STRUCTURE GEOTECHNICAL REPORT

Closen Road over F.A.I 474

Existing S.N. 072-0123
Proposed S.N. 072-0257

F.A. RTE. 6578
SECTION (72-3HB-3)BRR
PEORIA COUNTY, ILLINOIS
JOB NO. P-94-016-22
PTB 204-031, WO6
KEG NO. 22-1093.06

09/12/2024
Exp. 11/30/2025

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March 8, 2024
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Kaskaskia
Engineering Group, LLC

TABLE OF CONTENTS

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 a proposed bridge replacement carrying Closen Road over I-474. The project is located in Peoria 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 to present design and construction recommendations for the proposed structure.

1.2 Project Description

The project consists of the removal and replacement of a two-span bridge (Ex. SN 072-0123) carrying Closen Road over I-474. The existing structure was built in 1978. It has a total length of 259'-10" from back-to-back of abutments and a width of 42' 0" out-to-out. The general location of the proposed structure is shown on a Location Map, Exhibit A. The project is located in Bellevue, IL, about 1.3 miles northeast of Peoria International Airport. The site lies within the limits of the Fourth Principal Meridian (T. 8N, R. 7E, Section 11), within the Bloomington Ridge Plain of the Till Plains section of the Central Lowland Province.

1.3 Proposed Structure Information

The proposed structure (Pr. SN 072-0257) will consist of a two-span bridge, which will be built on a 0°55'59"-degree skew to I-474. It will provide two 11 ft. wide driving lanes, two 4 ft. wide shoulders, and two 5 ft. wide outer walkways with two 1 ft. wide fence railing for a total bridge width of 42 ft. out to out. The bridge will measure 244 feet. and 6 inches 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

Information regarding the site exploration was provided by IDOT District 4 and Shannon & Wilson, Inc. According to the information provided, three borings designated SB-1, SB-2, and SB-3 were drilled on March 1st and 2nd, 2021. Additional Rock Coring on borings SB-1 and SB-2 were obtained on April 30, 2021. 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. and 5.0-ft. intervals to termination depths in accordance with ASTM International D1586 Standard, using an automatic hammer. The rock cores were tested following ASTM D 7012 Method C. The field testing consisted of Rimac strength tests on all intact cohesive samples, as well as a pocket penetrometer.

The boring locations are shown in Exhibit B – Boring Location. 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 in Subsurface Profile, Exhibit E.

2.2 Subsurface Conditions

The profiles at the three (3) boring locations exhibited layers of silt, silty clay, silty clay loam and sandy clay loam. Bedrock was encountered in the three borings and consisted mostly of shale, with a layer of limestone on SB-1. Table 2.2.1 shows a summary of the pavement structure(s), topsoil, depth of drilling, the top of rock, and ground surface elevation (GSE) of the borings. A summary of the general condition of the subsurface is described in Table 2.2.2.

Table 2.2.1 - Boring Information Summary

Boring	Topsoil (in)	Depth (ft)	Top of Rock (ft.)	GSE (ft.)
SB-1	4.0	45.0	32.0	663.92
SB-2	6.0	23.0	6.50	634.81
SB-3	6.0	48.0	38.5	663.40

Table 2.2.2 – Subsurface Profile Summary

Soil Type	N-Values (bpf)	Q_u (tsf)	WC (%)	Boring
Silt	5 – 9	-	17 - 21	SB-01, SB-03
Silty Clay	1 - 15	0.3 – 3.3	15 - 40	SB-01, SB-02, SB-03
Silty Clay Loam	10	0.3	61	SB-02
Sandy Clay Loam	2	-	85	SB-02
Shaley Clay	39 - 48	-	10 - 13	SB-02, SB-03

2.3 Groundwater

Groundwater was not encountered at the time of drilling for Borings SB-1 and SB-3. For Boring SB-2, the groundwater was encountered at El. 631.3 (3.5 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. In addition, without extended periods of observation, measurement of true groundwater levels may not be possible.

3.0 GEOTECHNICAL EVALUATIONS

3.1 Settlement

Since no significant grading or changes to the existing embankments 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 on the abutments, using the proposed structure geometry on the TS&L and soil characteristics from Borings SB-1 and SB-3. The existing and proposed slopes are shown to be 1V:2H on Exhibit C – TS&L Two conditions were modeled: end-of-construction and long-term stability. A critical factor of safety (FOS) was calculated for each condition. According to the current standard of practice as mentioned in the IDOT Geotechnical Manual, the target FOS is 1.5 for end-of-construction and long-term slope stability for fill slopes.

To model the end-of-construction condition, full cohesion, and a friction angle of 0 degrees were assumed. Nominal values for cohesion were used with full friction angle to model the long-term condition to analyze the theoretical condition where pore water pressure has dissipated. Nominal values were between 50 and 150 psf for the cohesive soils, with friction angles between 12 and 26 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.

The results of the analysis, as provided in Table 3.2.1, indicate an acceptable FOS will exist under undrained conditions (end-of-construction). The FOSs for the long-term condition, however, are less than the required 1.5. In our opinion, a minimum FOS ranging from 1.2 and 1.4 will perform satisfactorily as designed for the proposed 1V:2H slopes and do not require changes on the slope inclination or any additional improvements apart from the slope concrete wall and abutment piles already in the design.

Table 3.2.1 – Slope Stability Critical FOS

Location (1V:2H Slope)	Critical FOS		
	End-of Construction	Long Term	
West Abutment (SB-01)	2.2	1.3	
East Abutment (SB-03)	3.3	1.3	

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, this project's controlling global site class 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 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design, was used to develop the parameters for the bridge location. The values, based on Soil Site Class C, are shown in Table 3.3.1.

Table 3.3.1 - Summary of Seismic Parameters

Parameter	Value
Soil Site Class	C
Peak ground acceleration	0.046 g
Spectral Response Acceleration, 0.2 Sec, S_{DS}	0.132 g
Spectral Response Acceleration, 1.0 Sec, S_{D1}	0.079 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. As stated in IDOT AGMU Memo 10.1 – Liquefaction Analysis Procedure, no liquefaction analysis is necessary in Seismic Performance Zone 1.

4.0 FOUNDATION EVALUATIONS AND DESIGN RECOMMENDATIONS

4.1 Bearing Resistance

A shallow foundation is considered a feasible alternative to driven piles for the pier. The soil encountered in boring SB-02 at the anticipated bearing elevation of the pier consists of Sandy Clay Loam material, not suitable for shallow bearing. The estimated factored design load for the pier, as provided by The Upchurch Group is 3500 kips. With an assumed width of 11 ft. and a length of 40 ft., the assumed applied pressure is 7954 psf. KEG recommends getting the bearing elevation to the top of the shaley clay layer (approximately 6 ft deep). Using a Resistance Factor of 0.5, the calculated bearing resistance was 10150 psf.

The calculated allowable bearing resistance on the shaley clay layer, using a Resistance Factor of 0.5, and the Sliding resistance, calculated as the lesser of the cohesion or one-half of the vertical stress, can be found in Exhibit G. A summary of the results is shown in Table 4.1.1.

Table 4.1.1 – Factored Bearing and Sliding Resistances

Substructure Unit	Recommended Footing Elevation (ft)	Allow. Bearing Resistance (psf)	Sliding Resistance (psf)
Pier (Boring SB-02)	628.8	10,150	180

Further analysis should be done by a structural engineer to evaluate if the depth of embedment should be increased to resist sliding and uplift loads. If the bearing elevation changes after the final design, KEG should be informed to review that the above recommendations still apply.

4.2 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 H).

The factored reactions and the preliminary design loads, as provided by The Upchurch Group are provided in Table 4.2.1.

Table 4.2.1 - Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
West Abutment	1630
Pier	3500
East Abutment	1630

The estimated pile lengths for applicable H-Piles types are shown in Tables 4.2.2 through 4.2.6 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. No estimations were done for the pier, as driven piles may not be feasible due to the shallow bedrock elevation.

Table 4.2.2 - Estimated Pile Lengths for HP 10x42 Steel H-Piles

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.)
West Abutment (SB-1)	335	184	29	659.19
East Abutment (SB-3)	335	184	37	657.48

Table 4.2.3 – Estimated Pile Lengths for HP 12x53 Steel H-Piles

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.)
West Abutment (SB-1)	418	230	29	659.19
East Abutment (SB-3)	418	230	37	657.48

Table 4.2.4 - Estimated Pile Lengths for HP 12x63 Steel H-Piles

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.)
West Abutment (SB-1)	497	273	29	659.19
East Abutment (SB-3)	497	273	38	657.48

Table 4.2.5 - Estimated Pile Lengths for HP 14x73 Steel H-Piles

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.)
West Abutment (SB-1)	578	318	29	659.19
East Abutment (SB-3)	578	318	38	657.48

Table 4.2.6 - Estimated Pile Lengths for HP 14x89 Steel H-Piles

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.)
West Abutment (SB-1)	705	388	30	659.19
East Abutment (SB-3)	705	388	40	657.48

KEG recommends one test pile be performed, at a minimum. A test pile is performed prior to production driving so that actual, on-site field data can be gathered to determine pile driving requirements for the project. This is also the way the contractor's proposed equipment and methodologies identified in their Pile Installation Plan can be assessed.

The piles are expected to be driven into shale and vuggy limestone. If additional depth into the bedrock is required for additional lateral support, then pre-coring may be required to reach

estimated embedment depths. Therefore, KEG recommends using pile shoes to facilitate driving and protect piles from damage.

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. Tables 4.3.1 and 4.3.2 are included for the structural engineer's use in determining lateral pile response.

Table 4.3.1 - Soil Parameters for Lateral Pile Load Analysis

Boring	Soil Type	Depth at Bot. (ft.)	γ (pcf)	Undrained		Drained		N Value (Ave.)	Assumed % Fines < #200	K (pci)	ε50
				c (psf)	Φ (deg)	c (psf)	Φ (deg)				
SB-01	Silty Clay	657.92	120	1500	0	100	26	5	65	500	0.007
	Silt	650.92	110	500	0	100	26	7	85	30	0.02
	Silty Clay	631.92	120	1050	0	100	26	7	65	500	0.007
SB-02	Silty Clay	632.81	120	300	0	100	26	10	65	30	0.02
	Silty Clay Loam	631.81	120	300	28	100	28	10	65	30	0.02
	Sandy clay loam	628.81	120	-	28	-	28	2	45	20	-,
	Shaley Clay	628.31	130	3500	0	150	12	48	25	1000	0.005
SB-03	Silty Clay	652.40	120	575	0	100	26	4	65	100	0.01
	Silt	647.40	110	500	0	100	26	6	85	30	0.02
	Silty Clay	637.40	120	675	0	100	26	4	65	100	0.01
	Silty Clay	629.90	120	2900	0	100	26	15	65	1000	0.005
	Shaley Clay	624.90	130	3500	0	150	12	39	25	1000	0.005

Table 4.3.2 - Rock Parameters for Lateral Pile Load Analysis

Boring	Rock Type	Depth Bot Layer (ft)	γ (psf)	RQD (%)	Qu (tsf)	ϕ (deg.)
SB-1	Limestone	627.92	150	59	45	45
	Shale	623.92	135	59	45	12
	Shale	618.92	145	87	45	12
SB-2	Shale	619.81	135	86	32	12
	Shale	611.81	145	81	77	12

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Construction Activities

Construction activities should be performed by 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 is not anticipated as the bridge will be reconstructed under road closure, and traffic will be detoured.

5.3 Site and Soil Conditions

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

5.4 Dewatering

Proper dewatering will be required to construct the recommended shallow foundation as the groundwater table was encountered at a relatively shallow depth at the pier location. As stated in the IDOT Geotechnical Manual, seepage water may be collected in sumps and pumped out depending on the nature of the materials. Under less common conditions, water may be drawn down using a well-point system. As the suitable foundation material constitutes shaley clay and shale layers, the footing construction must be done immediately to avoid the softening of the material.

Even with proper dewatering of the excavation during construction, soft subgrade conditions may be experienced. As the proposed elevation is at bedrock elevation, KEG recommends, at minimum, an additional 2 feet to be excavated and that the over-excavation be backfilled with free-draining clean crushed stone. Sumps can be installed into the clean stone to pump any water that may tend to accumulate.

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

Exhibit D contains soil boring logs, Exhibit E contains The Subsurface Profile, and Exhibit H contains Pile Design Tables.

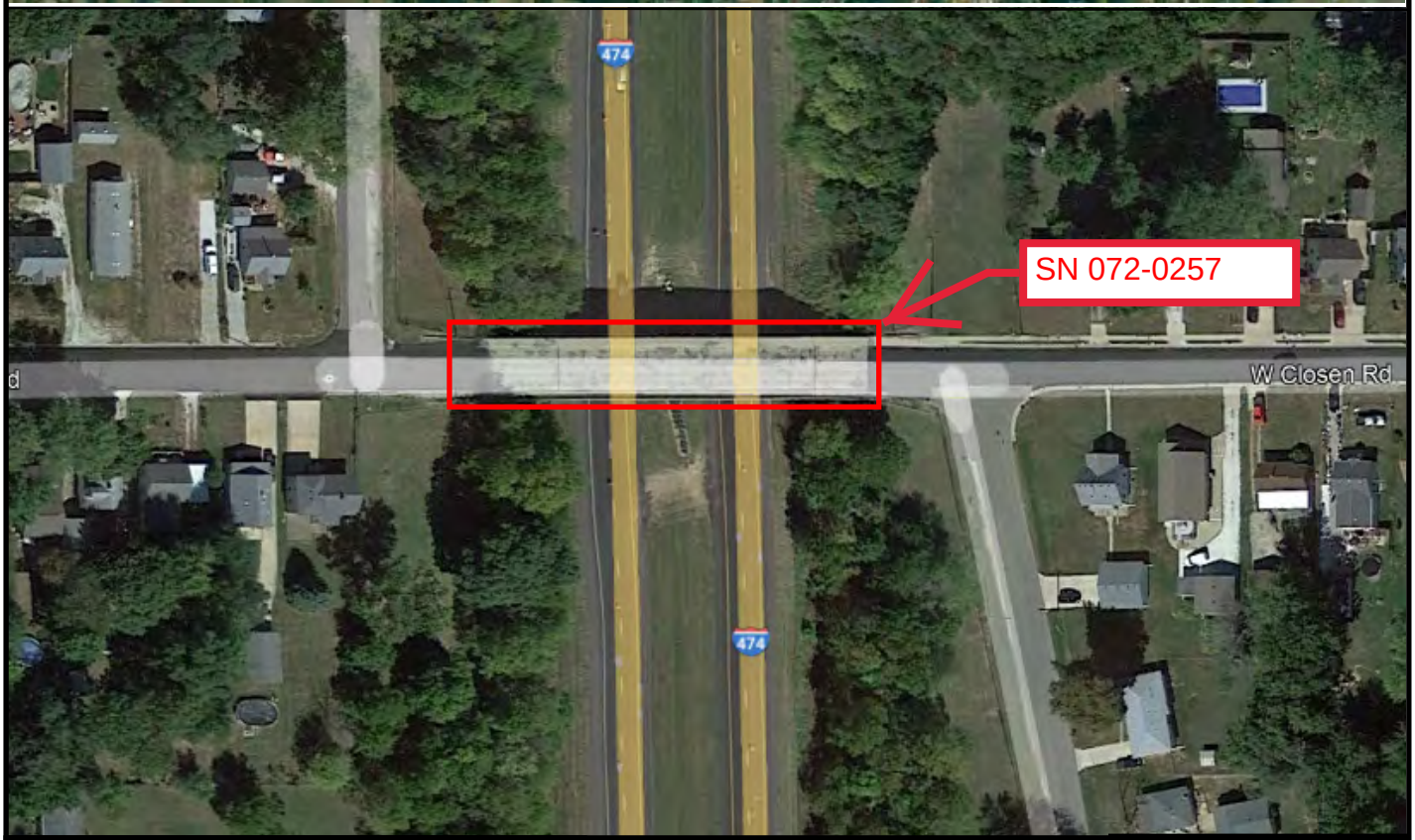
8.0 LIMITATIONS

The recommendations are for the exclusive use of The Upchurch Group and the Illinois Department of Transportation (IDOT) District 4. They are specific only to the project described. They are based on the subsurface information obtained at three boring locations within the structure area, 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 inconsistent with those described.

EXHIBIT A

LOCATION MAP



Kaskaskia Engineering Group, LLC

LOCATION MAP

Closen Road over FAI 474
Section (72-3HB-3)BRR
Peoria County, Illinois

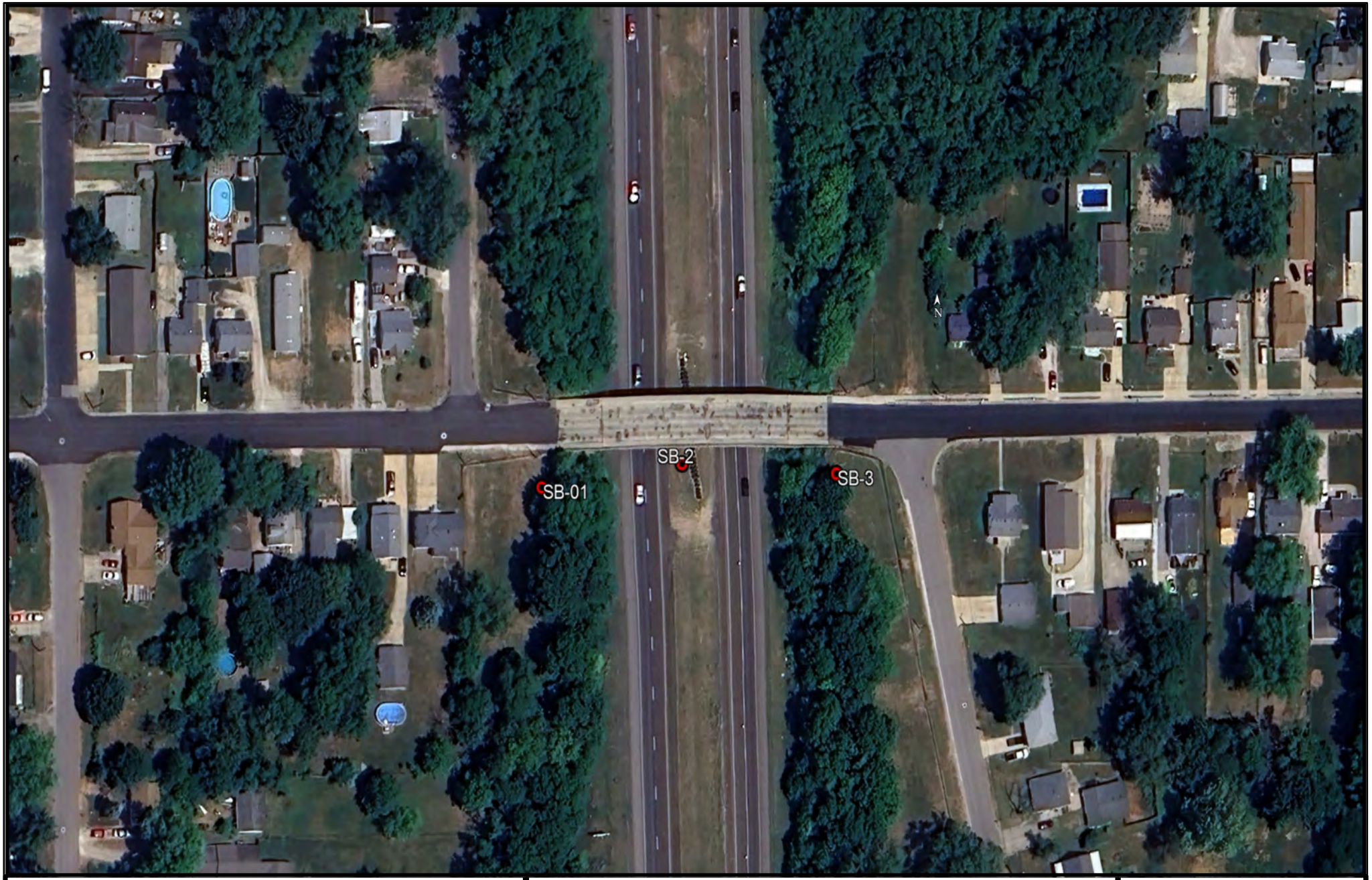
Exhibit No.

A

KEG JOB #22-1093.06

EXHIBIT B

BORING LOCATION



Kaskaskia Engineering Group, LLC

BORING LOCATION

Closen Road over FAI 474
Section (72-3HB-3)BRR
Peoria County, Illinois

Exhibit No.

B

KEG JOB #22-1093.06

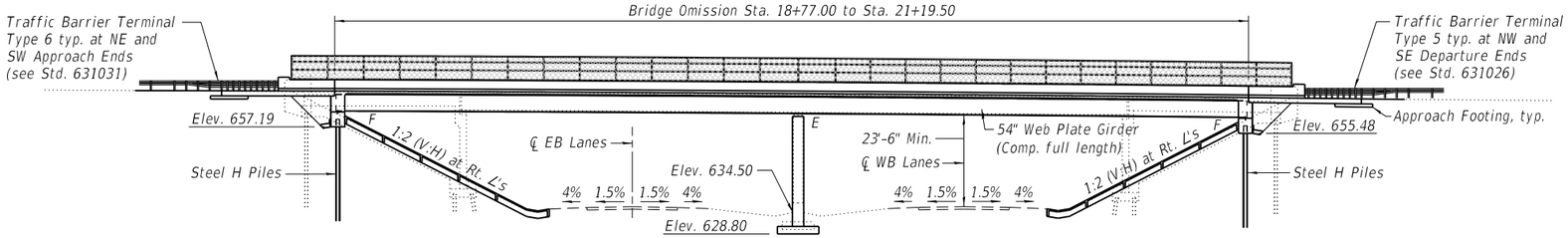
EXHIBIT C

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

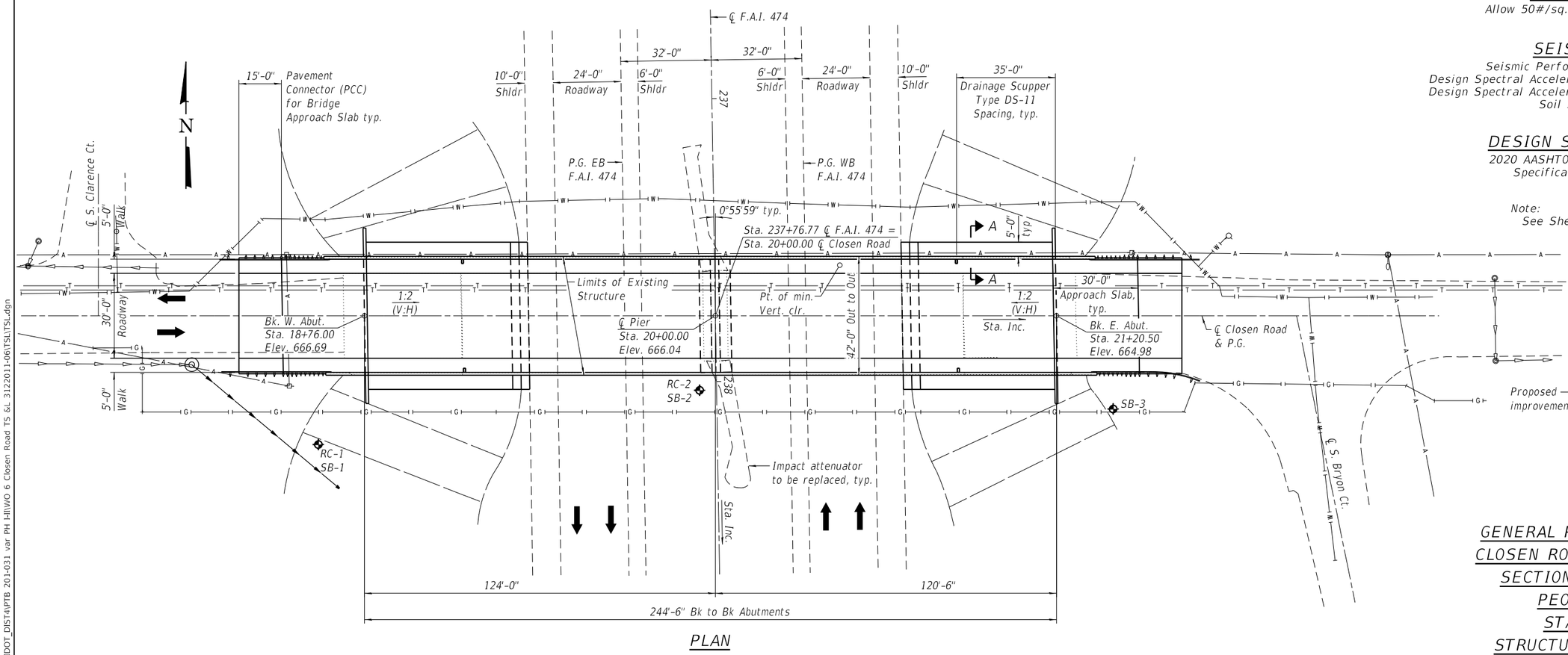
Bench Mark: Arrow bolt on fire hydrant on north side of Closen Road and west of I-474, Elev. 671.308.

Existing Structure: Existing structure S.N. 072-0123 built in 1978 as FAI 474, Section (72-3)I. The Structure is a two span 48" web plate steel girder bridge with a reinforced concrete deck supported on reinforced concrete vaulted abutments with PPC I-beams, and RC Pier. The abutments and the approach bents are supported on steel H-Piles. The pier has spread footing foundations. The existing structure is skewed 0°56'00" right forward, Bk to Bk Approach Bents 259'-10", Out to Out superstructure width 42'-0". HMA overlay of bridge deck in 2012.
Structure to be removed and replaced.
Traffic will be detoured and the road closed during construction.

No Salvage.



ELEVATION



PLAN

HIGHWAY CLASSIFICATION

Closen Road
Functional Class: Local Highway
ADT: 500 (2017); 903 (2032)
ADTT: 30 (2017); 55 (2032)
DHV: 50 (25 One-Way)
Design Speed: 30 m.p.h.
Posted Speed: 25 m.p.h.
2 -Way Traffic
Directional Distribution: 50:50

HIGHWAY CLASSIFICATION

F.A.I. 474
Functional Class: Interstate
ADT: 29200 (2017); 35600 (2037)
ADTT: 3975 (2017); 4843 (2037)
DHV: 3920 (2037)
Design Speed: 70 m.p.h.
Posted Speed: 70 m.p.h.
2 -Way Traffic
Directional Distribution: 50:50

DESIGN STRESSES

FIELD UNITS

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

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

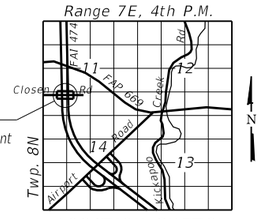
SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.079g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.132g
Soil Site Class = C

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

Note:
See Sheet 2 of 2 for Section A-A.



LOCATION SKETCH

GENERAL PLAN & ELEVATION
CLOSEN ROAD OVER F.A.I. 474
SECTION (72-3HB-3)BRR
PEORIA COUNTY
STA. 20+00.00
STRUCTURE NO. 072-0257

MODEL: Default
FILE NAME: P:\Civil_IDOT_DIST4\PTB 201-031 var PH II\WO 6 Closen Road TS &L 3122011-06\TS\LTSL.dgn

The Upchurch Group
architects engineers surveyors
Professional Design Firm Corporation License No. 184-003401
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e-mail: upchurchgroup@upchurchgroup.com

USER NAME =	DESIGNED - MJS	REVISED -
	CHECKED - SJF	REVISED -
PLOT SCALE =	DRAWN - SAE	REVISED -
PLOT DATE =	CHECKED - SJF	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
6578	(72-3HB-3)BRR	PEORIA	2	1
		CONTRACT NO. 68E86		
	ILLINOIS	FED. AID PROJECT		

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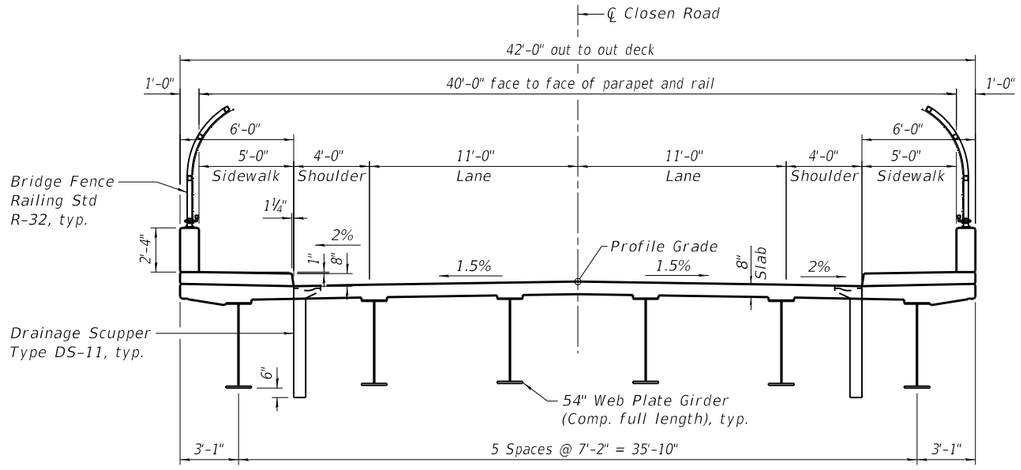
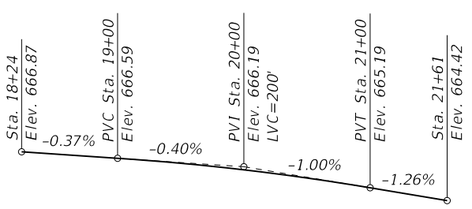
GENERAL NOTES

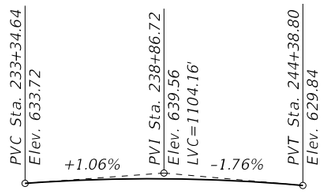
The Inorganic Zinc Rich Primer / Acrylic / Acrylic Paint System shall be used for shop and field painting of new structural steel except where otherwise noted. The color of the final finish coat for all interior steel surfaces shall be gray, Munsell No. 5B 7/1. The color of the final finish coat for the exterior and bottom flange of the fascia beams shall be Blue, Munsell No. 10B 3/6.



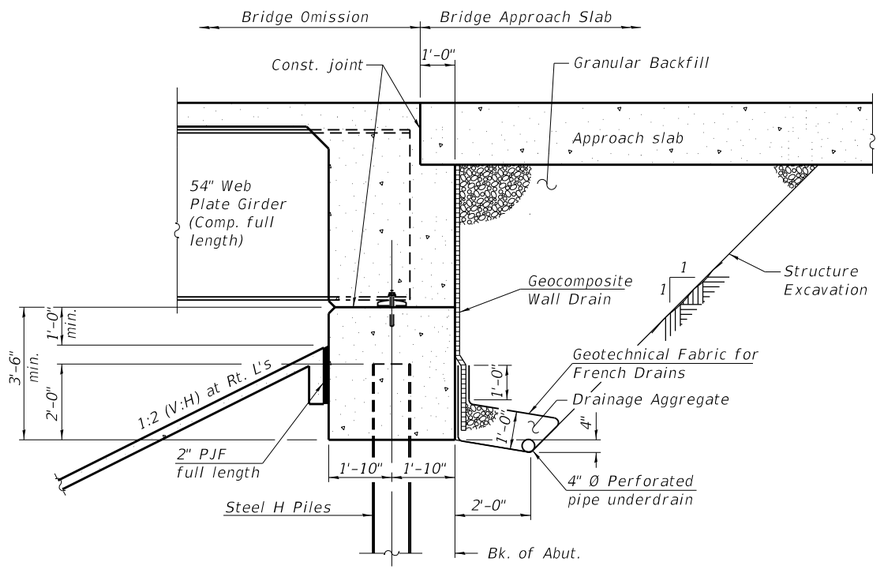
CROSS SECTION
(Looking East)



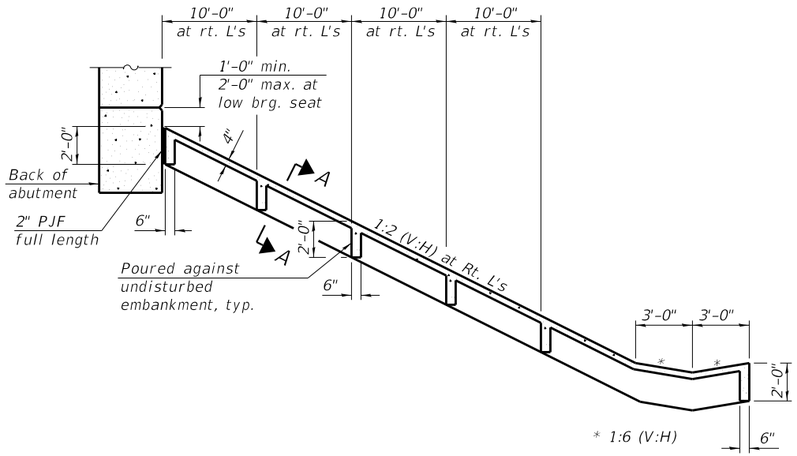
PROFILE GRADE ℄ CLOSEN ROAD



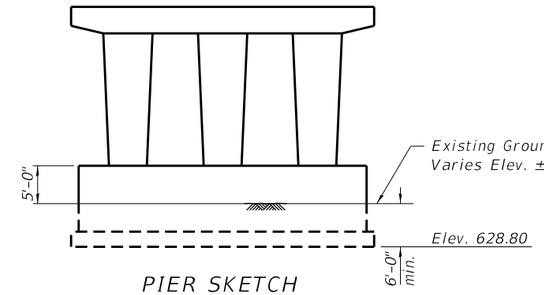
PROFILE GRADE F.A.I. 474
(EB and WB P.G. at Median Edge)



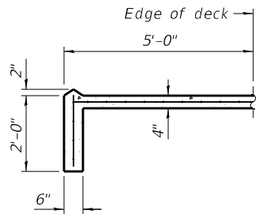
SECTION THRU INTEGRAL ABUTMENT
(Horiz. dim. @ Rt. ∠'s)



SECTION THRU
CONCRETE SLOPEWALL



PIER SKETCH
(Looking East)



SECTION A-A

DETAILS
CLOSEN ROAD OVER F.A.I. 474
SECTION (72-3HB-3)BRR
PEORIA COUNTY
STA. 20+00.00
STRUCTURE NO. 072-0257

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USER NAME =	DESIGNED - MJS	REVISED -	
	CHECKED - SJF	REVISED -	
PLOT SCALE =	DRAWN - SAE	REVISED -	
PLOT DATE =	CHECKED - SJF	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
6578	(72-3HB-3)BRR	PEORIA	2	2
		CONTRACT NO. 68E86		
		ILLINOIS	FED. AID PROJECT	

MODEL: Default
FILE NAME: P:\Civil_IDOT_DIST4\PTB 201-031 var PH I-III\WO 6 Closen Road TS &L 3122011-06\TSL\TSL.dgn
9/10/2024 9:26:48 AM

EXHIBIT D

BORING LOGS

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 3/1/21

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for west abutment **LOGGED BY** RUBINO (JL)

SECTION (72-3HB-3)BRR **LOCATION** Closen Road over I-474, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'3.64"N, **Longitude** 89°40'33.47"W

COUNTY Peoria **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 072-0123
Station 237+77

BORING NO. SB-1
Station 238+20
Offset 141.0 ft RT
Ground Surface Elev. 663.92 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Black SILTY CLAY TOPSOIL, with roots 663.62			
	2		
Brown, Stiff SILTY CLAY, trace sand and gravel	2 4	1.5 P	22
	3		
-5	2 3	1.5 P	15
657.92			
Brown and Gray, Loose SILT, trace sand and gravel	3		
	4 4		17
	2		
-10	2 3		17
	5		
	4 5		18
650.92			
Brown, Medium Stiff to Very Stiff SILTY CLAY, trace sand and gravel	1		
-15	WOH 1	0.4 S	28
	1		
	1 2	0.4 S	27
	2		
-20	2 5	0.7 S	24
Brown, Medium Stiff to Very Stiff SILTY CLAY, trace sand and gravel *(continued)*	1		
	1 2	0.8 S	23
	3		
-25	5 7	2.1 S	23
638.42			
Brown and Gray, Medium Stiff to Very Stiff SILTY CLAY, trace sand and gravel	3		
	4 6	2.6 B	30
	2		
-30	3 11	0.5 P	40 18
-sample disturbed 633.92			
-35	Borehole continued with rock coring.		
-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
IDOT

ROCK CORE LOG

Date 4/30/21

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for west abutment **LOGGED BY** Terracon

SECTION (72-3HB-3)BRR **LOCATION** Closen Road over I-474, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40°41'3.64"N, **Longitude** 89°40'33.47"W

COUNTY Peoria **CORING METHOD**

STRUCT. NO. 072-0123
Station 237+77

BORING NO. SB-1
Station 238+20
Offset 141.0 ft RT
Ground Surface Elev. 663.92 ft

CORING BARREL TYPE & SIZE
Core Diameter 2 in
Top of Rock Elev. 633.92 ft
Begin Core Elev. 633.92 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Brown and gray SILTY CLAY, trace sand and gravel	633.92		1	90	59			
	631.92							
Yellowish White, Vuggy LIMESTONE [43 inches]		-35						
	627.92							
Gray, Friable, Weakly Laminated SHALE								
	623.92	-40						
Dark Gray SHALE			2	99	87		45.0	6.3
	618.92	-45						
End of Boring								
		-50						

Color pictures of the cores Yes
Cores will be stored for examination until
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 3/2/21

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for center pier **LOGGED BY** RUBINO (JL)

SECTION (72-3HB-3)BRR **LOCATION** Closen Road over I-474, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40°41'3.81"N, **Longitude** 89°40'31.73"W

COUNTY Peoria **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 072-0123
Station 237+77

BORING NO. SB-2
Station 238+03
Offset 6.0 ft RT
Ground Surface Elev. 634.81 ft

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

Groundwater Elev.:
First Encounter 631.3 ft ▼
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Dark Brown to Black SILTY CLAY TOPSOIL, with roots and organic matter	634.31		2		
Reddish Brown and Gray SILTY CLAY, trace sand, gravel and wood pieces (FILL)	632.81		5 5	0.3 B	38 61
Brown, Medium Stiff SILTY CLAY LOAM, some gravel (FILL)	631.81 ▼		WOH		
Brown, Very Loose SANDY CLAY LOAM		-5	1 1		85
	628.81				
Light Brown SHALEY CLAY	628.31		13		
Gray, Highly Weathered SHALE			16 32		13
			13		
	624.81	-10	30 50	6.1 S	12
Borehole continued with rock coring.		-15			
		-20			

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
IDOT

ROCK CORE LOG

Date 4/30/21

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for center pier **LOGGED BY** Terracon

SECTION (72-3HB-3)BRR **LOCATION** Closen Road over I-474, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40°41'3.81"N, **Longitude** 89°40'31.73"W

COUNTY Peoria **CORING METHOD**

STRUCT. NO. 072-0123
Station 237+77

BORING NO. SB-2
Station 238+03
Offset 6.0 ft RT
Ground Surface Elev. 634.81 ft

CORING BARREL TYPE & SIZE

Core Diameter 2 in
Top of Rock Elev. 624.81 ft
Begin Core Elev. 624.81 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Gray, Friable, Weakly Laminated SHALE	624.81		1	95	86		32.0	5.9
	619.81	-15						
Gray, Friable, Weakly Laminated SHALE			2	100	81		77.0	5.0
	614.81	-20						
Dark Gray SHALE			3	100	89			
	611.81							
End of Boring		-25						
		-30						

Color pictures of the cores Yes
Cores will be stored for examination until
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 3/1/21

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for east abutment **LOGGED BY** RUBINO (JL)

SECTION (72-3HB-3)BRR **LOCATION** Closen Road over I-474, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'3.72"N, **Longitude** 89°40'29.82"W

COUNTY Peoria **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 072-0123
Station 237+77

BORING NO. SB-3
Station 238+12
Offset 140.0 ft LT
Ground Surface Elev. 663.40 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Dark Brown, SILTY CLAY TOPSOIL, with roots and organic matter
				662.90
	1			
	2	0.5	26	Brown, Soft to Stiff SILTY CLAY, trace sand and gravel
	3	P		
	2			
	2	1.2	31	
-5	3	B		
	WOH			
	2	0.3	28	
	1	P		
	WOH			
	1	0.3	26	
-10	1	P		
				652.40
	2			Brown to Brownish Gray, Loose SILT, trace sand and gravel
	3		21	
	3			
	3		21	
-15	4			
				647.40
	2			Brown, Medium Stiff SILTY CLAY
	2	0.6	25	
	2	B		
	1			
	1	0.5	25	
-20	2	S		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Brown, Medium Stiff SILTY CLAY *(continued)*
	2			
	3	0.8	25	
	4	B		
	1			
	2	0.8	26	
-25	2	S		
				637.40
	3			Orangish Brown and Black, Very Stiff SILTY CLAY, trace sand and gravel
	6	2.5	20	
	9	S		
	5			
	6	3.3	27	
-30	9	S		
				629.90
	7			Gray SHALEY CLAY
	14		10	
-35	25			
				624.90
	7			Gray, Highly Weathered SHALE
	24		8	
-40	44			

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
IDOT

SOIL BORING LOG

Date 3/1/21

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for east abutment **LOGGED BY** RUBINO (JL)

SECTION (72-3HB-3)BRR **LOCATION** Closen Road over I-474, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40°41'3.72"N, **Longitude** 89°40'29.82"W

COUNTY Peoria **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 072-0123
Station 237+77

BORING NO. SB-3
Station 238+12
Offset 140.0 ft LT
Ground Surface Elev. 663.40 ft

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

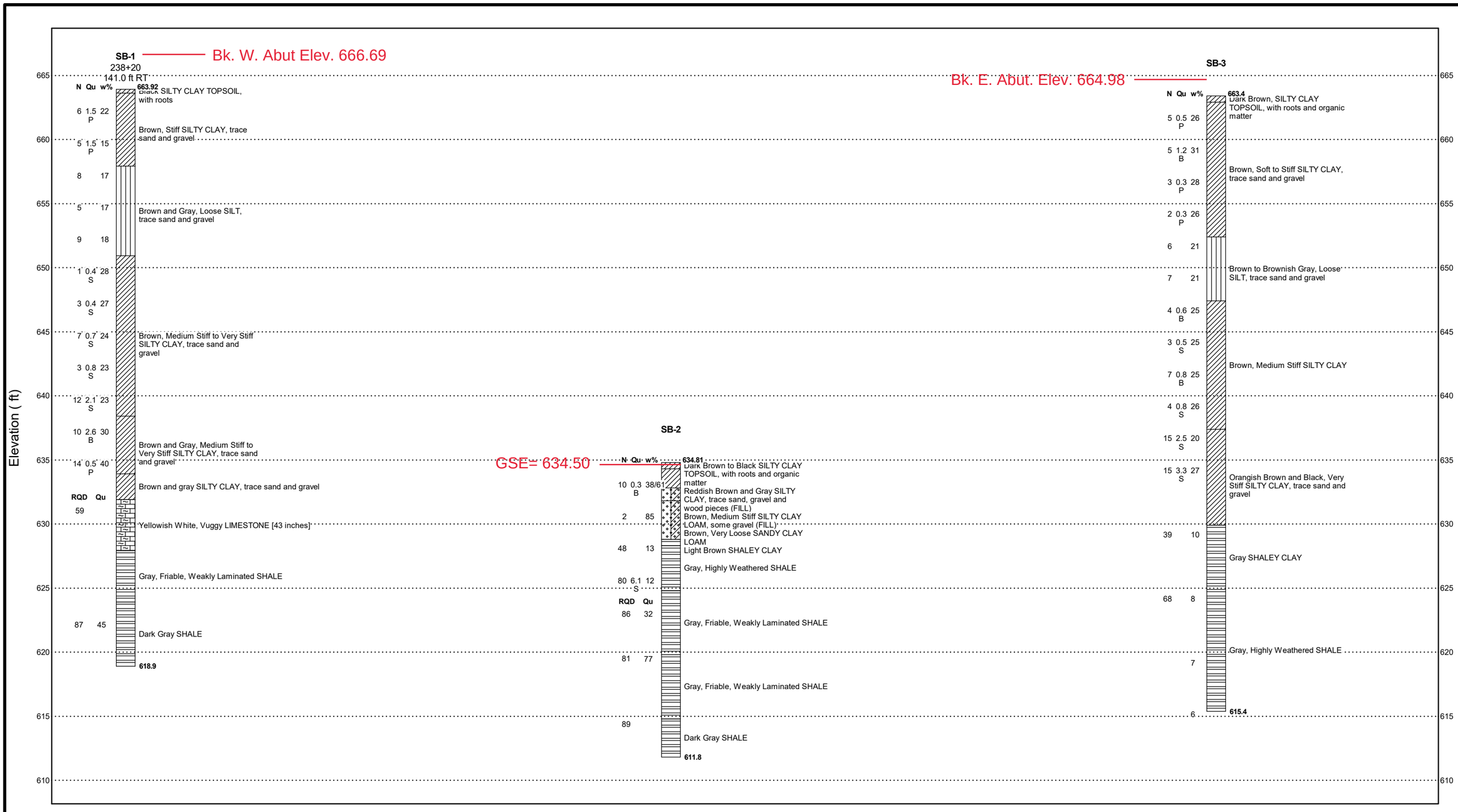
Groundwater Elev.:
First Encounter NA ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray, Highly Weathered SHALE *(continued)*				
		43		
		50		7
	-45			
	615.40	50		6
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)

EXHIBIT E

SUBSURFACE PROFILE



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

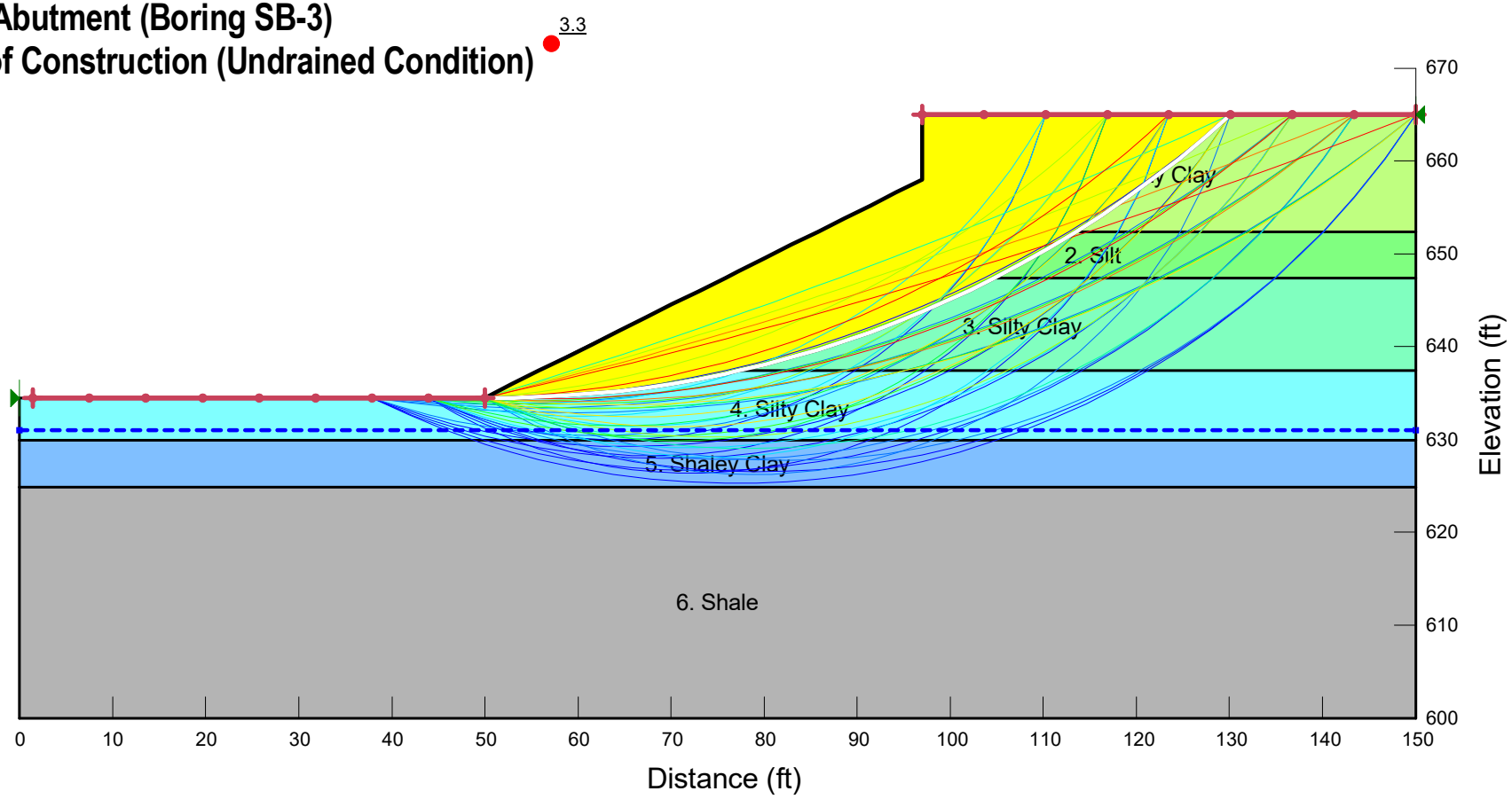
SUBSURFACE PROFILE

Route: Closen Road over FAI 474 (I-474)
Section: (72-3HB-3)BRR
County: Peoria

EXHIBIT F

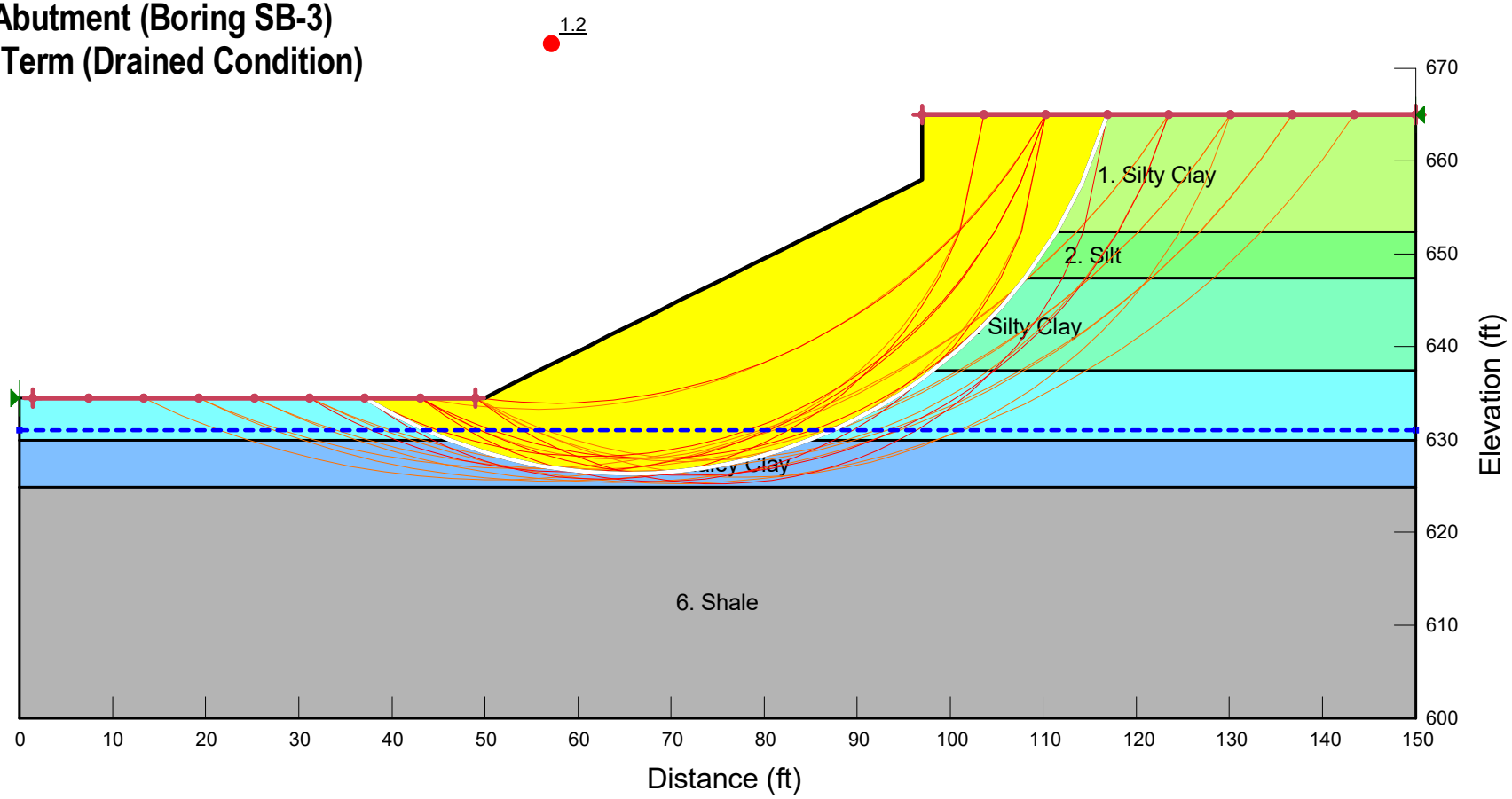
SLOPE/W SLOPE STABILITY ANALYSIS

Closen Road over I-474
East Abutment (Boring SB-3)
End of Construction (Undrained Condition)



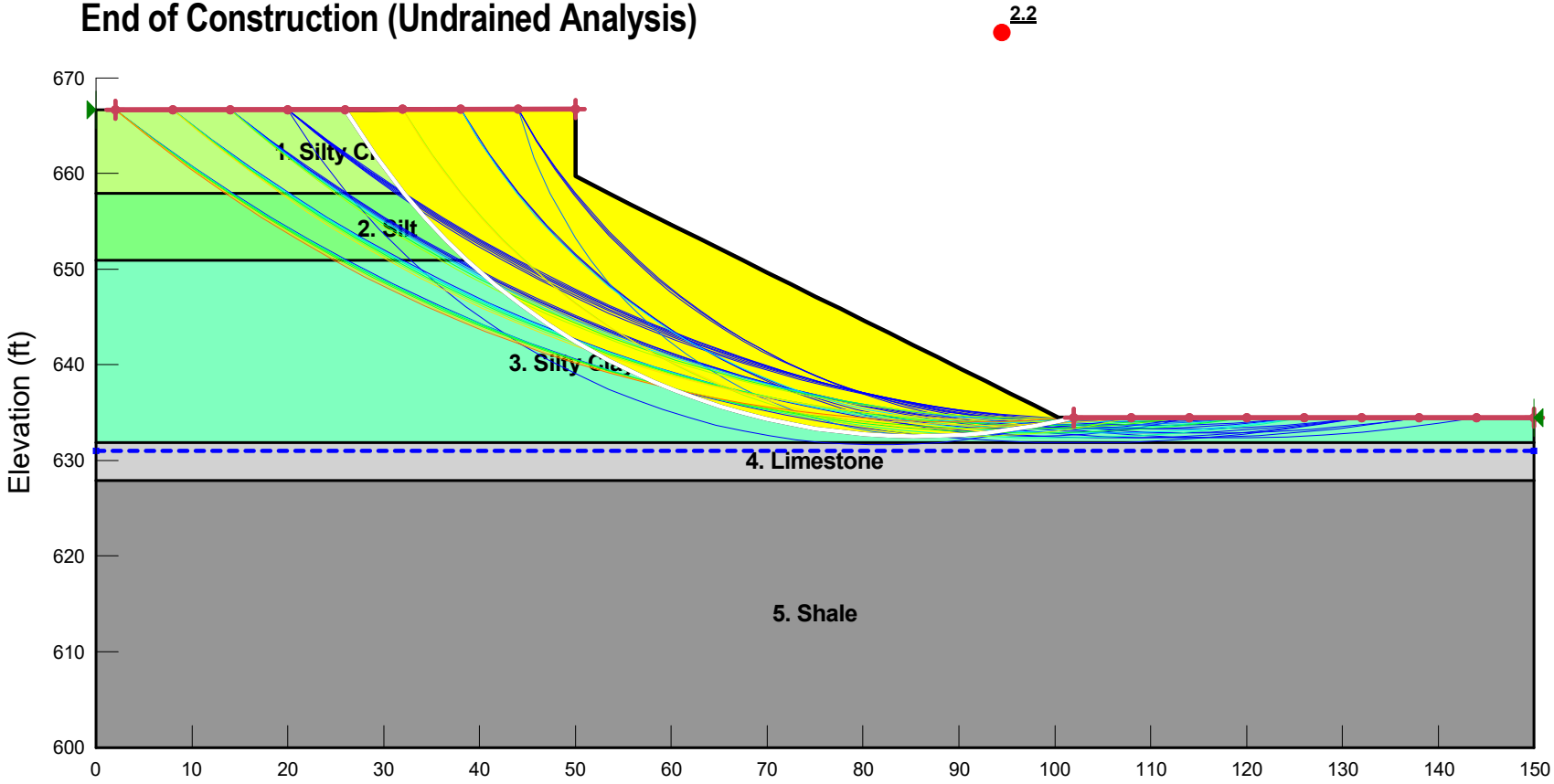
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Surface
	1. Silty Clay	Mohr-Coulomb	120	575	0	1
	2. Silt	Mohr-Coulomb	110	500	0	1
	3. Silty Clay	Mohr-Coulomb	120	675	0	1
	4. Silty Clay	Mohr-Coulomb	120	2,900	0	1
	5. Shaley Clay	Mohr-Coulomb	130	3,500	0	1
	6. Shale	Mohr-Coulomb	135	10,000	12	1

Closen Road over I-474
East Abutment (Boring SB-3)
Long Term (Drained Condition)



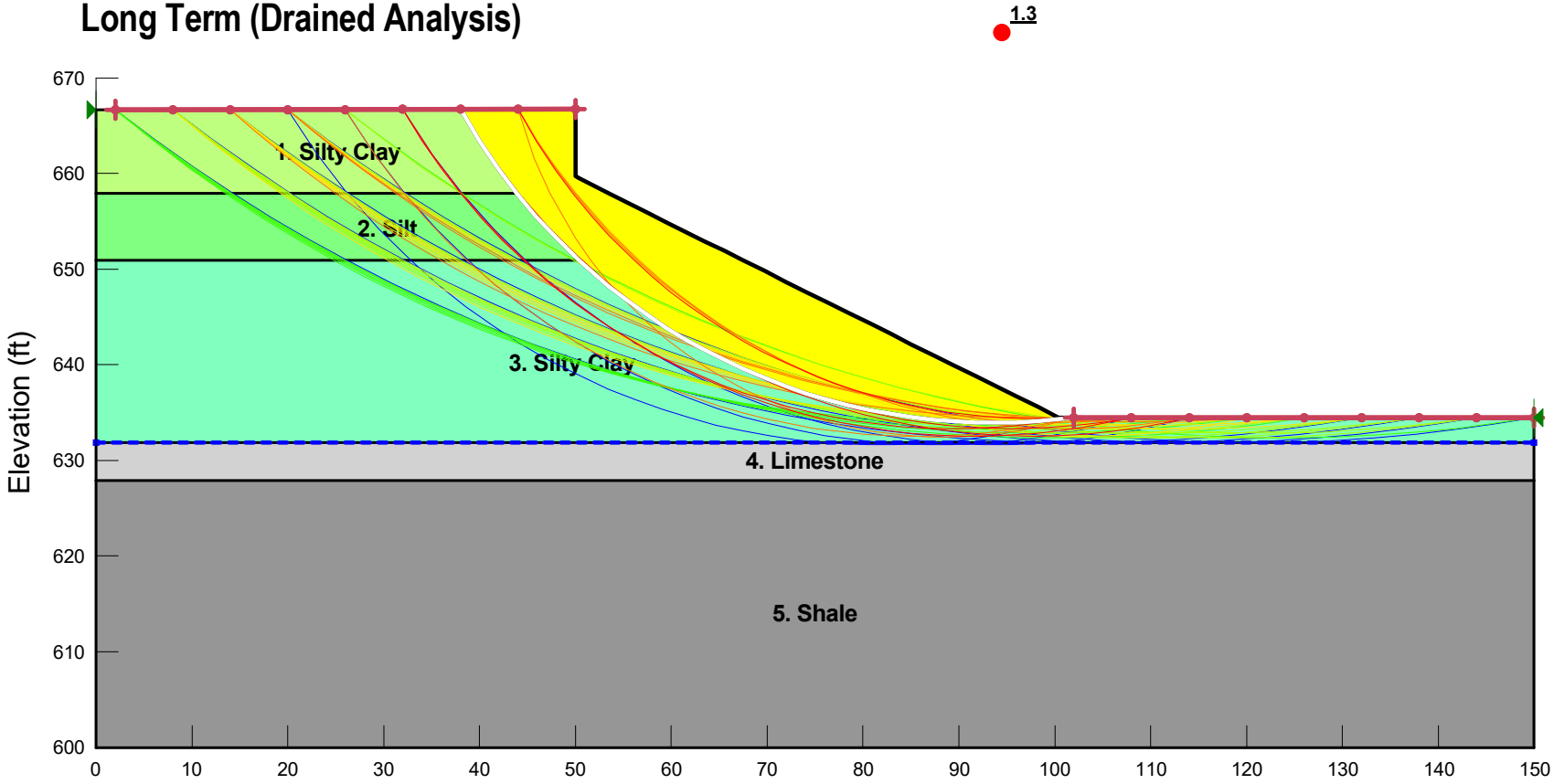
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Surface
	1. Silty Clay	Mohr-Coulomb	120	100	26	1
	2. Silt	Mohr-Coulomb	110	100	26	1
	3. Silty Clay	Mohr-Coulomb	120	100	26	1
	4. Silty Clay	Mohr-Coulomb	120	100	26	1
	5. Shaley Clay	Mohr-Coulomb	130	150	12	1
	6. Shale	Mohr-Coulomb	135	10,000	12	1

Closen Road over I-474
West Abutment (Boring SB-1)
End of Construction (Undrained Analysis)



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Surface
	1. Silty Clay	Mohr-Coulomb	120	1,500	0	1
	2. Silt	Mohr-Coulomb	110	500	0	1
	3. Silty Clay	Mohr-Coulomb	120	1,050	0	1
	4. Limestone	Mohr-Coulomb	150	10,000	45	1
	5. Shale	Mohr-Coulomb	135	10,000	12	1

Closen Road over I-474
West Abutment (Boring SB-1)
Long Term (Drained Analysis)



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Surface
	1. Silty Clay	Mohr-Coulomb	120	100	26	1
	2. Silt	Mohr-Coulomb	110	100	26	1
	3. Silty Clay	Mohr-Coulomb	120	100	26	1
	4. Limestone	Mohr-Coulomb	150	10,000	45	1
	5. Shale	Mohr-Coulomb	135	10,000	12	1

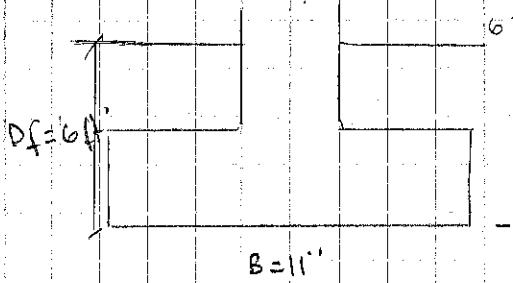
EXHIBIT G

BEARING RESISTANCE CALCULATIONS

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

Project Title: Closen Road over I-474 Sheet: 1 of 1
Project Number: 22-1093.06
Calculated By: TG Date: 3/6/2024
Checked By: _____ Date: _____
Comments: _____

Bearing Capacity (Boring SB-2)



$\gamma = 130$ pcf
$c = 3500$ psf (assumed)
$\phi = 0$

$N_c = 5.7$
$N_q = 1$
$N_\gamma = 0$

$$q_u = c'N_c + \gamma' D_f N_q + 0.5\gamma' B N_\gamma$$

$$= 3500(5.7) + [(120-62.4)(4.5) + (130-62.4)(1.5)](1)$$

$$= 20310.60 \text{ psf}$$

$$q_a = \frac{q_u}{2} = 10155.30 \text{ psf}$$

Factored load: $\frac{3500 \text{ kips}}{11 \times 40} = 7.95 \text{ ksf} = 7954 \text{ psf}$

$q_a = 10{,}155 > 7954$ ✓ OK

Sliding Bearing Resistance

lesser between ½ σ'v and cohesion

$\sigma_v = (120-62.4)(4.5) + (130-62.4)1.5$
$= 360.60$ psf

½ σ'v = 180.3 psf < c = 3500 psf

Sliding Bearing Resistance = 180 psf

EXHIBIT H

PILE LENGTH/PILE TYPE

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.19 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.19 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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	**334** KIPS	**183** KIPS	**29** 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.)
656.42	0.77	0.50			1.0		5.8	1.5		***2.1***	2	0	0	1	3
653.92	2.50	0.50			3.2	4.8	9.0	4.7	0.6	***6.8***	7	0	0	4	5
650.92	3.00	0.50			3.9	4.8	***11.9***	5.7	0.6	12.4	12	0	0	7	8
647.92	3.00	0.40			3.1	3.8	***15.0***	4.6	0.5	17.0	15	0	0	8	11
645.42	2.50	0.40			2.6	3.8	***20.5***	3.9	0.5	21.2	21	0	0	11	14
642.92	2.50	0.70			4.3	6.7	***25.8***	6.4	0.8	27.7	26	0	0	14	16
640.42	2.50	0.80			4.9	7.6	43.1	7.2	1.0	***36.5***	36	0	0	20	19
638.42	2.00	2.10			7.9	20.0	55.8	11.7	2.5	***48.7***	49	0	0	27	21
635.92	2.50	2.60			11.4	24.8	***47.1***	16.8	3.1	63.0	47	0	0	26	23
633.92	2.00	0.50			2.6	4.8	***49.7***	3.8	0.6	66.8	50	0	0	27	25
631.92	2.00	0.50			2.6	4.8	217.0	3.8	0.6	***91.4***	91	0	0	50	27
630.92	1.00			Limestone	82.2	169.5	299.2	121.0	21.5	***212.5***	212	0	0	117	28.3
629.92	1.00			Limestone	82.2	169.5	381.5	121.0	21.5	***333.5***	334	0	0	183	29.3
628.92	1.00			Limestone	82.2	169.5	463.7	121.0	21.5	***454.5***	455	*0*	*0*	*250*	*30.3*
627.92	1.00			Limestone	82.2	169.5	***461.1***	121.0	21.5	564.9	461	*0*	*0*	*254*	*31.3*
626.92	1.00			Shale	41.1	84.8	***502.3***	60.5	10.7	625.4	502	*0*	*0*	*276*	*32.3*
625.92	1.00			Shale	41.1	84.8	***543.4***	60.5	10.7	685.9	543	*0*	*0*	*299*	*33.3*
624.92	1.00			Shale	41.1	84.8	***584.5***	60.5	10.7	746.4	584	*0*	*0*	*321*	*34.3*
623.92	1.00			Shale	41.1	84.8	***625.6***	60.5	10.7	806.9	626	*0*	*0*	*344*	*35.3*
622.92	1.00			Shale	41.1	84.8	***666.7***	60.5	10.7	867.5	667	*0*	*0*	*367*	*36.3*
621.92	1.00			Shale	41.1	84.8	***707.8***	60.5	10.7	928.0	708	*0*	*0*	*389*	*37.3*
620.92	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.19 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.19 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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
418 KIPS	**399** KIPS	**220** KIPS	**29** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 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.)
656.42	0.77	0.50			1.2		8.1	1.7		***2.5***	2	0	0	1	3
653.92	2.50	0.50			3.9	6.9	11.9	5.7	0.8	***8.1***	8	0	0	4	5
650.92	3.00	0.50			4.6	6.9	15.2	6.8	0.8	***14.8***	15	0	0	8	8
647.92	3.00	0.40			3.8	5.5	***19.0***	5.5	0.6	20.3	19	0	0	10	11
645.42	2.50	0.40			3.1	5.5	26.3	4.6	0.6	***25.4***	25	0	0	14	14
642.92	2.50	0.70			5.2	9.6	***32.9***	7.6	1.1	33.1	33	0	0	18	16
640.42	2.50	0.80			5.9	11.0	56.6	8.6	1.2	***43.7***	44	0	0	24	19
638.42	2.00	2.10			9.5	28.9	73.1	13.9	3.2	***58.3***	58	0	0	32	21
635.92	2.50	2.60			13.7	35.8	***57.8***	20.1	3.9	75.2	58	0	0	32	23
633.92	2.00	0.50			3.1	6.9	***60.9***	4.5	0.8	79.8	61	0	0	34	25
631.92	2.00	0.50			3.1	6.9	302.1	4.5	0.8	***110.3***	110	0	0	61	27
630.92	1.00			Limestone	98.8	245.0	400.9	144.5	26.8	***254.8***	255	0	0	140	28.3
629.92	1.00			Limestone	98.8	245.0	499.8	144.5	26.8	***399.3***	399	0	0	220	29.3
628.92	1.00			Limestone	98.8	245.0	598.6	144.5	26.8	***543.8***	~~544~~	~~0~~	~~0~~	~~299~~	~~30.3~~
627.92	1.00			Limestone	98.8	245.0	***574.9***	144.5	26.8	674.9	~~575~~	~~0~~	~~0~~	~~316~~	~~31.3~~
626.92	1.00			Shale	49.4	122.5	***624.3***	72.3	13.4	747.2	~~624~~	~~0~~	~~0~~	~~343~~	~~32.3~~
625.92	1.00			Shale	49.4	122.5	***673.8***	72.3	13.4	819.4	~~674~~	~~0~~	~~0~~	~~371~~	~~33.3~~
624.92	1.00			Shale	49.4	122.5	***723.2***	72.3	13.4	891.7	~~723~~	~~0~~	~~0~~	~~398~~	~~34.3~~
623.92	1.00			Shale	49.4	122.5	***772.6***	72.3	13.4	964.0	~~773~~	~~0~~	~~0~~	~~425~~	~~35.3~~
622.92	1.00			Shale	49.4	122.5	***822.0***	72.3	13.4	1036.2	~~822~~	~~0~~	~~0~~	~~452~~	~~36.3~~
621.92	1.00			Shale	49.4	122.5	***871.4***	72.3	13.4	1108.5	~~871~~	~~0~~	~~0~~	~~479~~	~~37.3~~
620.92	1.00			Shale		122.5			13.4						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.19 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.19 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 63
Plugged Pile Perimeter========== 4.000 FT. Unplugged Pile Perimeter========== 5.883 FT.
Plugged Pile End Bearing Area========== 1.000 SQFT. Unplugged Pile End Bearing Area======== 0.128 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
497 KIPS	**410** KIPS	**225** KIPS	**29** 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.)
656.42	0.77	0.50			1.2		8.2	1.8		***2.7***	3	0	0	1	3
653.92	2.50	0.50			3.9	7.0	12.1	5.7	0.9	***8.4***	8	0	0	5	5
650.92	3.00	0.50			4.7	7.0	15.4	6.9	0.9	***15.1***	15	0	0	8	8
647.92	3.00	0.40			3.8	5.6	***19.2***	5.6	0.7	20.7	19	0	0	11	11
645.42	2.50	0.40			3.2	5.6	26.6	4.7	0.7	***25.9***	26	0	0	14	14
642.92	2.50	0.70			5.3	9.8	***33.2***	7.7	1.3	33.8	33	0	0	18	16
640.42	2.50	0.80			5.9	11.2	57.4	8.7	1.4	***44.8***	45	0	0	25	19
638.42	2.00	2.10			9.6	29.4	74.0	14.1	3.8	***59.9***	60	0	0	33	21
635.92	2.50	2.60			13.8	36.4	***58.4***	20.3	4.7	76.5	58	0	0	32	23
633.92	2.00	0.50			3.1	7.0	***61.5***	4.6	0.9	81.0	61	0	0	34	25
631.92	2.00	0.50			3.1	7.0	306.7	4.6	0.9	***116.6***	117	0	0	64	27
630.92	1.00			Limestone	99.7	249.1	406.4	146.6	31.8	***263.1***	263	0	0	145	28.3
629.92	1.00			Limestone	99.7	249.1	506.0	146.6	31.8	***409.7***	410	0	0	225	29.3
628.92	1.00			Limestone	99.7	249.1	605.7	146.6	31.8	***556.3***	~~556~~	~~0~~	~~0~~	~~306~~	~~30.3~~
627.92	1.00			Limestone	99.7	249.1	***580.8***	146.6	31.8	687.0	~~581~~	~~0~~	~~0~~	~~319~~	~~31.3~~
626.92	1.00			Shale	49.8	124.6	***630.6***	73.3	15.9	760.3	~~631~~	~~0~~	~~0~~	~~347~~	~~32.3~~
625.92	1.00			Shale	49.8	124.6	***680.5***	73.3	15.9	833.5	~~680~~	~~0~~	~~0~~	~~374~~	~~33.3~~
624.92	1.00			Shale	49.8	124.6	***730.3***	73.3	15.9	906.8	~~730~~	~~0~~	~~0~~	~~402~~	~~34.3~~
623.92	1.00			Shale	49.8	124.6	***780.1***	73.3	15.9	980.1	~~780~~	~~0~~	~~0~~	~~429~~	~~35.3~~
622.92	1.00			Shale	49.8	124.6	***829.9***	73.3	15.9	1053.4	~~830~~	~~0~~	~~0~~	~~456~~	~~36.3~~
621.92	1.00			Shale	49.8	124.6	***879.8***	73.3	15.9	1126.7	~~880~~	~~0~~	~~0~~	~~484~~	~~37.3~~
620.92	1.00			Shale		124.6			15.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.19 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.19 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area======== 0.149 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
578 KIPS	**485** KIPS	**267** KIPS	**29** 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.)
656.42	0.77	0.50			1.4		11.1	2.1		***3.1***	3	0	0	2	3
653.92	2.50	0.50			4.6	9.7	15.7	6.8	1.0	***9.9***	10	0	0	5	5
650.92	3.00	0.50			5.5	9.7	19.2	8.2	1.0	***17.9***	18	0	0	10	8
647.92	3.00	0.40			4.5	7.7	***23.7***	6.6	0.8	24.5	24	0	0	13	11
645.42	2.50	0.40			3.7	7.7	33.2	5.5	0.8	***30.7***	31	0	0	17	14
642.92	2.50	0.70			6.2	13.5	41.3	9.2	1.5	***40.1***	40	0	0	22	16
640.42	2.50	0.80			6.9	15.5	73.4	10.3	1.7	***53.1***	53	0	0	29	19
638.42	2.00	2.10			11.3	40.6	94.3	16.7	4.4	***70.9***	71	0	0	39	21
635.92	2.50	2.60			16.3	50.2	***70.0***	24.1	5.4	90.6	70	0	0	39	23
633.92	2.00	0.50			3.7	9.7	***73.7***	5.4	1.0	96.1	74	0	0	41	25
631.92	2.00	0.50			3.7	9.7	411.2	5.4	1.0	***137.5***	137	0	0	76	27
630.92	1.00			Limestone	117.1	343.5	528.3	173.8	37.0	***311.3***	311	0	0	171	28.3
629.92	1.00			Limestone	117.1	343.5	645.4	173.8	37.0	***485.0***	485	0	0	267	29.3
628.92	1.00			Limestone	117.1	343.5	762.5	173.8	37.0	***658.8***	~~659~~	~~0~~	~~0~~	~~362~~	~~30.3~~
627.92	1.00			Limestone	117.1	343.5	***707.8***	173.8	37.0	814.1	~~708~~	~~0~~	~~0~~	~~389~~	~~31.3~~
626.92	1.00			Shale	58.5	171.8	***766.4***	86.9	18.5	901.0	~~766~~	~~0~~	~~0~~	~~422~~	~~32.3~~
625.92	1.00			Shale	58.5	171.8	***824.9***	86.9	18.5	987.8	~~825~~	~~0~~	~~0~~	~~454~~	~~33.3~~
624.92	1.00			Shale	58.5	171.8	***883.5***	86.9	18.5	1074.7	~~883~~	~~0~~	~~0~~	~~486~~	~~34.3~~
623.92	1.00			Shale	58.5	171.8	***942.0***	86.9	18.5	1161.6	~~942~~	~~0~~	~~0~~	~~518~~	~~35.3~~
622.92	1.00			Shale	58.5	171.8	***1000.6***	86.9	18.5	1248.5	~~1001~~	~~0~~	~~0~~	~~550~~	~~36.3~~
621.92	1.00			Shale	58.5	171.8	***1059.1***	86.9	18.5	1335.4	~~1059~~	~~0~~	~~0~~	~~583~~	~~37.3~~
620.92	1.00			Shale		171.8			18.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.19 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.19 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area======== 0.181 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
705 KIPS	**672** KIPS	**370** KIPS	**30** 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.)
656.42	0.77	0.50			1.4		11.3	2.1		***3.4***	3	0	0	2	3
653.92	2.50	0.50			4.6	9.9	15.9	6.9	1.3	***10.2***	10	0	0	6	5
650.92	3.00	0.50			5.6	9.9	19.5	8.2	1.3	***18.2***	18	0	0	10	8
647.92	3.00	0.40			4.5	7.9	***24.0***	6.7	1.0	24.9	24	0	0	13	11
645.42	2.50	0.40			3.8	7.9	33.7	5.6	1.0	***31.2***	31	0	0	17	14
642.92	2.50	0.70			6.3	13.8	41.9	9.3	1.8	***40.8***	41	0	0	22	16
640.42	2.50	0.80			7.0	15.8	74.6	10.4	2.0	***54.4***	54	0	0	30	19
638.42	2.00	2.10			11.4	41.5	95.9	16.9	5.3	***72.6***	73	0	0	40	21
635.92	2.50	2.60			16.4	51.3	***70.9***	24.3	6.6	91.6	71	0	0	39	23
633.92	2.00	0.50			3.7	9.9	***74.6***	5.5	1.3	97.1	75	0	0	41	25
631.92	2.00	0.50			3.7	9.9	419.4	5.5	1.3	***146.5***	146	0	0	81	27
630.92	1.00			Limestone	118.3	351.0	537.7	175.2	45.2	***321.7***	322	0	0	177	28.3
629.92	1.00			Limestone	118.3	351.0	656.1	175.2	45.2	***496.9***	497	0	0	273	29.3
628.92	1.00			Limestone	118.3	351.0	774.4	175.2	45.2	***672.2***	672	0	0	370	30.3
627.92	1.00			Limestone	118.3	351.0	***717.3***	175.2	45.2	824.8	~~717~~	~~0~~	~~0~~	~~394~~	~~31.3~~
626.92	1.00			Shale	59.2	175.5	***776.4***	87.6	22.6	912.4	~~776~~	~~0~~	~~0~~	~~427~~	~~32.3~~
625.92	1.00			Shale	59.2	175.5	***835.6***	87.6	22.6	1000.0	~~836~~	~~0~~	~~0~~	~~460~~	~~33.3~~
624.92	1.00			Shale	59.2	175.5	***894.8***	87.6	22.6	1087.6	~~895~~	~~0~~	~~0~~	~~492~~	~~34.3~~
623.92	1.00			Shale	59.2	175.5	***954.0***	87.6	22.6	1175.3	~~954~~	~~0~~	~~0~~	~~525~~	~~35.3~~
622.92	1.00			Shale	59.2	175.5	***1013.1***	87.6	22.6	1262.9	~~1013~~	~~0~~	~~0~~	~~557~~	~~36.3~~
621.92	1.00			Shale	59.2	175.5	***1072.3***	87.6	22.6	1350.5	~~1072~~	~~0~~	~~0~~	~~590~~	~~37.3~~
620.92	1.00			Shale		175.5			22.6						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== SB-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.48 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.48 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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	**320** KIPS	**176** 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.)
652.40	3.08	0.30			2.5		7.2	3.6		***4.2***	4	0	0	2	5
649.90	2.50	0.50			3.2	4.8	10.4	4.7	0.6	***9.0***	9	0	0	5	8
647.40	2.50	0.50			3.2	4.8	14.6	4.7	0.6	***13.8***	14	0	0	8	10
644.90	2.50	0.60			3.8	5.7	***17.5***	5.6	0.7	19.3	17	0	0	10	13
642.40	2.50	0.50			3.2	4.8	***23.5***	4.7	0.6	24.4	24	0	0	13	15
639.90	2.50	0.80			4.9	7.6	***28.4***	7.2	1.0	31.5	28	0	0	16	18
637.40	2.50	0.80			4.9	7.6	49.5	7.2	1.0	***40.8***	41	0	0	22	20
634.90	2.50	2.50			11.1	23.8	68.2	16.4	3.0	***58.1***	58	0	0	32	23
629.90	5.00	3.30	15		27.1	31.5	113.4	39.8	4.0	***100.2***	100	0	0	55	28
624.90	5.00		39	Hard Till	7.3	49.6	155.9	10.8	6.3	***115.5***	115	0	0	64	33
623.90	1.00			Shale	41.1	84.8	197.0	60.5	10.7	***176.0***	176	0	0	97	33.6
622.90	1.00			Shale	41.1	84.8	238.1	60.5	10.7	***236.5***	237	0	0	130	34.6
621.90	1.00			Shale	41.1	84.8	***279.2***	60.5	10.7	297.0	279	0	0	154	35.6
620.90	1.00			Shale	41.1	84.8	***320.3***	60.5	10.7	357.5	320	0	0	176	36.6
619.90	1.00			Shale	41.1	84.8	***361.4***	60.5	10.7	418.1	~~361~~	~~0~~	~~0~~	~~199~~	~~37.6~~
618.90	1.00			Shale	41.1	84.8	***402.5***	60.5	10.7	478.6	~~403~~	~~0~~	~~0~~	~~221~~	~~38.6~~
617.90	1.00			Shale	41.1	84.8	***443.7***	60.5	10.7	539.1	~~444~~	~~0~~	~~0~~	~~244~~	~~39.6~~
616.90	1.00			Shale	41.1	84.8	***484.8***	60.5	10.7	599.6	~~485~~	~~0~~	~~0~~	~~267~~	~~40.6~~
615.90	1.00			Shale	41.1	84.8	***525.9***	60.5	10.7	660.1	~~526~~	~~0~~	~~0~~	~~289~~	~~41.6~~
614.90	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== SB-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.48 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.48 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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
418 KIPS	**406** KIPS	**223** KIPS	**37** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 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.)
652.40	3.08	0.30			3.0		9.8	4.3		***5.1***	5	0	0	3	5
649.90	2.50	0.50			3.9	6.9	13.7	5.7	0.8	***10.7***	11	0	0	6	8
647.40	2.50	0.50			3.9	6.9	19.0	5.7	0.8	***16.5***	17	0	0	9	10
644.90	2.50	0.60			4.6	8.3	***22.1***	6.7	0.9	23.0	22	0	0	12	13
642.40	2.50	0.50			3.9	6.9	30.1	5.7	0.8	***29.2***	29	0	0	16	15
639.90	2.50	0.80			5.9	11.0	***36.0***	8.6	1.2	37.7	36	0	0	20	18
637.40	2.50	0.80			5.9	11.0	65.3	8.6	1.2	***48.8***	49	0	0	27	20
634.90	2.50	2.50			13.4	34.5	89.7	19.5	3.8	***69.6***	70	0	0	38	23
629.90	5.00	3.30	15		32.5	45.5	148.4	47.6	5.0	***120.0***	120	0	0	66	28
624.90	5.00		39	Hard Till	8.8	71.7	208.0	12.9	7.8	***138.4***	138	0	0	76	33
623.90	1.00			Shale	49.4	122.5	257.4	72.3	13.4	***210.7***	211	0	0	116	33.6
622.90	1.00			Shale	49.4	122.5	306.8	72.3	13.4	***282.9***	283	0	0	156	34.6
621.90	1.00			Shale	49.4	122.5	356.2	72.3	13.4	***355.2***	355	0	0	195	35.6
620.90	1.00			Shale	49.4	122.5	***405.7***	72.3	13.4	427.4	406	0	0	223	36.6
619.90	1.00			Shale	49.4	122.5	***455.1***	72.3	13.4	499.7	~~455~~	~~0~~	~~0~~	~~250~~	~~37.6~~
618.90	1.00			Shale	49.4	122.5	***504.5***	72.3	13.4	571.9	~~504~~	~~0~~	~~0~~	~~277~~	~~38.6~~
617.90	1.00			Shale	49.4	122.5	***553.9***	72.3	13.4	644.2	~~554~~	~~0~~	~~0~~	~~305~~	~~39.6~~
616.90	1.00			Shale	49.4	122.5	***603.3***	72.3	13.4	716.4	~~603~~	~~0~~	~~0~~	~~332~~	~~40.6~~
615.90	1.00			Shale	49.4	122.5	***652.7***	72.3	13.4	788.7	~~653~~	~~0~~	~~0~~	~~359~~	~~41.6~~
614.90	1.00			Shale		122.5			13.4						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== SB-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.48 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.48 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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
497 KIPS	**460** KIPS	**253** KIPS	**38** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 63
Plugged Pile Perimeter========== 4.000 FT. Unplugged Pile Perimeter========== 5.883 FT.
Plugged Pile End Bearing Area========== 1.000 SQFT. Unplugged Pile End Bearing Area======== 0.128 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.)
652.40	3.08	0.30			3.0		10.0	4.4		***5.3***	5	0	0	3	5
649.90	2.50	0.50			3.9	7.0	13.9	5.7	0.9	***11.0***	11	0	0	6	8
647.40	2.50	0.50			3.9	7.0	19.2	5.7	0.9	***16.9***	17	0	0	9	10
644.90	2.50	0.60			4.6	8.4	***22.4***	6.8	1.1	23.5	22	0	0	12	13
642.40	2.50	0.50			3.9	7.0	30.5	5.7	0.9	***29.8***	30	0	0	16	15
639.90	2.50	0.80			5.9	11.2	***36.4***	8.7	1.4	38.5	36	0	0	20	18
637.40	2.50	0.80			5.9	11.2	66.1	8.7	1.4	***50.2***	50	0	0	28	20
634.90	2.50	2.50			13.5	35.0	90.8	19.8	4.5	***71.4***	71	0	0	39	23
629.90	5.00	3.30	15		32.8	46.2	150.2	48.2	5.9	***123.1***	123	0	0	68	28
624.90	5.00		39	Hard Till	8.9	72.9	210.8	13.1	9.3	***142.8***	143	0	0	79	33
623.90	1.00			Shale	49.8	124.6	260.6	73.3	15.9	***216.0***	216	0	0	119	33.6
622.90	1.00			Shale	49.8	124.6	310.5	73.3	15.9	***289.3***	289	0	0	159	34.6
621.90	1.00			Shale	49.8	124.6	***360.3***	73.3	15.9	362.6	360	0	0	198	35.6
620.90	1.00			Shale	49.8	124.6	***410.1***	73.3	15.9	435.9	410	0	0	226	36.6
619.90	1.00			Shale	49.8	124.6	***459.9***	73.3	15.9	509.2	460	0	0	253	37.6
618.90	1.00			Shale	49.8	124.6	***509.8***	73.3	15.9	582.5	~~510~~	~~0~~	~~0~~	~~280~~	~~38.6~~
617.90	1.00			Shale	49.8	124.6	***559.6***	73.3	15.9	655.8	~~560~~	~~0~~	~~0~~	~~308~~	~~39.6~~
616.90	1.00			Shale	49.8	124.6	***609.4***	73.3	15.9	729.1	~~609~~	~~0~~	~~0~~	~~335~~	~~40.6~~
615.90	1.00			Shale	49.8	124.6	***659.3***	73.3	15.9	802.4	~~659~~	~~0~~	~~0~~	~~363~~	~~41.6~~
614.90	1.00			Shale		124.6			15.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== SB-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.48 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.48 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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
578 KIPS	**566** KIPS	**311** KIPS	**38** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area======== 0.149 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.)
652.40	3.08	0.30			3.5		13.2	5.2		***6.2***	6	0	0	3	5
649.90	2.50	0.50			4.6	9.7	17.7	6.8	1.0	***13.0***	13	0	0	7	8
647.40	2.50	0.50			4.6	9.7	24.3	6.8	1.0	***20.0***	20	0	0	11	10
644.90	2.50	0.60			5.4	11.6	***27.7***	8.0	1.2	27.9	28	0	0	15	13
642.40	2.50	0.50			4.6	9.7	38.1	6.8	1.0	***35.3***	35	0	0	19	15
639.90	2.50	0.80			6.9	15.5	***45.0***	10.3	1.7	45.6	45	0	0	25	18
637.40	2.50	0.80			6.9	15.5	84.8	10.3	1.7	***59.4***	59	0	0	33	20
634.90	2.50	2.50			15.8	48.3	116.1	23.5	5.2	***84.6***	85	0	0	47	23
629.90	5.00	3.30	15		38.5	63.8	191.4	57.2	6.9	***145.7***	146	0	0	80	28
624.90	5.00		39	Hard Till	10.4	100.5	273.1	15.5	10.8	***168.9***	169	0	0	93	33
623.90	1.00			Shale	58.5	171.8	331.6	86.9	18.5	***255.8***	256	0	0	141	33.6
622.90	1.00			Shale	58.5	171.8	390.2	86.9	18.5	***342.7***	343	0	0	188	34.6
621.90	1.00			Shale	58.5	171.8	448.7	86.9	18.5	***429.5***	430	0	0	236	35.6
620.90	1.00			Shale	58.5	171.8	***507.3***	86.9	18.5	516.4	507	0	0	279	36.6
619.90	1.00			Shale	58.5	171.8	***565.8***	86.9	18.5	603.3	566	0	0	311	37.6
618.90	1.00			Shale	58.5	171.8	***624.4***	86.9	18.5	690.2	~~624~~	~~0~~	~~0~~	~~343~~	~~38.6~~
617.90	1.00			Shale	58.5	171.8	***682.9***	86.9	18.5	777.1	~~683~~	~~0~~	~~0~~	~~376~~	~~39.6~~
616.90	1.00			Shale	58.5	171.8	***741.5***	86.9	18.5	864.0	~~741~~	~~0~~	~~0~~	~~408~~	~~40.6~~
615.90	1.00			Shale	58.5	171.8	***800.0***	86.9	18.5	950.9	~~800~~	~~0~~	~~0~~	~~440~~	~~41.6~~
614.90	1.00			Shale		171.8			18.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== SB-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.48 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.48 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1630 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 310.48 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 116.43 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
705 KIPS	**692** KIPS	**381** KIPS	**40** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area======== 0.181 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.)
652.40	3.08	0.30			3.5		13.4	5.2		***6.5***	7	0	0	4	5
649.90	2.50	0.50			4.6	9.9	18.0	6.9	1.3	***13.4***	13	0	0	7	8
647.40	2.50	0.50			4.6	9.9	24.6	6.9	1.3	***20.5***	20	0	0	11	10
644.90	2.50	0.60			5.5	11.8	***28.1***	8.1	1.5	28.3	28	0	0	15	13
642.40	2.50	0.50			4.6	9.9	38.7	6.9	1.3	***35.9***	36	0	0	20	15
639.90	2.50	0.80			7.0	15.8	***45.7***	10.4	2.0	46.3	46	0	0	25	18
637.40	2.50	0.80			7.0	15.8	86.3	10.4	2.0	***61.0***	61	0	0	34	20
634.90	2.50	2.50			16.0	49.4	118.1	23.7	6.4	***86.7***	87	0	0	48	23
629.90	5.00	3.30	15		38.9	65.2	194.5	57.7	8.4	***149.2***	149	0	0	82	28
624.90	5.00		39	Hard Till	10.5	102.7	277.9	15.6	13.2	***174.2***	174	0	0	96	33
623.90	1.00			Shale	59.2	175.5	337.1	87.6	22.6	***261.8***	262	0	0	144	33.6
622.90	1.00			Shale	59.2	175.5	396.2	87.6	22.6	***349.4***	349	0	0	192	34.6
621.90	1.00			Shale	59.2	175.5	455.4	87.6	22.6	***437.1***	437	0	0	240	35.6
620.90	1.00			Shale	59.2	175.5	***514.6***	87.6	22.6	524.7	515	0	0	283	36.6
619.90	1.00			Shale	59.2	175.5	***573.7***	87.6	22.6	612.3	574	0	0	316	37.6
618.90	1.00			Shale	59.2	175.5	***632.9***	87.6	22.6	699.9	633	0	0	348	38.6
617.90	1.00			Shale	59.2	175.5	***692.1***	87.6	22.6	787.5	692	0	0	381	39.6
616.90	1.00			Shale	59.2	175.5	***751.3***	87.6	22.6	875.1	~~751~~	~~0~~	~~0~~	~~413~~	~~40.6~~
615.90	1.00			Shale	59.2	175.5	***810.4***	87.6	22.6	962.7	~~810~~	~~0~~	~~0~~	~~446~~	~~41.6~~
614.90	1.00			Shale		175.5			22.6						