Structural Geotechnical Report

Bridge Replacement Project
IL Route 17/ IL Route 91 Bridge over Spoon River Stark County, Illinois

Proposed Structure Number: **SN 088-0030**
Existing Structure Number: SN 088-0002

Route 91 (FAP 643)
Section: (11B) (BR-1)
Job Number: P-94-013-07

Original Geotechnical Consultant:
GSG Consultants, Inc.

Final Geotechnical Author: IDOT Bridge Office

Original Report (GSG) Date: December 23, 2011

Final Revisions by IDOT FGU: October 24, 2021

Revised/Reviewed by:
Doris D. Gonzalez
doris.gonzalez@illinois.gov

Bradly L. Hessing
bradly.hessing@illinois.gov

TABLE OF CONTENTS

Structural Geotechnical Report
Bridge Replacement Project
Existing Structure Number: SN 088-0002
Proposed Structure Number: SN 088-0030
Route Carried: IL Route 17/IL Route 91 (FAP 643)
Section: (11B) (BR-1)
Stark County, Illinois
Job Number: P-94-013-07

1.0 PROJECT DESCRIPTION AND PROPOSED STRUCTURE

GSG Consultants, Inc (GSG) completed a geotechnical investigation for the replacement of the Illinois Route 17/Illinois Route 91 (FAP 643) bridge over Spoon River in Stark County, Illinois. The purpose of the investigation was to explore the subsurface conditions, to determine engineering properties of the subsurface soil, and develop design and construction recommendations for the project.

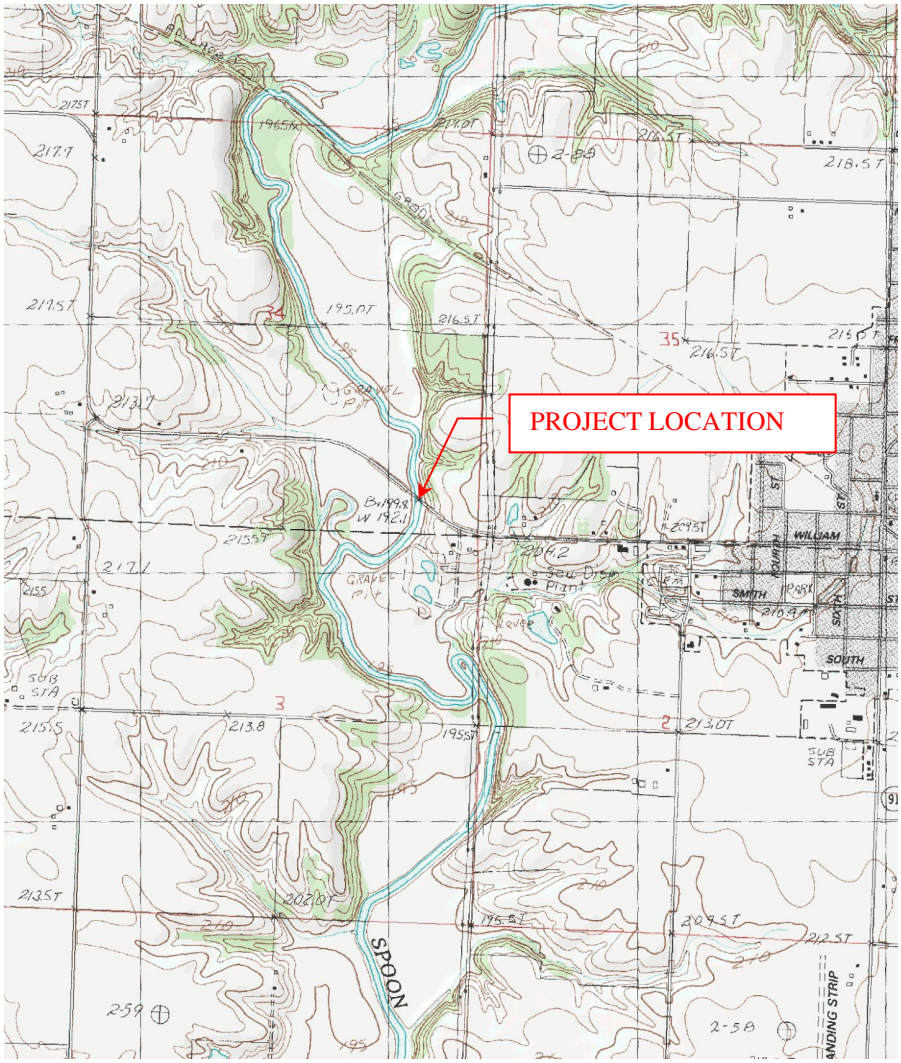


Figure 1. Project Location Map - Site is located in Stark County, Section 34 of Township 13 North, Range 6 East, of the Third Principle Meridian

The existing bridge structure (SN 088-0002) is to be removed and replaced with a new bridge structure (SN 088-0030). The **Boring Location Map (Appendix A)** shows the layout of the proposed improvements in relation to the existing site conditions.

1.1 Existing and Proposed Structure Information

According to the TS&L (included in **Appendix D**), the existing bridge (SN 088-0002), consisting of a 4-span structure, was first constructed in 1924. The main span of the bridge structure consisted of two through steel trusses with a concrete deck and the outer three spans consisted of reinforced concrete T-beams. The substructure consisted of two closed abutments and three solid wall type piers, supported on 12-inch diameter untreated timber piles. The substructure was constructed at 37° 25' skew with the flowline of Spoon River.

Repairs were performed on the bridge in 1967, which was then reconstructed in 1984 as F.A. Route 643 (S.B.I -30). The work included replacement of the main span with five composite steel plate girders. The outer three spans were replaced with 21"x36" precast deck beams. Approach slabs were constructed with precast concrete slabs. The deck was widened to 33'-0" with a total length of 256'-10". The existing bridge consists of two (2) lanes of traffic, one (1) in each direction, with shoulders on either side.

The proposed bridge (SN 088-0030) will consist of three spans supported by a total of two piers (pier 1(east pier) and pier 2 (west pier)) and two semi-integral abutments (East Abutment and West Abutment) with a total length of 396'-4.5" from the back of the East Abutment (Station: 61+46.00) to the back of the West Abutment (Station: 65+42.38). The out-to-out width of the proposed structure will be 38'-10". The proposed structure will be at a 35° skew to the flowline of Spoon River. The surface profile for the proposed bridge will be approximately equal to the existing bridge profile and will have two 12'-0" lanes of traffic, one in each direction, with 6'-0" shoulders on either side. The proposed improvements are to include the removal and replacement of the existing bridge deck, superstructure, and substructures.

It is our understanding that the proposed bridge replacement project will be a staged construction process in order to maintain traffic across the bridge.

1.2 Existing Subsurface Information

IDOT has furnished previous soil boring logs from 1972 for this project that were used for information only in this report. The boring logs indicate that the subsurface soils predominantly consist of loose to medium dense sandy loam, sand, and/or medium stiff loamy soils underlain by stiff to very stiff clayey loamy soils. The existing boring logs are included in **Appendix B**.

2.0 SITE SUBSURFACE EXPLORATION

2.1 Site Conditions

The existing IL Route 17/IL Route 91 runs East and West and crosses over the Spoon River, which flows from north to south. The existing structure is on average about 20 ft above the streambed elevation of the Spoon River. The embankment slopes on the west side of the bridge appear to be approximately 2.5:1 (horizontal to vertical, H:V) and on the east side of the bridge appear to be approximately 1.5:1. Reconstruction plans of the bridge dated 1982 indicate that the existing bridge structure slope has a vertical gradient of approximately -2.855% grade from east to west.

The areas adjacent to the embankment slopes at the ends of the existing structure are primarily farm fields and appear to be relatively flat. The area immediately east of the existing Spoon River is heavily wooded. Figures 2 and 3 provide views of the existing site.

Figure 2: View from Southeast side of IL Rte. 17/IL Rte. 91 looking West at the existing IL17/IL91 Bridge over Spoon River.

Figure 3: View from Northwest side of IL Rte. 17/IL Rte. 91 looking East at the existing IL17/IL91 Bridge over Spoon River.

2.2 Subsurface Exploration Program

The initial site subsurface exploration for the proposed structure was conducted from November 28th to December 7th, 2011 and included advancing a total of five (5) standard penetration test (SPT) borings within the vicinity of the proposed bridge abutment and pier locations. A supplemental exploration was performed on April 8th and 9th, 2014 and included drilling two (2) additional borings (B-6 and B-7) at the site. The locations of the soil borings were coordinated with HOH and were approved by IDOT. Boring locations were adjusted in the field based on utility clearance and accessibility. The abutment borings (borings B-1, B-2, B-4 and B-5) were drilled to a maximum depth of 109 feet below existing surface. Borings B-3, B-6, and B-7 were performed in the vicinity of the proposed pier locations and extended to depths ranging from 65 feet to 90 feet below existing grade. Another supplemental exploration was performed on December 10, 2020. Two additional borings were drilled, labeled B-5P and B-7P. These borings were drilled close to the location of borings B-5 (2011) and B-7 (2014) to obtain additional information regarding the soil profile below the extent of the original borings and to find the top of rock . The locations of the soil borings are shown on the **Boring Location Map (Appendix A)**.

2.3 Subsurface Conditions

This section provides a brief description of the soils encountered in the borings performed in the vicinity of the proposed improvements. Detailed descriptions of the subsurface soils are provided in the **Soil Boring Logs (Appendix B)** and are shown graphically in the **Subsurface Profile (Appendix C)**. The soil boring logs provide specific conditions encountered at each boring location, including soil descriptions, stratifications, penetration resistance, elevations, location of the samples, water levels (when encountered), and laboratory test data. Variations in the general subsurface soil profile were noted during the drilling activities. The stratifications shown on the boring logs represent the conditions only at the actual boring locations and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual. Below is a brief description of the subsurface soil conditions at each boring location.

Bridge Abutments

For the West Abutment boring B-1 was drilled in the vicinity of the proposed West Abutment while boring B-2 was drilled near the existing West Abutment. Overall, both borings predominantly consisted of 40' to 50' of interbedded clay, sandy clay loam, and sand underlain by 45' to 50' of stiff to very stiff clay loam and terminating in dense granular material.

For the East Abutment borings B-4 and B-5 were drilled in the vicinity of the proposed East Abutment. These borings' profiles consisted of ~ 10' of clay underlain by ~ 30' of sand and in turn underlain by over 50' of stiff to hard clay loam and terminating in that material. In December 2020, B-5P was drilled adjacent to B-5 to supplement B-5 and extend it to rock. B-5P was blind drilled to elevation 581.0 (80 ft bgs) with sampling taking place below this elevation. Material encountered below elevation 581.0 consisted of stiff to very stiff clay loam down to the top of rock (weathered clayey shale) at elevation 545.5 (115.5 ft bgs).

Bridge Piers

Borings B-3 and B-7 were drilled in the vicinity of the proposed West Pier (Pier 2). Both borings indicate approximately 35' or more of predominantly sand and sandy loam with several intermittent clay layers underlain by a thick sequence of stiff to very stiff clay to the bottom of borings. Boring B-7P was drilled December 2020 adjacent to B-7 and consisted of blind drilling to elevation 557.5 (83.5 ft bgs) and after sampling through 6.5 ft of medium stiff clay loam, the top of rock (highly weathered shale) was encountered at elevation 551.0 (90 ft bgs).

Boring B-6 was drilled in the vicinity of the proposed East Pier (Pier 1) and showed almost 20' of sand and sandy loam underlain by stiff to very stiff to hard clay loam down to the boring termination depth of 90 feet (approx. elevation 551).

2.4 Groundwater Conditions

Water levels were checked in each boring to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed. Groundwater was encountered in all of the borings while drilling at elevations ranging from 634 to 627 feet. It should be noted that water was recorded in all of the borings in the granular soil layers. Water level measurements in such sandy soils are generally considered accurate and indicate long term groundwater readings.

3.0 GEOTECHNICAL EVALUATIONS

3.1 Derivation of Soil Parameters for Design

Based on the field investigation data collected, generalized soil parameters for the soils for use in design are presented in **Table 3.1**

Table 3.1 – Summary of Soil Parameters

Elevation Range (feet)	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained	
			Cohesion c (psf)	Friction Angle φ (°)	Cohesion c (psf)	Friction Angle φ (°)
	New Engineered Clay Fill	125	1,000	0	50	25
	New Engineered Granular Fill	125	0	32	0	32
638-620*	Loose to Medium Dense, Brown Sand	115	0	33	0	33
620-550	Stiff to Hard, Gray Clay Loam	135	2,750	0	100	28
660-653 (B-4 Only)	Brown Sandy Clay Fill	125	1,500	0	75	25
660-650 (B-4, B-5 Only)	Medium Stiff to Stiff, Brown Clay	130	1,500	0	75	28
652-645 (B-1 Only)	Brown and Gray Clay Fill	130	2,500	0	100	28
645-638 (B-1 Only)	Black and Brown Sandy Loam Fill	115	0	30	0	30
638-633 (B-1, B-2 Only)	Medium Stiff, Brown Sandy Clay Loam	125	750	0	0	25
620-600 (B-1 to B-3, B-6, B-7 Only)	Medium Stiff to Stiff, Gray Silty Clay	132	1,250	0	50	25
605-600 (B-2, B-3, B-7 Only)	Medium Dense, Gray Sand	125	0	34	0	34
584-579 (B-7 Only)	Loose, Gray Sand	105	0	28	0	28
550-543 (B-1, B-2 Only)	Extremely Dense, Gray Sand with Gravel	140	0	42	0	42

* Layer begins at elevation 650 feet for borings B-4, B-5

3.2 Settlement

The existing IL Rte. 17/IL Rte. 91 abutment side slopes are about 1.5:1 (H:V) towards the East Abutment on the East side of the Spoon River and about 2.5:1 (H:V) towards the West Abutment on the West side of Spoon River, with no discernable ditches at the base. The preliminary TS&L shows the proposed side slopes near the abutment locations at 2:1 (H:V), and that the proposed grades will be approximately equal to the existing grades at the abutment locations. The area below the proposed bridge will be wider than the existing conditions, and as such, excavation and regrading of the soils below the bridge will be required. The anticipated settlement due to the regrading activity is considered to be negligible.

3.3 Slope Stability

IDOT requires that, at a minimum, slope stability analysis should be performed for any area having a cut depth or fill height greater than or equal to 15 feet. The proposed East Abutment end slope will require a cut depth greater than 15 feet. Therefore, a slope stability analysis is required for this project and is discussed further in Section 4.6 of this report.

3.4 Seismic Considerations

The seismic hazard for the site was analyzed per the IDOT Geotech Manual, IDOT Bridge Design Manual, and AASHTO LRFD Bridge Design Specifications.

The Seismic Soil Site Class was determined per the requirements of All Geotechnical Manual Users (AGMU) Memo 9.1, Design Guide for Seismic Site Class Determination, and the "Seismic Site Class Determination" Excel spreadsheet provided by IDOT. The proposed bridge has a total length less than 750 feet, with no single span longer than 200 feet, therefore, a global Site Class Definition was determined for this project, and was found to be Soil Site Class D. The Seismic Performance Zone (SPZ) was determined using Figure 2.3.10-2 in the IDOT Bridge Manual and was found to be Seismic Performance Zone 1. The AASHTO Seismic Design Parameters program was used to determine the peak ground acceleration coefficient (PGA), and the short (S_{DS}) and long (S_{D1}) period design spectral acceleration coefficients. A 1000-year design return period was used, with a 7% probability of exceedance in 75 years, per IDOT requirements. The S_{DS} was determined to be 0.157g and the S_{D1} was determined to be 0.102g. **Table 3.2** presents a summary of the above parameters.

The site is located in Seismic Performance Zone 1. Per the AGMU Memo 10.1, Liquefaction Analysis, the site does not need to be evaluated for liquefaction.

Table 3.2 - 7% Probability of Exceedance in 75 Years (Approx.1,000-year Return Period)

Soil Site Class	Seismic Performance Zone (SPZ)	Horizontal Response Design Spectral Acceleration Coefficient Period 0.2 Second (S_{DS})	Horizontal Response Design Spectral Acceleration Coefficient Period 1 Seconds (S_{D1})
		5% Critical Damping	
D	1	0.157	0.102

3.5 Scour

The Hydraulic report dated March 2017 recommends raw scour depths of 32 and 35 feet for the 100 Year and 200 Year events, respectively. Per the IDOT Bridge Manual (2012), scour would not be applicable to the abutment locations if the abutment end slopes are designed with armored embankments (slopewalls). This can be accomplished by having end slopes of 2:1 (H:V) lined with Class A4 or A5 stone riprap which would be considered an adequate level of protection for the abutments. Therefore, scour will not be further considered for the abutments.

Per the IDOT Bridge Manual Section 2.3.6.3.2, reduction to the scour depths could be applied based on the type of soil encountered in the borings. Based on the soils encountered, the scour values provided in the hydraulic report were adjusted due to cohesive soils encountered in portions of the soil borings. **Table 3.3** provides the adjusted scour values for the 100 Year and 200 Year events. Note that the design scour elevations at the abutments are taken at the bottom of cap elevation; should the bottom of cap elevations change, the scour elevations should be revised to coincide with those elevations.

Table 3.3-Design Scour Elevation Table (ft)

Event Limit State	East Abutment	Pier 1	Pier 2	West Abutment	Item 113
Q100	651.98	606.8	597.7	642.91	5
Q200	651.98	605.3	596.2	642.91	
Design	651.98	606.8	597.7	642.91	
Check	651.98	605.3	596.2	642.91	

The elevations for the 100 Year storm shown in **Table 3.3** were used to calculate the reduction in pile capacities due to the effect of scour.

4.0 FOUNDATION EVALUATIONS & DESIGN RECOMMENDATIONS

The foundation for the proposed replacement bridge must provide sufficient support to resist the dead and live loads, as well as seismic loading. Based on the subsurface conditions encountered and the design information provided by the structural engineer, the proposed replacement bridge should be supported on a deep foundation system consisting of driven piles. The foundation design recommendations were completed per the AASHTO LRFD 9th Edition with Interim Revisions (2020) and included the adjusted scour elevation based on the 100 Year storm provided in Table 3.4.

4.1 Anticipated Loads

The anticipated factored loads provided by the TS&L Structural Engineer for the proposed replacement bridge are shown in **Table 4.1**:

Table 4.1 - Design Loads

Sub-Structural Element	Total Factored Load
East Abutment	24.3 k/ft of substructure*
Pier 1	4367 k
Pier 2	6333 k
West Abutment	34.3 k/ft of substructure*

*NOTE: The loads are given in kips per linear foot of sub-structural element width.

Discussion of shallow spread footings, drilled shafts, and driven piles are presented below.

4.2 Shallow Foundations

Based on the soils encountered, and the deep scour at the piers, shallow foundations are not a feasible option for the proposed bridge and are not discussed further in this report.

4.3 Drilled Shafts

Based on the soil conditions encountered on the borings, drilled shafts bearing in the stiff cohesive soils are not considered a feasible option as a deep foundation system for the proposed bridge structure as they will not provide adequate end-bearing support and will not meet the loading requirements. Therefore, they are not discussed further in this report.

4.4 Pile Foundations

Based on the soil conditions and proposed loadings, a deep foundation system consisting of piles is considered for the proposed bridge structure. The pile types that were considered at this site included metal shell piles, large diameter open-ended pipe piles (LDOEPs; for the piers only), and steel H-piles. Metal shell piles are considered the most feasible option. Before rock probes were taken in late 2020, the boring logs did not indicate encountering bedrock which would have resulted in deeper driven H-piles and variable/uncontrolled splicing, which, in turn, would lead to sizeable cost increases if H-piles were chosen. However, once the rock probes were obtained, the top of rock was determined (elev. 545.5 at B-5P and elev. 551.0 at B-7P). Although rock was reached, artesian conditions were encountered by the drill crew when penetrating into it. Based on this, and to avoid any possible problems with respect to the artesian conditions, both District 4 and the Bridge Office agreed to stay above the rock with the foundations. Therefore, neither friction H-piles nor H-piles driven to rock are recommended here.

For the pile foundation design, two pile types were evaluated for this site based on the subsurface soil conditions. This included metal shell piles (for all substructures), and large diameter open-ended pipe piles (LDOEPs) at the piers. LDOEPs have more lateral stiffness and are normally used due to their ability to resist large lateral, high overturning moments, and/or due to scour where long unsupported length may occur due to extreme event loading. The following criteria were used in the IDOT piles tables. If any of the assumptions below are incorrect or change, the pile elevations should be adjusted accordingly.

- Ground surface Elevation Against Pile During Driving = Proposed bottom of structure cap elevation.
- Pile Cutoff Elevation = 1-ft embedment at the abutments and 2-ft embedment at the pier structures.
- Scour depth = 100 Year scour elevation.

Table 4.2 – Pile Foundation Elevation Summary

Substructure	Proposed Bottom of Structure Cap Elevation	Pile Cutoff Elevation	Scour Depth Elevation
East Abutment	651.98	652.98	None
Pier 1	621.4	623.4	606.8
Pier 2	621.4	623.4	597.7
West Abutment	642.91	643.91	None

4.4.1 Abutment Pile Design

The Modified IDOT Static Method of Estimating Pile Length excel spreadsheet was used to estimating the pile lengths at various axial geotechnical resistances for driven piles per AGMU Memo 10.2. The recommended pile design tables generated by the IDOT spreadsheet are summarized in **Tables 4.3 and 4.4**, for the East and West Abutment, respectively. Using elevations summarized in **Table 4.2** for each substructure, the estimated pile lengths at various axial resistances for various driven pile sections for each substructure were derived. No geotechnical losses due to scour, downdrag or liquefaction were included in the axial capacity calculations. A copy of the abutment spreadsheets is presented in **Appendix E, Abutment Pile Design.**

Table 4.3 – East Abutment Pile Design Table

Estimated Pile Length (feet)	Metal Shell 12" Φ w/ 0.250" Walls (Max. R_N = 392 kips)*		Metal Shell 14" Φ w/ 0.250" Walls (Max. R_N = 459 kips)*		Metal Shell 14" Φ w/ 0.312" Walls (Max. R_N = 570 kips)*		Metal Shell 16" Φ w/ 0.312" Walls (Max. R_N = 654 kips)*	
	R_N (kips)	R_F (kips)	R_N (kips)	R_F (kips)	R_N (kips)	R_F (kips)	R_N (kips)	R_F (kips)
48	255	140	303	167	303	167	353	194
53	291	160	344	189	344	189	399	219
58	329	181	390	214	390	214	453	249
63	369	203	436	240	436	240	507	279
68	392	216	459	252	472	259	561	308
73	N/A	N/A	N/A	N/A	522	287	610	336
78	N/A	N/A	N/A	N/A	570	314	654	360

Table 4.4 – West Abutment Pile Design Table

Estimated Pile Length (feet)	Metal Shell 12" Φ w/ 0.250" Walls (Max. R_N = 392 kips)*		Metal Shell 14" Φ w/ 0.250" Walls (Max. R_N = 459 kips)*		Metal Shell 14" Φ w/ 0.312" Walls (Max. R_N = 570 kips)*		Metal Shell 16" Φ w/ 0.312" Walls (Max. R_N = 654 kips)*	
	R_N (kips)	R_F (kips)	R_N (kips)	R_F (kips)	R_N (kips)	R_F (kips)	R_N (kips)	R_F (kips)
68	292	161	346	190	346	190	381	210
73	321	177	378	208	378	208	434	239
78	347	191	408	224	408	224	461	254
83	373	205	439	241	439	241	493	271
88	392	216	459	252	482	265	530	291
93	N/A	N/A	N/A	N/A	570	314	572	315
95	N/A	N/A	N/A	N/A	N/A	N/A	654	360

Based on the preliminary factored loads provided by the designer, a wall thickness of 0.250-inch or greater is recommended for the metal shell piles to minimize potential damage to the piles during driving and increase capacity per pile. Hard driving is not anticipated though the clay soils, and shale was encountered at an approximate elevation of 550-545 ft. Therefore, driving shoes are not recommended for the shell piles unless an estimated pile length greater than 84 feet is selected for design, as this pile design may potentially reach the extremely dense soils around an elevation of 550 feet.

The actual pile depth should be based on a test pile. We recommend driving at least one (1) test pile for each abutment driven to 110% of the nominal bearing value indicated in the plan. The production piles for the structures should then be ordered after a careful review of the test pile record and the foundation borings.

4.4.2 Pier Pile Design

This section provides design recommendations for the piers using Metal Shell Piles (16" and 18" diameters) and large diameter open-ended pipe piles (LDOEPs). Originally, LDOEPs were considered and chosen as the foundation treatment at the piers. The punishingly high scour depths, in combination with high factored axial loading, moderate strength soils, and bedrock being so deep and not present in the borings, initially made LDOEPs the most geotechnically appropriate deep foundation choice for the piers. Piles with diameters of 36 inches or greater are considered to be large diameters and were considered in the evaluation. The axial capacity of LDOEPs would include both side friction and end-bearing. Their large diameter and wall thickness would lend themselves well here for pile stiffness needed for unbraced lengths resulting from deep scour. However, based on the structural engineer's (Bacon Farmer Workman (BFW)) determination that these large diameter piles were problematic with regards to the staging of the pier construction, the designer sought alternate pile types. They considered large section H-piles (HP16 or HP18) for their structural shape, however, rock was not in sight with the original borings taken by GSG. Subsequently, rock probes were obtained in December 2020, and the top of rock was determined to be at elev. 545.5 at B-5P and elev. 551.0 at B-7P. As discussed above, artesian conditions were encountered by the drill crew when penetrating into rock at B-7P. In addition to the artesian condition, coal fragments were also encountered. Based on this and discussions with District 4, it was decided that we were not going to go into the rock with the bridge foundations to avoid both the artesian condition as well tipping H-piles in coal; therefore H-piles would not be used. Moving forward, it was decided that 16" and 18" diameter metal shell piles would then be considered at the Piers; the 16" diameter comes in 0.312" and 0.375" thicknesses. The 18" shell has 0.375" wall thickness. If 16" diameter is chosen, the wall thickness chosen will depend on what the structural designer will need to satisfy bending. **To ensure that the same hammer be used at both the abutments and piers, such that the nominal bearings at the piers are not more than 1.5 those at the abutments, the abutment piles should be sized based on the bearing chosen for the pier piles; the pier piles should be sized first. Once the pile size and bearing are chosen at the piers, the nominal required bearing at the abutments should be equal to or greater than the nominal bearing at the piers divided by 1.5, even if the required bearings at the abutments yield factored resistances greater than what is needed.** To keep the shells above the rock and from risk of damage, the nominal bearings in the tables are limited to the values shown in the tables. Conical tips (shoes) are recommended for all pier piles to facilitate penetration below scour depth. A test pile at each pier is also recommended.

The Modified IDOT Static Method of Estimating Pile Length spreadsheet was used to estimatethe pile lengths at various axial geotechnical resistances for driven Metal Shell Piles. The pile design tables generated by the IDOT spreadsheet are summarized in **Tables 4.6 through 4.11**, for Piers 1 and 2. **Geotechnical losses due to scour were included in the axial capacity calculations.** A copy of the spreadsheets is presented in **Appendix F, Pier Pile Design.**

Table 4.6 – Pier 1 Metal Shell Pile Design Table

Estimated Pile Length (feet)	**Metal Shell 16" Φ w/ 0.312" Walls** (Max. R_N = 654 kips)	
	R_N (kips)	R_F (kips)
45	451	192
50	503	221
55	539	240
60	578	262
68	654	304

Table 4.7 – Pier 2 Metal Shell Pile Design Table

Estimated Pile Length (feet)	**Metal Shell 16" Φ w/ 0.312" Walls** (Max. R_N = 654 kips)	
	R_N (kips)	R_F (kips)
45	490	146
50	524	165
55	578	194
60	637	227
64	654	236

Please note that the tables for the 0.312" wall and 0.375" wall 16" diameter shells appear the same since we are limiting the bearings to the values in the tables to avoid risk of damage from hitting rock. Both thicknesses are shown for designer's choice, as previously mentioned on Page 10.

Table 4.8 – Pier 1 Metal Shell Pile Design Table

Estimated Pile Length (feet)	**Metal Shell 16" Φ w/ 0.375" Walls** (Max. R_N = 782 kips)	
	R_N (kips)	R_F (kips)
45	451	192
50	503	221
55	539	240
60	578	262
68	654	304

Table 4.9 – Pier 2 Metal Shell Pile Design Table

Estimated Pile Length (feet)	**Metal Shell 16" Φ w/ 0.375" Walls** (Max. R_N = 782 kips)	
	R_N (kips)	R_F (kips)
45	490	146
50	524	165
55	578	194
60	637	227
64	654	236

Table 4.10– Pier 1 18" Metal Shell Pile Design Table

Estimated Pile Length (feet)	**Metal Shell 18" Φ w/ 0.375" Walls** (Max. R_N = 882 kips)	
	R_N (kips)	R_F (kips)
45	514	220
50	572	252
55	611	273
60	655	297
65	707	326

Table 4.11 – Pier 2 18" Metal Shell Pile Design Table

Estimated Pile Length (feet)	**Metal Shell 18" Φ w/ 0.375" Walls** (Max. R_N = 882 kips)	
	R_N (kips)	R_F (kips)
45	558	168
50	594	188
55	656	222
60	724	259
65	764	281

4.5 Lateral Load Resistance

Lateral loadings applied to pile foundations are typically resisted by battering selected piles, the soil/structure interaction, pile flexure, or a combination of these factors. It is anticipated that at least some of the required lateral resistance will be provided by soil/structure interaction. The structural designer should calculate lateral loads on the foundation units and evaluate lateral resistance based on both soil and structure properties. Section 3.10.1.10 of the 2012 IDOT Bridge Manual requires performing detailed structure interaction analysis if the factored lateral loading per pile exceeds 3 kips. The analysis shall determine actual pile moment and deflection to determine the selected pile adequacy for the existing loadings. **Table 4.12** provides recommended lateral soil modulus and soil strain parameters that can be used for laterally loaded pile analysis via the p-y curve method based on the encountered subsurface conditions.

Table 4.12 – Lateral Resistance Soil Parameters

Elevation Depth (feet)	Soil Description	Horizontal Strain Factor E_{50}	Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At-Rest Earth Pressure Coefficient (K_o)	Subgrade Modulus+ k_{py} (pci)
	New Engineered Granular Fill	n/a	0.33	3.00	0.50	90
	New Engineered Clay Fill	0.007	0.40	2.50	0.58	500
638-620*	Loose to Medium Dense, Brown Sand	n/a	0.30	3.39	0.46	25
620-550	Stiff to Hard, Gray Clay Loam	0.005	0.36	2.77	0.53	1,450
620-600 (B-1 to B-3, B-6, B-7 Only)	Medium Stiff to Stiff, Gray Silty Clay	0.007	0.41	2.46	0.58	610
605-600 (B-2, B-3, B-7 Only)	Medium Dense, Gray Sand	n/a	0.28	3.53	0.44	60
584-579 (B-7 Only)	Loose, Gray Sand	n/a	0.36	2.77	0.53	20
550-543 (B-1, B-2 Only)	Extremely Dense, Gray Sand with Gravel	n/a	0.20	5.04	0.33	125

* Layer begins at elevation 650 feet for borings B-4, B-5

+ The initial p-y modulus, E_{py} , varies linearly with depth. To obtain E_{py} use the equation $E_{py} = k_{py} * z$, where k_{py} is the subgrade modulus given in the table and z is the distance from the surface to the center point of the layer in inches.

4.6 Slope Stability

Based on the preliminary information provided by HOH, the proposed new end slopes below the bridge abutments will be excavated to a 2:1 vertical side slope. The following parameters were used to evaluate the bridge end slope.

Table 4.13 – East Abutment End Slope Description

Maximum height of embankment	22 feet
Side Slope	2:1 (H:V)

Slide 7.0 is a comprehensive slope stability analysis software used to evaluate the proposed slopes for the project based on the limit equilibrium method. The proposed side slopes were analyzed based on the preliminary grading and the soils encountered while drilling. A circular failure analysis was evaluated using the simplified Bishop analyses methods for the proposed slope geometry. The analyses were performed using the soil parameters in **Table 3.1**. Based on the proposed geometry and the soil borings, global stability analyses were performed.

A circular failure analysis was evaluated for both a short term (undrained) and long term (drained) conditions for the proposed slopes for both normal case and seismic scenarios. The analyses were performed at the east abutment embankment, which is the anticipated maximum height of the proposed abutment embankment. The results of the analyses are shown in **Table 4.14**.

Table 4.14 – Stability Analyses Results

Analysis Exhibit	Location	Failure Type	Factor of Safety	Required Minimum Factor of Safety
Exhibit 1	East Abutment Slope	Circular – Short Term	1.9	1.5
Exhibit 2		Circular – Long Term	1.6	1.5
Exhibit 3		Seismic Circular – Short Term	1.2	1.0
Exhibit 4		Seismic Circular – Long Term	1.1	1.0

Based on the analyses performed, the proposed abutment end slope meets the minimum factor of safety of 1.5 for normal slope stability calculations and 1.0 for seismic. Copies of the slope stability analyses are included in **Appendix G, Slope Stability Analyses Exhibits**.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Temporary Sheeting and Soil Retention

The TS&L plan indicates that the construction of the proposed bridge will be phased, allowing the bridge to remain open to traffic while construction is ongoing. Temporary sheet piling will be required at he centerline of the East and West Abutments and approaches to facilitate the construction of the approach embankments and slopewalls. Based on the soil profile, a cantilevered sheet pile system could be used where there is sufficient depth available for the installation of the piles. The sheet pile retaining system should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, *Temporary Sheet Piling Design, Temporary Soil Retention Systems and Braced Excavations.* Considering the loose and soft soils in the upper soil stratums and that sheet piling is anticipated to driven deep, the IDOT Design Guide, Section 3.13.1, *Temporary Sheet Piling Design* may not be used and a Temporary Soil Retention System (TSRS) should be used for design. The design of a Temporary Soil Retention System (TSRS) is the responsibility of the contractor, and the contractor should submit the TSRS plans to the structural design team for review prior to commencing construction of the TSRS.

5.2 Cofferdams

The Estimated Water Surface Elevation (EWSE) was calculated by Fuhrmann and Associates (Hydraulic Design Engineer) and was based on adjusting the surveyed existing water level elevation per the guidelines in the IDOT Bridge Manual; the EWSE for this project was given as elevation 634.17 feet. Due to the soils encountered in the borings, it is recommended that seal coats be used for cofferdams at both piers. For the construction of both of the piers, IDOT Cofferdam Type 2 should be specified in the plans.

5.3 Foundation Construction

The proposed project will include the demolition of the existing bridge and all its components, excluding the piles supporting the abutments and piers. The existing foundation elements should be completely removed. It is assumed that the existing piles will be abandoned in place. Since the new bridge is to be supported on a deep foundation system, the footing excavations from the demolition activities should be backfilled to the new bearing depth in accordance with IDOT backfill specifications.

The excavation for the new structure may require dewatering, depending on the seasonal fluctuations in the elevation of the water table and the depth of the excavation. Trenching and sump pump procedures may be used for excavations in predominantly cohesive soils and shallow excavations in granular material.

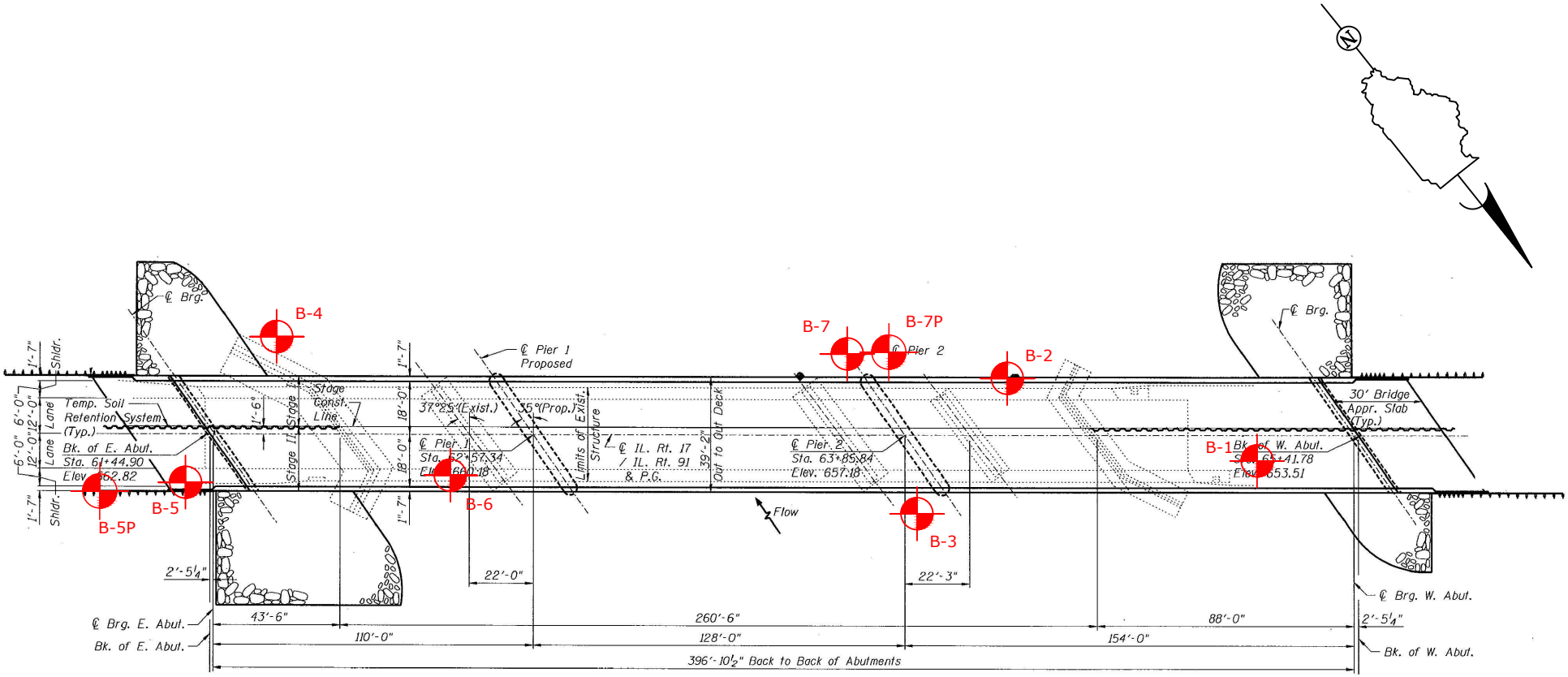
The groundwater is not anticipated to be an issue with the construction of the abutments or embankments, given the proposed elevation above the surrounding area.

6.0 LIMITATIONS

This report has been prepared for the exclusive use of the Illinois Department of Transportation and its structural consultant. The recommendations provided in the report are specific to the project described herein and are based on the information obtained at seven (7) soil boring locations within the proposed bridge area. The analyses have been performed and the recommendations have been provided in this report are based on subsurface conditions determined at the location of the borings. This report may not reflect all variations that may occur between boring locations or at some other time, the nature and extent of which may not become evident until during the time of construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and review the recommendations presented herein.

APPENDIX A

BORING LOCATION PLAN



SOIL BORING

GSG CONSULTANTS, INC.
623 Cooper Court
Schaumburg, Illinois 60173
tel: 630.994.2600 • fax: 312.733.5612

SCALE: N.T.S.	DRAWN BY: CDJ	SOIL BORING LOCATION MAP
	CHECKED BY: JR	IDOT RTE 17 / RTE 91 OVER SPOON RIVER
	DATE: 5/2/14	STARK COUNTY, ILLINOIS PROPOSED STRUCTURE NO: 088-0030

APPENDIX B

SOIL BORING LOGS

- **GSG BORING LOGS**
- **ROCK PROBE BORINGS (2020) BY TERRACON**
- **PREVIOUS BORING LOGS**
  (PROVIDED BY IDOT (1972)) FOR REFERENCE ONLY

GSG BORING LOGS
B-1 through B-5 (2011)

B-6 and B-7 (2014)

TERRACON BORING LOGS
B-5P and B-7P (2020)

Illinois Department of Transportation
Division of Highways
GSG Consultants, Inc.

SOIL BORING LOG

Date 11/28/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** W. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-1
Station 65+07
Offset 13.00ft RT
Ground Surface Elev. 651.93 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 629.9 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Asphalt - 8 inches, Base Course - 6 inches
			1	
650.73				
	3			Brown and Gray, Moist CLAY (Fill), trace sand
	3	2.3	15	
	3	P		
	2			
	2	3.5	25	
-5	3	P		
	3			
645.43				
	4	2.0	27	Black, Moist SANDY LOAM (Fill), trace organics
	5	P		
	5			
	4		31	
-10	4			
640.93				
	4			Dark Brown to Black, Moist SANDY LOAM (Fill) with buried topsoil
	4		16	
	5			
638.43				
	3			Medium Stiff Dark Brown, Moist SANDY CLAY LOAM
	2		15	
-15	3			
	2			
	2	0.5	19	
	2	B		
633.43				
	4			Very Loose to Loose Brown to Gray, Moist to Wet Medium to Coarse SAND
	3		17	
-20	2			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Very Loose to Loose Brown to Gray, Moist to Wet Medium to Coarse SAND *(continued)*
	2			
▼	1		39	
	2			
	2			
	2		21	
-25	3			
625.93				
	1			Very Loose to Loose Gray, Wet SANDY LOAM
	0		22	
	0			
	3			
	3	0.4	26	
-30	5	B		
	3			
	2		21	
-35	4			
	3			
612.93				
	3	0.5	25	
-40	5	B		

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 11/28/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** W. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-1
Station 65+07
Offset 13.00ft RT
Ground Surface Elev. 651.93 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 629.9 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Soft to Medium Stiff Gray, Moist SILTY CLAY LOAM *(continued)*			
	3		
-45	3 5	0.4 B	19
Switched to mud rotary at 45 ft.			
	10		
-50	15 7	0.8 P	14
598.43			
Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel	7		
-55	10 14	3.8 S	13
	10		
-60	11 17	3.0 S	15
Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	7		
-65	10 12	2.9 S	13
	8		
-70	10 14	3.1 S	17
	7		
-75	8 12	3.1 S	15
	6		
-80	10 18	3.2 S	17

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 11/28/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** W. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-1
Station 65+07
Offset 13.00ft RT
Ground Surface Elev. 651.93 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 629.9 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*
	6			
-85	8 12	2.0 S	16	
	6			
-90	8 10	1.7 S	19	
	6			
-95	8 10	1.8 S	20	
553.43				
	3			Loose Gray, Wet Fine SAND
-100	2 3		21	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Loose Gray, Wet Fine SAND *(continued)*
548.93				
	100/4"		10	Extremely Dense Gray, Wet Coarse SAND with gravel
-105				
542.93	100/4"		10	
-110				End of Boring
-115				
-120				

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 11/30/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** W. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-2
Station 64+21
Offset 24.00ft LT
Ground Surface Elev. 639.73 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 629.7 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Dark Brown, Moist
			21	SANDY LOAM with Topsoil
638.73				
	3			Medium Stiff to Stiff
	3	1.8	25	Dark Brown, Moist
	3	P		SANDY CLAY LOAM
	2			
	1	0.5	27	
-5	2	B		
	2			
633.23				
	2		21	Loose
	2			Brown, Moist
				Medium to Coarse SAND
631.23				
	2			Loose
	2		16	Brown, Moist to Wet
▼-10	3			Coarse SAND, with gravel
628.73				
	1			Loose
	1		23	Brown, Wet
	3			Medium to Coarse SAND
626.23				
	8			Medium Dense
	8		11	Brown, Wet
-15	4			Coarse SAND, with gravel
	16			
	16		16	
	5			
621.23				
	6			Loose to Medium Dense
	5		21	Brown to Gray, Wet
-20	8			Fine to Medium SAND

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Loose to Medium Dense
				Brown to Gray, Wet
	14			Fine to Medium SAND *(continued)*
	7		17	
	8			
	4			
	3		17	
-25	2			
613.73				
	4			Medium Stiff to Stiff
	3	0.5	27	Gray, Moist
	3	B		SILTY CLAY LOAM
	2			
	3	1.6	31	
-30	3	S		
				Switched to mud rotary at 30 ft.
605.73				
	3			
	2		14	Very Loose
-35	1			Gray, Wet
				Fine SAND changes to Coarse SAND with gravel
600.73				
	9			
	6	2.9	13	
-40	10	S		

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 11/30/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** W. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-2
Station 64+21
Offset 24.00ft LT
Ground Surface Elev. 639.73 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 629.7 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	5		
-45	8 12	2.7 S	13
	6		
-50	9 11	3.1 S	13
	6		
-55	9 10	2.9 S	14
	7		
-60	10 14	3.3 S	14

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	9		
-65	11 14	3.8 S	12
	6		
-70	9 11	2.7 S	17
	6		
-75	7 10	2.5 S	18
	6		
-80	8 11	1.8 S	17

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 11/30/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** W. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-2
Station 64+21
Offset 24.00ft LT
Ground Surface Elev. 639.73 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 629.7 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*		7		
	-85	7 11	1.9 S	19
551.23				
Extremely Dense Gray, Wet Coarse SAND, with gravel		10 27 110		13
549.73	-90			
End of Boring	-95			
	-100			

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/1/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** Pier 2, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-3
Station 63+90
Offset 24.00ft RT
Ground Surface Elev. 638.43 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 627.4 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Dark Brown, Moist
			21	SANDY LOAM with Topsoil 637.63
	0			Soft to Stiff
	1	2.0	25	Dark Brown, Moist
	3	P		SANDY CLAY LOAM
	1			
	2	0.4	32	
-5	3	B		
	1			
	2	0.4	27	
	3	B		
				629.93
	3			Loose
	3		15	Brown, Moist to Wet
-10	4			Medium to Coarse SAND, trace gravel
				627.43 ▼
	2			Very Loose to Medium Dense
	1		16	Brown, Wet
	1			Coarse SAND, with gravel
	2			
	5		17	
-15	6			
	0			
	12		13	
	6			
	2			
	1		17	
-20	1			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Very Loose to Medium Dense
				Brown, Wet
	9			Coarse SAND, with gravel
				(continued)
				616.43
	12	0.6	14	Medium Stiff
	14	B		Gray, Moist
				SILTY CLAY LOAM
	2			
	2	1.3	24	
-25	3	S		
				612.43
	2			Medium Dense
	3		20	Gray, Wet
	9			SANDY LOAM, trace gravel
	6			
	6		15	
-30	10			
				Switched to mud rotary at 30 ft.
				604.93
	24			Dense
	23		7	Gray, Wet
-35	21			Coarse SAND, with gravel
				599.93
	7			Stiff to Very Stiff
	9	3.2	13	Gray, Moist
-40	13	S		CLAY LOAM, trace gravel

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/1/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** Pier 2, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-3
Station 63+90
Offset 24.00ft RT
Ground Surface Elev. 638.43 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 627.4 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*
	10			
-45	9 12	3.8 S	13	
	7			
-50	9 12	3.9 S	13	
	7			
-55	11 14	3.0 P	16	
	8			
-60	11 15	3.2 S	14	
	8			Stiff to Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*
573.43 -65	10 14	3.3 S	16	
-70				End of Boring
-75				
-80				

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/2/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** E. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-4
Station 61+69
Offset 31.00ft LT
Ground Surface Elev. 659.25 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 633.3 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				Dark Brown, Moist
658.75				CLAY (Fill) with Topsoil
			21	
	5			Dark Brown, Moist
	4	1.5	19	SANDY CLAY (Fill), trace gravel
	5	P		
	4			
	4	2.5	21	
-5	5	P		
653.25				
	3			Stiff
	2	1.5	24	Dark Brown to Black, Moist
	3	P		CLAY (Possible Buried Topsoil),
651.75				trace organics
	2			Stiff
	2	1.3	24	Dark Brown, Moist
-10	3	P		CLAY, trace sand
647.75				
	1		17	Very Loose to Medium Dense
	2			Brown, Moist to Wet
				Fine SAND
	2			
	1		12	
-15	2			
	4			
	5		5	
	6			
	7			
	7		5	
-20	6			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				Very Loose to Medium Dense
				Brown, Moist to Wet
				Fine SAND *(continued)*
	3			
	4		5	
	7			
	3			
	4		5	
-25	4			
▼				
	2			
	1		30	
	2			
	4			
	4		28	
-30	6			
	11			
	4		23	
-35	5			
	3			
619.75				
	4	1.8	14	
-40	5	P		

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/2/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** E. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-4
Station 61+69
Offset 31.00ft LT
Ground Surface Elev. 659.25 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 633.3 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*				Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	8				9		
Noted thin layer of gravelly sand at 44 ft.	14 8	2.4 S	15	-65	12 18	3.9 S	14
	8				11		
-50	11 14	3.3 S	14	-70	14 20	4.5 S	14
Switched to mud rotary at 50 ft.							
	10				10		
-55	13 17	4.8 S	12	-75	20 24	4.2 S	14
	9				7		
-60	12 18	4.2 S	14	-80	9 13	3.0 S	18

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/2/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** E. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-4
Station 61+69
Offset 31.00ft LT
Ground Surface Elev. 659.25 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 633.3 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	9		
-85	9 12	2.5 S	17
	4		
-90	6 9	2.1 S	19
	7		
-95	8 10	1.9 S	19
	6		
-100	8 10	1.9 S	18

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	7		
554.25 -105	9 11	1.6 S	16
End of Boring			
-110			
-115			
-120			

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/5/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** E. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-5
Station 61+37
Offset 37.00ft RT
Ground Surface Elev. 661.77 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 633.8 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Dark Brown, Moist CLAY, with topsoil				
660.77				26
Stiff to Very Stiff Brown, Moist CLAY, trace sand		3		
		3	2.3	27
		6	S	
		3		
		3	1.9	27
	-5	3	S	
655.77				
Medium Stiff Brown, Moist SANDY CLAY		2		
		2	0.8	28
		3	B	
653.27				
Loose Brown, Moist SANDY LOAM		2		
		3		13
	-10	2		
650.27		2		
Loose to Medium Dense Brown, Moist to Wet Fine to Medium SAND		2		17
		2		
		5		
		6		7
	-15	10		
		5		
		6		4
		7		
		4		
		6		4
	-20	7		

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Loose to Medium Dense Brown, Moist to Wet Fine to Medium SAND *(continued)*				
		5		
		5		2
		6		
		4		
		4		3
	-25	6		
		5		
		5		13
		5		
▼				
		3		
		3		26
	-30	5		
		5		
		7		18
	-35	7		
		12		
622.27				
		7	2.8	14
	-40	7	S	

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/5/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** E. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-5
Station 61+37
Offset 37.00ft RT
Ground Surface Elev. 661.77 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 633.8 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*		
	7		
-45	9 12	2.8 S	13
	8		
-50	11 13	3.5 S	12
	4		
-55	8 11	2.7 S	12
	5		
-60	6 9	3.3 S	13
	Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*		
	7		
-65	9 12	2.8 S	12
	7		
-70	9 11	3.2 S	12
	Switched to mud rotary at 70 ft.		
	6		
-75	10 13	3.3 S	13
	Noted thin layer of gravelly sand at 78 ft.		
	582.77		
	7		
-80	6 10	2.3 S	16

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 12/5/11

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** KSC

SECTION (11B) BR-1 **LOCATION** E. Abut, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude , **Longitude**

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

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-5
Station 61+37
Offset 37.00ft RT
Ground Surface Elev. 661.77 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 633.8 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Gray, Moist CLAY LOAM, with gravel *(continued)*				
		12		
		13 16	3.5 P	18
576.77	-85			
Very Stiff Gray, Moist CLAY LOAM, trace gravel				
		12		
		11 15	2.7 S	17
	-90			
		8		
		9 11	2.5 S	18
566.77	-95			
End of Boring				
	-100			

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 4/9/14

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** JJR

SECTION (11B) BR-1 **LOCATION** Pier 1, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude 41.062913, **Longitude** 89.795191

COUNTY Stark **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-6
Station 62+29
Offset 11.00ft RT
Ground Surface Elev. 640.85 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 634.9 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Loose to Medium Dense Dark Brown, Moist SANDY LOAM
	4			
	8		16	
	6			
	2			
636.35				
-5	3		18	Loose Brown, Moist SAND
	3			
634.85 ▼				
	2			Medium Dense Brown, Moist SANDY LOAM
	3		23	
	3			
631.85				
	1			Medium Dense Brown, Moist SAND
-10	4		22	
	7			
	4			
	6		18	
	9			
626.85				
	6			Medium Dense Brown, Moist SANDY LOAM
-15	7		20	
	7			
	6		27	
623.85				
	5			Stiff Gray, Moist SILTY CLAY LOAM
	2			
	2	1.5	28	
-20	2	P		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Stiff Gray, Moist SILTY CLAY LOAM *(continued)*
	1			
	2	1.5	28	
	3	P		
	2			
	2	1.5	33	
-25	3	P		
	3			
	3	1.5	25	
	5	P		
612.35				
	16			Very Stiff to Hard Gray, Moist CLAY LOAM, trace gravel
	9	5.0	13	
-30	13	B		
	36			
	15	3.0	23	
-35	20	P		
	9			
	10	4.0	22	
-40	16	P		

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 4/9/14

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** JJR

SECTION (11B) BR-1 **LOCATION** Pier 1, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude 41.062913, **Longitude** 89.795191

COUNTY Stark **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-6
Station 62+29
Offset 11.00ft RT
Ground Surface Elev. 640.85 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 634.9 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	7		
-45	9 14	4.0 P	22
	6		
-50	9 12	3.5 B	14
	7		
-55	8 10	3.1 B	14
	7		
-60	12 23	3.5 B	13

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*			
	8		
-65	10 15	3.1 B	14
	4		
-70	7 9	3.1 B	15
	5		
-75	6 8	2.1 B	15
	5		
-80	7 11	2.1 B	17

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 4/9/14

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** JJR

SECTION (11B) BR-1 **LOCATION** Pier 1, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude 41.062913, **Longitude** 89.795191

COUNTY Stark **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-6
Station 62+29
Offset 11.00ft RT
Ground Surface Elev. 640.85 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 634.9 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray, Moist CLAY LOAM, trace gravel *(continued)*				
		6		
		7 10	2.5 B	18
	-85			
		8		
		7 10	3.1 B	17
550.85	-90			
End of Boring				
	-95			
	-100			

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 4/8/14

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** JJR

SECTION (11B) BR-1 **LOCATION** Pier 2, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude 41.063064, **Longitude** 89.795678

COUNTY Stark **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-7
Station 63+66
Offset 26.00ft LT
Ground Surface Elev. 639.00 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 632.0 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				24" Topsoil
	5			
637.00	5 5		26	
				Loose to Medium Dense Brown and Gray, Moist SANDY LOAM
	6			
-5	7 8		19	
	2			
632.00 ▼	2 2		22	
				Loose Gray, Moist SAND
	2			
-10	3 4		13	
628.00				
	4			Loose to Medium Dense Gray, Moist SAND, w/ gravel
	3 3		15	
625.00	7			
-15	7 7		21	Medium Dense Gray, Moist SAND
	6			
	6 9		23	
	7			
-20	9 10		24	
				Medium Dense Gray, Moist SAND *(continued)*
	7			
617.00	6 4		30	
				Stiff Gray, Moist SILTY CLAY LOAM
	3			
-25	4 4	1.5 P	29	
612.50	2			
	3 4	2.1 B	31	Very Stiff Gray, Moist CLAY
	7			
-30	5 5	2.5 B	15	
607.00				
				Medium Dense Gray, Moist SAND, w/ gravel
	24			
604.00 -35	17 8		9	
				Very Stiff Gray, Moist CLAY LOAM, trace gravel
	5			
-40	9 11	2.5 B	12	

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 4/8/14

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** JJR

SECTION (11B) BR-1 **LOCATION** Pier 2, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude 41.063064, **Longitude** 89.795678

COUNTY Stark **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-7
Station 63+66
Offset 26.00ft LT
Ground Surface Elev. 639.00 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 632.0 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*				Very Stiff Gray, Moist CLAY LOAM, trace gravel			
	7				8		
-45	10 12	3.1 B	11	-65	10 14	2.0 P	21
	6				10		
-50	9 13	3.0 P	15	-70	7 10	2.5 B	17
	9				5		
584.00 -55	11 14	3.0 P	17	-75	8 10	3.1 B	17
Loose Gray, Moist SAND, w/ gravel							
	3				4		
579.00 -60	2 3		16	-80	6 8	2.5 B	17

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
GSG Consultants, Inc.

SOIL BORING LOG

Date 4/8/14

ROUTE F.A Route 643 (S.B.I-30) **DESCRIPTION** IL Rt. 17/IL Rt. 91 over Spoon River **LOGGED BY** JJR

SECTION (11B) BR-1 **LOCATION** Pier 2, **SEC.** 34, **TWP.** 13N, **RNG.** 6E,
Latitude 41.063064, **Longitude** 89.795678

COUNTY Stark **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 088-0030
Station 63+00

BORING NO. B-7
Station 63+66
Offset 26.00ft LT
Ground Surface Elev. 639.00 ft

Surface Water Elev. 631.45 ft
Stream Bed Elev. 630.75 ft

Groundwater Elev.:
First Encounter 632.0 ft ▼
Upon Completion NA ft
After - **Hrs.** - ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Gray, Moist CLAY LOAM, trace gravel *(continued)*				
		5		
		6 9	2.5 B	18
	-85			
		7		
		11 10	3.1 B	18
549.00	-90			
End of Boring				
	-95			
	-100			

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 12/9/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 46" N, **Longitude** 89d 47' 42" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-5P
Station 61+07
Offset 34.0 ft RT
Ground Surface Elev. 661.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 80 feet. See B-5 boring log by GSG dated 12/5/11 for subsuface conditions from 0 to 80 feet.			
-5			
-10			
-15			
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 80 feet. See B-5 boring log by GSG dated 12/5/11 for subsuface conditions from 0 to 80 feet. *(continued)*			
-25			
-30			
-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
Division of Highways
IDOT

SOIL BORING LOG

Date 12/9/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 46" N, **Longitude** 89d 47' 42" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-5P
Station 61+07
Offset 34.0 ft RT
Ground Surface Elev. 661.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 80 feet. See B-5 boring log by GSG dated 12/5/11 for subsuface conditions from 0 to 80 feet. *(continued)*	-45			
	-50			
	-55			
	-60			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 80 feet. See B-5 boring log by GSG dated 12/5/11 for subsuface conditions from 0 to 80 feet. *(continued)*	-65			
	-70			
	-75			
581.00	-80			

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 12/9/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 46" N, **Longitude** 89d 47' 42" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-5P
Station 61+07
Offset 34.0 ft RT
Ground Surface Elev. 661.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	13			GRAVELLY SANDY CLAY LOAM, with sand seams and pea gravel, gray, very stiff to hard
	24		10	
-85	33			
574.25				
	7			CLAY LOAM, trace sand and gravel, gray, stiff to very stiff
	9	2.3	16	
-90	14	B		
	7			
	9	1.5	17	
-95	12	B		
	5			
	8	1.3	18	
-100	11	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			CLAY LOAM, trace sand and gravel, gray, stiff to very stiff *(continued)*
	6	1.3	17	
-105	9	P		
554.25				
	10			CLAY LOAM, with sand seams, gray, stiff to very stiff
	26	3.0	18	
-110	25	B		
	50		12	
-115				
545.50				
				CLAYEY SHALE, greenish gray
-120				

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 12/9/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 46" N, **Longitude** 89d 47' 42" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-5P
Station 61+07
Offset 34.0 ft RT
Ground Surface Elev. 661.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAYEY SHALE, greenish gray *(continued)*		13		
		50		13
537.50				
HIGHLY WEATHERED SHALE, with clay seams, gray				
536.30				
	-125	50		12
End of Boring				
	-130			
	-135			
	-140			

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 12/10/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 47" N, **Longitude** 89d 47' 44" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-7P
Station 63+80
Offset 25.0 ft LT
Ground Surface Elev. 641.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 554.0 ft ▼
Upon Completion Artesian ft
After ____ **Hrs.** see notes ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 83.5 feet. See B-7 boring log by GSG dated 4/8/14 for subsuface conditions from 0 to 80 feet.			
-5			
-10			
-15			
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 83.5 feet. See B-7 boring log by GSG dated 4/8/14 for subsuface conditions from 0 to 80 feet. *(continued)*			
-25			
-30			
-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
Division of Highways
IDOT

SOIL BORING LOG

Date 12/10/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 47" N, **Longitude** 89d 47' 44" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-7P
Station 63+80
Offset 25.0 ft LT
Ground Surface Elev. 641.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 554.0 ft ▼
Upon Completion Artesian ft
After ____ **Hrs.** see notes ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 83.5 feet. See B-7 boring log by GSG dated 4/8/14 for subsuface conditions from 0 to 80 feet. *(continued)*	-45			
	-50			
	-55			
	-60			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 83.5 feet. See B-7 boring log by GSG dated 4/8/14 for subsuface conditions from 0 to 80 feet. *(continued)*	-65			
	-70			
	-75			
	-80			

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 12/10/20

ROUTE FAP 643 (IL 17/91) **DESCRIPTION** Rock probe boring **LOGGED BY** MRK(Terracon)

SECTION (11B)(BR-1) **LOCATION** SE 1/4, **SEC.** 34, **TWP.** 13N, **RNG.** 6E, 4th **PM**,
Latitude 41d 03' 47" N, **Longitude** 89d 47' 44" W

COUNTY Stark **DRILLING METHOD** HSA to 40' then mud rotarry **HAMMER TYPE** AUTO

STRUCT. NO. 088-0002 (EX) 088-0030 (PR)
Station 63+00 (EX), 63+44 (PR)

BORING NO. B-7P
Station 63+80
Offset 25.0 ft LT
Ground Surface Elev. 641.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

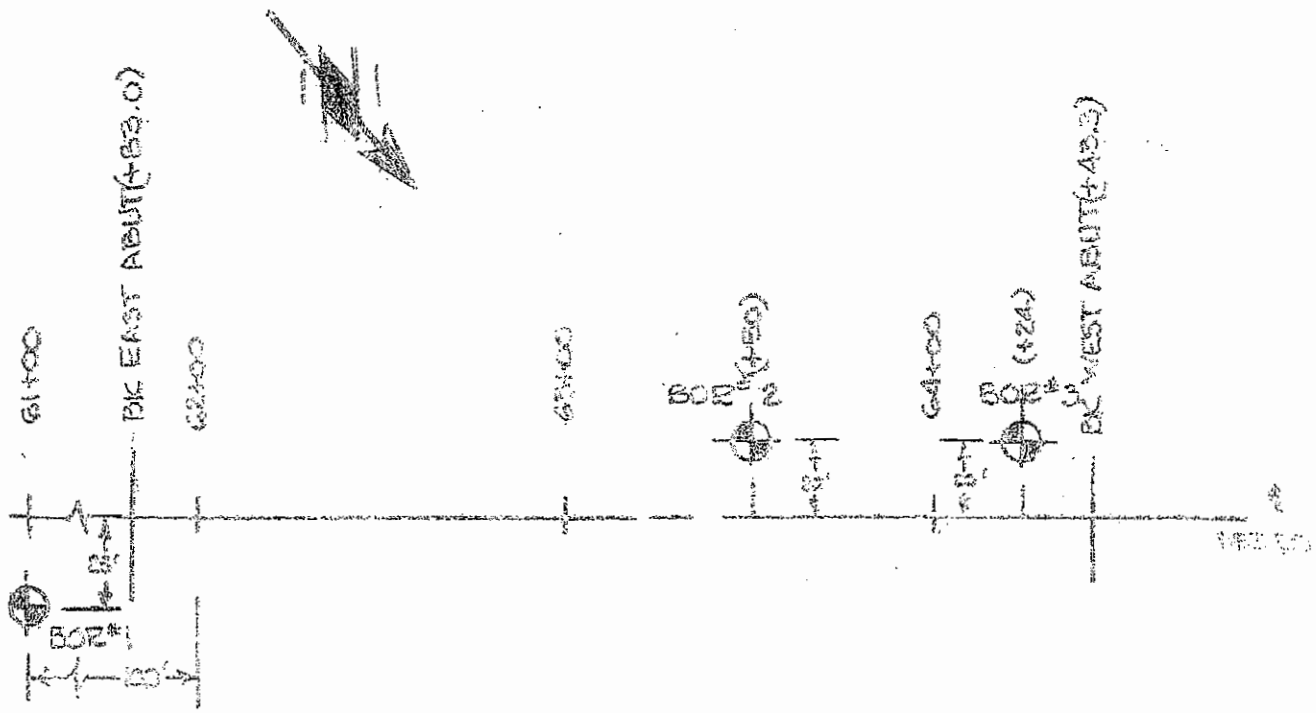
Groundwater Elev.:
First Encounter 554.0 ft ▼
Upon Completion Artesian ft
After Hrs. see notes ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Blind drilled to 83.5 feet. See B-7 boring log by GSG dated 4/8/14 for subsuface conditions from 0 to 80 feet. *(continued)*			
557.50			
CLAY LOAM, gray, medium stiff to stiff	4		
	6	0.5	18
-85	9	B	
Driller's Note: At about 87', driller reported a sudden change in fluid pressure but was able to continue drilling to 91' and run SPT. Soon after, artesian groundwater flowed up to the surface and sprayed out of the hollow stem auger. ▼			
551.00 -90			
HIGHLY WEATHERED SHALE			
	50		
Driller's Note: At 91.5', apparent coal pieces were observed in the drilling mud tank.			
-95			
545.00			
End of Boring			
-100			

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)

PREVIOUS BORING LOGS
(PROVIDED BY IDOT (1972))
FOR REFERENCE ONLY

BORING LOCATION SKETCH



LOCATION: SE¼ SEC 34, T12N, R6E, 4PM

ROUTE: SBI 30
SECTION: 11BR
COUNTY: STARK

(ILLINOIS RTE. 17 OVER SPOON RIVER)

BL Wright

OJECT

UTE SBI 30

11 BR

UNTY Stark

Boring No. 1

Station 61+00

Offset 23' RT ℄

BRIDGE ILL. ROUTE 17

OVER SPOON RIVER

STA.

Date 6-6 & 12-72

Bored By D. L. Nafziger

Checked By R. E. Dalton

Surface Water El. ____

Groundwater El. at Completion ____

After ____ Hours ____

Elevation	N	Qu t/s.f.	w (%)
nd Surface 107.5			
0			
BROWN AND GRAY MOIST SICL			
	11	2.1 S	25
-5			
102.0	15	1.1 B	24
LT BROWN MOIST SICLLM			
99.50	9	0.4 B	18
BROWN MOIST SANDY LOAM			
-10			
97.0	14	-	18
LT. BROWN DAMP FINE SAND			
	28	-	11
-15			
	20	-	-
	23	-	5
-20			
	24	-	-

Elevation	N	Qu t/s.f.	w (%)
84.50	19	-	-
LT. BROWN WET SILM TR. SAND			
-25			
82.0	10	0.4 B	24
LT. BROWN WET FINE SAND			
	19	-	24
-30			
	20	-	-
	26	-	-
-35			
	26	-	19
	18	-	-
-40			
67.0	17	-	-

Continued Sheet #2

Continued Next Column

Standard Penetration Test – number of blows per foot to drive 2" O.D. Split Spoon Sampler 12" with hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

OJECT

UTE SBI 30
11 BR

UNTY Stark

Boring No. 1
Station 61+00
Offset 23'RT ℄

BRIDGE ILL. ROUTE 17
OVER SPOON RIVER
STA.

Date 6-6 & 12-72
Bored By D. L. Nafziger
Checked By R. E. Dalton

Surface Water El.
Groundwater El. at Completion
After ___ Hours

Elevation	N	Qu t/s.f.	w (%)
nd Surface			
-40	0		
67.0			
LT. GRAY DAMP CILM TR. SAND & GRAVEL			
	18	3.7 B	13
-45	13	4.1 B	13
	44	-	-
-50	18	3.3 B	11
	26		
	22	-	-
-55	31	-	12
	42	-	-
-60	50	-	-
47.0			
END OF BORING			

Elevation	N	Qu t/s.f.	(%) w
-65	25		
-70	30		
-75	35		
-80	42		
-85	45		

andard Penetration Test – per foot to drive 2" Split Spoon Sampler 12" with hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

PROJECT

ROUTE SBI 30

SEC. 11 BR

COUNTY STARK

Boring No. 2

Station 63+50

Offset 20'LT ℄

BRIDGE ILLINOIS ROUTE 17 OVER SPOON RIVER

STA.

Date 6/6/72

Bored By R. L. Irwin

Checked By R. E. Dalton

Surface Water El. —

Groundwater El. at Completion —

After — Hours —

Elevation	N	Qu t/s.f.	w (%)
Ground Surface 87.8 (0)			
DARK BROWN DAMP SANDY LOAM			
84.8	4	0.5 E	-
DARK BROWN MOIST LOAM			
(-5)	5	0.6 S	19
79.8	3	0.4 S	22
BROWN WET COARSE SAND			
(-10) 77.3	6	-	15
GRAY WET LOAM			
74.8	3	0.5 B	19
GRAY WET COARSE SAND			
(-15)	12	-	24
69.8	8	-	-
GRAY WET FINE SAND			
(-20)	15	-	23

Elevation	N	Qu t/s.f.	w (%)
64.8	21	-	-
GRAY WET SILM			
(-25) 62.3	10	0.4 B	28
GRAY WET SICL			
59.8	7	1.2 B	30
GRAY MOIST CLAY			
(-30) 57.3	9	1.7 S	30
GRAY WET SILM			
	3	-	-
(-35) 52.3	6	0.5 B	26
GRAY WET SAND & GRAVEL			
49.8	48	-	8
GRAY MOIST CLAY LOAM			
(-40) 47.3	35	-	-
CONTINUED ON SHEET 3			
(-45)			

Standard Penetration Test – number of blows per foot to drive 2" O.D. Split Spoon Sampler 12" with hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value

Foundation Boring Log

PROJECT

ROUTE SBI 30

SEC. 11 BR

COUNTY STARK

Boring No. 2

Station 63+50

Offset 20' LT ℄

BRIDGE ILLINOIS ROUTE 17 OVER SPOON RIVER

STA.

Date 6/6/72

Bored By R. L. Irwin

Checked By R. E. Dalton

Surface Water El.

Groundwater El. at Completion

After ___ Hours

Elevation	N	Qu t/s.f.	w (%)
Ground Surface			
-40			
47.3			
GRAY MOIST CLAY LOAM			
	51	2.1 E	-
-45	32	2.1 B	12
END OF BORING			
	30	2.0 B	-
-50	24	1.9 B	13
	33	2.1 B	-
-55	31	2.5 B	12
	25	2.4 E	-
-60	25	2.3 E	-
-65	28	2.3 B	-
	30	3.1 B	15
19.8	27	2.3 E	15
-70			
-75			
-80			
-85			

Standard Penetration Test – # per foot to drive 2" Split Spoon Sample 12" with hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

PROJECT _____ BRIDGE ILLINOIS ROUTE 17 Date 6-23-72

ROUTE SBI 30 OVER SPOON RIVER Bored By D. L. Nefzger

SEC. 11 BR STA. _____ Checked By R. E. Dalton

COUNTY Stark

Boring No. 3
Station 64+21
Offset 20' LT ℄

Surface Water El. _____
Groundwater El. at Completion 8.5'
After ____ Hours _____

Elevation	N	Qu t/s.f.	w (%)
Ground Surface 89.0			
0			
DK. BR. DAMP SANDY LOAM			
86.0	6	-	-
DK. BR. MOIST LOAM			
-5	5	0.7 B	25
81.0	2	0.4 B	25
BR. WET SAND/SANDY LOAM			
78.5 -10	4	-	23
BR/GR. WET SAND			
	4	-	18
73.5 -15	5	-	-
GRAY-WET FINE SAND			
	8	-	-
-20	21	-	21
CONTINUED NEXT COLUMN			

Elevation	N	Qu t/s.f.
GRAY-WET FINE SAND		
	25	-
-25	14	-
	5	-
-30	9	-
56.0	8	-
GRAY-WET SAND		
-35		
53.5	10	-
GRAY WET SANDY LOAM		
	15	-
49.0 -40		
CONTINUED NEXT SHEET		
-45		

N – Standard Penetration Test – Blows per foot to drive 2" O.D. Split Spoon Sampler 12" with 140# hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value

PROJECT

ROUTE SBI 20

SEC. 11 BR

COUNTY Stark

Boring No. 3

Station 6+24

Offset 20' LT ℄

BRIDGE ILLINOIS ROUTE 17 OVER SPOON RIVER

STA.

Date 6-23-72

Bored By D. L. Nafziger

Checked By R. E. Dalton

Surface Water El.

Groundwater El. at Completion

After ___ Hours

Elevation	N	Qu t/s.f.	w (%)
Ground Surface			
-40	20	3.7 B	18
49.0			
0			
GRAY-DAMP/MOIST CLAY			
	25	3.7 B	-
-45			
-5	25	3.1 B	13
	20	-	-
-50			
-10	18	2.7 S	13
	24	2.9 S	12
-55			
-15	28	-	-
33.5			
GRAY/BROWN MOIST CLAY			
	23	3.9 B	12
-60			
-20	27	3.9 B	14
28.5			
END OF BORING			

Elevation	N	Qu t/s.f.
-65		
-25		
-70		
-30		
-75		
-35		
-80		
-40		
-85		
-45		

N – Standard Penetration Test – Blows per foot to drive 2" O.D. Split Spoon Sampler 12" with 140# hammer falling 30".

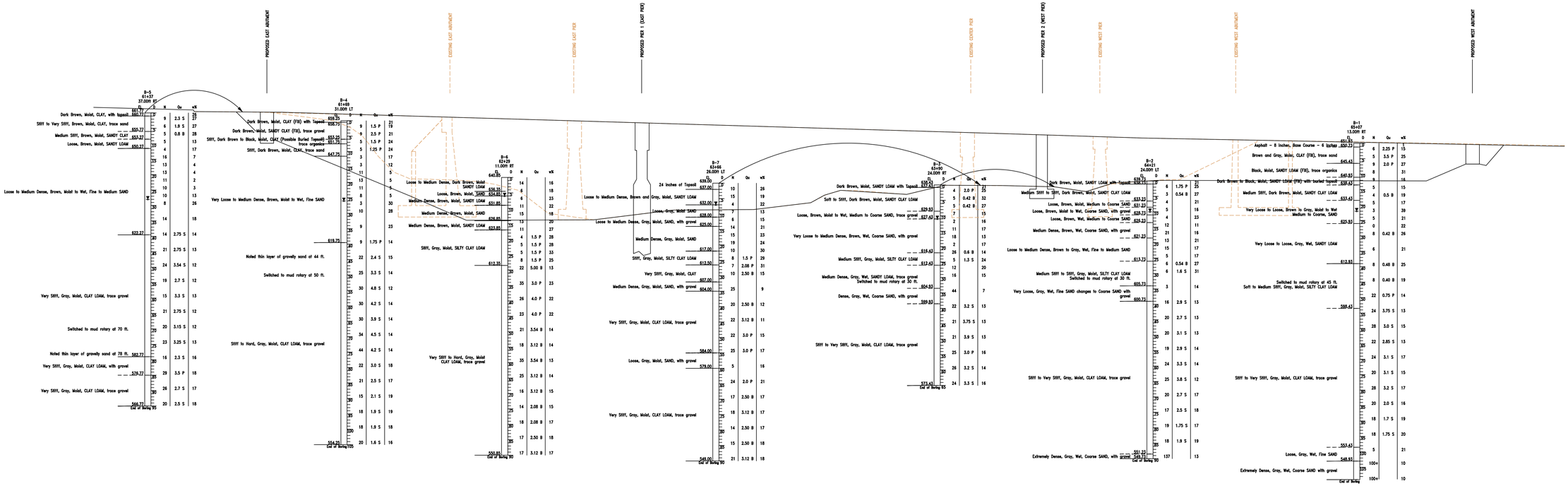
Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value

APPENDIX C

SUBSURFACE PROFILES



LEGEND

EL = Elevation (ft)
D = Depth Below Existing Ground Surface (ft)
N = SPT N-VALUE (AASHTO T206)
Qu = Unconfined Compressive Strength in tons per sq. ft. (tsf)
Failure Mode (B = bulge, S = shear, P = penetrometer)
w% = Moisture Content Percentage
▼ = Groundwater Level First Encountered
▽ = Groundwater Level After Boring Completion
WH = Weight of Hammer

Soil profile is for illustrative purposes only. Actual conditions will vary.

REVISIONS

NUMBER	BY	DATE

IDOT IL17/IL 91 OVER SPOON RIVER
STARK COUNTY, ILLINOIS

SOIL PROFILE

GSG CONSULTANTS, INC.
623 Cooper Court
Schaumburg, Illinois 60173
tel: 630.994.2600 • fax: 312.733.5612

DESIGN BY: CDJ

DRAWN BY: CDJ

CHECKED BY: JR

SCALE: NTS

DATE: 5/7/14

PROJECT NO:

SHEET: 1 of 1

APPENDIX D

TYPE SIZE AND LOCATION PLAN

Bench Mark: Chiseled square at NW corner of the curb at Sta.64+85.51, Rt. 16.23 ft., Elev. 652.77.

Existing Structure: S.N. 088-0002 built in 1924 as Route 30, Section 11A,B&C. The main span consisted of two through steel trusses with concrete deck. The outer three spans consisted of reinforced concrete t-beams. The substructure consisted of closed abutments and solid wall type piers, supported on 12" dia. untreated timber piles.
In 1984 the bridge was reconstructed as F.A. Route 643(S.B.I.-30). The work included replacement of the main span with five composite steel plate girders. The outer three spans 1, 3&4 were replaced with 21"x36" pre-cast deck beams. Approach slabs are constructed with pre-cast concrete slabs. The deck was widened to 33'-0" with a total length of 256'-10". The structure is to be removed and replaced. Two stage construction will be used to maintain traffic.
No salvage.

APPROVED

JAN 28 2020

AS A BASIS FOR
PREPARATION OF DETAILED PLANS

HIGHWAY CLASSIFICATION

F.A.P. Rte. 643 - IL. Rte. 17/IL. RT. 91
Functional Class: Minor Arterial (Rural)
ADT: 1950 (2017); 2380 (2037)
ADTT: 230; (2017), 280 (2037)
DHV: 215
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

LOADING HL-93

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

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications 8th Edition

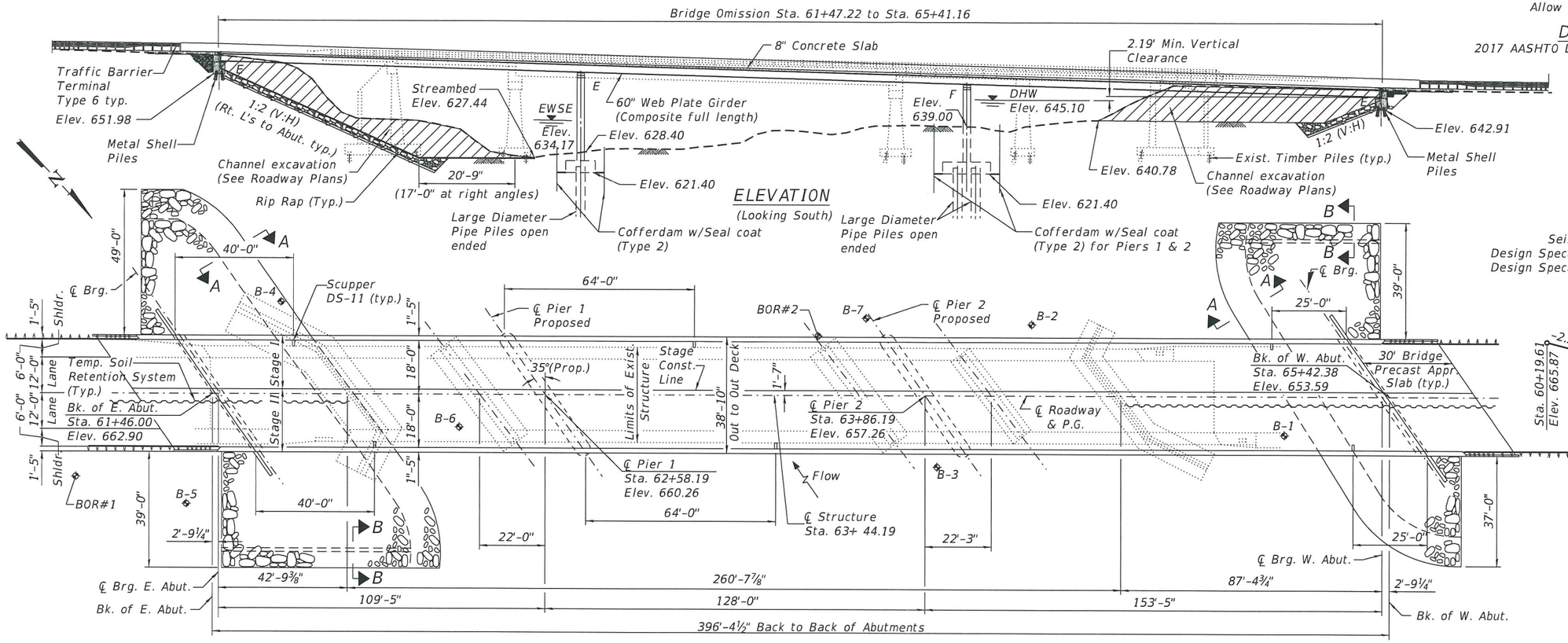
DESIGN STRESSES

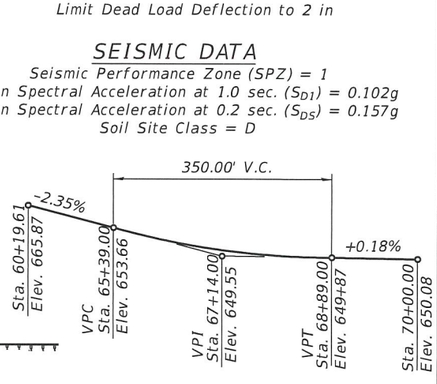
FIELD UNITS

f'c = 4,000 psi (Superstructure)
f'c = 3,500 psi (Substructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)
All Structural Steel shall be Galvanized
Limit Dead Load Deflection to 2 in

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (S_{D1}) = 0.102g
Design Spectral Acceleration at 0.2 sec. (S_{DS}) = 0.157g
Soil Site Class = D



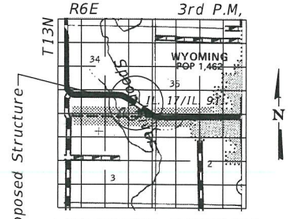


PROFILE GRADE

(Along ℄ of IL Rt. 17/IL Rt. 91)

LEGEND

- ◆ B-1 - 2011 & 2014 Soil Borings
- ◆ BOR#1 - 1972 Soil Borings



LOCATION SKETCH

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevation (ft.)					
Event Limit State	E. Abut.	Pier 1	Pier 2	W. Abut.	Item 113
Q100	651.98	606.8	597.7	642.91	5
Q200	651.98	605.3	596.2	642.91	
Design	651.98	606.8	597.7	642.91	
Check	651.98	605.3	596.2	642.91	

WATERWAY INFORMATION TABLE

Drainage Area = 198 sq. mi.
Existing Overtopping Elev. = 649.65 @ Sta. 68+50
Proposed Overtopping Elev. = 649.86 @ Sta. 68+50

Flood Event	Freq. Yr.	Discharge Cu.Ft./Sec.	Waterway Opening-Sq. Ft. Exist.	Waterway Opening-Sq. Ft. Prop.	Natural H.W.E. Ft.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Ft. Exist.	Headwater El. Ft. Prop.
	10	8,980	1,818	2,560	643.8	1.6	1.3	645.4	645.1
Design	50	13,800	2,070	2,933	645.1	2.5	1.9	647.6	647.0
Base	100	15,900	2,169	3,080	645.6	2.9	2.2	648.5	647.8
Scour Design Check	200	18,035	2,262	3,220	646.1	3.2	2.4	649.3	648.5
Overtopping Exist.	250	18,814	2,296	N/A	646.3	3.4	N/A	649.7	N/A
Overtopping Prop.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max. Calc.	500	21,110	2,363	3,372	646.7	3.8	2.8	650.5	649.5

GENERAL PLAN & ELEVATION
IL. RT. 17 / IL. RT. 91
OVER SPOON RIVER
F.A.P. 643 - SEC. 11B (BR-1)
STARK COUNTY
STATION 63+44.19
STRUCTURE NO. 088-0030

The Upchurch Group
architects engineers surveyors
Professional Design Firm Corporation License No. 184-003401
123 North 15th Street Mattoon, IL 61938 Phone: 217.235.3177
e-mail: upchurchgroup@upchurchgroup.com

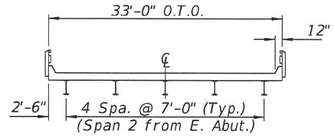
USER NAME = Sta34	DESIGNED RAS	REVISED For BBS Review - 6/18/18
	CHECKED RCS	REVISED For BBS Review - 02/21/19
PLOT SCALE = 40:0.2000 ':' / in.	DRAWN HE	REVISED By TUG - 11/1/19
PLOT DATE = 1/6/2020	CHECKED DNB	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 4 SHEETS

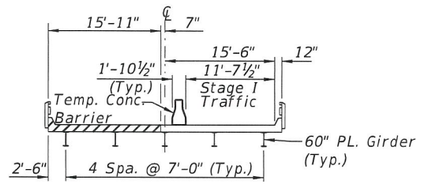
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
643	11B (BR-1)	STARK		
		ILLINOIS	FED. AID PROJECT	

FILE NAME = P:\Civil_IDOT_DISTRICT8 191-088 var PH I-II 31190449\WD 3 PH II IL 17 IL 91 over Spoon River 31190449\CAD Sheets\TSL1-088088.dgn



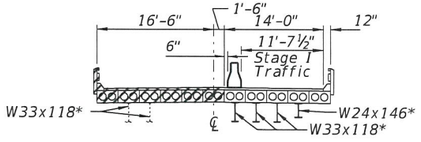
EXISTING STRUCTURE - SPAN 2

(Looking West)



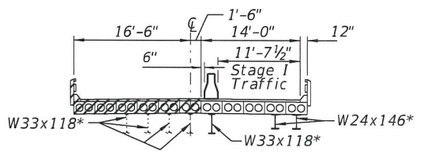
STAGE I REMOVAL - EXISTING SPAN 2

3 Beams to Remain for Stage 1 Traffic



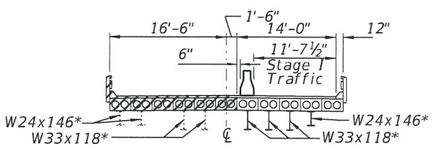
STAGE I REMOVAL - EXISTING SPAN 1

(Looking West)



STAGE I REMOVAL - EXISTING SPAN 3

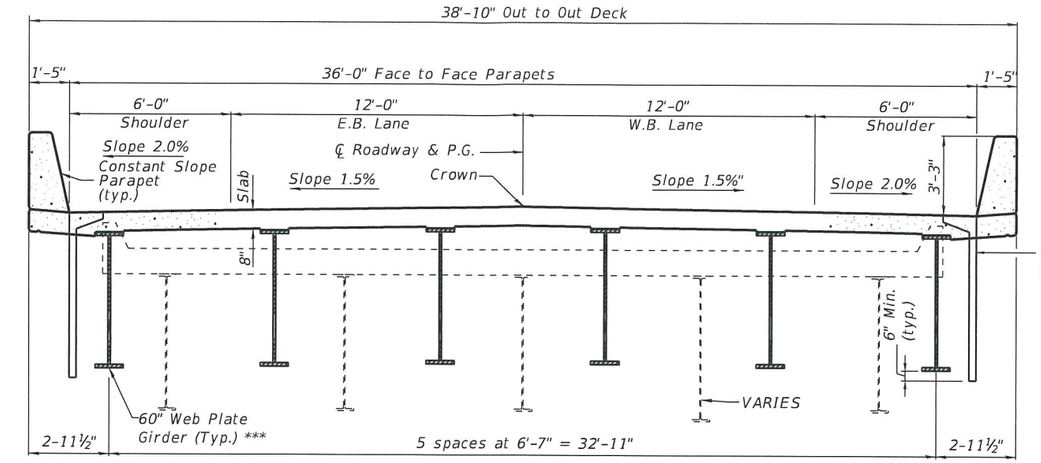
(Looking West)



STAGE I REMOVAL - EXISTING SPAN 4

(Looking West)

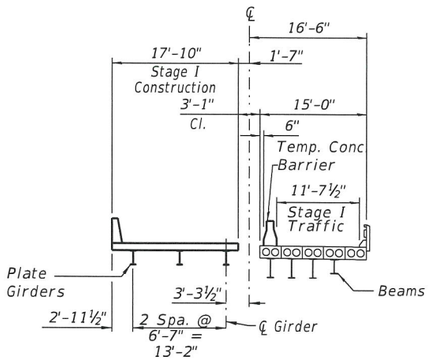
* Existing Temporary Support Beams



CROSS SECTION

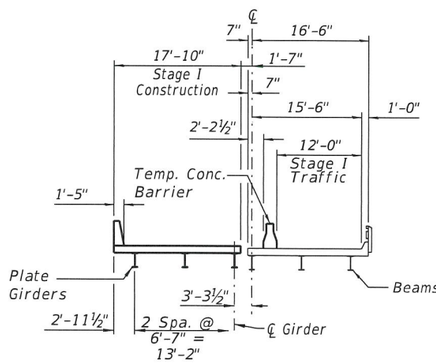
(Looking West)

***Composite full length. All Structural Steel shall be Galvanized



STAGE I CONSTRUCTION - EXISTING SPANS 1, 3 & 4

(Looking West)

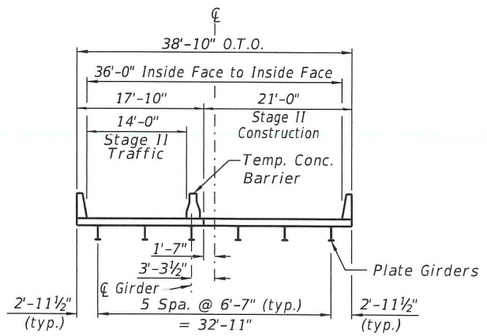


STAGE I CONSTRUCTION - EXISTING SPAN 2

(Looking West)

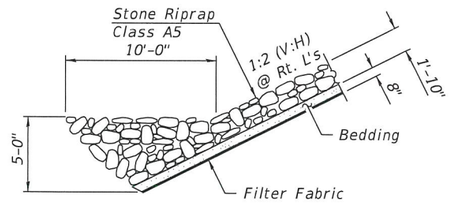
STAGE II REMOVAL - EXISTING SPANS 1, 3 & 4

(Looking West)

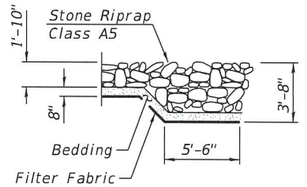


STAGE II CONSTRUCTION

(Looking West)



SECTION A-A



SECTION B-B

APPROVED

JAN 28 2020

AS A BASIS FOR PREPARATION OF DETAILED PLANS

SECTIONS & DETAILS
IL. RT. 17 / IL. RT. 91
OVER SPOON RIVER
F.A.P. 643 - SEC. 11B (BR-1)
STARK COUNTY
STATION 63+44.19
STRUCTURE NO. 088-0030

FILE NAME = P:\Civil_IDOT_DIST4\PTB 191-008 var PH I-II 31?0849\WD 3 PH II IL 17 IL 91 over Spoon River 3170849-03\CAD\Sheets\TS-2-088030.dgn

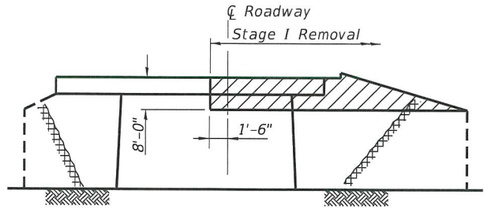
The Upchurch Group
architects engineers surveyors
Professional Design Firm Corporation License No. 184-003401
123 North 15th Street Mattoon, IL 61938 Phone: 217.235.3177
e-mail: upchurchgroup@upchurchgroup.com

USER NAME = Sta34	DESIGNED RAS	REVISED For BBS Review - 6/18/18	
	CHECKED RCS	REVISED For BBS Review - 02/21/19	
PLOT SCALE = 21:4.0000 '/ in.	DRAWN HE	REVISED By TUG - 11/1/19	
PLOT DATE = 1/6/2020	CHECKED DNB	REVISED	

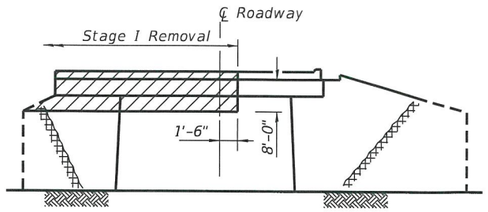
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 4 SHEETS

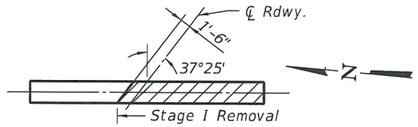
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
643	11B (BR-1)	STARK		
		ILLINOIS	FED. AID PROJECT	



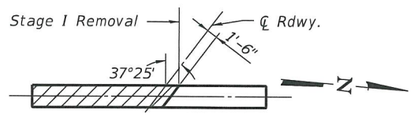
EAST ABUTMENT ELEVATION
(Looking East)



WEST ABUTMENT ELEVATION
(Looking West)



PLAN

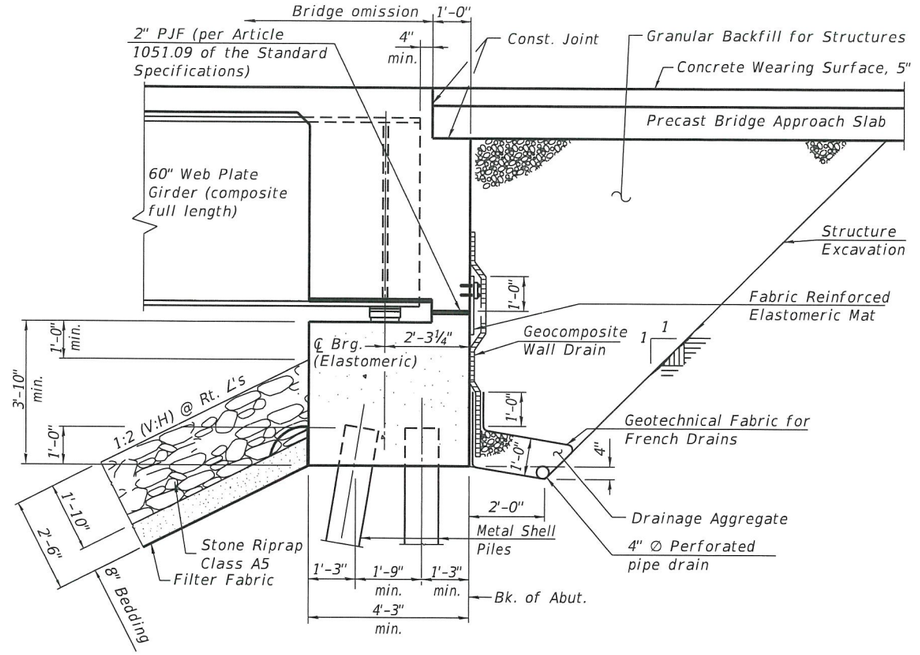


PLAN

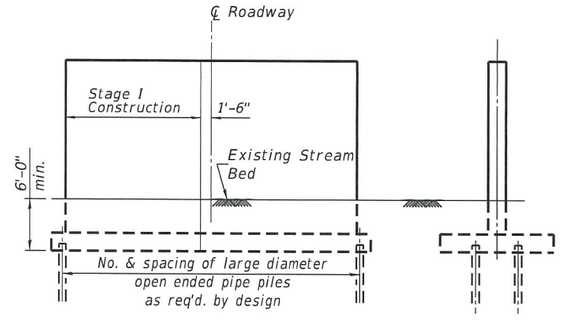
STAGE I REMOVAL

LEGEND

Concrete Removal



SECTION THRU SEMI-INTEGRAL ABUTMENT
(Horiz. dim. @ Rt. L's)



PIER SKETCH
(Solid Wall)
(Looking West)

APPROVED

JAN 28 2020

AS A BASIS FOR PREPARATION OF DETAILED PLANS

SECTIONS & DETAILS
IL. RT. 17 / IL. RT. 91
OVER SPOON RIVER
F.A.P. 643 - SEC. 11B (BR-1)
STARK COUNTY
STATION 63+44.19
STRUCTURE NO. 088-0030

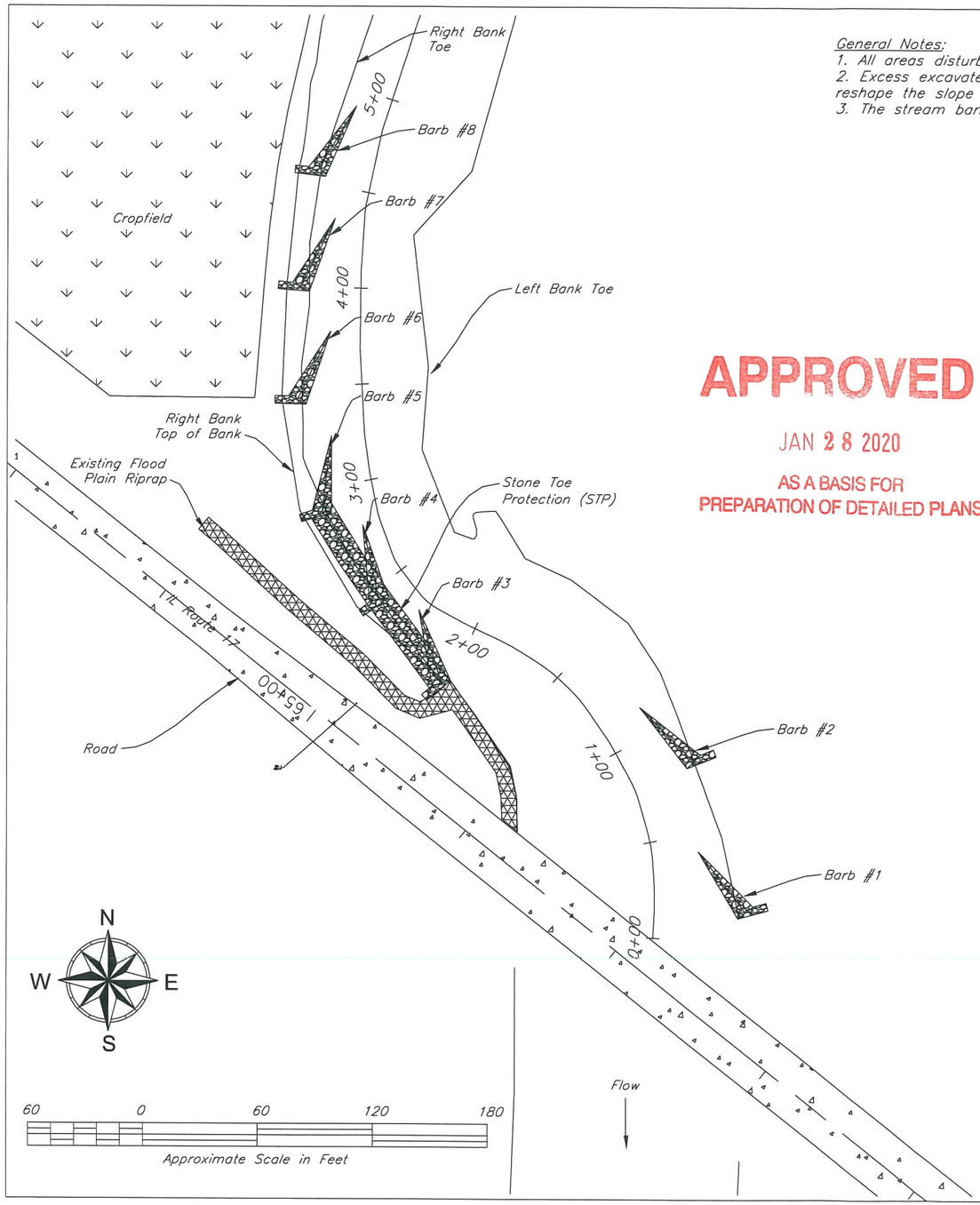
The Upchurch Group
architects engineers surveyors
Professional Design Firm Corporation License No. 184-003401
123 North 15th Street Mattoon, IL 61938 Phone: 217.235.3177
e-mail: upchurchgroup@upchurchgroup.com

USER NAME = Sta34	DESIGNED RAS	REVISED For BBS Review - 6/18/18	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
	CHECKED RCS	REVISED For BBS Review - 02/21/19	
PLOT SCALE = 21:4.0000 ':' / in.	DRAWN HE	REVISED By TUG - 11/1/19	
PLOT DATE = 1/6/2020	CHECKED DNB	REVISED	

SHEET NO. 3 OF 4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
643	11B (BR-1)	STARK		
		ILLINOIS	FED. AID PROJECT	

FILE NAME = P:\Civil_IDOT_DIST4\PTB 191-008 var PH I-II 31198491\WD 3 PH II IL 17 IL 91 over Spoon River 31198491-03\C0D\Sheets\TSL3_08000030.dgn



General Notes:
1. All areas disturbed by construction activities including all earthfill and excavation shall be seeded.
2. Excess excavated material may be placed in between the stone toe protection and the adjacent bank to reshape the slope or this area may be left to fill in naturally.
3. The stream barb keys will also act as keys for the stone toe protection.

APPROVED

JAN 28 2020

AS A BASIS FOR PREPARATION OF DETAILED PLANS

Hatch Legend

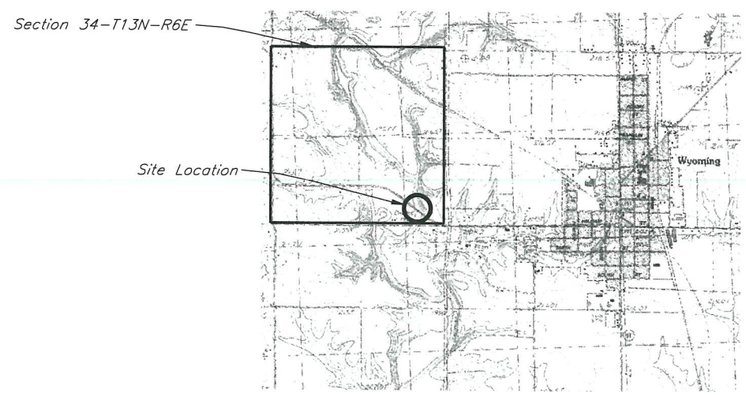
= Planned Riprap Stone Toe Protection and Stream Barbs

= Existing Riprap

= IL-Rt. 17 Roadway

Benchmark Table

Name	Elevation	Description
TBM 1	652.77	Chiseled square at NW corner of the curb on the bridge



Location Map

	Designed	Drawn	Checked	Approved
	J. Rudsell	J. Rudsell		
Date	3-1-16	3-1-16		

Terwilliger/IL Rt. 17
Plan Map

Stark County, Illinois

Section 34-T13N-R6E

United States Department of Agriculture
Natural Resources Conservation Service

File No.
TSL4-0880030.dgn

FILE NAME = P:\Civil\IDOT_DISTA\PTB 191-008 var PH I-II 31YB041\WD 3 PH II IL 17 IL 91 over Spoon River 31YB041-03\CAD Sheets\TSL4-0880030.dgn

The Upchurch Group
architects engineers surveyors
Professional Design Firm Corporation License No. 184-003401
123 North 15th Street Mattoon, IL 61938 Phone: 217.235.3177
e-mail: upchurchgroup@upchurchgroup.com

USER NAME = Sta34	DESIGNED	REVISED For BBS Review - 6/18/18
	CHECKED	REVISED For BBS Review - 01/22/19
PLOT SCALE = 70.0000 ' / in.	DRAWN JPM	REVISED By TUG - 11/1/19
PLOT DATE = 1/6/2020	CHECKED	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

Spoon River Bank Stabilization Plan
At IL 17 & IL 91
SHEET NO. 4 OF 4 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
643	11B (BR-1)	STARK		
	ILLINOIS	FED. AID PROJECT		

APPENDIX E

ABUTMENT PILE DESIGN

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== E Abutment
REFERENCE BORING ========== B-5
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.98 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 651.98 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 ========== 1152 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 97.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 36.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 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
392 KIPS	**371** KIPS	**204** KIPS	**63** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
650.27	1.71		5	Very Fine Silty Sand	2.1		***9.0***				9	0	0	5	3
648.52	1.75		4	Medium Sand	2.0	6.8	***51.3***				51	0	0	28	4
646.02	2.50		16	Medium Sand	11.6	47.1	***70.1***				70	0	0	39	7
643.52	2.50		13	Medium Sand	9.4	54.4	***89.4***				89	0	0	49	9
641.02	2.50		13	Medium Sand	9.4	64.3	***88.9***				89	0	0	49	12
638.52	2.50		11	Medium Sand	8.0	54.4	***91.9***				92	0	0	51	14
636.02	2.50		10	Medium Sand	7.2	49.4	***99.1***				99	0	0	55	17
633.52	2.50		10	Medium Sand	7.2	49.4	***96.5***				96	0	0	53	19
629.77	3.75		8	Medium Sand	8.7	39.6	***134.8***				135	0	0	74	23
627.27	2.50		14	Medium Sand	10.1	69.2	***144.9***				145	0	0	80	26
624.77	2.50		14	Medium Sand	10.1	69.2	***155.1***				155	0	0	85	28
622.27	2.50		14	Medium Sand	10.1	69.2	***120.1***				120	0	0	66	31
619.77	2.50	2.80			17.9	24.1	***138.0***				138	0	0	76	33
614.77	5.00	2.80			35.8	24.1	***179.8***				180	0	0	99	38
609.77	5.00	3.50	24		42.1	30.2	***215.1***				215	0	0	118	43
604.77	5.00	2.70			34.9	23.3	***255.2***				255	0	0	140	48
599.77	5.00	3.30	15		40.3	28.4	***291.2***				291	0	0	160	53
594.77	5.00	2.80			35.8	24.1	***330.4***				330	0	0	182	58
589.77	5.00	3.20	20		39.4	27.6	***370.7***				371	0	0	204	63
584.77	5.00	3.30	23		40.3	28.4	***411.0***				~~411~~	~~0~~	~~0~~	~~226~~	~~68~~
582.77	2.00	3.30	23		16.1	28.4	***418.5***				~~419~~	~~0~~	~~0~~	~~230~~	~~70~~
579.77	3.00	2.30			18.8	19.8	***447.7***				~~448~~	~~0~~	~~0~~	~~246~~	~~73~~
576.77	3.00	3.50	29		25.3	30.2	***466.0***				~~466~~	~~0~~	~~0~~	~~256~~	~~76~~
574.77	2.00	2.70			14.0	23.3	***480.0***				~~480~~	~~0~~	~~0~~	~~264~~	~~78~~
573.77	1.00	2.70			7.0	23.3	***487.0***				~~487~~	~~0~~	~~0~~	~~268~~	~~79~~
572.27	1.50	2.70			10.5	23.3	***497.5***				~~497~~	~~0~~	~~0~~	~~274~~	~~81~~
569.77	2.50	2.70			17.5	23.3	***513.2***				~~513~~	~~0~~	~~0~~	~~282~~	~~83~~
566.77	3.00	2.50			19.9	21.5	***524.5***				~~524~~	~~0~~	~~0~~	~~288~~	~~86~~
564.00	2.77	1.50			13.1	12.9	***535.8***				~~536~~	~~0~~	~~0~~	~~295~~	~~89~~
561.50	2.50	1.30			10.7	11.2	***546.5***				~~547~~	~~0~~	~~0~~	~~301~~	~~91~~
559.00	2.50	1.30			10.7	11.2	***557.2***				~~557~~	~~0~~	~~0~~	~~306~~	~~94~~
556.50	2.50	1.30			10.7	11.2	***567.9***				~~568~~	~~0~~	~~0~~	~~312~~	~~96~~
554.25	2.25	1.30			9.6	11.2	***592.2***				~~592~~	~~0~~	~~0~~	~~326~~	~~99~~
551.50	2.75	3.00			20.7	25.8	***612.9***				~~613~~	~~0~~	~~0~~	~~337~~	~~101~~
545.50	6.00	3.00			45.1	25.8	***879.4***				~~879~~	~~0~~	~~0~~	~~484~~	~~107~~
544.50	1.00			Shale	197.8	247.2	***1077.1***				~~1077~~	~~0~~	~~0~~	~~592~~	~~108.5~~
543.50	1.00			Shale		247.2									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== E Abutment
REFERENCE BORING ========== B-5
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.98 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 651.98 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 ========== 1152 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 97.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 36.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
459 KIPS	**438** KIPS	**241** KIPS	**63** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
650.27	1.71		5	Very Fine Silty Sand	2.5		***10.4***				10	0	0	6	3
648.52	1.75		4	Medium Sand	2.4	8.0	***59.8***				60	0	0	33	4
646.02	2.50		16	Medium Sand	13.5	55.0	***81.8***				82	0	0	45	7
643.52	2.50		13	Medium Sand	11.0	63.4	***111.5***				111	0	0	61	9
641.02	2.50		13	Medium Sand	11.0	82.2	***114.3***				114	0	0	63	12
638.52	2.50		11	Medium Sand	9.3	74.0	***116.8***				117	0	0	64	14
636.02	2.50		10	Medium Sand	8.4	67.3	***125.3***				125	0	0	69	17
633.52	2.50		10	Medium Sand	8.4	67.3	***120.2***				120	0	0	66	19
629.77	3.75		8	Medium Sand	10.1	53.8	***170.7***				171	0	0	94	23
627.27	2.50		14	Medium Sand	11.8	94.2	***182.6***				183	0	0	100	26
624.77	2.50		14	Medium Sand	11.8	94.2	***194.4***				194	0	0	107	28
622.27	2.50		14	Medium Sand	11.8	94.2	***144.8***				145	0	0	80	31
619.77	2.50	2.80			20.9	32.8	***165.7***				166	0	0	91	33
614.77	5.00	2.80			41.8	32.8	***215.7***				216	0	0	119	38
609.77	5.00	3.50	24		49.1	41.0	***255.4***				255	0	0	140	43
604.77	5.00	2.70			40.7	31.7	***303.2***				303	0	0	167	48
599.77	5.00	3.30	15		47.0	38.7	***344.4***				344	0	0	189	53
594.77	5.00	2.80			41.8	32.8	***390.9***				391	0	0	215	58
589.77	5.00	3.20	20		46.0	37.5	***438.0***				438	0	0	241	63
584.77	5.00	3.30	23		47.0	38.7	***485.1***				~~485~~	~~0~~	~~0~~	~~267~~	~~68~~
582.77	2.00	3.30	23		18.8	38.7	***492.1***				~~492~~	~~0~~	~~0~~	~~271~~	~~70~~
579.77	3.00	2.30			21.9	27.0	***528.1***				~~528~~	~~0~~	~~0~~	~~290~~	~~73~~
576.77	3.00	3.50	29		29.5	41.0	***548.2***				~~548~~	~~0~~	~~0~~	~~302~~	~~76~~
574.77	2.00	2.70			16.3	31.7	***564.5***				~~565~~	~~0~~	~~0~~	~~310~~	~~78~~
573.77	1.00	2.70			8.1	31.7	***572.7***				~~573~~	~~0~~	~~0~~	~~315~~	~~79~~
572.27	1.50	2.70			12.2	31.7	***584.9***				~~585~~	~~0~~	~~0~~	~~322~~	~~81~~
569.77	2.50	2.70			20.4	31.7	***602.9***				~~603~~	~~0~~	~~0~~	~~332~~	~~83~~
566.77	3.00	2.50			23.2	29.3	***614.4***				~~614~~	~~0~~	~~0~~	~~338~~	~~86~~
564.00	2.77	1.50			15.3	17.6	***627.3***				~~627~~	~~0~~	~~0~~	~~345~~	~~89~~
561.50	2.50	1.30			12.5	15.2	***639.8***				~~640~~	~~0~~	~~0~~	~~352~~	~~91~~
559.00	2.50	1.30			12.5	15.2	***652.3***				~~652~~	~~0~~	~~0~~	~~359~~	~~94~~
556.50	2.50	1.30			12.5	15.2	***664.7***				~~665~~	~~0~~	~~0~~	~~366~~	~~96~~
554.25	2.25	1.30			11.2	15.2	***695.9***				~~696~~	~~0~~	~~0~~	~~383~~	~~99~~
551.50	2.75	3.00			24.1	35.2	***720.0***				~~720~~	~~0~~	~~0~~	~~396~~	~~101~~
545.50	6.00	3.00			52.7	35.2	***1074.0***				~~1074~~	~~0~~	~~0~~	~~591~~	~~107~~
544.50	1.00			Shale	230.7	336.5	***1304.7***				~~1305~~	~~0~~	~~0~~	~~718~~	~~108.5~~
543.50	1.00			Shale		336.5									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== E Abutment
REFERENCE BORING ========== B-5
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.98 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 651.98 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 ========== 1152 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 97.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 36.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
570 KIPS	**565** KIPS	**310** KIPS	**78** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
650.27	1.71		5	Very Fine Silty Sand	2.5		***10.4***				10	0	0	6	3
648.52	1.75		4	Medium Sand	2.4	8.0	***59.8***				60	0	0	33	4
646.02	2.50		16	Medium Sand	13.5	55.0	***81.8***				82	0	0	45	7
643.52	2.50		13	Medium Sand	11.0	63.4	***111.5***				111	0	0	61	9
641.02	2.50		13	Medium Sand	11.0	82.2	***114.3***				114	0	0	63	12
638.52	2.50		11	Medium Sand	9.3	74.0	***116.8***				117	0	0	64	14
636.02	2.50		10	Medium Sand	8.4	67.3	***125.3***				125	0	0	69	17
633.52	2.50		10	Medium Sand	8.4	67.3	***120.2***				120	0	0	66	19
629.77	3.75		8	Medium Sand	10.1	53.8	***170.7***				171	0	0	94	23
627.27	2.50		14	Medium Sand	11.8	94.2	***182.6***				183	0	0	100	26
624.77	2.50		14	Medium Sand	11.8	94.2	***194.4***				194	0	0	107	28
622.27	2.50		14	Medium Sand	11.8	94.2	***144.8***				145	0	0	80	31
619.77	2.50	2.80			20.9	32.8	***165.7***				166	0	0	91	33
614.77	5.00	2.80			41.8	32.8	***215.7***				216	0	0	119	38
609.77	5.00	3.50	24		49.1	41.0	***255.4***				255	0	0	140	43
604.77	5.00	2.70			40.7	31.7	***303.2***				303	0	0	167	48
599.77	5.00	3.30	15		47.0	38.7	***344.4***				344	0	0	189	53
594.77	5.00	2.80			41.8	32.8	***390.9***				391	0	0	215	58
589.77	5.00	3.20	20		46.0	37.5	***438.0***				438	0	0	241	63
584.77	5.00	3.30	23		47.0	38.7	***485.1***				485	0	0	267	68
582.77	2.00	3.30	23		18.8	38.7	***492.1***				492	0	0	271	70
579.77	3.00	2.30			21.9	27.0	***528.1***				528	0	0	290	73
576.77	3.00	3.50	29		29.5	41.0	***548.2***				548	0	0	302	76
574.77	2.00	2.70			16.3	31.7	***564.5***				565	0	0	310	78
573.77	1.00	2.70			8.1	31.7	***572.7***				~~573~~	~~0~~	~~0~~	~~315~~	~~79~~
572.27	1.50	2.70			12.2	31.7	***584.9***				~~585~~	~~0~~	~~0~~	~~322~~	~~81~~
569.77	2.50	2.70			20.4	31.7	***602.9***				~~603~~	~~0~~	~~0~~	~~332~~	~~83~~
566.77	3.00	2.50			23.2	29.3	***614.4***				~~614~~	~~0~~	~~0~~	~~338~~	~~86~~
564.00	2.77	1.50			15.3	17.6	***627.3***				~~627~~	~~0~~	~~0~~	~~345~~	~~89~~
561.50	2.50	1.30			12.5	15.2	***639.8***				~~640~~	~~0~~	~~0~~	~~352~~	~~91~~
559.00	2.50	1.30			12.5	15.2	***652.3***				~~652~~	~~0~~	~~0~~	~~359~~	~~94~~
556.50	2.50	1.30			12.5	15.2	***664.7***				~~665~~	~~0~~	~~0~~	~~366~~	~~96~~
554.25	2.25	1.30			11.2	15.2	***695.9***				~~696~~	~~0~~	~~0~~	~~383~~	~~99~~
551.50	2.75	3.00			24.1	35.2	***720.0***				~~720~~	~~0~~	~~0~~	~~396~~	~~101~~
545.50	6.00	3.00			52.7	35.2	***1074.0***				~~1074~~	~~0~~	~~0~~	~~591~~	~~107~~
544.50	1.00			Shale	230.7	336.5	***1304.7***				~~1305~~	~~0~~	~~0~~	~~718~~	~~108.5~~
543.50	1.00			Shale		336.5									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== E Abutment
REFERENCE BORING ========== B-5
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.98 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 651.98 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 ========== 1152 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 97.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 36.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 16"Φ w/.312" walls
Pile Perimeter========== 4.189 FT.
Pile End Bearing Area========== 1.396 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
654 KIPS	**650** KIPS	**358** KIPS	**78** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
650.27	1.71		5	Very Fine Silty Sand	2.8		***13.2***				13	0	0	7	3
648.52	1.75		4	Medium Sand	2.7	10.4	***77.4***				77	0	0	43	4
646.02	2.50		16	Medium Sand	15.4	71.8	***103.8***				104	0	0	57	7
643.52	2.50		13	Medium Sand	12.5	82.9	***140.8***				141	0	0	77	9
641.02	2.50		13	Medium Sand	12.5	107.3	***142.7***				143	0	0	78	12
638.52	2.50		11	Medium Sand	10.6	96.7	***144.5***				145	0	0	79	14
636.02	2.50		10	Medium Sand	9.6	87.9	***154.2***				154	0	0	85	17
633.52	2.50		10	Medium Sand	9.6	87.9	***146.2***				146	0	0	80	19
629.77	3.75		8	Medium Sand	11.6	70.3	***210.5***				211	0	0	116	23
627.27	2.50		14	Medium Sand	13.5	123.1	***224.0***				224	0	0	123	26
624.77	2.50		14	Medium Sand	13.5	123.1	***237.5***				238	0	0	131	28
622.27	2.50		14	Medium Sand	13.5	123.1	***170.8***				171	0	0	94	31
619.77	2.50	2.80			23.9	42.9	***194.7***				195	0	0	107	33
614.77	5.00	2.80			47.8	42.9	***253.2***				253	0	0	139	38
609.77	5.00	3.50	24		56.2	53.6	***297.1***				297	0	0	163	43
604.77	5.00	2.70			46.6	41.4	***352.8***				353	0	0	194	48
599.77	5.00	3.30	15		53.8	50.5	***398.9***				399	0	0	219	53
594.77	5.00	2.80			47.8	42.9	***452.8***				453	0	0	249	58
589.77	5.00	3.20	20		52.6	49.0	***506.9***				507	0	0	279	63
584.77	5.00	3.30	23		53.8	50.5	***560.7***				561	0	0	308	68
582.77	2.00	3.30	23		21.5	50.5	***566.9***				567	0	0	312	70
579.77	3.00	2.30			25.1	35.2	***610.3***				610	0	0	336	73
576.77	3.00	3.50	29		33.7	53.6	***631.7***				632	0	0	347	76
574.77	2.00	2.70			18.6	41.4	***650.4***				650	0	0	358	78
573.77	1.00	2.70			9.3	41.4	***659.7***				~~660~~	~~0~~	~~0~~	~~363~~	~~79~~
572.27	1.50	2.70			14.0	41.4	***673.6***				~~674~~	~~0~~	~~0~~	~~370~~	~~81~~
569.77	2.50	2.70			23.3	41.4	***693.8***				~~694~~	~~0~~	~~0~~	~~382~~	~~83~~
566.77	3.00	2.50			26.5	38.3	***705.0***				~~705~~	~~0~~	~~0~~	~~388~~	~~86~~
564.00	2.77	1.50			17.5	23.0	***719.4***				~~719~~	~~0~~	~~0~~	~~396~~	~~89~~
561.50	2.50	1.30			14.3	19.9	***733.7***				~~734~~	~~0~~	~~0~~	~~404~~	~~91~~
559.00	2.50	1.30			14.3	19.9	***747.9***				~~748~~	~~0~~	~~0~~	~~411~~	~~94~~
556.50	2.50	1.30			14.3	19.9	***762.2***				~~762~~	~~0~~	~~0~~	~~419~~	~~96~~
554.25	2.25	1.30			12.8	19.9	***801.1***				~~801~~	~~0~~	~~0~~	~~441~~	~~99~~
551.50	2.75	3.00			27.6	45.9	***828.7***				~~829~~	~~0~~	~~0~~	~~456~~	~~101~~
545.50	6.00	3.00			60.2	45.9	***1282.4***				~~1282~~	~~0~~	~~0~~	~~705~~	~~107~~
544.50	1.00			Shale	263.7	439.5	***1546.1***				~~1546~~	~~0~~	~~0~~	~~850~~	~~108.5~~
543.50	1.00			Shale		439.5									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== W Abutment
REFERENCE BORING ========== B-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.91 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 642.91 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 ========== 1626 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 137.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 51.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 12"Φ w/.25" walls
Pile Perimeter========== 3.142 FT.
Pile End Bearing Area========== 0.785 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
392 KIPS	**392** KIPS	**216** KIPS	**87** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
640.93	1.98		8	Very Fine Silty Sand	3.9		***23.9***				24	0	0	13	3
638.43	2.50		9	Very Fine Silty Sand	5.6	19.9	***13.8***				14	0	0	8	5
635.93	2.50	0.50			4.8	4.3	***18.6***				19	0	0	10	8
633.43	2.50	0.50			4.8	4.3	***43.8***				44	0	0	24	10
630.93	2.50		5	Medium Sand	3.6	24.7	***37.5***				38	0	0	21	13
628.43	2.50		3	Medium Sand	2.2	14.8	***49.6***				50	0	0	27	15
625.93	2.50		5	Medium Sand	3.6	24.7	***32.2***				32	0	0	18	18
623.68	2.25		1	Very Fine Silty Sand	0.6	3.7	***32.5***				32	0	0	18	20
619.93	3.75	0.40			5.9	3.4	***57.1***				57	0	0	31	24
614.93	5.00		6	Very Fine Silty Sand	7.4	22.2	***64.5***				65	0	0	35	29
612.93	2.00		6	Very Fine Silty Sand	3.0	22.2	***49.6***				50	0	0	27	31
609.93	3.00	0.50			5.8	4.3	***54.5***				54	0	0	30	34
604.93	5.00	0.40			7.8	3.4	***65.7***				66	0	0	36	39
598.43	6.50	0.80			18.9	6.9	***110.4***				110	0	0	61	45
593.93	4.50	3.80	24		40.3	32.7	***143.9***				144	0	0	79	50
588.93	5.00	3.00			37.6	25.8	***180.6***				181	0	0	99	55
583.93	5.00	2.90			36.7	25.0	***219.1***				219	0	0	120	60
578.93	5.00	3.10	24		38.5	26.7	***257.6***				258	0	0	142	65
576.43	2.50	3.10	20		19.3	26.7	***276.8***				277	0	0	152	67
573.93	2.50	3.10	20		19.3	26.7	***297.0***				297	0	0	163	70
571.43	2.50	3.20	28		19.7	27.6	***316.7***				317	0	0	174	72
568.93	2.50	3.20	28		19.7	27.6	***326.0***				326	0	0	179	75
566.43	2.50	2.00			14.3	17.2	***340.3***				340	0	0	187	77
563.93	2.50	2.00			14.3	17.2	***352.1***				352	0	0	194	80
561.43	2.50	1.70			12.9	14.6	***364.9***				365	0	0	201	82
558.93	2.50	1.70			12.9	14.6	***378.7***				379	0	0	208	85
556.43	2.50	1.80			13.4	15.5	***392.1***				392	0	0	216	87
554.43	2.00	1.80			10.7	15.5	***402.7***				~~403~~	~~0~~	~~0~~	~~222~~	~~89~~
553.43	1.00	1.80			5.3	15.5	***417.3***				~~417~~	~~0~~	~~0~~	~~230~~	~~90~~
550.93	2.50		5	Fine Sand	3.4	24.7	***420.7***				~~421~~	~~0~~	~~0~~	~~231~~	~~93~~
549.93	1.00		5	Fine Sand	1.4	24.7	***422.1***				~~422~~	~~0~~	~~0~~	~~232~~	~~94~~
548.93	1.00		5	Fine Sand	1.4	24.7	***893.1***				~~893~~	~~0~~	~~0~~	~~491~~	~~95~~
545.93	3.00		100	Clean Coarse Sand	222.3	494.4	***1115.5***				~~1115~~	~~0~~	~~0~~	~~613~~	~~98~~
542.93	3.00		100	Clean Coarse Sand		494.4									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== W Abutment
REFERENCE BORING ========== B-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.91 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 642.91 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 ========== 1626 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 137.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 51.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.25" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
459 KIPS	**445** KIPS	**245** KIPS	**85** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
640.93	1.98		8	Very Fine Silty Sand	4.6		***27.8***				28	0	0	15	3
638.43	2.50		9	Very Fine Silty Sand	6.5	23.3	***16.9***				17	0	0	9	5
635.93	2.50	0.50			5.6	5.9	***22.5***				23	0	0	12	8
633.43	2.50	0.50			5.6	5.9	***55.9***				56	0	0	31	10
630.93	2.50		5	Medium Sand	4.2	33.6	***46.6***				47	0	0	26	13
628.43	2.50		3	Medium Sand	2.5	20.2	***62.6***				63	0	0	34	15
625.93	2.50		5	Medium Sand	4.2	33.6	***38.3***				38	0	0	21	18
623.68	2.25		1	Very Fine Silty Sand	0.6	5.0	***38.5***				39	0	0	21	20
619.93	3.75	0.40			6.8	4.7	***71.0***				71	0	0	39	24
614.93	5.00		6	Very Fine Silty Sand	8.7	30.3	***79.6***				80	0	0	44	29
612.93	2.00		6	Very Fine Silty Sand	3.5	30.3	***58.7***				59	0	0	32	31
609.93	3.00	0.50			6.7	5.9	***64.2***				64	0	0	35	34
604.93	5.00	0.40			9.1	4.7	***78.0***				78	0	0	43	39
598.43	6.50	0.80			22.0	9.4	***135.2***				135	0	0	74	45
593.93	4.50	3.80	24		47.1	44.6	***172.9***				173	0	0	95	50
588.93	5.00	3.00			43.9	35.2	***215.6***				216	0	0	119	55
583.93	5.00	2.90			42.8	34.0	***260.8***				261	0	0	143	60
578.93	5.00	3.10	24		44.9	36.3	***305.7***				306	0	0	168	65
576.43	2.50	3.10	20		22.5	36.3	***328.2***				328	0	0	180	67
573.93	2.50	3.10	20		22.5	36.3	***351.8***				352	0	0	193	70
571.43	2.50	3.20	28		23.0	37.5	***374.8***				375	0	0	206	72
568.93	2.50	3.20	28		23.0	37.5	***383.7***				384	0	0	211	75
566.43	2.50	2.00			16.7	23.5	***400.4***				400	0	0	220	77
563.93	2.50	2.00			16.7	23.5	***413.6***				414	0	0	227	80
561.43	2.50	1.70			15.0	19.9	***428.6***				429	0	0	236	82
558.93	2.50	1.70			15.0	19.9	***444.8***				445	0	0	245	85
556.43	2.50	1.80			15.6	21.1	***460.4***				~~460~~	~~0~~	~~0~~	~~253~~	~~87~~
554.43	2.00	1.80			12.5	21.1	***472.9***				~~473~~	~~0~~	~~0~~	~~260~~	~~89~~
553.43	1.00	1.80			6.2	21.1	***491.7***				~~492~~	~~0~~	~~0~~	~~270~~	~~90~~
550.93	2.50		5	Fine Sand	4.0	33.6	***495.6***				~~496~~	~~0~~	~~0~~	~~273~~	~~93~~
549.93	1.00		5	Fine Sand	1.6	33.6	***497.2***				~~497~~	~~0~~	~~0~~	~~273~~	~~94~~
548.93	1.00		5	Fine Sand	1.6	33.6	***1138.1***				~~1138~~	~~0~~	~~0~~	~~626~~	~~95~~
545.93	3.00		100	Clean Coarse Sand	259.4	672.9	***1397.5***				~~1397~~	~~0~~	~~0~~	~~769~~	~~98~~
542.93	3.00		100	Clean Coarse Sand		672.9									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== W Abutment
REFERENCE BORING ========== B-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.91 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 642.91 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 ========== 1626 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 137.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 51.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
570 KIPS	**497** KIPS	**273** KIPS	**94** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
640.93	1.98		8	Very Fine Silty Sand	4.6		***27.8***				28	0	0	15	3
638.43	2.50		9	Very Fine Silty Sand	6.5	23.3	***16.9***				17	0	0	9	5
635.93	2.50	0.50			5.6	5.9	***22.5***				23	0	0	12	8
633.43	2.50	0.50			5.6	5.9	***55.9***				56	0	0	31	10
630.93	2.50		5	Medium Sand	4.2	33.6	***46.6***				47	0	0	26	13
628.43	2.50		3	Medium Sand	2.5	20.2	***62.6***				63	0	0	34	15
625.93	2.50		5	Medium Sand	4.2	33.6	***38.3***				38	0	0	21	18
623.68	2.25		1	Very Fine Silty Sand	0.6	5.0	***38.5***				39	0	0	21	20
619.93	3.75	0.40			6.8	4.7	***71.0***				71	0	0	39	24
614.93	5.00		6	Very Fine Silty Sand	8.7	30.3	***79.6***				80	0	0	44	29
612.93	2.00		6	Very Fine Silty Sand	3.5	30.3	***58.7***				59	0	0	32	31
609.93	3.00	0.50			6.7	5.9	***64.2***				64	0	0	35	34
604.93	5.00	0.40			9.1	4.7	***78.0***				78	0	0	43	39
598.43	6.50	0.80			22.0	9.4	***135.2***				135	0	0	74	45
593.93	4.50	3.80	24		47.1	44.6	***172.9***				173	0	0	95	50
588.93	5.00	3.00			43.9	35.2	***215.6***				216	0	0	119	55
583.93	5.00	2.90			42.8	34.0	***260.8***				261	0	0	143	60
578.93	5.00	3.10	24		44.9	36.3	***305.7***				306	0	0	168	65
576.43	2.50	3.10	20		22.5	36.3	***328.2***				328	0	0	180	67
573.93	2.50	3.10	20		22.5	36.3	***351.8***				352	0	0	193	70
571.43	2.50	3.20	28		23.0	37.5	***374.8***				375	0	0	206	72
568.93	2.50	3.20	28		23.0	37.5	***383.7***				384	0	0	211	75
566.43	2.50	2.00			16.7	23.5	***400.4***				400	0	0	220	77
563.93	2.50	2.00			16.7	23.5	***413.6***				414	0	0	227	80
561.43	2.50	1.70			15.0	19.9	***428.6***				429	0	0	236	82
558.93	2.50	1.70			15.0	19.9	***444.8***				445	0	0	245	85
556.43	2.50	1.80			15.6	21.1	***460.4***				460	0	0	253	87
554.43	2.00	1.80			12.5	21.1	***472.9***				473	0	0	260	89
553.43	1.00	1.80			6.2	21.1	***491.7***				492	0	0	270	90
550.93	2.50		5	Fine Sand	4.0	33.6	***495.6***				496	0	0	273	93
549.93	1.00		5	Fine Sand	1.6	33.6	***497.2***				497	0	0	273	94
548.93	1.00		5	Fine Sand	1.6	33.6	***1138.1***				~~1138~~	~~0~~	~~0~~	~~626~~	~~95~~
545.93	3.00		100	Clean Coarse Sand	259.4	672.9	***1397.5***				~~1397~~	~~0~~	~~0~~	~~769~~	~~98~~
542.93	3.00		100	Clean Coarse Sand		672.9									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 2
REFERENCE BORING ========== 3, 7, 7P
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 623.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 621.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 597.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 6333 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 356.21 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 133.58 KIPS

PILE TYPE AND SIZE ========== Metal Shell 16"Φ w/.312" walls
Pile Perimeter========== 4.189 FT.
Pile End Bearing Area========== 1.396 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
654 KIPS	**652** KIPS	**235** KIPS	**63** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
620.18	1.22		18	Clean Coarse Sand	9.3		***16.8***				17	5	0	4	3
616.43	3.75		2	Clean Coarse Sand	3.2	7.5	***21.6***				22	7	0	5	7
615.18	1.25	0.60			3.8	9.2	***36.1***				36	9	0	11	8
612.43	2.75	1.30			15.7	19.9	***111.0***				111	18	0	44	11
610.18	2.25		12	Very Fine Silty Sand	8.9	79.1	***146.2***				146	22	0	58	13
604.93	5.25		16	Very Fine Silty Sand	27.7	105.5	***455.2***				455	38	0	213	18
602.43	2.50		44	Clean Coarse Sand	66.4	386.7	***521.6***				522	74	0	213	21
599.93	2.50		44	Clean Coarse Sand	66.4	386.7	***250.3***				250	111	0	27	23
597.70	2.23	3.20	22		23.4	49.0	***273.8***				274	124	0	27	26
596.43	1.27	3.20	22		13.3	49.0	***296.3***				296	124	0	39	27
593.93	2.50	3.80	21		29.9	58.2	***326.2***				326	124	0	56	29
591.43	2.50	3.80	21		29.9	58.2	***357.6***				358	124	0	73	32
586.43	5.00	3.90	21		61.0	59.7	***404.8***				405	124	0	99	37
581.43	5.00	3.00			50.2	45.9	***458.0***				458	124	0	128	42
578.43	3.00	3.20	26		31.5	49.0	***489.5***				490	124	0	146	45
576.43	2.00	3.20	26		21.0	49.0	***512.1***				512	124	0	158	47
573.43	3.00	3.30	24		32.3	50.5	***524.4***				524	124	0	165	50
572.00	1.43	2.00			10.9	30.6	***543.0***				543	124	0	175	51
568.00	4.00	2.50			35.3	38.3	***578.3***				578	124	0	194	55
567.00	1.00	2.50			8.8	38.3	***596.3***				596	124	0	204	56
563.00	4.00	3.10	18		41.1	47.5	***637.4***				637	124	0	227	60
562.00	1.00	3.10	18		10.3	47.5	***638.5***				638	124	0	228	61
560.50	1.50	2.50			13.2	38.3	***651.7***				652	124	0	235	63
559.50	1.00	2.50			8.8	38.3	***660.6***				~~661~~	~~*124*~~	~~*0*~~	~~*240*~~	~~*64*~~
558.00	1.50	2.50			13.2	38.3	***673.8***				~~674~~	~~*124*~~	~~*0*~~	~~*247*~~	~~*65*~~
557.00	1.00	2.50			8.8	38.3	***682.6***				~~683~~	~~*124*~~	~~*0*~~	~~*252*~~	~~*66*~~
554.50	2.50	2.50			22.1	38.3	***704.7***				~~705~~	~~*124*~~	~~*0*~~	~~*264*~~	~~*69*~~
552.00	2.50	2.50			22.1	38.3	***696.2***				~~696~~	~~*124*~~	~~*0*~~	~~*259*~~	~~*71*~~
551.00	1.00	0.50			2.6	7.7	***1130.6***				~~1131~~	~~*124*~~	~~*0*~~	~~*498*~~	~~*72*~~
550.00	1.00			Shale	263.7	439.5	***1394.2***				~~1394~~	~~*124*~~	~~*0*~~	~~*643*~~	~~*73.4*~~
549.00	1.00			Shale	263.7	439.5	***1657.9***				~~1658~~	~~*124*~~	~~*0*~~	~~*788*~~	~~*74.4*~~
548.00	1.00			Shale	263.7	439.5	***1921.6***				~~1922~~	~~*124*~~	~~*0*~~	~~*933*~~	~~*75.4*~~
547.00	1.00			Shale	263.7	439.5	***2185.3***				~~2185~~	~~*124*~~	~~*0*~~	~~*1078*~~	~~*76.4*~~
546.00	1.00			Shale		439.5									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== W Abutment
REFERENCE BORING ========== B-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 643.91 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 642.91 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 ========== 1626 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 137.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 51.45 KIPS

PILE TYPE AND SIZE ========== Metal Shell 16"Φ w/.312" walls
Pile Perimeter========== 4.189 FT.
Pile End Bearing Area========== 1.396 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
654 KIPS	**574** KIPS	**316** KIPS	**94** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
640.93	1.98		8	Very Fine Silty Sand	5.2		***35.6***				36	0	0	20	3
638.43	2.50		9	Very Fine Silty Sand	7.4	30.4	***20.3***				20	0	0	11	5
635.93	2.50	0.50			6.4	7.7	***26.7***				27	0	0	15	8
633.43	2.50	0.50			6.4	7.7	***69.4***				69	0	0	38	10
630.93	2.50		5	Medium Sand	4.8	43.9	***56.6***				57	0	0	31	13
628.43	2.50		3	Medium Sand	2.9	26.4	***77.1***				77	0	0	42	15
625.93	2.50		5	Medium Sand	4.8	43.9	***44.5***				45	0	0	24	18
623.68	2.25		1	Very Fine Silty Sand	0.7	6.6	***44.8***				45	0	0	25	20
619.93	3.75	0.40			7.8	6.1	***86.0***				86	0	0	47	24
614.93	5.00		6	Very Fine Silty Sand	9.9	39.6	***95.9***				96	0	0	53	29
612.93	2.00		6	Very Fine Silty Sand	4.0	39.6	***68.0***				68	0	0	37	31
609.93	3.00	0.50			7.7	7.7	***74.1***				74	0	0	41	34
604.93	5.00	0.40			10.4	6.1	***90.7***				91	0	0	50	39
598.43	6.50	0.80			25.2	12.3	***161.8***				162	0	0	89	45
593.93	4.50	3.80	24		53.8	58.2	***203.3***				203	0	0	112	50
588.93	5.00	3.00			50.2	45.9	***251.9***				252	0	0	139	55
583.93	5.00	2.90			49.0	44.4	***304.0***				304	0	0	167	60
578.93	5.00	3.10	24		51.4	47.5	***355.3***				355	0	0	195	65
576.43	2.50	3.10	20		25.7	47.5	***381.0***				381	0	0	210	67
573.93	2.50	3.10	20		25.7	47.5	***408.2***				408	0	0	225	70
571.43	2.50	3.20	28		26.3	49.0	***434.5***				434	0	0	239	72
568.93	2.50	3.20	28		26.3	49.0	***442.4***				442	0	0	243	75
566.43	2.50	2.00			19.1	30.6	***461.5***				461	0	0	254	77
563.93	2.50	2.00			19.1	30.6	***475.9***				476	0	0	262	80
561.43	2.50	1.70			17.2	26.0	***493.1***				493	0	0	271	82
558.93	2.50	1.70			17.2	26.0	***511.8***				512	0	0	281	85
556.43	2.50	1.80			17.8	27.6	***529.6***				530	0	0	291	87
554.43	2.00	1.80			14.3	27.6	***543.9***				544	0	0	299	89
553.43	1.00	1.80			7.1	27.6	***567.4***				567	0	0	312	90
550.93	2.50		5	Fine Sand	4.5	43.9	***571.9***				572	0	0	315	93
549.93	1.00		5	Fine Sand	1.8	43.9	***573.7***				574	0	0	316	94
548.93	1.00		5	Fine Sand	1.8	43.9	***1410.6***				~~1411~~	~~0~~	~~0~~	~~776~~	~~95~~
545.93	3.00		100	Clean Coarse Sand	296.4	878.9	***1707.0***				~~1707~~	~~0~~	~~0~~	~~939~~	~~98~~
542.93	3.00		100	Clean Coarse Sand		878.9									

APPENDIX F

PIER PILE DESIGN

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1
REFERENCE BORING ========== 6
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 623.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 621.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 606.80 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 4367 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 245.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 92.11 KIPS

PILE TYPE AND SIZE ========== Metal Shell 16"Φ w/.312" walls
Pile Perimeter========== 4.189 FT.
Pile End Bearing Area========== 1.396 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
654 KIPS	**646** KIPS	**299** KIPS	**67** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
620.10	1.30	0.75			4.8		***16.2***				16	3	0	6	3
617.60	2.50	0.75			9.2	11.5	***25.4***				25	8	0	6	6
615.10	2.50	0.75			9.2	11.5	***34.6***				35	13	0	6	8
612.35	2.75	0.75			10.1	11.5	***109.7***				110	18	0	42	11
608.85	3.50	5.00	22		47.7	76.6	***126.8***				127	44	0	25	15
606.80	2.05	3.00			20.6	45.9	***147.4***				147	56	0	25	17
603.85	2.95	3.00			29.6	45.9	***192.3***				192	56	0	50	20
601.35	2.50	4.00	26		31.1	61.3	***223.4***				223	56	0	67	22
598.85	2.50	4.00	26		31.1	61.3	***254.4***				254	56	0	84	25
598.50	0.35	4.00	23		4.4	61.3	***258.8***				259	56	0	87	25
596.35	2.15	4.00	23		26.7	61.3	***285.5***				286	56	0	101	27
593.85	2.50	4.00	23		31.1	61.3	***308.9***				309	56	0	114	30
591.35	2.50	3.50	21		28.1	53.6	***337.0***				337	56	0	130	32
588.85	2.50	3.50	21		28.1	53.6	***359.0***				359	56	0	142	35
586.35	2.50	3.10	18		25.7	47.5	***384.6***				385	56	0	156	37
583.85	2.50	3.10	18		25.7	47.5	***593.6***				594	56	0	271	40
581.35	2.50		35	Hard Till	20.5	230.7	***614.0***				614	56	0	282	42
578.85	2.50		35	Hard Till	20.5	230.7	***451.3***				451	56	0	192	45
576.35	2.50	3.10	25		25.7	47.5	***477.0***				477	56	0	207	47
573.85	2.50	3.10	25		25.7	47.5	***502.6***				503	56	0	221	50
571.35	2.50	3.10	16		25.7	47.5	***528.3***				528	56	0	235	52
568.85	2.50	3.10	16		25.7	47.5	***538.7***				539	56	0	240	55
566.35	2.50	2.10			19.7	32.2	***558.4***				558	56	0	251	57
563.85	2.50	2.10			19.7	32.2	***578.0***				578	56	0	262	60
561.35	2.50	2.10			19.7	32.2	***597.7***				598	56	0	273	62
558.85	2.50	2.10			19.7	32.2	***623.5***				624	56	0	287	65
556.35	2.50	2.50			22.1	38.3	***645.6***				646	56	0	299	67
554.85	1.50	2.50			13.2	38.3	***658.8***				~~659~~	~~56~~	~~0~~	~~307~~	~~69~~
553.85	1.00	2.50			8.8	38.3	***676.9***				~~677~~	~~56~~	~~0~~	~~316~~	~~70~~
552.85	1.00	3.10	17		10.3	47.5	***687.1***				~~687~~	~~56~~	~~0~~	~~322~~	~~71~~
551.85	1.00	3.10	17		10.3	47.5	***697.4***				~~697~~	~~56~~	~~0~~	~~328~~	~~72~~
550.85	1.00	3.10	17		10.3	47.5	***707.7***				~~708~~	~~56~~	~~0~~	~~333~~	~~73~~
548.50	2.35	3.10	17		24.1	47.5	***1123.8***				~~1124~~	~~56~~	~~0~~	~~562~~	~~75~~
547.50	1.00			Shale	263.7	439.5	***1387.5***				~~1387~~	~~56~~	~~0~~	~~707~~	~~75.9~~
546.50	1.00			Shale	263.7	439.5	***1651.2***				~~1651~~	~~56~~	~~0~~	~~852~~	~~76.9~~
545.50	1.00			Shale	263.7	439.5	***1914.9***				~~1915~~	~~56~~	~~0~~	~~997~~	~~77.9~~
544.50	1.00			Shale		439.5									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 2
REFERENCE BORING ========== 3 and 7
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 623.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 621.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 597.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 6333 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 356.21 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 133.58 KIPS

PILE TYPE AND SIZE ========== Metal Shell 18"Φ w/.375" walls
Pile Perimeter========== 4.712 FT.
Pile End Bearing Area========== 1.767 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
882 KIPS	**744** KIPS	**270** KIPS	**71** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
620.18	1.22		18	Clean Coarse Sand	10.4		***21.5***				21	6	0	6	3
616.43	3.75		2	Clean Coarse Sand	3.6	11.1	***25.6***				26	8	0	6	7
615.18	1.25	0.60			4.2	11.6	***43.4***				43	10	0	14	8
612.43	2.75	1.30			17.6	25.2	***136.0***				136	20	0	55	11
610.18	2.25		12	Very Fine Silty Sand	10.0	100.1	***179.3***				179	25	0	73	13
604.93	5.25		16	Very Fine Silty Sand	31.1	133.5	***566.4***				566	42	0	269	18
602.43	2.50		44	Clean Coarse Sand	74.7	489.4	***641.2***				641	83	0	269	21
599.93	2.50		44	Clean Coarse Sand	74.7	489.4	***288.5***				288	125	0	34	23
597.70	2.23	3.20	22		26.4	62.0	***314.8***				315	139	0	34	26
596.43	1.27	3.20	22		15.0	62.0	***341.5***				341	139	0	49	27
593.93	2.50	3.80	21		33.6	73.6	***375.1***				375	139	0	67	29
591.43	2.50	3.80	21		33.6	73.6	***410.6***				411	139	0	87	32
586.43	5.00	3.90	21		68.6	75.6	***461.8***				462	139	0	115	37
581.43	5.00	3.00			56.4	58.1	***522.1***				522	139	0	148	42
578.43	3.00	3.20	26		35.5	62.0	***557.5***				558	139	0	168	45
576.43	2.00	3.20	26		23.6	62.0	***583.1***				583	139	0	182	47
573.43	3.00	3.30	24		36.3	64.0	***594.2***				594	139	0	188	50
572.00	1.43	2.00			12.3	38.8	***616.2***				616	139	0	200	51
568.00	4.00	2.50			39.7	48.5	***655.9***				656	139	0	222	55
567.00	1.00	2.50			9.9	48.5	***677.5***				677	139	0	234	56
563.00	4.00	3.10	18		46.2	60.1	***723.7***				724	139	0	259	60
562.00	1.00	3.10	18		11.6	60.1	***723.6***				724	139	0	259	61
560.50	1.50	2.50			14.9	48.5	***738.5***				739	139	0	267	63
559.50	1.00	2.50			9.9	48.5	***748.5***				748	139	0	273	64
557.50	2.00	2.50			19.9	48.5	***729.6***				730	139	0	262	66
555.00	2.50	0.50			7.2	9.7	***736.8***				737	139	0	266	68
552.50	2.50	0.50			7.2	9.7	***743.9***				744	139	0	270	71
551.00	1.50	0.50			4.3	9.7	***1294.7***				~~1295~~	~~139~~	~~0~~	~~573~~	~~72~~
550.50	0.50			Shale	148.3	556.2	***1443.0***				~~1443~~	~~139~~	~~0~~	~~655~~	~~72.9~~
550.00	0.50			Shale	148.3	556.2	***1591.4***				~~1591~~	~~139~~	~~0~~	~~736~~	~~73.4~~
549.50	0.50			Shale	148.3	556.2	***1739.7***				~~1740~~	~~139~~	~~0~~	~~818~~	~~73.9~~
549.00	0.50			Shale		556.2									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1
REFERENCE BORING ========== 6
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 623.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 621.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 606.80 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 4367 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 245.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 92.11 KIPS

PILE TYPE AND SIZE ========== Metal Shell 18"Φ w/.375" walls
Pile Perimeter========== 4.713 FT.
Pile End Bearing Area========== 1.767 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
882 KIPS	**803** KIPS	**379** KIPS	**73** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
620.10	1.30	0.75			5.4		***19.9***				20	3	0	8	3
617.60	2.50	0.75			10.3	14.5	***30.2***				30	9	0	8	6
615.10	2.50	0.75			10.3	14.5	***40.5***				41	14	0	8	8
612.35	2.75	0.75			11.3	14.5	***134.2***				134	21	0	53	11
608.85	3.50	5.00	22		53.7	96.9	***149.1***				149	50	0	32	15
606.80	2.05	3.00			23.1	58.1	***172.3***				172	63	0	32	17
603.85	2.95	3.00			33.3	58.1	***224.9***				225	63	0	61	20
601.35	2.50	4.00	26		35.0	77.5	***259.9***				260	63	0	80	22
598.85	2.50	4.00	26		35.0	77.5	***294.9***				295	63	0	99	25
598.50	0.35	4.00	23		4.9	77.5	***299.8***				300	63	0	102	25
596.35	2.15	4.00	23		30.1	77.5	***329.8***				330	63	0	119	27
593.85	2.50	4.00	23		35.0	77.5	***355.1***				355	63	0	133	30
591.35	2.50	3.50	21		31.6	67.8	***386.7***				387	63	0	150	32
588.85	2.50	3.50	21		31.6	67.8	***410.5***				411	63	0	163	35
586.35	2.50	3.10	18		28.9	60.1	***439.4***				439	63	0	179	37
583.85	2.50	3.10	18		28.9	60.1	***700.2***				700	63	0	322	40
581.35	2.50		35	Hard Till	23.0	292.0	***723.3***				723	63	0	335	42
578.85	2.50		35	Hard Till	23.0	292.0	***514.4***				514	63	0	220	45
576.35	2.50	3.10	25		28.9	60.1	***543.3***				543	63	0	236	47
573.85	2.50	3.10	25		28.9	60.1	***572.2***				572	63	0	252	50
571.35	2.50	3.10	16		28.9	60.1	***601.1***				601	63	0	268	52
568.85	2.50	3.10	16		28.9	60.1	***610.6***				611	63	0	273	55
566.35	2.50	2.10			22.1	40.7	***632.7***				633	63	0	285	57
563.85	2.50	2.10			22.1	40.7	***654.9***				655	63	0	297	60
561.35	2.50	2.10			22.1	40.7	***677.0***				677	63	0	310	62
558.85	2.50	2.10			22.1	40.7	***706.9***				707	63	0	326	65
556.35	2.50	2.50			24.8	48.5	***731.8***				732	63	0	340	67
554.85	1.50	2.50			14.9	48.5	***746.7***				747	63	0	348	69
553.85	1.00	2.50			9.9	48.5	***768.2***				768	63	0	360	70
552.85	1.00	3.10	17		11.6	60.1	***779.8***				780	63	0	366	71
551.85	1.00	3.10	17		11.6	60.1	***791.3***				791	63	0	372	72
550.85	1.00	3.10	17		11.6	60.1	***802.9***				803	63	0	379	73
548.50	2.35	3.10	17		27.2	60.1	***1326.1***				~~1326~~	~~63~~	~~0~~	~~667~~	~~75~~
547.50	1.00			Shale	296.7	556.2	***1622.8***				~~1623~~	~~63~~	~~0~~	~~830~~	~~75.9~~
546.50	1.00			Shale	296.7	556.2	***1919.5***				~~1920~~	~~63~~	~~0~~	~~993~~	~~76.9~~
545.50	1.00			Shale	296.7	556.2	***2216.2***				~~2216~~	~~63~~	~~0~~	~~1156~~	~~77.9~~
544.50	1.00			Shale		556.2									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 2
REFERENCE BORING ========== 3, 7, 7P
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 623.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 621.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 597.70 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 6333 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 47.41 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 356.21 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 133.58 KIPS

PILE TYPE AND SIZE ========== Metal Shell 18"Φ w/.375" walls
Pile Perimeter========== 4.713 FT.
Pile End Bearing Area========== 1.767 SQFT.

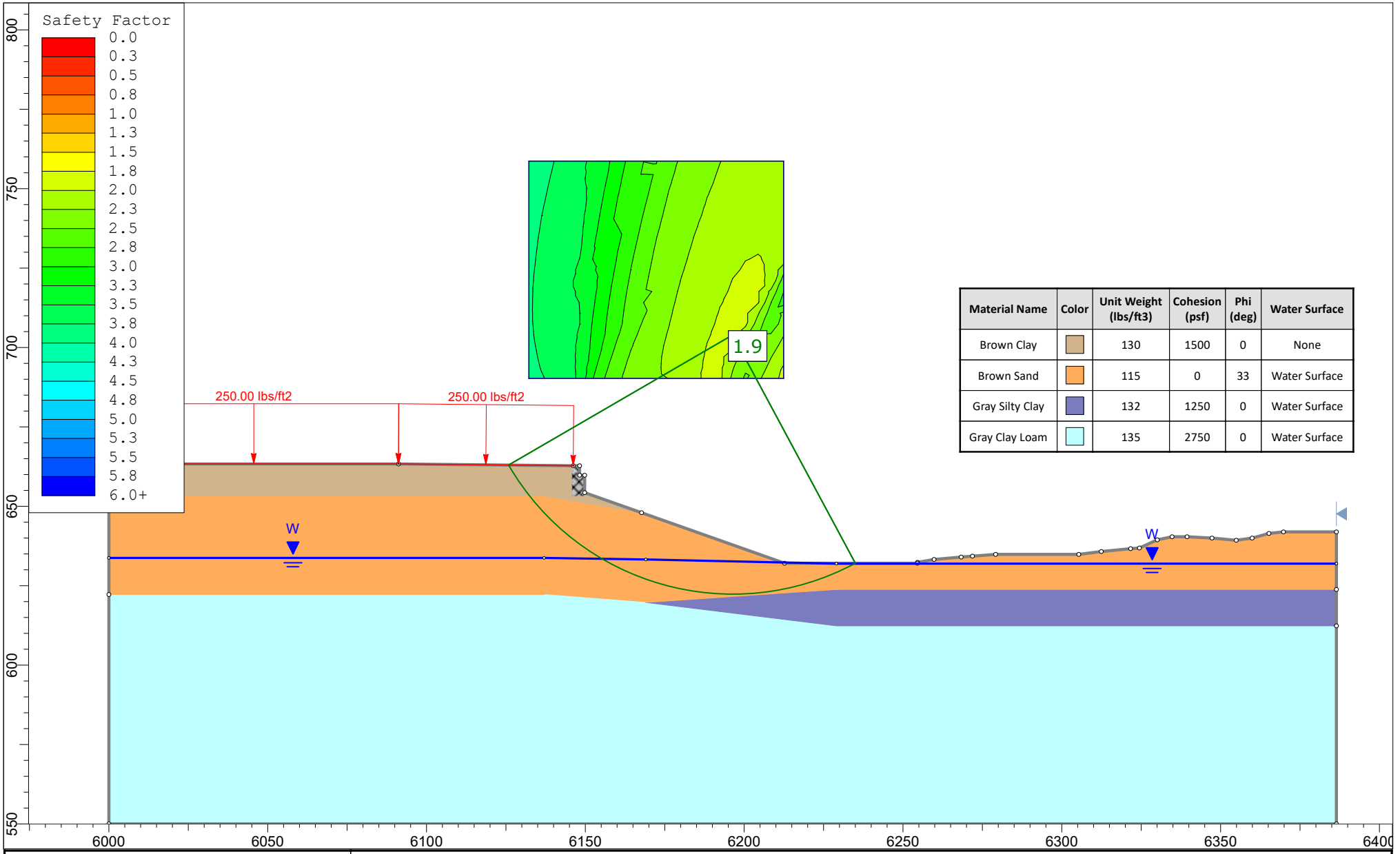
MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

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
882 KIPS	**784** KIPS	**292** KIPS	**71** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
620.18	1.22		18	Clean Coarse Sand	10.4		***21.5***				21	6	0	6	3
616.43	3.75		2	Clean Coarse Sand	3.6	11.1	***25.6***				26	8	0	6	7
615.18	1.25	0.60			4.2	11.6	***43.4***				43	10	0	14	8
612.43	2.75	1.30			17.6	25.2	***136.0***				136	20	0	55	11
610.18	2.25		12	Very Fine Silty Sand	10.0	100.1	***179.4***				179	25	0	73	13
604.93	5.25		16	Very Fine Silty Sand	31.2	133.5	***566.5***				566	42	0	269	18
602.43	2.50		44	Clean Coarse Sand	74.7	489.4	***641.2***				641	83	0	269	21
599.93	2.50		44	Clean Coarse Sand	74.7	489.4	***288.5***				289	125	0	34	23
597.70	2.23	3.20	22		26.4	62.0	***314.9***				315	139	0	34	26
596.43	1.27	3.20	22		15.0	62.0	***341.6***				342	139	0	49	27
593.93	2.50	3.80	21		33.6	73.6	***375.2***				375	139	0	67	29
591.43	2.50	3.80	21		33.6	73.6	***410.7***				411	139	0	87	32
586.43	5.00	3.90	21		68.6	75.6	***461.9***				462	139	0	115	37
581.43	5.00	3.00			56.4	58.1	***522.2***				522	139	0	148	42
578.43	3.00	3.20	26		35.5	62.0	***557.6***				558	139	0	168	45
576.43	2.00	3.20	26		23.7	62.0	***583.2***				583	139	0	182	47
573.43	3.00	3.30	24		36.3	64.0	***594.3***				594	139	0	188	50
572.00	1.43	2.00			12.3	38.8	***616.3***				616	139	0	200	51
568.00	4.00	2.50			39.7	48.5	***656.1***				656	139	0	222	55
567.00	1.00	2.50			9.9	48.5	***677.6***				678	139	0	234	56
563.00	4.00	3.10	18		46.2	60.1	***723.8***				724	139	0	259	60
562.00	1.00	3.10	18		11.6	60.1	***723.8***				724	139	0	259	61
560.50	1.50	2.50			14.9	48.5	***738.7***				739	139	0	267	63
559.50	1.00	2.50			9.9	48.5	***748.6***				749	139	0	273	64
558.00	1.50	2.50			14.9	48.5	***763.5***				764	139	0	281	65
557.00	1.00	2.50			9.9	48.5	***773.5***				773	139	0	286	66
554.50	2.50	2.50			24.8	48.5	***798.3***				798	139	0	300	69
552.00	2.50	2.50			24.8	48.5	***784.4***				784	139	0	292	71
551.00	1.00	0.50			2.9	9.7	***1333.7***				~~1334~~	~~139~~	~~0~~	~~594~~	~~72~~
550.00	1.00			Shale	296.7	556.2	***1630.4***				~~1630~~	~~139~~	~~0~~	~~758~~	~~73.4~~
549.00	1.00			Shale	296.7	556.2	***1927.1***				~~1927~~	~~139~~	~~0~~	~~921~~	~~74.4~~
548.00	1.00			Shale	296.7	556.2	***2223.8***				~~2224~~	~~139~~	~~0~~	~~1084~~	~~75.4~~
547.00	1.00			Shale	296.7	556.2	***2520.5***				~~2520~~	~~139~~	~~0~~	~~1247~~	~~76.4~~
546.00	1.00			Shale		556.2									

APPENDIX G

SLOPE STABILTY ANALYSES EXHIBITS

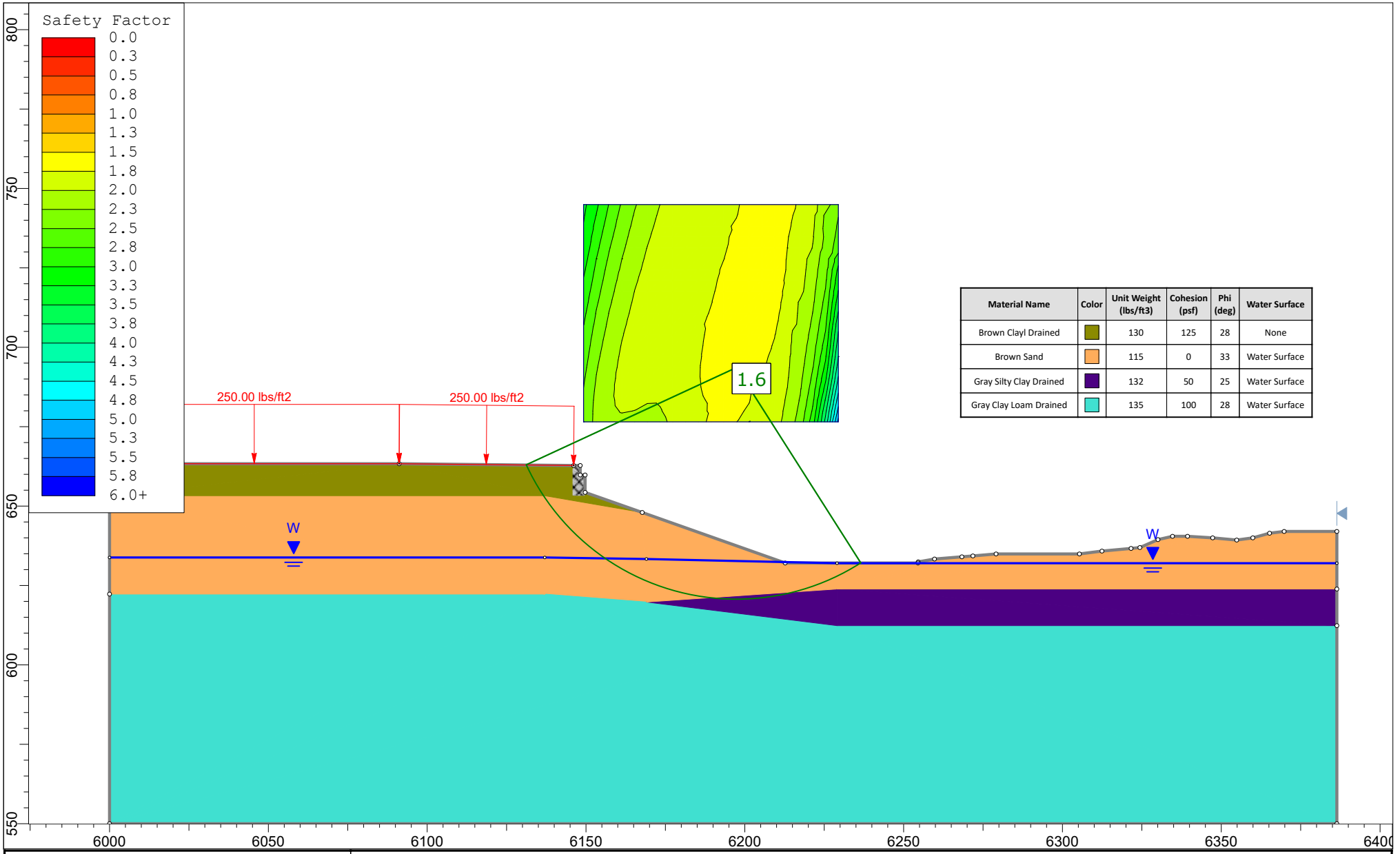


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Brown Clay		130	1500	0	None
Brown Sand		115	0	33	Water Surface
Gray Silty Clay		132	1250	0	Water Surface
Gray Clay Loam		135	2750	0	Water Surface

GSG CONSULTANTS, INC.
623 Cooper Court
Schaumburg, Illinois 60173
tel: 630.994.2600 • fax: 312.733.5612

SLIDEINTERPRET 7.032

Project	IL Rte. 17/IL Rte. 91 over Spoon River		
Analysis Description	Exhibit 1 - Circular Failure Short Term		
Drawn By	JR	Scale 1:500	Company GSG Consultants, Inc
Date	4/19/2018, 1:05:48 PM		File Name Spoon River - East Embankment Circular Short.slim

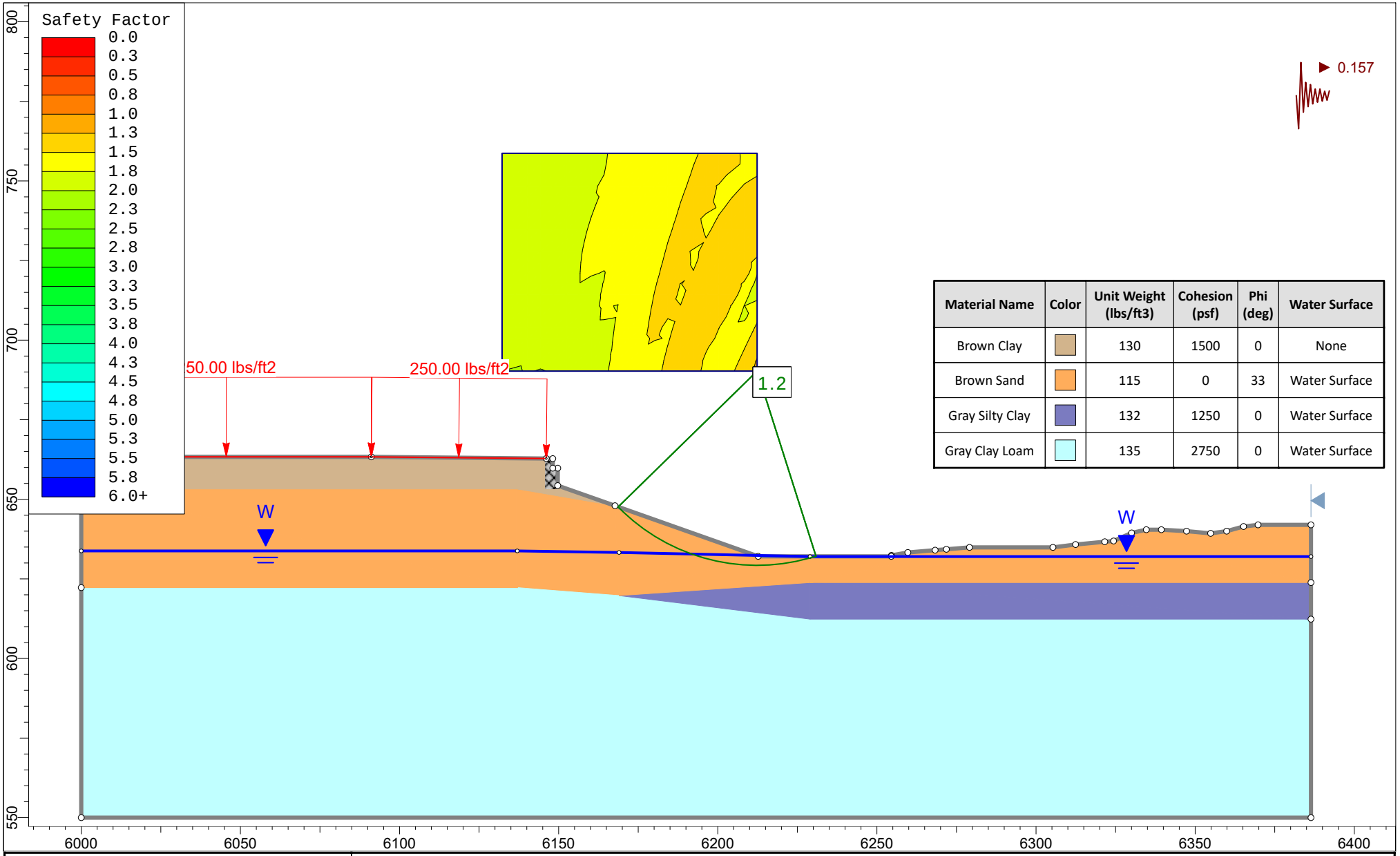


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Brown Clayl Drained		130	125	28	None
Brown Sand		115	0	33	Water Surface
Gray Silty Clay Drained		132	50	25	Water Surface
Gray Clay Loam Drained		135	100	28	Water Surface

GSG CONSULTANTS, INC.
623 Cooper Court
Schaumburg, Illinois 60173
tel: 630.994.2600 • fax: 312.733.5612

SLIDEINTERPRET 7.032

Project	IL Rte. 17/IL Rte. 91 over Spoon River		
Analysis Description	Exhibit 2 - Circular Failure Long Term		
Drawn By	JR	Scale 1:500	Company GSG Consultants, Inc
Date	4/19/2018, 1:05:48 PM		File Name Spoon River - East Embankment Circular Long.slim

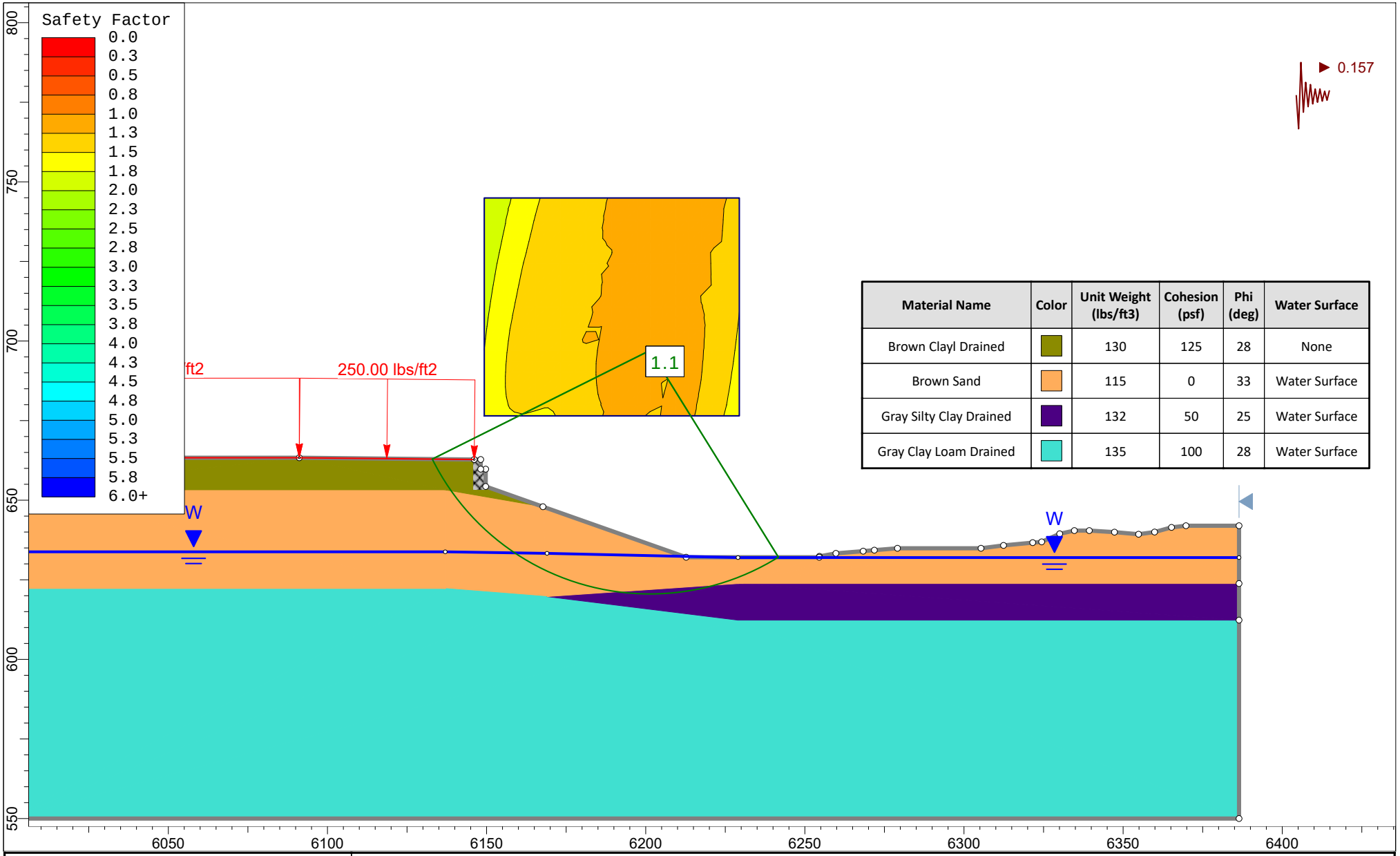


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Brown Clay		130	1500	0	None
Brown Sand		115	0	33	Water Surface
Gray Silty Clay		132	1250	0	Water Surface
Gray Clay Loam		135	2750	0	Water Surface

623 Cooper Court
Schaumburg, IL 60173
Tel: 630.994.2600
www.gsg-consultants.com

SLIDEINTERPRET 8.021

Project	IL Rte. 17/IL Rte. 91 over Spoon River		
Analysis Description	Exhibit 3 - Seismic Circular Failure Short Term		
Drawn By	AUB	Scale 1:500	Company GSG Consultants, Inc
Date	01/21/2019		File Name Spoon River - East Embankment Circular Short Seismic.slim



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Brown Clayl Drained		130	125	28	None
Brown Sand		115	0	33	Water Surface
Gray Silty Clay Drained		132	50	25	Water Surface
Gray Clay Loam Drained		135	100	28	Water Surface

623 Cooper Court
Schaumburg, IL 60173
Tel: 630.994.2600
www.gsg-consultants.com

SLIDEINTERPRET 8.021

Project	IL Rte. 17/IL Rte. 91 over Spoon River		
Analysis Description	Exhibit 4 - Seismic Circular Failure Long Term		
Drawn By	AUB	Scale 1:500	Company GSG Consultants, Inc
Date	01/21/2019		File Name Spoon River - East Embankment Circular Long Seismic.slim

APPENDIX H

PRELIMINARY FACTORED LOADS AT PIERS

IL 17 OVER SPOON RIVER BRIDGE PROJECT (SN088-0030)

Estimated Maximum Pile Loads

Option	No of Rows of Piles	Total Number of Piles	Max. Vertical Load per pile (kips)		Max. Longitudinal Horizontal Load per Pile (kips)		Max. Lateral Horizontal Load per Pile (kips)	
			Pier 1	Pier 2	Pier 1	Pier 2	Pier 1	Pier 2
16" Dia MS piles (Option A)	3	36	197	238	4.99	4.73	2.04	2.76
16" Dia MS piles (Option B)	3	33	210	237	5.44	5.16	2.22	3.02
16" Dia MS piles (Option C)	3	32	225	262	5.61	5.33	2.29	3.11
16" Dia MS piles (Option A)	4	48	142	180	3.74	3.55	1.53	2.07
16" Dia MS piles (Option B)	4	43	156	187	4.18	3.96	1.71	2.31
16" Dia MS piles (Option C)	4	44	159	195	4.08	3.87	1.67	2.26
36" Large Dia. Concrete Piles	2	12	525	650	14.96	14.20	6.10	8.29

Estimated Total Factored vertical Load

Pier 1 = 4367 kips

Pier 2 = 6333 kips