Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 5-24-2017	**Proposed SN:** 050-0259	**Route:**	FAS 169 (US 52)
Revised Date: 7-19-17	**Existing SN:** 050-0052	**Section:**	121-BR
Geotechnical Engineer: Terry McCleary of McCleary Engineering		**County:**	LaSalle
Structural Engineer: Joseph M. Lowrance of Farnsworth Group, Inc.		**Contract:**	66A57

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): A proposed 3 span structure, 134.00 ft. back to back abutments (outside spans of 47.00 ft. and a middle span of 40.00 ft.) with a 30 degree left-forward skew with a concrete deck supported by steel beams wide enough to carry 2 lanes @ 12 ft. with 4 ft. shoulders over the Little Vermilion River in Troy Grove. The superstructure will rest on integral abutments supported by steel piles bearing on limestone and drilled shaft piers with web walls. The proposed piers are located between the existing spread footings. See the attached TS&L drawing for more information. Factored loadings are estimated to be 532 kips at the abutments and 556 kips at each pier (Loadings sheet attached). The pier foundation width is estimated to be 40.6 ft.

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): The 1955 bridge plans showed data from 2 borings, at the west abutment and west pier. Both were topped with 2 to 8 ft. of stiff gravelly clay fill over 12 to 13 ft. of medium to very stiff clays, silty clays, and sandy clays. Below this was 4 to 6 ft. of dense to very dense angular gravel and limey silt. The underlying bedrock was hard gray brown limestone at about an elevation of 618 (W. abutment) and 621 (W. pier).

The two 2014 borings were taken at the west and east abutments, borings 01 and 02, respectively. The borings were advanced down to limestone, then the limestone was cored 20 ft. Boring 01 had a top 20 ft. of very stiff to hard silty clay, silty clay loam fills with silt pockets/organics and gravel pieces. Qu's varied from 2.5 to 4.0 tsf. This was over 4.5 ft. of very stiff to soft sandy clay/sandy loam alluvial deposits with sand and organics layers. This was over 5.5 ft. of medium gray fine sand to course gravel. The top 12 inches of the limestone bedrock was weathered. Limestone was at elev. 619.20. The groundwater level at completion was 619.2. Boring 02 was taken at the east abutment. It showed the top 10 ft.to be hard and stiff silty clay and silty clay loam fills with gravel pieces with Qu's at 4.0 and 4.5 tsf. This was over 4.5 ft. of very still silty clay loam tilll with a Qu of 3.1 to 4.0 tsf. The bedrock limestone was encountered at elev. 634.86.

Both rock cores showed the top 10 to 15 ft of limestone as being highly fractured. The remainder of the the cores showed some cracking and very good strengths. Rock Core 02C (S.E. Quad.) had a 3 in. shaley sand layer at an elev. of 620.86 and thin pockets, seams, & crack fills of Greenish Gray Shale from elevs. 620.36 to 618.86. See the attached Rock Core Logs.

Note that the 2014 borings show a rise in the elevation of the limestone of almost 16 ft. from the west boring to east boring. It is apparent from field observations and the as-built plans that the jump in elevation occurs between the east pier and east abutment, somewhere under the east 2:1 slopewall.

We do not see any need for further sub-surface investigation. The 1955 and 2014 boring data are attached.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: The proposed structure will maintain the same profile and location as the existing structure, there are no existing settlement issues, and future settlement is a minimal consideration. No ground improvement beyond normal construction practice is expected at this site, therefore, no further testing or analysis is proposed at this time.

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The are no new cuts or fills. The current endslopes have concrete slopewalls while the proposed structure has Class A-4 Rip Rap slopewalls. We analyzed short term (undrained) conditions for the temporary end slopes for both abutments. Since we don't know the exact limits of the rock between the east pier and abutment, we estimated the location of the rock. The high Qu values of the Silty Clay and Silty Clay Loam material ranged between 3.1 and 4.5 tsf; this minimizes the potential for a slope failure of the east end slope. The short term slope analysis showed the east end slope with a factor of safety of 16.7. The west side short term analysis showed a factor of safety of 2.6. See attached SLIDE analyses.

The factors of safety were estimated using commercially available SLIDE 6.0 software. No further testing or analysis is required.

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:

Event/Limit	Design Scour Elevations (ft.)				Item
State	W. Abut	Pier 1	Pier 2	E. Abut.	113
Q100	-	±619.0	±619.0	-	8
Q200	-	±619.0	±619.0	-	
Design	642.76	±619.0	±619.0	643.55	
Check	642.76	±619.0	±619.0	643.55	

The type of superstructure and terrain would not allow access to the substructure locations at Piers 1 and 2; therefore the scour elevations are approximate.

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: The seismic soil class site = C. The SD1 = 0.068 g. The SDs = 0.121 g. The Seismic Performance Zone (SPZ) for this bridge = 1 and therefore a liquefaction analysis was not performed.

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: We used the information from Boring 01 N.W. Quad.) and Boring 02 (S.E. Quad.) to design the foundations for the proposed structure. We cross checked these with the elevations given in the 1955 plans. Due to field conditions, it was not possible to obtain borings close to the piers. We supplemented the borings with Rock Cores 01C (N.W. Quad.) and 02C (S.E. Quad.). No geotechnical reducrions in the foundation depth because of the limestone bedrock that is present.

Integral Abutments - The west abutment should utilize conventional contruction methods to drive piles to refusal into the limestone. We recommend shoes because of the need to drive into the highy fractured limestone. Driving through weathered limestone and setting into the denser but highly fractured material another foot would put the tip elevation at approximately 616.8. At the east abutment, the shallow bedrock and the stiffness of the soils dictate the need to precore and socket the piles into the bedrock. Utilizing bentonite to backfill a minimum 10 ft. length of the pile would allow the required movement for an integral abutment. See the attached drilled shaft tables for the east abutment for further information

H-piles are recommended for both abutments, whether they are driven or drilled and socketed into the rock. See the attached pile tables for the design, resistances, and pile lengths. Because of the difference in bedrock elevations from the east and west abutments, test piles are recommended if driven pilling are used as the foundation. At least one test pile at the west abutment is recommended.

If a semi-integral abutment is desired for the east abutment, drilled shafts are also an option for the east abutment.

Drilled Shafts/Rock Sockets - See the attached drilled shaft tables for shaft resistances at various tip elevations and socket diameters. See the attached rock core logs for further information regarding rock quality. The use of casing for the drilling shafts, above the bedrock is recommended because of the sandy soils encountered in the borings.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: The estimated water surface elevation is 629.5 ft. The proposed piers are drilled shafts in rock; they will have casings. The concrete for the web walls could be tremied as shown on the TSL drawing. This negates the need for cofferdams at the piers.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: The road will be closed during construction and there will be no need for temporary sheeting or other soil retention methods at the stage construction line.

This report was prepared by McCleary Engineering
Terry@mcclearyengineering.com
Office Phone 815-780-8486

Benchmarks: #1: Chiseled "□" on northwest wing wall of SN 050-0052. Elev. = 649.92, Sta. 172+39.40, 17.92' LT.
#2: Railroad spike in power pole. Elev. = 647.55, Sta. 170+22.71, 60.04' RT.

Existing Structure: Structure No. 050-0052 was originally constructed in 1956 as S.B.I. Route 69, Section 121-B-1. In 1984, the bridge was retrofitted with a thrie-beam type railing. The superstructure consists of three-span continuous, reinforced concrete T-Beams supporting a 6½" reinforced concrete deck. The substructure consists of stub abutments supported by driven steel H-piles and solid wall piers supported by spread footings on bedrock. The back-to-back of abutments length measures 146'-8" and the out-to-out width measures 35'-8". The span lengths are 42'-10½", 55'-9", and 42'-10½". The bridge is skewed 30° left forward. The bridge will be closed and traffic detoured during construction.

No Salvage.

DESIGN SPECIFICATIONS

2016 Interim to AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 7th Edition

DESIGN STRESSES

FIELD UNITS:

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

LOADING HL-93

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

HIGHWAY CLASSIFICATION

F.A.S. Route 169 (U.S. 52)
Functional Class: Major Collector
A.D.T.: 1,500 (2016), 1,850 (2036)
D.H.V.: 141
A.D.T.T.: 360 (2016)
Design Speed: 55 M.P.H.
Posted Speed: 55 M.P.H.
Two Way Traffic
Directional Distribution: 50/50

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.066g
Design Spectral Acceleration at 0.2 sec. (SDs) = 0120g
Soil Site Class = C

WATERWAY INFORMATION

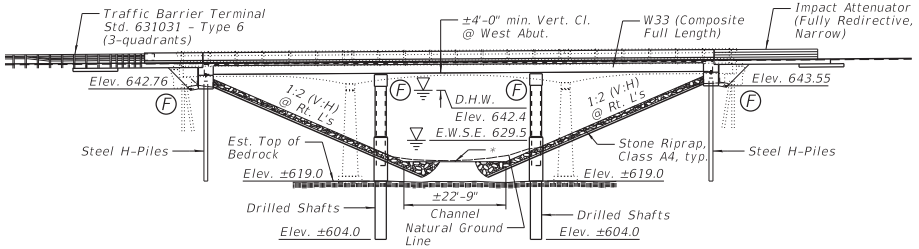
Drainage Area = 55.1 Sq. Mi.
Existing Low Grade Elev. 648.39 @ Sta. 170+66
Proposed Low Grade Elev. 648.39 @ Sta. 170+66

Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft. Exist.	Opening Sq. Ft. Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	4,160	746	755	638.7	0.2	0.2	638.9	638.9
Hydraulic Design	50	6,600	1,063	1,069	642.4	0.3	0.3	642.7	642.7
Base/Scour Design	100	7,680	1,204	1,206	643.8	0.4	0.3	644.2	644.1
Scour Check	200	8,820	1,360	1,353	645.3	0.4	0.3	645.6	645.5
Max. Calc.	500	10,300	1,468	1,434	646.7	0.4	0.4	647.1	647.1

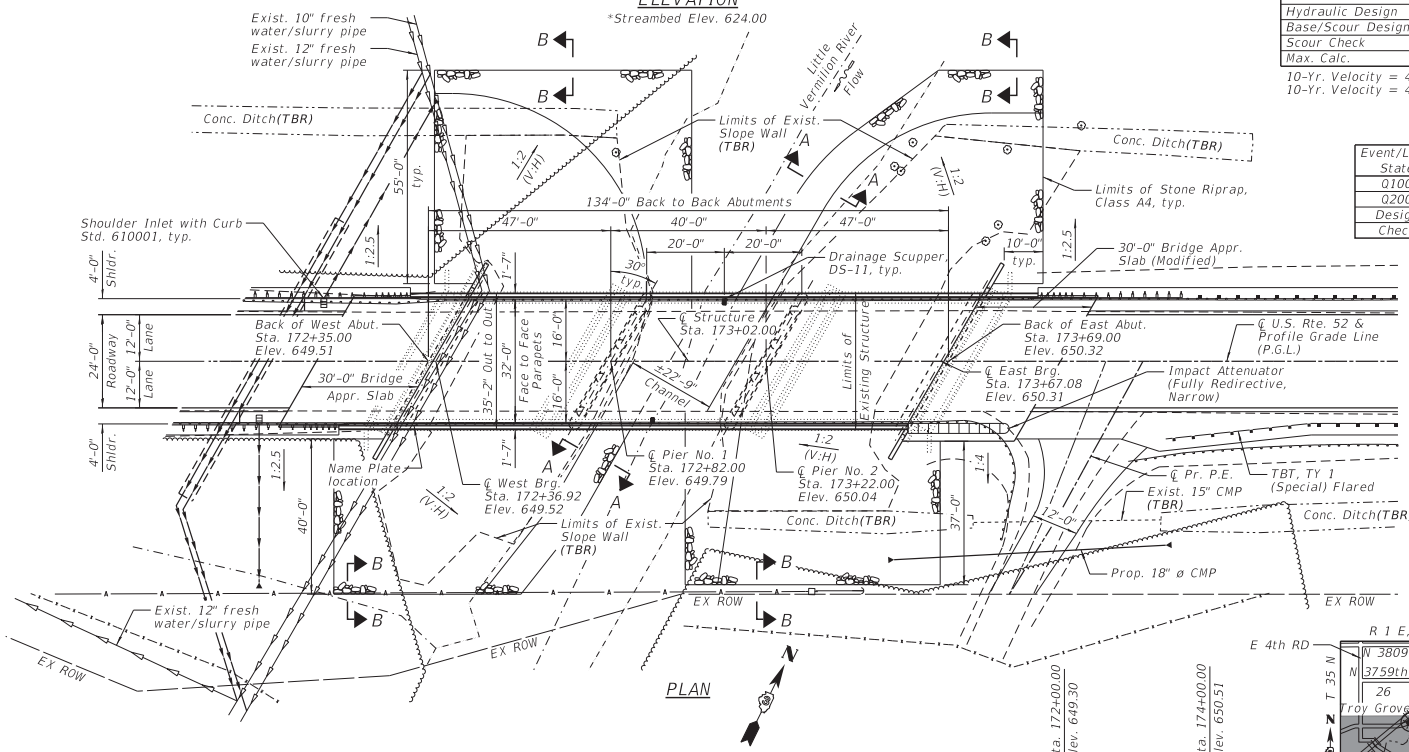
10-Yr. Velocity = 4.6 ft./sec. (Exist.)
10-Yr. Velocity = 4.6 ft./sec. (Prop.)

DESIGN SCOUR ELEVATION TABLE

Event/Limit State	Design Scour Elevations (ft.) W. Abut.	Pier 1	Pier 2	E. Abut.	Item 113
Q100	642.8	±619.0	±619.0	643.6	8
Q200	642.8	±619.0	±619.0	643.6	
Design	642.8	±619.0	±619.0	643.6	
Check	642.8	±619.0	±619.0	643.6	



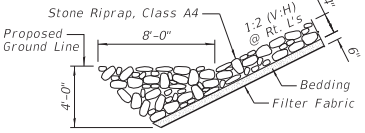
ELEVATION



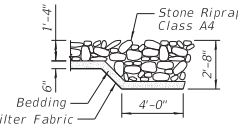
PLAN

PROFILE GRADE

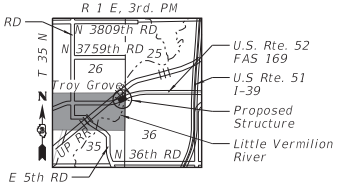
(Along ℄ Roadway)



SECTION A-A



SECTION B-B



LOCATION SKETCH

U.S. ROUTE 52 OVER LITTLE VERMILION RIVER
F.A.S. 169 - SECTION 121BR
LASALLE COUNTY
STATION 173+02.00
STRUCTURE NO. 050-0259

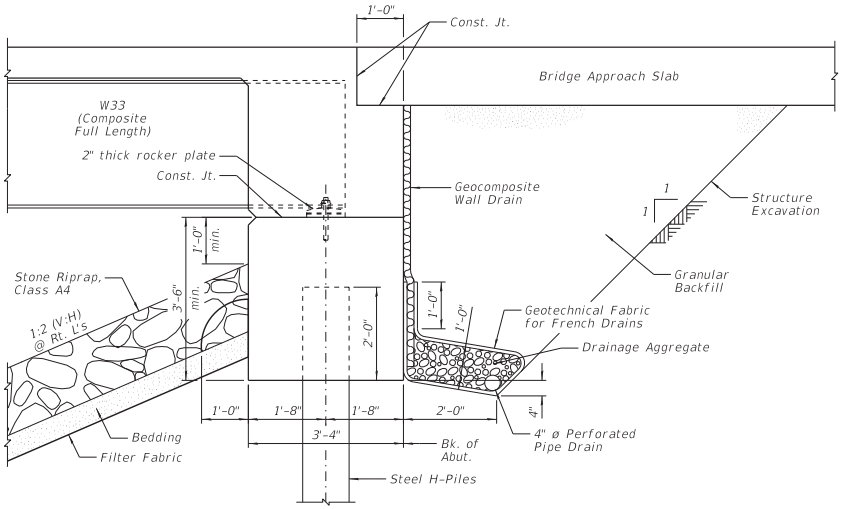
Farnsworth GROUP
2709 McGRAW DRIVE
BLOOMINGTON, ILLINOIS 61704
(309) 663-8435 / Info@f-w.com

	DESIGNED - PMG	REVISED
	CHECKED - JCZ	REVISED
	DRAWN - DJM	REVISED
DATE - 04/28/17	CHECKED - JML	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

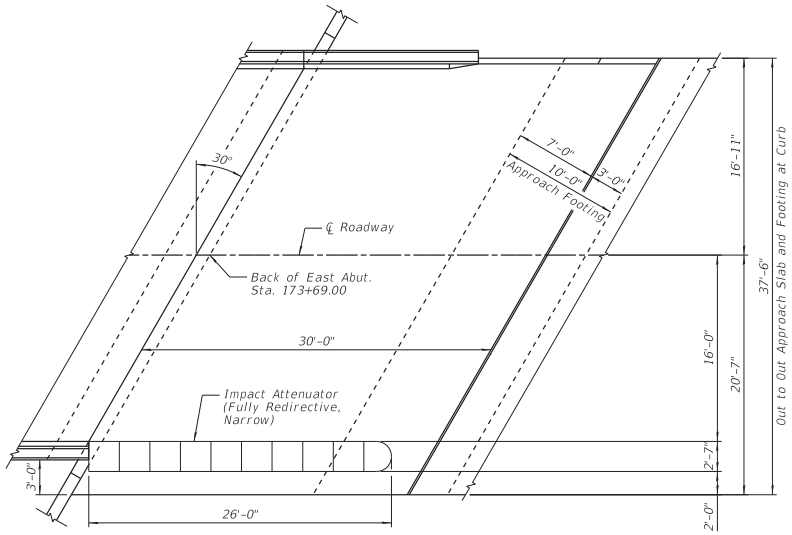
GENERAL PLAN
STRUCTURE NO. 050-0259
SHEET NO. 1 OF 2 SHEETS

F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
169	121BR	LASALLE	2	1
		CONTRACT NO. 66A57		
		ILLINOIS	FED. AID PROJECT	

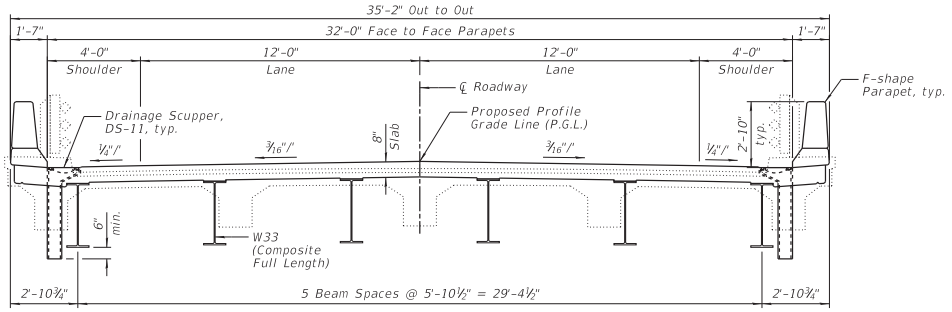


SECTION THRU ABUTMENT

(Horiz. dimensions @ Rt. L's)

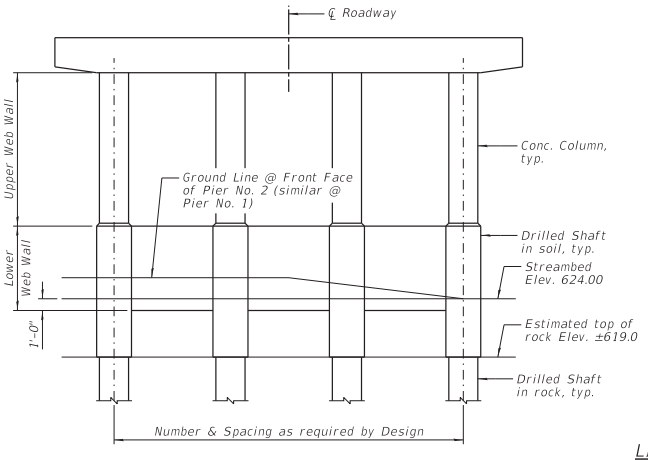


MODIFIED EAST BRIDGE APPROACH SLAB PLAN



CROSS SECTION

(Looking East)



PIER SKETCH

(Looking East)

U.S. ROUTE 52 OVER
LITTLE VERMILION RIVER
F.A.S. 169 - SECTION 121BR
LASALLE COUNTY
STATION 173+02.00
STRUCTURE NO. 050-0259

Farnsworth GROUP
2709 McGRAW DRIVE
BLOOMINGTON, ILLINOIS 61704
(309) 663-8435 / Info@f-w.com

	DESIGNED - PMG	REVISED
	CHECKED - JCZ	REVISED
	DRAWN - DJM	REVISED
DATE - 04/28/17	CHECKED - JML	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

DETAILS
STRUCTURE NO. 050-0259
SHEET NO. 2 OF 2 SHEETS

F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
169	121BR	LASALLE	2	2
		CONTRACT NO. 66A57		
		ILLINOIS	FED. AID PROJECT	

By: PMG 03-21-17
Check: JCZ 03-21-17

SGR LOADS:

Project: US 52 over Little Vermillion River
Route: FAS 169 (US 52)
Section: 121-BR
County: LaSalle
Structure: SN 050-0052 (Existing) SN 050-0259 (Proposed)

TOTAL SUBSTRUCTURE REACTION				
LOCATION	LOAD	VERTICAL (K)	SHEAR (K)	MOMENT (FT-K)
ABUTMENT	SERVICE	532	-	-
	STRENGTH	686	-	-
PIER	SERVICE	556	463	2061
	STRENGTH	730	244	1108

WORST CASE PILE / SHAFT REACTION				
LOCATION	LOAD	VERTICAL (K)	SHEAR (K)	MOMENT (FT-K)
ABUTMENT	SERVICE	165	-	-
	STRENGTH	215	-	-
PIER	SERVICE	334	117	1962
	STRENGTH	383	60	1052

Notes:

1. Number of piles per abutment: 6
2. Number of drilled shafts per pier: 4
3. Lateral loads not evaluated at abutments because integral abutments satisfy ABD Memo 12.3
4. Total substructure reactions are located at the center of the cap
5. Abutment pile reactions are located at the bottom of the cap
6. Pier shaft reactions are located at the bottom of the column and top of the drilled shaft in soil
7. Shear and moment reactions are the resultants of forces parallel and perpendicular to substructure

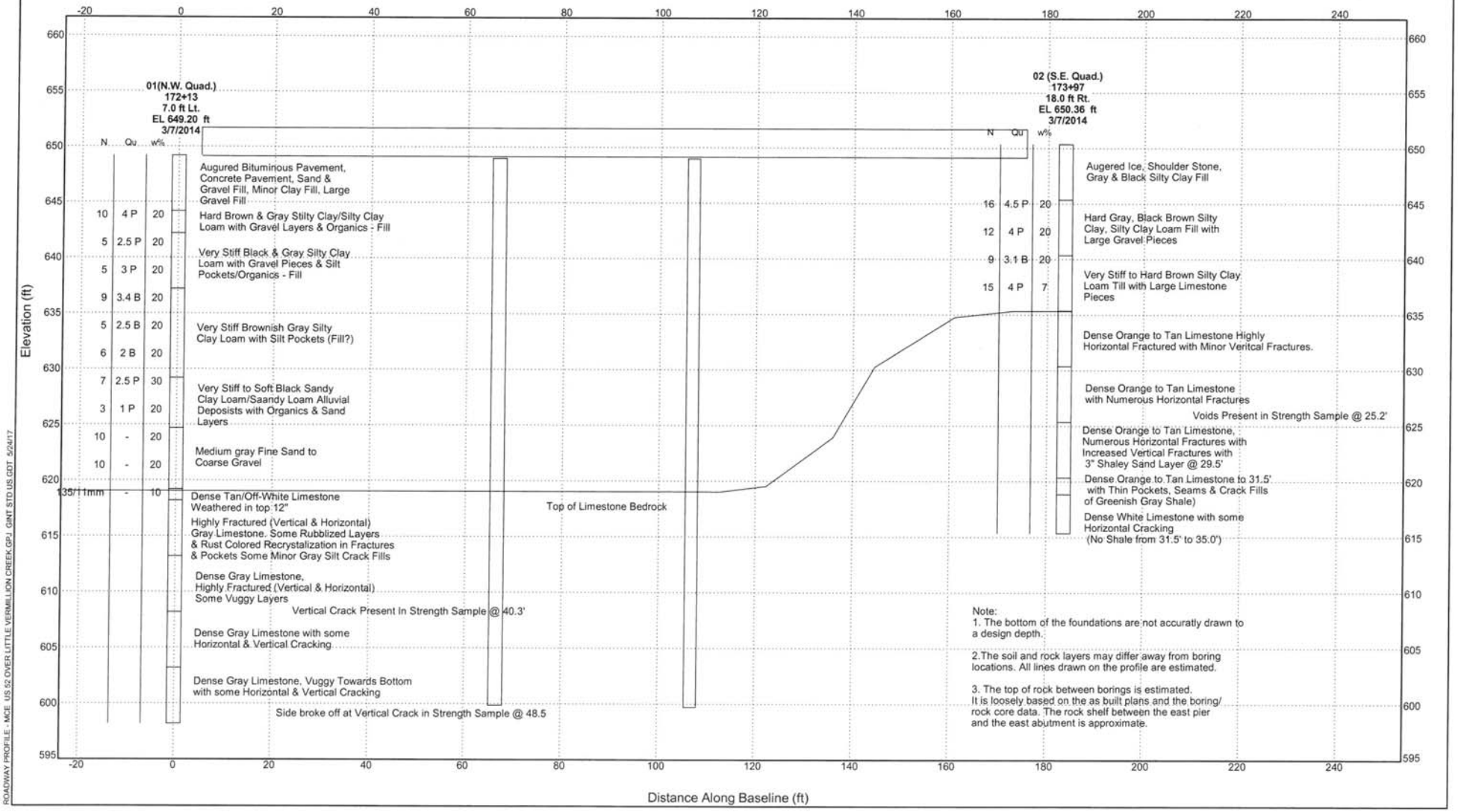
McCleary Engineering
3705 Progress Blvd
Peru, Il 61354
Telephone: 815 780-8486

ROUTE US 52 over Little Vermilion Creek
SECTION 121-B-1
COUNTY LaSalle
PROJECT LOCATION

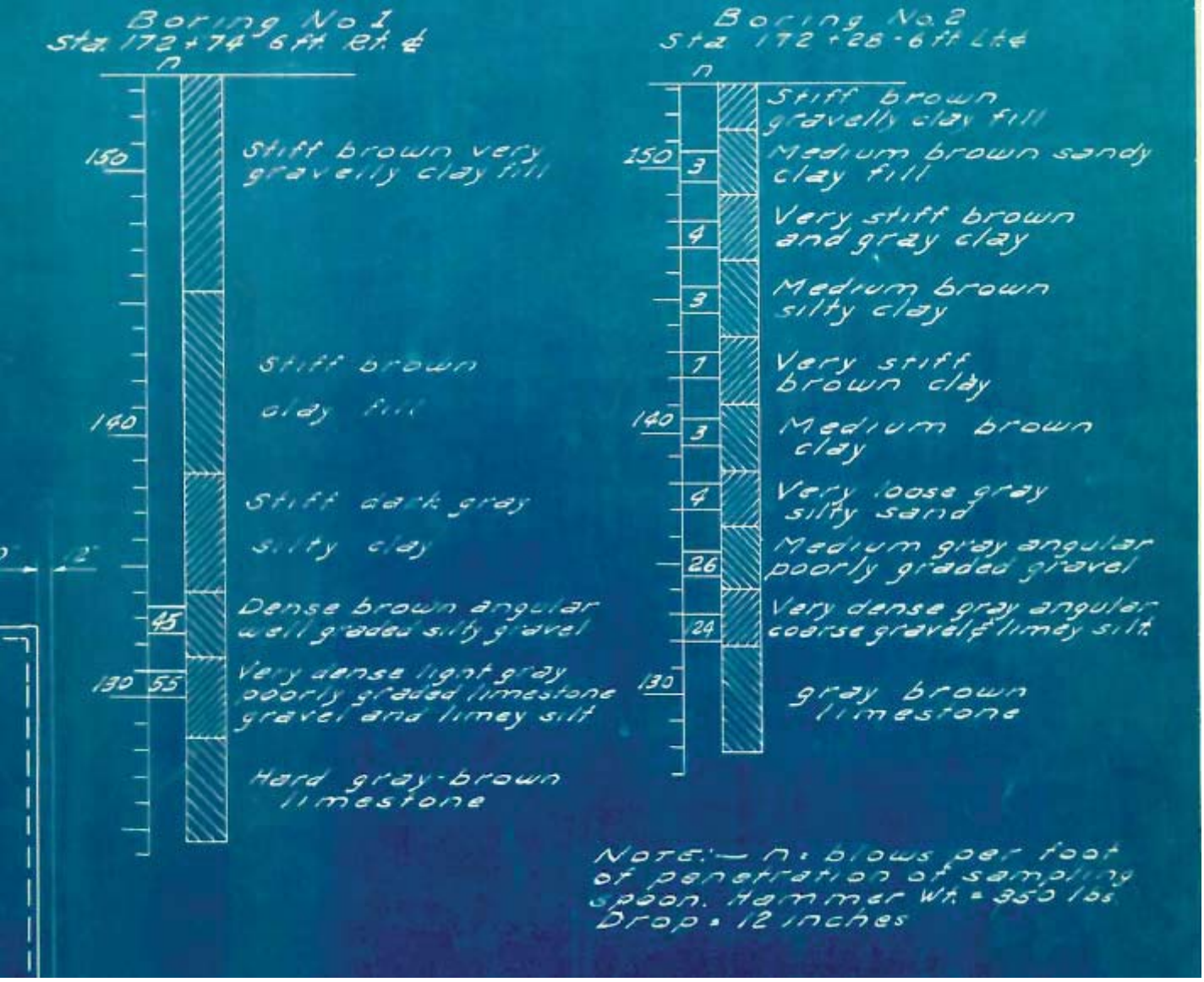
SUBSURFACE PROFILE
Soil Profile
SN 050-0259
US 52 over the Little Vermilion River

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_US 52 OVER LITTLE VERMILION CREEK.GPJ GINT STD US.GDT 5/24/17



Elevation Conversion Factor = add 489.7 to 1955 Borings to get to 2017 datum

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 3/7/14

ROUTE US 52 (FAS 169) **DESCRIPTION** US 52 over Little Vermilion Creek, 3.10 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 121-B-1 **LOCATION** NE 1/4, **SEC.** 35, **TWP.** 35N, **RNG.** 1E, 3rd **PM**, **Latitude** 41.468705, **Longitude** -89.06961

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

STRUCT. NO. 050-0052 (Exist.)
Station 173+02

BORING NO. 01 (N.W. Quad.)
Station 172+13
Offset 7.0 ft Lt.
Ground Surface Elev. 649.20 ft

Surface Water Elev. 626.18 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 624.2 ft ▼
Upon Completion 619.2 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Bituminous Pavement, Concrete Pavement, Sand & Gravel Fill, Minor Clay Fill, Large Gravel Fill			
644.20			
-5	3		
Hard Brown & Gray Silty Clay/Silty Clay Loam with Gravel Layers & Organics - Fill	4 6	4.0 P	18
642.20			
Very Stiff Black & Gray Silty Clay Loam with Gravel Pieces & Silt Pockets/Organics - Fill	4		
	3 2	2.5 P	17
-10			
	2		
	2 3	3.0 P	19
637.20			
Very Stiff Brownish Gray Silty Clay Loam with Silt Pockets (Fill?)	3		
	4 5	3.4 B	21
-15			
	2		
	2 3	2.5 B	23
	3		
	3 3	2.0 B	23
629.20			
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Soft Black Sandy Clay Loam/Sandy Loam Alluvial Deposits with Organics & Sand Layers	2		
	4 3	2.5 P	28
	WH		
	1 2	1.0 P	20
624.70			
-25 ▼ Medium Gray Fine Sand to Coarse Gravel	5		
	5 5		17
	7		
	5 5		15
619.20 ▽ -30			
Dense Tan/Off-White Limestone, Weathered in top 12"	27		
	35 100/5"		14
617.78			
End of Boring			
-35			
-40			

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

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 3/7/14

ROUTE US 52 (FAS 169) **DESCRIPTION** US 52 over Little Vermilion Creek, 3.10 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 121-B-1 **LOCATION** NE 1/4, **SEC.** 35, **TWP.** 35N, **RNG.** 1E, 3rd **PM**, **Latitude** 41.468876, **Longitude** -89.06898

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

STRUCT. NO. 050-0052 (Exist.)
Station 173+02

BORING NO. 02 (S.E. Quad.)
Station 173+97
Offset 18.0 ft Rt.
Ground Surface Elev. 650.36 ft

Surface Water Elev. 626.18 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 Ice, Shoulder Stone, Gray & Black Silty Clay Fill				
645.36	-5			
Hard Gray, Black, Brown Silty Clay, Silty Clay Loam Fill with Large Gravel Pieces		5		
		7 9	4.5 P	19
		3		
		5 7	4.0 P	21
640.36	-10			
Very Stiff to Hard Brown Silty Clay Loam Till with Large Limestone Pieces		3		
		4 5	3.1 B	20
		7		
		8 7	4.0 P	7
	-15			
634.86		31		
Buff to Orange Limestone, Weathered at Surface		100/3"		5
632.78				
End of Boring		100/1"		3
	-20			

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

ROCK CORE LOG

Date 4/18/17

ROUTE US 52 (FAS 169) **DESCRIPTION** US 52 over Little Vermilion Creek, 3.10 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 121-B-1 **LOCATION** NE 1/4, **SEC.** 35, **TWP.** 35N, **RNG.** 1E, 3rd **PM**,
Latitude 41.468705, **Longitude** -89.06961

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

STRUCT. NO. 050-0052 (Exist.)
Station 173+02

BORING NO. 01C (N.W. Quad.)
Station 172+13
Offset 7.0 ft Lt.
Ground Surface Elev. 649.20 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 618.20 ft
Begin Core Elev. 618.20 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Highly Fractured (Vertical & Horizontal) Gray Limestone. Some Rubblized Layers & Rust Colored Recrystalization in Fractures & Pockets. Some Minor Gray Silt Crack Fills.	-35	1	65	0	2.6	
	613.20					
Dense Gray Limestone, Highly Fractured (Vertical & Horizontal). Some Vuggy Layers.	-40	2	98	10	3.6	
Vertical Crack Present in Strength Sample @ 40.3'	608.20					521.2
Dense Gray Limestone with some Horizontal & Vertical Cracking.	-45	3	100	58	3.4	448.3
	603.20					1798.7
Dense Gray Limestone, Vuggy Towards Bottom with some Horizontal & Vertical Cracking.		4	100	72	4	2740.3
Side Broke Off at Vertical Crack in Strength Sample @ 48.5'	-50					408.2
	598.20					727.2 650.0

End of Boring

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

BBS, form 138 (Rev. 8-99)

ROCK CORE 050-0052.GPJ IL_DOT.GDT 5/10/17

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

ROCK CORE LOG

Date 4/21/17

ROUTE US 52 (FAS 169) **DESCRIPTION** US 52 over Little Vermilion Creek, 3.10 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 121-B-1 **LOCATION** NE 1/4, **SEC.** 35, **TWP.** 35N, **RNG.** 1E, 3rd **PM**,
Latitude 41.468876, **Longitude** -89.06898

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

STRUCT. NO. 050-0052 (Exist.)
Station 173+02

BORING NO. 02C (S.E. Quad.)
Station 173+97
Offset 18.0 ft Rt.
Ground Surface Elev. 650.36 ft

CORING BARREL TYPE & SIZE N W/L 2
Core Diameter 1.9 in
Top of Rock Elev. 635.36 ft
Begin Core Elev. 635.36 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Dense Orange to Tan Limestone Highly Horizontaly Fractured with Minor Vertical Fractures.	1	80	0	5.4	
630.36 -20					
Dense Orange to Tan Limestone with Numerous Horizontal Fractures.	2	100	23	3.6	
625.36 -25					
Voids Present in Strength Sample @ 25.2'					1448.9
Dense Orange to Tan Limestone, Numerous Horizontal Fractures with Increased Vertical Fractures with 3" Shaley Sand Layer at 29.5'.	3	100	75	4	901.6
					899.2
Vertical Crack Present in Strength Sample @ 28.5'					265.7
620.36 -30					
Dense Orange to Tan Limestone to 31.5' with Thin Pockets, Seams & Crack Fills of Greenish Gray Shale.	4	100	33	3.6	461.5
618.86					
Dense White Limestone with some Horizontal Cracking (No Shale From 31.5' - 35.0').					813.5
					619.5
					605.3
					918.9
615.36 -35					

End of Boring

Color pictures of the cores Yes

Cores will be stored for examination until Construction Complete

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

ROCK CORE 050-0052.GPJ IL_DOT.GDT 5/10/17

SN 050-0052
Hole # 1 N.W. Quad
4.18-17
Depth 31ft- 41 FT
Box 1 of 3

Run #1
31 Start

SN 050-0052

HOLE #1 N.W QUAD

4-18-17

DEPTH 41' - 50'

BOX 2 OF 3

Start Run #3 41

04/28/2017

SN 050-0052

HOLE #1 N.W QUAD

4-18-17

DEPTH 50-51'

BOX 3 OF 3

04/28/2017

SN 050-0052
Hole #2 S.E. Quad
4-21-17
Depth 15 FT to 25 FT
Box 1 of 3

Beg 15'

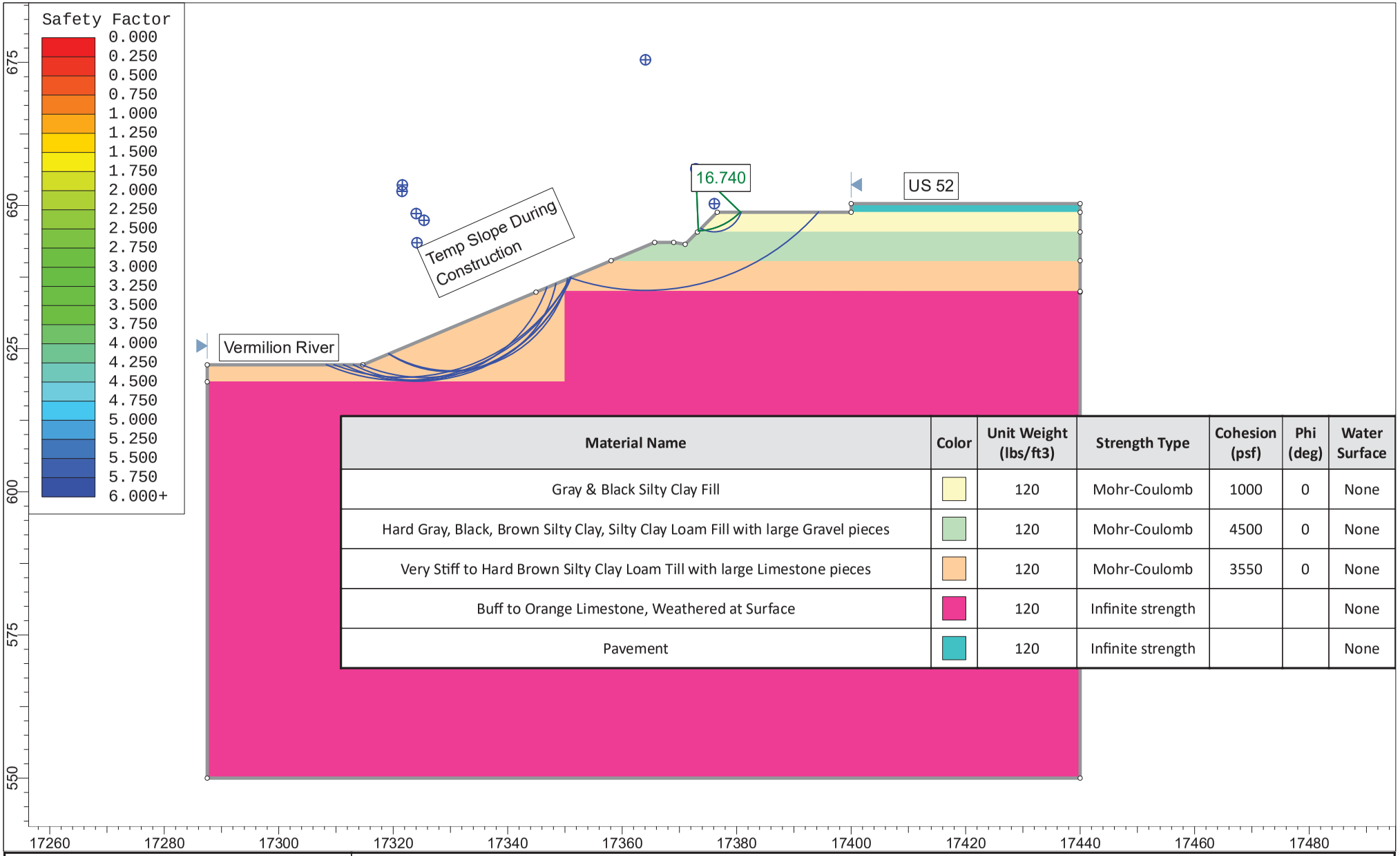
SN 050-0032
Hole #2 S.E. Quad
4-21-17
Depth: 25 FT to 33.5 FT
Box 2 of 3

Dup #3 start 25'

04/28/2017

SN 050-0052
Hole #2 S.E. Quad
4-21-17
Depth 33.5 Ft to 35.0 Ft
Box 3 of 3

04/28/2017



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Gray & Black Silty Clay Fill		120	Mohr-Coulomb	1000	0	None
Hard Gray, Black, Brown Silty Clay, Silty Clay Loam Fill with large Gravel pieces		120	Mohr-Coulomb	4500	0	None
Very Stiff to Hard Brown Silty Clay Loam Till with large Limestone pieces		120	Mohr-Coulomb	3550	0	None
Buff to Orange Limestone, Weathered at Surface		120	Infinite strength			None
Pavement		120	Infinite strength			None

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SLIDEINTERPRET 6.039

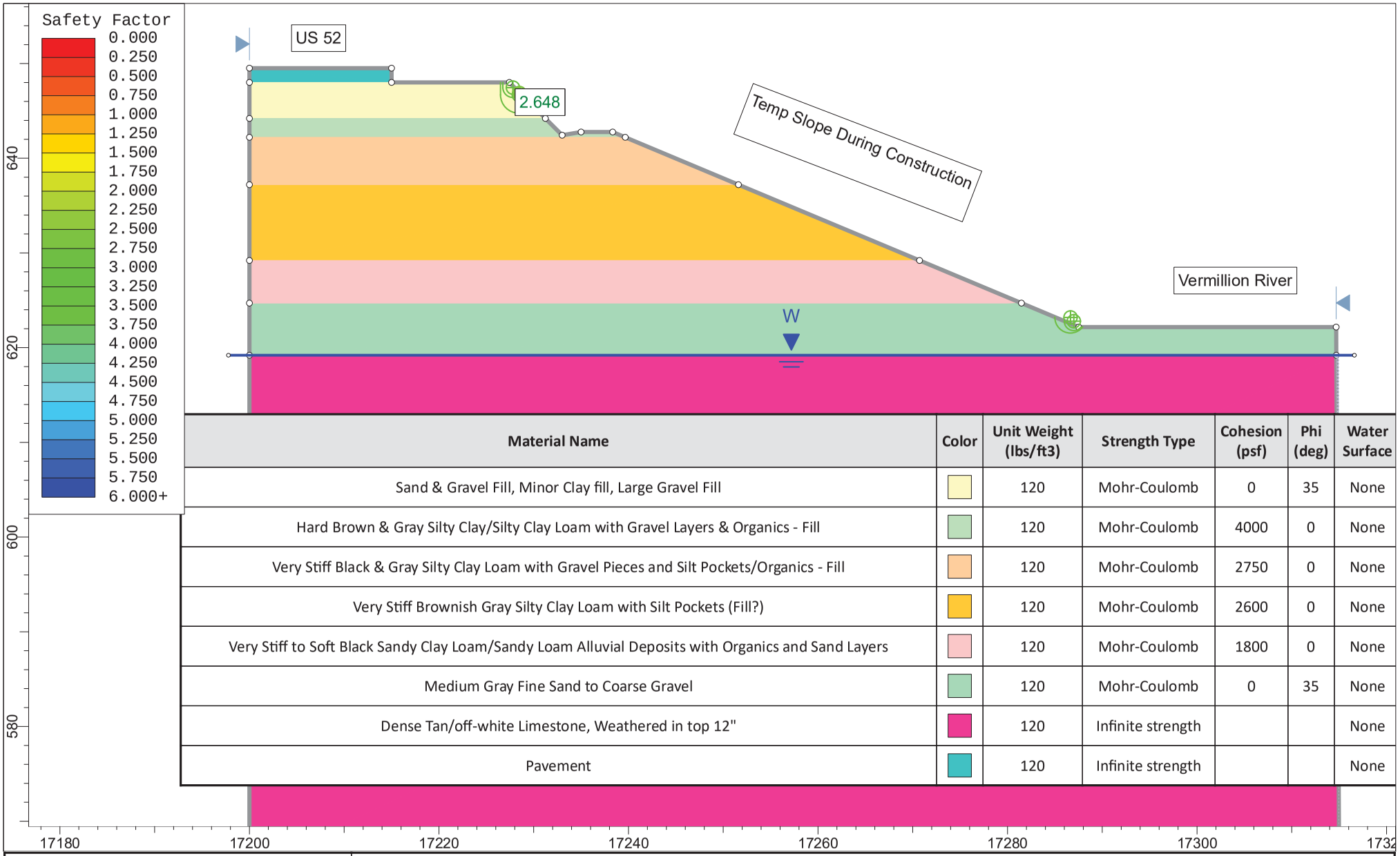
SLIDE - An Interactive Slope Stability Program

Slope Stabilty Analysis for East Abut SN 050-0259 US 52 over Vermilion River

Analysis Description: Short Term (Undrained) Slope Analysis

Drawn By: MJ | *Scale*: 1:278 | *Company*: McCleary Engineering

Date: 5/15/2017, 10:54:00 AM | *File Name*: Slide right side temp halfrock 050-0259.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sand & Gravel Fill, Minor Clay fill, Large Gravel Fill		120	Mohr-Coulomb	0	35	None
Hard Brown & Gray Silty Clay/Silty Clay Loam with Gravel Layers & Organics - Fill		120	Mohr-Coulomb	4000	0	None
Very Stiff Black & Gray Silty Clay Loam with Gravel Pieces and Silt Pockets/Organics - Fill		120	Mohr-Coulomb	2750	0	None
Very Stiff Brownish Gray Silty Clay Loam with Silt Pockets (Fill?)		120	Mohr-Coulomb	2600	0	None
Very Stiff to Soft Black Sandy Clay Loam/Sandy Loam Alluvial Deposits with Organics and Sand Layers		120	Mohr-Coulomb	1800	0	None
Medium Gray Fine Sand to Coarse Gravel		120	Mohr-Coulomb	0	35	None
Dense Tan/off-white Limestone, Weathered in top 12"		120	Infinite strength			None
Pavement		120	Infinite strength			None

rocscience

SLIDEINTERPRET 6.039

SLIDE - An Interactive Slope Stability Program

Slope Stabilty Analysis for West Abut SN 050-0259 US 52 over Vermilion River

Analysis Description: Short Term (Undrained) Slope Analysis

Drawn By	MJ	*Scale*	1:168	*Company*	McCleary Engineering
Date	5/15/2017, 10:25:06 AM			*File Name*	Slide left side temp 50-0256.slim

USGS Design Maps Summary Report

User–Specified Input

Report Title SN 050-0259 US 52 over the Vermilion River
Wed May 17, 2017 16:19:40 UTC

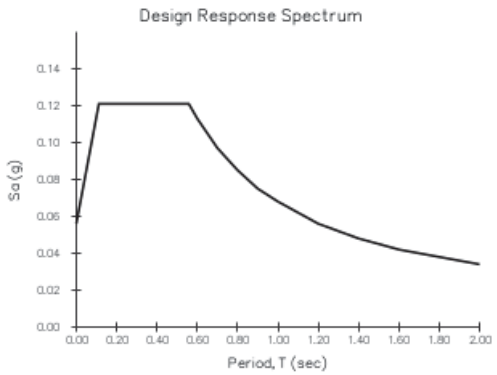
Building Code Reference Document 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design
(which utilizes USGS hazard data available in 2002)

Site Coordinates 41.46779°N, 89.07675°W

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

USGS–Provided Output

PGA =	0.046 g	**A_s =**	0.056 g
S_S =	0.101 g	**S_{DS} =**	0.121 g
S_1 =	0.040 g	**S_{D1} =**	0.068 g



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SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====

Substructure 1

Base of Substruct. Elev. (or ground surf for bents	642.76	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-1	
Top of Boring Elev.	649.2	ft.
Approximate Fixity Elev.	636.76	ft.

Individual Site Class Definition:

N (bar): 25 (Blows/ft.) Soil Site Class D
N_{ch} (bar): 64 (Blows/ft.) Soil Site Class C <----Controls
s_u (bar): 3.94 (ksf) Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	644.2	5.00	15	0.00	B
	642.2	2.00	10	4.00	B
	637.2	5.00	5	2.75	B
2.6	634.2	3.00	9	3.40	
4.6	632.2	2.00	5	2.50	
7.6	629.2	3.00	6	2.00	B
9.6	627.2	2.00	7	2.50	
12.1	624.7	2.50	3	1.00	B
14.6	622.2	2.50	10		
17.6	619.2	3.00	10		B
19.0	617.8	1.42	2	0.60	B
100.0	536.8	81.00	250	5.00	R

Substructure 2

Base of Substruct. Elev. (or ground surf for bents	643.55	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-2	
Top of Boring Elev.	650.36	ft.
Approximate Fixity Elev.	637.55	ft.

Individual Site Class Definition:

N (bar): 87 (Blows/ft.) Soil Site Class C
N_{ch} (bar): 100 (Blows/ft.) Soil Site Class C
s_u (bar): 4.97 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	645.4	5.00	15	4.80	B
	642.9	2.50	16	4.50	
	640.4	2.50	12	4.00	B
	637.9	2.50	9	3.10	
2.7	634.9	3.00	15	4.00	B
4.8	632.8	2.10	100		B
100.0	537.6	95.20	250	5.00	R

Substructure 3

Base of Substruct. Elev. (or ground surf for bents)		ft.
Pile or Shaft Dia.		inches
Boring Number		
Top of Boring Elev.		ft.
Approximate Fixity Elev.		ft.

Individual Site Class Definition:

N (bar): (Blows/ft.) NA
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): (ksf) NA

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary

Substructure 4

Base of Substruct. Elev. (or ground surf for bents)		ft.
Pile or Shaft Dia.		inches
Boring Number		
Top of Boring Elev.		ft.
Approximate Fixity Elev.		ft.

Individual Site Class Definition:

N (bar): (Blows/ft.) NA
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): (ksf) NA

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary

Global Site Class Definition: Substructures 1 through 2

N (bar): 56 (Blows/ft.) Soil Site Class C
N_{ch} (bar): 83 (Blows/ft.) Soil Site Class C <----Controls
s_u (bar): 4.46 (ksf) Soil Site Class C

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

STRUCTURE NUMBER==========	050-0052	
STRUCTURE TYPE ==========	MULTI-SPAN	
STRUCTURE SKEW==========	30	DEGREES
TOTAL STRUCTURE LENGTH==========	134.00	FT
LONGEST END SPAN LENGTH ==========	47.00	FT

ABUTMENT #1 DATA

ABUTMENT NAME ==========	West	
ABUTMENT REFERENCE BORING==========	B-1	
BOTTOM OF ABUTMENT ELEVATION==========	642.76	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	5	

ABUTMENT #2 DATA

ABUTMENT NAME ==========	East	
ABUTMENT REFERENCE BORING==========	B-2	
BOTTOM OF ABUTMENT ELEVATION==========	643.55	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	5	

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)
642.20	0.56	4.0		
639.70	2.50	2.5		
637.20	2.50	3.0		
634.70	2.50	3.4		
632.76	1.94	2.5		

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)
640.36	3.19	4.0		
637.86	2.50	3.1		
634.86	3.00	4.0		
633.55	1.31		400	5.2

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1======= 2.93 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*2.93])========== 1.76

#VALUE!

#VALUE!

WEIGHTED AVERAGE Qu FOR ABUTMENT #2======= 3.93 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #2

WEIGHTED AVE. Qu > 3.0 TSF, SO INTEGRAL ABUTMENT NOT ALLOWED

#VALUE! FT

#VALUE! FT

EFFECTIVE EXPANSION LENGTH (EEL) CALCULATION

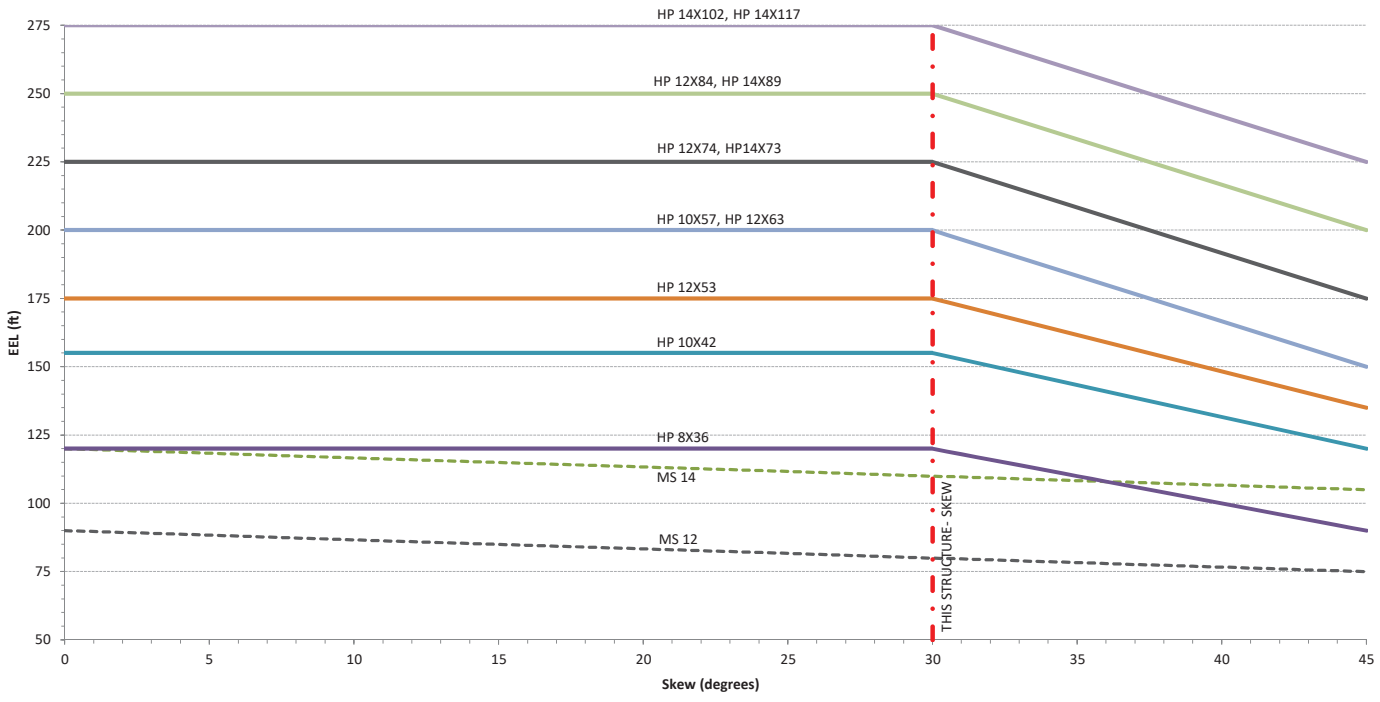
CONTROLLING ABUTMENT========== #VALUE!

CONTROLLING EXPANSION LENGTH (DISTANCE TO CENTROID OF STIFFNESS FROM CONTROLLING ABUTMENT) ==========	#VALUE!	#VALUE!
WEIGHTED AVE. Qu FOR CONTROLLING ABUTMENT ==========	#VALUE!	#VALUE!
	#VALUE!	
	#VALUE!	#VALUE!

FEASIBLE PILE TYPES PER CHART IN ABD MEMO 12.3 BASED ON SKEW AND EEL OR MODIFIED EEL:

AVAILABLE PILE SIZES:

INTEGRAL ABUTMENT MAY NOT BE USED DUE TO AVERAGE Qu WITHIN CRITICAL PILE DEPTH AT ABUTMENT EXCEEDING 3.0 TSF



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IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== west abut. SN 050-0259
REFERENCE BORING ========== 01 (N.W. Quad.)
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 644.76 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 642.76 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 532 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 40.60 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 104.83 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 39.31 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	**418** KIPS	**230** KIPS	**29** FT.

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
642.20	0.56	4.00	10		4.2		38.7	6.2		***9.9***	10	0	0	5	3
639.70	2.50	2.50	5		13.4	34.5	58.9	19.5	3.8	***30.2***	30	0	0	17	5
637.20	2.50	3.00	5		15.2	41.3	79.6	22.2	4.5	***53.0***	53	0	0	29	8
634.70	2.50	3.40	9		16.6	46.9	83.8	24.3	5.1	***75.9***	76	0	0	42	10
632.20	2.50	2.50	5		13.4	34.5	***90.3***	19.5	3.8	94.7	90	0	0	50	13
629.70	2.50	2.00	6		11.5	27.6	***101.8***	16.9	3.0	111.6	102	0	0	56	15
629.20	0.50	2.00	6		2.3	27.6	***111.0***	3.4	3.0	115.7	111	0	0	61	16
627.20	2.00	2.50	7		10.7	34.5	***101.0***	15.6	3.8	129.1	101	0	0	56	18
624.70	2.50	1.00	3		7.0	13.8	***118.8***	10.3	1.5	140.6	119	0	0	65	20
622.20	2.50		10	Sandy Gravel	2.3	24.5	***121.1***	3.4	2.7	144.0	121	0	0	67	23
619.70	2.50		10	Sandy Gravel	2.3	24.5	***123.4***	3.4	2.7	147.3	123	0	0	68	25
619.20	0.50		10	Sandy Gravel	0.5	24.5	163.7	0.7	2.7	***152.4***	152	0	0	84	26
618.20	1.00		35	Hard Till	1.5	64.3	321.4	2.2	7.0	***171.7***	172	0	0	94	27
617.70	0.50		120	Hard Till	6.1	220.5	352.0	8.9	24.1	***183.3***	183	0	0	101	27
616.70	1.00			Limestone	98.8	245.0	450.8	144.5	26.8	***327.8***	328	0	0	180	28.1
615.70	1.00			Limestone	98.8	245.0	549.6	144.5	26.8	***472.3***	~~472~~	~~0~~	~~0~~	~~260~~	~~29.1~~
614.70	1.00			Limestone	98.8	245.0	648.5	144.5	26.8	***616.8***	~~617~~	~~0~~	~~0~~	~~339~~	~~30.1~~
613.70	1.00			Limestone	98.8	245.0	***747.3***	144.5	26.8	761.3	~~747~~	~~0~~	~~0~~	~~411~~	~~31.1~~
612.70	1.00			Limestone		245.0			26.8						

Pile Design Table for west abut. SN 050-0259 utilizing Boring #01 (N.W. Quad.)

Metal Shell, Precast concrete and/or Timber Piling should not be used on this project due to the close proximity of bedrock

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
66	36	18
75	41	20
77	42	23
79	43	25
97	53	26
116	64	27
123	68	27
286	157	29
Steel HP 10 X 42		
71	39	13
81	44	15
82	45	18
95	52	20
97	54	23
99	55	25
127	70	26
143	79	27
153	84	27
335	184	29

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
65	36	10
73	40	13
83	46	15
84	46	18
98	54	20
100	55	23
102	56	25
130	72	26
150	83	27
161	88	27
454	250	30
Steel HP 12 X 53		
53	29	8
76	42	10
90	50	13
101	56	18
119	65	20
121	67	23
123	68	25
152	84	26
172	94	27
183	101	27
418	230	29
Steel HP 12 X 63		
55	30	8
78	43	10
91	50	13
102	56	18
120	66	20
122	67	23
125	69	25
156	86	26
178	98	27
191	105	27
497	273	30
Steel HP 12 X 74		
56	31	8
79	43	10
93	51	13
103	57	18
122	67	20
124	68	23
127	70	25
158	87	26
184	101	27
197	108	27
589	324	30
Steel HP 12 X 84		
57	31	8
80	44	10
94	52	13
105	58	18
124	68	20
126	69	23
128	71	25
160	88	26
189	104	27
203	112	27
664	365	31

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
65	36	8
92	51	10
113	62	13
123	67	18
146	80	20
149	82	23
152	83	25
185	101	26
211	116	27
225	124	27
578	318	30
Steel HP 14 X 89		
67	37	8
94	52	10
115	63	13
124	68	18
148	81	20
151	83	23
154	84	25
188	103	26
220	121	27
235	129	27
705	388	30
Steel HP 14 X 102		
68	38	8
95	52	10
116	64	13
126	69	18
150	82	20
153	84	23
156	86	25
190	105	26
226	124	27
242	133	27
810	445	31
Steel HP 14 X 117		
70	39	8
97	53	10
118	65	13
127	70	18
152	84	20
155	85	23
158	87	25
194	107	26
235	129	27
251	138	27
929	511	31

Illinois Department of Transportation

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

STRUCTURE ========== SN 050-0259
SUBSTRUCTURE & REFERENCE BORING ======= East Abut- Boring 02C (S.E. Quad.)
GROUND SURFACE ELEVATION ========== 650.36 FT
GROUND WATER ELEVATION ========== FT
ESTIMATED TOP OF ROCK ELEVATION ========= 635.36 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 24 IN.
FACTORED AXIAL LOAD ========== 215 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ===: REDUNDANT

Drilled Shaft Dia.'s for Design Table

24	IN.
30	IN,
36	IN.
42	IN.
48	IN.
54	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				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_p/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
5.00	630.36	5.00	50.0	Limestone	25	Fractured	0	Open	No	0	0	0	55	0.016	#####	50.0	87	44	0.041	0.00	0	0	55	0.016	#####
10.00	625.36	5.00	50.0	Limestone	35	Fractured	23	Open	No	98	98	54	111	0.017	#####	100.0	195	97	0.066	0.19	121	65	165	0.019	0.008
14.00	621.36	4.00	100.0	Limestone	50	Normal	75	Open	No	366	464	255	186	0.019	0.335	68.8	242	121	0.231	0.37	657	349	196	0.019	0.268
16.50	618.86	2.50	50.0	Limestone	15	Fractured	54	Open	No	58	522	287	215	0.023	0.366										
20.00	615.36	3.50	100.0	Limestone	60	Normal	33	Closed	Yes	320	842	463	284	0.024	0.380										

Illinois Department of Transportation

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

Drilled Shaft Design Table for East Abut- Boring 02C (S.E. Quad.)

Estimated Top of Rock Elevation: 635.36

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
24 in. Diameter Drilled Shaft							
5	630.36	87	44	TIP	--	--	0.041
10	625.36	195	97	TIP	--	--	0.066
14	621.36	657	349	SIDE + TIP	196	0.019	0.268
16.5	618.86	522	287	SIDE	215	0.023	0.366
20	615.36	842	463	SIDE	284	0.024	0.380
30 in. Diameter Drilled Shaft							
5	630.36	136	68	TIP	--	--	0.050
10	625.36	286	143	TIP	--	--	0.113
14	621.36	884	466	SIDE + TIP	251	0.020	0.285
16.5	618.86	652	359	SIDE	267	0.024	0.450
20	615.36	1052	579	SIDE	353	0.024	0.463
36 in. Diameter Drilled Shaft							
5	630.36	214	107	TIP	--	--	0.076
10	625.36	392	196	TIP	--	--	0.167
14	621.36	1145	600	SIDE + TIP	309	0.022	0.299
16.5	618.86	782	430	SIDE	318	0.025	0.535
20	615.36	1263	694	SIDE	420	0.025	0.547
42 in. Diameter Drilled Shaft							
5	630.36	307	154	TIP	--	--	0.088
10	625.36	529	265	TIP	--	--	0.198
14	621.36	812	446	SIDE	321	0.022	0.573
16.5	618.86	913	502	SIDE	370	0.026	0.621
20	615.36	1473	810	SIDE	488	0.025	0.633
48 in. Diameter Drilled Shaft							
5	630.36	417	209	TIP	--	--	0.076
10	625.36	703	351	TIP	--	--	0.207
14	621.36	927	510	SIDE	366	0.023	0.653
16.5	618.86	1043	574	SIDE	422	0.028	0.707
20	615.36	1684	926	SIDE	555	0.026	0.719
54 in. Diameter Drilled Shaft							
5	630.36	543	272	TIP	--	--	0.084
10	625.36	901	450	TIP	--	--	0.240
14	621.36	1043	574	SIDE	410	0.024	0.733
16.5	618.86	1174	645	SIDE	473	0.029	0.793
20	615.36	1894	1042	SIDE	622	0.027	0.806

Illinois Department of Transportation

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

STRUCTURE ========== SN 050-0259
SUBSTRUCTURE & REFERENCE BORING ======= Pier 1 - Boring 01C (N.W. Quad.)
GROUND SURFACE ELEVATION ========== 649.20 FT
GROUND WATER ELEVATION ========== 625.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 618.20 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 36 IN.
FACTORED AXIAL LOAD ========== 383 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

Drilled Shaft Dia.'s for Design Table

24	IN.
30	IN.
36	IN.
42	IN.
48	IN.
54	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				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_p/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
5.00	613.20	5.00	50.0	Limestone	25	Fractured	0	Open	No	0	0	0	83	0.019	#####	50.0	237	119	0.141	0.00	0	0	83	0.019	#####
10.00	608.20	5.00	50.0	Limestone	25	Fractured	10	Open	No	71	71	39	166	0.027	#####	75.0	324	162	0.163	0.00	71	39	166	0.027	#####
13.00	605.20	3.00	50.0	Limestone	25	Normal	58	Open	No	291	362	199	216	0.031	0.451	100.0	397	199	0.190	0.58	690	360	275	0.033	0.202
17.00	601.20	4.00	100.0	Limestone	25	Normal	65	Open	No	549	911	501	323	0.040	1.142										
20.00	598.20	3.00	100.0	Limestone	25	Normal	72	Open	Yes	412	1323	727	404	0.046	1.412										

Illinois Department of Transportation

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

Drilled Shaft Design Table for Pier 1 - Boring 01C (N.W. Quad.)

Estimated Top of Rock Elevation: 618.20

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
24 in. Diameter Drilled Shaft							
5	613.2	106	53	TIP	--	--	0.084
10	608.2	130	65	TIP	--	--	0.117
13	605.2	382	201	SIDE + TIP	172	0.027	0.153
17	601.2	607	334	SIDE	217	0.034	0.775
20	598.2	882	485	SIDE	272	0.041	0.963
30 in. Diameter Drilled Shaft							
5	613.2	165	82	TIP	--	--	0.104
10	608.2	217	108	TIP	--	--	0.135
13	605.2	525	275	SIDE + TIP	223	0.030	0.177
17	601.2	759	418	SIDE	270	0.037	0.958
20	598.2	1102	606	SIDE	338	0.043	1.187
36 in. Diameter Drilled Shaft							
5	613.2	237	119	TIP	--	--	0.141
10	608.2	324	162	TIP	--	--	0.163
13	605.2	690	360	SIDE + TIP	275	0.033	0.202
17	601.2	911	501	SIDE	323	0.040	1.142
20	598.2	1323	727	SIDE	404	0.046	1.412
42 in. Diameter Drilled Shaft							
5	613.2	323	162	TIP	--	--	0.164
10	608.2	452	226	TIP	--	--	0.191
13	605.2	878	456	SIDE + TIP	329	0.035	0.228
17	601.2	1063	585	SIDE	376	0.043	1.325
20	598.2	1543	849	SIDE	471	0.049	1.637
48 in. Diameter Drilled Shaft							
5	613.2	422	211	TIP	--	--	0.165
10	608.2	601	301	TIP	--	--	0.219
13	605.2	483	266	SIDE	287	0.036	0.595
17	601.2	1215	668	SIDE	429	0.045	1.509
20	598.2	1764	970	SIDE	537	0.052	1.863
54 in. Diameter Drilled Shaft							
5	613.2	565	283	TIP	--	--	0.192
10	608.2	772	386	TIP	--	--	0.273
13	605.2	543	299	SIDE	323	0.038	0.667
17	601.2	1367	752	SIDE	482	0.048	1.693
20	598.2	1984	1091	SIDE	603	0.054	2.089

Illinois Department of Transportation

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

STRUCTURE ========== SN 050-0259
SUBSTRUCTURE & REFERENCE BORING ======= Pier 2 - Boring 01C (N.W. Quad.)
GROUND SURFACE ELEVATION ========== 649.20 FT
GROUND WATER ELEVATION ========== 625.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========== 618.20 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 36 IN.
FACTORED AXIAL LOAD ========== 383 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

Drilled Shaft Dia.'s for Design Table

24	IN.
30	IN.
36	IN.
42	IN.
48	IN.
54	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.)
5.00	613.20	5.00	50.0	Limestone	25	Fractured	0	Open	No	0	0	0	83	0.019	#####	50.0	237	119	0.141	0.00	0	0	83	0.019	#####
10.00	608.20	5.00	50.0	Limestone	25	Fractured	10	Open	No	71	71	39	166	0.027	#####	75.0	324	162	0.163	0.00	71	39	166	0.027	#####
13.00	605.20	3.00	50.0	Limestone	25	Normal	58	Open	No	291	362	199	216	0.031	0.451	100.0	397	199	.0.190	0.58	690	360	275	0.033	0.202
17.00	601.20	4.00	100.0	Limestone	25	Normal	65	Open	No	549	911	501	323	0.040	1.142										
20.00	598.20	3.00	100.0	Limestone	25	Normal	72	Open	Yes	412	1323	727	404	0.046	1.412										

Illinois Department of Transportation

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

Drilled Shaft Design Table for Pier 2 - Boring 01C (N.W. Quad.)

Estimated Top of Rock Elevation: 618.20

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
24 in. Diameter Drilled Shaft							
5	613.2	106	53	TIP	--	--	0.084
10	608.2	130	65	TIP	--	--	0.117
13	605.2	382	201	SIDE + TIP	172	0.027	0.153
17	601.2	607	334	SIDE	217	0.034	0.775
20	598.2	882	485	SIDE	272	0.041	0.963
30 in. Diameter Drilled Shaft							
5	613.2	165	82	TIP	--	--	0.104
10	608.2	217	108	TIP	--	--	0.135
13	605.2	525	275	SIDE + TIP	223	0.030	0.177
17	601.2	759	418	SIDE	270	0.037	0.958
20	598.2	1102	606	SIDE	338	0.043	1.187
36 in. Diameter Drilled Shaft							
5	613.2	237	119	TIP	--	--	0.141
10	608.2	324	162	TIP	--	--	0.163
13	605.2	690	360	SIDE + TIP	275	0.033	0.202
17	601.2	911	501	SIDE	323	0.040	1.142
20	598.2	1323	727	SIDE	404	0.046	1.412
42 in. Diameter Drilled Shaft							
5	613.2	323	162	TIP	--	--	0.164
10	608.2	452	226	TIP	--	--	0.191
13	605.2	878	456	SIDE + TIP	329	0.035	0.228
17	601.2	1063	585	SIDE	376	0.043	1.325
20	598.2	1543	849	SIDE	471	0.049	1.637
48 in. Diameter Drilled Shaft							
5	613.2	422	211	TIP	--	--	0.165
10	608.2	601	301	TIP	--	--	0.219
13	605.2	483	266	SIDE	287	0.036	0.595
17	601.2	1215	668	SIDE	429	0.045	1.509
20	598.2	1764	970	SIDE	537	0.052	1.863
54 in. Diameter Drilled Shaft							
5	613.2	565	283	TIP	--	--	0.192
10	608.2	772	386	TIP	--	--	0.273
13	605.2	543	299	SIDE	323	0.038	0.667
17	601.2	1367	752	SIDE	482	0.048	1.693
20	598.2	1984	1091	SIDE	603	0.054	2.089