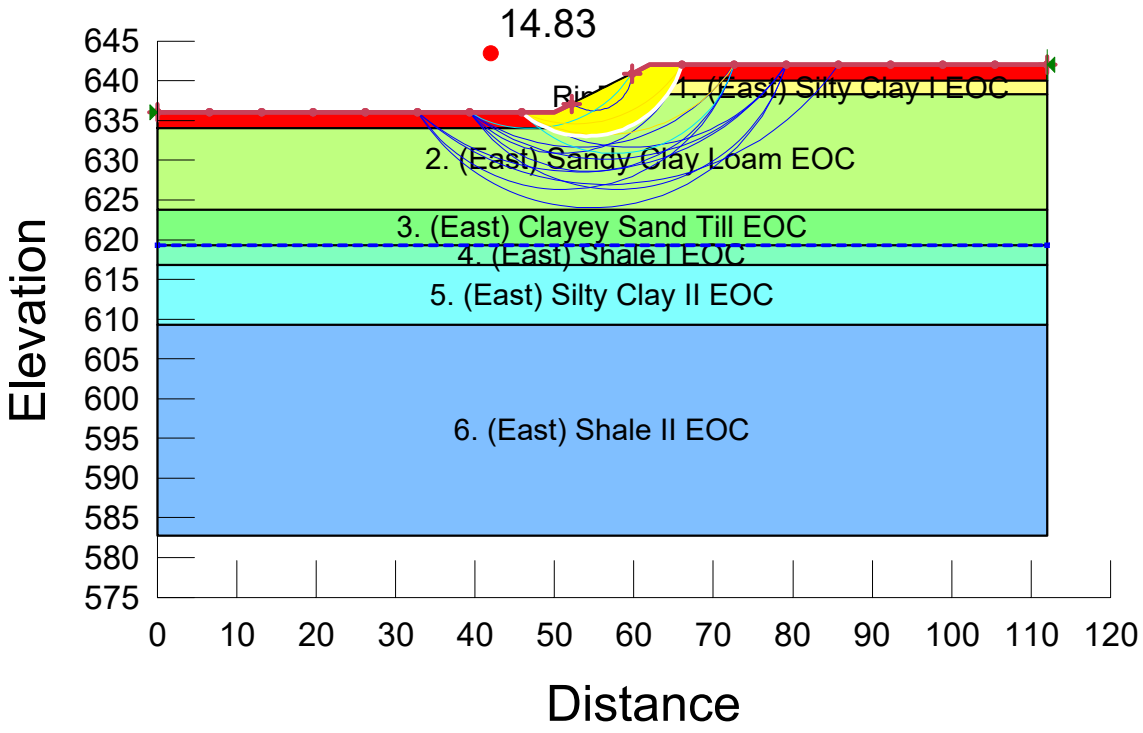
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. (West) Silty Clay LT	Mohr-Coulomb	120	100	26
	2. (West) Silty Clay Loam LT	Mohr-Coulomb	120	100	28
	3. (West) Sandy Loam LT	Mohr-Coulomb	120	0	30
	4. (West) Silty Clay Loam Till LT	Mohr-Coulomb	125	150	30
	5. (West) Sandy Clay LT	Mohr-Coulomb	120	150	30
	6. (West) Shale I LT	Mohr-Coulomb	135	150	12
	7. (West) Coal LT	Mohr-Coulomb	94	150	0
	8. (West) Shale II LT	Mohr-Coulomb	135	150	12
	RipRap	Mohr-Coulomb	145	0	48

I-74 Over Stony Creek Bridge Replacement - Western Abutments
Boring SB-01
Seismic Analysis: Ks = 0.0354



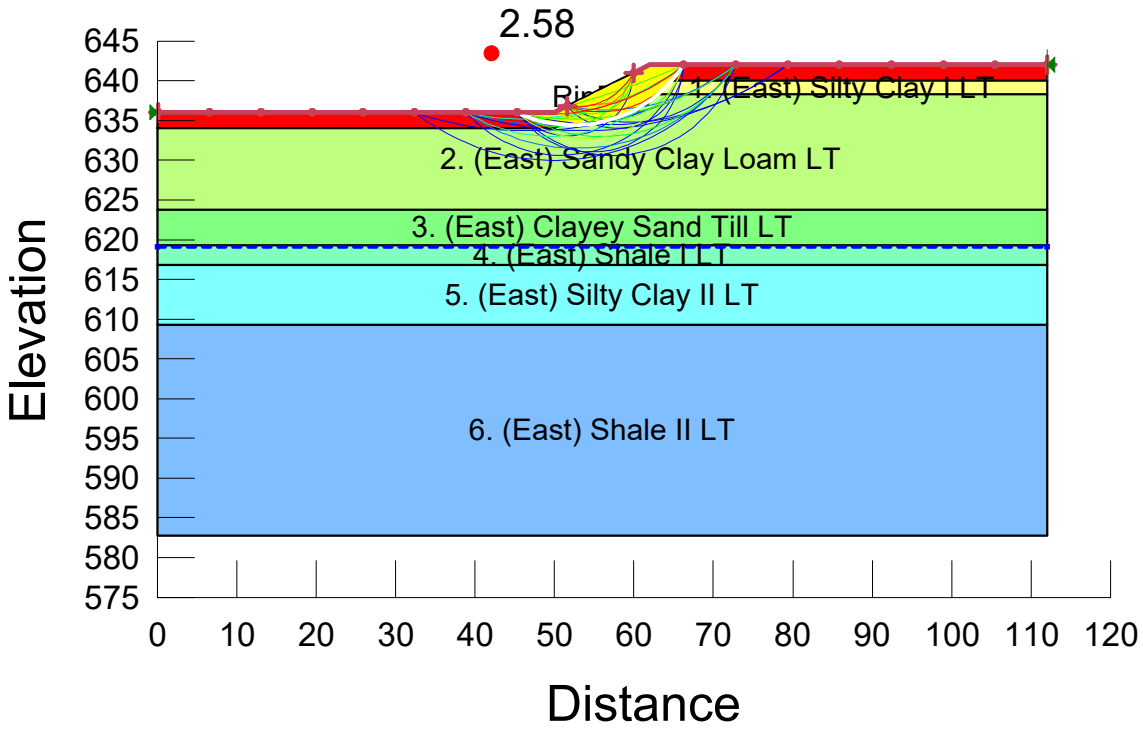
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. (West) Silty Clay EOC	Mohr-Coulomb	120	4,000	0
	2. (West) Silty Clay Loam EOC	Mohr-Coulomb	120	3,100	0
	3. (West) Sandy Loam EOC	Mohr-Coulomb	120	0	30
	4. (West) Silty Clay Loam Till EOC	Mohr-Coulomb	125	5,800	0
	5. (West) Sandy Clay EOC	Mohr-Coulomb	120	1,800	0
	6. (West) Shale I EOC	Mohr-Coulomb	135	1,300	0
	7. (West) Coal EOC	Mohr-Coulomb	94	6,900	0
	8. (West) Shale II EOC	Mohr-Coulomb	135	5,000	0
	RipRap	Mohr-Coulomb	145	0	48

I-74 Over Stony Creek Bridge Replacement - Eastern Abutments
Boring SB-02
End-of-Construction (Undrained Analysis)



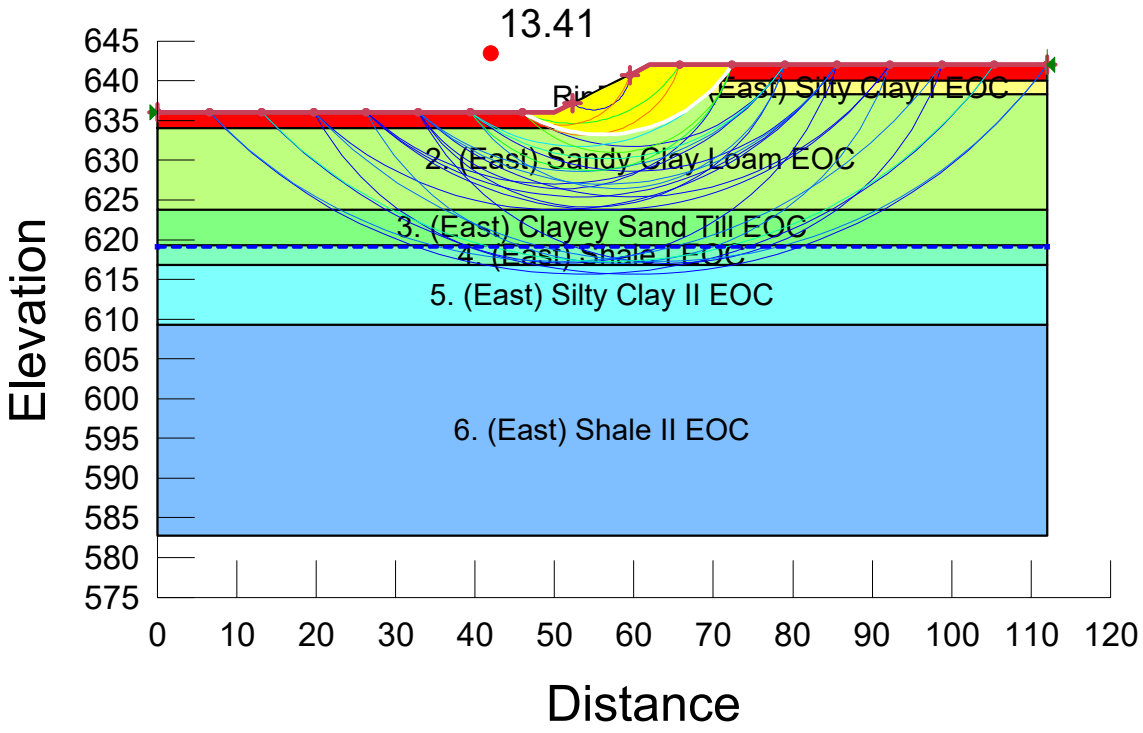
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. (East) Silty Clay I EOC	Mohr-Coulomb	120	4,500	0
	2. (East) Sandy Clay Loam EOC	Mohr-Coulomb	120	1,660	26
	3. (East) Clayey Sand Till EOC	Mohr-Coulomb	125	2,300	30
	4. (East) Shale I EOC	Mohr-Coulomb	135	1,800	0
	5. (East) Silty Clay II EOC	Mohr-Coulomb	120	3,100	0
	6. (East) Shale II EOC	Mohr-Coulomb	145	5,000	0
	RipRap	Mohr-Coulomb	145	0	48

I-74 Over Stony Creek Bridge Replacement - Eastern Abutments
Boring SB-02
Long Term (Drained Analysis)



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. (East) Silty Clay I LT	Mohr-Coulomb	120	150	26
	2. (East) Sandy Clay Loam LT	Mohr-Coulomb	120	100	26
	3. (East) Clayey Sand Till LT	Mohr-Coulomb	125	100	30
	4. (East) Shale I LT	Mohr-Coulomb	135	150	12
	5. (East) Silty Clay II LT	Mohr-Coulomb	120	100	26
	6. (East) Shale II LT	Mohr-Coulomb	145	150	12
	RipRap	Mohr-Coulomb	145	0	48

I-74 Over Stony Creek Bridge Replacement - Eastern Abutments
Boring SB-02
Seismic Analysis: Ks = 0.0354



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	1. (East) Silty Clay I EOC	Mohr-Coulomb	120	4,500	0
	2. (East) Sandy Clay Loam EOC	Mohr-Coulomb	120	1,660	26
	3. (East) Clayey Sand Till EOC	Mohr-Coulomb	125	2,300	30
	4. (East) Shale I EOC	Mohr-Coulomb	135	1,800	0
	5. (East) Silty Clay II EOC	Mohr-Coulomb	120	3,100	0
	6. (East) Shale II EOC	Mohr-Coulomb	145	5,000	0
	RipRap	Mohr-Coulomb	145	0	48

EXHIBIT G

PILE LENGTH/PILE TYPE

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== EB - East Abutment
REFERENCE BORING ========== SB-02
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.54 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING 641.54 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 641.53 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1278 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 238.79 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 89.54 KIPS

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area======= 0.086 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**37** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
639.29	2.25	4.50	22		15.4		51.7	22.7		***27.3***	27	0	0	15	4
636.79	2.50	3.80	11		15.0	36.2	***40.0***	22.1	4.6	46.1	40	0	0	22	7
634.29	2.50	1.00			5.9	9.5	***44.0***	8.6	1.2	54.5	44	0	0	24	9
631.79	2.50	0.80			4.9	7.6	***44.1***	7.2	1.0	61.0	44	0	0	24	12
629.29	2.50	0.30			2.0	2.9	***66.1***	2.9	0.4	66.5	66	0	0	36	14
626.79	2.50	2.40			10.8	22.9	***76.9***	15.9	2.9	82.4	77	0	0	42	17
624.29	2.50	2.40			10.8	22.9	212.3	15.9	2.9	***114.1***	114	0	0	63	19
621.79	2.50		87	Fine Sand	24.0	147.5	***132.7***	35.4	18.7	136.4	133	0	0	73	22
619.29	2.50	4.60	13		17.1	43.9	***123.2***	25.2	5.6	158.2	123	0	0	68	24
616.79	2.50	1.80			9.0	17.2	***155.0***	13.2	2.2	174.4	155	0	0	85	27
614.29	2.50	4.20	16		16.2	40.0	***150.3***	23.9	5.1	195.6	150	0	0	83	29
609.29	5.00	2.00			19.2	19.1	235.2	28.3	2.4	***232.2***	232	0	0	128	34
608.29	1.00			Shale	41.1	84.8	***276.3***	60.5	10.7	292.7	276	0	0	152	35.3
607.29	1.00			Shale	41.1	84.8	***317.4***	60.5	10.7	353.2	317	0	0	175	36.3
606.29	1.00			Shale	41.1	84.8	***358.5***	60.5	10.7	413.8	~~359~~	~~0~~	~~0~~	~~197~~	~~37.3~~
605.29	1.00			Shale	41.1	84.8	***399.6***	60.5	10.7	474.3	~~400~~	~~0~~	~~0~~	~~220~~	~~38.3~~
604.29	1.00			Shale	41.1	84.8	***440.7***	60.5	10.7	534.8	~~441~~	~~0~~	~~0~~	~~242~~	~~39.3~~
603.29	1.00			Shale	41.1	84.8	***481.8***	60.5	10.7	595.3	~~482~~	~~0~~	~~0~~	~~265~~	~~40.3~~
602.29	1.00			Shale	41.1	84.8	***522.9***	60.5	10.7	655.8	~~523~~	~~0~~	~~0~~	~~288~~	~~41.3~~
601.29	1.00			Shale	41.1	84.8	***564.1***	60.5	10.7	716.4	~~564~~	~~0~~	~~0~~	~~310~~	~~42.3~~
600.29	1.00			Shale	41.1	84.8	***605.2***	60.5	10.7	776.9	~~605~~	~~0~~	~~0~~	~~333~~	~~43.3~~
599.29	1.00			Shale	41.1	84.8	***646.3***	60.5	10.7	837.4	~~646~~	~~0~~	~~0~~	~~355~~	~~44.3~~
598.29	1.00			Shale	41.1	84.8	***687.4***	60.5	10.7	897.9	~~687~~	~~0~~	~~0~~	~~378~~	~~45.3~~
597.29	1.00			Shale	41.1	84.8	***728.5***	60.5	10.7	958.5	~~728~~	~~0~~	~~0~~	~~401~~	~~46.3~~
596.29	1.00			Shale	41.1	84.8	***769.6***	60.5	10.7	1019.0	~~770~~	~~0~~	~~0~~	~~423~~	~~47.3~~
595.29	1.00			Shale	41.1	84.8	***810.7***	60.5	10.7	1079.5	~~811~~	~~0~~	~~0~~	~~446~~	~~48.3~~
594.29	1.00			Shale	41.1	84.8	***851.8***	60.5	10.7	1140.0	~~852~~	~~0~~	~~0~~	~~468~~	~~49.3~~
593.29	1.00			Shale	41.1	84.8	***892.9***	60.5	10.7	1200.5	~~893~~	~~0~~	~~0~~	~~491~~	~~50.3~~
592.29	1.00			Shale	41.1	84.8	***934.0***	60.5	10.7	1261.1	~~934~~	~~0~~	~~0~~	~~514~~	~~51.3~~
591.29	1.00			Shale	41.1	84.8	***975.1***	60.5	10.7	1321.6	~~975~~	~~0~~	~~0~~	~~536~~	~~52.3~~
590.29	1.00			Shale	41.1	84.8	***1016.3***	60.5	10.7	1382.1	~~1016~~	~~0~~	~~0~~	~~559~~	~~53.3~~
589.29	1.00			Shale	41.1	84.8	***1057.4***	60.5	10.7	1442.6	~~1057~~	~~0~~	~~0~~	~~582~~	~~54.3~~
588.29	1.00			Shale	41.1	84.8	***1098.5***	60.5	10.7	1503.1	~~1098~~	~~0~~	~~0~~	~~604~~	~~55.3~~
587.29	1.00			Shale	41.1	84.8	***1139.6***	60.5	10.7	1563.7	~~1140~~	~~0~~	~~0~~	~~627~~	~~56.3~~
586.29	1.00			Shale	41.1	84.8	***1180.7***	60.5	10.7	1624.2	~~1181~~	~~0~~	~~0~~	~~649~~	~~57.3~~
585.29	1.00			Shale	41.1	84.8	***1221.8***	60.5	10.7	1684.7	~~1222~~	~~0~~	~~0~~	~~672~~	~~58.3~~
584.29	1.00			Shale	41.1	84.8	***1262.9***	60.5	10.7	1745.2	~~1263~~	~~0~~	~~0~~	~~695~~	~~59.3~~
583.29	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== EB - West Abutment
REFERENCE BORING ========== SB-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.88 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 641.88 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 642.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1278 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1

Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 238.79 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 89.54 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**41** FT.

PILE TYPE AND SIZE ========== Steel HP 10 X 42

Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
639.14	2.74	1.00			6.4		59.7	9.5		***16.2***	16	0	0	9	5
635.64	3.50		42	Hard Till	5.7	53.3	35.9	8.4	6.7	***20.8***	21	0	0	11	8
633.14	2.50	2.50			11.1	23.8	***33.7***	16.4	3.0	35.5	34	0	0	19	11
630.64	2.50	1.10			6.3	10.5	***43.8***	9.3	1.3	45.3	44	0	0	24	13
628.14	2.50	1.50			7.9	14.3	***55.6***	11.7	1.8	57.5	56	0	0	31	16
625.64	2.50	1.90			9.3	18.1	87.8	13.7	2.3	***74.0***	74	0	0	41	18
623.14	2.50	4.30	6		16.5	41.0	***68.1***	24.4	5.2	93.8	68	0	0	37	21
620.64	2.50	0.50			3.2	4.8	***89.4***	4.7	0.6	100.8	89	0	0	49	23
618.14	2.50	2.40			10.8	22.9	121.8	15.9	2.9	***119.5***	119	0	0	66	26
615.64	2.50		35	Hard Till	3.2	44.5	130.1	4.7	5.6	***124.8***	125	0	0	69	28
613.14	2.50	5.20	28		17.1	49.6	***133.0***	25.2	6.3	148.3	133	0	0	73	31
610.64	2.50	3.70	18		14.7	35.3	***129.6***	21.7	4.5	167.7	130	0	0	71	33
605.64	5.00	1.80			17.9	17.2	215.1	26.4	2.2	***202.6***	203	0	0	111	38
604.64	1.00			Shale	41.1	84.8	***256.2***	60.5	10.7	263.2	256	0	0	141	39.2
603.64	1.00			Shale	41.1	84.8	***297.3***	60.5	10.7	323.7	297	0	0	164	40.2
602.64	1.00			Shale	41.1	84.8	***338.4***	60.5	10.7	384.2	~~338~~	~~0~~	~~0~~	~~186~~	~~41.2~~
601.64	1.00			Shale	41.1	84.8	***379.5***	60.5	10.7	444.7	~~380~~	~~0~~	~~0~~	~~209~~	~~42.2~~
600.64	1.00			Shale	41.1	84.8	***420.7***	60.5	10.7	505.2	~~421~~	~~0~~	~~0~~	~~231~~	~~43.2~~
599.64	1.00			Shale	41.1	84.8	***461.8***	60.5	10.7	565.8	~~462~~	~~0~~	~~0~~	~~254~~	~~44.2~~
598.64	1.00			Shale	41.1	84.8	***502.9***	60.5	10.7	626.3	~~503~~	~~0~~	~~0~~	~~277~~	~~45.2~~
597.64	1.00			Shale	41.1	84.8	***544.0***	60.5	10.7	686.8	~~544~~	~~0~~	~~0~~	~~299~~	~~46.2~~
596.64	1.00			Shale	41.1	84.8	***585.1***	60.5	10.7	747.3	~~585~~	~~0~~	~~0~~	~~322~~	~~47.2~~
595.64	1.00			Shale	41.1	84.8	***626.2***	60.5	10.7	807.9	~~626~~	~~0~~	~~0~~	~~344~~	~~48.2~~
594.64	1.00			Shale	41.1	84.8	***667.3***	60.5	10.7	868.4	~~667~~	~~0~~	~~0~~	~~367~~	~~49.2~~
593.64	1.00			Shale	41.1	84.8	***708.4***	60.5	10.7	928.9	~~708~~	~~0~~	~~0~~	~~390~~	~~50.2~~
592.64	1.00			Shale	41.1	84.8	***749.5***	60.5	10.7	989.4	~~750~~	~~0~~	~~0~~	~~412~~	~~51.2~~
591.64	1.00			Shale	41.1	84.8	***790.6***	60.5	10.7	1049.9	~~791~~	~~0~~	~~0~~	~~435~~	~~52.2~~
590.64	1.00			Shale	41.1	84.8	***831.7***	60.5	10.7	1110.5	~~832~~	~~0~~	~~0~~	~~457~~	~~53.2~~
589.64	1.00			Shale	41.1	84.8	***872.8***	60.5	10.7	1171.0	~~873~~	~~0~~	~~0~~	~~480~~	~~54.2~~
588.64	1.00			Shale	41.1	84.8	***914.0***	60.5	10.7	1231.5	~~914~~	~~0~~	~~0~~	~~503~~	~~55.2~~
587.64	1.00			Shale	41.1	84.8	***955.1***	60.5	10.7	1292.0	~~955~~	~~0~~	~~0~~	~~525~~	~~56.2~~
586.64	1.00			Shale	41.1	84.8	***996.2***	60.5	10.7	1352.5	~~996~~	~~0~~	~~0~~	~~548~~	~~57.2~~
585.64	1.00			Shale	41.1	84.8	***1037.3***	60.5	10.7	1413.1	~~1037~~	~~0~~	~~0~~	~~571~~	~~58.2~~
584.64	1.00			Shale	41.1	84.8	***1078.4***	60.5	10.7	1473.6	~~1078~~	~~0~~	~~0~~	~~593~~	~~59.2~~
583.64	1.00			Shale	41.1	84.8	***1119.5***	60.5	10.7	1534.1	~~1119~~	~~0~~	~~0~~	~~616~~	~~60.2~~
582.64	1.00			Shale	41.1	84.8	***1160.6***	60.5	10.7	1594.6	~~1161~~	~~0~~	~~0~~	~~638~~	~~61.2~~
581.64	1.00			Shale	41.1	84.8	***1201.7***	60.5	10.7	1655.1	~~1202~~	~~0~~	~~0~~	~~661~~	~~62.2~~
580.64	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== WB - East Abutment
REFERENCE BORING ========== SB-02
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.37 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 641.37 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 641.48 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1278 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1

Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 238.79 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 89.54 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**37** FT.

PILE TYPE AND SIZE ========== Steel HP 10 X 42

Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
639.29	2.08	4.50	22		14.3		50.5	21.0		***25.6***	26	0	0	14	4
636.79	2.50	3.80	11		15.0	36.2	***38.8***	22.1	4.6	44.4	39	0	0	21	7
634.29	2.50	1.00			5.9	9.5	***42.8***	8.6	1.2	52.7	43	0	0	24	9
631.79	2.50	0.80			4.9	7.6	***42.9***	7.2	1.0	59.3	43	0	0	24	12
629.29	2.50	0.30			2.0	2.9	64.9	2.9	0.4	***64.8***	65	0	0	36	14
626.79	2.50	2.40			10.8	22.9	***75.7***	15.9	2.9	80.7	76	0	0	42	17
624.29	2.50	2.40			10.8	22.9	211.1	15.9	2.9	***112.4***	112	0	0	62	19
621.79	2.50		87	Fine Sand	24.0	147.5	***131.6***	35.4	18.7	134.7	132	0	0	72	22
619.29	2.50	4.60	13		17.1	43.9	***122.0***	25.2	5.6	156.5	122	0	0	67	24
616.79	2.50	1.80			9.0	17.2	***153.9***	13.2	2.2	172.6	154	0	0	85	27
614.29	2.50	4.20	16		16.2	40.0	***149.1***	23.9	5.1	193.9	149	0	0	82	29
609.29	5.00	2.00			19.2	19.1	234.0	28.3	2.4	***230.5***	230	0	0	127	34
608.29	1.00			Shale	41.1	84.8	***275.1***	60.5	10.7	291.0	275	0	0	151	35.1
607.29	1.00			Shale	41.1	84.8	***316.2***	60.5	10.7	351.5	316	0	0	174	36.1
606.29	1.00			Shale	41.1	84.8	***357.3***	60.5	10.7	412.0	~~357~~	~~0~~	~~0~~	~~197~~	~~37.1~~
605.29	1.00			Shale	41.1	84.8	***398.5***	60.5	10.7	472.6	~~398~~	~~0~~	~~0~~	~~219~~	~~38.1~~
604.29	1.00			Shale	41.1	84.8	***439.6***	60.5	10.7	533.1	~~440~~	~~0~~	~~0~~	~~242~~	~~39.1~~
603.29	1.00			Shale	41.1	84.8	***480.7***	60.5	10.7	593.6	~~481~~	~~0~~	~~0~~	~~264~~	~~40.1~~
602.29	1.00			Shale	41.1	84.8	***521.8***	60.5	10.7	654.1	~~522~~	~~0~~	~~0~~	~~287~~	~~41.1~~
601.29	1.00			Shale	41.1	84.8	***562.9***	60.5	10.7	714.7	~~563~~	~~0~~	~~0~~	~~310~~	~~42.1~~
600.29	1.00			Shale	41.1	84.8	***604.0***	60.5	10.7	775.2	~~604~~	~~0~~	~~0~~	~~332~~	~~43.1~~
599.29	1.00			Shale	41.1	84.8	***645.1***	60.5	10.7	835.7	~~645~~	~~0~~	~~0~~	~~355~~	~~44.1~~
598.29	1.00			Shale	41.1	84.8	***686.2***	60.5	10.7	896.2	~~686~~	~~0~~	~~0~~	~~377~~	~~45.1~~
597.29	1.00			Shale	41.1	84.8	***727.3***	60.5	10.7	956.7	~~727~~	~~0~~	~~0~~	~~400~~	~~46.1~~
596.29	1.00			Shale	41.1	84.8	***768.4***	60.5	10.7	1017.3	~~768~~	~~0~~	~~0~~	~~423~~	~~47.1~~
595.29	1.00			Shale	41.1	84.8	***809.5***	60.5	10.7	1077.8	~~810~~	~~0~~	~~0~~	~~445~~	~~48.1~~
594.29	1.00			Shale	41.1	84.8	***850.6***	60.5	10.7	1138.3	~~851~~	~~0~~	~~0~~	~~468~~	~~49.1~~
593.29	1.00			Shale	41.1	84.8	***891.8***	60.5	10.7	1198.8	~~892~~	~~0~~	~~0~~	~~490~~	~~50.1~~
592.29	1.00			Shale	41.1	84.8	***932.9***	60.5	10.7	1259.3	~~933~~	~~0~~	~~0~~	~~513~~	~~51.1~~
591.29	1.00			Shale	41.1	84.8	***974.0***	60.5	10.7	1319.9	~~974~~	~~0~~	~~0~~	~~536~~	~~52.1~~
590.29	1.00			Shale	41.1	84.8	***1015.1***	60.5	10.7	1380.4	~~1015~~	~~0~~	~~0~~	~~558~~	~~53.1~~
589.29	1.00			Shale	41.1	84.8	***1056.2***	60.5	10.7	1440.9	~~1056~~	~~0~~	~~0~~	~~581~~	~~54.1~~
588.29	1.00			Shale	41.1	84.8	***1097.3***	60.5	10.7	1501.4	~~1097~~	~~0~~	~~0~~	~~604~~	~~55.1~~
587.29	1.00			Shale	41.1	84.8	***1138.4***	60.5	10.7	1561.9	~~1138~~	~~0~~	~~0~~	~~626~~	~~56.1~~
586.29	1.00			Shale	41.1	84.8	***1179.5***	60.5	10.7	1622.5	~~1180~~	~~0~~	~~0~~	~~649~~	~~57.1~~
585.29	1.00			Shale	41.1	84.8	***1220.6***	60.5	10.7	1683.0	~~1221~~	~~0~~	~~0~~	~~671~~	~~58.1~~
584.29	1.00			Shale	41.1	84.8	***1261.7***	60.5	10.7	1743.5	~~1262~~	~~0~~	~~0~~	~~694~~	~~59.1~~
583.29	1.00			Shale		84.8			10.7						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== WB - West Abutment
REFERENCE BORING ========== SB-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.92 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 641.92 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 641.92 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1278 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1

Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 238.79 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 89.54 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**44** FT.

PILE TYPE AND SIZE ========== Steel HP 10 X 42

Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
639.14	2.78	1.50			8.8		62.2	13.0		***19.7***	20	0	0	11	5
635.64	3.50		42	Hard Till	5.7	53.4	38.3	8.4	6.8	***24.4***	24	0	0	13	8
633.14	2.50	2.50			11.1	23.8	***36.1***	16.4	3.0	39.0	36	0	0	20	11
630.64	2.50	1.10			6.3	10.5	***46.2***	9.3	1.3	48.8	46	0	0	25	13
628.14	2.50	1.50			7.9	14.3	***58.0***	11.7	1.8	61.0	58	0	0	32	16
625.64	2.50	1.90			9.3	18.1	90.2	13.7	2.3	***77.6***	78	0	0	43	18
623.14	2.50	4.30	6		16.5	41.0	***70.5***	24.4	5.2	97.3	70	0	0	39	21
620.64	2.50	0.50			3.2	4.8	***91.8***	4.7	0.6	104.4	92	0	0	50	23
618.14	2.50	2.40	63		10.8	22.9	124.2	15.9	2.9	***123.0***	123	0	0	68	26
615.64	2.50		35	Hard Till	3.2	44.5	132.5	4.7	5.6	***128.4***	128	0	0	71	28
613.14	2.50	5.20	28		17.1	49.6	***135.4***	25.2	6.3	151.8	135	0	0	74	31
610.64	2.50	3.70	18		14.7	35.3	***132.0***	21.7	4.5	171.2	132	0	0	73	33
608.14	2.50	1.80			9.0	17.2	***136.2***	13.2	2.2	183.8	136	0	0	75	36
603.14	5.00	1.30			14.3	12.4	222.9	21.1	1.6	***214.1***	214	0	0	118	41
602.14	1.00			Shale	41.1	84.8	***264.0***	60.5	10.7	274.6	264	0	0	145	41.8
601.14	1.00			Shale	41.1	84.8	***305.1***	60.5	10.7	335.1	305	0	0	168	42.8
600.14	1.00			Shale	41.1	84.8	***346.2***	60.5	10.7	395.7	~~346~~	~~0~~	~~0~~	~~190~~	~~43.8~~
599.14	1.00			Shale	41.1	84.8	***387.3***	60.5	10.7	456.2	~~387~~	~~0~~	~~0~~	~~213~~	~~44.8~~
598.14	1.00			Shale	41.1	84.8	***428.4***	60.5	10.7	516.7	~~428~~	~~0~~	~~0~~	~~236~~	~~45.8~~
597.14	1.00			Shale	41.1	84.8	***469.5***	60.5	10.7	577.2	~~470~~	~~0~~	~~0~~	~~258~~	~~46.8~~
596.14	1.00			Shale	41.1	84.8	***510.6***	60.5	10.7	637.7	~~511~~	~~0~~	~~0~~	~~281~~	~~47.8~~
595.14	1.00			Shale	41.1	84.8	***551.8***	60.5	10.7	698.3	~~552~~	~~0~~	~~0~~	~~303~~	~~48.8~~
594.14	1.00			Shale	41.1	84.8	***592.9***	60.5	10.7	758.8	~~593~~	~~0~~	~~0~~	~~326~~	~~49.8~~
593.14	1.00			Shale	41.1	84.8	***634.0***	60.5	10.7	819.3	~~634~~	~~0~~	~~0~~	~~349~~	~~50.8~~
592.14	1.00			Shale	41.1	84.8	***675.1***	60.5	10.7	879.8	~~675~~	~~0~~	~~0~~	~~371~~	~~51.8~~
591.14	1.00			Shale	41.1	84.8	***716.2***	60.5	10.7	940.3	~~716~~	~~0~~	~~0~~	~~394~~	~~52.8~~
590.14	1.00			Shale	41.1	84.8	***757.3***	60.5	10.7	1000.9	~~757~~	~~0~~	~~0~~	~~417~~	~~53.8~~
589.14	1.00			Shale	41.1	84.8	***798.4***	60.5	10.7	1061.4	~~798~~	~~0~~	~~0~~	~~439~~	~~54.8~~
588.14	1.00			Shale	41.1	84.8	***839.5***	60.5	10.7	1121.9	~~840~~	~~0~~	~~0~~	~~462~~	~~55.8~~
587.14	1.00			Shale	41.1	84.8	***880.6***	60.5	10.7	1182.4	~~881~~	~~0~~	~~0~~	~~484~~	~~56.8~~
586.14	1.00			Shale	41.1	84.8	***921.7***	60.5	10.7	1242.9	~~922~~	~~0~~	~~0~~	~~507~~	~~57.8~~
585.14	1.00			Shale	41.1	84.8	***962.8***	60.5	10.7	1303.5	~~963~~	~~0~~	~~0~~	~~530~~	~~58.8~~
584.14	1.00			Shale	41.1	84.8	***1004.0***	60.5	10.7	1364.0	~~1004~~	~~0~~	~~0~~	~~552~~	~~59.8~~
583.14	1.00			Shale	41.1	84.8	***1045.1***	60.5	10.7	1424.5	~~1045~~	~~0~~	~~0~~	~~575~~	~~60.8~~
582.14	1.00			Shale	41.1	84.8	***1086.2***	60.5	10.7	1485.0	~~1086~~	~~0~~	~~0~~	~~597~~	~~61.8~~
581.14	1.00			Shale	41.1	84.8	***1127.3***	60.5	10.7	1545.6	~~1127~~	~~0~~	~~0~~	~~620~~	~~62.8~~
580.14	1.00			Shale	41.1	84.8	***1168.4***	60.5	10.7	1606.1	~~1168~~	~~0~~	~~0~~	~~643~~	~~63.8~~
579.14	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== EB - Pier 1/Pier 2
REFERENCE BORING ========== SB-04
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 644.19 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 627.50 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 624.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1821 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 340.19 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 127.57 KIPS

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**304** KIPS	**212** KIPS	**34** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
627.00	0.50	0.80			1.0		20.0	1.4		***3.8***	4	1	0	2	17
624.50	2.50	2.00			9.6	19.1	29.6	14.1	2.4	***18.0***	18	1	0	12	20
622.00	2.50	2.00			9.6	19.1	49.7	14.1	2.4	***33.4***	33	1	0	23	22
619.50	2.50	3.10	14		12.9	29.6	62.7	19.0	3.7	***52.5***	52	1	0	36	25
617.00	2.50	3.10	8		12.9	29.6	***62.2***	19.0	3.7	69.8	62	1	0	43	27
614.50	2.50	1.70			8.6	16.2	139.4	12.7	2.1	***91.2***	91	1	0	63	30
613.50	1.00			Shale	41.1	84.8	180.5	60.5	10.7	***151.7***	152	1	0	106	30.7
612.50	1.00			Shale	41.1	84.8	221.6	60.5	10.7	***212.2***	212	1	0	148	31.7
611.50	1.00			Shale	41.1	84.8	***262.7***	60.5	10.7	272.8	263	1	0	183	32.7
610.50	1.00			Shale	41.1	84.8	***303.9***	60.5	10.7	333.3	304	1	0	212	33.7
609.50	1.00			Shale	41.1	84.8	***345.0***	60.5	10.7	393.8	~~345~~	~~1~~	~~0~~	~~241~~	~~34.7~~
608.50	1.00			Shale	41.1	84.8	***386.1***	60.5	10.7	454.3	~~386~~	~~1~~	~~0~~	~~270~~	~~35.7~~
607.50	1.00			Shale	41.1	84.8	***427.2***	60.5	10.7	514.9	~~427~~	~~1~~	~~0~~	~~298~~	~~36.7~~
606.50	1.00			Shale	41.1	84.8	***468.3***	60.5	10.7	575.4	~~468~~	~~1~~	~~0~~	~~327~~	~~37.7~~
605.50	1.00			Shale	41.1	84.8	***509.4***	60.5	10.7	635.9	~~509~~	~~1~~	~~0~~	~~356~~	~~38.7~~
604.50	1.00			Shale	41.1	84.8	***550.5***	60.5	10.7	696.4	~~551~~	~~1~~	~~0~~	~~385~~	~~39.7~~
603.50	1.00			Shale	41.1	84.8	***591.6***	60.5	10.7	756.9	~~592~~	~~1~~	~~0~~	~~413~~	~~40.7~~
602.50	1.00			Shale	41.1	84.8	***632.7***	60.5	10.7	817.5	~~633~~	~~1~~	~~0~~	~~442~~	~~41.7~~
601.50	1.00			Shale	41.1	84.8	***673.8***	60.5	10.7	878.0	~~674~~	~~1~~	~~0~~	~~471~~	~~42.7~~
600.50	1.00			Shale	41.1	84.8	***714.9***	60.5	10.7	938.5	~~715~~	~~1~~	~~0~~	~~500~~	~~43.7~~
599.50	1.00			Shale	41.1	84.8	***756.0***	60.5	10.7	999.0	~~756~~	~~1~~	~~0~~	~~529~~	~~44.7~~
598.50	1.00			Shale	41.1	84.8	***797.2***	60.5	10.7	1059.5	~~797~~	~~1~~	~~0~~	~~557~~	~~45.7~~
597.50	1.00			Shale	41.1	84.8	***838.3***	60.5	10.7	1120.1	~~838~~	~~1~~	~~0~~	~~586~~	~~46.7~~
596.50	1.00			Shale	41.1	84.8	***879.4***	60.5	10.7	1180.6	~~879~~	~~1~~	~~0~~	~~615~~	~~47.7~~
595.50	1.00			Shale	41.1	84.8	***920.5***	60.5	10.7	1241.1	~~920~~	~~1~~	~~0~~	~~644~~	~~48.7~~
594.50	1.00			Shale	41.1	84.8	***961.6***	60.5	10.7	1301.6	~~962~~	~~1~~	~~0~~	~~672~~	~~49.7~~
593.50	1.00			Shale	41.1	84.8	***1002.7***	60.5	10.7	1362.1	~~1003~~	~~1~~	~~0~~	~~701~~	~~50.7~~
592.50	1.00			Shale	41.1	84.8	***1043.8***	60.5	10.7	1422.7	~~1044~~	~~1~~	~~0~~	~~730~~	~~51.7~~
591.50	1.00			Shale	41.1	84.8	***1084.9***	60.5	10.7	1483.2	~~1085~~	~~1~~	~~0~~	~~759~~	~~52.7~~
590.50	1.00			Shale	41.1	84.8	***1126.0***	60.5	10.7	1543.7	~~1126~~	~~1~~	~~0~~	~~788~~	~~53.7~~
589.50	1.00			Shale	41.1	84.8	***1167.1***	60.5	10.7	1604.2	~~1167~~	~~1~~	~~0~~	~~816~~	~~54.7~~
588.50	1.00			Shale	41.1	84.8	***1208.2***	60.5	10.7	1664.8	~~1208~~	~~1~~	~~0~~	~~845~~	~~55.7~~
587.50	1.00			Shale	41.1	84.8	***1249.3***	60.5	10.7	1725.3	~~1249~~	~~1~~	~~0~~	~~874~~	~~56.7~~
586.50	1.00			Shale	41.1	84.8	***1290.5***	60.5	10.7	1785.8	~~1290~~	~~1~~	~~0~~	~~903~~	~~57.7~~
585.50	1.00			Shale	41.1	84.8	***1331.6***	60.5	10.7	1846.3	~~1332~~	~~1~~	~~0~~	~~931~~	~~58.7~~
584.50	1.00			Shale	41.1	84.8	***1372.7***	60.5	10.7	1906.8	~~1373~~	~~1~~	~~0~~	~~960~~	~~59.7~~
583.50	1.00			Shale	41.1	84.8	***1413.8***	60.5	10.7	1967.4	~~1414~~	~~1~~	~~0~~	~~989~~	~~60.7~~
582.50	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== EB - Pier 2
REFERENCE BORING ========== SB-04
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 644.05 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 627.50 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 624.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1821 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 340.19 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 127.57 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**304** KIPS	**212** KIPS	**34** FT.

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
627.00	0.50	0.80	6		1.0		20.0	1.4		***3.8***	4	1	0	2	17
624.50	2.50	2.00	50		9.6	19.1	29.6	14.1	2.4	***18.0***	18	1	0	12	20
622.00	2.50	2.00	31		9.6	19.1	49.7	14.1	2.4	***33.4***	33	1	0	23	22
619.50	2.50	3.10	14		12.9	29.6	62.7	19.0	3.7	***52.5***	52	1	0	36	25
617.00	2.50	3.10	8		12.9	29.6	***62.2***	19.0	3.7	69.8	62	1	0	43	27
614.50	2.50	1.70	48		8.6	16.2	139.4	12.7	2.1	***91.2***	91	1	0	63	30
613.50	1.00			Shale	41.1	84.8	180.5	60.5	10.7	***151.7***	152	1	0	106	30.6
612.50	1.00			Shale	41.1	84.8	221.6	60.5	10.7	***212.2***	212	1	0	148	31.6
611.50	1.00			Shale	41.1	84.8	***262.7***	60.5	10.7	272.8	263	1	0	183	32.6
610.50	1.00			Shale	41.1	84.8	***303.9***	60.5	10.7	333.3	304	1	0	212	33.6
609.50	1.00			Shale	41.1	84.8	***345.0***	60.5	10.7	393.8	~~345~~	~~1~~	~~0~~	~~241~~	~~34.6~~
608.50	1.00			Shale	41.1	84.8	***386.1***	60.5	10.7	454.3	~~386~~	~~1~~	~~0~~	~~270~~	~~35.6~~
607.50	1.00			Shale	41.1	84.8	***427.2***	60.5	10.7	514.9	~~427~~	~~1~~	~~0~~	~~298~~	~~36.6~~
606.50	1.00			Shale	41.1	84.8	***468.3***	60.5	10.7	575.4	~~468~~	~~1~~	~~0~~	~~327~~	~~37.6~~
605.50	1.00			Shale	41.1	84.8	***509.4***	60.5	10.7	635.9	~~509~~	~~1~~	~~0~~	~~356~~	~~38.6~~
604.50	1.00			Shale	41.1	84.8	***550.5***	60.5	10.7	696.4	~~551~~	~~1~~	~~0~~	~~385~~	~~39.6~~
603.50	1.00			Shale	41.1	84.8	***591.6***	60.5	10.7	756.9	~~592~~	~~1~~	~~0~~	~~413~~	~~40.6~~
602.50	1.00			Shale	41.1	84.8	***632.7***	60.5	10.7	817.5	~~633~~	~~1~~	~~0~~	~~442~~	~~41.6~~
601.50	1.00			Shale	41.1	84.8	***673.8***	60.5	10.7	878.0	~~674~~	~~1~~	~~0~~	~~471~~	~~42.6~~
600.50	1.00			Shale	41.1	84.8	***714.9***	60.5	10.7	938.5	~~715~~	~~1~~	~~0~~	~~500~~	~~43.6~~
599.50	1.00			Shale	41.1	84.8	***756.0***	60.5	10.7	999.0	~~756~~	~~1~~	~~0~~	~~529~~	~~44.6~~
598.50	1.00			Shale	41.1	84.8	***797.2***	60.5	10.7	1059.5	~~797~~	~~1~~	~~0~~	~~557~~	~~45.6~~
597.50	1.00			Shale	41.1	84.8	***838.3***	60.5	10.7	1120.1	~~838~~	~~1~~	~~0~~	~~586~~	~~46.6~~
596.50	1.00			Shale	41.1	84.8	***879.4***	60.5	10.7	1180.6	~~879~~	~~1~~	~~0~~	~~615~~	~~47.6~~
595.50	1.00			Shale	41.1	84.8	***920.5***	60.5	10.7	1241.1	~~920~~	~~1~~	~~0~~	~~644~~	~~48.6~~
594.50	1.00			Shale	41.1	84.8	***961.6***	60.5	10.7	1301.6	~~962~~	~~1~~	~~0~~	~~672~~	~~49.6~~
593.50	1.00			Shale	41.1	84.8	***1002.7***	60.5	10.7	1362.1	~~1003~~	~~1~~	~~0~~	~~701~~	~~50.6~~
592.50	1.00			Shale	41.1	84.8	***1043.8***	60.5	10.7	1422.7	~~1044~~	~~1~~	~~0~~	~~730~~	~~51.6~~
591.50	1.00			Shale	41.1	84.8	***1084.9***	60.5	10.7	1483.2	~~1085~~	~~1~~	~~0~~	~~759~~	~~52.6~~
590.50	1.00			Shale	41.1	84.8	***1126.0***	60.5	10.7	1543.7	~~1126~~	~~1~~	~~0~~	~~788~~	~~53.6~~
589.50	1.00			Shale	41.1	84.8	***1167.1***	60.5	10.7	1604.2	~~1167~~	~~1~~	~~0~~	~~816~~	~~54.6~~
588.50	1.00			Shale	41.1	84.8	***1208.2***	60.5	10.7	1664.8	~~1208~~	~~1~~	~~0~~	~~845~~	~~55.6~~
587.50	1.00			Shale	41.1	84.8	***1249.3***	60.5	10.7	1725.3	~~1249~~	~~1~~	~~0~~	~~874~~	~~56.6~~
586.50	1.00			Shale	41.1	84.8	***1290.5***	60.5	10.7	1785.8	~~1290~~	~~1~~	~~0~~	~~903~~	~~57.6~~
585.50	1.00			Shale	41.1	84.8	***1331.6***	60.5	10.7	1846.3	~~1332~~	~~1~~	~~0~~	~~931~~	~~58.6~~
584.50	1.00			Shale	41.1	84.8	***1372.7***	60.5	10.7	1906.8	~~1373~~	~~1~~	~~0~~	~~960~~	~~59.6~~
583.50	1.00			Shale	41.1	84.8	***1413.8***	60.5	10.7	1967.4	~~1414~~	~~1~~	~~0~~	~~989~~	~~60.6~~
582.50	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== WB - Pier 1
REFERENCE BORING ========== SB-03
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 644.17 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 629.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 624.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1821 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 340.19 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 127.57 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**331** KIPS	**117** KIPS	**21** FT.

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
628.00	1.00			Shale	41.1		125.9	60.5		***71.2***	71	29	0	21	16.2
627.00	1.00			Shale	41.1	84.8	167.0	60.5	10.7	***131.8***	132	58	0	35	17.2
626.00	1.00			Shale	41.1	84.8	208.1	60.5	10.7	***192.3***	192	86	0	48	18.2
625.00	1.00			Shale	41.1	84.8	***249.2***	60.5	10.7	252.8	249	115	0	59	19.2
624.00	1.00			Shale	41.1	84.8	***290.3***	60.5	10.7	313.3	290	115	0	88	20.2
623.00	1.00			Shale	41.1	84.8	***331.4***	60.5	10.7	373.9	331	115	0	117	21.2
622.00	1.00			Shale	41.1	84.8	***372.5***	60.5	10.7	434.4	~~373~~	~~115~~	~~0~~	~~146~~	~~22.2~~
621.00	1.00			Shale	41.1	84.8	***413.6***	60.5	10.7	494.9	~~414~~	~~115~~	~~0~~	~~174~~	~~23.2~~
620.00	1.00			Shale	41.1	84.8	***454.7***	60.5	10.7	555.4	~~455~~	~~115~~	~~0~~	~~203~~	~~24.2~~
619.00	1.00			Shale	41.1	84.8	***495.8***	60.5	10.7	615.9	~~496~~	~~115~~	~~0~~	~~232~~	~~25.2~~
618.00	1.00			Shale	41.1	84.8	***477.6***	60.5	10.7	668.9	~~478~~	~~115~~	~~0~~	~~219~~	~~26.2~~
613.00	5.00		20	Hard Till	3.6	25.4	***540.5***	5.3	3.2	681.8	~~541~~	~~115~~	~~0~~	~~263~~	~~31~~
612.00	1.00			Shale	41.1	84.8	***581.7***	60.5	10.7	742.3	~~582~~	~~115~~	~~0~~	~~292~~	~~32.2~~
611.00	1.00			Shale	41.1	84.8	***622.8***	60.5	10.7	802.8	~~623~~	~~115~~	~~0~~	~~321~~	~~33.2~~
610.00	1.00			Shale	41.1	84.8	***663.9***	60.5	10.7	863.3	~~664~~	~~115~~	~~0~~	~~350~~	~~34.2~~
609.00	1.00			Shale	41.1	84.8	***705.0***	60.5	10.7	923.8	~~705~~	~~115~~	~~0~~	~~378~~	~~35.2~~
608.00	1.00			Shale	41.1	84.8	***746.1***	60.5	10.7	984.4	~~746~~	~~115~~	~~0~~	~~407~~	~~36.2~~
607.00	1.00			Shale	41.1	84.8	***787.2***	60.5	10.7	1044.9	~~787~~	~~115~~	~~0~~	~~436~~	~~37.2~~
606.00	1.00			Shale	41.1	84.8	***828.3***	60.5	10.7	1105.4	~~828~~	~~115~~	~~0~~	~~465~~	~~38.2~~
605.00	1.00			Shale	41.1	84.8	***869.4***	60.5	10.7	1165.9	~~869~~	~~115~~	~~0~~	~~493~~	~~39.2~~
604.00	1.00			Shale	41.1	84.8	***910.5***	60.5	10.7	1226.4	~~911~~	~~115~~	~~0~~	~~522~~	~~40.2~~
603.00	1.00			Shale	41.1	84.8	***951.6***	60.5	10.7	1287.0	~~952~~	~~115~~	~~0~~	~~551~~	~~41.2~~
602.00	1.00			Shale	41.1	84.8	***992.7***	60.5	10.7	1347.5	~~993~~	~~115~~	~~0~~	~~580~~	~~42.2~~
601.00	1.00			Shale	41.1	84.8	***1033.8***	60.5	10.7	1408.0	~~1034~~	~~115~~	~~0~~	~~609~~	~~43.2~~
600.00	1.00			Shale	41.1	84.8	***1075.0***	60.5	10.7	1468.5	~~1075~~	~~115~~	~~0~~	~~637~~	~~44.2~~
599.00	1.00			Shale	41.1	84.8	***1116.1***	60.5	10.7	1529.0	~~1116~~	~~115~~	~~0~~	~~666~~	~~45.2~~
598.00	1.00			Shale	41.1	84.8	***1157.2***	60.5	10.7	1589.6	~~1157~~	~~115~~	~~0~~	~~695~~	~~46.2~~
597.00	1.00			Shale	41.1	84.8	***1198.3***	60.5	10.7	1650.1	~~1198~~	~~115~~	~~0~~	~~724~~	~~47.2~~
596.00	1.00			Shale	41.1	84.8	***1239.4***	60.5	10.7	1710.6	~~1239~~	~~115~~	~~0~~	~~752~~	~~48.2~~
595.00	1.00			Shale	41.1	84.8	***1280.5***	60.5	10.7	1771.1	~~1280~~	~~115~~	~~0~~	~~781~~	~~49.2~~
594.00	1.00			Shale	41.1	84.8	***1321.6***	60.5	10.7	1831.6	~~1322~~	~~115~~	~~0~~	~~810~~	~~50.2~~
593.00	1.00			Shale	41.1	84.8	***1362.7***	60.5	10.7	1892.2	~~1363~~	~~115~~	~~0~~	~~839~~	~~51.2~~
592.00	1.00			Shale	41.1	84.8	***1403.8***	60.5	10.7	1952.7	~~1404~~	~~115~~	~~0~~	~~868~~	~~52.2~~
591.00	1.00			Shale	41.1	84.8	***1444.9***	60.5	10.7	2013.2	~~1445~~	~~115~~	~~0~~	~~896~~	~~53.2~~
590.00	1.00			Shale	41.1	84.8	***1486.0***	60.5	10.7	2073.7	~~1486~~	~~115~~	~~0~~	~~925~~	~~54.2~~
589.00	1.00			Shale	41.1	84.8	***1527.1***	60.5	10.7	2134.3	~~1527~~	~~115~~	~~0~~	~~954~~	~~55.2~~
588.00	1.00			Shale	41.1	84.8	***1568.3***	60.5	10.7	2194.8	~~1568~~	~~115~~	~~0~~	~~983~~	~~56.2~~
587.00	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== WB - Pier 2
REFERENCE BORING ========== SB-03
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.95 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 629.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 624.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1821 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 340.19 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 127.57 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**331** KIPS	**117** KIPS	**21** FT.

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
628.00	1.00			Shale	41.1		125.9	60.5		***71.2***	71	29	0	21	16
627.00	1.00			Shale	41.1	84.8	167.0	60.5	10.7	***131.8***	132	58	0	35	17
626.00	1.00			Shale	41.1	84.8	208.1	60.5	10.7	***192.3***	192	86	0	48	18
625.00	1.00			Shale	41.1	84.8	***249.2***	60.5	10.7	252.8	249	115	0	59	19
624.00	1.00			Shale	41.1	84.8	***290.3***	60.5	10.7	313.3	290	115	0	88	20
623.00	1.00			Shale	41.1	84.8	***331.4***	60.5	10.7	373.9	331	115	0	117	21
622.00	1.00			Shale	41.1	84.8	***372.5***	60.5	10.7	434.4	~~373~~	~~115~~	~~0~~	~~146~~	~~22~~
621.00	1.00			Shale	41.1	84.8	***413.6***	60.5	10.7	494.9	~~414~~	~~115~~	~~0~~	~~174~~	~~23~~
620.00	1.00			Shale	41.1	84.8	***454.7***	60.5	10.7	555.4	~~455~~	~~115~~	~~0~~	~~203~~	~~24~~
619.00	1.00			Shale	41.1	84.8	***495.8***	60.5	10.7	615.9	~~496~~	~~115~~	~~0~~	~~232~~	~~25~~
618.00	1.00			Shale	41.1	84.8	***477.6***	60.5	10.7	668.9	~~478~~	~~115~~	~~0~~	~~219~~	~~26~~
613.00	5.00		20	Hard Till	3.6	25.4	***540.5***	5.3	3.2	681.8	~~541~~	~~115~~	~~0~~	~~263~~	~~31~~
612.00	1.00			Shale	41.1	84.8	***581.7***	60.5	10.7	742.3	~~582~~	~~115~~	~~0~~	~~292~~	~~32~~
611.00	1.00			Shale	41.1	84.8	***622.8***	60.5	10.7	802.8	~~623~~	~~115~~	~~0~~	~~321~~	~~33~~
610.00	1.00			Shale	41.1	84.8	***663.9***	60.5	10.7	863.3	~~664~~	~~115~~	~~0~~	~~350~~	~~34~~
609.00	1.00			Shale	41.1	84.8	***705.0***	60.5	10.7	923.8	~~705~~	~~115~~	~~0~~	~~378~~	~~35~~
608.00	1.00			Shale	41.1	84.8	***746.1***	60.5	10.7	984.4	~~746~~	~~115~~	~~0~~	~~407~~	~~36~~
607.00	1.00			Shale	41.1	84.8	***787.2***	60.5	10.7	1044.9	~~787~~	~~115~~	~~0~~	~~436~~	~~37~~
606.00	1.00			Shale	41.1	84.8	***828.3***	60.5	10.7	1105.4	~~828~~	~~115~~	~~0~~	~~465~~	~~38~~
605.00	1.00			Shale	41.1	84.8	***869.4***	60.5	10.7	1165.9	~~869~~	~~115~~	~~0~~	~~493~~	~~39~~
604.00	1.00			Shale	41.1	84.8	***910.5***	60.5	10.7	1226.4	~~911~~	~~115~~	~~0~~	~~522~~	~~40~~
603.00	1.00			Shale	41.1	84.8	***951.6***	60.5	10.7	1287.0	~~952~~	~~115~~	~~0~~	~~551~~	~~41~~
602.00	1.00			Shale	41.1	84.8	***992.7***	60.5	10.7	1347.5	~~993~~	~~115~~	~~0~~	~~580~~	~~42~~
601.00	1.00			Shale	41.1	84.8	***1033.8***	60.5	10.7	1408.0	~~1034~~	~~115~~	~~0~~	~~609~~	~~43~~
600.00	1.00			Shale	41.1	84.8	***1075.0***	60.5	10.7	1468.5	~~1075~~	~~115~~	~~0~~	~~637~~	~~44~~
599.00	1.00			Shale	41.1	84.8	***1116.1***	60.5	10.7	1529.0	~~1116~~	~~115~~	~~0~~	~~666~~	~~45~~
598.00	1.00			Shale	41.1	84.8	***1157.2***	60.5	10.7	1589.6	~~1157~~	~~115~~	~~0~~	~~695~~	~~46~~
597.00	1.00			Shale	41.1	84.8	***1198.3***	60.5	10.7	1650.1	~~1198~~	~~115~~	~~0~~	~~724~~	~~47~~
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593.00	1.00			Shale	41.1	84.8	***1362.7***	60.5	10.7	1892.2	~~1363~~	~~115~~	~~0~~	~~839~~	~~51~~
592.00	1.00			Shale	41.1	84.8	***1403.8***	60.5	10.7	1952.7	~~1404~~	~~115~~	~~0~~	~~868~~	~~52~~
591.00	1.00			Shale	41.1	84.8	***1444.9***	60.5	10.7	2013.2	~~1445~~	~~115~~	~~0~~	~~896~~	~~53~~
590.00	1.00			Shale	41.1	84.8	***1486.0***	60.5	10.7	2073.7	~~1486~~	~~115~~	~~0~~	~~925~~	~~54~~
589.00	1.00			Shale	41.1	84.8	***1527.1***	60.5	10.7	2134.3	~~1527~~	~~115~~	~~0~~	~~954~~	~~55~~
588.00	1.00			Shale	41.1	84.8	***1568.3***	60.5	10.7	2194.8	~~1568~~	~~115~~	~~0~~	~~983~~	~~56~~
587.00	1.00			Shale		84.8			10.7						