Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 7-29-2020	**Proposed SN:** 046-0160	**Route:**	FAP 330 (US 45/52)
Revised Date:	**Existing SN:** 046-0046	**Section:**	16 BR-1
Geotechnical Engineer: Mark Jones of McCleary Engineering		**County:**	Kankakee
Structural Engineer: William Vegrzyn of V3 Companies		**Contract:**	66H54

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structure SN046-0160 is a three-span structure with integral abutments and solid wall piers. Drilled shafts are proposed for the pier foundations. The end spans are 33.0 ft. long and the center span is 40 ft. long. The out to out superstructure width is 42.83 ft. and the back to back abutment length is 109.79 ft. The estimated factored loading at the abutments is 840 kips; 750 kips at the piers. The skew is 15° and the estimated width of the substructure unit is 44.35 ft. See attached TSL drawing for further information

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): Four boring were taken in 1967. The borings are not very deep, ranging from 6 ft. to 15 ft. before refusal. The borings show anywhere from 5 ft. to 8.5 ft. of overlying Sand, Clay, Silty Clay, and Silty Loam, most with Limestone Fragments. All 4 borings reported a base layer of Limestone rubble or very dense thinly to moderately bedded Argillaceous Limestone. The thickness of this base layer varied from 1 ft. to 8.5 ft. before refusal. The depth of refusal varied between elevations of 642.19 ft. and 647.79 ft.

Two borings were taken in March of 2018, Boring 01 (S.E. Quad) and Boring 02 (N.W. Quad). Both borings exhibited a similar soils, with ±7 ft. of Stiff to Very Stiff Silty Clay Loam Fill with Gravel and Asphalt pieces, and Concrete debris over ±6 ft. Stiff to Very Stiff Silty Loam and Loamy Sand and Gravel. Beneath this, Boring 01 had 2 ft. of Hard Black Clay (Eroded Reworked Coal?) over ±7.5 ft. of Hard Silty Clay – Silty Calcareous Shale with Coal Pieces. Boring 02 had 5 ft. of Dense Calcareous Shale with Limestone Gravel and Fragments. Both borings ended with 3 to 4 ft. of Dense Silty Calcareous Shale with Limestone Layer and Pieces. The borings ended in this last layer when the blow counts reached 100 or more per 4 inches. Boring 01 was terminated at 635.68 ft. and Boring 02 was terminated at 641.21 ft. The groundwater elevation was 650.5 ft. and 651.4 ft. in Boring 01 and 02, respectively.

Six cores were taken. Two taken by State personnel; Core 03 (N.E. Quad) and Core 04 (S.W. Quad.) at the abutments in May of 2020. Four more borings/cores (Identified in this report as Wang Borings, B-01 through B-04 because of the repeating nomenclature) were taken each side of the 2 proposed piers in June of 2020. They reveal a dramatically varied bedrock surface, possibly an erosional surface, with dense to very dense limestone and shale, and medium dense to very dense siltstone. Elevations of the top of limestone varied from 627.3 to 645.87. Wang Boring B-02 reported only Siltstone while the 5 other cores/borings reported only Shale over Limestone (State Core 03 (N.E. Quad) reported Limestone over Shale). The reported bedrock elevations would indicate a sloping west to east surface except that Core 03 (N.E. Quad.) on the east side reported the highest surface of limestone found (645.87). Note this core is less than 20 ft. away from Wang Boring B-04, which reported the lowest top of limestone, 627.8 ft.

McCleary Engineering (McE) feels that more information is required to define the top of rock surface. Without further subsurface exploration of the variable top of rock McE cannot making meaningful estimates which will lead to construction delays and cost over-runs as redesigns of the foundations are developed. Especially troublesome are the Pier borings/cores. Drilled shafts would be advantageous at the pier locations because of the stream and a nearby top surface of rock. Pier 1 shows only siltstone on the west side of the pier—the east side shows the top of limestone at 637.8. Also note that Core 4 is less than 15 ft. from Wang Boring B-02 and it show a top of limestone at 643.22 ft., about a 17 ft. difference. The Wang Borings at Pier 2 both report a limestone surface, but the difference in elevation is concerning (also about 17 ft.).

McE recommends additional 15 ft. cores be taken at the roadway centerline along Pier 1 and Pier 2 to try and establish a more accurate profile of the top of limestone surface. More exploration of the siltstone reported at Wang Boring B-02 is needed. If limestone could be found within a reasonable depth, McE could be consistent with recommending sockets in the limestone. Without discovery of the limestone, unconfined compressive strengths of the siltstone are required to develop accurate side and tip resistances in the siltstone. See the attached 1967 and 2018 borings, the 2020 cores, and the 2020 Wang Borings/cores. Also attached is a comparison between the old and new borings with further thoughts on the current status of subsurface exploration.

The as built plans for the existing structure, SN 046-0046, show a ±85 foot 3-span bridge on closed abutments and solid stem piers supported on spread footings. As-built plans show the bottom of the spread footings at an elevation of 647.63 ft. (Pier 2 shows an elevation of 647.60 ft.) Routine bridge inspections did not report any critical scour or bridge settlement.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: The proposed roadway will retain the same vertical and horizontal alignment as the existing roadway. The existing bridge has been in place since 1967 and shows no settlement problems. Future settlement is of minimal concern.

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The current structure (±85 ft. b-b) has closed abutments, the proposed structure (±110 ft. b-b) will utilize open spill-through abutments and will require removal of the material behind the existing abutments. Following state policy, it is expected that after construction the new end slopes will be 2:1 (H:V) and lined with Class A4 or A5 stone riprap. A temporary slope stability analysis was completed using Slide for the temporary end slopes. Using the information from boring SB-01 (S.E.Quad.) in an undrained condition the proposed 2:1 end slope will have a factor of safety against a slope failure of 4.912

Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: The abutments were not evaluated for scour in accordance with IDOT policy**.** Spill through abutments shall be protected by riprap or slope wall. The Thalweg has an elevation of 651.0 ft. The unadjusted scour depths are as follows; Q_{100} scour depth = 16.54 ft. and Q_{200} scour depth = 15.83 ft.

Pier Scour: Two borings/cores were taken at each pier, the worst case was used to determine the scour depth; for Pier 1 (south pier); below the Thalweg elevation is 0.7 feet of soft to very soft Silt Loam, Loam, and Clay Loam (zero geotechnical reduction in scour). Then a ≥ 19.5 ft. layer of siltstone was reported. The top of the siltstone has an estimated Q_U of 2.4 tsf (say 50% geotechnical reduction in scour, the second “layer”; 50%, third “layer”; 75%). See attached calculations and Siltstone sample pictures. The recommended design scour elevation for the south pier is 645.1. The recommended check scour elevation would be 645.3 ft.

For Pier 2 (north pier), under a foot and a half of Gravel (zero geotechnical reduction in scour), a minimum 6.5 ft. of dense to very dense, weathered to highly weathered shale was reported (90% geotechnical reduction in scour). With a Thalweg of 651.0 and using B-01 as the worst case boring/core, the recommended design scour elevation for the north pier is 648.0. The recommended check scour elevation would be 648.1 ft.

A geotechnical reduction in the scour depths for Pier 1 and Pier 2 was applied and the results are shown in the Design Scour Table below.

Event/Limit State	Design Scour Elevations (ft.)				Item 113
	S. Abut	Pier 1	Pier 2	N. Abut.	
Q100	-	645.10	648.00	-	5
Q200	-	645.30	648.10	-	
Design	656.65	645.10	648.00	656.62	
Check	656.65	645.30	648.10	656.62	

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: This site has a seismic site class of “C”, the seismic performance zone (SPZ)=1. The S_{DS}= 0.124 and an S_{D1}=0.07. Due to the S_{D1} being less than 0.15 g, a liquefaction analysis was not performed.

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: Data from the two March 2018 borings, Boring 01 (S.E. Quad) and Boring 02 (N.W. Quad) was used to populate the data fields in the Estimated Pile Length spreadsheets. Boring 01 was used for the north abutment and Boring 02 was used for the south abutment. These borings satisfactorily represent soil layers at the proposed substructure locations.

Data from the two 2018 borings, 01 (S.E. Quad.) and 02 (N.E. Quad.) were used to populate the data fields in the Estimated Pile Length Spreadsheets. Total factored loading for the abutments is 840 kips.

Integral Abutments – At the abutments McE recommends the use of H Piles with metal shoes driven to refusal. The BBS 145 Integral Abutment worksheet was used to analyze the soils. McE used the data from the 2018 borings, Boring 01 (S.E. Quad.) and Boring 02 (N.W. Quad.) to populate the fields in the integral abutment worksheet. The results show the abutment soils would allow the required movement for integral abutments and no remediation is required. The numerous layers with Gravel and Limestone pieces, as well as the Asphalt and Concrete debris dictate the need for metal shoes for the piles. Boring 01 (S.E. Quad.) indicate hard soils starting at elevation 649.0 ft., but the relatively lower blow counts indicate drive-ability. The calculated settlement is negligible; therefore, down drag was not used in the analysis. Also, the site is in a SPZ 1, therefore, liquefaction was not considered. Due to the inconsistent boring results, two test piles are recommended, one should be driven at each abutment. See the appendix for pile tables and spreadsheets for all common size H-Piles.

Top of Rock elevations vary dramatically. The top of rock was taken from the 4 Wang borings--the top of rock for Boring B-02 was taken to be the top of the Siltstone where the increase in blow counts was dramatic (from 28 to over 100). Top of Rock elevations are as follows:

Pier 1	East Side	Wang Boring B-03	637.8
Pier 1	West Side	Wang Boring B-02	645.8
Pier 2	East Side	Wang Boring B-04	627.3
Pier 2	West Side	Wang Boring B-01	644.4

Assumptions used for the pile length analysis include:

- Bottom of North and South Abutment Elevation are respectively = 656.62 and 656.65.
- The factored loading for the Abutments is 840 kips and 750 kips for the piers.
- The pile cutoff elevation allows for a 2 ft. embedment into concrete for the integral abutments.
- No geotechnical losses were accounted for in the abutment analyses.

Drilled Shafts -- Design methods used for this report are discussed in FHWA Publication No. FHWA-NHI-10-016 for Drilled Shafts: Construction Procedures and LRFD Design Methods. Chapter 13 equations were used to develop side and base resistances for the boring at the west side of Pier 1 (Wang Boring B-02) in the Siltstone. See attached hand calculations in the appendix. The IDOT BBS 141 spreadsheet for Drilled Shaft Axial Capacity In Rock was used to evaluate the side and tip resistances for the 3 remaining pier cores, the east side of Pier 1 and the east and west sides of Pier 2. See attached Drilled Shaft Design tables for Wang Borings B-01, B-03, and B-04.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: The E.W.S.E is 653.8 ft. The use of drilled shafts with web walls would preclude the need for a cofferdam for pier construction.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: At this time, McE anticipates the structure to be built under staged construction conditions; due to the shallow depth of bedrock, a temporary retention system with need to be required at the stage line. The existing substructures shall be removed as per Section 501 of the 2016 IDOT Standard Specifications for Road and Bridge Construction.

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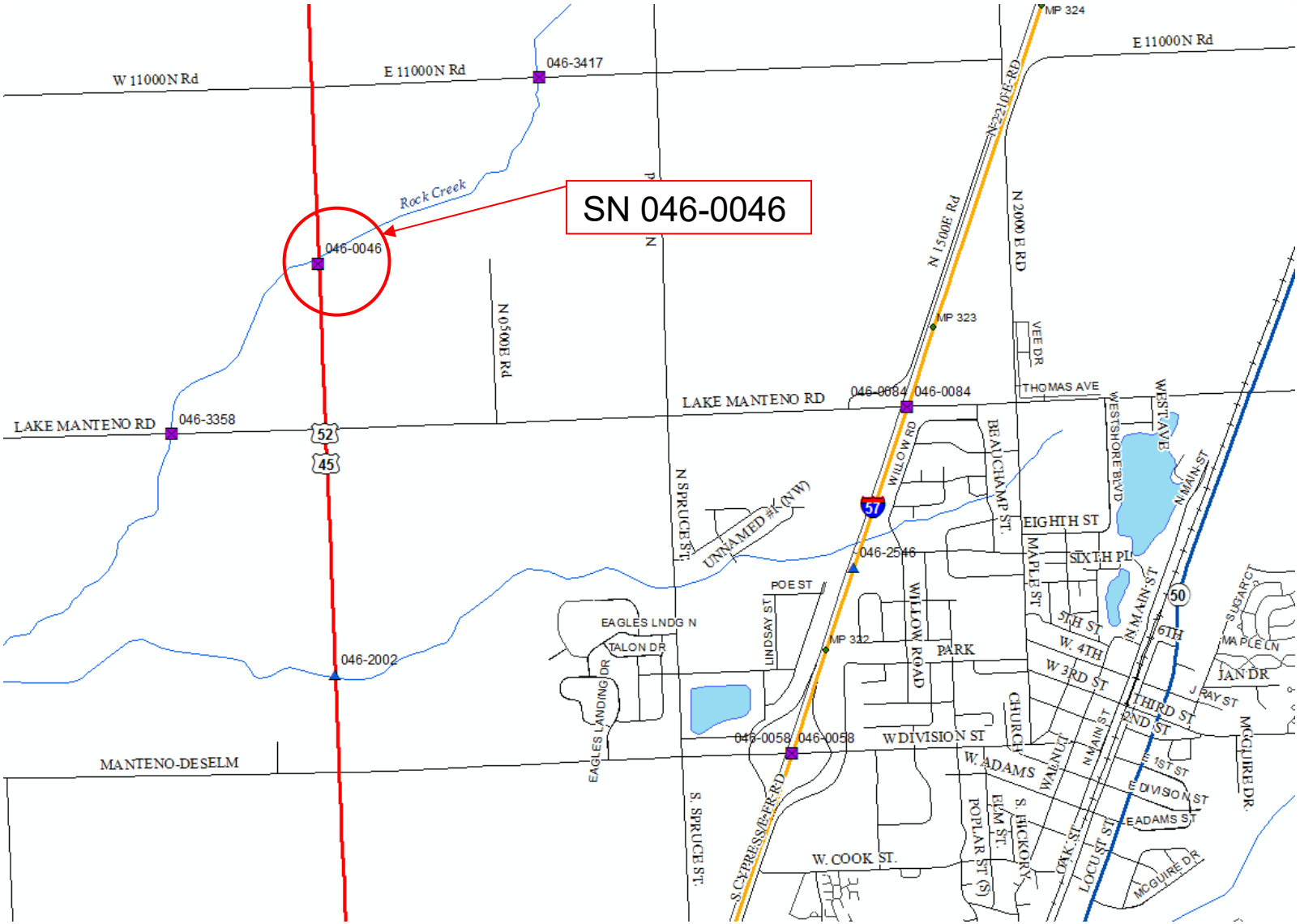
Location Map



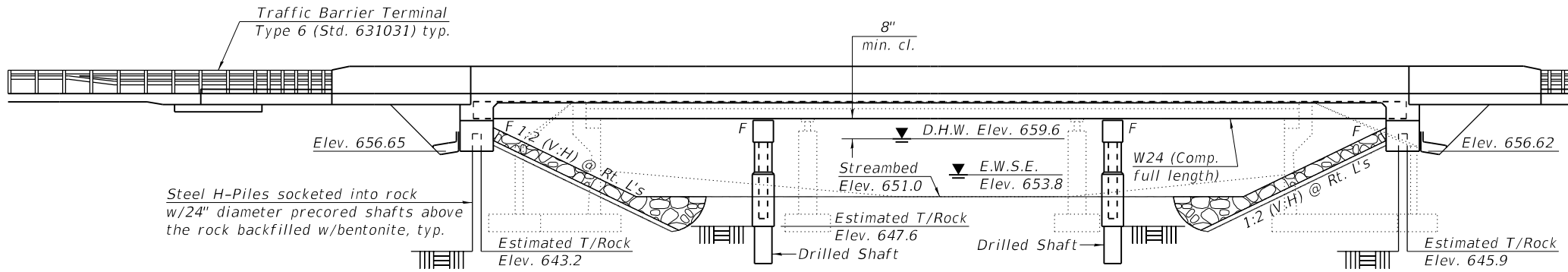
Benchmark: BM 14: Rivet on top of the NE wingwall of SN 046-0046; Elev. 661.91

Existing Structure: SN 046-0046 was originally constructed in 1967 as F.A. 45, Section 16 BR-1 at Station 517+09. The existing 3-span reinforced concrete slab superstructure is supported by closed abutments on spread footings and solid wall piers on spread footings. The outer spans are 24'-7" and the middle span is 30'-10" with a 15 degree skew. The back-to-back of abutments measure 84'-10" and the out-to-out width is 46'-6". The existing structure will be removed and replaced utilizing staged construction.

No salvage.

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.)				
	S. Abut.	Pier 1	Pier 2	N. Abut.	Item 113
Q100	656.65	647.60	647.60	656.62	8
Q200	656.65	647.60	647.60	656.62	
Design	656.65	647.60	647.60	656.62	
Check	656.65	647.60	647.60	656.62	



ELEVATION

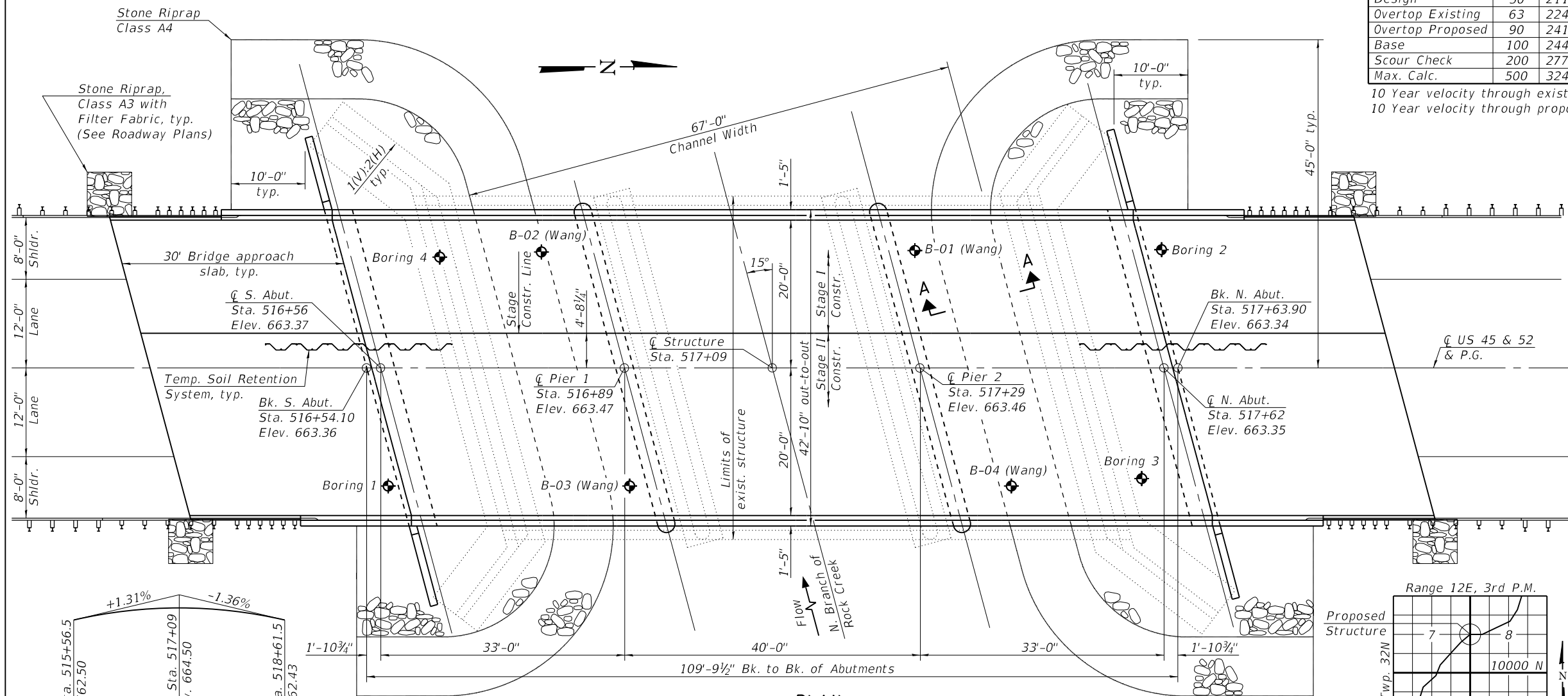
WATERWAY INFORMATION

Drainage Area=30.8 sq.mi.

Existing Overtopping Elev.=660.14 @ Sta. 510+00
Proposed Overtopping Elev.=660.14 @ Sta. 510+00

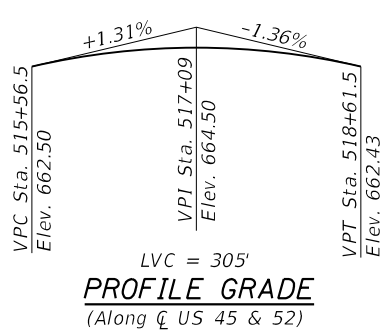
Flood	Freq. Yr.	Q C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	1400	588	643	658.9	0.1	0.1	659.1	659.1
Design	50	2110	637	707	659.6	0.5	0.4	660.1	659.9
Overtop Existing	63	2240	644	716	659.7	0.5	0.4	660.1	660.0
Overtop Proposed	90	2410	651	725	659.8	0.7	0.4	660.5	660.2
Base	100	2440	652	726	659.8	0.7	0.4	660.5	660.2
Scour Check	200	2770	662	744	660.0	0.8	0.7	660.8	660.6
Max. Calc.	500	3240	662	744	660.2	0.9	0.7	661.0	660.9

10 Year velocity through existing structure = 2.4 ft./sec.
10 Year velocity through proposed structure = 2.2 ft./sec.

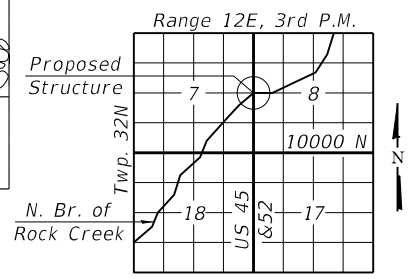


PLAN

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



PROFILE GRADE
(Along ℄ US 45 & 52)



LOCATION SKETCH

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL-93

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

DESIGN STRESSES

FIELD UNITS

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

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.073
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.125
Soil Site Class = C

HIGHWAY CLASSIFICATION

F.A.P. Rte. 330 - US Rte. 45 & 52
Functional Class: Other Principal Arterial
ADT: 7473 (2022); 10,293 (2042)
ADTT: 957 (2022); 1318 (2042)
DHV: 680 (2022); 937 (2042)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

GENERAL PLAN AND ELEVATION
US 45 & 52 OVER
NORTH BRANCH OF ROCK CREEK
F.A.P. RTE. 330 - SEC. 16 BR-1
KANKAKEE COUNTY
STATION 517+09.00
STRUCTURE NO. 046-0160

V3 Companies
7325 Janes Avenue
Woodridge, IL 60517
630.724.9200 phone
630.724.9202 fax
www.v3co.com

USER NAME = ____	DESIGNED - B. Vegrzyn	REVISED - ____	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		
	CHECKED - D. Greifzu	REVISED - ____			
PLOT SCALE = ____	DRAWN - B. Vegrzyn	REVISED - ____			
PLOT DATE = ____	CHECKED - D. Greifzu	REVISED - ____			

SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
330	16 BR-1	Kankakee		
		CONTRACT NO. 66H54		
		ILLINOIS	FED. AID PROJECT	

MODEL:
FILE NAME:
7/16/2020 11:51:17 AM

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 3/15/18

ROUTE FAP 330 (US 45/52) **DESCRIPTION** US 45/52 over North Branch of Rock Creek, 1.5 miles North of Manteno Road **LOGGED BY** Larry Myers

SECTION (16BR-1)ES **LOCATION** NE 1/4, **SEC.** 7, **TWP.** 32N, **RNG.** 12E, 3rd **PM**, **Latitude** 41.271699, **Longitude** -87.878047

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0046
Station 517+09

BORING NO. 01 (S.E. Quad.)
Station 516+57
Offset 16.0 ft Rt.
Ground Surface Elev. 661.51 ft

Surface Water Elev. 652.64 ft
Stream Bed Elev. 650.39 ft

Groundwater Elev.:
First Encounter 646.5 ft ▼
Upon Completion 650.5 ft ▽
After ____ **Hrs.** ____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Shoulder Stone. Brown & Black Silty Clay Loam Fill				
659.01				
Stiff to Very Stiff Black & Brown Silty Clay Loam Fill with Asphalt Pieces & Concrete Debris		2		
		3 7	2.0 P	19
	-5			
		3		
		4 5	2.5 P	21
654.51				
Very Stiff Brown Silty Loam & Loamy Sand / Gravel		5		
		6 9	2.5 P	13
652.01				
Medium Loamy Fine Sand to Coarse Gravel, mainly Limestone Gravel Pieces	-10	7		
▽		11 7		9
649.01				
Hard Black Clay (Eroded Reworked Coal?)		4		
		5 8	>4.5 P	17
647.01				
Hard Gray Silty Clay - Blocky, Highly Weathered & Reworked Silty Calcareous Shale with Coal Pieces	▼-15	7		
		9 11	>4.5 P	12
		7		
		9 11	>4.5 P	12
	-20			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
		11		
Hard Gray Silty Clay - Blocky, Highly Weathered & Reworked Silty Calcareous Shale with Coal Pieces *(continued)*		21 35	>4.5 P	10
639.51				
Dense Gray Blocky Silty Calcareous Shale with Limestone Pieces		12		
		18 27	>4.5 P	11
	-25			
		56		
635.68		100/4"		11
End of Boring				
	-30			
	-35			
	-40			

SOIL BORING 046-0046.GPJ IL_DOT.GDT 4/20/18

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)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 3/15/18

ROUTE FAP 330 (US 45/52) **DESCRIPTION** US 45/52 over North Branch of Rock Creek, 1.5 miles North of Manteno Road **LOGGED BY** Larry Myers

SECTION (16BR-1)ES **LOCATION** SW 1/4, **SEC.** 8, **TWP.** 32N, **RNG.** 12E, 3rd **PM**, **Latitude** 41.271985, **Longitude** -87.878169

COUNTY Kankakee **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 046-0046
Station 517+09

BORING NO. 02 (N.W. Quad.)
Station 517+61
Offset 16.0 ft Lt.
Ground Surface Elev. 661.38 ft

Surface Water Elev. 652.64 ft
Stream Bed Elev. 650.82 ft

Groundwater Elev.:
First Encounter 646.4 ft ▼
Upon Completion 651.4 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Shoulder Stone. Black & Brown Silty Clay Loam Fill
658.88				
	3			Very Stiff Black & Brown Silty Clay Loam Fill with Gravel Pieces
	4 5	2.5 P	19	
-5				
	2			
	4 5	2.0 P	25	
653.88				
	3			Stiff Brown & Gray Silty Loam, Silt, Loamy Sand & Gravel
	5 4	1.5 P	19	
651.88				
▽ -10				Medium Loamy Fine Sand to Coarse Gravel
	9			
	11 13		15	
649.38				
	10			Dense Gray Reworked Silty Calcareous Shale with Limestone Gravel Pieces
	20 30		8	
646.88				
▼ -15				Dense Gray Silty Calcareous Shale - Thin Blocky Bedding, Limestone Fragments throughout - Poor Quality
	27			
	28 31		11	
644.38				
	33			Dense Gray Silty Calcareous Shale - Blocky with Limestone Layers @ 20 Ft.
	76 100/4"		12	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
641.21	100/2"		10	End of Boring
-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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 046-0046.GPJ IL_DOT.GDT 4/20/18

Illinois Department of Transportation
Division of Highways
IDOT

ROCK CORE LOG

Date 5/12/20

ROUTE FAP 330 (US 45/52) **DESCRIPTION** US 45/52 over North Branch of Rock Creek, 1.5 miles North of Manteno Road **LOGGED BY** Larry Myers

SECTION (16BR-1)ES **LOCATION** NW 1/4, **SEC.** 8, **TWP.** 32N, **RNG.** 12E, 3rd **PM**,
Latitude 41.27199, **Longitude** -87.87804

COUNTY Kankakee **CORING METHOD** Split Barrel Wire Line

STRUCT. NO. 046-0046 (Exist.)
Station 517+09

BORING NO. 03 (N.E. Quad.)
Station 517+59
Offset 15.0 ft Rt.
Ground Surface Elev. 660.87 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 645.87 ft
Begin Core Elev. 645.87 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dense Gray Limestone with some Loose Horizontal Joints	645.87		1	95	37	5.6	
Vertical Fractures from 16.5 ft to 18 ft							267.4
	640.87	-20					506.3 503.4
Dense Gray Limestone with some Loose Joints			2	95	43	8.6	505.1
							525.2 505.3 539.0
	637.37						
Dark Gray Calcaueous Shale Thin to Medium Bedded with Limestone Layers							556.5
	635.87	-25					
Dense Gray, Green & Black Calcaceous Shale Bedded with Thin Limestone Layers - Numerous Seperations on Bedding Planes with some Vertical Fracturing			3	97	8	10.2	274.3
	630.87	-30					
End of Boring							
		-35					

ROCK CORE 046-0046.GPJ IL_DOT.GDT 6/10/20

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

Illinois Department of Transportation
Division of Highways
IDOT

ROCK CORE LOG

Date 5/13/20

ROUTE FAP 330 (US 45/52) **DESCRIPTION** US 45/52 over North Branch of Rock Creek, 1.5 miles North of Manteno Road **LOGGED BY** Larry Myers

SECTION (16BR-1)ES **LOCATION** SE 1/4, **SEC.** 7, **TWP.** 32N, **RNG.** 12E, 3rd **PM**,
Latitude 41.27168, **Longitude** -87.87815

COUNTY Kankakee **CORING METHOD** Split Barrel Wire Line

STRUCT. NO. 046-0046 (Exist.)
Station 517+09

BORING NO. 04 (S.W. Quad.)
Station 516+64
Offset 15.0 ft Lt.
Ground Surface Elev. 661.22 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 643.22 ft
Begin Core Elev. 643.22 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dense Gray & Green Limestone with some Loose Joints	643.22		1	93	68	8	
							1048.6
		-20					1078.0
							1101.6
	638.22						1140.6
Gray & Green Limestone with High Vertical Fracturing - Loose Joints with some Fractures Filled with Weathered Gray Shale. Numerous Striations on the Vertical Shear Faces			2	98	0	6.8	
		-25					1034.5
	633.22						
Dense Gray & Green Limestone - Vertical Fracturing continues to 29 ft Fracturing becomes Angled - Loose Joints, No Noticable Joint Filling			3	98	17	7.8	
		-30					
	628.22						
End of Boring							
		-35					

ROCK CORE 046-0046.GPJ IL_DOT.GDT 6/10/20

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

BBS, form 138 (Rev. 8-99)

US 45/52 Kankakee 046-0046
Hole #3 Depth From 15 to 25
Box 1 of 2 Core Run 1 & 2
Driller: IDOT D3

5/12/2020

15' Core Run 15-20

US 45/52 Kankakee 046-0046
Hole #3 Depth 25' to 30'
Box 2 of 2 Core Run 3
Driller: IDOT D3
5/12/2020

Cm Run #3
25

US 45/52 Kankakee 046-0046

Hole #4 Depth 18' to 27'

Box 1 of 2 Core Run 1 & 2

Driller: IDOT D3

5/13/2020

18'

US 45/52 Kankakee 046-0046
Hole #4 Depth 27' to 33'
Box 2 of 2 Core Run 2 + 3
Driller: IDOT D3
5/13/2020
Run 3
Run 2
05/20/2020 10:18

Wang Engineering
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BORING LOG B-01

WEI Job No.: 390-04-01

Client: **Engineering Resource Associates, Inc.**
Project: **US 45/52 Over N. Branch of Rock Creek**
Location: **Kankakee County**

Datum: NAVD 83
Elevation: 661.35 ft
Latitude: 41.27188
Longitude: -87.87816
Station: 517+28.30
Offset: -15.7079

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
660.2	0	14-inch thick CONCRETE --BRIDGE DECK--					
		Casing through open air					
	5						
653.1		Surface of stream water					
652.4		Loose, brown, gray and black GRAVEL; saturated		1	1 1 3	NP	10
650.9	10	--RDR 1--					
		Very dense, gray WEATHERED SHALE; damp to moist --RDR 2 to 3--		2	19 30 45	NP	10
				3	50/5.5"	NP	12
	15			4	50/3"	NP	
644.4		Strong, light greyish gray, very poor to fair quality, LIMESTONE; Closely spaced, slightly weathered, horizontal and oblique JOINTS, with <0.05 inch opening, slightly rough walls, and <0.2 inch thick clay infill. --Run 1: 17.0 to 18.0 feet-- --RECOVERY = 100%-- --RQD = 0%-- --Run 2: 18.0 to 28.0 feet-- --RECOVERY = 97%-- --RQD = 58%--		5	CORE	879.44	
	20			6			
	25					806.64 967.15 849.20	
	30	--Run 3: 28.0 to 33.0 feet-- --RECOVERY = 96%-- --RQD = 50%--		7	CORE	608.98 614.17 332.90	
628.4		Boring terminated at 33.00 ft					
	35						
	40						
	45						
	50						

GENERAL NOTES

Begin Drilling: **05-28-2020** Complete Drilling: **05-28-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **18CME55T [85%]**
Driller: **RR&JV** Logger: **E. Yim** Checked by: **JAB**
Drilling Method: **2.25" IDA HSA to 11'; mud rotary thereafter; autohammer, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **8.25 ft**
At Completion of Drilling: **8.25 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 3900401.GPJ WANGENG.GDT 6/29/20

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BORING LOG B-02

WEI Job No.: 390-04-01

Client: **Engineering Resource Associates, Inc.**
Project: **US 45/52 Over N. Branch of Rock Creek**
Location: **Kankakee County**

Datum: NAVD 83
Elevation: 661.33 ft
Latitude: 41.27175
Longitude: -87.87815
Station: 516+77.76
Offset: -15.6797

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	660.1	14.75-inch thick, CONCRETE --BRIDGE DECK--						
		Casing through open air	5					
	654.8	Very loose, brown SANDY LOAM, trace gravel; moist --RDR 2--			1	1 1 1	NP	15
	652.8	Very loose, brown LOAM to CLAY LOAM, trace gravel; wet --RDR 2--	10		2	2 1 2	NP	30
	650.8	Medium dense, light gray to gray HIGHLY WEATHERED SILTSTONE; damp --RDR 2--			3	7 3 7	NP	13
			15		4	13 13 15	NP	14
	645.8	--rig chatter--						
		Very dense, light gray to gray HIGHLY WEATHERED SILTSTONE; dry to damp --RDR 2 to 3--			5	32 50/4"	NP	13
	643.3	--rig chatter--						
		Very dense, gray HIGHLY WEATHERED SILTSTONE; damp --RDR 2 to 3--	20		6	50/6"	NP	11
					7	50/4"	NP	11
					8	50/2"	NP	10
			25					
	633.3	Very dense, light gray HIGHLY WEATHERED SILTSTONE; damp			9	50/4"	NP	8
	631.3	--RDR 2--	30		10	50/4"	NP	17
		Boring terminated at 30.00 ft						
			35					
			40					
			45					
			50					

GENERAL NOTES

Begin Drilling: **05-28-2020** Complete Drilling: **05-28-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **18CME55T [85%]**
Driller: **RR&JV** Logger: **E. Yim** Checked by: **JAB**
Drilling Method: **2.25" IDA HSA to 10.5'; mud rotary thereafter; autohammer, boring backfilled upon completion**

WATER LEVEL DATA

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

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

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BORING LOG B-03

WEI Job No.: 390-04-01

Client: **Engineering Resource Associates, Inc.**
Project: **US 45/52 Over N. Branch of Rock Creek**
Location: **Kankakee County**

Datum: NAVD 83
Elevation: 661.31 ft
Latitude: 41.27178
Longitude: -87.87804
Station: 516+89.71
Offset: 15.9673

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
660.1	0	14.25-inch thick CONCRETE --BRIDGE DECK--					
		Casing through open air					
	5						
652.6		Surface of stream water					
	10						
651.1							
650.6		Very dense, gray SANDY GRAVEL; saturated --RDR 3--		1	8 24 44	NP	11
		Very dense, greenish gray SHALE --RDR 3 to 4--		2	34 50/4"	NP	12
	15			3	28 50/3"	NP	11
				4	80/3"	NP	9
	20			5	50/2"	NP	8
637.8							
		Medium strong to very strong, light greenish white, fair to good quality, LIMESTONE; Closely spaced, fresh to slightly			CORE	956.79 1092.45	
	25						
		weathered, horizontal and vertical JOINTS, with 0.05 - 0.2 inch opening, slicken to slightly rough walls, and 0 - 0.2 inch thick clay infill.		6		931.94 820.25	
		--Run 1: 23.5 to 29.5 feet-- --RECOVERY = 94%-- --RQD = 72%--			CORE	858.71	
	30	--Run 2: 29.5 to 39.5 feet-- --RECOVERY = 100%-- --RQD = 77%--				1026.13	
	35			7		1086.40	
						1026.56	
						689.13	
621.8		Boring terminated at 39.50 ft					
	40						
	45						
	50						

GENERAL NOTES

Begin Drilling: **05-29-2020** Complete Drilling: **05-29-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **17B57T [91%]**
Driller: **NC&KG** Logger: **F. Bozga** Checked by: **JAB**
Drilling Method: **2.25" IDA HSA to 10.5'; mud rotary thereafter; autohammer, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **8.75 ft**
At Completion of Drilling: **8.75 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

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BORING LOG B-04

WEI Job No.: 390-04-01

Client: **Engineering Resource Associates, Inc.**
Project: **US 45/52 Over N. Branch of Rock Creek**
Location: **Kankakee County**

Datum: NAVD 83
Elevation: 661.28 ft
Latitude: 41.27192
Longitude: -87.87804
Station: 517+41.36
Offset: 15.9843

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
660.1	14-inch thick CONCRETE --BRIDGE DECK-- Casing through open air						
		5					
651.3		10	▼				
650.4	Surface of stream water						
	Dense to very dense, light gray HIGHLY WEATHERED SHALE; damp --RDR 2--			1	17 20 17 19	NP	15
				2	22 37 21 36	NP	12
		15					
645.8	Very dense, light gray WEATHERED SHALE; damp --RDR 2--			3	50/4"	NP	16
643.3	Very dense, light gray SHALE --RDR 2 to 3--			4	50/4"	NP	12
		20					
				5	50/0.5"	NP	
	--quick and slow alternating drilling to 26'--			6	50/4"	NP	14
		25					
635.3							

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	Very dense, black WEATHERED SHALE; damp --RDR 2 to 3--			7	50/5"	NP	19
633.3	Very dense, bluish gray to black WEATHERED SHALE; damp --RDR 2 to 3--			8	50/3"	NP	18
		30		9	50/4"	NP	17
627.8				10	50/0.5" CORE	NP	
	Very dense, gray LIMESTONE Strong, light grayish gray to dark gray, very poor to fair quality, LIMESTONE and SHALE; Closely spaced, slightly weathered, horizontal and oblique JOINTS, with > 0.2 inch opening, slicken to slightly rough walls, and 0-0.2 inch thick clay infill.	35					
	--Run 1: 34.0 to 42.0 feet-- --RECOVERY = 91%-- --RQD = 18%--	40		11		784.83	
	--Run 2: 42.0 to 51.0 feet-- --RECOVERY = 98%-- --RQD = 57%--				CORE	713.76	
		45				660.83	
				12		661.91	
		50					
610.3	Boring terminated at 51.00 ft						

GENERAL NOTES

Begin Drilling: **05-28-2020** Complete Drilling: **05-28-2020**
Drilling Contractor: **Wang Testing Services** Drill Rig: **18CME55T [85%]**
Driller: **RR&JV** Logger: **E. Yim** Checked by: **JAB**
Drilling Method: **2.25" IDA HSA to 15'; mud rotary thereafter; autohammer, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **10.00 ft**
At Completion of Drilling: **10.00 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 3900401.GPJ WANGENG.GDT 6/29/20

0 50 100 ft

LEGEND

Boring Location

BORING LOCATION PLAN: US-45/52 OVER ROCK CREEK, MANTENO, ILLINOIS

SCALE: Graphical	EXHIBIT 2-1	DRAWN BY: M. Sadowski CHECKED BY: N. Davis

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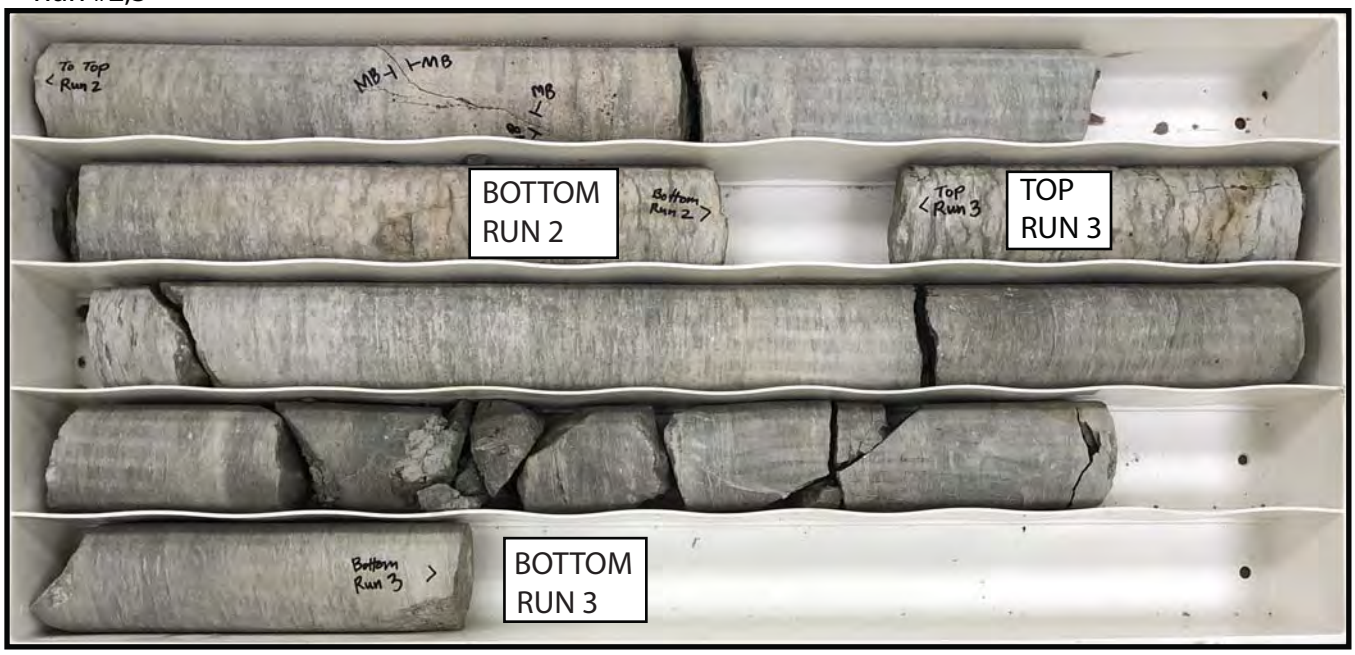
Boring B-01:
Run 1, 17' to 18', RECOVERY=100%, RQD=0%
Run 2, 18' to 28', RECOVERY=97.2%, RQD=58.3%

Run #1, 2

Boring B-01:
Run 2, 18' to 28', RECOVERY=97.2%, RQD=58.3%
Run 3, 28' to 33', RECOVERY=95.8%, RQD=50%

Run #2,3



0 3 6 9 12 inches

BEDROCK CORES: US-45/52 OVER ROCK CREEK, MANTENO, ILLINOIS

SCALE : GRAPHIC	Exhibit 2-2	DRAWN BY: M. Sadowski CHECKED BY: N. Davis

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Boring B-03:
Run 1, 23.5' to 29.5', RECOVERY=94.4%, RQD=72.2%

Run #1

Boring B-03:
Run 2, 29.5' to 39.5', RECOVERY=100%, RQD=76.7%

Run #2

0 3 6 9 12 inches

BEDROCK CORES: US-45/52 OVER ROCK CREEK, MANTENO, ILLINOIS

SCALE : GRAPHIC	Exhibit 2-3	DRAWN BY: M. Sadowski CHECKED BY: N. Davis

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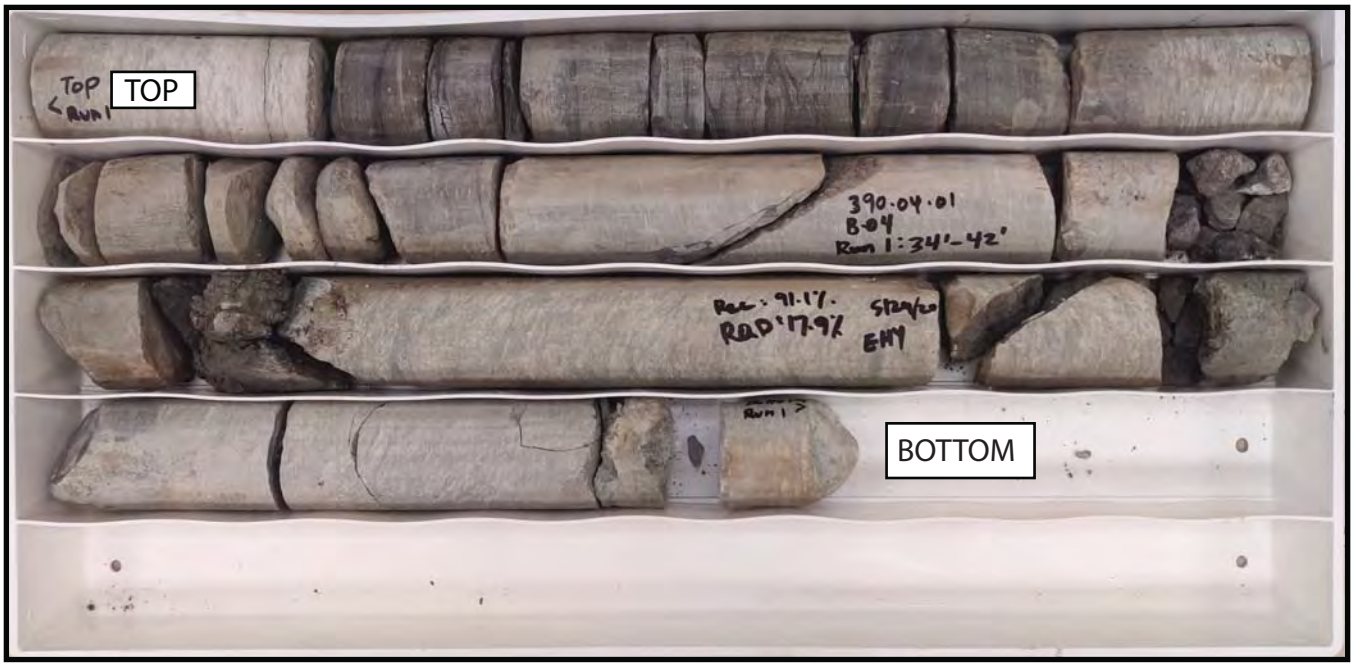
Boring B-04:
Run 1, 34' to 42', RECOVERY=91.1%, RQD=17.9%

Run #1



Boring B-04:
Run 2, 42' to 51', RECOVERY=98.1%, RQD=56.9%

Run #2

0 3 6 9 12 inches

BEDROCK CORES: US-45/52 OVER ROCK CREEK, MANTENO, ILLINOIS

SCALE : GRAPHIC	Exhibit 2-4	DRAWN BY: M. Sadowski CHECKED BY: N. Davis

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FOR Engineering Resource Associates, Inc. 390-04-01

Wang Engineering

Unconfined Compressive Strength of Intact Rock Core Specimens

Project: US 45/52 Over Rock Creek

Client: ERA

WEI Job No.: 390-04-01

Note: The specimens were sulphur capped for a more uniform break

Field Sample ID	Lab Specimen ID	Depth (ft)	Location	Sample Description	Length (in)		Diameter (in)	Total Load (lbs)	Total Pressure (psi)	Strength (tsf)	Fracture Type*	Break Date	Tested By	Area (in^2)
					Before Capping	After Capping								
B-1	1	21.2	US45/52	Limestone	4.05	4.13	2.06	40710	12214.5	879.44	3	6/16/20	MAC	3.33
B-1	3	24.3	US45/52	Limestone	4.08	4.17	2.06	37340	11203.4	806.64	3	6/16/20	MAC	3.33
B-1	4	24.8	US45/52	Limestone	4.08	4.23	2.06	44770	13432.7	967.15	3	6/16/20	MAC	3.33
B-1	5	25.3	US45/52	Limestone	4.03	4.12	2.06	39310	11794.5	849.20	3	6/16/20	MAC	3.33
B-1	6	26.3	US45/52	Limestone	4.02	4.12	2.06	28190	8458.1	608.98	3	6/16/20	MAC	3.33
B-1	7	27.0	US45/52	Limestone	4.11	4.20	2.06	28430	8530.1	614.17	3	6/16/20	MAC	3.33

*** Fracture Types:**

Type 1 - Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps;
Type 2 - Well-formed cone on one end, vertical cracks running through caps, no well defined cone on other end;
Type 3 - Columnar vertical cracking through both ends, no well-formed cones;
Type 4 - Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1;
Type 5 - Side fractures at top or bottom (occur commonly with unbonded caps);
Type 6 - Similar to Type 5 but end of cylinder is pointed.

Prepared by: _____ 6-18-20

Checked by: _____ 6-18-20

WANG ENGINEERING, INC.
1145 N. Main Street, Lombard. IL 60148

Wang Engineering

Unconfined Compressive Strength of Intact Rock Core Specimens

Project: US 45/52 Over Rock Creek

Client: ERA

WEI Job No.: 390-04-01

Note: The specimens were sulphur capped for a more uniform break

Field Sample ID	Lab Specimen ID	Depth (ft)	Location	Sample Description	Length (in)		Diameter (in)	Total Load (lbs)	Total Pressure (psi)	Strength (tsf)	Fracture Type*	Break Date	Tested By	Area (in^2)
					Before Capping	After Capping								
B-1	9	29.3	US45/52	Limestone	4.11	4.23	2.06	15410	4623.6	332.90	3	6/16/20	MAC	3.33
B-3	1	24.0	US45/52	Limestone	4.04	4.10	2.06	44290	13288.7	956.79	3	6/16/20	MAC	3.33
B-3	4	25.1	US45/52	Limestone	4.17	4.26	2.06	50570	15172.9	1092.45	3	6/16/20	MAC	3.33
B-3	8	26.9	US45/52	Limestone	4.08	4.13	2.06	43140	12943.6	931.94	3	6/16/20	MAC	3.33
B-3	10	27.7	US45/52	Limestone	4.15	4.21	2.06	37970	11392.4	820.25	3	6/16/20	MAC	3.33
B-3	12	31.0	US45/52	Limestone	4.01	4.09	2.06	39750	11926.5	858.71	3	6/16/20	MAC	3.33

*** Fracture Types:**

Type 1 - Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps;
Type 2 - Well-formed cone on one end, vertical cracks running through caps, no well defined cone on other end;
Type 3 - Columnar vertical cracking through both ends, no well-formed cones;
Type 4 - Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1;
Type 5 - Side fractures at top or bottom (occur commonly with unbonded caps);
Type 6 - Similar to Type 5 but end of cylinder is pointed.

Prepared by: _____ 6-18-20

Checked by: _____ 6-18-20

WANG ENGINEERING, INC.
1145 N. Main Street, Lombard. IL 60148

Wang Engineering

Unconfined Compressive Strength of Intact Rock Core Specimens

Project: US 45/52 Over Rock Creek

Client: ERA

WEI Job No.: 390-04-01

Note: The specimens were sulphur capped for a more uniform break

Field Sample ID	Lab Specimen ID	Depth (ft)	Location	Sample Description	Length (in)		Diameter (in)	Total Load (lbs)	Total Pressure (psi)	Strength (tsf)	Fracture Type*	Break Date	Tested By	Area (in^2)
					Before Capping	After Capping								
B-3	14	31.9	US45/52	Limestone	4.08	4.15	2.06	47500	14251.8	1026.13	3	6/16/20	MAC	3.33
B-3	19	34.3	US45/52	Limestone	4.02	4.13	2.06	50290	15088.9	1086.40	3	6/16/20	MAC	3.33
B-3	22	36.3	US45/52	Limestone	4.04	4.15	2.06	47520	14257.8	1026.56	3	6/16/20	MAC	3.33
B-3	26	37.8	US45/52	Limestone	4.04	4.15	2.06	31900	9571.2	689.13	3	6/16/20	MAC	3.33
B-4	3	39.0	US45/52	Limestone	4.02	4.16	2.06	36330	10900.4	784.83	3	6/16/20	MAC	3.33
B-4	5	42.3	US45/52	Limestone	4.01	4.13	2.06	33040	9913.3	713.76	3	6/16/20	MAC	3.33

*** Fracture Types:**

Type 1 - Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps;
Type 2 - Well-formed cone on one end, vertical cracks running through caps, no well defined cone on other end;
Type 3 - Columnar vertical cracking through both ends, no well-formed cones;
Type 4 - Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1;
Type 5 - Side fractures at top or bottom (occur commonly with unbonded caps);
Type 6 - Similar to Type 5 but end of cylinder is pointed.

Prepared by: _____ 6-18-20

Checked by: _____ 6-18-20

WANG ENGINEERING, INC.
1145 N. Main Street, Lombard. IL 60148

Wang Engineering

Unconfined Compressive Strength of Intact Rock Core Specimens

Project: US 45/52 Over Rock Creek

Client: ERA

WEI Job No.: 390-04-01

Note: The specimens were sulphur capped for a more uniform break

Field Sample ID	Lab Specimen ID	Depth (ft)	Location	Sample Description	Length (in)		Diameter (in)	Total Load (lbs)	Total Pressure (psi)	Strength (tsf)	Fracture Type*	Break Date	Tested By	Area (in^2)
					Before Capping	After Capping								
B-4	11	45.0	US45/52	Limestone	4.04	4.16	2.06	30590	9178.2	660.83	3	6/16/20	MAC	3.33
B-4	14	46.2	US45/52	Limestone	4.00	4.21	2.06	30640	9193.2	661.91	3	6/16/20	MAC	3.33

*** Fracture Types:**

Type 1 - Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps;
Type 2 - Well-formed cone on one end, vertical cracks running through caps, no well defined cone on other end;
Type 3 - Columnar vertical cracking through both ends, no well-formed cones;
Type 4 - Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1;
Type 5 - Side fractures at top or bottom (occur commonly with unbonded caps);
Type 6 - Similar to Type 5 but end of cylinder is pointed.

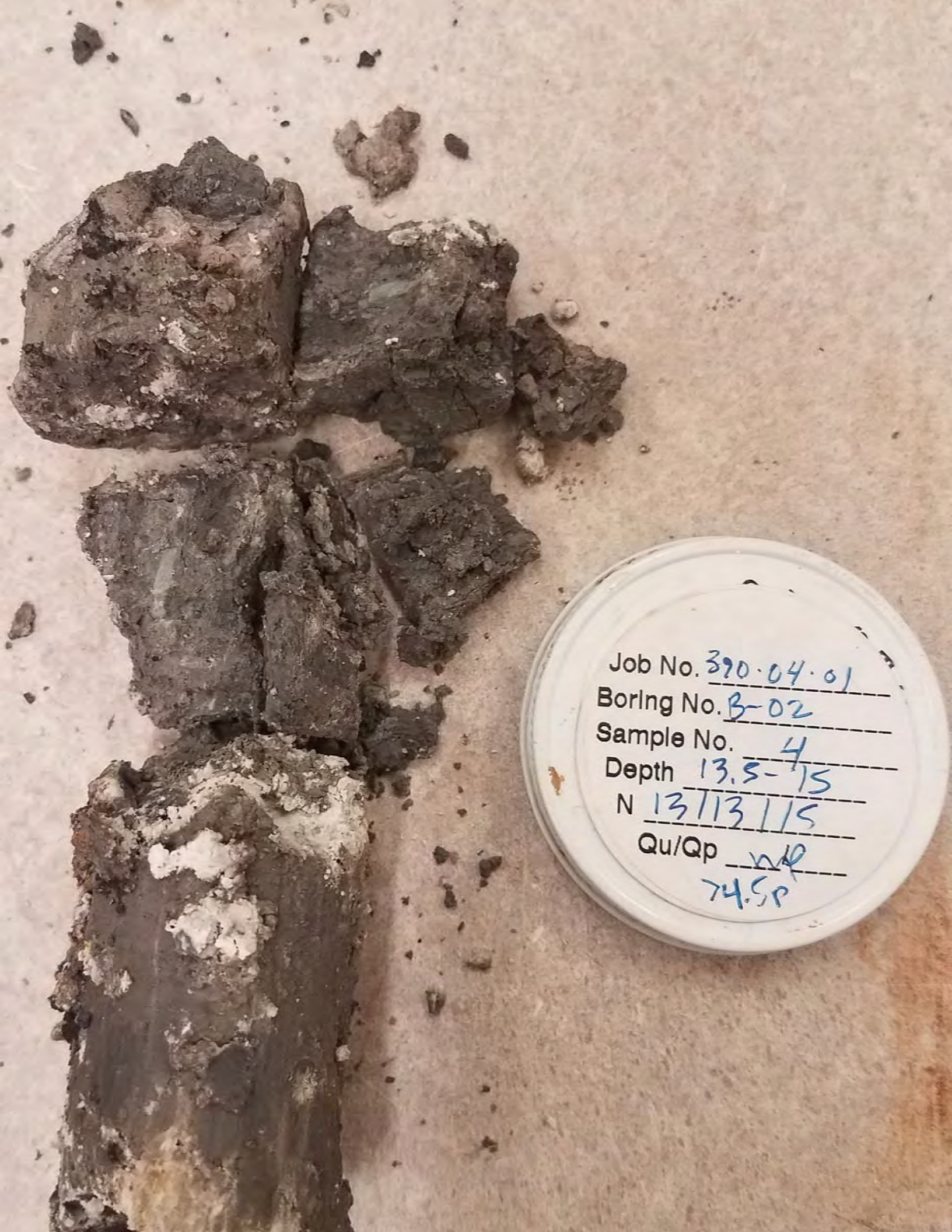
Prepared by: _____ 6-18-20

Checked by: _____ 6-18-20

WANG ENGINEERING, INC.
1145 N. Main Street, Lombard. IL 60148

Job No. 390.04.01
Boring No. B-02
Sample No. 3
Depth 11-12.5
N 7/3/7
Qu/Qp 14.0p
Job No. 390-04-01
Boring No. B-02
Sample No. 4
Depth 13.5-15
N 13/13/15
Qu/Qp 74.5p
Job No. 390.04.01
Boring No. B-02
Sample No. 5
Depth 16-17.5
N 32/50/4
Qu/Qp n/p

Job No. 390.04.01
Boring No. B-02
Sample No. 3
Depth 11-12.5
N 7 13 17
Qu/Qp 23' 14.0p
np


Job No. 390.04.01
Boring No. B-02
Sample No. 4
Depth 13.5-15
N 13/13/15
Qu/Qp NP
74.5P

Job No. 390.04-01
Boring No. B-02
Sample No. 5
Depth 16-17.5
N 32/50/4
Qu/Qp n/p

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
45	16BR-1	KKK	107	42
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

SHEET NO. 5 SHEETS

E. Abut.
Boring No. 1
Station 517+42.9
Offset 53' Lt.

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	657.29 0			
Loose Yellowish Brown Sub-angular Fine to Coarse SAND	653.79	6	--	-
Medium Yellowish Brown & Gray CLAY w/limestone Fragments	-5 651.29	29	0.5 S	8
Medium Gray Sub-angular Fine to Coarse SAND	648.79	22	--	-
Very Dense Gray Thinly Bedded Argillaceous LIMESTONE: H.S. Augers Penetrated very slowly	-10 646.13	3"/100 7"/200	--	--
Augers Refused to Penetrate Below	646.79 -15			

Surface Water El.	651.89
Groundwater El. at Completion	651.29
After 20 Hours	651.79

Pier #2
Boring No. 2
Station 517+20.0
Offset 18.5' Lt.

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	652.89 0			
Medium Olive Brown & Gray CLAY & Limestone Fragments	649.39	30	0.4 S	11
Dense Gray CLAY & LIMESTONE Fragments	-5 645.59	61	--	--
Very Dense Gray LIMESTONE, Thin to Moderate Bedding (Core) 70% Recovery	-10	104/7"		

Surface Water El.	651.89
Groundwater El. at Completion	651.89
After -- Hours	---

S. Abut.
Boring No. 3
Station 516+51.5
Offset 39' Lt.

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	657.19 0			
Medium Brownish Black SILTY CLAY	653.69	9	0.5 S	23
Medium Lt. Brown SILTY LOAM & LIMESTONE Fragments	-5 651.19	23	--	--
Very Dense Gray Thinly Bedded LIMESTONE (Argillaceous) Very Difficult to Penetrate with H.S. Augers	-10	300/6 1/2"	--	
		300/5"		
		300/6"		
	642.19 -15	Refusal		
	200/0"			

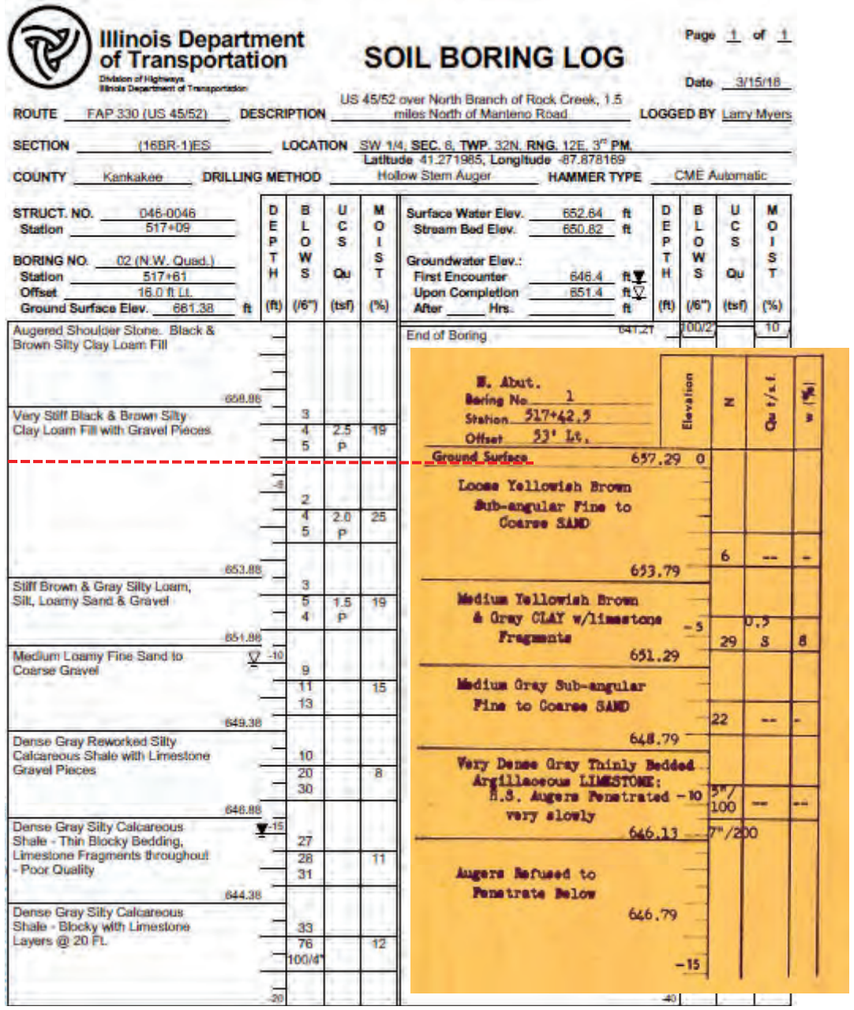
Surface Water El.	651.89
Groundwater El. at Completion	650.69
After 42 Hours	651.89

Pier #1
Boring No. 4
Station 516+98
Offset 15.5' Lt.

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	653.79 0			
Yellowish Brown to Gray CLAY & LIMESTONE Fragments. (See Note)	648.79 -5			
LIMESTONE BOULDER	647.79			
REFUSAL				

NOTE:
This boring was inaccessible to the foundation boring machine. A lightweight portable drill -10 was used to penetrate to the Limestone Surface.

Surface Water El.	651.89
Groundwater El. at Completion	651.89
After -- Hours	---



Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Page 1 of 1

Date 3/15/18

ROUTE FAP 330 (US 45/52) DESCRIPTION US 45/52 over North Branch of Rock Creek, 1.5 miles North of Manteno Road LOGGED BY Larry Myers

SECTION (16BR-1)ES LOCATION SW 1/4, SEC. 6, TWP. 32N, RNG. 12E, 3rd PM. Latitude 41.271985, Longitude -87.878169

COUNTY Kankakee DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 046-0046
Station 517+09

BORING NO. 02 (N.W. Quad.)
Station 517+61
Offset 16.0 ft Lt.
Ground Surface Elev. 661.38 ft

Surface Water Elev. 652.64 ft
Stream Bed Elev. 650.82 ft

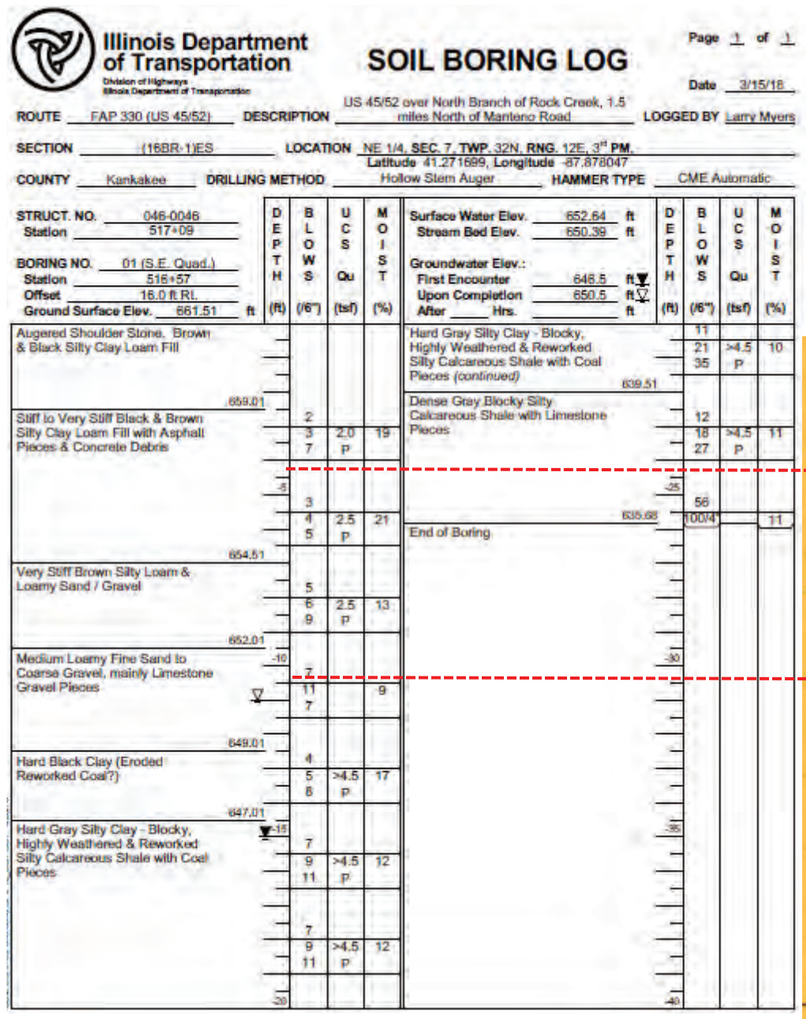
Groundwater Elev.:
First Encounter 646.4 ft
Upon Completion 651.4 ft
After ___ Hrs. ___ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Shoulder Stone. Black & Brown Silty Clay Loam Fill			
658.86			
Very Stiff Black & Brown Silty Clay Loam Fill with Gravel Pieces	3		
	4 5	2.5 P	19
-5	2		
	4 5	2.0 P	25
653.88			
Stiff Brown & Gray Silty Loam, Silt, Loamy Sand & Gravel	3		
	5 4	1.5 P	19
651.88			
Medium Loamy Fine Sand to Coarse Gravel ▽ -10	9		
	11 13		15
649.38			
Dense Gray Reworked Silty Calcareous Shale with Limestone Gravel Pieces	10		
	20 30		8
646.88			
Dense Gray Silty Calcareous Shale - Thin Blocky Bedding, Limestone Fragments throughout - Poor Quality ▽ -15	27		
	28 31		11
644.38			
Dense Gray Silty Calcareous Shale - Blocky with Limestone Layers @ 20 Ft.	33		
	76 100/4"		12
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
End of Boring 641.27	100/2"		10
-40			

N. Abut.
Boring No. 1
Station 517+42.5
Offset 53' Lt.

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	657.29 0			
Loose Yellowish Brown Sub-angular Fine to Coarse SAND	653.79	6	--	-
Medium Yellowish Brown & Gray CLAY w/limestone Fragments	651.29 -5	29	0.5 S	8
Medium Gray Sub-angular Fine to Coarse SAND	648.79	22	--	-
Very Dense Gray Thinly Bedded Argillaceous LIMESTONE: H.S. Augers Penetrated very slowly -10	646.13	5"/100	--	--
		7"/200		
Augers Refused to Penetrate Below	646.79 -15			



Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Page 1 of 1

Date 3/15/18

ROUTE FAP 330 (US 45/52) DESCRIPTION US 45/52 over North Branch of Rock Creek, 1.5 miles North of Manteno Road LOGGED BY Larry Myers

SECTION (16BR-1)ES LOCATION NE 1/4, SEC. 7, TWP. 32N, RNG. 12E, 3rd PM. Latitude 41.271699, Longitude -87.878047

COUNTY Kankakee DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 046-0046
Station 517+09

BORING NO. 01 (S.E. Quad.)
Station 516+57
Offset 16.0 ft Rt.
Ground Surface Elev. 661.51 ft

Surface Water Elev. 652.64 ft
Stream Bed Elev. 650.39 ft

Groundwater Elev.:
First Encounter 646.5 ft
Upon Completion 650.5 ft
After ___ Hrs. ___ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Shoulder Stone. Brown & Black Silty Clay Loam Fill			
659.01			
Stiff to Very Stiff Black & Brown Silty Clay Loam Fill with Asphalt Pieces & Concrete Debris	2		
	3 7	2.0 P	19
-5	3		
	4 5	2.5 P	21
654.51			
Very Stiff Brown Silty Loam & Loamy Sand / Gravel	5		
	6 9	2.5 P	13
652.01			
Medium Loamy Fine Sand to Coarse Gravel, mainly Limestone Gravel Pieces -10 ▽	7		
	11 7		9
649.01			
Hard Black Clay (Eroded Reworked Coal?)	4		
	5 8	>4.5 P	17
647.01			
Hard Gray Silty Clay - Blocky, Highly Weathered & Reworked Silty Calcareous Shale with Coal Pieces -15 ▽	7		
	9 11	>4.5 P	12
	7		
	9 11	>4.5 P	12
-20			

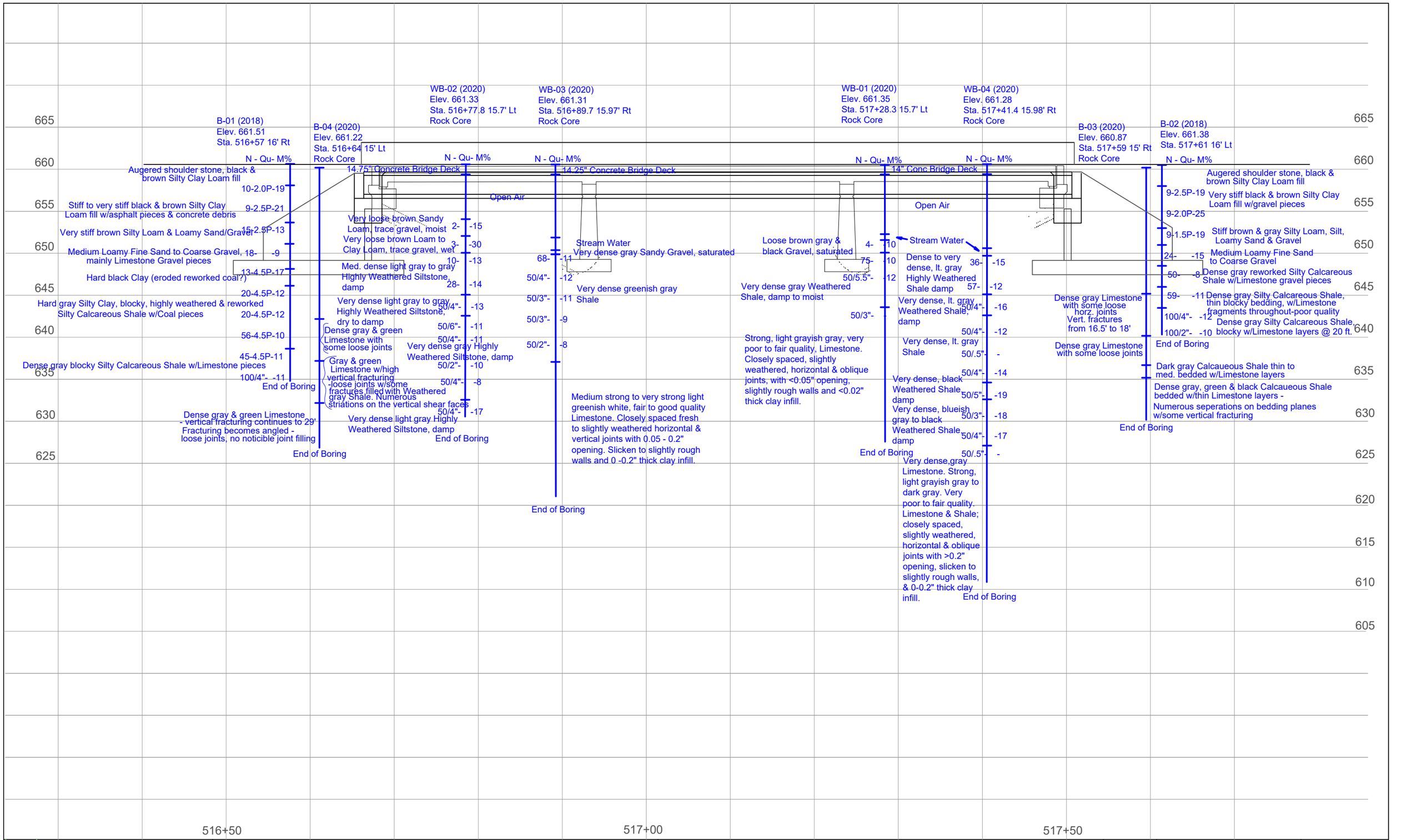
DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay - Blocky, Highly Weathered & Reworked Silty Calcareous Shale with Coal Pieces (continued)	11		
639.51			
	21 35	>4.5 P	10
Dense Gray Blocky Silty Calcareous Shale with Limestone Pieces	12		
	18 27	>4.5 P	11
-35	56		
635.68	100/4		11
End of Boring			
-40			

E. Abut.
Boring No. 3
Station 516+31.5
Offset 39' Lt.

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	657.19 0			
Medium Brownish Black SILTY CLAY	653.69	9	0.5 S	23
Medium Lt. Brown SILTY LOAM & LIMESTONE Fragments -5	651.19	23	--	--
Very Dense Gray Thinly Bedded LIMESTONE (Argillaceous) Very Difficult to Penetrate with H.S. Augers		300/6 1/2"	--	
-10		300/5"		
		300/6"		
	642.19 -15	Refusal		
		200/0"		

Note:

- Blow counts are likely different because we use automatic hammers now and they used a cathead.
  - However, the stark differences between the blow counts that we encountered in 2018 at say 648.88 ft. Elev. (10-20-30) compared to that in 1967 of (100/3") at 647.79 Elev. are dramatic. The rock in this area may be an erosional surface where at a particular location the rock is high and 3 ft. away the rock drops 7 ft. and 3 ft. away from the low rock the rock rises again to the elevation of the original boring. I don't usually see it this far away from the Kankakee River
- Auger refusal may differ between the rigs. Not sure what rig they were using back in 1967 compared to the rigs you have in your fleet today.
- The issue is that we would probably recommend driven H-piles using the new borings, but with the 1967 borings we would go with a spread footing or drilled shaft foundations.

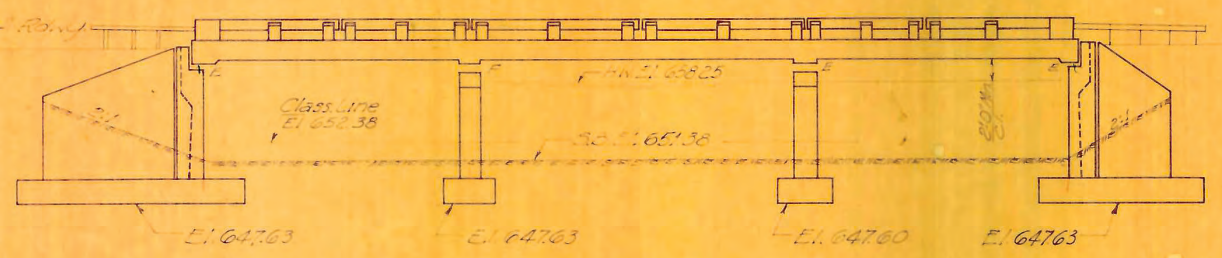


Cleary Engineering	Designed by:	Date:	US 45/52 over North Branch of Rock Creek		Route	Section	County
	Drawn by: MLL	Date: 7-28-20			FAP-330	(16BR-1)ES	Kankakee
	Checked by:	Date:	Scale = NA	Sheet 1 of 1	Sta. _____ to Sta._____	Bridge number: 046-0046	

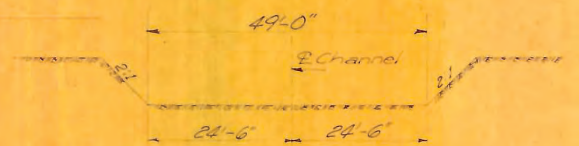
3-#6 16'-10" Bars in PP 26.42
Sta. 514+15 Sec. 6A.69
Existing Structure: Two span Reinf. Conc. thru Girder Rdwy. Width 1'-20'-6" on S.C. Abuts. & Piers will be removed by Bridge Contractor before new construction begins.

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

					SHEET NO. 1
	45	16BR-1	KKK	107	38	5 SHEETS
				F-30(8)	



ELEVATION



TYPICAL CROSS SECTION OF PROPOSED CHANNEL IMPROVEMENT OUTSIDE STRUCTURE LIMITS

STATION 517+09
BUILT 196 BY
STATE OF ILLINOIS
F.A. RT. 45 SEC. 16BR-1
F.A. PROJ. F-30 (8)
LOADING HS-20

NAME PLATE
See Sta. 21.13-1

GENERAL NOTES

Class X Concrete shall be used throughout except as noted.

The handrail concrete in the rail post & railing shall be poured in separate operations.

The concrete floor slab shall be finished in accordance with Art. 5.19 of the Sta. Specifications.

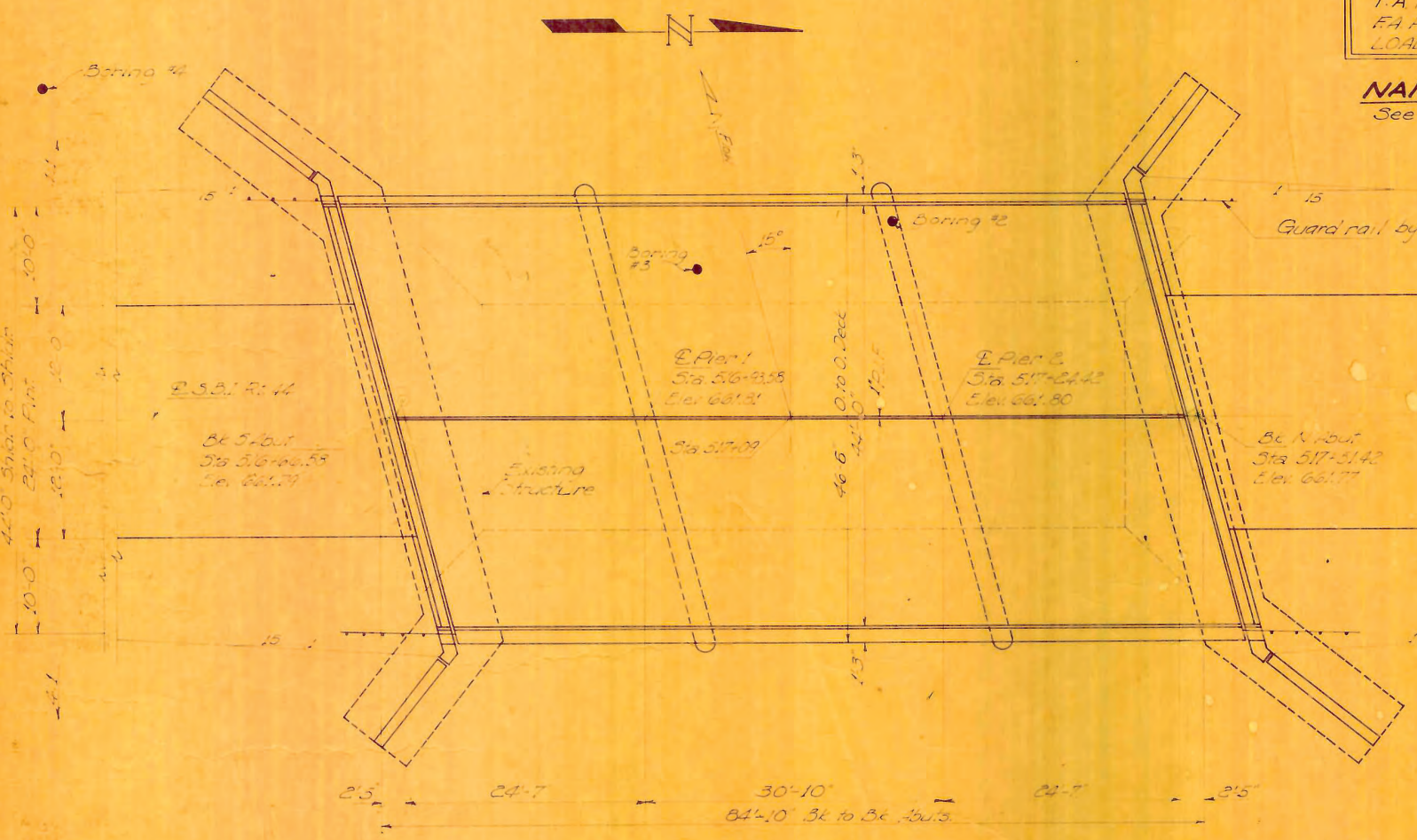
All reinforcement bars shall be lapped a minimum of 20 diameters unless otherwise shown.

The exposed surface of expansion guards shall be given two shop coats of red lead paint, the contact surface shall be given one coat of red lead paint. Anchor studs shall not be painted. All paints shall be furnished & applied by the Contractor.

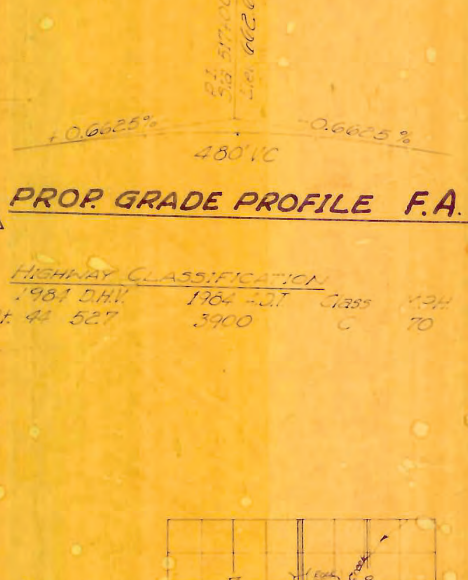
Expansion guards are included in the quantity of Structural Steel. Est. Weight 2400#

All structural steel shall comply with Specifications for Structural Steel A7 7 A36 & shall receive one shop coat of red lead paint & two field coats of Aluminum paint. See Art. 56-1 to 56-5 incl. of the Sta Specifications.

The back of bridge abuts & wing walls from the ground line to the top of the footing shall be waterproofed. Water proofing shall be done in accordance with Art. 5.10.1 of the Standard Specifications.



PLAN



PROP. GRADE PROFILE F.A. RT. 45

HIGHWAY CLASSIFICATION

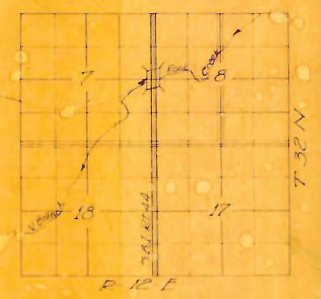
	1981 D.H.V.	1964 A.D.T.	Class	H.S.
S.B.I. Rt. 44	527	3900	C	20

TOTAL BILL OF MATERIAL

	ITEM		SUPER.	SUB.	TOTAL	PAVE.
	Class X Concrete	Cu. Yds.	1772	1574	3346	471.3
	Class A Concrete	Cu. Yds.		107.8	107.8	28.3
	Handrail Concrete	Cu. Yds.	5.2		5.2	
	Reinforcement Bars	Lbs.	16480	48550	65030	15,480
	Structural Steel	Lbs.	12830		12830	12,822
	Class "A" Exc. for Structure	Cu. Yds.		138	138	175
	Class "B" Exc. for Structure	Cu. Yds.		352	352	300
	Rock Excavation	Cu. Yds.		427	427	37.4
	Protective Coat	Sq. Yds.	488.3		488.3	400
*	Bridge Seat Sealant	Lump Sum	1		1	
	Name Plate	Ea.	1		1	
	Removal of Exist. Struct.	Ea.	1		1	

* Applied At Abutments Only.

* Quoted only if different from planned quantity



LOCATION PLAN

DESIGNED	Ebrary Jarsh
CHECKED	Lumay Chew
DRAWN	
CHECKED	L. M. C.

APRIL 28 1965
EXAMINED
PASSED
APPROVED

WATERWAY INFORMATION

Drainage Area ——— 18.982 Acres
Character ——— Level, rolling, cultivated
Required Opening ——— 482 Sq. Ft. (30 yrs. flood)
Present Opening ——— 301 Sq. Ft.
Proposed Opening ——— 492 Sq. Ft.
Low Water El. 651.38

DESIGN STRESSES

f_c = 1400 psi Super.
v_c = 75 psi. Footing
f_s = 20,000 psi. Reinf.
f_s = 1,000 psi. Abut & Wing Walls
n = 10

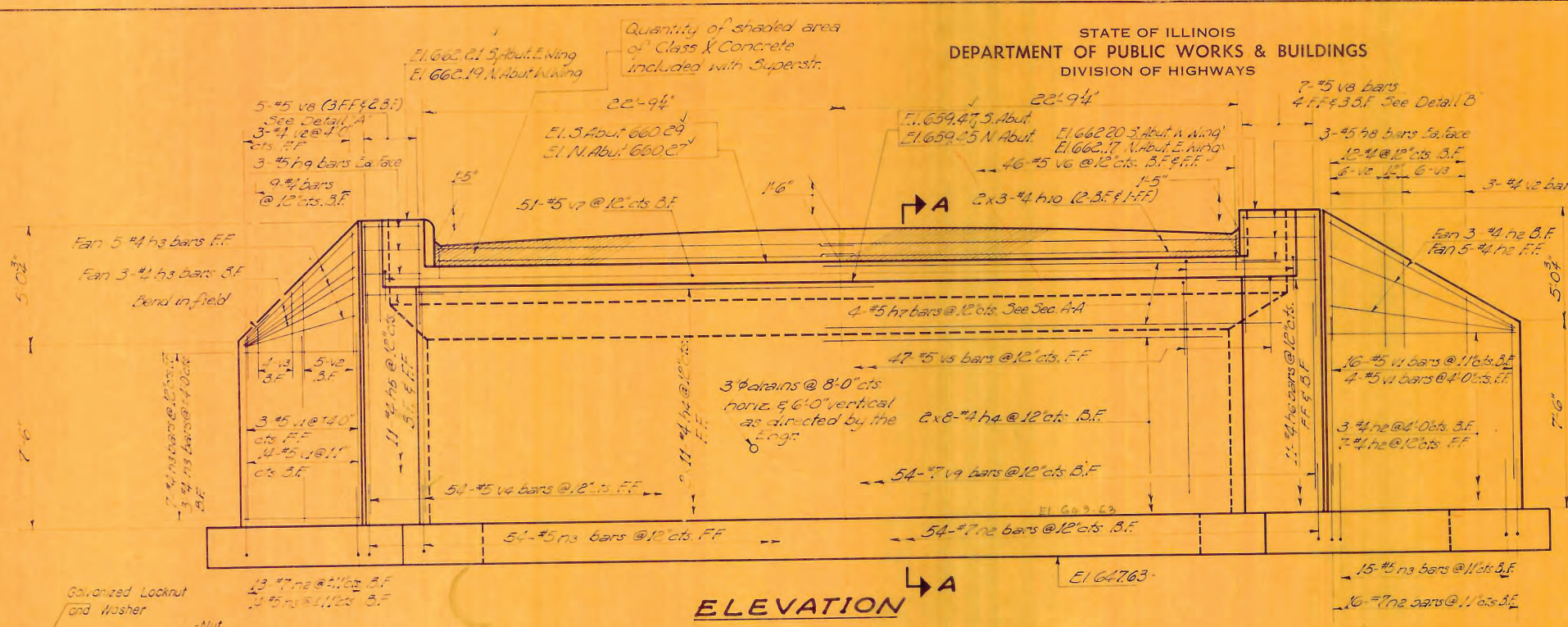
LOADING H S 20-44

PROJ. F-30 (8)
GENERAL PLAN & ELEVATION
F.A. RT. 45 SEC. 16BR-1
KANKAKEE COUNTY
STA. 517+09

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
45	16BR-1	KKK	107	40

SHEET NO. 3
5 SHEETS



TWO ABUTS. BILL OF MATERIAL.

Bar	No.	Size	Length	Shape
n2	36	#7	13'-8"	
n3	36	#4	10'-8"	
n4	76	#4	24'-0"	
n5	44	#4	4'-9"	
n6	44	#4	5'-9"	
n7	16	#5	25'-6"	
n8	12	#5	3'-0"	
n9	12	#5	3'-0"	
n10	12	#4	23'-8"	
h2	166	#7	4'-7"	
h3	166	#5	4'-2"	
v1	68	#6	7'-0"	
v2	68	#5	7'-0"	
v3	84	#6	6'-6"	
v4	84	#5	6'-6"	
v5	74	5	7'-0"	
v6	32	#4	4'-10"	
v7	20	#4	21'-9"	
v8	108	#5	8'-0"	
v9	102	#5	5'-8"	
v10	184	#5	34'-0"	
v11	102	#5	5'-7"	
v8	24	#5	3'-3"	
v9	108	#7	8'-0"	
w1	14	#4	18'-9"	
w2	14	#4	15'-6"	
w3	28	#4	21'-6"	
Class X Concrete		C.Yds.	1074	
Reinf. Bars		Lbs.	136,50	

DESIGNED	Johnny Parks
CHECKED	Lin-may Chou
	B.F. A. Batista
DRAWN	
CHECKED	L. M. C.

EXAMINED
PASSED
APPROVED

TABLE OF DIMENSIONS

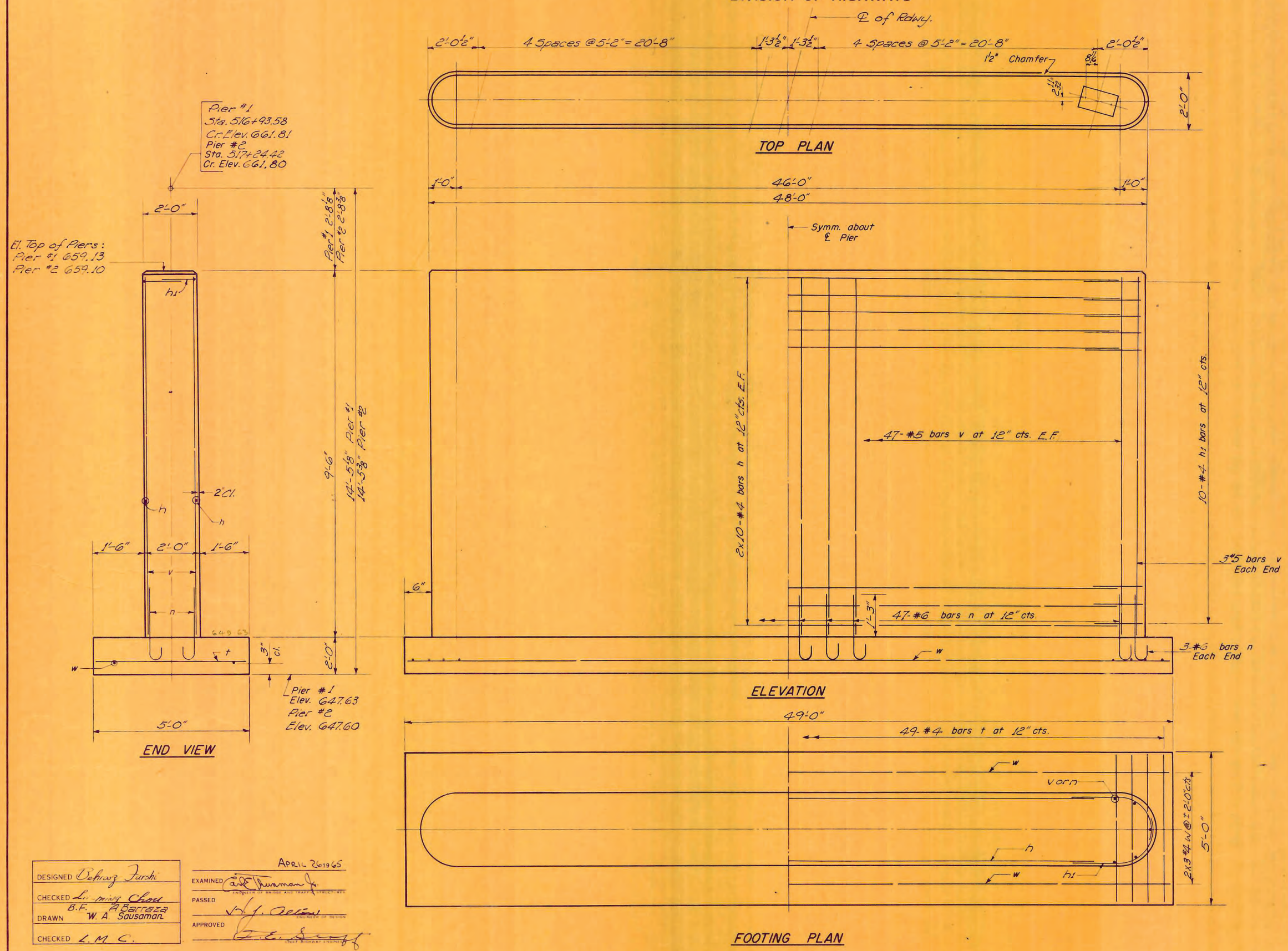
Bar	A	B	C	D
h5	1'-6"	2'-0"	2'-7"	3'-3"
n6	1'-6"	3'-4½"	2'-7½"	4'-3"
n8	2'-0"	9½"	7¼"	1'-0"
n9	2'-0"	7¼"	9½"	1'-0"

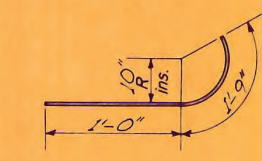
ABUTMENTS
F.A. RT. 45 SEC. 16BR-1
KANKAKEE COUNTY
STA. 517+09

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

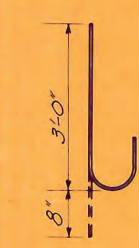
ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
S.B.I. F.A. 45	16BR-1	KKK	107	41
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT		

SHEET NO. 4
5 SHEETS





BAR h1



BAR n

TWO PIERS
BILL OF MATERIAL

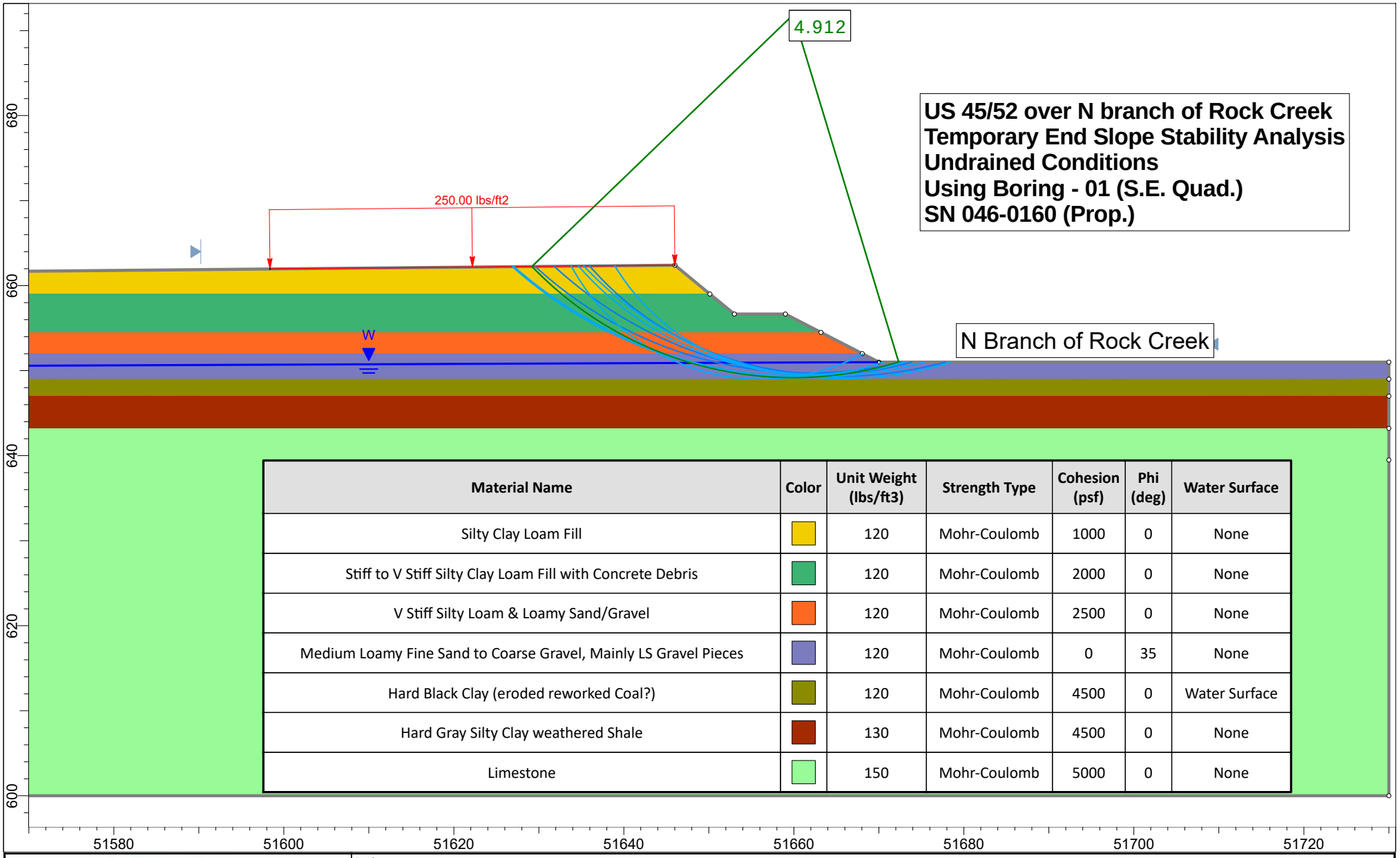
Bar	No.	Size	Length	Shape
h	80	#4	23'-6"	
h1	80	#4	2'-9"	
n	200	#6	3'-8"	
t	98	#4	4'-8"	
v	200	#5	9'-1	
w	12	#4	24'-9"	
Class A Concrete			Cu. Yds.	1078
Reinforcement Bars			Lbs.	4900

DESIGNED	Behrooz Farshi
CHECKED	Lin-ming Chou
DRAWN	B.F. A. Barraza W. A. Sausaman
CHECKED	L. M. C.

APRIL 26 1965
EXAMINED [signature] ENGINEER OF BRIDGE AND TRAFFIC STRUCTURES
PASSED [signature] ENGINEER OF DESIGN
APPROVED [signature] CHIEF HIGHWAY ENGINEER

P-1 Re-drawn 7-21-59 Rev. 11-25-59

PIERS
F.A. RT. 45 SEC. 16BR-1
KANKAKEE COUNTY
STA. 517+09



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Silty Clay Loam Fill		120	Mohr-Coulomb	1000	0	None
Stiff to V Stiff Silty Clay Loam Fill with Concrete Debris		120	Mohr-Coulomb	2000	0	None
V Stiff Silty Loam & Loamy Sand/Gravel		120	Mohr-Coulomb	2500	0	None
Medium Loamy Fine Sand to Coarse Gravel, Mainly LS Gravel Pieces		120	Mohr-Coulomb	0	35	None
Hard Black Clay (eroded reworked Coal?)		120	Mohr-Coulomb	4500	0	Water Surface
Hard Gray Silty Clay weathered Shale		130	Mohr-Coulomb	4500	0	None
Limestone		150	Mohr-Coulomb	5000	0	None

McCleary Engineering

SLIDEINTERPRET 8.032

Project	US 45/52 over North Branch of Rock Creek, SN 046-0161 (Prop.)		
Analysis Description	Short Term (Undrained) Analysis		
Drawn By	MJ	Scale 1:187	Company McCleary Engineering
Date	6/30/2020, 2:46:16 PM		File Name N Br Rock Cr End Slope Undrained slope stability analysis.slmd

McCleary Engineering

Project SN 046-0120 WO. 9

Page 1 of 3

Calculated By M Date 7-2-20 • Rev. 7-28-20

Checked By TMR Date 7-9-20 TMR 7-29-20

Scour Elev. Calcs

evaluate layers by trial & error to find layer of deepest scour

Thalweg Elev. = 651.00

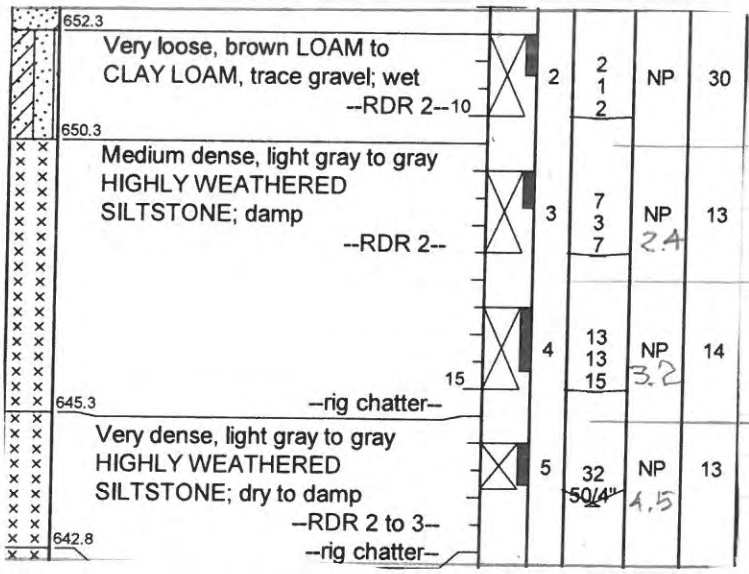
Q_{100} scour depth = 16.54'

Q_{200} " " = 15.83'

scour depths from consultant

Pier 1 South Pier

use Wang Engr. Boring Logs B-02 ~~B-03~~ use worst case



651.0

0.7' R% 0% Geotechnical Reduction

2.5' 50% • ✓

2.5' 50% • ✓

X 75% • ✓

16.54

↑ Q_u estimate from BBS-145

$16.54' = 0.7' + 2.5' + 2.5' + X/(1-0.75)$ • ✓

$16.54 = 5.7$ ✓ $+ 4X$ • ✓

10.84 ✓ $= 4X$ • ✓

$X = 2.71$ ✓ • ✓

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Project WO # 9

Page 2 of 3

Calculated By M Date 7-2-20 • Rev. 7-28-20

Checked By TMR Date 7-9-20

Scour Elev Calcs

Tier 1 total geotech scour depth

- 1 x 0.7 = 0.7' loams @ 0% R
- .5 x 2.5 = 1.25 siltstone @ 50% R
- .5 x 2.5 = 1.25 siltstone @ 50% R
- 2.71 siltstone @ 75% R

- 5.91 ft ✓ = Q_{100} scour depth ✓
- 651.0 − 5.9' = 645.1 = Q_{100} ✓ scour elev ✓

Similarly for Q_{200}

- $15.83 = 5.7 + 4x$
- $x = 2.53'$ ∴ 5.7 = Q_{200} scour depth
- 651.0 − 5.7 = 645.3 ✓ = Q_{200} scour elev ✓

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Project WO# 9

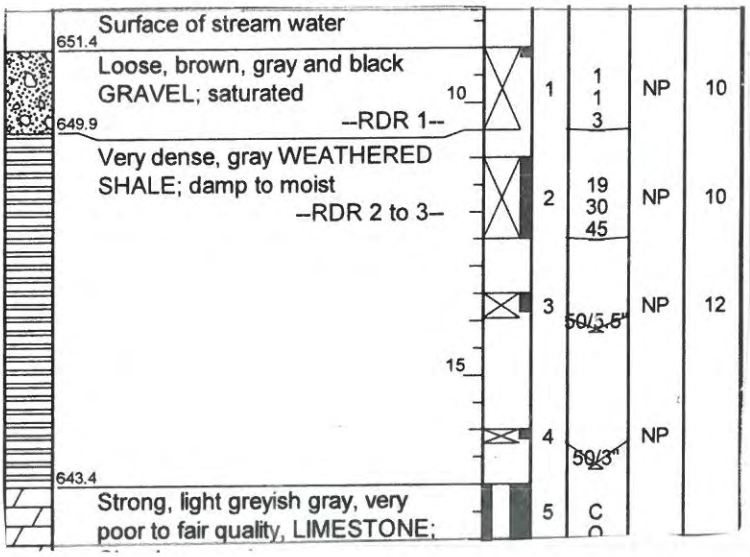
Page 3 of 3

Calculated By M Date 7-2-20

Checked By TMR Date 7-9-20

Pier 2 North Pier

Wang Engr. Log @ 1 ← worst case
OA



651.0 RTO

1.5 0% Geotechnical Reduction

X 90%

Q_{100} $16.5' = 1.5' + X/(1-0.9)$

$15.0' = 10X$

$X = 1.50'$ ✓ ∴ Q_{100} SD = 1.5' + 1.5' = 3.0' ✓

651.0 − 3.0' = 648.0 = Q_{100} scour elev

Q_{200} $15.93 = 1.5 + 10X$

$X = 1.43$ ✓ ∴ 2.93 ✓ = Q_{200} scour depth

651.0 − 2.93 = 648.1 ✓ = Q_{200} scour elev.

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US 45 Bridge over Rock Creek Scour Depth Summary

Scour Depths (ft)				
	South (Left) Abutment	South Pier	North Pier	North (Right) Abutment
Q100	3.23	16.54	16.54	3.57
Q200	3.80	15.83	15.83	4.16

Scour Elevations (ft)				
	South (Left) Abutment	South Pier	North Pier	North (Right) Abutment
Q100	647.77	634.46	634.46	647.43
Q200	647.20	635.17	635.17	646.84

Notes:

1. Scour depths calculated via HEC-RAS

2. The following particle sizes were used: D50 = 0.2 mm, D95 = 4.0 mm

RECREATION SERVICES
Illinois State University
www.rec.ilstu.edu

Estimating Qu of Silt-fore w/ N = 10 & 28 150

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

TOTAL STRUCTURE LENGTH==========	450.00	FT
NUMBER OF SPANS ==========	6	
END SPAN LENGTH ==========	75.00	FT
ADJACENT INTERIOR SPAN LENGTH ==========	75.00	FT

SUPERSTRUCTURE DATA (ADJACENT SPAN)

CONCRETE BEAM ==========	IL27-1830	
BEAM F'C ==========	6	KSI
BEAM SPACING PERP. TO CL ==========	7.00	FT
SLAB THICKNESS ==========	8.00	IN
SLAB F'C ==========	4.00	KSI

BEAM SPACING PERP. TO CL ==========	7.00	FT
SLAB THICKNESS ==========	8.00	IN
SLAB F'C ==========	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME ==========	West	
ABUTMENT REFERENCE BORING ==========	B-1	
BOTTOM OF ABUTMENT ELEVATION ==========	700	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	5	
PILE SPACING PERP. TO CL ==========	7	FT

ABUTMENT #2 DATA

ABUTMENT NAME ==========	East	
ABUTMENT REFERENCE BORING==========	B-2	
BOTTOM OF ABUTMENT ELEVATION==========	708	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	5	
PILE SPACING PERP. TO CL ==========	7	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	LAYER THICKNESS (FT)	UNCONFINED COMPRESSIVE STRENGTH (TSF)	N S.P.T. VALUE (BLOWS/12 IN.)	Qu EQUIV. FOR N VALUE (TSF)
699.00	1.00	1.5		
696.50	2.50	1.8		
694.00	2.50		150	4.5
691.50	2.50		28	3.2
691.43	0.07		10	2.4

8.57 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	LAYER THICKNESS (FT)	UNCONFINED COMPRESSIVE STRENGTH (TSF)	N S.P.T. VALUE (BLOWS/12 IN.)	Qu EQUIV. FOR N VALUE (TSF)
704.50	3.50	1.5		
699.50	5.00	1.0		
698.00	1.50	1.5		

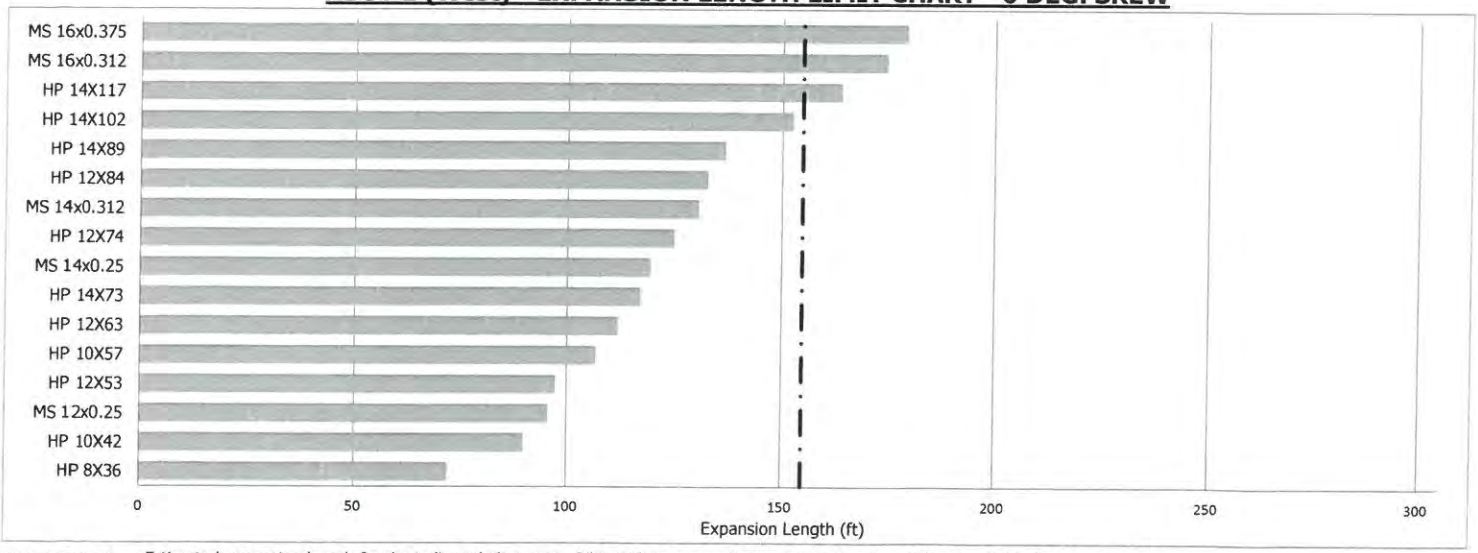
10.00 FT = TOTAL DEPTH ENTERED

ENTER 10 FT OF SOIL DATA

WEIGHTED AVERAGE Qu FOR ABUTMENT #1=======	2.95	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*2.95])==========	1.77	
WEIGHTED AVERAGE Qu FOR ABUTMENT #2=======	1.25	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*1.25])==========	0.93	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.77*5*0+0.93*5*450]/[1.77*5+0.93*5]==========	154.83	FT
DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [0.93*5*0+1.77*5*450]/[0.93*5+1.77*5]==========	295.17	FT

ABUT 1 (West) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)

JWR

Illinois Department of Transportation

SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====Exist SN 046-0046 US 45 & 52 over the N Branch of Rock Creek

Substructure 1

Base of Substruct. Elev. (or ground surf for bents	657	ft.
Pile or Shaft Dia.	12	inches
Boring Number	01 (SE Quad)	
Top of Boring Elev.	661.51	ft.
Approximate Fixity Elev.	651	ft.

Individual Site Class Definition:

N (bar): 71 (Blows/ft.) Soil Site Class C
N_{ch} (bar): 90 (Blows/ft.) Soil Site Class C <----Controls
s_u (bar): 4.93 (ksf) Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	659.0	2.50	5	1.00	B
	657.0	2.00	10	2.00	
	654.5	2.50	9	2.50	B
	652.0	2.50	15	2.50	B
2.0	649.0	3.00	18	0.00	B
4.0	647.0	2.00	13	4.50	B
6.5	644.5	2.50	20	4.50	
9.0	642.0	2.50	20	4.50	
11.5	639.5	2.50	56	4.50	B
14.0	637.0	2.50	45	4.50	
16.5	634.5	2.50	300	5.00	B
100.0	551.0	83.50	134	5.00	R

Substructure 2

Base of Substruct. Elev. (or ground surf for bents	647	ft.
Pile or Shaft Dia.	12	inches
Boring Number	01 (SE Quad)	
Top of Boring Elev.	661.51	ft.
Approximate Fixity Elev.	641	ft.

Individual Site Class Definition:

N (bar): 97 (Blows/ft.) Soil Site Class C
N_{ch} (bar): NA (Blows/ft.) NA
s_u (bar): 4.98 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	659.0	2.50	5	1.00	B
	657.0	2.00	10	2.00	
	654.5	2.50	9	2.50	B
	652.0	2.50	15	2.50	B
	649.0	3.00	18	0.00	B
	647.0	2.00	13	4.50	B
	644.5	2.50	20	4.50	
	642.0	2.50	20	4.50	
1.5	639.5	2.50	56	4.50	B
4.0	637.0	2.50	45	4.50	
6.5	634.5	2.50	300	5.00	B
100.0	541.0	93.50	134	5.00	R

Substructure 3

Base of Substruct. Elev. (or ground surf for bents	647	ft.
Pile or Shaft Dia.	12	inches
Boring Number	02 (NW Quad)	
Top of Boring Elev.	661.38	ft.
Approximate Fixity Elev.	641	ft.

Individual Site Class Definition:

N (bar): 100 (Blows/ft.) Soil Site Class C <----Controls
N_{ch} (bar): 100 (Blows/ft.) Soil Site Class C
s_u (bar): (ksf) NA, H < 0.1*H (Soil)

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	658.4	3.00	5	1.00	B
	655.9	2.50	9	2.50	
	653.4	2.50	9	2.00	B
	651.4	2.00	9	1.50	B
	648.9	2.50	24	0.00	B
	646.4	2.50	50		B
	643.9	2.50	59		B
	641.4	2.50	376		
0.3	640.7	0.67	600		B
100.0	541.0	99.70	345	5.00	R

Substructure 4

Base of Substruct. Elev. (or ground surf for bents	657	ft.
Pile or Shaft Dia.	12	inches
Boring Number	02 (NW Quad)	
Top of Boring Elev.	661.38	ft.
Approximate Fixity Elev.	651	ft.

Individual Site Class Definition:

N (bar): 90 (Blows/ft.) Soil Site Class C <----Controls
N_{ch} (bar): 90 (Blows/ft.) Soil Site Class C
s_u (bar): (ksf) NA, H < 0.1*H (Soil)

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	658.4	3.00	5	1.00	B
	655.9	2.50	9	2.50	
	653.4	2.50	9	2.00	B
	651.4	2.00	9	1.50	B
2.1	648.9	2.50	24	0.00	B
4.6	646.4	2.50	50		B
7.1	643.9	2.50	59		B
9.6	641.4	2.50	376		
10.3	640.7	0.67	600		B
100.0	551.0	89.70	345	5.00	R

Global Site Class Definition: Substructures 1 through 4

N (bar): 90 (Blows/ft.) Soil Site Class C
N_{ch} (bar): 95 (Blows/ft.) Soil Site Class C <----Controls
s_u (bar): 4.98 (ksf) Soil Site Class C

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON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                                         title=US 45 & 52 over N branch of Rock Creek SN 046-0046="
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      10:
        0:                               0.4
        1:                               0.124
      11:
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        1:                               0.124
      12:
        0:                               0.5
        1:                               0.124
```

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	046-0160 (prop) 046-0046 (Exist)		TOTAL STRUCTURE LENGTH	109.79	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	3	
STRUCTURE SKEW	0	DEGREES	END SPAN LENGTH	33.00	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	40.00	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE	WIDE FLANGE	
WIDE FLANGE	W24X146	
BEAM SPACING PERP. TO CL	6.00	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

WIDE FLANGE	W36X150	
BEAM SPACING PERP. TO CL	6.00	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	South	
ABUTMENT REFERENCE BORING	01 (S.E. Quad.)	
BOTTOM OF ABUTMENT ELEVATION	656.65	FT
ESTIMATED NUMBER OF PILES AT ABUT.	7	
PILE SPACING PERP. TO CL	7	FT

ABUTMENT #2 DATA

ABUTMENT NAME	North	
ABUTMENT REFERENCE BORING	02 (N.W. Quad.)	
BOTTOM OF ABUTMENT ELEVATION	656.62	FT
ESTIMATED NUMBER OF PILES AT ABUT.	7	
PILE SPACING PERP. TO CL	6	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
654.51	2.14	2.5		
652.01	2.50	2.5		
649.01	3.00	0.0	18	2.9
647.01	2.00	5.0		
646.65	0.36	5.0		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
656.38	0.24	2.5		
653.88	2.50	2.0		
651.88	2.00	1.5		
649.38	2.50		24	3.1
646.88	2.50		50	3.6
646.62	0.26		59	3.8

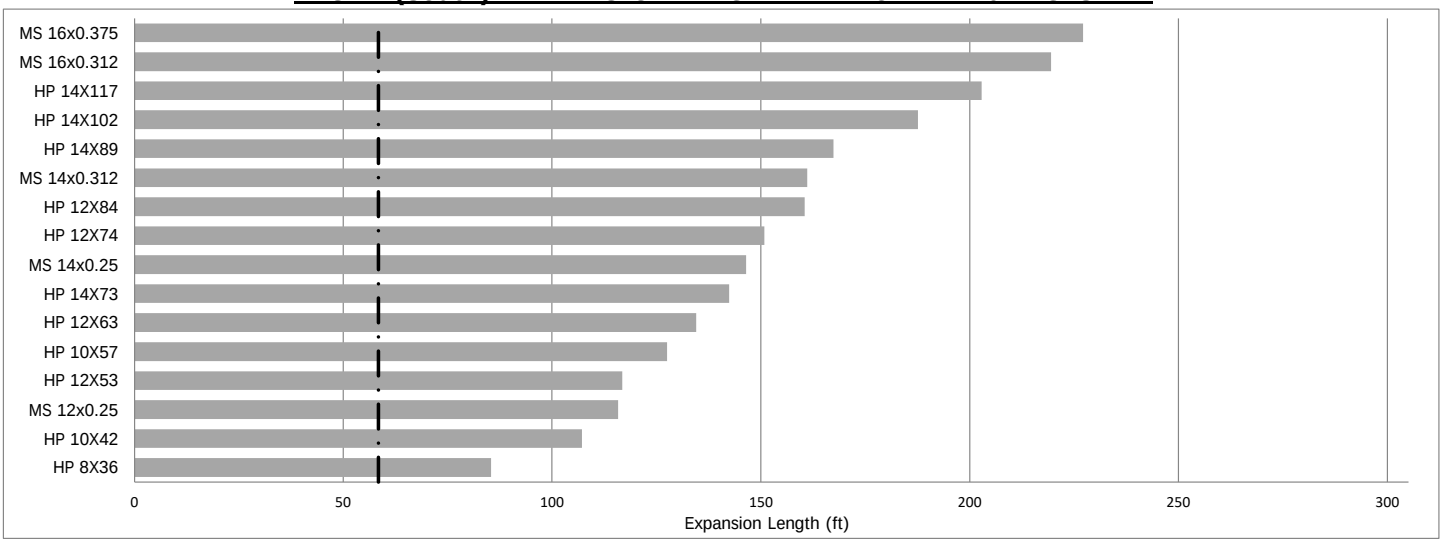
10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1	2.34	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2	2.64	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*2.34])	1.34		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*2.64])	1.52	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.34*7*0+1.52*7*109.79]/[1.34*7+1.52*7] = 58.37 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.52*7*0+1.34*7*109.79]/[1.52*7+1.34*7] = 51.42 FT

ABUT 1 (South) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration
(Note: The same size pile should be used at both abutments.)

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== 02 (NW Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.62 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.62 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 43.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 155.02 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 58.13 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**309** KIPS	**170** KIPS	**15** FT.

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
656.50	0.12	2.50	9		0.5		19.6	0.8		***3.2***	3	0	0	2	2
653.50	3.00	2.00	9		11.5	19.1	26.4	17.0	2.4	***19.6***	20	0	0	11	5
651.50	2.00	1.50	9		6.3	14.3	***18.4***	9.3	1.8	27.1	18	0	0	10	7
649.00	2.50	0.00	24	Sandy Gravel	0.0	0.0	103.2	0.0	0.0	***37.8***	38	0	0	21	10
648.00	1.00			Shale	41.1	84.8	144.3	60.5	10.7	***98.3***	98	0	0	54	10.6
647.00	1.00			Shale	41.1	84.8	185.4	60.5	10.7	***158.9***	159	0	0	87	11.6
646.00	1.00			Shale	41.1	84.8	226.5	60.5	10.7	***219.4***	219	0	0	121	12.6
645.00	1.00			Shale	41.1	84.8	***267.6***	60.5	10.7	279.9	268	0	0	147	13.6
644.00	1.00			Shale	41.1	84.8	***308.7***	60.5	10.7	340.4	309	0	0	170	14.6
643.00	1.00			Shale	41.1	84.8	***349.8***	60.5	10.7	400.9	~~350~~	~~0~~	~~0~~	~~192~~	~~15.6~~
642.00	1.00			Shale	41.1	84.8	***390.9***	60.5	10.7	461.5	~~391~~	~~0~~	~~0~~	~~215~~	~~16.6~~
641.00	1.00			Shale	41.1	84.8	***432.0***	60.5	10.7	522.0	~~432~~	~~0~~	~~0~~	~~238~~	~~17.6~~
640.00	1.00			Shale	41.1	84.8	***473.1***	60.5	10.7	582.5	~~473~~	~~0~~	~~0~~	~~260~~	~~18.6~~
639.00	1.00			Shale	41.1	84.8	***514.2***	60.5	10.7	643.0	~~514~~	~~0~~	~~0~~	~~283~~	~~19.6~~
638.00	1.00			Shale	41.1	84.8	***555.4***	60.5	10.7	703.6	~~555~~	~~0~~	~~0~~	~~305~~	~~20.6~~
637.00	1.00			Shale	41.1	84.8	***596.5***	60.5	10.7	764.1	~~596~~	~~0~~	~~0~~	~~328~~	~~21.6~~
636.00	1.00			Shale	41.1	84.8	***637.6***	60.5	10.7	824.6	~~638~~	~~0~~	~~0~~	~~351~~	~~22.6~~
635.00	1.00			Shale	41.1	84.8	***678.7***	60.5	10.7	885.1	~~679~~	~~0~~	~~0~~	~~373~~	~~23.6~~
634.00	1.00			Shale	41.1	84.8	***719.8***	60.5	10.7	945.6	~~720~~	~~0~~	~~0~~	~~396~~	~~24.6~~
633.00	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== 02 (NW Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.62 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.62 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 43.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 155.02 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 58.13 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**392** KIPS	**215** KIPS	**15** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area========= 0.108 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
656.50	0.12	2.50	9		0.6		28.2	0.9		***4.0***	4	0	0	2	2
653.50	3.00	2.00	9		13.9	27.6	35.2	20.3	3.0	***23.5***	23	0	0	13	5
651.50	2.00	1.50	9		7.6	20.7	***22.1***	11.2	2.3	32.3	22	0	0	12	7
649.00	2.50	0.00	24	Sandy Gravel	0.0	0.0	144.6	0.0	0.0	***45.8***	46	0	0	25	10
648.00	1.00			Shale	49.4	122.5	194.0	72.3	13.4	***118.0***	118	0	0	65	10.6
647.00	1.00			Shale	49.4	122.5	243.4	72.3	13.4	***190.3***	190	0	0	105	11.6
646.00	1.00			Shale	49.4	122.5	292.9	72.3	13.4	***262.5***	263	0	0	144	12.6
645.00	1.00			Shale	49.4	122.5	342.3	72.3	13.4	***334.8***	335	0	0	184	13.6
644.00	1.00			Shale	49.4	122.5	***391.7***	72.3	13.4	407.0	392	0	0	215	14.6
643.00	1.00			Shale	49.4	122.5	***441.1***	72.3	13.4	479.3	~~441~~	~~0~~	~~0~~	~~243~~	~~15.6~~
642.00	1.00			Shale	49.4	122.5	***490.5***	72.3	13.4	551.5	~~491~~	~~0~~	~~0~~	~~270~~	~~16.6~~
641.00	1.00			Shale	49.4	122.5	***539.9***	72.3	13.4	623.8	~~540~~	~~0~~	~~0~~	~~297~~	~~17.6~~
640.00	1.00			Shale	49.4	122.5	***589.3***	72.3	13.4	696.0	~~589~~	~~0~~	~~0~~	~~324~~	~~18.6~~
639.00	1.00			Shale	49.4	122.5	***638.8***	72.3	13.4	768.3	~~639~~	~~0~~	~~0~~	~~351~~	~~19.6~~
638.00	1.00			Shale	49.4	122.5	***688.2***	72.3	13.4	840.5	~~688~~	~~0~~	~~0~~	~~378~~	~~20.6~~
637.00	1.00			Shale	49.4	122.5	***737.6***	72.3	13.4	912.8	~~738~~	~~0~~	~~0~~	~~406~~	~~21.6~~
636.00	1.00			Shale	49.4	122.5	***787.0***	72.3	13.4	985.0	~~787~~	~~0~~	~~0~~	~~433~~	~~22.6~~
635.00	1.00			Shale	49.4	122.5	***836.4***	72.3	13.4	1057.3	~~836~~	~~0~~	~~0~~	~~460~~	~~23.6~~
634.00	1.00			Shale	49.4	122.5	***885.8***	72.3	13.4	1129.5	~~886~~	~~0~~	~~0~~	~~487~~	~~24.6~~
633.00	1.00			Shale		122.5			13.4						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== 02 (NW Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.62 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.62 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 43.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 155.02 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 58.13 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 63
Plugged Pile Perimeter========== 4.000 FT. Unplugged Pile Perimeter========== 5.883 FT.
Plugged Pile End Bearing Area========== 1.000 SQFT. Unplugged Pile End Bearing Area========= 0.128 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
497 KIPS	**496** KIPS	**273** KIPS	**17** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
656.50	0.12	2.50	9		0.6		28.7	1.0		***4.5***	5	0	0	2	2
653.50	3.00	2.00	9		14.0	28.0	35.6	20.5	3.6	***24.2***	24	0	0	13	5
651.50	2.00	1.50	9		7.7	21.0	***22.3***	11.3	2.7	32.8	22	0	0	12	7
649.00	2.50	0.00	24	Sandy Gravel	0.0	0.0	146.9	0.0	0.0	***48.7***	49	0	0	27	10
648.00	1.00			Shale	49.8	124.6	196.7	73.3	15.9	***122.0***	122	0	0	67	10.6
647.00	1.00			Shale	49.8	124.6	246.5	73.3	15.9	***195.3***	195	0	0	107	11.6
646.00	1.00			Shale	49.8	124.6	296.4	73.3	15.9	***268.6***	269	0	0	148	12.6
645.00	1.00			Shale	49.8	124.6	346.2	73.3	15.9	***341.9***	342	0	0	188	13.6
644.00	1.00			Shale	49.8	124.6	***396.0***	73.3	15.9	415.2	396	0	0	218	14.6
643.00	1.00			Shale	49.8	124.6	***445.8***	73.3	15.9	488.5	446	0	0	245	15.6
642.00	1.00			Shale	49.8	124.6	***495.7***	73.3	15.9	561.8	496	0	0	273	16.6
641.00	1.00			Shale	49.8	124.6	***545.5***	73.3	15.9	635.0	~~546~~	~~0~~	~~0~~	~~300~~	~~17.6~~
640.00	1.00			Shale	49.8	124.6	***595.3***	73.3	15.9	708.3	~~595~~	~~0~~	~~0~~	~~327~~	~~18.6~~
639.00	1.00			Shale	49.8	124.6	***645.2***	73.3	15.9	781.6	~~645~~	~~0~~	~~0~~	~~355~~	~~19.6~~
638.00	1.00			Shale	49.8	124.6	***695.0***	73.3	15.9	854.9	~~695~~	~~0~~	~~0~~	~~382~~	~~20.6~~
637.00	1.00			Shale	49.8	124.6	***744.8***	73.3	15.9	928.2	~~745~~	~~0~~	~~0~~	~~410~~	~~21.6~~
636.00	1.00			Shale	49.8	124.6	***794.6***	73.3	15.9	1001.5	~~795~~	~~0~~	~~0~~	~~437~~	~~22.6~~
635.00	1.00			Shale	49.8	124.6	***844.5***	73.3	15.9	1074.8	~~844~~	~~0~~	~~0~~	~~464~~	~~23.6~~
634.00	1.00			Shale	49.8	124.6	***894.3***	73.3	15.9	1148.1	~~894~~	~~0~~	~~0~~	~~492~~	~~24.6~~
633.00	1.00			Shale		124.6			15.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== 02 (NW Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.62 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.62 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 43.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 155.02 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 58.13 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	**549** KIPS	**302** KIPS	**16** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area========= 0.149 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
656.50	0.12	2.50	9		0.8		39.4	1.1		***5.3***	5	0	0	3	2
653.50	3.00	2.00	9		16.4	38.6	46.2	24.4	4.2	***28.6***	29	0	0	16	5
651.50	2.00	1.50	9		9.0	29.0	***26.2***	13.4	3.1	38.9	26	0	0	14	7
649.00	2.50	0.00	24	Sandy Gravel	0.0	0.0	198.0	0.0	0.0	***57.4***	57	0	0	32	10
648.00	1.00			Shale	58.5	171.8	256.5	86.9	18.5	***144.3***	144	0	0	79	10.6
647.00	1.00			Shale	58.5	171.8	315.1	86.9	18.5	***231.2***	231	0	0	127	11.6
646.00	1.00			Shale	58.5	171.8	373.6	86.9	18.5	***318.1***	318	0	0	175	12.6
645.00	1.00			Shale	58.5	171.8	432.2	86.9	18.5	***405.0***	405	0	0	223	13.6
644.00	1.00			Shale	58.5	171.8	***490.7***	86.9	18.5	491.9	491	0	0	270	14.6
643.00	1.00			Shale	58.5	171.8	***549.3***	86.9	18.5	578.7	549	0	0	302	15.6
642.00	1.00			Shale	58.5	171.8	***607.8***	86.9	18.5	665.6	~~608~~	~~0~~	~~0~~	~~334~~	~~16.6~~
641.00	1.00			Shale	58.5	171.8	***666.4***	86.9	18.5	752.5	~~666~~	~~0~~	~~0~~	~~367~~	~~17.6~~
640.00	1.00			Shale	58.5	171.8	***724.9***	86.9	18.5	839.4	~~725~~	~~0~~	~~0~~	~~399~~	~~18.6~~
639.00	1.00			Shale	58.5	171.8	***783.5***	86.9	18.5	926.3	~~783~~	~~0~~	~~0~~	~~431~~	~~19.6~~
638.00	1.00			Shale	58.5	171.8	***842.0***	86.9	18.5	1013.2	~~842~~	~~0~~	~~0~~	~~463~~	~~20.6~~
637.00	1.00			Shale	58.5	171.8	***900.6***	86.9	18.5	1100.1	~~901~~	~~0~~	~~0~~	~~495~~	~~21.6~~
636.00	1.00			Shale	58.5	171.8	***959.1***	86.9	18.5	1187.0	~~959~~	~~0~~	~~0~~	~~528~~	~~22.6~~
635.00	1.00			Shale	58.5	171.8	***1017.7***	86.9	18.5	1273.9	~~1018~~	~~0~~	~~0~~	~~560~~	~~23.6~~
634.00	1.00			Shale	58.5	171.8	***1076.2***	86.9	18.5	1360.7	~~1076~~	~~0~~	~~0~~	~~592~~	~~24.6~~
633.00	1.00			Shale		171.8			18.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== 02 (NW Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.62 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.62 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 43.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 155.02 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 58.13 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**675** KIPS	**371** KIPS	**18** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area========= 0.181 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
656.50	0.12	2.50	9		0.8		40.3	1.1		***6.2***	6	0	0	3	2
653.50	3.00	2.00	9		16.6	39.5	47.0	24.6	5.1	***29.5***	30	0	0	16	5
651.50	2.00	1.50	9		9.1	29.6	***26.5***	13.5	3.8	39.2	26	0	0	15	7
649.00	2.50	0.00	24	Sandy Gravel	0.0	0.0	202.0	0.0	0.0	***61.8***	62	0	0	34	10
648.00	1.00			Shale	59.2	175.5	261.2	87.6	22.6	***149.4***	149	0	0	82	10.6
647.00	1.00			Shale	59.2	175.5	320.3	87.6	22.6	***237.0***	237	0	0	130	11.6
646.00	1.00			Shale	59.2	175.5	379.5	87.6	22.6	***324.7***	325	0	0	179	12.6
645.00	1.00			Shale	59.2	175.5	438.7	87.6	22.6	***412.3***	412	0	0	227	13.6
644.00	1.00			Shale	59.2	175.5	***497.8***	87.6	22.6	499.9	498	0	0	274	14.6
643.00	1.00			Shale	59.2	175.5	***557.0***	87.6	22.6	587.5	557	0	0	306	15.6
642.00	1.00			Shale	59.2	175.5	***616.2***	87.6	22.6	675.1	616	0	0	339	16.6
641.00	1.00			Shale	59.2	175.5	***675.4***	87.6	22.6	762.7	675	0	0	371	17.6
640.00	1.00			Shale	59.2	175.5	***734.5***	87.6	22.6	850.3	~~735~~	~~0~~	~~0~~	~~404~~	~~18.6~~
639.00	1.00			Shale	59.2	175.5	***793.7***	87.6	22.6	938.0	~~794~~	~~0~~	~~0~~	~~437~~	~~19.6~~
638.00	1.00			Shale	59.2	175.5	***852.9***	87.6	22.6	1025.6	~~853~~	~~0~~	~~0~~	~~469~~	~~20.6~~
637.00	1.00			Shale	59.2	175.5	***912.0***	87.6	22.6	1113.2	~~912~~	~~0~~	~~0~~	~~502~~	~~21.6~~
636.00	1.00			Shale	59.2	175.5	***971.2***	87.6	22.6	1200.8	~~971~~	~~0~~	~~0~~	~~534~~	~~22.6~~
635.00	1.00			Shale	59.2	175.5	***1030.4***	87.6	22.6	1288.4	~~1030~~	~~0~~	~~0~~	~~567~~	~~23.6~~
634.00	1.00			Shale	59.2	175.5	***1089.6***	87.6	22.6	1376.0	~~1090~~	~~0~~	~~0~~	~~599~~	~~24.6~~
633.00	1.00			Shale		175.5			22.6						

Pile Design Table for North Abut utilizing Boring #02 (NW Quad.)

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
27	15	7
275	151	10
Metal Shell 14"Φ w/.25" walls		
32	18	7
368	203	10
Metal Shell 14"Φ w/.312" walls		
32	18	7
368	203	10
Metal Shell 16"Φ w/.312" walls		
37	20	7
476	262	10
Metal Shell 16"Φ w/.375" walls		
37	20	7
476	262	10
Steel HP 8 X 36		
273	150	16

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
309	170	15
Steel HP 10 X 57		
442	243	18
Steel HP 12 X 53		
392	215	15
Steel HP 12 X 63		
496	273	17
Steel HP 12 X 74		
554	305	18

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
613	337	19
Steel HP 14 X 73		
549	302	16
Steel HP 14 X 89		
675	371	18
Steel HP 14 X 102		
804	442	20
Steel HP 14 X 117		
875	481	21
Precast 14"x 14"		
41	22	7

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment SN 046-0046
REFERENCE BORING ========== 01 (S.E. Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.65 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.65 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 44.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 151.52 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 56.82 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**24** FT.

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			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.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
654.16	2.49	2.50	9		11.1		34.9	16.3		***19.3***	19	0	0	11	4
651.66	2.50	2.50	15		11.1	23.8	***22.2***	16.4	3.0	32.7	22	0	0	12	7
648.66	3.00	0.00	18	Sandy Gravel	0.0	0.0	65.1	0.0	0.0	***38.1***	38	0	0	21	10
646.66	2.00	4.50	13		13.7	42.9	78.8	20.2	5.4	***58.3***	58	0	0	32	12
644.16	2.50	4.50	20		17.1	42.9	96.0	25.2	5.4	***83.5***	84	0	0	46	14
641.66	2.50	4.50	20		17.1	42.9	141.4	25.2	5.4	***112.4***	112	0	0	62	17
639.16	2.50		56	Hard Till	6.3	71.2	161.2	9.3	9.0	***123.3***	123	0	0	68	19
638.16	1.00			Shale	41.1	84.8	202.4	60.5	10.7	***183.9***	184	0	0	101	20.5
637.16	1.00			Shale	41.1	84.8	***243.5***	60.5	10.7	244.4	243	0	0	134	21.5
636.16	1.00			Shale	41.1	84.8	***284.6***	60.5	10.7	304.9	285	0	0	157	22.5
635.16	1.00			Shale	41.1	84.8	***325.7***	60.5	10.7	365.4	326	0	0	179	23.5
634.16	1.00			Shale	41.1	84.8	***366.8***	60.5	10.7	425.9	~~367~~	~~0~~	~~0~~	~~202~~	~~24.5~~
633.16	1.00			Shale	41.1	84.8	***407.9***	60.5	10.7	486.5	~~408~~	~~0~~	~~0~~	~~224~~	~~25.5~~
632.16	1.00			Shale	41.1	84.8	***449.0***	60.5	10.7	547.0	~~449~~	~~0~~	~~0~~	~~247~~	~~26.5~~
631.16	1.00			Shale	41.1	84.8	***490.1***	60.5	10.7	607.5	~~490~~	~~0~~	~~0~~	~~270~~	~~27.5~~
630.83	0.33			Shale	13.6	84.8	***503.7***	20.0	10.7	627.5	~~504~~	~~0~~	~~0~~	~~277~~	~~27.8~~
629.83	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment SN 046-0046
REFERENCE BORING ========== 01 (S.E. Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.65 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.65 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 44.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 151.52 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 56.82 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**418** KIPS	**230** KIPS	**24** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area========= 0.108 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
654.16	2.49	2.50	9		13.3		47.8	19.5		***23.2***	23	0	0	13	4
651.66	2.50	2.50	15		13.4	34.5	***26.7***	19.5	3.8	39.0	27	0	0	15	7
648.66	3.00	0.00	18	Sandy Gravel	0.0	0.0	88.7	0.0	0.0	***45.8***	46	0	0	25	10
646.66	2.00	4.50	13		16.5	62.0	105.2	24.1	6.8	***69.9***	70	0	0	38	12
644.16	2.50	4.50	20		20.6	62.0	125.8	30.1	6.8	***100.0***	100	0	0	55	14
641.66	2.50	4.50	20		20.6	62.0	187.3	30.1	6.8	***134.6***	135	0	0	74	17
639.16	2.50		56	Hard Till	7.6	102.9	214.4	11.1	11.3	***147.8***	148	0	0	81	19
638.16	1.00			Shale	49.4	122.5	263.9	72.3	13.4	***220.1***	220	0	0	121	20.5
637.16	1.00			Shale	49.4	122.5	313.3	72.3	13.4	***292.3***	292	0	0	161	21.5
636.16	1.00			Shale	49.4	122.5	***362.7***	72.3	13.4	364.6	363	0	0	199	22.5
635.16	1.00			Shale	49.4	122.5	***412.1***	72.3	13.4	436.8	412	0	0	227	23.5
634.16	1.00			Shale	49.4	122.5	***461.5***	72.3	13.4	509.1	~~462~~	~~0~~	~~0~~	~~254~~	~~24.5~~
633.16	1.00			Shale	49.4	122.5	***510.9***	72.3	13.4	581.4	~~511~~	~~0~~	~~0~~	~~281~~	~~25.5~~
632.16	1.00			Shale	49.4	122.5	***560.3***	72.3	13.4	653.6	~~560~~	~~0~~	~~0~~	~~308~~	~~26.5~~
631.16	1.00			Shale	49.4	122.5	***609.7***	72.3	13.4	725.9	~~610~~	~~0~~	~~0~~	~~335~~	~~27.5~~
630.83	0.33			Shale	16.3	122.5	***626.1***	23.8	13.4	749.7	~~626~~	~~0~~	~~0~~	~~344~~	~~27.8~~
629.83	1.00			Shale		122.5			13.4						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment SN 046-0046
REFERENCE BORING ========== 01 (S.E. Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.65 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.65 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 44.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 151.52 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 56.82 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
497 KIPS	**497** KIPS	**273** KIPS	**25** FT.

PILE TYPE AND SIZE ========== Steel HP 12 X 63
Plugged Pile Perimeter========== 4.000 FT. Unplugged Pile Perimeter========== 5.883 FT.
Plugged Pile End Bearing Area========== 1.000 SQFT. Unplugged Pile End Bearing Area========= 0.128 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
654.16	2.49	2.50	9		13.4		48.4	19.7		***24.2***	24	0	0	13	4
651.66	2.50	2.50	15		13.5	35.0	***26.9***	19.8	4.5	39.5	27	0	0	15	7
648.66	3.00	0.00	18	Sandy Gravel	0.0	0.0	89.9	0.0	0.0	***47.6***	48	0	0	26	10
646.66	2.00	4.50	13		16.6	63.1	106.6	24.5	8.1	***72.1***	72	0	0	40	12
644.16	2.50	4.50	20		20.8	63.1	127.4	30.6	8.1	***102.6***	103	0	0	56	14
641.66	2.50	4.50	20		20.8	63.1	189.7	30.6	8.1	***138.5***	139	0	0	76	17
639.16	2.50		56	Hard Till	7.6	104.6	217.3	11.2	13.4	***152.3***	152	0	0	84	19
638.16	1.00			Shale	49.8	124.6	267.1	73.3	15.9	***225.6***	226	0	0	124	20.5
637.16	1.00			Shale	49.8	124.6	316.9	73.3	15.9	***298.9***	299	0	0	164	21.5
636.16	1.00			Shale	49.8	124.6	***366.8***	73.3	15.9	372.2	367	0	0	202	22.5
635.16	1.00			Shale	49.8	124.6	***416.6***	73.3	15.9	445.4	417	0	0	229	23.5
634.16	1.00			Shale	49.8	124.6	***466.4***	73.3	15.9	518.7	466	0	0	257	24.5
633.16	1.00			Shale	49.8	124.6	***516.3***	73.3	15.9	592.0	~~516~~	~~0~~	~~0~~	~~284~~	~~25.5~~
632.16	1.00			Shale	49.8	124.6	***566.1***	73.3	15.9	665.3	~~566~~	~~0~~	~~0~~	~~311~~	~~26.5~~
631.16	1.00			Shale	49.8	124.6	***615.9***	73.3	15.9	738.6	~~616~~	~~0~~	~~0~~	~~339~~	~~27.5~~
630.83	0.33			Shale	16.4	124.6	***632.4***	24.2	15.9	762.8	~~632~~	~~0~~	~~0~~	~~348~~	~~27.8~~
629.83	1.00			Shale		124.6			15.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment SN 046-0046
REFERENCE BORING ========== 01 (S.E. Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.65 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.65 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 44.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 151.52 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 56.82 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	**578** KIPS	**318** KIPS	**25** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area========= 0.149 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
654.16	2.49	2.50	9		15.8		64.1	23.4		***28.6***	29	0	0	16	4
651.66	2.50	2.50	15		15.8	48.3	***31.6***	23.5	5.2	46.9	32	0	0	17	7
648.66	3.00	0.00	18	Sandy Gravel	0.0	0.0	118.5	0.0	0.0	***56.3***	56	0	0	31	10
646.66	2.00	4.50	13		19.5	87.0	138.1	29.0	9.4	***85.3***	85	0	0	47	12
644.16	2.50	4.50	20		24.4	87.0	162.5	36.2	9.4	***121.5***	121	0	0	67	14
641.66	2.50	4.50	20		24.4	87.0	244.3	36.2	9.4	***163.9***	164	0	0	90	17
639.16	2.50		56	Hard Till	9.0	144.3	280.7	13.3	15.5	***180.2***	180	0	0	99	19
638.16	1.00			Shale	58.5	171.8	339.3	86.9	18.5	***267.1***	267	0	0	147	20.5
637.16	1.00			Shale	58.5	171.8	397.8	86.9	18.5	***354.0***	354	0	0	195	21.5
636.16	1.00			Shale	58.5	171.8	456.4	86.9	18.5	***440.9***	441	0	0	242	22.5
635.16	1.00			Shale	58.5	171.8	***514.9***	86.9	18.5	527.7	515	0	0	283	23.5
634.16	1.00			Shale	58.5	171.8	***573.5***	86.9	18.5	614.6	573	0	0	315	24.5
633.16	1.00			Shale	58.5	171.8	***632.0***	86.9	18.5	701.5	~~632~~	~~0~~	~~0~~	~~348~~	~~25.5~~
632.16	1.00			Shale	58.5	171.8	***690.6***	86.9	18.5	788.4	~~691~~	~~0~~	~~0~~	~~380~~	~~26.5~~
631.16	1.00			Shale	58.5	171.8	***749.1***	86.9	18.5	875.3	~~749~~	~~0~~	~~0~~	~~412~~	~~27.5~~
630.83	0.33			Shale	19.3	171.8	***768.4***	28.7	18.5	904.0	~~768~~	~~0~~	~~0~~	~~423~~	~~27.8~~
629.83	1.00			Shale		171.8			18.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment SN 046-0046
REFERENCE BORING ========== 01 (S.E. Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 658.65 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 656.65 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 424.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 434.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 840 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 44.35 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 151.52 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 56.82 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
705 KIPS	**705** KIPS	**388** KIPS	**27** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area========= 0.181 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
654.16	2.49	2.50	9		15.9		65.3	23.6		***29.9***	30	0	0	16	4
651.66	2.50	2.50	15		16.0	49.4	***31.9***	23.7	6.4	47.3	32	0	0	18	7
648.66	3.00	0.00	18	Sandy Gravel	0.0	0.0	120.8	0.0	0.0	***58.7***	59	0	0	32	10
646.66	2.00	4.50	13		19.7	88.8	140.5	29.2	11.4	***87.9***	88	0	0	48	12
644.16	2.50	4.50	20		24.7	88.8	165.2	36.6	11.4	***124.5***	124	0	0	68	14
641.66	2.50	4.50	20		24.7	88.8	248.5	36.6	11.4	***168.6***	169	0	0	93	17
639.16	2.50		56	Hard Till	9.1	147.4	285.6	13.4	19.0	***185.6***	186	0	0	102	19
638.16	1.00			Shale	59.2	175.5	344.8	87.6	22.6	***273.2***	273	0	0	150	20.5
637.16	1.00			Shale	59.2	175.5	403.9	87.6	22.6	***360.8***	361	0	0	198	21.5
636.16	1.00			Shale	59.2	175.5	463.1	87.6	22.6	***448.5***	448	0	0	247	22.5
635.16	1.00			Shale	59.2	175.5	***522.3***	87.6	22.6	536.1	522	0	0	287	23.5
634.16	1.00			Shale	59.2	175.5	***581.4***	87.6	22.6	623.7	581	0	0	320	24.5
633.16	1.00			Shale	59.2	175.5	***640.6***	87.6	22.6	711.3	641	0	0	352	25.5
632.16	1.00			Shale	59.2	175.5	***699.8***	87.6	22.6	798.9	700	0	0	385	26.5
631.16	1.00			Shale	59.2	175.5	***759.0***	87.6	22.6	886.5	~~759~~	~~0~~	~~0~~	~~417~~	~~27.5~~
630.83	0.33			Shale	19.5	175.5	***778.5***	28.9	22.6	915.4	~~778~~	~~0~~	~~0~~	~~428~~	~~27.8~~
629.83	1.00			Shale		175.5			22.6						

Pile Design Table for South Abutment SN 046-0046 utilizing Boring #01 (S.E. Quad.)

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
92	51	12
118	65	14
312	172	17
382	210	19
Metal Shell 14"Φ w/.25" walls		
91	50	10
115	63	12
145	80	14
405	223	17
Metal Shell 14"Φ w/.312" walls		
91	50	10
115	63	12
145	80	14
405	223	17
494	272	19
Metal Shell 16"Φ w/.312" walls		
44	24	7
113	62	10
140	77	12
174	96	14
509	280	17
619	341	19
Metal Shell 16"Φ w/.375" walls		
44	24	7
113	62	10
140	77	12
174	96	14
509	280	17
619	341	19
Steel HP 8 X 36		
253	139	23

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
84	46	14
112	62	17
123	68	19
335	184	24
Steel HP 10 X 57		
86	47	14
116	64	17
128	70	19
454	250	26
Steel HP 12 X 53		
100	55	14
135	74	17
148	81	19
418	230	24
Steel HP 12 X 63		
103	56	14
139	76	17
152	84	19
497	273	25
Steel HP 12 X 74		
74	41	12
105	57	14
142	78	17
156	86	19
589	324	27

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
75	41	12
106	58	14
144	79	17
159	87	19
664	365	29
Steel HP 14 X 73		
85	47	12
121	67	14
164	90	17
180	99	19
578	318	25
Steel HP 14 X 89		
88	48	12
124	68	14
169	93	17
186	102	19
705	388	27
Steel HP 14 X 102		
90	49	12
127	70	14
172	95	17
190	104	19
810	445	29
Steel HP 14 X 117		
92	51	12
129	71	14
176	97	17
195	107	19
929	511	29
Precast 14"x 14"		
49	27	7
116	64	10
147	81	12
185	102	14

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for Pier #1 - SE Wang Core Log B-03

Estimated Top of Rock Elevation: 637.80

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
24 in. Diameter Drilled Shaft							
0.5	637.3	4806	2403	TIP	--	--	0.293
1.5	636.3	5926	2963	TIP	--	--	0.528
2.5	635.3	7018	3509	TIP	--	--	0.746
3.5	634.3	13185	6592	TIP	--	--	1.639
4.5	633.3	13994	6997	TIP	--	--	1.843
5.5	632.3	14844	7422	TIP	--	--	1.618
6.5	631.3	15694	7847	TIP	--	--	1.684
7.5	630.3	16590	8295	TIP	--	--	1.747
8.5	629.3	16709	8355	TIP	--	--	2.059
9.5	628.3	16593	8297	TIP	--	--	2.274
10.5	627.3	15152	7576	TIP	--	--	2.115
11.5	626.3	13591	6796	TIP	--	--	2.004
12.5	625.3	2292	1261	SIDE	-9508	-0.325	0.036
13.5	624.3	2498	1374	SIDE	-7914	-0.274	0.041
14.5	623.3	2703	1487	SIDE	-6818	-0.235	0.046
15.5	622.3	2908	1600	SIDE	-6154	-0.211	0.051
16	621.8	3011	1656	SIDE	-6166	-0.213	0.055
30 in. Diameter Drilled Shaft							
0.5	637.3	7337	3669	TIP	--	--	0.491
1.5	636.3	9097	4549	TIP	--	--	0.668
2.5	635.3	10967	5483	TIP	--	--	0.903
3.5	634.3	18074	9037	TIP	--	--	1.556
4.5	633.3	22676	11338	TIP	--	--	2.051
5.5	632.3	23739	11869	TIP	--	--	1.901
6.5	631.3	24951	12476	TIP	--	--	1.883
7.5	630.3	25923	12962	TIP	--	--	2.085
8.5	629.3	25926	12963	TIP	--	--	2.314
9.5	628.3	24124	12062	TIP	--	--	2.266
10.5	627.3	22322	11161	TIP	--	--	2.115
11.5	626.3	2608	1435	SIDE	96243	2.517	0.027
12.5	625.3	2865	1576	SIDE	-74596	-1.991	0.032
13.5	624.3	3122	1717	SIDE	-28388	-0.766	0.036
14.5	623.3	3379	1858	SIDE	-18102	-0.484	0.040
15.5	622.3	3635	1999	SIDE	-14072	-0.374	0.045
16	621.8	3764	2070	SIDE	-13767	-0.370	0.048
36 in. Diameter Drilled Shaft							
0.5	637.3	10399	5200	TIP	--	--	0.580
1.5	636.3	12990	6495	TIP	--	--	0.797
2.5	635.3	16303	8151	TIP	--	--	0.984
3.5	634.3	26908	13454	TIP	--	--	1.731
4.5	633.3	28091	14046	TIP	--	--	1.979
5.5	632.3	34886	17443	TIP	--	--	2.122
6.5	631.3	36165	18082	TIP	--	--	2.223
7.5	630.3	37154	18577	TIP	--	--	2.360
8.5	629.3	35169	17585	TIP	--	--	2.356
9.5	628.3	33007	16504	TIP	--	--	2.301
10.5	627.3	2822	1552	SIDE	9210	0.202	0.026
11.5	626.3	3130	1722	SIDE	16690	0.359	0.026
12.5	625.3	3438	1891	SIDE	27611	0.605	0.030
13.5	624.3	3746	2060	SIDE	67620	1.495	0.034
14.5	623.3	4054	2230	SIDE	-223024	-4.877	0.037
15.5	622.3	4362	2399	SIDE	-49905	-1.083	0.041
16	621.8	4517	2484	SIDE	-44203	-0.968	0.044
42 in. Diameter Drilled Shaft							
0.5	637.3	14035	7017	TIP	--	--	0.677
1.5	636.3	18039	9020	TIP	--	--	0.846

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for Pier #1 - SE Wang Core Log B-03

Estimated Top of Rock Elevation: 637.80

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
2.5	635.3	22792	11396	TIP	--	--	1.075
3.5	634.3	37482	18741	TIP	--	--	1.969
4.5	633.3	39042	19521	TIP	--	--	2.151
5.5	632.3	47961	23981	TIP	--	--	2.446
6.5	631.3	49246	24623	TIP	--	--	2.484
7.5	630.3	48082	24041	TIP	--	--	2.378
8.5	629.3	45766	22883	TIP	--	--	2.389
9.5	628.3	2933	1613	SIDE	5735	0.108	0.026
10.5	627.3	3292	1811	SIDE	7633	0.144	0.027
11.5	626.3	3652	2009	SIDE	11455	0.210	0.027
12.5	625.3	4011	2206	SIDE	15504	0.289	0.030
13.5	624.3	4371	2404	SIDE	22712	0.426	0.033
14.5	623.3	4730	2602	SIDE	38651	0.716	0.036
15.5	622.3	5090	2799	SIDE	91353	1.675	0.039
16	621.8	5269	2898	SIDE	127222	2.351	0.042

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for Pier #2 - NE Wang Core Log B-04

Estimated Top of Rock Elevation: 627.30

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
24 in. Diameter Drilled Shaft							
1	626.3	844	422	TIP	--	--	0.202
2	625.3	1047	523	TIP	--	--	0.259
3	624.3	1375	687	TIP	--	--	0.318
4	623.3	2021	1011	TIP	--	--	0.494
5	622.3	1997	998	TIP	--	--	0.411
6	621.3	11384	5692	TIP	--	--	1.806
7	620.3	11143	5571	TIP	--	--	1.532
8	619.3	10797	5399	TIP	--	--	1.114
9	618.3	10595	5298	TIP	--	--	1.187
10	617.3	10495	5247	TIP	--	--	1.258
11	616.3	6840	3420	TIP	--	--	1.141
12	615.3	4845	2422	TIP	--	--	1.425
13	614.3	2843	1421	TIP	--	--	1.279
14	613.3	2047	1126	SIDE	4568	0.180	0.057
15	612.3	2080	1144	SIDE	4113	0.167	0.062
16	611.3	2113	1162	SIDE	3705	0.156	0.069
17	610.3	2146	1180	SIDE	3395	0.148	0.075
30 in. Diameter Drilled Shaft							
1	626.3	1665	833	TIP	--	--	0.317
2	625.3	1801	901	TIP	--	--	0.318
3	624.3	2216	1108	TIP	--	--	0.394
4	623.3	3124	1562	TIP	--	--	0.512
5	622.3	3080	1540	TIP	--	--	0.426
6	621.3	17605	8803	TIP	--	--	1.908
7	620.3	17173	8587	TIP	--	--	1.626
8	619.3	16746	8373	TIP	--	--	1.208
9	618.3	16493	8247	TIP	--	--	1.272
10	617.3	11405	5703	TIP	--	--	1.241
11	616.3	8806	4403	TIP	--	--	1.671
12	615.3	6314	3157	TIP	--	--	1.844
13	614.3	2303	1266	SIDE	3308	0.105	0.056
14	613.3	2559	1408	SIDE	4316	0.133	0.057
15	612.3	2600	1430	SIDE	4092	0.130	0.062
16	611.3	2641	1453	SIDE	3854	0.127	0.068
17	610.3	2682	1475	SIDE	3659	0.124	0.075
36 in. Diameter Drilled Shaft							
1	626.3	2728	1364	TIP	--	--	0.410
2	625.3	2752	1376	TIP	--	--	0.398
3	624.3	3232	1616	TIP	--	--	0.420
4	623.3	4443	2222	TIP	--	--	0.504
5	622.3	4397	2199	TIP	--	--	0.459
6	621.3	25020	12510	TIP	--	--	1.997
7	620.3	24507	12254	TIP	--	--	1.726
8	619.3	23995	11997	TIP	--	--	1.318
9	618.3	17106	8553	TIP	--	--	1.328
10	617.3	13990	6995	TIP	--	--	1.859
11	616.3	10874	5437	TIP	--	--	2.234
12	615.3	2455	1350	SIDE	2671	0.074	0.062
13	614.3	2763	1520	SIDE	3377	0.089	0.060
14	613.3	3071	1689	SIDE	4264	0.108	0.060
15	612.3	3120	1716	SIDE	4140	0.108	0.065
16	611.3	3169	1743	SIDE	3989	0.108	0.071
17	610.3	3218	1770	SIDE	3861	0.108	0.078
42 in. Diameter Drilled Shaft							
1	626.3	4033	2017	TIP	--	--	0.521
2	625.3	3870	1935	TIP	--	--	0.442

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for Pier #2 - NE Wang Core Log B-04

Estimated Top of Rock Elevation: 627.30

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
3	624.3	4417	2209	TIP	--	--	0.437
4	623.3	5994	2997	TIP	--	--	0.528
5	622.3	5920	2960	TIP	--	--	0.477
6	621.3	33739	16870	TIP	--	--	2.091
7	620.3	33141	16571	TIP	--	--	1.799
8	619.3	5150	2575	TIP	--	--	0.294
9	618.3	20307	10154	TIP	--	--	2.018
10	617.3	16676	8338	TIP	--	--	2.511
11	616.3	2505	1378	SIDE	2280	0.060	0.075
12	615.3	2864	1575	SIDE	2835	0.068	0.070
13	614.3	3224	1773	SIDE	3507	0.080	0.067
14	613.3	3583	1971	SIDE	4325	0.094	0.065
15	612.3	3640	2002	SIDE	4253	0.095	0.070
16	611.3	3698	2034	SIDE	4151	0.096	0.076
17	610.3	3755	2065	SIDE	4064	0.097	0.083

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for Pier #2 - NW Wang Core Log B-01

Estimated Top of Rock Elevation: 644.40

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
24 in. Diameter Drilled Shaft							
1	643.4	393	196	TIP	--	--	0.122
2	642.4	732	366	TIP	--	--	0.170
3	641.4	1178	589	TIP	--	--	0.205
4	640.4	1082	541	TIP	--	--	0.111
5	639.4	13489	6745	TIP	--	--	1.286
6	638.4	12523	6262	TIP	--	--	1.285
7	637.4	11671	5836	TIP	--	--	1.306
7.66	636.74	10194	5097	TIP	--	--	1.233
8.33	636.07	8181	4091	TIP	--	--	1.068
9	635.4	6385	3193	TIP	--	--	0.878
10	634.4	2537	1269	TIP	--	--	0.661
11	633.4	1638	819	TIP	--	--	0.533
12	632.4	1822	1002	SIDE	2747	0.113	0.059
13	631.4	1989	1094	SIDE	3058	0.123	0.064
14	630.4	2048	1127	SIDE	2974	0.125	0.071
15	629.4	2108	1159	SIDE	2931	0.127	0.078
16	628.4	2168	1192	SIDE	2928	0.131	0.083
30 in. Diameter Drilled Shaft							
1	643.4	733	366	TIP	--	--	0.146
2	642.4	1229	615	TIP	--	--	0.181
3	641.4	1895	947	TIP	--	--	0.219
4	640.4	1702	851	TIP	--	--	0.127
5	639.4	19851	9925	TIP	--	--	1.417
6	638.4	18668	9334	TIP	--	--	1.425
7	637.4	15750	7875	TIP	--	--	1.337
7.66	636.74	13676	6838	TIP	--	--	1.194
8.33	636.07	9376	4688	TIP	--	--	1.083
9	635.4	5956	2978	TIP	--	--	1.002
10	634.4	3636	1818	TIP	--	--	0.785
11	633.4	2515	1257	TIP	--	--	0.612
12	632.4	2277	1252	SIDE	2779	0.090	0.063
13	631.4	2486	1367	SIDE	3084	0.098	0.068
14	630.4	2560	1408	SIDE	3081	0.102	0.074
15	629.4	2635	1449	SIDE	3105	0.106	0.080
16	628.4	2710	1490	SIDE	3160	0.110	0.085
36 in. Diameter Drilled Shaft							
1	643.4	1161	580	TIP	--	--	0.168
2	642.4	1864	932	TIP	--	--	0.198
3	641.4	2795	1397	TIP	--	--	0.246
4	640.4	2345	1173	TIP	--	--	0.117
5	639.4	27438	13719	TIP	--	--	1.574
6	638.4	23795	11897	TIP	--	--	1.477
7	637.4	19880	9940	TIP	--	--	1.291
7.66	636.74	11643	5821	TIP	--	--	1.169
8.33	636.07	12108	6054	TIP	--	--	1.587
9	635.4	7834	3917	TIP	--	--	1.221
10	634.4	4920	2460	TIP	--	--	0.850
11	633.4	2434	1339	SIDE	2646	0.072	0.061
12	632.4	2733	1503	SIDE	2885	0.078	0.070
13	631.4	2983	1641	SIDE	3178	0.083	0.074
14	630.4	3073	1690	SIDE	3215	0.088	0.081
15	629.4	3162	1739	SIDE	3275	0.092	0.086
16	628.4	3252	1788	SIDE	3361	0.097	0.091
42 in. Diameter Drilled Shaft							
1	643.4	1694	847	TIP	--	--	0.196
2	642.4	2641	1320	TIP	--	--	0.234

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for Pier #2 - NW Wang Core Log B-01

Estimated Top of Rock Elevation: 644.40

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
3	641.4	3693	1846	TIP	--	--	0.259
4	640.4	3092	1546	TIP	--	--	0.137
5	639.4	17593	8797	TIP	--	--	0.871
6	638.4	28905	14452	TIP	--	--	1.440
7	637.4	12876	6438	TIP	--	--	1.138
7.66	636.74	14379	7189	TIP	--	--	1.518
8.33	636.07	15124	7562	TIP	--	--	1.828
9	635.4	9941	4970	TIP	--	--	1.309
10	634.4	2480	1364	SIDE	2332	0.057	0.066
11	633.4	2840	1562	SIDE	2794	0.066	0.068
12	632.4	3188	1753	SIDE	3034	0.071	0.079
13	631.4	3480	1914	SIDE	3319	0.075	0.082
14	630.4	3585	1972	SIDE	3381	0.079	0.089
15	629.4	3689	2029	SIDE	3462	0.083	0.095
16	628.4	3794	2086	SIDE	3569	0.088	0.099

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Project SN 046-0160 Prop

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Calculated By M Date 7-28-20

Checked By MK Date 7-28-20

Resistance in Siltstone

assume ave $N = \frac{50}{4"} \sim 150$

use BBS 145 spreadsheet

$N = 150 \rightarrow Q_u = 4.5$ ksf

$\frac{Q_u}{2} = S_u \rightarrow S_u = 4.5$ ksf

→ for side resistance $P_a = 2116$ psf

$\frac{S_u}{P_a} = \frac{4500}{2116} = 2.13$ ✓

$\alpha = 0.55 - 0.1\left(\frac{S_u}{P_a} - 1.5\right)^{.06}$ when $\frac{S_u}{P_a} > 1.5$

$\alpha = 0.49$ ✓

unit side resistance $= f_{SN} = \alpha \times S_u$

$f_{SN} = 0.49 \times 4500$ psf $= 2,205$ psf ✓

factored unit $f_{SN} = 0.55 \times \frac{2205 \text{ psf}}{1000 \frac{\text{psf}}{\text{ksf}}}$ ✓

$= \underline{1.21 \text{ ksf}}$

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Project 046-0160 Prop

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Calculated By M Date ____

Checked By MC Date ____

Resistance in Siltstone

for base resistance $q_{BN} = N_c^* s_u$

$s_u = 4500$ psf

$N_c^* = 9.0$ (p. 13-17 FHWA Drilled Shafts Man.)

$q_{BN} = 9 \times 4500 = 40,500$ psf ✓

factored base resistance

$= 0.55 \times \frac{40,500}{1000 \text{ psf/ksf}} = 22.28$ ksf ✓

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Illinois Department of Transportation

Waterway Information Table

Route	Existing SN	Proposed SN	Structure C.L. Sta.
FAP 330 (US 45/52)	046-0046	-	517+09

Section Number	County	Waterway
(16BR-1)ES	Kankakee	Rock Creek

Prepared by	Date	Checked by	Date
Brian Smith	03/20/20	Steven Ferguson	3/20/2020

			Existing Overtopping Elev. =	660.14	at Sta.	510+00	
Drainage Area	30.8	sq. mi.	Proposed Overtopping Elev. =	660.14	at Sta.	510+00	

Flood Event	Freq. Yr.	Discharge	Waterway Opening (sf)		Natural	Head (ft)		Headwater Elev. (ft)	
		(cfs)	Existing	Proposed	H.W.E. (ft)	Existing	Proposed	Existing	Proposed
Ten-Year	10	1,400	588	643	658.9	0.1	0.1	659.1	659.1
Design	50	2,110	637	707	659.6	0.5	0.4	660.1	659.9
Overtop Existing	63	2,240	644	716	659.7	0.5	0.4	660.1	660.0
Overtop Proposed	90	2,410	651	725	659.8	0.7	0.4	660.5	660.2
Base	100	2,440	652	726	659.8	0.7	0.4	660.5	660.2
Scour Check	200	2,770	662	744	660.0	0.8	0.7	660.8	660.6
Max Calc	500	3,240	662	744	660.2	0.9	0.7	661.0	660.9

Existing 10 Year Average Velocity (Q/A) = 2.4 ft/s

Proposed 10 Year Average Velocity (Q/A) = 2.2 ft/s

All-Time H.W.E. & Date: 660.8 - 7/22/2017

Scope of Work: Complete Replacement

Existing Bridge

Abutment Type	Closed Abutment	
# Spans	3	
Length (ft)	84'-10"	BK-BK
Skew	15	RT-AH
Low E.O.P.	659.98	
Low Beam	659.91	
US Flowline	651.0	
DS Flowline	651.0	

Proposed Bridge

Abutment Type	Open Abutment	
# Spans	3	
Length (ft)	109'-9 9/16"	BK-BK
Skew	15	RT-AH
Low E.O.P.	659.98	
Low Beam	659.96	
US Flowline	651.0	
DS Flowline	651.0	

Note(s)

Ex. span configuration: 24'-7"/30'-10"/24'-7" (ctr-ctr). Ex. bridge width: 46'-6" out-out
Pr. span configuration: 33'-0"/40'-0"/33'-0" (ctr-ctr). Pr. bridge width: 42'-10" out-out

Proposed structure details are preliminary; subject to refinement in TSL stage.

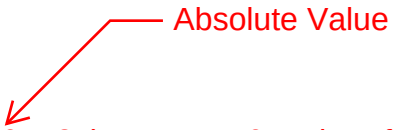
See Floor Drains at the bottom of page 2-67 of the Bridge Manual.

Vertical Curve

L=305

g1= +1.31%

g2= -1.36%



K=L/(g2-g1) = 305/(-1.36-1.31) = 114 < 167 Therefore no Floor Drains are needed