Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 12-6-2018 **Proposed SN:** 046-0158, 046-0159 **Route:** FAI 57 over Grinnell Rd
Revised Date: 6-6-2019 **Existing SN:** 046-0010, 11 **Section:** (139 VB)ES
Geotechnical Engineer: Terrence McCleary of McCleary Engineering **County:** Kankakee
Structural Engineer: Michael Haley of Lin Engineering, Ltd. **Contract** 66F74

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): Subject twin structures, carrying Interstate 57 over Grinnell Road, SN 046-0158 and -0159, will be 3 span,159.25 ft. B-B abuts., 48 ft. wide F-F. The structures will have an 8 inch concrete deck on 36 inch PPC beams. The bridge will have integral abutments supported on steel piles driven to refusal and piers with drilled shaft column bents socketed into limestone. Existing skew equals 2.35°, no proposed skew. The total factored loading is 1538 kips at the abutments and 4832 kips at the piers. The width of each bridge is 50 ft. 11 inch O-O, future widening to allow 3 lanes in each direction could make that 62 ft. 11 inch O-O. The vertical profile of the roadway will be raised ±2 ft. See attached TSL 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 borings were taken in March 2018. Four other borings were taken in November 2017, however, the augered material was not documented. It did record the top of rock; 2 rock cores were taken. The 2018 borings were advanced about 25 ft. through the bridge and roadway fill, consisting of stiff to hard Silty Clay Loams and Silty Clay Loam Tills above a loose to medium, rust red/brown/black fine to coarse Sand. Groundwater was not reported. The fine to coarse sand overlaid bedrock, with a highly weathered limestone to a dense limestone/dolostone surface. Two rock cores were taken in 2017 at locations right (west side) and left (east side) of the existing structures on Grinnell Road. The elevation of the limestone surface was 631.47 on the right and 630.47 on the left. Below 1 to 5 ft. of highly fractured limestone the cores reported dense gray limestone with horizontal fractures with tight joints with strengths ranging from 630 to 1530 tsf. See attached 2017 & 2018 borings, rock cores, and the subsurface profile plot.

The existing structures were originally constructed in 1954 and widened in 1990. The 1954 bridge was supported by open counterfort abutments on spread footings bearing on rock, the pier columns were supported on spread footings bearing on rock. The 1990 bridge widening work is all supported by H piles bearing on rock. The 1954 General Plan and Elevation sheet is attached. The 1990 pile driving records for the widening improvement are attached to this SGR (note the 1990 elevation datum matches the 1954 datum, the one used for this improvement is different).

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 profile of the interstate will be raised ±2 ft.; any fill is expected to be granular material. Considering the length of time the existing stuctures have been in place and that no significant settlement problems have been reported, minimal, if any settlement is expected. No further testing, analysis, or ground improvement is necessary.

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: There are no cross sections this time, however with the slight raise in grade anticipated, fill slope angles will remain the same on the end slopes and will remain the same or become slightly steeper on the side slopes. Standard construction practices will result in stable side slopes. A temporary (undrained) condition was analyzed for a proposed worst case scenario end slope situation, the resulting factor of safety was 4.44 against slope failure. See attached slope stability analysis.

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: N/A

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 soil site class of "C", the seismic performance zone, SPZ = 1. The S_{DS} = 0.125 g and the S_{D1} = 0.072 g. Because the S_{D1} is less than 0.15 g, a liquifaction analysis is NOT required. See attached Seismic Report.

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 2018 borings were used to populate the fields in the pile length spreadsheets. Data from the 2017 cores were used to populate the drilled shaft spreadsheets.

Strength I loading was used at the substructures as follows: Abutments = 1538 kips, Piers = 4832 kips. H piles are recommended bear against the bedrock. The site is in a SPZ 1, therefore, liquifaction was not analyzed. We recommend one test pile per abutment. Metal Shell or concrete piling is not recommended. No reductions in the geotechnical analyses were used because all the substructure supports will be bearing on the limestone bedrock. See Pile Attachments, Table 1, PILE LENGTH TABLES.

Assumptions used for the pile length analysis include:
- The bottom elevation of both north abutments = 655.6.
- The bottom elevation of both the south abutments = 657.9
- The cutoff elevation for the piling allowed a 2 ft. embedment into the concrete.
- Pile shoes are recommended to drive into fractured bedrock.

See attached for pile length estimating spreadsheets, 2018 boring logs, and loading documentation.

Integral Abutments: The information from 2018 Boring 1 and 2 was to populate the fields in the integral abutment worksheet for the SB structure and Boring 3 and 4 was used for the NB structure. The stiffness of the soils at both structures dictate the need to precore the piles at all 4 abutments. Utilizing bentonite to backfill a 10 ft. precore at an 18 inch diameter would allow the required movement for integral abutments.

Drilled Shafts: Table 2 presents the factored side, tip and combined side and tip resistances for 48, 54, and 60 inch diameter rock sockets at the northbound and southbound piers. To complete this Table 2, the data from the last foot of the core was extended an additional 5 ft. below the bottom of the rock core.

Table 2, Drilled shaft resistance

Piers 1 and 2	Shaft Diameter, inches	Socket Depth, foot	Factored Side Resistance, kips	Factored Tip Resistance, kips	Combined Side and Tip Resistance, kips
NB	48	4	451	5331	1641
	48	6	903	5295	1967
	48	8	1355	31954	2417
	48	10	1806	32219	2593
	54	4	507	6748	2049
	54	6	1016	6735	2384
	54	8	1524	40516	2892
	54	10	2032	40814	3064
	60	4	564	8342	2501
	60	6	1128	8348	2836
	60	8	1693	50094	3401
	60	10	2258	50425	3565
SB	48	4	225	2841	1898
	48	6	677	4013	3664
	48	8	1129	36429	2655
	48	10	1581	34165	2624
	54	4	253	3590	2441
	54	6	761	5035	4590
	54	8	1270	45712	3230
	54	10	1778	43165	3132
	60	4	281	4435	3054
	60	6	846	6173	5616
	60	8	1411	56046	3857
	60	10	1976	53216	3675

See the attached drilled shaft tables for further information. See the attached 2017 Rock Core Logs for further information on rock quality.

The recommended soil parameters for a lateral load analysis using the L-pile software are shown in the Table 3.

Table 3, Lateral Load Soil Parameters

Soil Type	Angle of Internal Friction (degrees)	Average Undrained Cohesion, (psf)	Static Soil Modulus k (pci)	Soil Strain Parameter E_{50}	Total Unit Wt. (pcf)	Effective Unit Wt. (pcf)	UCS of Rock, (ksf)
V. Stiff Silty Clay Loam Fill	-	3000	1000	0.005	125	62.6	-
Loose Loamy Fine Sand	30	-	25	-	115	52.6	-
Fractured Limestone treated as Gravel	46	-	200	-	-	-	-
Dense Limestone	-	-	-	-	155	92.6	2000

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: N/A

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Stage construction utilizing crossovers should minimize construction conflicts. The borings indicate sheet piling can be driven to a sufficient depth to permit abutment construction. The proposed foundations have been spaced to avoid conflict with the existing substructures. The substructures shall be removed as per Section 501 if the 2016 IDOT Standard Specifications for Road and Bridge Construction.

Prepared by McCleary Engineering
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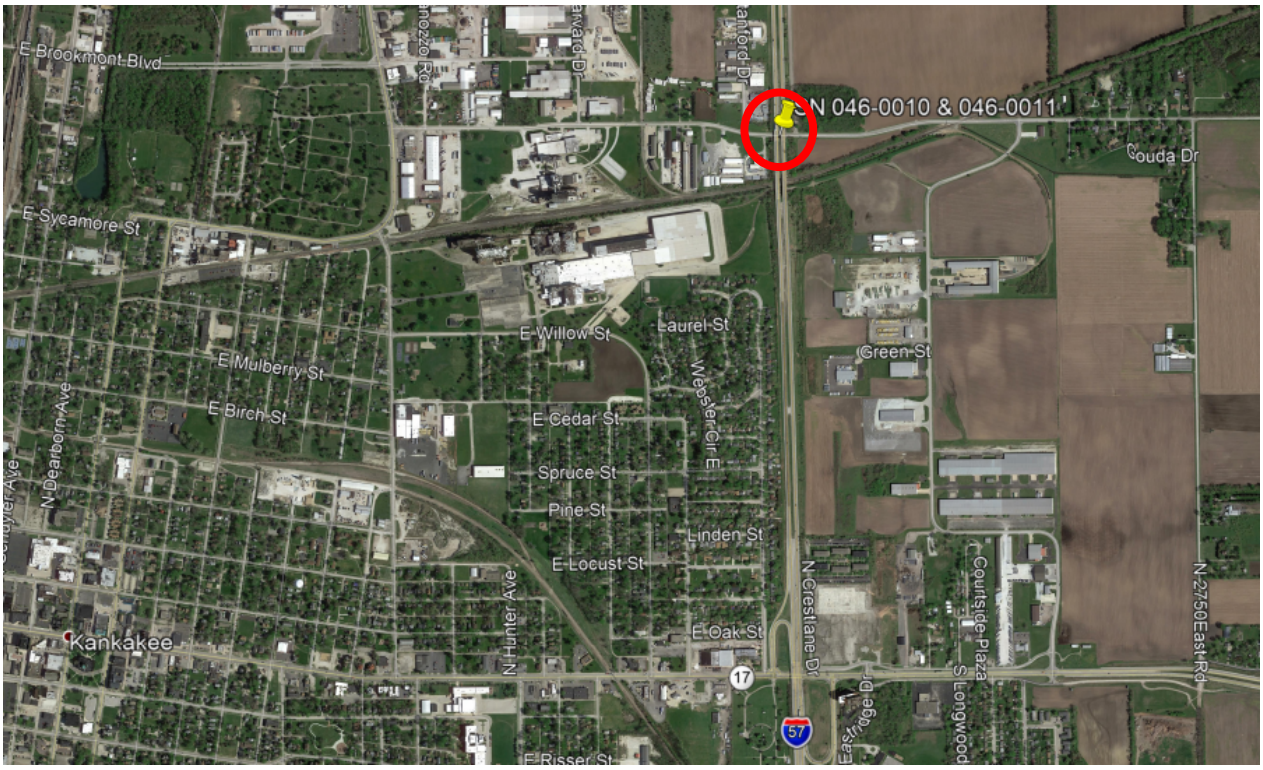
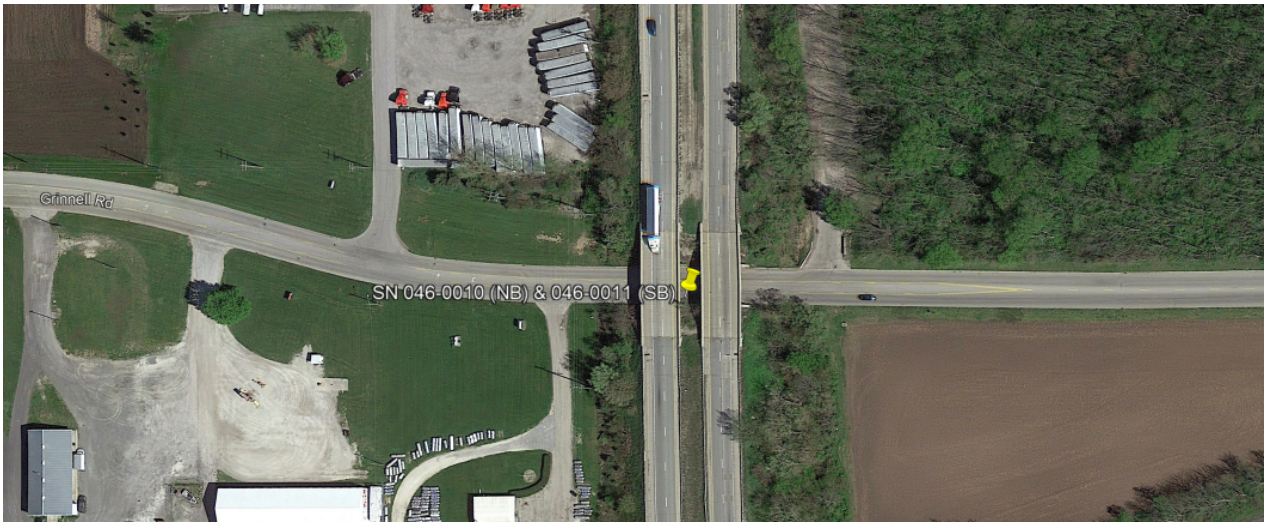
Terry@McClearyEngineering.com

Terrence L. McCleary
Illinois Professional Engineer
License No. 062.050019 Exp. 11/2019

LOCATION MAP

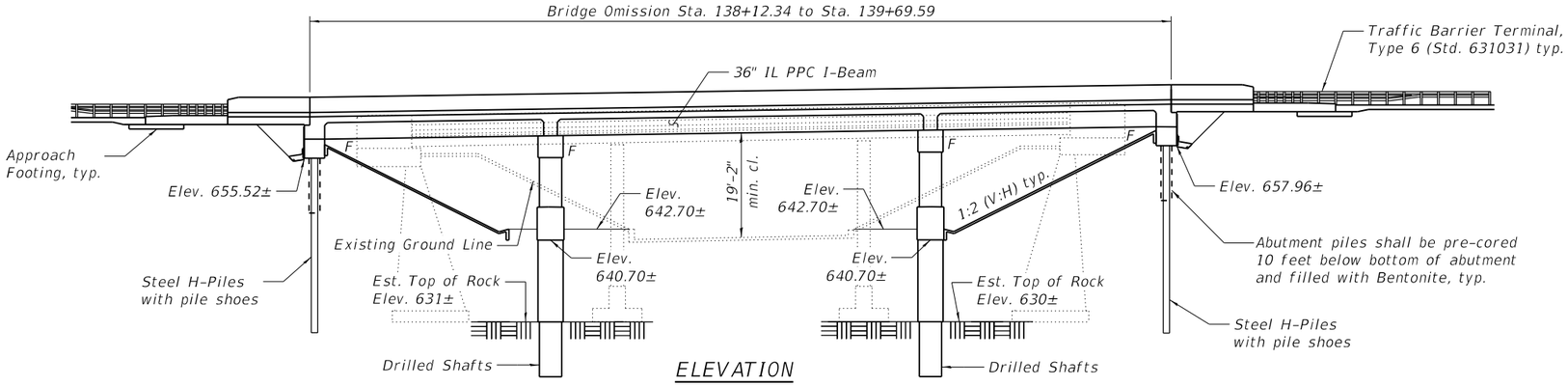
SNs 046-0010 & 046-0011





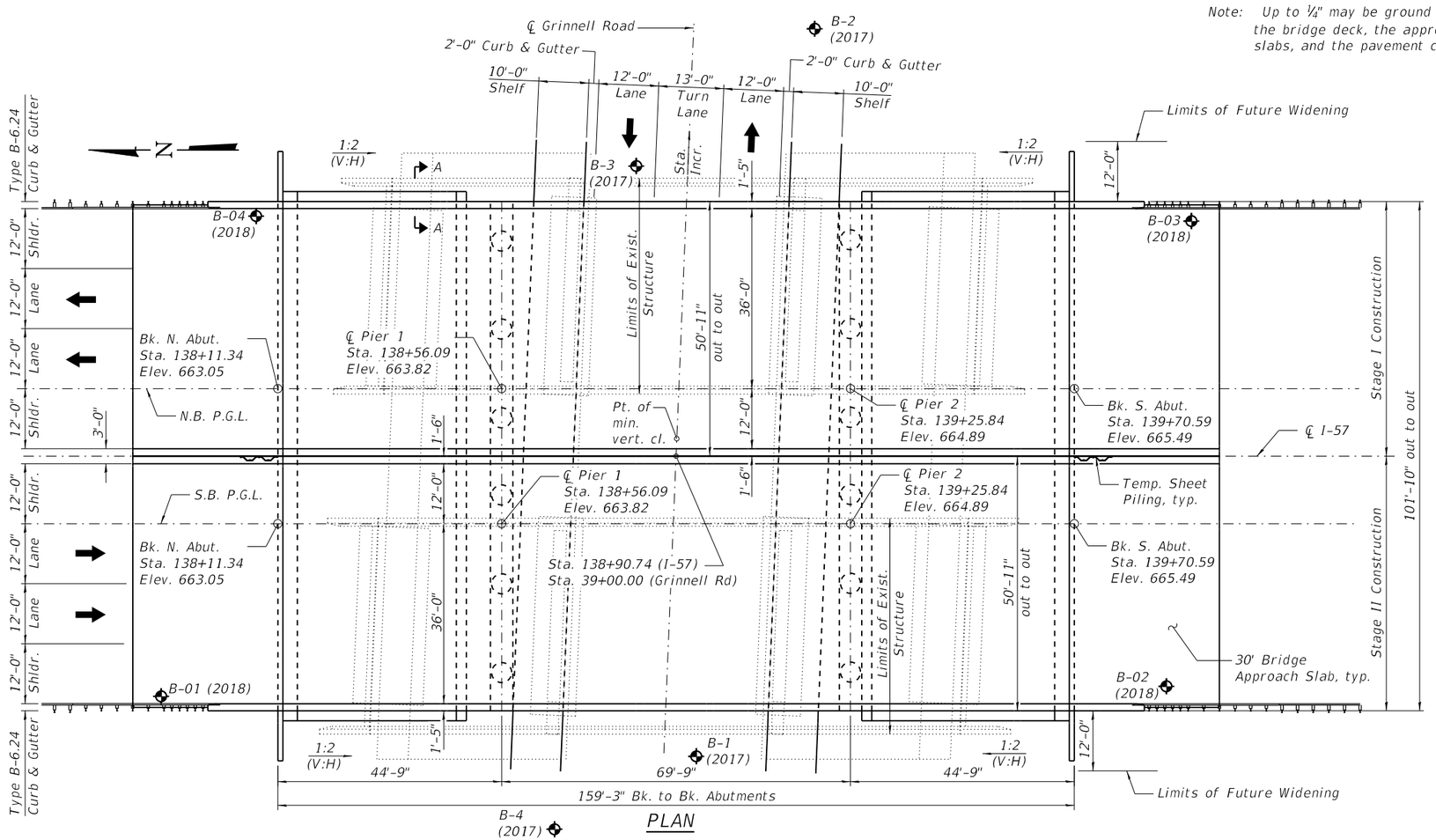
FAI-57(I-57)
Section (139VB)ES
Kankakee County
SNs 046-0010 (NB) & 046-0011 (SB) (Exist)
I-57 over Grinnell Rd.
1.0 Mi. N of IL-17

Bench Mark (BM 140): Chiseled "□" top of curb at southeast end of east parapet wall SN 046-0010, Sta. 139+61, 54' Left, Elev. 663.37.
Existing Structures: S.N. 046-0010 (N.B.) and S.N. 046-0011 (S.B.), built in 1954 as F.A. Rte 26, Section 139-HB3-HF3, at station 138+90.96. The bridge decks were replaced and structures widened in 1990 under F.A.I. Rte 57, Section 139HBR-3. The existing dual structures are 3-span bridges with rolled steel beams supported on spill-thru counterfort abutments and multi-column concrete piers on spread footings. 120'-2" back to back abutments, 43'-2" out to out deck with a 2°-21'-00" left ahead skew. Structures to be removed and replaced. Traffic shall be maintained utilizing crossovers during construction. No Salvage.



ELEVATION

Note: Up to ¼" may be ground off the bridge deck, the approach slabs, and the pavement connectors.



PLAN

LOADING HL-93

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

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi
f'c = 4,000 psi (Superstructure Concrete)
fy = 60,000 psi (Reinforcement)

PRECAST PRESTRESSED UNITS
f'c = 8,500 psi
f'ci = 7,000 psi
fpu = 270,000 psi (0.6" ○ low lax. strands)
fpbt = 202,300 psi (0.6" ○ low lax. strands)

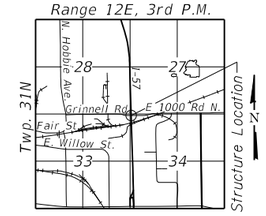
SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.072 g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.125 g
Soil Site Class = C

HIGHWAY CLASSIFICATION

F.A.U. Rte. 6221 (Grinnell Rd.)	F.A.I. Rte. 57
Functional Class: Minor Arterial	Functional Class: Interstate
ADT: 3,120 (2021); 3,720 (2041)	ADT: 31,392 (2021); 37,152 (2041)
ADTT: 250 (2021); 298 (2041)	ADTT: 7,409 (2021); 8,768 (2041)
DHV: 312 (2021); 372 (2041)	DHV: 3,139 (2021); 3,715 (2041)
Design Speed: 30 m.p.h.	Design Speed: 75 m.p.h.
Posted Speed: 30 m.p.h.	Posted Speed: 70 m.p.h.
Two-Way Traffic	Two-Way Traffic
Directional Distribution: 50:50	Directional Distribution: 50:50

Range 12E, 3rd P.M.



LOCATION SKETCH

GENERAL PLAN & ELEVATION
I-57 OVER GRINNELL ROAD
F.A.I. RTE 57 - SEC. [(139)HB-3]ES
KANKAKEE COUNTY
STATION 138+90.74
STRUCTURE NO. 046-0158 (N.B.)
STRUCTURE NO. 046-0159 (S.B.)

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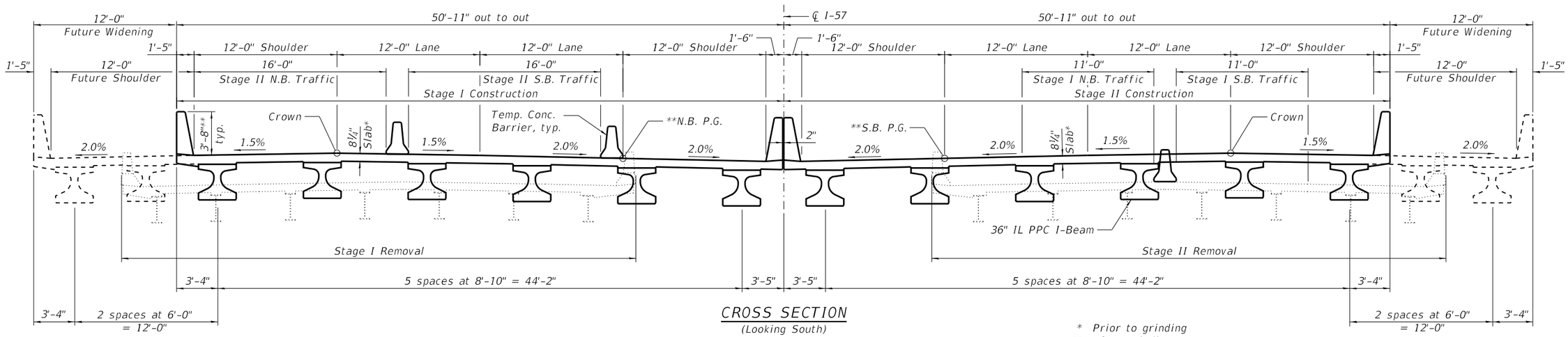
LIN ENGINEERING, LTD.
Consulting Engineers
Springfield, Illinois

USER NAME =	DESIGNED - MTH	REVISED -	
	CHECKED - VPT	REVISED -	
PLOT SCALE =	DRAWN - DAS	REVISED -	
PLOT DATE = 2/19/2019	CHECKED - MTH	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

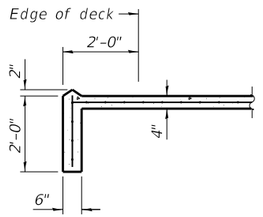
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	[(139)HB-3]ES	KANKAKEE		
		CONTRACT NO. 66F74		
		ILLINOIS	FED. AID PROJECT	



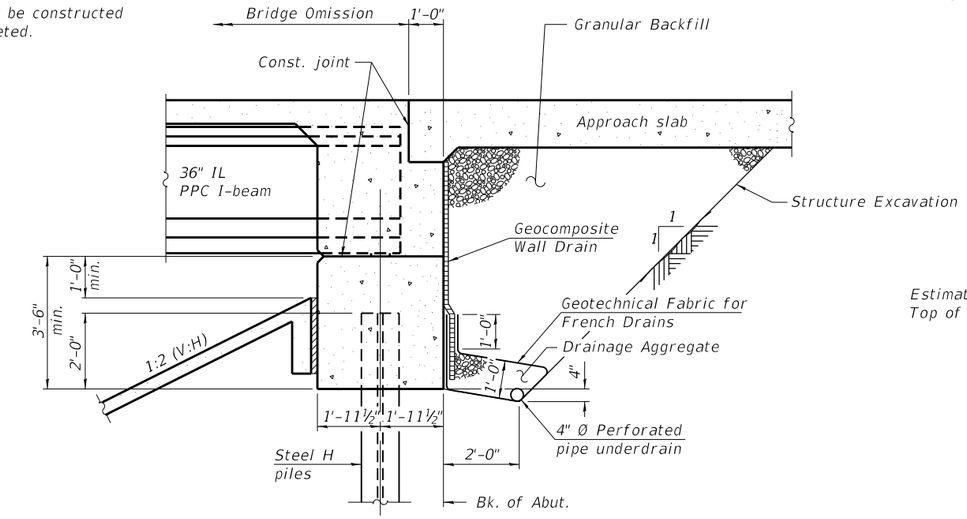
CROSS SECTION
(Looking South)

* Prior to grinding
** After grinding

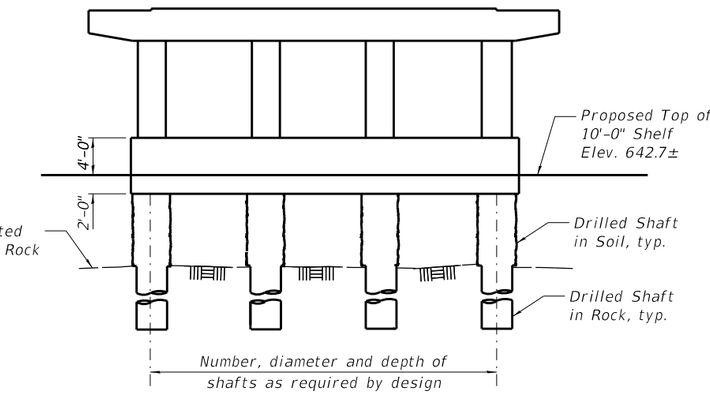
Note:
Both median parapets shall be constructed after Stage II deck is completed.



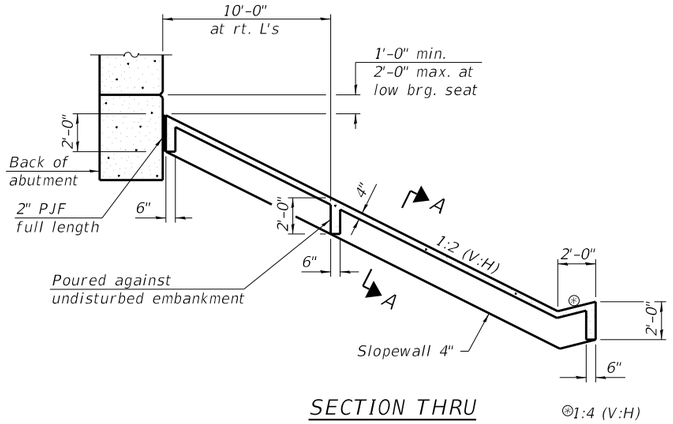
SECTION A-A



SECTION THRU INTEGRAL ABUTMENT

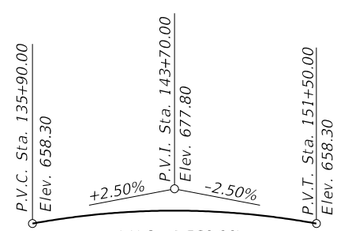


PIER SKETCH
(Separate piers for N.B. and S.B. bridges)



SECTION THRU CONCRETE SLOPEWALL

Ⓢ1:4 (V:H)



I-57 PROFILE GRADE
(Along inside edge of pavement)
(PG shows final elevations after grinding)

GRINNELL ROAD PROFILE GRADE
(Along ℄ roadway)

GENERAL DATA
I-57 OVER GRINNELL ROAD
F.A.I. RTE 57 - SEC. [(139)HB-3]ES
KANKAKEE COUNTY
STATION 138+90.74
STRUCTURE NO. 046-0158 (N.B.)
STRUCTURE NO. 046-0159 (S.B.)

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LIN ENGINEERING, LTD.
Consulting Engineers
Springfield, Illinois

USER NAME =	DESIGNED - MTH	REVISED -	
	CHECKED - VPT	REVISED -	
PLOT SCALE =	DRAWN - DAS	REVISED -	
PLOT DATE = 2/19/2019	CHECKED - MTH	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	[(139)HB-3]ES	KANKAKEE		
		CONTRACT NO. 66F74		
		ILLINOIS FED. AID PROJECT		

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 3/12/18

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**, **Latitude** 41.133537, **Longitude** -87.836429

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 01
Station 137+88
Offset 48.0 ft Rt.
Ground Surface Elev. 660.19 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Bituminous Shoulder. Black, Gray & Brown Silty Clay Loam Fill			
657.69			
Very Stiff Black Silty Clay Loam with some Gray & Brown Silty Clay Loam mixed in - Fill	4		
	5 6	3.5 P	26
655.69			
Stiff to Very Stiff Gray Silty Clay Loam Till Fill with some Black & Brown Silty Clay Loam mixed in	2		
	2 3	2.0 P	28
	2		
	4 5	3.5 P	25
	2		
	4 4	3.1 B	28
	3		
	4 5	3.7 B	25
	4		
	5 7	3.9 B	24
643.19			
Very Stiff Brown & Gray Silty Clay Loam Till Fill with Asphalt & Gravel @ 20.5 Ft.	4		
	5 5	3.7 B	19

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	10		
Very Stiff Brown & Gray Silty Clay Loam Till Fill with Asphalt & Gravel @ 20.5 Ft. *(continued)*	49 18		6
	4		
	6 8	3.9 B	20
635.69			
Loose Brown / Rust Red Fine to Coarse Sand	3		
	4 5		17
	21		
632.19			
Weathered Limestone / Dolostone Surface 631.61	61 100/1"		6
End of Boring			

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 3/29/18

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 3/12/18

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.132976, **Longitude** -87.836405

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 02
Station 139+89
Offset 46.0 ft Rt.
Ground Surface Elev. 663.81 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Asphalt Shoulder. Black Silty Clay Loam Fill
661.31				
	2			Very Stiff Black, Gray & Brown Silty Clay Loam Intermixed - Fill
	3 3	2.5 P	21	
-5	3			
	3 4	3.0 P	24	
	2			
	3 4	2.5 P	19	
-10	2			
	3 4	2.3 P	24	
	2			
	3 5	3.1 B	19	
-15	3			
	4 5	3.4 B	21	
	3			
	4 5	3.1 B	21	
643.81	-20			
	3			Very Stiff to Hard Gray Silty Clay Loam Till Fill
	5 6	4.1 S	20	
	3			
	5 5	4.0 S	20	
639.31				
-25	3			Loose Black to Brown Loamy Fine to Coarse Sand
	3 4		16	
636.81				
	3			Loose to Medium Brown / Rust Red Fine to Coarse Sand
	4 5		19	
-30	3			
	5 6		17	
	3			
	5 7		14	
629.81				
-35				Dense Gray Limestone / Dolostone Surface
	61			
628.14	100/2"		9	
				End of Boring
-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 046-0010,0011.GPJ IL_DOT.GDT 3/29/18

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 3/13/18

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.132966, **Longitude** -87.836069

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 03
Station 139+94
Offset 47.0 ft Lt.
Ground Surface Elev. 664.04 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Bituminous Shoulder. White & Brown Sand & Gravel Fill
661.54				
	4			Medium Brown Sand / Gravel Fill
	6 9		5	
659.54				
-5				Very Stiff Black & Gray Silty Clay Loam Fill
	2			
	3 4	2.5 P	22	
	2			
	3 4	2.5 P	17	
-10				
	3			
	5 7	3.9 B	19	
	3			
	5 6	3.7 B	19	
-15				
	3			
	4 6	3.9 B	22	
	3			
	5 6	3.7 B	19	
644.54				
-20				
	3			Very Stiff to Hard Gray & Brown Silty Clay Loam Till Fill with some Black Silty Clay Loam *(continued)*
	6 6	4.1 B	20	
	3			
	5 6	4.1 B	19	
-25				
	2			
	3 8	4.0 B	17	
	2			
	4 6	3.1 B	19	
634.54				
-30				Medium Brown Fine to Coarse Sand
	3			
	5 7		19	
	4			
	6 9		16	
629.04 -35				
	21			Gray Limestone Surface - Highly Weathered & Reworked in top 12"
627.79	34 100/3"		11	
				End of Boring
-40				

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 3/29/18

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 3/13/18

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.133472, **Longitude** -87.836087

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 04
Station 138+07
Offset 48.0 ft Lt.
Ground Surface Elev. 660.59 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Bituminous Shoulder. Black Silty Clay Loam Fill
658.09				
	2			Stiff to Very Stiff Black Silty Clay Loam and Brown & Gray Silty Clay Loam Fill
	3 3	1.8 P	29	
-5				
	2			
	3 2	2.0 P	29	
	2			
	1 2	1.5 P	28	
-10				
	1			
	1 2	1.5 P	26	
648.59				
	3			Very Stiff Black, Gray, Brown Silty Clay Loam Fill with Asphalt Pieces at 21.5 ft.
	4 5	2.9 B	19	
-15				
	2			
	5 6	3.2 B	17	
	3			
	6 7	3.5 B	15	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	6			Very Stiff Black, Gray, Brown Silty Clay Loam Fill with Asphalt Pieces at 21.5 ft. *(continued)*
	8 16	3.7 B	10	
637.59	4			
	5 6		18	Medium Rust Red / Brown Fine to Coarse Sand
-25				
	4			
	5 5		10	
	4			
631.59	5 6		7	
				Dense Gray Limestone / Dolostone - Weathered at Surface
-30				
630.34	100/3"		6	
				End of Boring
-35				
-40				

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 3/29/18

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 11/21/17

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.133231, **Longitude** -87.836477

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 1
Station 138+95
Offset 60.0 ft Rt.
Ground Surface Elev. 641.47 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None ft
Upon Completion ft
After Hrs. ft

Augered Material - Not Documented

-5

631.47 -10

Borehole continued with rock coring.

-15

-20

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 9/25/18

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 11/21/17

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.133181, **Longitude** -87.835945

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 2
Station 139+12
Offset 84.0 ft Lt.
Ground Surface Elev. 641.42 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 631.4 ft ▼
Upon Completion ft
After Hrs. ft

Augered Material - Not Documented

-5

▼-10

630.42

Rock Surface
End of Boring

-15

-20

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 9/25/18

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 11/22/17

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.133265, **Longitude** -87.836022

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 3
Station 138+83
Offset 58.0 ft Lt.
Ground Surface Elev. 641.47 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-5			
-10			
-15			
-20			

Augered Material - Not Documented

630.47

Borehole continued with rock coring.

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None ft
Upon Completion ft
After Hrs. ft

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 9/25/18

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 11/22/17

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.13331, **Longitude** -87.836545

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 4
Station 138+73
Offset 82.0 ft Rt.
Ground Surface Elev. 641.35 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)

Surface Water Elev. ft
Stream Bed Elev. ft

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

Augered Material - Not Documented

-5

632.35

Rock Surface
End of Boring

-10

-15

-20

SOIL BORING 046-0010,0011.GPJ IL_DOT.GDT 9/25/18

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

ROCK CORE LOG

Date 11/21/17

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.133231, **Longitude** -87.836477

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 1
Station 138+95
Offset 60.0 ft Rt.
Ground Surface Elev. 641.47 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 631.47 ft
Begin Core Elev. 631.47 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Tan & Gray Dolomitic Limestone - Highly Vertical & Horizontally Fractured, Very Loose Joints	631.47		1	100	0	3.2	
	629.47						
Gray Limestone, Tan Oxidation at Joints, Highly Horizontally Fractured with some Tight Joints.	626.47	-15					
Gray Limestone, Horizontal Fractures with Tight Joints, Minor Tan Oxidation at Joints.			2	100	44	4	1308.9 1242.5 1241.0 1224.5 1535.6 1442.3
		-20					1325.4
			3	93	81	3.8	1188.2 1156.8 1013.9 1035.5 1059.9 1037.4 1053.9
	616.47	-25					1087.5
End of Boring		-30					

ROCK CORE 046-0010,0011.GPJ IL_DOT.GDT 9/25/18

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
Illinois Department of Transportation

ROCK CORE LOG

Date 11/22/17

ROUTE FAI 57 (I-57) **DESCRIPTION** I-57 over Grinnell Road, 0.95 Miles North of IL 17 **LOGGED BY** Larry Myers

SECTION 139HBR-3 **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 31N, **RNG.** 12E, 3rd **PM**,
Latitude 41.133265, **Longitude** -87.836022

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

STRUCT. NO. 046-0010/0011
Station 138+90.96

BORING NO. 3
Station 138+83
Offset 58.0 ft Lt.
Ground Surface Elev. 641.47 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 630.47 ft
Begin Core Elev. 630.47 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dense Gray Limestone with Minor Tan Oxidation at Joints. Tight Joints, Some Horizontal Fracturing, Highly Fractured in top 1 Ft.	630.47		1	87	23	5.4	
							951.9
		-15					1187.6
	625.47						1029.7
Dense Gray Limestone with some Horizontal Fractures & Tight Joints			2	97	50	4.8	
							1168.0
							634.4
		-20					1023.9
							977.8
							975.6
			3	95	80	5.2	
							1034.9
							1005.1
							1000.5
							1009.3
		-25					
	615.47						1034.0
End of Boring							
		-30					

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)

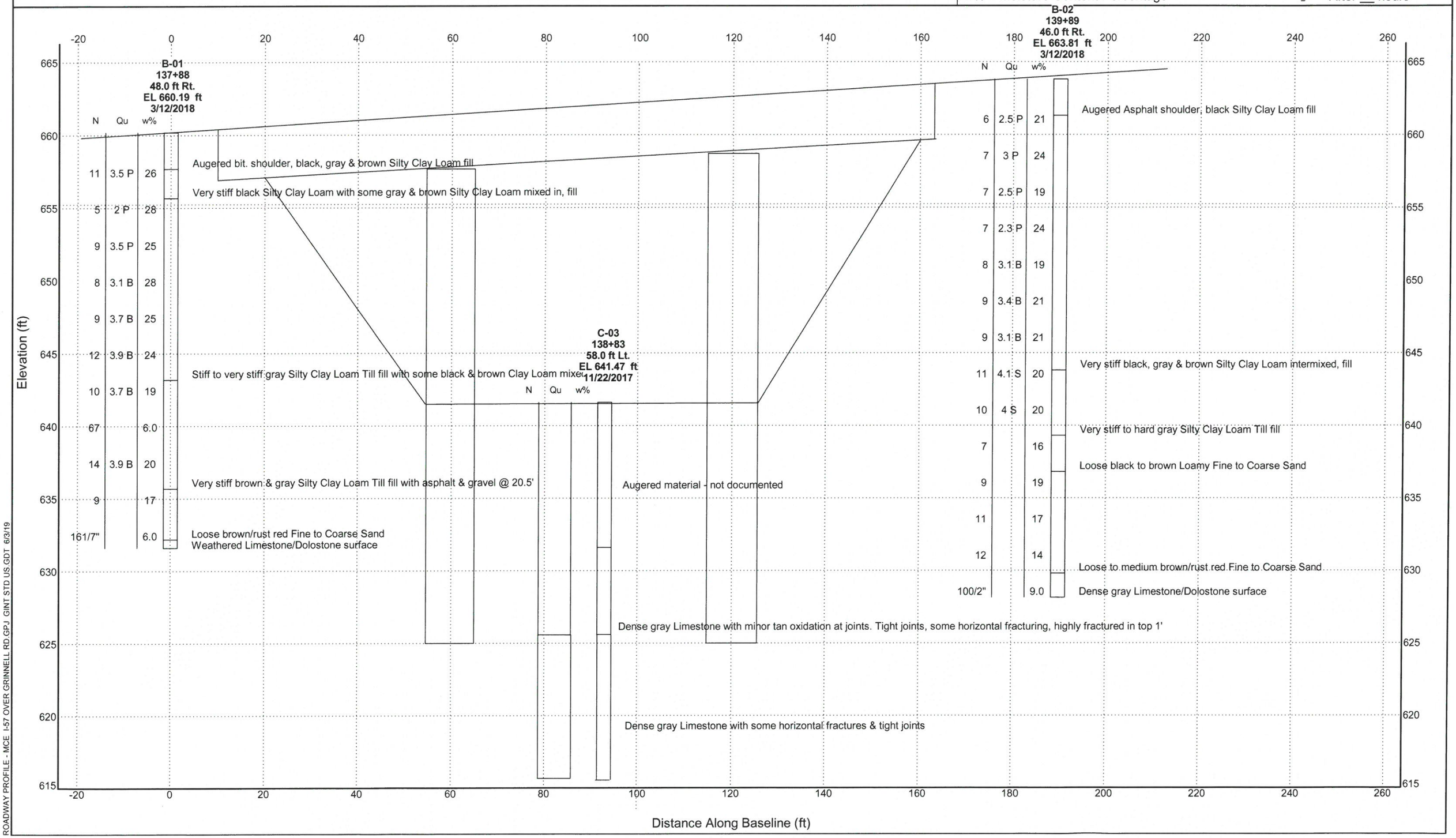
McCleary Engineering
3705 Progress Blvd, Ste 2
Peru, Illinois 61354
Telephone: 815-780-8486

ROUTE FAI 57
SECTION 139HBR-3
COUNTY Kankakee
PROJECT LOCATION Grinnell Rd

SUBSURFACE PROFILE
I-57 over Grinnell Road in Kankakee

LEGEND
EL = Elevation (ft)
D = Depth Below Existing Ground Surface (ft)
N = SPT N-Value (AASHTO T206)
Qu = Unconfined compressive Strength (tsf)
Failure Mode (B= Bulge, S= shear, P= penetrometer)
w% = Moisture Content Percentage

WATER TABLE LEGEND
▼ = First Encountered
▽ = Upon Completion
▽ = After __ hours



ROADWAY PROFILE - MCE I-57 OVER GRINNELL RD.GPJ GINT STD US.GDT 6/3/19

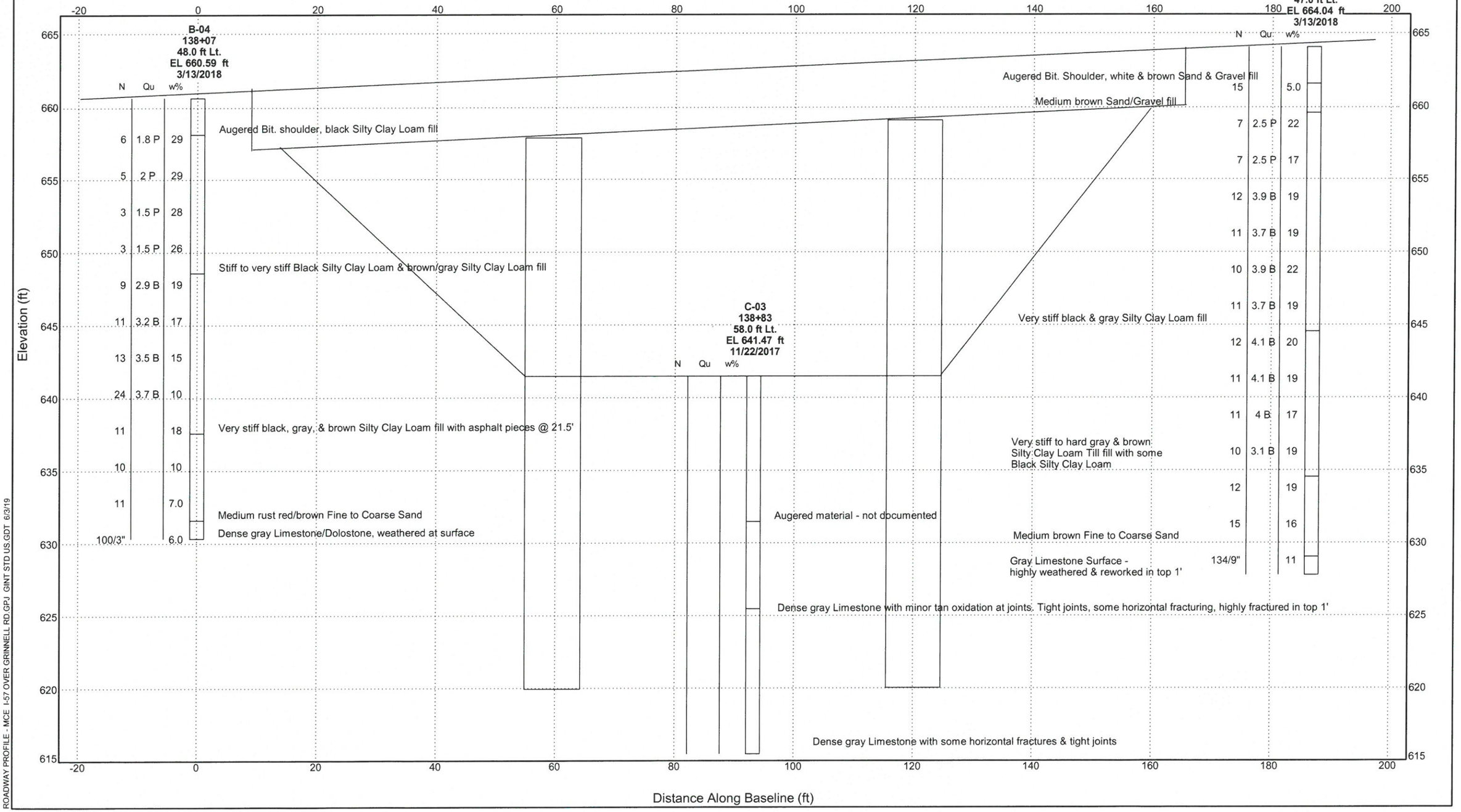
McCleary Engineering
3705 Progress Blvd, Ste 2
Peru, Illinois 61354
Telephone: 815-780-8486

ROUTE FAI 57
SECTION 139HBR-3
COUNTY Kankakee
PROJECT LOCATION Grinnell Rd

SUBSURFACE PROFILE
I-57 over Grinnell Road in Kankakee

LEGEND
EL = Elevation (ft)
D = Depth Below Existing Ground Surface (ft)
N = SPT N-Value (AASHTO T206)
Qu = Unconfined compressive Strength (tsf)
Failure Mode (B= Bulge, S= shear, P= penetrometer)
w% = Moisture Content Percentage

WATER TABLE LEGEND
▼ = First Encountered
▽ = Upon Completion
▽ = After __ hours



ROADWAY PROFILE - MCE I-57 OVER GRINNELL RD.GPJ GINT STD US.GDT 6/3/19

I-57 over Grinnell Road
SN 046-0010 / 0011
Hole #1 11-21-2017
Depth 10 FT to 19.5 FT
Box 1 of 2

Core Run 1
Start 10'

SAMPLE 17.05
SAMPLE 17.45
17.05
2 17.45
SAMPLE 17.85
SAMPLE 18.3
17.85
18.3
18.05
19.25

12/11/2017

I-57 over Grinnell Road
SN 046-0010 / 0011
Hole #1 11-21-2017
Depth 19.5 FT to 25.0 FT
Box 2 of 2

12/11/2017


Grinnell Road under I-57
SN 046-0010/0011
Hole #3 11-22-2017
Depth 11 Ft to 21 FT
Box 1 of 2
19.4
12/11/2017

Grinnell Road under I-57

SN 046-0010 / 0011

Hole #3 11-22-2017

Depth 21 FT to 26 FT

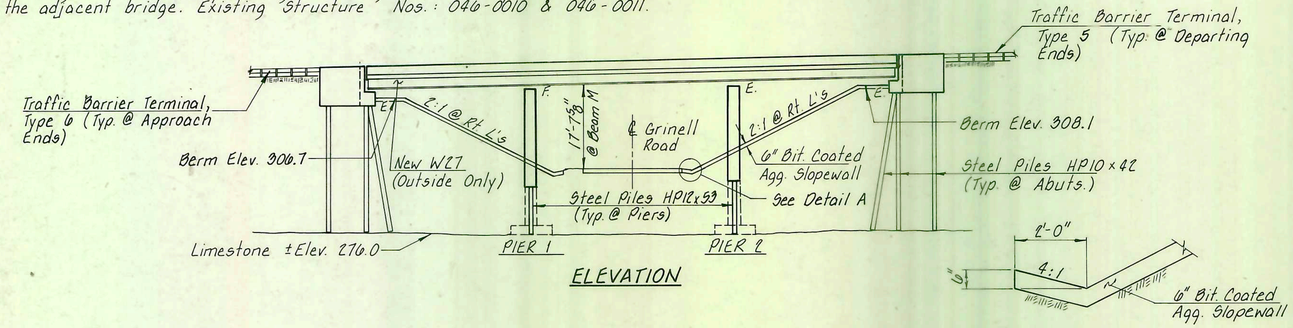
Box 2 of 2

12/11/2017

Benchmark ~ Sta. 138+31, Chiseled "□" on top of Retaining Wall, N. Abut. Elev. 311.44
Existing Structures: Sta. 138+90.96 built in 1955 as F.A. Rte. 26, Sec. 139-HB3-IF 3
Existing deck to be replaced and widened utilizing additional girder as shown.
Widen and repair existing substructure. Utilize existing beams with minor repairs.
Utilize stage construction by building one bridge and two way traffic open at all times on the adjacent bridge. Existing Structure Nos.: 046-0010 & 046-0011.

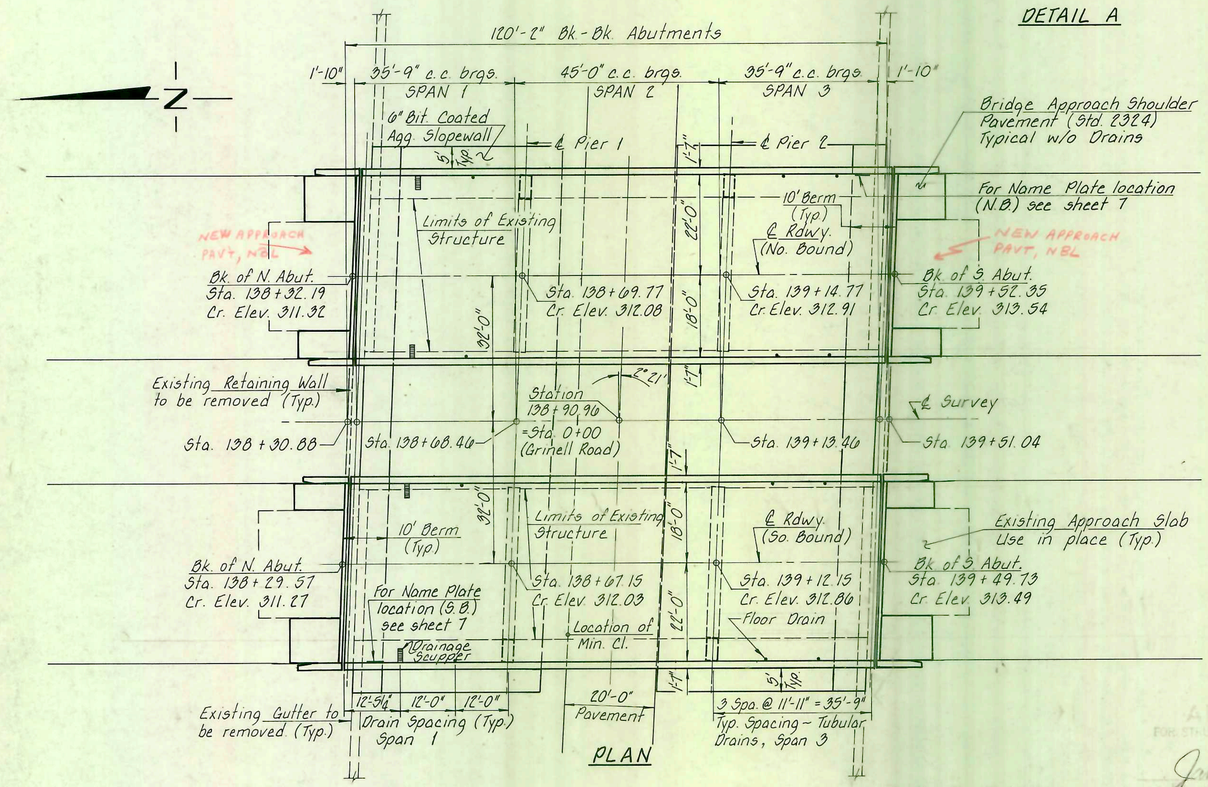
ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
F.A.I. 57	139 HBR-3	KANKAKEE	82	28
FED. ROAD DIST. NO. 7	ILLINOIS	PROJECT		

Sheet 1 of 19

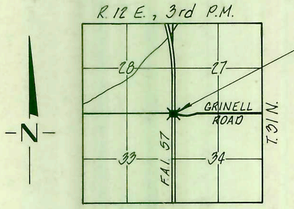


ELEVATION

DETAIL A



PLAN



LOCATION PLAN

STATION 138 + 90.96
REBUILT 198_ BY
STATE OF ILLINOIS
F.A.I. ROUTE 57 SEC. 139HBR-3
F.A. PROJ. IR-57-6(150)
LOADING HS20 & ALT.
STR. NO. 046-0011

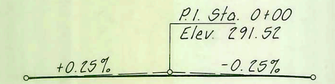
LETTERING FOR NAME PLATE SOUTHBOUND BRIDGE
See Std. 2113

STATION 138 + 90.96
REBUILT 198_ BY
STATE OF ILLINOIS
F.A.I. ROUTE 57 SEC. 139HBR-3
F.A. PROJ. IR-57-6(150)
LOADING HS20 & ALT.
STR. NO. 046-0010

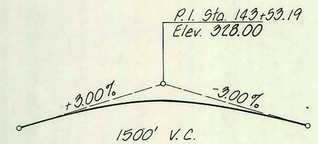
LETTERING FOR NAME PLATE NORTHBOUND BRIDGE
See Std. 2113

Note: Existing name plates shall be cleaned and relocated next to new name plates. Cost shall be incidental to Name Plates. See sheet 7 for details.

INDEX OF SHEETS



PROFILE GRADE GRINELL ROAD



PROFILE GRADE ON ℄ RDWY. OF EACH BRIDGE

DESIGN STRESSES

f'_c = 3,500 p.s.i.
f_y = 60,000 p.s.i. (Reinforcement)
f_s = 20,000 p.s.i. (Structural Steel - New)
f_s = 18,000 p.s.i. (Structural Steel - Exist.)
f_c = 1,400 p.s.i. Super, 800 p.s.i. Sub (Exist)
f_s = 20,000 p.s.i. (Reinf. Bars - Exist.)
LOADING HS20-44 & Alt. Military Loading
Design Specifications: 1983 AASHTO, 1984 Interims
25#/sq.Ft. included in dead load for future wearing surface.

James K. Klein
Illinois Structural No. 4024

JAMES K. KLEIN 4024 REGISTERED STRUCTURAL ENGINEER OF ILLINOIS

APPROVED FOR STRUCTURAL ADEQUACY ONLY
James T. Rayburn

GENERAL PLAN & ELEVATION
F.A.I. ROUTE 57 OVER GRINELL ROAD
SECTION 139 HBR-3
KANKAKEE COUNTY
STATION 138+90.96

COLLINS AND RICE
CONSULTING ENGINEERS

DESIGNED J.K.K. CHECKED Z.B.U.
DRAWN J.B. & M.G. DATE 2-20-86 NO. 2000

GRINELL ROAD 1/19

BD-757 (Rev. 2-73)

STATE OF ILLINOIS

DEPARTMENT OF TRANSPORTATION

046-0010

Test Pile Driving Record

Project IR-57-6(150)313
Route FAI 57
Section 139 HBR-3
County KANKAKEE
Station of Structure 138+90.96 SBL

GRINELL BRIDGE
Station location at which pile was driven SOUTHWEST ABUT. WESTERNMOST PILE
Elev. from which pile was driven 306.51

Type & Weight of Hammer McKIERNAN TERRY DE-40 4000#
Length of Fall VARIABLE
Type of Pile HP 10x42
Required Bearing REFUSAL (84 TON)
Elev. Top Pile 324.01
Elev. Tip of Pile 278.91 45.1'
Elev. Cutoff 307.51
Estimated Plan Length 32
Ordered Length

STROKE

Elev.	Feet Below Cut Off	Blows Per Foot	~~Blows Per Minute~~	Bearing In Tons	Remarks
	0.19				VERY LITTLE RESISTANCE
287.51	20	11	4 1/2	15	ENCOUNTERED IN FIRST 19 FT
286.51	21	11		15	
285.51	22	10		14	P = 2WH/S+0.1
284.51	23	11		15	
283.51	24	10		14	DATE DRIVEN 5-17-89
282.51	25	10		14	
281.51	26	10		14	WITNESSED BY: JIM GROMER
280.51	27	14	5	21	GREG SARGENT
279.51	28	19	5 1/2	30	
278.91	28.6	38/.6	7 1/2	103	

Final Inspection Report of State Road Work

Illinois Department of Transportation

Director of Highways
Department of Transportation
Springfield, Illinois

Contract No. 42818
FAI Route 57
Section 139VBR,139HBR-3,139BR-2

County Kankakee
F. A. Project IR-57-6(150)313

Contractor Azzarelli Const. Co.
P. O. Box 767
Address Kankakee, IL 60901
(City) (State)

C-93-004-88

Dear Sir:

On February 4, 1991 final inspection was made of work designated and same was found to be completed substantially in accordance with all of the requirements of the plans, specifications and contract. The improvement begins at Station 91+67.80 CL and ends at Station 145+01.86 CL Gross length 5534.00 ft. The work is located between (nearest town) Bradley and (nearest town) Kankakee on (marked route). FAI 57.

SUMMARY OF LENGTH BUILT

Nature of* Improvement	Surface or Bridge Type	Surface or Bridge Width	Net Length	Shoulders Width	Shoulders Type	Within corporate limits of	Station to Station
Section 139BR-2			76'-7"			91+67.80 CL to	92+45.24 CL
Widened Bridge to 43'-2" & Replaced Deck (Both directions) (STR #046-0012, 046-0013)							
Section 139HBR-3			120'-2"			138+30.88 CL TO	139+51.04 CL
Widened Bridge to 43'-2" & Replaced Deck (Both Directions) (STR #046-0011, 046-0010)							
Section 139VBR			259'-8"			142+42.19 CL to	145+01.86 CL
Widened Bridge to 43'-2" & Replaced Deck						(Both Directions)	
						(STR #046-0009, 046-0008)	
Resurfaced approaches to all structures with bituminus overlay.							
Total							

* Describe nature of improvements as (1) PCC Pavement, (2) W&RS, (3) Resurfacing, (4) Bridge Widening, (5) Bridge Repairs, (6) Bridge (new), (7) Pregrade. Omission and equations should be noted. Use above space for remarks or comments. If additional space is necessary use additional BC-71 Form(s).

GENERAL INFORMATION

Date contract awarded 2-24-89. Construction began 4-3-89 Construction completed 2-1-91
Date pavement opened to traffic N/A Was work completed under traffic? Yes
Contract time limit 200 Working days used 200 Extension(s) N/A Liquidated damages (days)
Sub-contractors Ald-Cass Electric, Maintenance Coating, Interstate Landscaping, SSACC Inc., Certified Painting Co., Midwest Const. Services, Gateway Erectors
Resident Engineer and Inspectors J. Gromer, G. Sargent, R. Fortelka, T. Magolan, N. Love, C. Purcell A. Sargent, W. Bott, E. Collins, Contractor's Superintendent Johnny Azzarelli
Contractor's performance: Excavating & Grading S; PCC Paving ; Bituminous Paving S; Structures S; Drainage ; Electrical S; Seal Coat ; Miscellaneous S; EEO S
(Use E = Excellent; S = Satisfactory; P = Poor; U = Unacceptable)

Bonding company Firemen's Insurance Company of Newark, New Jersey
Final Inspection made by Ken Lang 2-4-91 (State personnel) Date; Sal Deocampo 2-4-91 (FHWA Personnel) Date

Yours truly,

R. H. Blaine '86 JUL 19 1991
District Engineer Date

Passed
Date

Contract Price	2,418,095.76
Additions	242,385.16
Deductions	92,649.29
Total Cost	2,567,831.63

Illinois Department of Transportation

Sheet 1 of 4

County: Kankakee (091)
Section: 139(BR-2,HBR-3,VBR)
Route: FAI 57
District: 3
Contract No.: 42818
Job No.: C-93-004-88
Project: IR-57-6(150)313
None

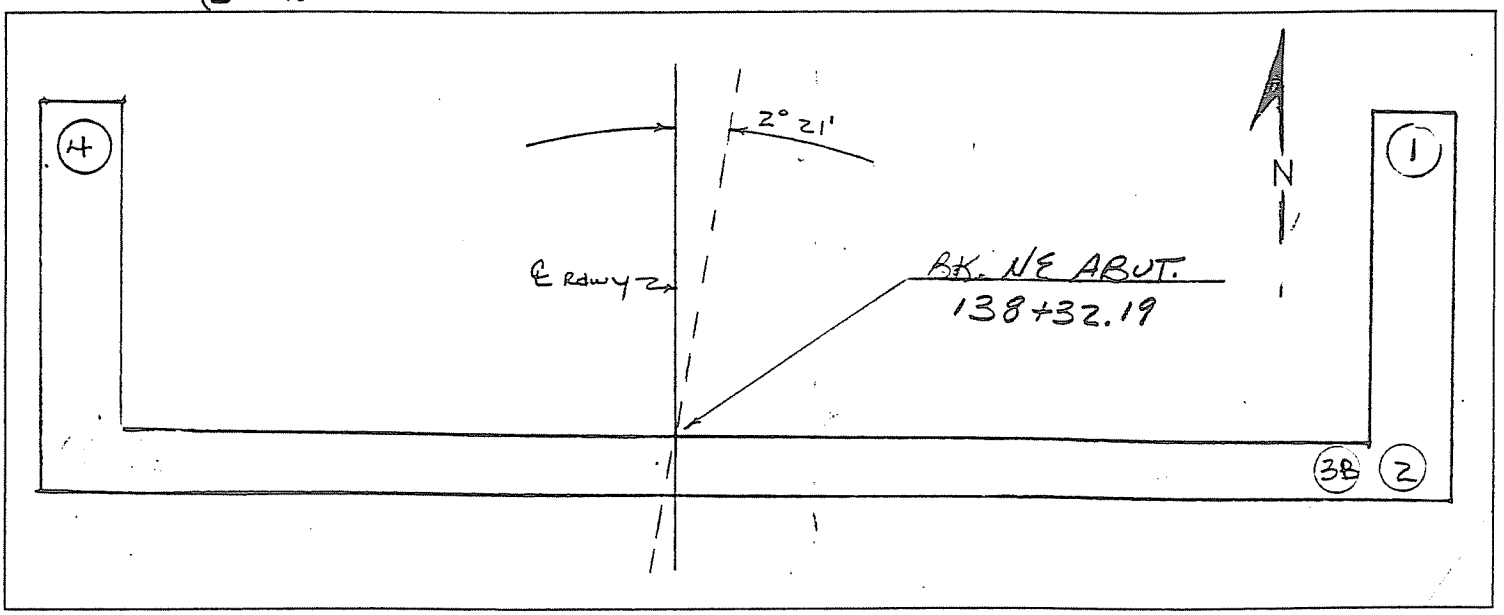
Piling Diagram Report

Structure No. 046-0010 NBL

Pier/Abutment No. N.E. ABUT. NBL
Plan Length 30 FT.
Pile Type Steel HP 10 x 42
Ordered Length 30 FT.
Required Bearing REFUSAL (84 TON)
Cutoff Elevation 305.39
Letter to Contractor 6-12-89

Hammer Data: Type VULCAN
Height of Fall 3'
Ram Weight 5000#
Blows/min. 60
Batter Coefficient .9?
Cushion Material
Thickness

Formula: $P = \frac{2WH}{(S+.1)}$



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	30	30	5.1	24.9	98						
2	30	30.2	4.9	25.3	94						
38	30	30	3.6	26.4	91						
4	30	30.2	5.0	25.2	88						
TOTAL	120	120.4	18.6	101.8							

B indicates batter.

Pay Quantities

Remarks:

Initial(s)
Calculated By: GS
Checked By: JLG

Date
5-8-90
"

Illinois Department of Transportation

Sheet 2 of 4

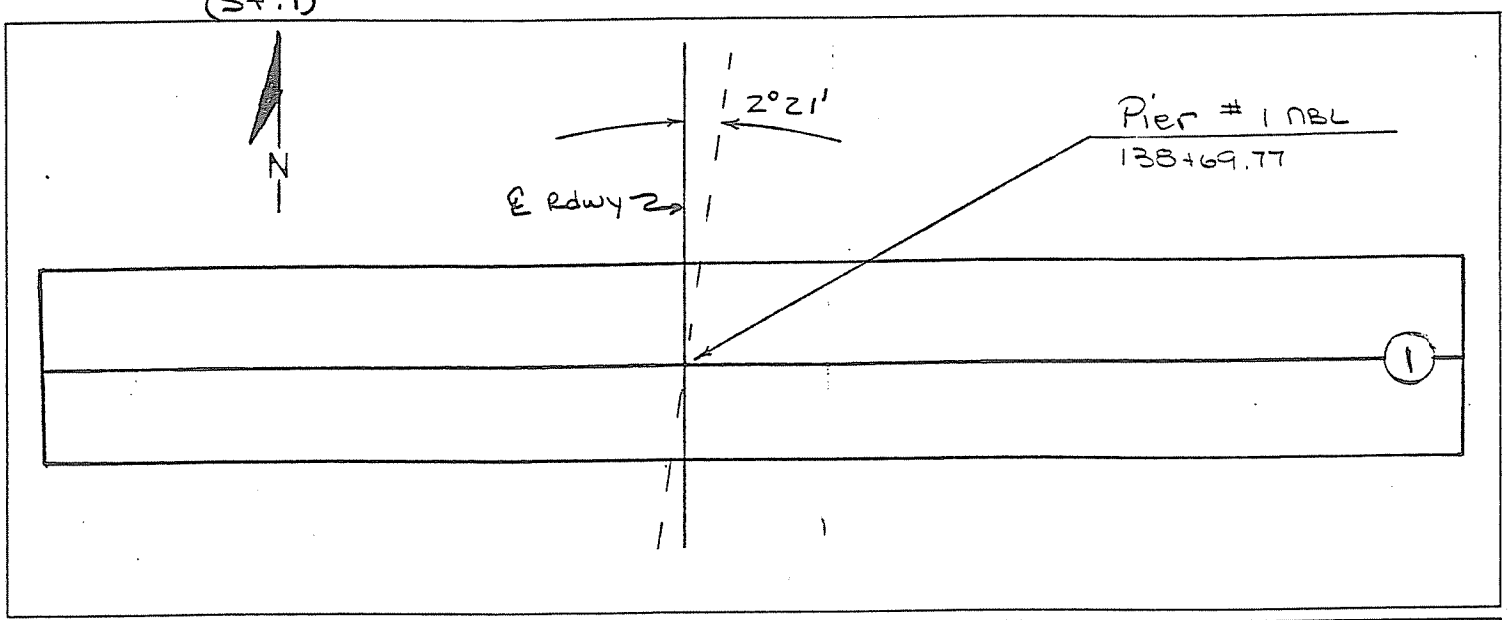
County: Kankakee (091)
Section: 139(BR-2,HBR-3,VBR)
Route: FAI 57
District: 3
Contract No.: 42818
Job No.: C-93-004-88
IR-57-6(150)313
Project: None

Piling Diagram Report

Structure No. 046-0010 NBL

Pier/Abutment No. Pier #1
Plan Length 22 FT.
Pile Type Steel HP12 x 53
Ordered Length 22 FT.
Required Bearing Refusal (105 TON)
Cutoff Elevation 295.99
Letter to Contractor 6-12-89

Hammer Data: Type Vulcan #1
Height of Fall 3'
Ram Weight 5000#
Blows/min. 60
Batter Coefficient
Cushion Material
Thickness
Formula: $P = \frac{2WH}{(S+.1)}$



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	22	25.2	7.3	17.9	113						
TOTAL							22	25.2	7.3	17.9	

B indicates batter.

Pay Quantities

Remarks:

Initial(s)
Calculated By: GS — Date 5-8-90
Checked By: JLG — Date 5-9-90

Illinois Department of Transportation

Sheet 3 of 4

County: Kankakee (091)
Section: 139(BR-2,HBR-3,VBR
Route: FAI 57
District: 3
Contract No.: 42818
Job No.: C-93-004-88
IR-57-6(150)313
Project: None

Piling Diagram Report

Structure No. 046-0010 NBL

Pier/Abutment No. Pier #2 NBL
Plan Length 22 FT.

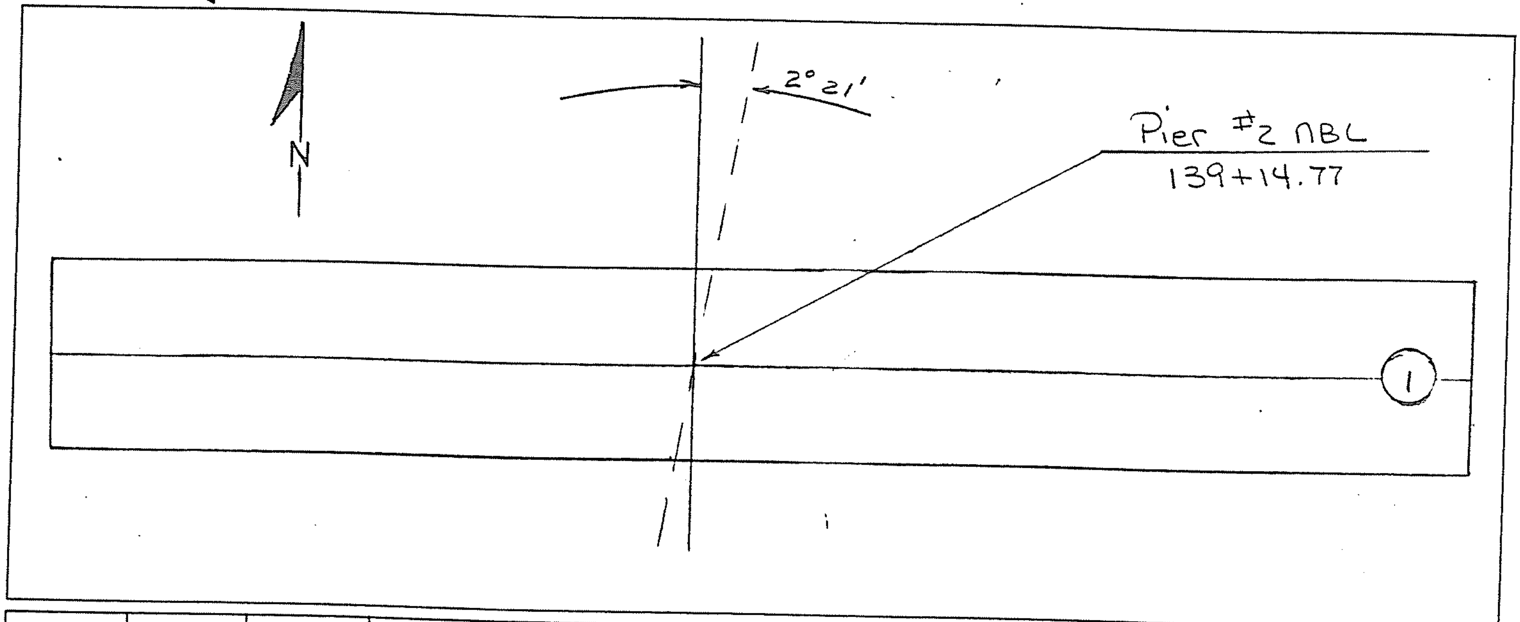
Pile Type Steel HP 12 x 53
Ordered Length 22 FT.

Required Bearing REFUSAL (105 TON)
Cutoff Elevation 296.00
Letter to Contractor 6-12-89

Hammer Data: Type VULCAN #1
Height of Fall 3'
Formula: $P = \frac{2WH}{(S+.1)}$

Ram Weight 5000#
Blows/min. 60
Batter Coefficient

Cushion Material
Thickness



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	22	25.2	6.9	18.3	108						

B indicates batter.

	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.
TOTAL	22	25.2	6.9	18.3

Pay Quantities

Remarks:

Initial(s)
Calculated By: GS
Date 5-8-90

Illinois Department of Transportation

Sheet 4 of 4

County: Kankakee (091)
Section: 139(BR-2,HBR-3,VBR)
Route: FAI 57
District: 3
Contract No.: 42818
Job No.: C-93-004-88
IR-57-6(150)313
Project: None

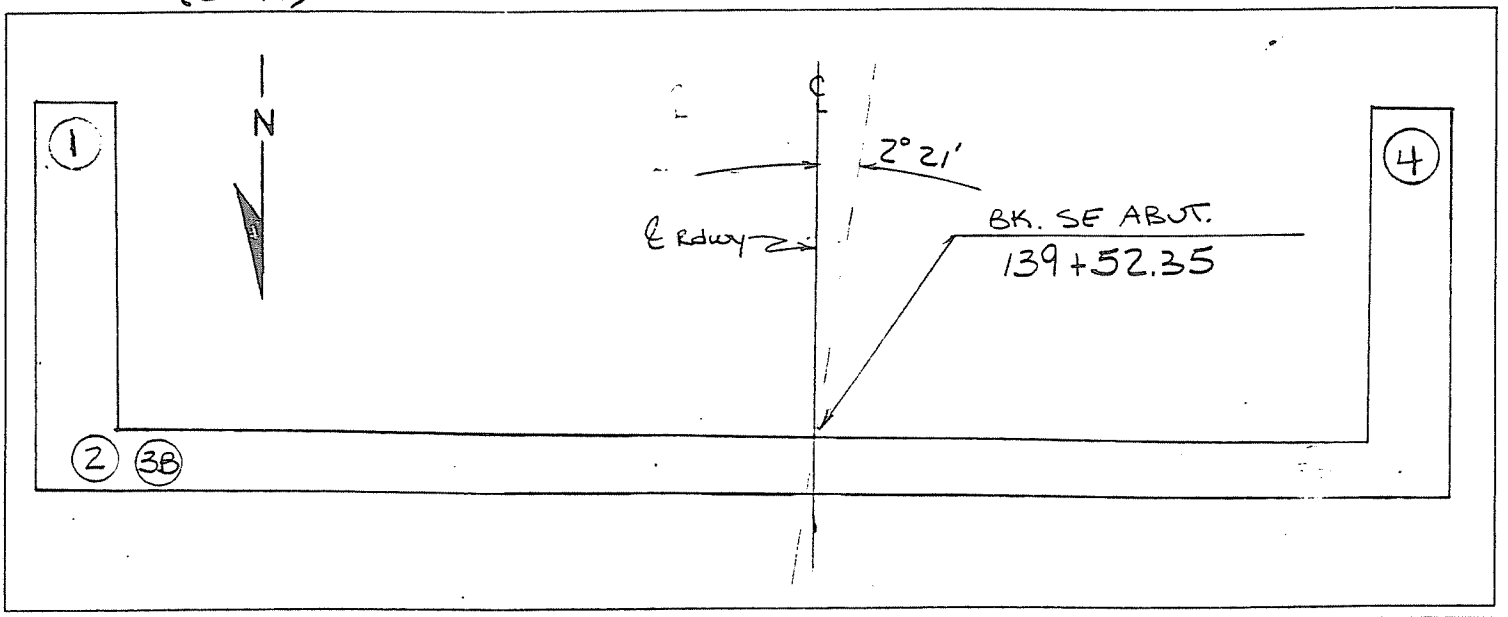
Piling Diagram Report

Structure No. 046-0010 NBL

Pier/Abutment No. S.E ABUT.
Plan Length 32 FT.
Pile Type Steel HP 10x42
Ordered Length 32 FT.
Required Bearing ~~REFSAL~~
Cutoff Elevation 307.55
Letter to Contractor 6-12-89

Hammer Data: Type VULCAN # 1
Height of Fall 3'
Ram Weight 5000#
Blows/min. 60
Batter Coefficient .99
Cushion Material
Thickness

Formula: $P = \frac{2WH}{(S+.1)}$



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	32	35.2	7.0	28.2	99						
2	32	35.2	5.9	29.3	89						
3B	32	35.2	5.9	29.3	89						
4	32	35.2	7.4	27.8	99						
						TOTAL	128	140.8	26.2	114.6	

B indicates batter.

Pay Quantities

Remarks:

Initial(s)
Calculated By: GS — Date 5-8-90
Checked By: JLG — Date 5-9-90

046-0011
SBC

Illinois Department of Transportation

Sheet 1 of 4

County: Kankakee (091)
Section: 139(BR-2,HBR-3,VBR)
Route: FAI 57
District: 3
Contract No.: 42818
Job No.: C-93-004-88, IR-57-6(150)313
Project: None

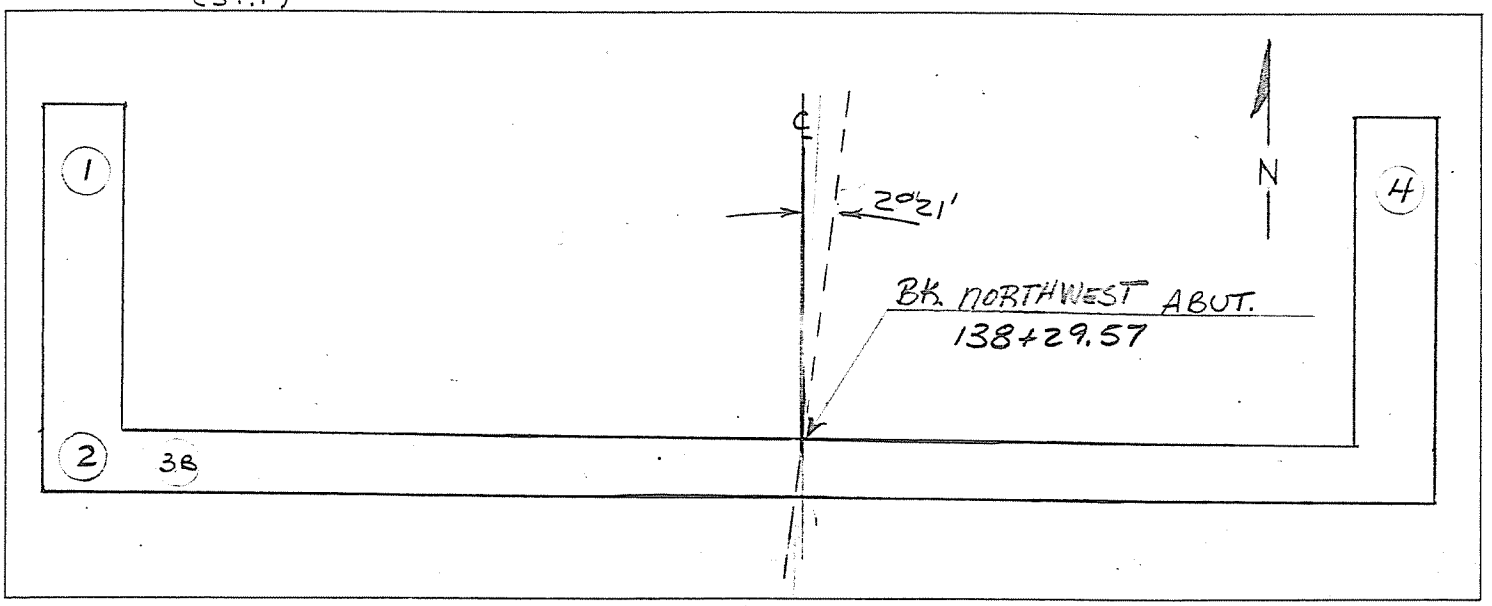
Piling Diagram Report

Structure No. 046-0011

Pier/Abutment No. N. W. ABUT.
Plan Length 30 FT.
Pile Type Steel HP 10x42
Ordered Length 30 FT
Required Bearing REFUSAL (84 TON)
Cutoff Elevation 305.34
Letter to Contractor 6-12-89

Hammer Data: Type McKIERNAN TERRY DE-40
Height of Fall VARIABLE
Ram Weight 4000 #
~~Blows~~/min. 48-52
Batter Coefficient .97
Cushion Material
Thickness

Formula: $P = \frac{2WH}{(S+.1)}$



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	30.0	30.1	5.1	25.0	152						
2		TEST	PILE								
3B	30.0	30.1	3.9	26.2	119						
4	30.0	30.1	5.7	24.4	156						
						TOTAL	90	93.3	14.7	75.6	

B indicates batter.

Pay Quantities

Remarks:

Initial(s)
Calculated By: GS JLG
Checked By: JLG

Date
3-16-90
3-16-90

BC 2184 (11/89)

Illinois Department of Transportation

Sheet 2 of 4

GLINELL ROAD
PIER #1

County Kankakee (091)
Section 139(BR-2,HBR-3,VBR)
Route FAI 57
District 3
Contract No. 42818
Job No. C-93-004-88
IR-57-6(150)313
Project None

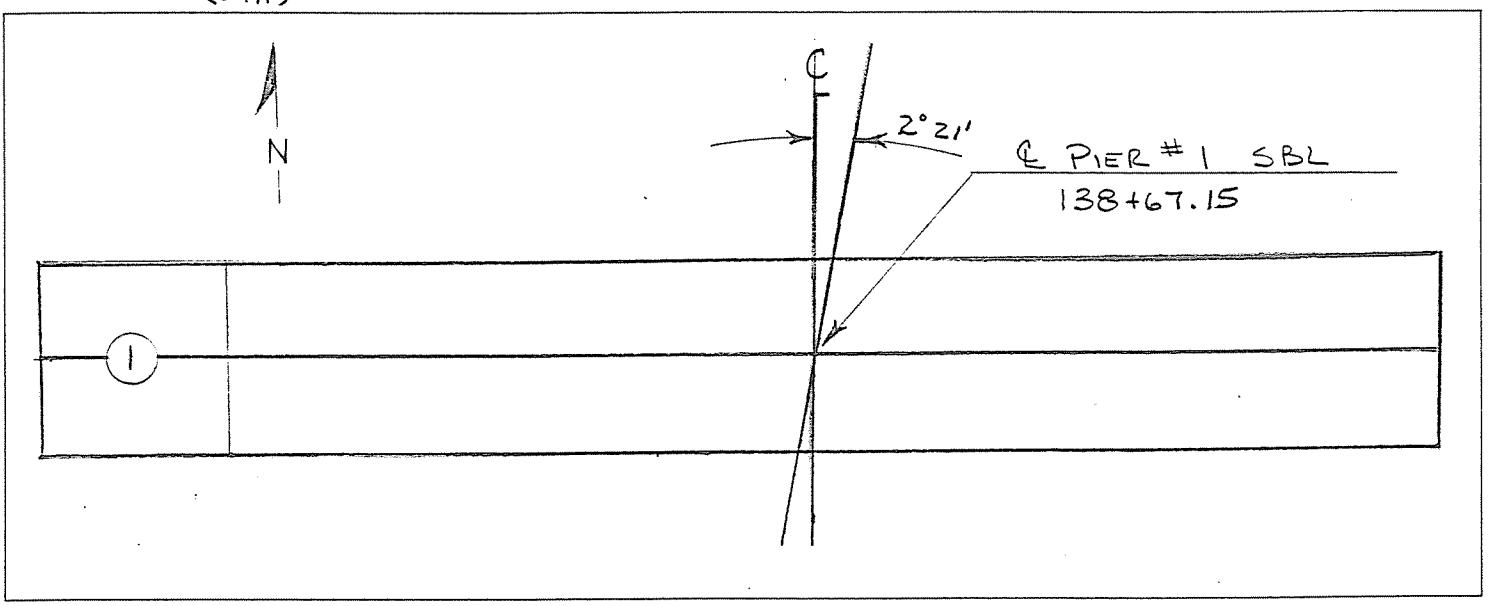
Piling Diagram Report

Structure No. 046-0011

Pier/Abutment No. PIER # 1 SBL
Plan Length 22.0 FT.
Pile Type Steel HP 12 x 53
Ordered Length 22 FT
Required Bearing REFUSAL (105 TONS)
Cutoff Elevation 295.92
Letter to Contractor 6-12-89

Hammer Data: Type NICKIERNAN TERRY DE-40
Height of Fall VARIABLE
Ram Weight 4000 #
Blows/min. 48-52
Batter Coefficient
Cushion Material
Thickness

Formula: $P = \frac{2WH}{(S+.1)}$



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	22.0	25.3	9.1	16.2	143						
						TOTAL	220	25.3	9.1	16.2	

B indicates batter.

Pay Quantities

Remarks:

Initial(s)
Calculated By: GS JLG
Checked By: JLG

Date
3-16-90
3-16-90

BC 2184 (11/89)

Illinois Department of Transportation

Grinell Road
Pier #2

Sheet 3 of 4

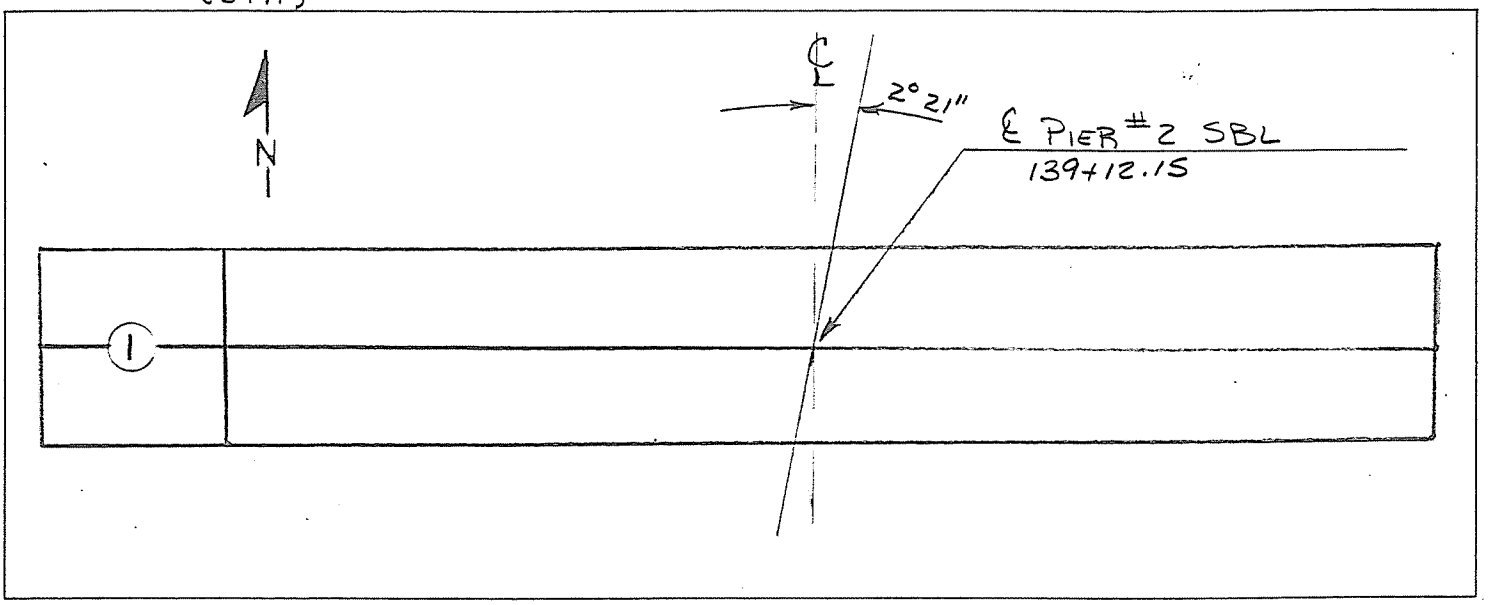
County Kankakee (091)
Section 139(BR-2,HBR-3,VBR)
Route FAI 57
District 3
Contract No. 42818
Job No. C-93-004-88
IR-57-6(150)313
Project None

Piling Diagram Report

Structure No. 046-011

Pier/Abutment No. Pier #2 SBL
Plan Length 22 FT.
Pile Type Steel HP 12x53
Ordered Length 22 FT
Required Bearing Refusal (105 tons)
Cutoff Elevation 295.96
Letter to Contractor 6-12-89

Hammer Data: Type McKiernan Terry DE-40
Height of Fall Variable
Ram Weight 4000 #
Blows/min. 48-52
Cushion Material
Thickness
Formula: $P = \frac{2WH}{(S+.1)}$
Batter Coefficient



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	22	25.3	8.3	17.0	116						
						TOTAL	22.0	25.3	8.3	17.0	

B indicates batter.

Pay Quantities

Remarks:

Initial(s)
Calculated By: GJS - JLG
Checked By: JLG

Date
3-16-90
3-16-90

BC 2184 (11/89)

Illinois Department of Transportation

Sheet 4 of 4

County Kankakee (091)
Section 139(BR-2,HBR-3,VBR)
Route FAI 57
District 3
Contract No. 42818
Job No. C-93-004-88
IR-57-6(150)313
Project None

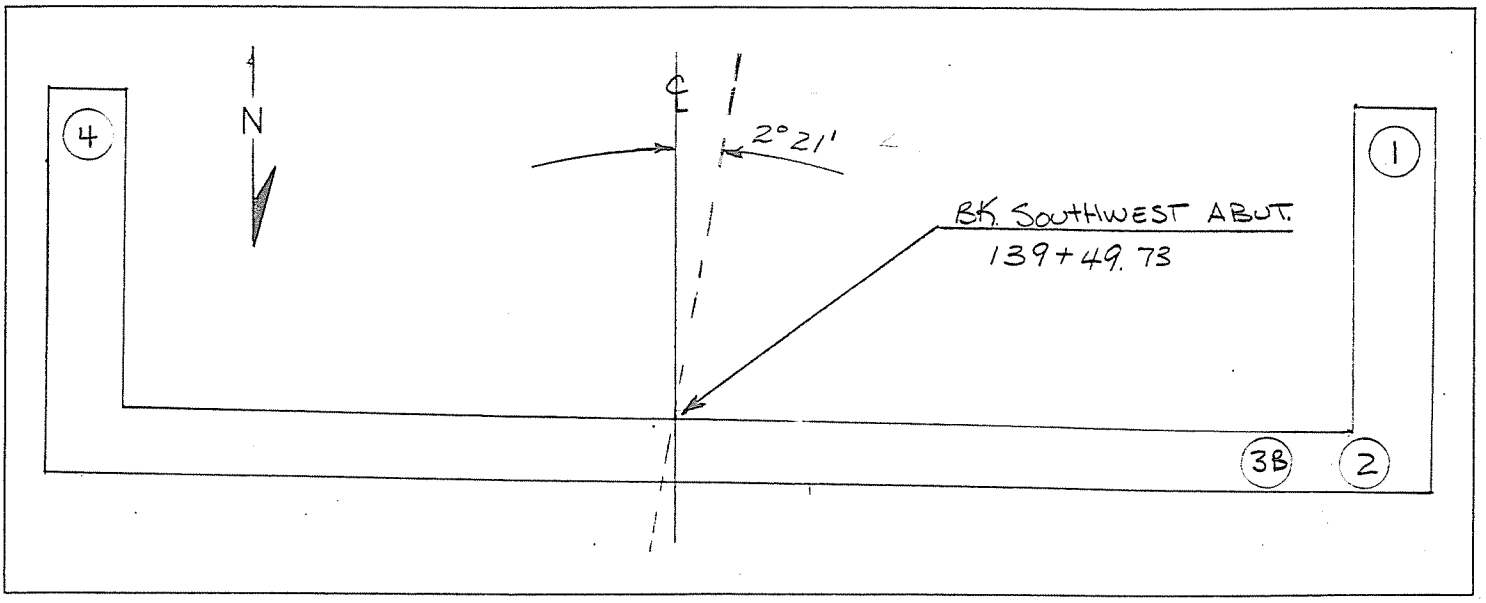
Piling Diagram Report

Structure No. 046-0011

Pier/Abutment No. S.W. ABUT.
Plan Length 32 FT.
Pile Type Steel HP 10x42
Ordered Length 32 FT
Required Bearing REFUSAL
Cutoff Elevation 307.51
Letter to Contractor 6-12-89

Hammer Data: Type McKiernan Terry DE-40
Height of Fall VARIABLE
Ram Weight 4000#
Blows/min. 48-52
Batter Coefficient .97
Cushion Material
Thickness

Formula: $P = \frac{2WH}{(S+.1)}$



Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons	Pile No.	Length Furn. Ft.	Length Del. Ft.	Length Cutoff Ft.	Length Driven Ft.	Final Bearing Tons
1	32	35.1	7.1	28.0	105						
2		TEST	PILE								
3B	32	35.1	6.2	28.9	157						
4	32	35.1	7.0	28.1	103						
TOTAL							96	1053	20.3	85.0	

Pay Quantities

B indicates batter.

Remarks:

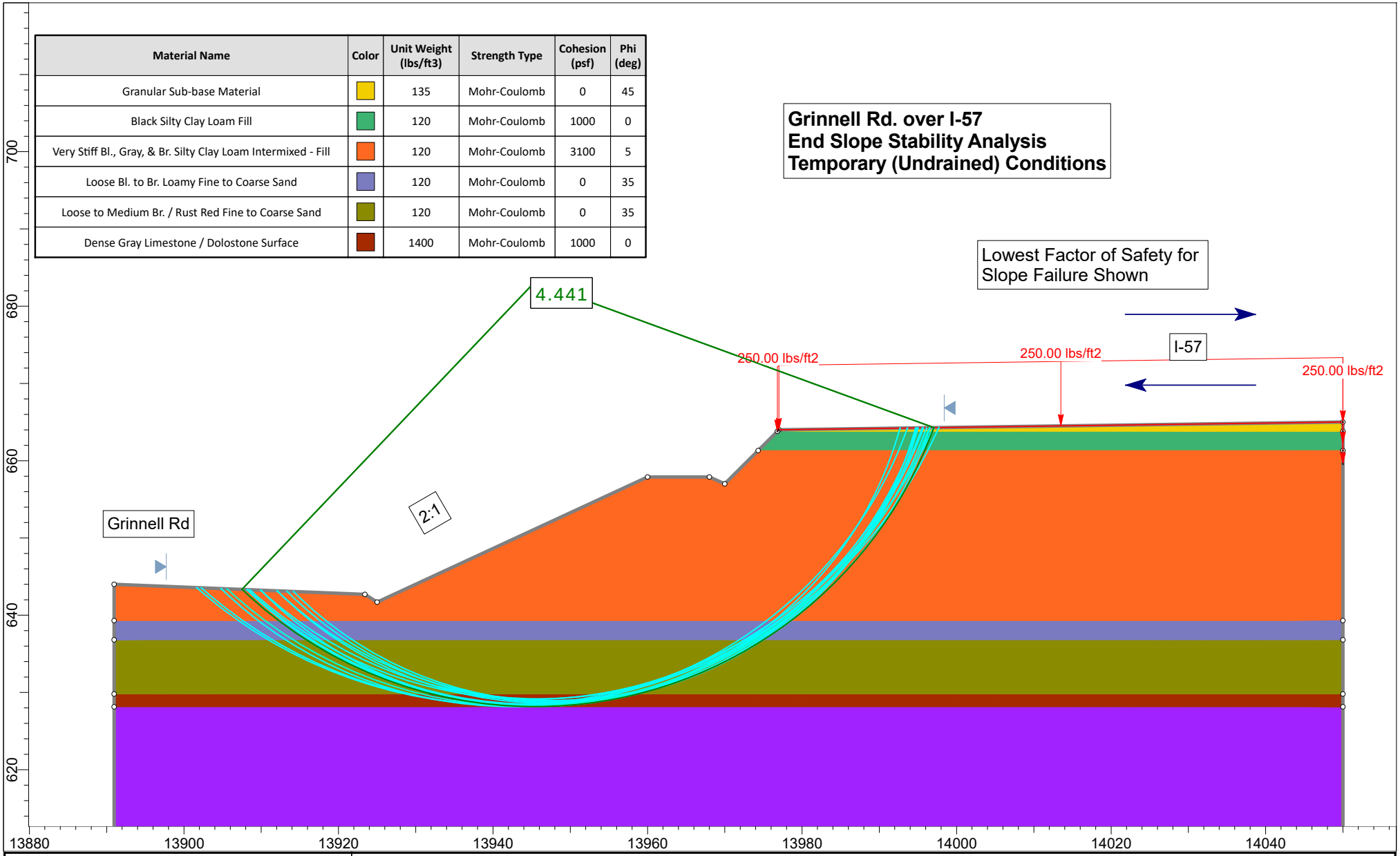
Initial(s)
Calculated By: GS JLG
Checked By: JLG

Date
3-16-90
3-16-90

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Granular Sub-base Material		135	Mohr-Coulomb	0	45
Black Silty Clay Loam Fill		120	Mohr-Coulomb	1000	0
Very Stiff Bl., Gray, & Br. Silty Clay Loam Intermixed - Fill		120	Mohr-Coulomb	3100	5
Loose Bl. to Br. Loamy Fine to Coarse Sand		120	Mohr-Coulomb	0	35
Loose to Medium Br. / Rust Red Fine to Coarse Sand		120	Mohr-Coulomb	0	35
Dense Gray Limestone / Dolostone Surface		1400	Mohr-Coulomb	1000	0

Grinnell Rd. over I-57
End Slope Stability Analysis
Temporary (Undrained) Conditions

Lowest Factor of Safety for Slope Failure Shown



McCleary Engineering

SLIDEINTERPRET 8.018

Project	**Grinnell Rd. over I-57 Endslope Stability Analysis Temporary (Undrained) Conditions**		
Analysis Method	SLIDEINTERPRET 8.018 Bishop simplified		
Drawn By	MEJ	Scale 1:206	Company McCleary Engineering
Date	11/15/2018		File Name Temporary Endslope Stability Analysis - I-57 over Grinnell Road.slmd

USGS Design Maps Summary Report

User–Specified Input

Report Title Seimic Report I-57 over Grinnell Rd. Kankakee
Sun November 18, 2018 02:04:46 UTC

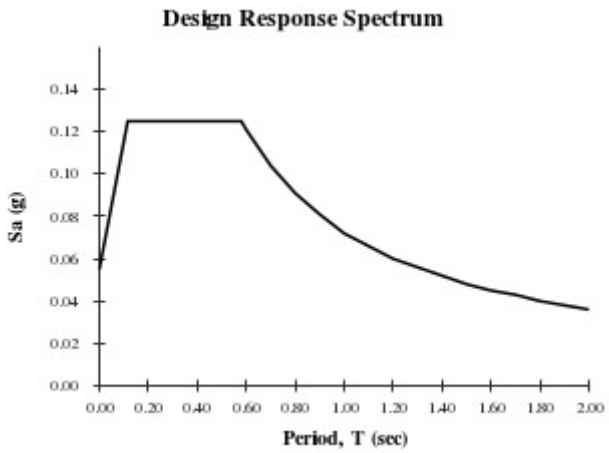
Building Code Reference Document 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design
(which utilizes USGS hazard data available in 2002)

Site Coordinates 41.13322°N, 87.83636°W

Site Soil Classification Site Class C – "Very Dense Soil and Soft Rock"

USGS–Provided Output

PGA =	0.046 g	**A_s =**	0.055 g
S_S =	0.104 g	**S_{DS} =**	0.125 g
S_1 =	0.043 g	**S_{D1} =**	0.072 g



Illinois Department of Transportation

SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====Grinnell Rd - This page is SB, west side. B-01 (Substructure 1) is SB North Abut / (Substructure 2 is SB Pier 1) / (Substructure 3 is SB Pier 2) / B-02 (Substructure 4) is SB South Abut----------

Substructure 1

Base of Substruct. Elev. (or ground surf for bents	655.6 ft.
Pile or Shaft Dia.	12 inches
Boring Number	B-01 2018
Top of Boring Elev.	660.19 ft.
Approximate Fixity Elev.	649.6 ft.

Individual Site Class Definition:

N (bar):	51 (Blows/ft.)	Soil Site Class C	
N_{ch} (bar):	81 (Blows/ft.)	Soil Site Class C	<----Controls
s_u (bar):	4.76 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	657.7	2.50			B
	655.7	2.00	11	3.50	B
	653.2	2.50	5	2.00	
	650.7	2.50	9	3.50	
1.4	648.2	2.50	8	3.10	
3.9	645.7	2.50	9	3.70	
6.4	643.2	2.50	12	3.90	B
8.9	640.7	2.50	10	3.70	
11.4	638.2	2.50	67		
13.9	635.7	2.50	14	3.90	B
16.4	633.2	2.50	9		
17.4	632.2	1.00	21		B
18.0	631.6	0.58	660		
100.0	549.6	82.02	120	5.00	R

Substructure 2

Base of Substruct. Elev. (or ground surf for bents	642.7 ft.
Pile or Shaft Dia.	18 inches
Boring Number	B-01, C-1
Top of Boring Elev.	641.47 ft.
Approximate Fixity Elev.	633.7 ft.

Individual Site Class Definition:

N (bar):	92 (Blows/ft.)	Soil Site Class C	<----Controls
N_{ch} (bar):	92 (Blows/ft.)	Soil Site Class C	
s_u (bar):	5 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	640.7	0.78	10	3.70	
	638.2	2.50	67		
	635.7	2.50	14	3.90	B
0.5	633.2	2.50	9		
1.5	632.2	1.00	21		B
2.1	631.6	0.58	660		
100.0	533.7	97.92	120	5.00	R

Substructure 3

Base of Substruct. Elev. (or ground surf for bents	642.7 ft.
Pile or Shaft Dia.	18 inches
Boring Number	B-02, C-1
Top of Boring Elev.	641.47 ft.
Approximate Fixity Elev.	633.7 ft.

Individual Site Class Definition:

N (bar):	64 (Blows/ft.)	Soil Site Class C	<----Controls
N_{ch} (bar):	64 (Blows/ft.)	Soil Site Class C	
s_u (bar):	5 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	641.3	0.16	11	4.10	
	639.3	2.00	10	4.00	B
	636.8	2.50	7		
	634.3	2.50	9		
1.9	631.8	2.50	11		B
4.4	629.3	2.50	12		
6.1	627.6	1.67	600		
100.0	533.7	93.90	120	5.00	R

Substructure 4

Base of Substruct. Elev. (or ground surf for bents	657.9 ft.
Pile or Shaft Dia.	12 inches
Boring Number	B-02 2018
Top of Boring Elev.	663.81 ft.
Approximate Fixity Elev.	651.9 ft.

Individual Site Class Definition:

N (bar):	31 (Blows/ft.)	Soil Site Class D	
N_{ch} (bar):	49 (Blows/ft.)	Soil Site Class D	<----Controls
s_u (bar):	4.09 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	661.3	2.50			
	658.8	2.50	6	2.50	
	656.3	2.50	7	3.00	
	653.8	2.50	7	2.50	
0.6	651.3	2.50	7	2.30	
3.1	648.8	2.50	8	3.10	
5.6	646.3	2.50	9	3.40	
8.1	643.8	2.50	9	3.10	B
10.6	641.3	2.50	11	4.10	
12.6	639.3	2.00	10	4.00	B
15.1	636.8	2.50	7		B
17.6	634.3	2.50	9		
20.1	631.8	2.50	11		
22.1	629.8	2.00	12		B
23.8	628.1	1.67	600		
100.0	551.9	76.23	120	5.00	R

Global Site Class Definition: Substructures 1 through 8

N (bar):	60 (Blows/ft.)	Soil Site Class C	
N_{ch} (bar):	73 (Blows/ft.)	Soil Site Class C	<----Controls
s_u (bar):	4.67 (ksf)	Soil Site Class C	

Illinois Department of Transportation

SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====Grinnell Rd - This page is NB, east side. B-03 (Substructure 5) is NB South abut / (Substructure 6 is NB Pier 2) / (Substructure 7 is NB Pier 1) / B-04(Substructure 8) is NB N Abut

Substructure 5

Base of Substruct. Elev. (or ground surf for bents	657.9	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-03 2018	
Top of Boring Elev.	664.04	ft.
Approximate Fixity Elev.	651.9	ft.

Individual Site Class Definition:

N (bar):	36 (Blows/ft.)	Soil Site Class D	
N_{ch} (bar):	71 (Blows/ft.)	Soil Site Class C	<----Controls
s_u (bar):	4.31 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	661.5	2.50			
	659.5	2.00	15		B
	657.0	2.50	7	2.50	
	654.5	2.50	7	2.50	
	652.0	2.50	12	3.90	
2.4	649.5	2.50	11	3.70	
4.9	647.0	2.50	10	3.90	
7.4	644.5	2.50	11	3.70	B
9.9	642.0	2.50	12	4.10	
12.4	639.5	2.50	11	4.10	
14.9	637.0	2.50	11	4.00	
17.4	634.5	2.50	10	3.10	B
19.9	632.0	2.50	12		
21.9	630.0	2.00	15		
22.9	629.0	1.00	15		B
24.1	627.8	1.25	434		
100.0	551.9	75.90	120	5.00	R

Substructure 6

Base of Substruct. Elev. (or ground surf for bents	642.7	ft.
Pile or Shaft Dia.	18	inches
Boring Number	B-03, C-3	
Top of Boring Elev.	641.47	ft.
Approximate Fixity Elev.	633.7	ft.

Individual Site Class Definition:

N (bar):	78 (Blows/ft.)	Soil Site Class C	<----Controls
N_{ch} (bar):	78 (Blows/ft.)	Soil Site Class C	
s_u (bar):	5 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	639.5	1.93	11	4.10	
	637.0	2.50	11	4.00	
	634.5	2.50	10	3.10	B
1.7	632.0	2.50	12		
3.7	630.0	2.00	15		
4.7	629.0	1.00	15		B
5.9	627.8	1.25	434		
100.0	533.7	94.10	120	5.00	R

Substructure 7

Base of Substruct. Elev. (or ground surf for bents	642.7	ft.
Pile or Shaft Dia.	18	inches
Boring Number	B-04, C-3	
Top of Boring Elev.	641.47	ft.
Approximate Fixity Elev.	633.7	ft.

Individual Site Class Definition:

N (bar):	85 (Blows/ft.)	Soil Site Class C	<----Controls
N_{ch} (bar):	85 (Blows/ft.)	Soil Site Class C	
s_u (bar):	5 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	641.1	0.38	13	3.50	
	638.6	2.50	24	3.70	
	637.6	1.00	24	3.70	B
	635.6	2.00	11		
0.1	633.6	2.00	10		
2.1	631.6	2.00	11		B
3.4	630.3	1.25	400		
100.0	533.7	96.60	120	5.00	R

Substructure 8

Base of Substruct. Elev. (or ground surf for bents	655.6	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-04 2018	
Top of Boring Elev.	660.59	ft.
Approximate Fixity Elev.	649.6	ft.

Individual Site Class Definition:

N (bar):	42 (Blows/ft.)	Soil Site Class D	
N_{ch} (bar):	64 (Blows/ft.)	Soil Site Class C	<----Controls
s_u (bar):	4.09 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	658.1	2.50			
	655.6	2.50	6	1.80	
	653.1	2.50	5	2.00	
	650.6	2.50	3	1.50	
1.0	648.6	2.00	3	1.50	B
3.5	646.1	2.50	9	2.90	
6.0	643.6	2.50	11	3.20	
8.5	641.1	2.50	13	3.50	
11.0	638.6	2.50	24	3.70	
12.0	637.6	1.00	24	3.70	B
14.0	635.6	2.00	11		
16.0	633.6	2.00	10		
18.0	631.6	2.00	11		B
19.3	630.3	1.25	400		
100.0	549.6	80.70	120	5.00	R

From: Michael Haley <mhaley@lineng.com>
Sent: Monday, July 30, 2018 2:35:09 PM
To: Ferguson, Steven P
Cc: Fred Lin
Subject: [External] RE: New work order

Steve,
Below are the preliminary loads for developing the Grinnell Road SGR.

- Strength I
  - Abutments – 1538 kips
  - Piers – 4832 kips
- Service I
  - Abutments – 1126 kips
  - Piers – 3680 kips

Our preliminary bridge layout is in line with the attached Structure Sketch from the BCR. Let me know if you need any more information at this time.
Thanks.

Mike Haley
Lin Engineering, Ltd.

From: Ferguson, Steven P [mailto:Steven.Ferguson@illinois.gov]
Sent: Tuesday, May 01, 2018 9:04 AM
To: Michael Haley

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER==========	NB structure		TOTAL STRUCTURE LENGTH==========	159.25	FT
STRUCTURE TYPE ==========	MULTI-SPAN		NUMBER OF SPANS ==========	3	
STRUCTURE SKEW==========	0	DEGREES	END SPAN LENGTH ==========	44.75	FT
SUPER. DATA IN REFERENCE TO SUB. DATA ====	ABUT 2		ADJACENT INTERIOR SPAN LENGTH ==========	69.75	FT

SUPERSTRUCTURE DATA (END OR MAIN SPAN)

BEAM TYPE ==========	CONCRETE BEAM	
CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	KSI
BEAM SPACING PERP. TO CL ==========	7.00	FT
SLAB THICKNESS ==========	8.00	IN
SLAB F'C ==========	4.00	KSI

SUPERSTRUCTURE DATA (ADJACENT SPAN)

CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	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 ==========	NB south abut	
ABUTMENT REFERENCE BORING ==========	B-3	
BOTTOM OF ABUTMENT ELEVATION ==========	657.96	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	7	
PILE SPACING PERP. TO CL ==========	7.33	FT

ABUTMENT #2 DATA

ABUTMENT NAME ==========	NB north abut	
ABUTMENT REFERENCE BORING==========	B-4	
BOTTOM OF ABUTMENT ELEVATION==========	655.52	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	7	
PILE SPACING PERP. TO CL ==========	7.33	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)*
657.56	0.40	2.5		
655.06	2.50	2.5		
652.56	2.50	3.9		
650.06	2.50	3.7		
647.96	2.10	3.9		

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)*
655.02	0.50	1.8		
652.52	2.50	2.0		
650.02	2.50	1.5		
647.52	2.50	1.50		
645.52	2.00	2.90		

10.00 FT = TOTAL DEPTH ENTERED

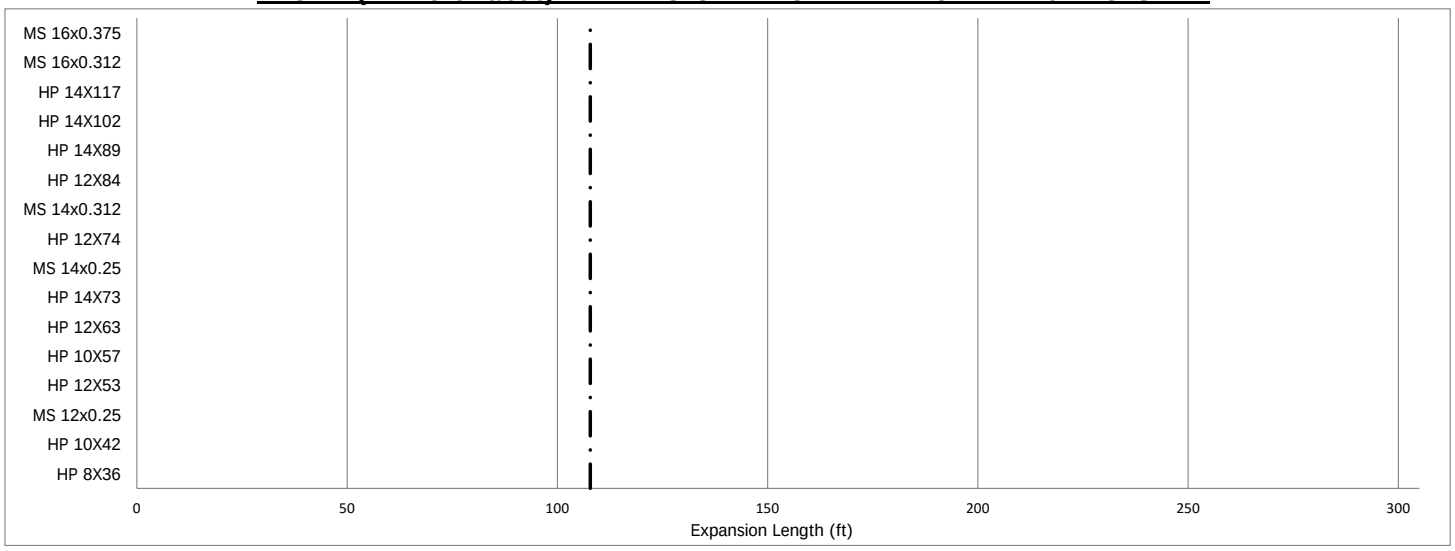
WEIGHTED AVERAGE Qu FOR ABUTMENT #1=======	3.44	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2=======	1.92	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*3.44])==========	2.40		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*1.92])==========	1.14	

WEIGHTED AVG. Qu > 3.0 TSF WITH TRIB. LENGTH > 20%, INTEGRAL ABUTMENT STRUCTURE NOT ALLOWED

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [2.4*7*0+1.14*7*159.25]/[2.4*7+1.14*7]========== ~~51.42~~ FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.14*7*0+2.4*7*159.25]/[1.14*7+2.4*7]========== 107.83 FT

ABUT 2 (NB north abut) - 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

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER==========	SB structure		TOTAL STRUCTURE LENGTH==========	159.25	FT
STRUCTURE TYPE ==========	MULTI-SPAN		NUMBER OF SPANS ==========	3	
STRUCTURE SKEW==========	0	DEGREES	END SPAN LENGTH ==========	44.75	FT
SUPER. DATA IN REFERENCE TO SUB. DATA ====	ABUT 1		ADJACENT INTERIOR SPAN LENGTH ==========	69.75	FT

SUPERSTRUCTURE DATA (END OR MAIN SPAN)

BEAM TYPE ==========	CONCRETE BEAM	
CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	KSI
BEAM SPACING PERP. TO CL ==========	7.00	FT
SLAB THICKNESS ==========	8.00	IN
SLAB F'C ==========	4.00	KSI

SUPERSTRUCTURE DATA (ADJACENT SPAN)

CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	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 ==========	SB north abut	
ABUTMENT REFERENCE BORING ==========	B-1	
BOTTOM OF ABUTMENT ELEVATION ==========	655.52	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	6	
PILE SPACING PERP. TO CL ==========	7.33	FT

ABUTMENT #2 DATA

ABUTMENT NAME ==========	SB south abut	
ABUTMENT REFERENCE BORING==========	B-2	
BOTTOM OF ABUTMENT ELEVATION==========	657.96	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	6	
PILE SPACING PERP. TO CL ==========	7.33	FT

ENTER ONLY Qu VALUE IF AVAILABLE, OTHERWISE ENTER N VALUE

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)*
653.12	2.40	3.5		
650.62	2.50	2.0		
648.12	2.50	3.5		
645.62	2.50	3.1		
645.52	0.10	3.7	9	2.3

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)*
657.36	0.60	3.0		
654.86	2.50	2.5		
652.36	2.50	2.3		
649.86	2.50	3.10		
647.96	1.90	3.40		

10.00 FT = TOTAL DEPTH ENTERED

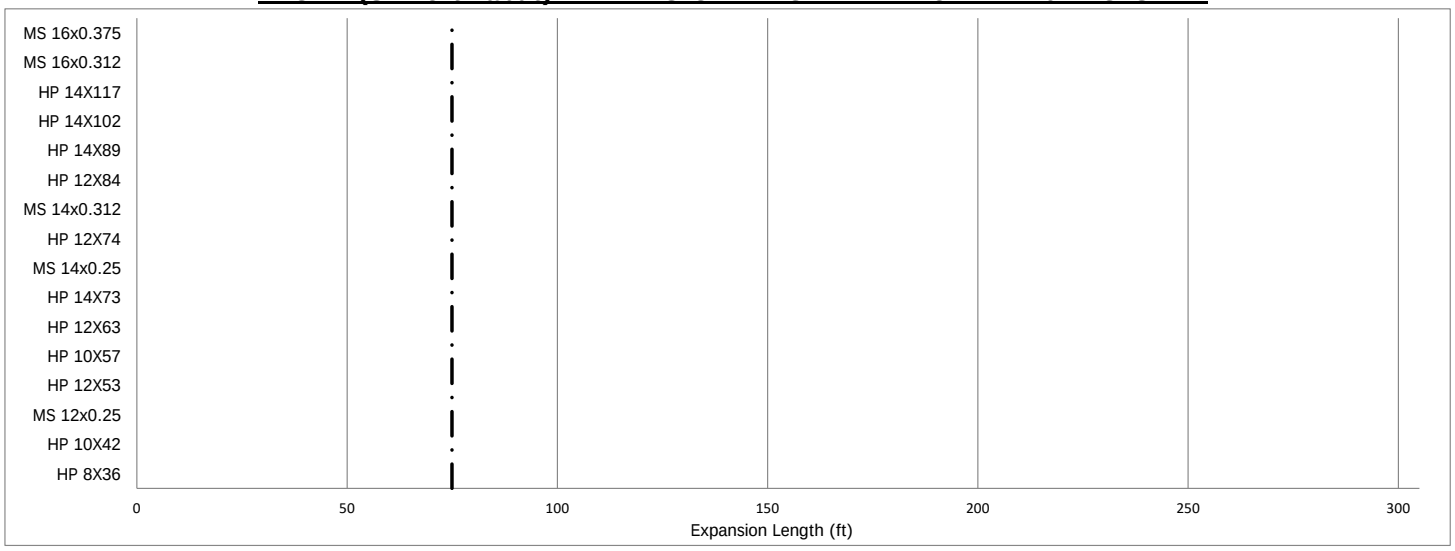
WEIGHTED AVERAGE Qu FOR ABUTMENT #1=======	3.03	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2=======	2.80	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*3.03])==========	1.85		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*2.8])==========	1.64	

WEIGHTED AVG. Qu > 3.0 TSF WITH TRIB. LENGTH > 20%, INTEGRAL ABUTMENT STRUCTURE NOT ALLOWED

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.85*6*0+1.64*6*159.25]/[1.85*6+1.64*6]========== ~~74.94~~ FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.64*6*0+1.85*6*159.25]/[1.64*6+1.85*6]========== 84.31 FT

ABUT 1 (SB north abut) - 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

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER==========	NB structure w/ 10' precore, bentonite		TOTAL STRUCTURE LENGTH==========	159.25	FT
STRUCTURE TYPE ==========	MULTI-SPAN		NUMBER OF SPANS ==========	3	
STRUCTURE SKEW==========	0	DEGREES	END SPAN LENGTH ==========	44.75	FT
SUPER. DATA IN REFERENCE TO SUB. DATA ====	ABUT 2		ADJACENT INTERIOR SPAN LENGTH ==========	69.75	FT

SUPERSTRUCTURE DATA (END OR MAIN SPAN)

BEAM TYPE ==========	CONCRETE BEAM	
CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	KSI
BEAM SPACING PERP. TO CL ==========	7.00	FT
SLAB THICKNESS ==========	8.00	IN
SLAB F'C ==========	4.00	KSI

SUPERSTRUCTURE DATA (ADJACENT SPAN)

CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	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 ==========	NB south abut	
ABUTMENT REFERENCE BORING ==========	B-3	
BOTTOM OF ABUTMENT ELEVATION ==========	657.96	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	7	
PILE SPACING PERP. TO CL ==========	7.33	FT

ABUTMENT #2 DATA

ABUTMENT NAME ==========	NB north abut	
ABUTMENT REFERENCE BORING==========	B-4	
BOTTOM OF ABUTMENT ELEVATION==========	655.52	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	7	
PILE SPACING PERP. TO CL ==========	7.33	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)*
657.56	0.40	0.1		
655.06	2.50	0.1		
652.56	2.50	0.1		
650.06	2.50	0.1		
647.96	2.10	0.1		

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)*
655.02	0.50	0.1		
652.52	2.50	0.1		
650.02	2.50	0.1		
647.52	2.50	0.10		
645.52	2.00	0.10		

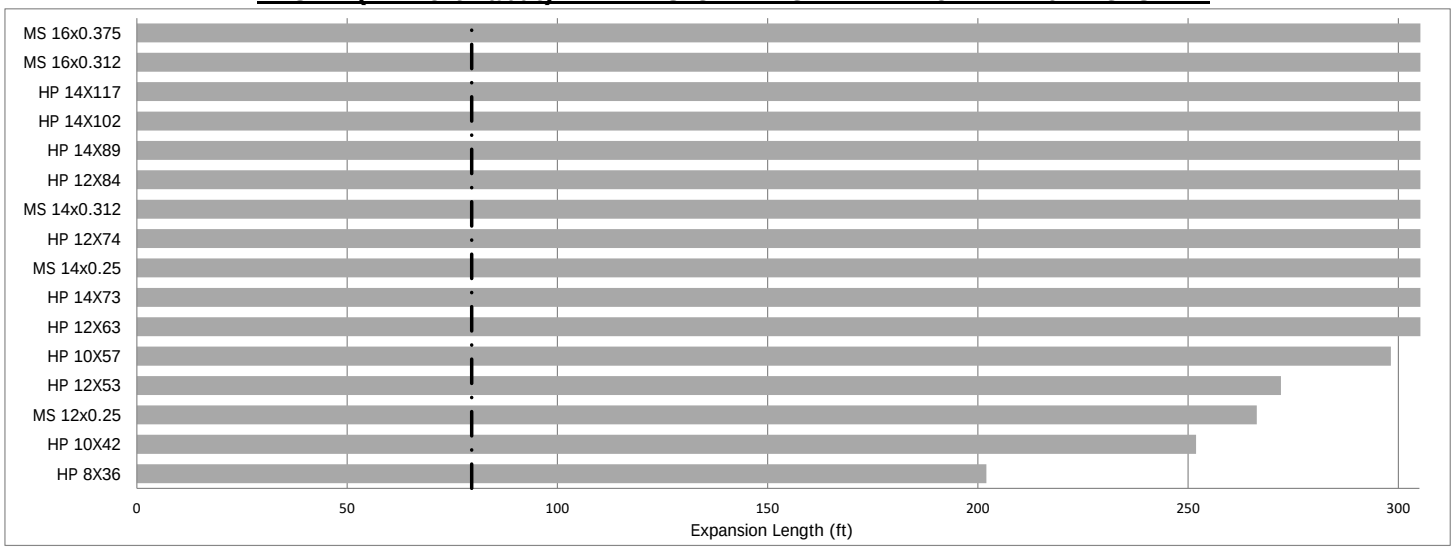
10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1=======	0.10	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2=======	0.10	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*0.1])==========	0.70		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*0.1])==========	0.70	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [0.7*7*0+0.7*7*159.25]/[0.7*7+0.7*7]========== 79.63 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [0.7*7*0+0.7*7*159.25]/[0.7*7+0.7*7]========== 79.63 FT

ABUT 2 (NB north abut) - 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

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER==========	SB structure w/ 10' precore, bentonite		TOTAL STRUCTURE LENGTH==========	159.25	FT
STRUCTURE TYPE ==========	MULTI-SPAN		NUMBER OF SPANS ==========	3	
STRUCTURE SKEW==========	0	DEGREES	END SPAN LENGTH ==========	44.75	FT
SUPER. DATA IN REFERENCE TO SUB. DATA ====	ABUT 1		ADJACENT INTERIOR SPAN LENGTH ==========	69.75	FT

SUPERSTRUCTURE DATA (END OR MAIN SPAN)

BEAM TYPE ==========	CONCRETE BEAM	
CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	KSI
BEAM SPACING PERP. TO CL ==========	7.00	FT
SLAB THICKNESS ==========	8.00	IN
SLAB F'C ==========	4.00	KSI

SUPERSTRUCTURE DATA (ADJACENT SPAN)

CONCRETE BEAM ==========	36" PPC I-BEAM	
BEAM F'C ==========	7	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 ==========	SB north abut	
ABUTMENT REFERENCE BORING ==========	B-1	
BOTTOM OF ABUTMENT ELEVATION ==========	655.52	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	6	
PILE SPACING PERP. TO CL ==========	7.33	FT

ABUTMENT #2 DATA

ABUTMENT NAME ==========	SB south abut	
ABUTMENT REFERENCE BORING==========	B-2	
BOTTOM OF ABUTMENT ELEVATION==========	657.96	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	6	
PILE SPACING PERP. TO CL ==========	7.33	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)*
653.12	2.40	0.1		
650.62	2.50	0.1		
648.12	2.50	0.1		
645.62	2.50	0.1		
645.52	0.10	0.1		

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)*
657.36	0.60	0.1		
654.86	2.50	0.1		
652.36	2.50	0.1		
649.86	2.50	0.10		
647.96	1.90	0.10		

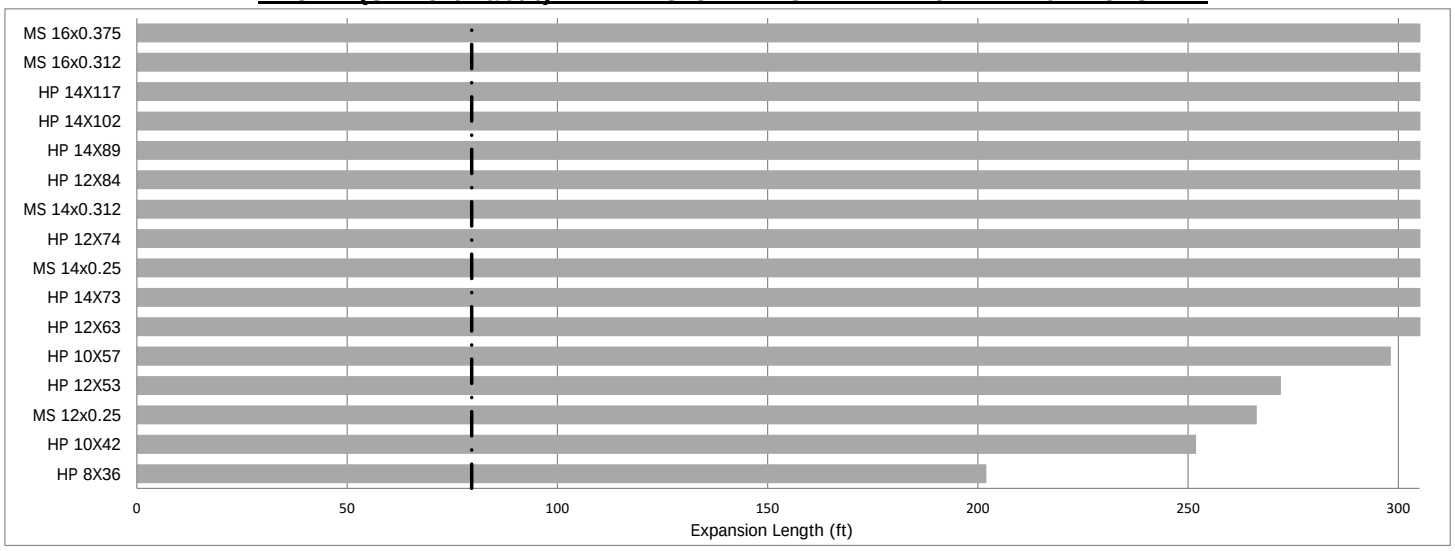
10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1=======	0.10	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2=======	0.10	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*0.1])==========	0.70		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*0.1])==========	0.70	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [0.7*6*0+0.7*6*159.25]/[0.7*6+0.7*6]========== 79.63 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [0.7*6*0+0.7*6*159.25]/[0.7*6+0.7*6]========== 79.63 FT

ABUT 1 (SB north abut) - 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.)

Table 1: **PILE LENGTH TABLES USING SOIL DATA for NB SN046-0158 N & S Abutments**

North Abutment, Using Boring B-04				South Abutment, Using Boring B-03		
Nominal Required Bearing (KIPS)	**Factored Resistance Available (KIPS)**	**Estimated Pile Length (Ft.)**		**Nominal Required Bearing (KIPS)**	**Factored Resistance Available (KIPS)**	**Estimated Pile Length (Ft.)**
HP 10x42				HP 10x42		
193	106	27		175	96	31
314	173	28		265	146	32
*335	184	29		*335	184	33
HP 12x53				HP 12x53		
232	127	27		212	117	31
376	207	28		318	175	32
*418	230	29		*418	230	33
HP 12x63				HP 12x63		
240	132	27		327	180	32
386	212	28		474	260	33
*497	273	29		*497	273	34
HP 14x73				HP 14x73		
284	156	27		387	213	32
457	252	28		561	308	33
*578	318	29		*578	318	34
HP 14x89				HP 14x89		
469	258	28		398	219	32
644	354	29		573	315	33
*705	388	30		*705	388	34

*** Maximum nominal required bearing at refusal**

Table 1: **PILE LENGTH TABLES USING SOIL DATA for SB SN046-0159 N & S Abutments**

North Abutment, Using Boring B-01				South Abutment, Using Boring B-02		
Nominal Required Bearing (KIPS)	**Factored Resistance Available (KIPS)**	**Estimated Pile Length (Ft.)**		**Nominal Required Bearing (KIPS)**	**Factored Resistance Available (KIPS)**	**Estimated Pile Length (Ft.)**
HP 10x42				HP 10x42		
86	47	25		70	39	26
225	124	26		73	40	28
*335	184	27		*335	87	30
HP 12x53				HP 12x53		
103	57	25		93	51	28
276	152	26		192	106	30
*418	230	27		*418	230	32
HP 12x63				HP 12x63		
335	184	26		212	117	30
482	265	27		437	241	32
*497	273	28		*497	273	33
HP 14x73				HP 14x73		
397	218	26		249	137	30
570	314	27		518	285	32
*578	318	28		*578	318	33
HP 14x89				HP 14x89		
408	224	26		279	154	30
583	321	27		530	291	32
*705	388	28		*705	338	33

*** Maximum nominal required bearing at refusal**

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== north abut NB SN046-0158
REFERENCE BORING ========== 4
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.60 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.60 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 ========== 1538 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 51.20 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 240.31 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 90.12 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	**29** FT.

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
653.10	2.50	0.00	0		0.0		0.0	0.0		0.0	0	0	0	0	5
650.60	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	7
648.60	2.00	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	9
646.10	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	12
645.60	0.50	0.00	0		0.0	0.0	30.5	0.0	0.0	***3.9***	4	0	0	2	12
643.60	2.00	3.20	11		10.6	30.5	44.0	15.6	3.9	***19.8***	20	0	0	11	14
641.10	2.50	3.50	13		14.1	33.4	60.0	20.8	4.2	***40.8***	41	0	0	22	17
638.60	2.50	3.70	24		14.7	35.3	74.7	21.7	4.5	***62.5***	63	0	0	34	19
637.60	1.00	3.70	24		5.9	35.3	***64.0***	8.7	4.5	69.1	64	0	0	35	20
635.60	2.00		11	Medium Sand	1.3	18.6	***63.6***	1.9	2.4	70.8	64	0	0	35	22
633.60	2.00		10	Medium Sand	1.2	17.0	***66.5***	1.8	2.1	72.8	67	0	0	37	24
631.60	2.00		11	Medium Sand	1.3	18.6	388.2	1.9	2.4	***115.3***	115	0	0	63	26
630.35	1.25		200	Sandy Gravel	67.4	339.0	286.1	99.3	42.9	***193.2***	193	0	0	106	27
629.35	1.00			Limestone	82.2	169.5	368.4	121.0	21.5	***314.2***	314	0	0	173	28.3
628.35	1.00			Limestone	82.2	169.5	450.6	121.0	21.5	***435.2***	~~435~~	~~0~~	~~0~~	~~239~~	~~29.3~~
627.35	1.00			Limestone	82.2	169.5	***532.8***	121.0	21.5	556.3	~~533~~	~~0~~	~~0~~	~~293~~	~~30.3~~
626.35	1.00			Limestone		169.5			21.5						

Pile Design Table for north abut NB SN046-0158 utilizing Boring #4

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
253	139	28

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
115	63	26
193	106	27
335	184	29
Steel HP 10 X 57		
131	72	26
202	111	27
454	250	30
Steel HP 12 X 53		
140	77	26
232	127	27
418	230	29
Steel HP 12 X 63		
151	83	26
240	132	27
497	273	29
Steel HP 12 X 74		
164	90	26
247	136	27
589	324	30

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
88	49	24
174	96	26
253	139	27
664	365	30
Steel HP 14 X 73		
105	58	24
178	98	26
284	156	27
578	318	29
Steel HP 14 X 89		
107	59	24
195	107	26
294	162	27
705	388	30
Steel HP 14 X 102		
108	59	24
209	115	26
301	166	27
810	445	30
Steel HP 14 X 117		
110	60	24
225	124	26
311	171	27
Precast 14"x 14"		
143	78	19
195	107	20
195	108	22
213	117	24

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== south abut. NB SN 046-0158
REFERENCE BORING ========== 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.90 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.90 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 ========== 1538 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 51.20 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 240.31 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 90.12 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	**34** 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.)
657.04	0.86	0.00	0		0.0		0.0	0.0		0.0	0	0	0	0	3
654.54	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	5
652.04	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	8
649.54	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	10
647.90	1.64	0.00	0		0.0	0.0	77.0	0.0	0.0	***9.9***	10	0	0	5	12
647.04	0.86	3.90	10		7.6	77.0	80.6	11.2	9.9	***20.6***	21	0	0	11	13
644.54	2.50	3.70	11		21.2	73.0	109.7	31.4	9.4	***53.1***	53	0	0	29	15
642.04	2.50	4.10	12		22.9	80.9	132.7	34.0	10.4	***87.0***	87	0	0	48	18
639.54	2.50	4.10	11		22.9	80.9	153.7	34.0	10.4	***120.8***	121	0	0	66	20
637.04	2.50	4.00	11		22.5	79.0	158.4	33.3	10.2	***151.8***	152	0	0	84	23
634.54	2.50	3.10	10		18.6	61.2	***157.9***	27.5	7.9	176.9	158	0	0	87	25
632.04	2.50		12	Medium Sand	2.6	42.1	***171.1***	3.8	5.4	182.1	171	0	0	94	28
630.04	2.00		15	Medium Sand	2.6	52.6	***173.7***	3.8	6.8	185.9	174	0	0	96	30
629.04	1.00		15	Medium Sand	1.3	52.6	943.6	1.9	6.8	***286.8***	287	0	0	158	31
627.79	1.25		234	Sandy Gravel	115.9	821.3	589.2	171.7	105.7	***397.9***	398	0	0	219	32
626.79	1.00			Limestone	118.3	351.0	707.6	175.2	45.2	***573.2***	573	0	0	315	33.1
625.79	1.00			Limestone	118.3	351.0	825.9	175.2	45.2	***748.4***	~~748~~	~~0~~	~~0~~	~~412~~	~~34.1~~
624.79	1.00			Limestone	118.3	351.0	944.3	175.2	45.2	***923.6***	~~924~~	~~0~~	~~0~~	~~508~~	~~35.1~~
623.79	1.00			Limestone	118.3	351.0	***1062.6***	175.2	45.2	1098.9	~~1063~~	~~0~~	~~0~~	~~584~~	~~36.1~~
622.79	1.00			Limestone	118.3	351.0	***1180.9***	175.2	45.2	1274.1	~~1181~~	~~0~~	~~0~~	~~650~~	~~37.1~~
621.79	1.00			Limestone		351.0			45.2						

Pile Design Table for south abut. NB SN 046-0158 utilizing Boring #3

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
143	79	31
214	117	32
286	157	33
Steel HP 10 X 42		
109	60	30
175	96	31
265	146	32
335	184	33
Steel HP 10 X 57		
112	62	30
194	107	31
274	151	32
454	250	34
Steel HP 12 X 53		
138	76	30
212	117	31
318	175	32
418	230	33
Steel HP 12 X 63		
139	77	30
226	124	31
327	180	32
497	273	34
Steel HP 12 X 74		
141	78	30
240	132	31
334	184	32
589	324	34
Steel HP 12 X 84		
144	79	30
253	139	31
341	187	32
664	365	35
Steel HP 14 X 73		
156	86	25
169	93	28
171	94	30
266	146	31
387	213	32
578	318	34
Steel HP 14 X 89		
158	87	25
171	94	28
174	96	30
287	158	31
398	219	32
705	388	34
Steel HP 14 X 102		
160	88	25
173	95	28
176	97	30
303	167	31
406	223	32
810	445	35
Steel HP 14 X 117		
162	89	25
176	97	28
178	98	30
323	177	31
416	229	32
Precast 14"x 14"		
141	77	18
175	96	20
196	108	23

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut SB SN 046-0159
REFERENCE BORING ========== 1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 657.60 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 655.60 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 ========== 1538 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 51.20 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 240.31 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 90.12 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	**28** 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			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)					
653.10	2.50	0.00	0		0.0		0.0	0.0		0.0	0	0	0	0	5
650.60	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	7
648.10	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	10
645.60	2.50	0.00	0		0.0	0.0	77.0	0.0	0.0	***9.9***	10	0	0	5	12
643.10	2.50	3.90	12		22.1	77.0	95.1	32.7	9.9	***42.1***	42	0	0	23	15
640.60	2.50	3.70	10		21.2	73.0	219.7	31.4	9.4	***86.8***	87	0	0	48	17
638.10	2.50		67	Hard Till	12.3	176.4	132.6	18.2	22.7	***92.2***	92	0	0	51	20
635.60	2.50	3.90	14		22.1	77.0	***109.2***	32.7	9.9	119.0	109	0	0	60	22
633.10	2.50		9	Medium Sand	1.9	31.6	153.3	2.9	4.1	***127.3***	127	0	0	70	25
632.10	1.00		21	Medium Sand	1.8	73.7	2397.9	2.7	9.5	***418.7***	419	0	0	230	26
631.52	0.58		660	Sandy Gravel	163.4	2316.5	595.8	242.0	298.1	***407.7***	408	0	0	224	26
630.52	1.00			Limestone	118.3	351.0	714.2	175.2	45.2	***583.0***	583	0	0	321	27.1
629.52	1.00			Limestone	118.3	351.0	832.5	175.2	45.2	***758.2***	~~758~~	~~0~~	~~0~~	~~417~~	~~28.1~~
628.52	1.00			Limestone	118.3	351.0	950.9	175.2	45.2	***933.4***	~~933~~	~~0~~	~~0~~	~~513~~	~~29.1~~
627.52	1.00			Limestone	118.3	351.0	***1069.2***	175.2	45.2	1108.6	~~1069~~	~~0~~	~~0~~	~~588~~	~~30.1~~
626.52	1.00			Limestone		351.0			45.2						

Pile Design Table for North Abut SB SN 046-0159 utilizing Boring #1

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
69	38	25
188	103	26
219	120	26
286	157	27
Steel HP 10 X 42		
86	47	25
225	124	26
272	150	26
335	184	27
Steel HP 10 X 57		
88	48	25
276	152	26
281	154	26
454	250	28
Steel HP 12 X 53		
103	57	25
276	152	26
326	179	26
418	230	27
Steel HP 12 X 63		
105	58	25
311	171	26
335	184	26
497	273	28
Steel HP 12 X 74		
107	59	25
342	188	26
589	324	28
Steel HP 12 X 84		
108	60	25
349	192	26
664	365	29
Steel HP 14 X 73		
125	69	25
364	200	26
397	218	26
578	318	28
Steel HP 14 X 89		
127	70	25
408	224	26
705	388	28
Steel HP 14 X 102		
129	71	25
416	229	26
810	445	29
Steel HP 14 X 117		
132	72	25
426	235	26
Precast 14"x 14"		
89	49	15

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South abut SB SN 046-0159
REFERENCE BORING ========== 2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 659.90 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 657.90 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 ========== 1538 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 51.20 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 240.31 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 90.12 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	**33** 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			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)					
655.40	2.50	0.00	0		0.0		0.0	0.0		0.0	0	0	0	0	5
652.90	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	7
650.40	2.50	0.00	0		0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	10
647.90	2.50	0.00	0		0.0	0.0	67.1	0.0	0.0	***8.6***	9	0	0	5	12
645.40	2.50	3.40	9		19.9	67.1	81.1	29.5	8.6	***37.4***	37	0	0	21	15
642.90	2.50	3.10	9		18.6	61.2	119.5	27.5	7.9	***67.4***	67	0	0	37	17
640.40	2.50	4.10	11		22.9	80.9	140.4	34.0	10.4	***101.2***	101	0	0	56	20
639.40	1.00	4.00	10		9.0	79.0	***95.0***	13.3	10.2	107.5	95	0	0	52	21
636.90	2.50		7	Medium Sand	1.5	24.6	***103.6***	2.2	3.2	110.6	104	0	0	57	23
634.40	2.50		9	Medium Sand	1.9	31.6	***112.5***	2.9	4.1	114.4	113	0	0	62	26
631.90	2.50		11	Medium Sand	2.4	38.6	118.4	3.5	5.0	***118.4***	118	0	0	65	28
629.90	2.00		12	Medium Sand	2.1	42.1	1345.4	3.1	5.4	***279.1***	279	0	0	154	30
628.23	1.67		361	Sandy Gravel	249.0	1267.0	678.4	368.7	163.1	***529.9***	530	0	0	291	32
627.23	1.00			Limestone	118.3	351.0	796.7	175.2	45.2	***705.2***	~~705~~	~~0~~	~~0~~	~~388~~	~~32.7~~
626.23	1.00			Limestone	118.3	351.0	915.1	175.2	45.2	***880.4***	~~880~~	~~0~~	~~0~~	~~484~~	~~33.7~~
625.23	1.00			Limestone	118.3	351.0	***1033.4***	175.2	45.2	1055.6	~~1033~~	~~0~~	~~0~~	~~568~~	~~34.7~~
624.23	1.00			Limestone	118.3	351.0	***1151.7***	175.2	45.2	1230.9	~~1152~~	~~0~~	~~0~~	~~633~~	~~35.7~~
623.23	1.00			Limestone		351.0			45.2						

Pile Design Table for South abut SB SN 046-0159 utilizing Boring #2

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
130	72	30

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
158	87	30
Steel HP 10 X 57		
75	41	28
186	102	30
366	201	32
454	250	33
Steel HP 12 X 53		
93	51	28
192	106	30
418	230	32
Steel HP 12 X 63		
94	52	28
212	117	30
437	241	32
497	273	33
Steel HP 12 X 74		
96	53	28
234	129	30
445	245	32
589	324	33

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
97	53	28
252	138	30
452	249	32
664	365	34
Steel HP 14 X 73		
116	64	28
249	137	30
518	285	32
578	318	33
Steel HP 14 X 89		
118	65	28
279	154	30
530	291	32
705	388	33
Steel HP 14 X 102		
120	66	28
304	167	30
538	296	32
810	445	34
Steel HP 14 X 117		
121	67	28
332	183	30
550	303	32
Precast 14"x 14"		
154	85	20
168	93	21
193	106	23
220	121	26
240	132	28

Illinois Department of Transportation

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

STRUCTURE ==========: SN 046-0010/0011
SUBSTRUCTURE & REFERENCE BORING ======= NB Pier 1 & Pier 2 using Core 3
GROUND SURFACE ELEVATION ========== 642.70 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 630.47 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 48 IN.
FACTORED AXIAL LOAD ========== 4832 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ====== 3.5 KSI

FOUNDATION REDUNDANCY ====: REDUNDANT

Drilled Shaft Dia.'s for Design Table

30	IN.
36	IN,
42	IN.
48	IN.
54	IN.
60	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE NOM. RESIST. (KIPS)	TIP RESISTANCE FACT. RESIST. (KIPS)	TIP RESISTANCE SETTL. w_{Rn} (IN.)	COMBINED SIDE & TIP RESISTANCE R_P/R_n	COMBINED SIDE & TIP RESISTANCE NOM. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE FACT. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT Q_{C1} (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{C1} (IN.)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{Rn} (IN.)
1.00	629.47	1.00	100.0	Limestone	35	Fractured	0	Open	No	0	0	0	35	0.000	-0.426	1586.4	4358	2179	0.447	0.00	0	0	35	0.000	-0.426
2.00	628.47	1.00	200.0	Limestone	40	Fractured	0	Open	No	0	0	0	90	0.009	-0.378	1805.5	6142	3071	0.548	0.00	0	0	90	0.009	-0.378
3.00	627.47	1.00	500.0	Limestone	50	Normal	23	Closed	Yes	409	409	225	194	0.017	0.370	2001.8	10522	5261	0.878	0.88	3386	1713	406	0.018	0.250
4.00	626.47	1.00	1904.0	Limestone	50	Normal	23	Closed	Yes	411	820	451	456	0.034	0.281	2014.5	10662	5331	0.829	0.74	3201	1642	955	0.038	0.188
5.00	625.47	1.00	2217.0	Limestone	50	Normal	23	Closed	Yes	411	1231	677	760	0.050	0.244	1989.6	10619	5309	0.764	0.64	3389	1756	1643	0.060	0.161
6.00	624.47	1.00	2217.0	Limestone	50	Normal	50	Closed	Yes	411	1641	903	1080	0.065	0.230	1967.9	10589	5295	0.701	0.56	3770	1967	2466	0.084	0.150
7.00	623.47	1.00	2336.0	Limestone	50	Normal	50	Closed	Yes	411	2052	1129	1432	0.079	0.221	1934.4	60770	30385	3.670	0.51	4198	2202	3552	0.114	0.142
8.00	622.47	1.00	1269.0	Limestone	60	Normal	50	Closed	Yes	411	2463	1355	1697	0.082	0.220	2034.3	63908	31954	3.816	0.46	4591	2419	4099	0.124	0.144
9.00	621.47	1.00	2048.0	Limestone	60	Normal	50	Closed	Yes	411	2874	1581	2082	0.090	0.205	2036.8	63986	31993	3.721	0.40	4823	2555	5102	0.147	0.137
10.00	620.47	1.00	1953.0	Limestone	70	Normal	50	Closed	Yes	411	3285	1807	2537	0.095	0.177	2051.1	64438	32219	3.884	0.32	4858	2593	5899	0.161	0.124
11.00	619.47	1.00	2070.0	Limestone	70	Normal	80	Closed	Yes	411	3695	2032	3068	0.103	0.158	2050.9	64430	32215	3.997	0.26	4986	2678	6964	0.182	0.116
12.00	618.47	1.00	2006.0	Limestone	70	Normal	80	Closed	Yes	411	4106	2258	3660	0.113	0.146	2058.6	64674	32337	4.139	0.21	5184	2797	8226	0.208	0.111
13.00	617.47	1.00	2018.0	Limestone	70	Normal	80	Closed	Yes	411	4517	2484	4336	0.126	0.137										
14.00	616.47	1.00	2043.0	Limestone	70	Normal	80	Closed	Yes	411	4928	2710	5114	0.141	0.131										
15.00	615.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	411	5338	2936	6014	0.159	0.126										
16.00	614.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	411	5749	3162	7054	0.181	0.123										
17.00	613.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	411	6160	3388	8261	0.207	0.122										
18.00	612.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	411	6571	3614	9671	0.238	0.121										
19.00	611.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	411	6981	3840	11333	0.274	0.121										
20.00	610.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	411	7392	4066	13307	0.317	0.122										

This data is below the bottom of the rock core. This information was extended from the last foot of the core.

Illinois Department of Transportation

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

STRUCTURE ==========: SN 046-0010/0011
SUBSTRUCTURE & REFERENCE BORING ======= NB Pier 1 & Pier 2 using Core 3
GROUND SURFACE ELEVATION ========== 642.70 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 630.47 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 54 IN.
FACTORED AXIAL LOAD ========== 4832 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ====== 3.5 KSI

FOUNDATION REDUNDANCY ====: REDUNDANT

Drilled Shaft Dia.'s for Design Table

30	IN.
36	IN,
42	IN.
48	IN.
54	IN.
60	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE NOM. RESIST. (KIPS)	TIP RESISTANCE FACT. RESIST. (KIPS)	TIP RESISTANCE SETTL. w_{Rn} (IN.)	COMBINED SIDE & TIP RESISTANCE R_P/R_n	COMBINED SIDE & TIP RESISTANCE NOM. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE FACT. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT Q_{C1} (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{C1} (IN.)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{Rn} (IN.)
1.00	629.47	1.00	100.0	Limestone	35	Fractured	0	Open	No	0	0	0	0	0.000	-0.479	1627.1	5633	2817	0.466	1.00	5633	2817	0	0.000	-0.003
2.00	628.47	1.00	200.0	Limestone	40	Fractured	0	Open	No	0	0	0	102	0.009	-0.426	1834.9	7883	3941	0.588	0.00	0	0	102	0.009	-0.426
3.00	627.47	1.00	500.0	Limestone	50	Normal	23	Closed	Yes	460	460	253	218	0.017	0.413	2002.2	13320	6660	0.932	0.89	4341	2194	471	0.018	0.272
4.00	626.47	1.00	1904.0	Limestone	50	Normal	23	Closed	Yes	462	922	507	511	0.035	0.313	2014.9	13496	6748	0.908	0.77	4006	2049	1114	0.039	0.204
5.00	625.47	1.00	2217.0	Limestone	50	Normal	23	Closed	Yes	462	1385	762	849	0.052	0.270	1995.6	13475	6738	0.820	0.67	4168	2153	1912	0.062	0.174
6.00	624.47	1.00	2217.0	Limestone	50	Normal	50	Closed	Yes	462	1847	1016	1203	0.067	0.255	1979.0	13470	6735	0.784	0.60	4584	2384	2855	0.086	0.162
7.00	623.47	1.00	2336.0	Limestone	50	Normal	50	Closed	Yes	462	2309	1270	1589	0.082	0.245	1949.2	77503	38751	4.036	0.54	5062	2646	4075	0.116	0.154
8.00	622.47	1.00	1269.0	Limestone	60	Normal	50	Closed	Yes	462	2771	1524	1877	0.084	0.245	2038.0	81032	40516	4.114	0.50	5512	2895	4669	0.125	0.155
9.00	621.47	1.00	2048.0	Limestone	60	Normal	50	Closed	Yes	462	3233	1778	2292	0.092	0.228	2040.2	81121	40560	4.065	0.44	5757	3040	5754	0.147	0.147
10.00	620.47	1.00	1953.0	Limestone	70	Normal	50	Closed	Yes	462	3695	2032	2772	0.096	0.197	2053.0	81629	40814	4.242	0.36	5760	3065	6583	0.159	0.133
11.00	619.47	1.00	2070.0	Limestone	70	Normal	80	Closed	Yes	462	4157	2286	3325	0.103	0.176	2052.8	81620	40810	4.341	0.29	5878	3147	7682	0.177	0.123
12.00	618.47	1.00	2006.0	Limestone	70	Normal	80	Closed	Yes	462	4619	2541	3934	0.111	0.162										
13.00	617.47	1.00	2018.0	Limestone	70	Normal	80	Closed	Yes	462	5081	2795	4617	0.122	0.151										
14.00	616.47	1.00	2043.0	Limestone	70	Normal	80	Closed	Yes	462	5544	3049	5392	0.135	0.144										
15.00	615.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	462	6006	3303	6273	0.151	0.138										
16.00	614.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	462	6468	3557	7272	0.169	0.134										
17.00	613.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	462	6930	3811	8408	0.190	0.131										
18.00	612.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	462	7392	4066	9708	0.214	0.129										
19.00	611.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	462	7854	4320	11201	0.242	0.128										
20.00	610.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	462	8316	4574	12927	0.275	0.128										

This data is below the bottom of the rock core. This information was extended from the last foot of the core.

Illinois Department of Transportation

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

STRUCTURE ==========: SN 046-0010/0011
SUBSTRUCTURE & REFERENCE BORING ======= NB Pier 1 & Pier 2 using Core 3
GROUND SURFACE ELEVATION ========== 642.70 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 630.47 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 60 IN.
FACTORED AXIAL LOAD ========== 4832 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ====== 3.5 KSI

FOUNDATION REDUNDANCY ====: REDUNDANT

Drilled Shaft Dia.'s for Design Table

30	IN.
36	IN,
42	IN.
48	IN.
54	IN.
60	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)		NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
1.00	629.47	1.00	100.0	Limestone	35	Fractured	0	Open	No	0	0	0	0	0.000	-0.533	1671.4	7111	3556	0.541	1.00	7111	3556	0	0.000	-0.003
2.00	628.47	1.00	200.0	Limestone	40	Fractured	0	Open	No	0	0	0	113	0.008	-0.473	1852.0	9810	4905	0.610	0.00	0	0	113	0.008	-0.473
3.00	627.47	1.00	500.0	Limestone	50	Normal	23	Closed	Yes	511	511	281	242	0.017	0.456	2003.8	16456	8228	0.987	0.91	5418	2735	534	0.018	0.295
4.00	626.47	1.00	1904.0	Limestone	50	Normal	23	Closed	Yes	513	1025	564	566	0.035	0.344	2017.7	16683	8342	0.910	0.79	4899	2501	1273	0.039	0.220
5.00	625.47	1.00	2217.0	Limestone	50	Normal	23	Closed	Yes	513	1538	846	938	0.053	0.296	2002.8	16691	8346	0.906	0.69	5021	2587	2184	0.063	0.187
6.00	624.47	1.00	2217.0	Limestone	50	Normal	50	Closed	Yes	513	2052	1129	1326	0.069	0.279	1987.9	16697	8348	0.802	0.62	5467	2836	3248	0.088	0.174
7.00	623.47	1.00	2336.0	Limestone	50	Normal	50	Closed	Yes	513	2565	1411	1747	0.084	0.268	1961.1	16611	8305	0.751	0.57	5976	3116	4601	0.117	0.164
8.00	622.47	1.00	1269.0	Limestone	60	Normal	50	Closed	Yes	513	3079	1693	2058	0.086	0.269	2041.0	100187	50094	4.488	0.53	6502	3405	5243	0.126	0.167
9.00	621.47	1.00	2048.0	Limestone	60	Normal	50	Closed	Yes	513	3592	1976	2503	0.094	0.250	2043.0	100286	50143	4.370	0.47	6756	3558	6409	0.147	0.157
10.00	620.47	1.00	1953.0	Limestone	70	Normal	50	Closed	Yes	513	4106	2258	3010	0.097	0.217	2054.5	100850	50425	4.548	0.39	6721	3566	7270	0.157	0.141
11.00	619.47	1.00	2070.0	Limestone	70	Normal	80	Closed	Yes	513	4619	2541	3588	0.103	0.193										
12.00	618.47	1.00	2006.0	Limestone	70	Normal	80	Closed	Yes	513	5133	2823	4216	0.111	0.177										
13.00	617.47	1.00	2018.0	Limestone	70	Normal	80	Closed	Yes	513	5646	3105	4914	0.120	0.166										
14.00	616.47	1.00	2043.0	Limestone	70	Normal	80	Closed	Yes	513	6160	3388	5694	0.132	0.157										
15.00	615.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	513	6673	3670	6570	0.145	0.150										
16.00	614.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	513	7186	3953	7549	0.160	0.145										
17.00	613.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	513	7700	4235	8646	0.178	0.141										
18.00	612.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	513	8213	4517	9881	0.198	0.138										
19.00	611.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	513	8727	4800	11274	0.222	0.137										
20.00	610.47	1.00	2068.0	Limestone	70	Normal	80	Closed	Yes	513	9240	5082	12853	0.248	0.136										

This data is below the bottom of the rock core. This information was extended from the last foot of the core.

Illinois Department of Transportation

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

Drilled Shaft Design Table for NB Pier 1 & Pier 2 using Core 3

Estimated Top of Rock Elevation: 630.47

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.)
30 in. Diameter Drilled Shaft							
1	629.47	1543	772	TIP	--	--	0.283
2	628.47	2433	1216	TIP	--	--	0.409
3	627.47	4085	2043	TIP	--	--	0.675
4	626.47	24757	12379	TIP	--	--	3.970
5	625.47	24109	12055	TIP	--	--	3.496
6	624.47	23748	11874	TIP	--	--	3.093
7	623.47	22939	11469	TIP	--	--	2.663
8	622.47	24777	12388	TIP	--	--	2.788
9	621.47	24765	12382	TIP	--	--	2.721
10	620.47	25047	12523	TIP	--	--	2.884
11	619.47	25042	12521	TIP	--	--	3.008
12	618.47	25194	12597	TIP	--	--	3.152
13	617.47	25317	12658	TIP	--	--	3.293
14	616.47	25378	12689	TIP	--	--	3.428
15	615.47	25378	12689	TIP	--	--	3.547
16	614.47	3593	1976	SIDE	7422	0.300	0.103
17	613.47	3850	2117	SIDE	9533	0.381	0.105
18	612.47	4107	2259	SIDE	12474	0.493	0.109
19	611.47	4363	2400	SIDE	16803	0.659	0.114
20	610.47	4620	2541	SIDE	23726	0.925	0.119
36 in. Diameter Drilled Shaft							
1	629.47	2421	1210	TIP	--	--	0.363
2	628.47	3348	1674	TIP	--	--	0.436
3	627.47	5910	2955	TIP	--	--	0.770
4	626.47	5976	2988	TIP	--	--	0.709
5	625.47	35028	17514	TIP	--	--	3.862
6	624.47	34406	17203	TIP	--	--	3.423
7	623.47	33470	16735	TIP	--	--	3.004
8	622.47	35749	17875	TIP	--	--	3.124
9	621.47	35808	17904	TIP	--	--	3.081
10	620.47	36147	18073	TIP	--	--	3.218
11	619.47	36141	18071	TIP	--	--	3.359
12	618.47	36324	18162	TIP	--	--	3.485
13	617.47	36471	18235	TIP	--	--	3.625
14	616.47	36545	18272	TIP	--	--	3.776
15	615.47	4004	2202	SIDE	5727	0.197	0.107
16	614.47	4312	2372	SIDE	6991	0.235	0.107
17	613.47	4620	2541	SIDE	8566	0.283	0.108
18	612.47	4928	2710	SIDE	10563	0.345	0.110
19	611.47	5236	2880	SIDE	13156	0.425	0.113
20	610.47	5544	3049	SIDE	16623	0.533	0.117
42 in. Diameter Drilled Shaft							
1	629.47	3222	1611	TIP	--	--	0.397
2	628.47	4655	2328	TIP	--	--	0.512
3	627.47	8020	4010	TIP	--	--	0.821
4	626.47	8167	4084	TIP	--	--	0.775
5	625.47	8115	4057	TIP	--	--	0.728
6	624.47	47075	23537	TIP	--	--	3.755
7	623.47	46068	23034	TIP	--	--	3.317
8	622.47	48813	24407	TIP	--	--	3.460
9	621.47	48882	24441	TIP	--	--	3.418
10	620.47	49277	24639	TIP	--	--	3.551
11	619.47	49270	24635	TIP	--	--	3.666
12	618.47	49484	24742	TIP	--	--	3.818
13	617.47	49655	24828	TIP	--	--	3.977
14	616.47	4312	2371	SIDE	4874	0.151	0.119

Drilled Shaft Design Table for NB Pier 1 & Pier 2 using Core 3

Estimated Top of Rock Elevation: 630.47

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.)
15	615.47	4671	2569	SIDE	5817	0.174	0.116
16	614.47	5030	2767	SIDE	6934	0.201	0.114
17	613.47	5390	2964	SIDE	8267	0.235	0.114
18	612.47	5749	3162	SIDE	9876	0.276	0.114
19	611.47	6109	3360	SIDE	11840	0.326	0.116
20	610.47	6468	3557	SIDE	14276	0.389	0.118
48 in. Diameter Drilled Shaft							
1	629.47	4358	2179	TIP	--	--	0.447
2	628.47	6142	3071	TIP	--	--	0.548
3	627.47	10522	5261	TIP	--	--	0.878
4	626.47	10662	5331	TIP	--	--	0.829
5	625.47	10619	5309	TIP	--	--	0.764
6	624.47	10589	5295	TIP	--	--	0.701
7	623.47	60770	30385	TIP	--	--	3.670
8	622.47	63908	31954	TIP	--	--	3.816
9	621.47	63986	31993	TIP	--	--	3.721
10	620.47	64438	32219	TIP	--	--	3.884
11	619.47	64430	32215	TIP	--	--	3.997
12	618.47	64674	32337	TIP	--	--	4.139
13	617.47	4517	2484	SIDE	4336	0.126	0.137
14	616.47	4928	2710	SIDE	5114	0.141	0.131
15	615.47	5338	2936	SIDE	6014	0.159	0.126
16	614.47	5749	3162	SIDE	7054	0.181	0.123
17	613.47	6160	3388	SIDE	8261	0.207	0.122
18	612.47	6571	3614	SIDE	9671	0.238	0.121
19	611.47	6981	3840	SIDE	11333	0.274	0.121
20	610.47	7392	4066	SIDE	13307	0.317	0.122
54 in. Diameter Drilled Shaft							
1	629.47	5633	2817	TIP	--	--	0.466
2	628.47	7883	3941	TIP	--	--	0.588
3	627.47	13320	6660	TIP	--	--	0.932
4	626.47	13496	6748	TIP	--	--	0.908
5	625.47	13475	6738	TIP	--	--	0.820
6	624.47	13470	6735	TIP	--	--	0.784
7	623.47	77503	38751	TIP	--	--	4.036
8	622.47	81032	40516	TIP	--	--	4.114
9	621.47	81121	40560	TIP	--	--	4.065
10	620.47	81629	40814	TIP	--	--	4.242
11	619.47	81620	40810	TIP	--	--	4.341
12	618.47	4619	2541	SIDE	3934	0.111	0.162
13	617.47	5081	2795	SIDE	4617	0.122	0.151
14	616.47	5544	3049	SIDE	5392	0.135	0.144
15	615.47	6006	3303	SIDE	6273	0.151	0.138
16	614.47	6468	3557	SIDE	7272	0.169	0.134
17	613.47	6930	3811	SIDE	8408	0.190	0.131
18	612.47	7392	4066	SIDE	9708	0.214	0.129
19	611.47	7854	4320	SIDE	11201	0.242	0.128
20	610.47	8316	4574	SIDE	12927	0.275	0.128
60 in. Diameter Drilled Shaft							
1	629.47	7111	3556	TIP	--	--	0.541
2	628.47	9810	4905	TIP	--	--	0.610
3	627.47	16456	8228	TIP	--	--	0.987
4	626.47	16683	8342	TIP	--	--	0.910
5	625.47	16691	8346	TIP	--	--	0.906
6	624.47	16697	8348	TIP	--	--	0.802
7	623.47	16611	8305	TIP	--	--	0.751
8	622.47	100187	50094	TIP	--	--	4.488

Illinois Department of Transportation

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

Drilled Shaft Design Table for NB Pier 1 & Pier 2 using Core 3

Estimated Top of Rock Elevation: 630.47

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.)
9	621.47	100286	50143	TIP	--	--	4.370
10	620.47	100850	50425	TIP	--	--	4.548
11	619.47	4619	2541	SIDE	3588	0.103	0.193
12	618.47	5133	2823	SIDE	4216	0.111	0.177
13	617.47	5646	3105	SIDE	4914	0.120	0.166
14	616.47	6160	3388	SIDE	5694	0.132	0.157
15	615.47	6673	3670	SIDE	6570	0.145	0.150
16	614.47	7186	3953	SIDE	7549	0.160	0.145
17	613.47	7700	4235	SIDE	8646	0.178	0.141
18	612.47	8213	4517	SIDE	9881	0.198	0.138
19	611.47	8727	4800	SIDE	11274	0.222	0.137
20	610.47	9240	5082	SIDE	12853	0.248	0.136

Illinois Department of Transportation

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

STRUCTURE ========== SN 046-0010/0011
SUBSTRUCTURE & REFERENCE BORING ======= SB Pier 1 & Pier 2 Rock Core 1
GROUND SURFACE ELEVATION ========== 642.70 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 631.47 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 48 IN.
FACTORED AXIAL LOAD ========== 4832 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ====== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

Drilled Shaft Dia.'s for Design Table

30	IN.
36	IN,
42	IN.
48	IN.
54	IN.
60	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE NOM. RESIST. (KIPS)	TIP RESISTANCE FACT. RESIST. (KIPS)	TIP RESISTANCE SETTL. w_{Rn} (IN.)	COMBINED SIDE & TIP RESISTANCE R_P/R_n	COMBINED SIDE & TIP RESISTANCE NOM. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE FACT. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT Q_{C1} (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{C1} (IN.)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{Rn} (IN.)
1.00	630.47	1.00	100.0	Limestone	20	Fractured	0	Open	No	0	0	0	35	0.001	-0.843	1252.3	1743	871	0.250	0.00	0	0	35	0.001	-0.843
2.00	629.47	1.00	100.0	Limestone	35	Fractured	0	Open	No	0	0	0	70	0.011	-0.565	1585.8	4384	2192	0.561	0.00	0	0	70	0.011	-0.565
3.00	628.47	1.00	200.0	Limestone	35	Fractured	0	Open	No	0	0	0	125	0.018	-0.510	1857.8	5085	2542	0.557	0.00	0	0	125	0.018	-0.510
4.00	627.47	1.00	500.0	Limestone	35	Normal	0	Closed	Yes	409	409	225	229	0.030	0.437	2084.5	5682	2841	0.517	0.89	3757	1899	578	0.032	0.306
5.00	626.47	1.00	1000.0	Limestone	40	Normal	0	Closed	Yes	411	820	451	395	0.044	0.572	2215.6	7540	3770	0.586	0.86	5678	2880	1035	0.050	0.381
6.00	625.47	1.00	1000.0	Limestone	40	Normal	44	Closed	Yes	411	1231	677	565	0.056	0.622	2352.8	8025	4013	0.517	0.83	7206	3665	1616	0.067	0.392
7.00	624.47	1.00	2000.0	Limestone	60	Normal	44	Closed	Yes	411	1642	903	852	0.062	0.422	2370.4	74468	37234	4.720	0.71	5742	2953	2114	0.078	0.270
8.00	623.47	1.00	2551.0	Limestone	60	Normal	44	Closed	Yes	411	2052	1129	1211	0.071	0.315	2319.1	72857	36429	4.565	0.60	5104	2655	2853	0.097	0.205
9.00	622.47	1.00	2667.0	Limestone	60	Normal	44	Closed	Yes	411	2463	1355	1613	0.082	0.258	2253.4	70792	35396	4.329	0.50	4933	2590	3756	0.120	0.171
10.00	621.47	1.00	2768.0	Limestone	60	Normal	44	Closed	Yes	411	2874	1581	2063	0.094	0.222	2175.0	68330	34165	4.118	0.42	4961	2624	4881	0.148	0.152
11.00	620.47	1.00	2376.0	Limestone	70	Normal	81	Closed	Yes	411	3285	1807	2556	0.100	0.186	2145.6	67407	33703	4.183	0.33	4904	2616	5744	0.164	0.133
12.00	619.47	1.00	2314.0	Limestone	70	Normal	81	Closed	Yes	411	3695	2032	3109	0.109	0.164	2124.0	66727	33364	4.270	0.26	4996	2683	6799	0.186	0.122
13.00	618.47	1.00	2049.0	Limestone	70	Normal	81	Closed	Yes	411	4106	2258	3694	0.119	0.151										
14.00	617.47	1.00	2097.0	Limestone	70	Normal	81	Closed	Yes	411	4517	2484	4367	0.131	0.141										
15.00	616.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	411	4928	2710	5144	0.147	0.134										
16.00	615.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	411	5338	2936	6036	0.166	0.130										
17.00	614.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	411	5749	3162	7064	0.188	0.127										
18.00	613.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	411	6160	3388	8254	0.214	0.125										
19.00	612.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	411	6571	3614	9641	0.244	0.124										
20.00	611.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	411	6981	3840	11269	0.280	0.124										

This data is below the bottom of the rock core. This information was extended from the last foot of the core.

Illinois Department of Transportation

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

STRUCTURE ==========: SN 046-0010/0011
SUBSTRUCTURE & REFERENCE BORING ======= SB Pier 1 & Pier 2 Rock Core 1
GROUND SURFACE ELEVATION ========== 642.70 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 631.47 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 54 IN.
FACTORED AXIAL LOAD ========== 4832 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ====== 3.5 KSI

FOUNDATION REDUNDANCY ====: REDUNDANT

Drilled Shaft Dia.'s for Design Table

30	IN.
36	IN,
42	IN.
48	IN.
54	IN.
60	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE NOM. RESIST. (KIPS)	TIP RESISTANCE FACT. RESIST. (KIPS)	TIP RESISTANCE SETTL. w_{Rn} (IN.)	COMBINED SIDE & TIP RESISTANCE R_P/R_n	COMBINED SIDE & TIP RESISTANCE NOM. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE FACT. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT Q_{C1} (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{C1} (IN.)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{Rn} (IN.)
1.00	630.47	1.00	100.0	Limestone	20	Fractured	0	Open	No	0	0	0	0	0.000	-0.948	1420.7	2413	1207	0.277	1.00	2413	1207	0	0.000	-0.005
2.00	629.47	1.00	100.0	Limestone	35	Fractured	0	Open	No	0	0	0	78	0.010	-0.636	1673.6	5801	2901	0.610	0.00	0	0	78	0.010	-0.636
3.00	628.47	1.00	200.0	Limestone	35	Fractured	0	Open	No	0	0	0	141	0.018	-0.573	1908.4	6581	3290	0.596	0.00	0	0	141	0.018	-0.573
4.00	627.47	1.00	500.0	Limestone	35	Normal	0	Closed	Yes	460	460	253	257	0.031	0.487	2080.6	7180	3590	0.570	0.90	4837	2442	687	0.033	0.333
5.00	626.47	1.00	1000.0	Limestone	40	Normal	0	Closed	Yes	462	922	507	444	0.046	0.638	2202.4	9494	4747	0.621	0.87	7218	3655	1230	0.051	0.415
6.00	625.47	1.00	1000.0	Limestone	40	Normal	44	Closed	Yes	462	1385	762	634	0.059	0.694	2329.2	10070	5035	0.579	0.85	9043	4591	1910	0.070	0.427
7.00	624.47	1.00	2000.0	Limestone	60	Normal	44	Closed	Yes	462	1847	1016	952	0.064	0.470	2344.9	93235	46617	5.070	0.74	7105	3645	2479	0.081	0.294
8.00	623.47	1.00	2551.0	Limestone	60	Normal	44	Closed	Yes	462	2309	1270	1349	0.074	0.350	2299.3	91423	45712	4.859	0.63	6231	3231	3315	0.099	0.222
9.00	622.47	1.00	2667.0	Limestone	60	Normal	44	Closed	Yes	462	2771	1524	1788	0.085	0.286	2240.9	89099	44550	4.675	0.53	5956	3117	4325	0.122	0.185
10.00	621.47	1.00	2768.0	Limestone	60	Normal	44	Closed	Yes	462	3233	1778	2275	0.096	0.247	2171.2	86329	43165	4.484	0.46	5940	3132	5564	0.149	0.163
11.00	620.47	1.00	2376.0	Limestone	70	Normal	81	Closed	Yes	462	3695	2032	2799	0.101	0.206	2145.1	85291	42646	4.537	0.37	5824	3097	6476	0.164	0.142
12.00	619.47	1.00	2314.0	Limestone	70	Normal	81	Closed	Yes	462	4157	2286	3377	0.109	0.181										
13.00	618.47	1.00	2049.0	Limestone	70	Normal	81	Closed	Yes	462	4619	2541	3981	0.117	0.167										
14.00	617.47	1.00	2097.0	Limestone	70	Normal	81	Closed	Yes	462	5081	2795	4665	0.128	0.156										
15.00	616.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	462	5544	3049	5444	0.141	0.147										
16.00	615.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	462	6006	3303	6322	0.157	0.141										
17.00	614.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	462	6468	3557	7317	0.175	0.137										
18.00	613.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	462	6930	3811	8447	0.197	0.134										
19.00	612.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	462	7392	4066	9738	0.221	0.132										
20.00	611.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	462	7854	4320	11219	0.250	0.131										

This data is below the bottom of the rock core. This information was extended from the last foot of the core.

Illinois Department of Transportation

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

STRUCTURE ========== SN 046-0010/0011
SUBSTRUCTURE & REFERENCE BORING ======= SB Pier 1 & Pier 2 Rock Core 1
GROUND SURFACE ELEVATION ========== 642.70 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 631.47 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 60 IN.
FACTORED AXIAL LOAD ========== 4832 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ====== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

Drilled Shaft Dia.'s for Design Table

30	IN.
36	IN,
42	IN.
48	IN.
54	IN.
60	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE NOM. RESIST. (KIPS)	TIP RESISTANCE FACT. RESIST. (KIPS)	TIP RESISTANCE SETTL. w_{Rn} (IN.)	COMBINED SIDE & TIP RESISTANCE R_P/R_n	COMBINED SIDE & TIP RESISTANCE NOM. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE FACT. RESIST. (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT Q_{C1} (KIPS)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{C1} (IN.)	COMBINED SIDE & TIP RESISTANCE SETTLEMENT w_{Rn} (IN.)
1.00	630.47	1.00	100.0	Limestone	20	Fractured	0	Open	No	0	0	0	0	0.000	-1.053	1516.2	3122	1561	0.342	1.00	3122	1561	0	0.000	-0.004
2.00	629.47	1.00	100.0	Limestone	35	Fractured	0	Open	No	0	0	0	87	0.009	-0.706	1737.6	7389	3694	0.640	0.00	0	0	87	0.009	-0.706
3.00	628.47	1.00	200.0	Limestone	35	Fractured	0	Open	No	0	0	0	157	0.018	-0.637	1922.5	8174	4087	0.626	0.00	0	0	157	0.018	-0.637
4.00	627.47	1.00	500.0	Limestone	35	Normal	0	Closed	Yes	511	512	281	285	0.031	0.537	2082.2	8870	4435	0.546	0.92	6058	3055	798	0.033	0.360
5.00	626.47	1.00	1000.0	Limestone	40	Normal	0	Closed	Yes	513	1025	564	492	0.047	0.703	2196.3	11692	5846	0.686	0.89	8941	4522	1430	0.053	0.448
6.00	625.47	1.00	1000.0	Limestone	40	Normal	44	Closed	Yes	513	1538	846	703	0.061	0.765	2310.4	12346	6173	0.575	0.86	11080	5617	2211	0.072	0.461
7.00	624.47	1.00	2000.0	Limestone	60	Normal	44	Closed	Yes	513	2052	1129	1053	0.066	0.517	2324.5	30035	15018	1.414	0.76	8592	4399	2851	0.083	0.316
8.00	623.47	1.00	2551.0	Limestone	60	Normal	44	Closed	Yes	513	2565	1411	1487	0.076	0.385	2283.5	112091	56046	5.232	0.66	7458	3857	3787	0.101	0.239
9.00	622.47	1.00	2667.0	Limestone	60	Normal	44	Closed	Yes	513	3079	1693	1964	0.087	0.315	2230.9	109509	54755	4.983	0.56	7063	3685	4903	0.124	0.198
10.00	621.47	1.00	2768.0	Limestone	60	Normal	44	Closed	Yes	513	3592	1976	2489	0.099	0.271	2168.2	106431	53216	4.800	0.49	6990	3675	6252	0.150	0.174
11.00	620.47	1.00	2376.0	Limestone	70	Normal	81	Closed	Yes	513	4106	2258	3044	0.103	0.227										
12.00	619.47	1.00	2314.0	Limestone	70	Normal	81	Closed	Yes	513	4619	2541	3650	0.109	0.199										
13.00	618.47	1.00	2049.0	Limestone	70	Normal	81	Closed	Yes	513	5133	2823	4275	0.117	0.183										
14.00	617.47	1.00	2097.0	Limestone	70	Normal	81	Closed	Yes	513	5646	3105	4976	0.126	0.170										
15.00	616.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	513	6160	3388	5764	0.138	0.160										
16.00	615.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	513	6673	3670	6641	0.152	0.153										
17.00	614.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	513	7186	3953	7621	0.167	0.148										
18.00	613.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	513	7700	4235	8719	0.185	0.144										
19.00	612.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	513	8213	4517	9953	0.206	0.141										
20.00	611.47	1.00	2141.0	Limestone	70	Normal	81	Closed	Yes	513	8727	4800	11345	0.229	0.139										

This data is below the bottom of the rock core. This information was extended from the last foot of the core.

Illinois Department of Transportation

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

Drilled Shaft Design Table for SB Pier 1 & Pier 2 Rock Core 1

Estimated Top of Rock Elevation: 631.47

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.)
30 in. Diameter Drilled Shaft							
1	630.47	393	196	TIP	--	--	0.113
2	629.47	1126	563	TIP	--	--	0.285
3	628.47	1586	793	TIP	--	--	0.351
4	627.47	22624	11312	TIP	--	--	4.224
5	626.47	26964	13482	TIP	--	--	4.307
6	625.47	30341	15170	TIP	--	--	3.816
7	624.47	31112	15556	TIP	--	--	3.844
8	623.47	29879	14940	TIP	--	--	3.592
9	622.47	28481	14240	TIP	--	--	3.348
10	621.47	26942	13471	TIP	--	--	3.102
11	620.47	26365	13182	TIP	--	--	3.167
12	619.47	25940	12970	TIP	--	--	3.245
13	618.47	26166	13083	TIP	--	--	3.404
14	617.47	26274	13137	TIP	--	--	3.549
15	616.47	26274	13137	TIP	--	--	3.673
16	615.47	3336	1835	SIDE	5658	0.242	0.105
17	614.47	3593	1976	SIDE	7102	0.298	0.107
18	613.47	3850	2117	SIDE	8997	0.372	0.110
19	612.47	4107	2259	SIDE	11564	0.472	0.114
20	611.47	4363	2400	SIDE	15198	0.615	0.119
36 in. Diameter Drilled Shaft							
1	630.47	718	359	TIP	--	--	0.154
2	629.47	1978	989	TIP	--	--	0.376
3	628.47	2555	1277	TIP	--	--	0.438
4	627.47	3085	1543	TIP	--	--	0.435
5	626.47	39354	19677	TIP	--	--	4.739
6	625.47	43224	21612	TIP	--	--	4.167
7	624.47	43369	21684	TIP	--	--	4.117
8	623.47	42032	21016	TIP	--	--	3.897
9	622.47	40482	20241	TIP	--	--	3.695
10	621.47	38636	19318	TIP	--	--	3.439
11	620.47	37944	18972	TIP	--	--	3.526
12	619.47	37434	18717	TIP	--	--	3.592
13	618.47	37705	18853	TIP	--	--	3.748
14	617.47	37835	18917	TIP	--	--	3.909
15	616.47	3696	2033	SIDE	4660	0.172	0.113
16	615.47	4004	2202	SIDE	5652	0.202	0.111
17	614.47	4312	2372	SIDE	6861	0.239	0.111
18	613.47	4620	2541	SIDE	8353	0.286	0.112
19	612.47	4928	2710	SIDE	10224	0.344	0.114
20	611.47	5236	2880	SIDE	12618	0.420	0.117
42 in. Diameter Drilled Shaft							
1	630.47	1179	590	TIP	--	--	0.209
2	629.47	3061	1531	TIP	--	--	0.480
3	628.47	3764	1882	TIP	--	--	0.513
4	627.47	4293	2147	TIP	--	--	0.482
5	626.47	5826	2913	TIP	--	--	0.572
6	625.47	57469	28735	TIP	--	--	4.453
7	624.47	57802	28901	TIP	--	--	4.390
8	623.47	56394	28197	TIP	--	--	4.217
9	622.47	54586	27293	TIP	--	--	4.027
10	621.47	52432	26216	TIP	--	--	3.778
11	620.47	51624	25812	TIP	--	--	3.842
12	619.47	51030	25515	TIP	--	--	3.937
13	618.47	51346	25673	TIP	--	--	4.112
14	617.47	3952	2174	SIDE	4088	0.137	0.128

Drilled Shaft Design Table for SB Pier 1 & Pier 2 Rock Core 1

Estimated Top of Rock Elevation: 631.47

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.)
15	616.47	4312	2371	SIDE	4877	0.156	0.123
16	615.47	4671	2569	SIDE	5801	0.179	0.120
17	614.47	5031	2767	SIDE	6892	0.207	0.118
18	613.47	5390	2964	SIDE	8188	0.240	0.117
19	612.47	5749	3162	SIDE	9743	0.281	0.118
20	611.47	6109	3360	SIDE	11630	0.330	0.120
48 in. Diameter Drilled Shaft							
1	630.47	1743	871	TIP	--	--	0.250
2	629.47	4384	2192	TIP	--	--	0.561
3	628.47	5085	2542	TIP	--	--	0.557
4	627.47	5682	2841	TIP	--	--	0.517
5	626.47	7540	3770	TIP	--	--	0.586
6	625.47	8025	4013	TIP	--	--	0.517
7	624.47	74468	37234	TIP	--	--	4.720
8	623.47	72857	36429	TIP	--	--	4.565
9	622.47	70792	35396	TIP	--	--	4.329
10	621.47	68330	34165	TIP	--	--	4.118
11	620.47	67407	33703	TIP	--	--	4.183
12	619.47	66727	33364	TIP	--	--	4.270
13	618.47	4106	2258	SIDE	3694	0.119	0.151
14	617.47	4517	2484	SIDE	4367	0.131	0.141
15	616.47	4928	2710	SIDE	5144	0.147	0.134
16	615.47	5338	2936	SIDE	6036	0.166	0.130
17	614.47	5749	3162	SIDE	7064	0.188	0.127
18	613.47	6160	3388	SIDE	8254	0.214	0.125
19	612.47	6571	3614	SIDE	9641	0.244	0.124
20	611.47	6981	3840	SIDE	11269	0.280	0.124
54 in. Diameter Drilled Shaft							
1	630.47	2413	1207	TIP	--	--	0.277
2	629.47	5801	2901	TIP	--	--	0.610
3	628.47	6581	3290	TIP	--	--	0.596
4	627.47	7180	3590	TIP	--	--	0.570
5	626.47	9494	4747	TIP	--	--	0.621
6	625.47	10070	5035	TIP	--	--	0.579
7	624.47	93235	46617	TIP	--	--	5.070
8	623.47	91423	45712	TIP	--	--	4.859
9	622.47	89099	44550	TIP	--	--	4.675
10	621.47	86329	43165	TIP	--	--	4.484
11	620.47	85291	42646	TIP	--	--	4.537
12	619.47	4157	2286	SIDE	3377	0.109	0.181
13	618.47	4619	2541	SIDE	3981	0.117	0.167
14	617.47	5081	2795	SIDE	4665	0.128	0.156
15	616.47	5544	3049	SIDE	5444	0.141	0.147
16	615.47	6006	3303	SIDE	6322	0.157	0.141
17	614.47	6468	3557	SIDE	7317	0.175	0.137
18	613.47	6930	3811	SIDE	8447	0.197	0.134
19	612.47	7392	4066	SIDE	9738	0.221	0.132
20	611.47	7854	4320	SIDE	11219	0.250	0.131
60 in. Diameter Drilled Shaft							
1	630.47	3122	1561	TIP	--	--	0.342
2	629.47	7389	3694	TIP	--	--	0.640
3	628.47	8174	4087	TIP	--	--	0.626
4	627.47	8870	4435	TIP	--	--	0.546
5	626.47	11692	5846	TIP	--	--	0.686
6	625.47	12346	6173	TIP	--	--	0.575
7	624.47	30035	15018	TIP	--	--	1.414
8	623.47	112091	56046	TIP	--	--	5.232

Illinois Department of Transportation

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

Drilled Shaft Design Table for SB Pier 1 & Pier 2 Rock Core 1

Estimated Top of Rock Elevation: 631.47

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.)
9	622.47	109509	54755	TIP	--	--	4.983
10	621.47	106431	53216	TIP	--	--	4.800
11	620.47	4106	2258	SIDE	3044	0.103	0.227
12	619.47	4619	2541	SIDE	3650	0.109	0.199
13	618.47	5133	2823	SIDE	4275	0.117	0.183
14	617.47	5646	3105	SIDE	4976	0.126	0.170
15	616.47	6160	3388	SIDE	5764	0.138	0.160
16	615.47	6673	3670	SIDE	6641	0.152	0.153
17	614.47	7186	3953	SIDE	7621	0.167	0.148
18	613.47	7700	4235	SIDE	8719	0.185	0.144
19	612.47	8213	4517	SIDE	9953	0.206	0.141
20	611.47	8727	4800	SIDE	11345	0.229	0.139