Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 2/1/13	Proposed SN: 027-0102	Route:	IL 54 (FAP 71)
Revised Date: 3/6/13	Existing SN: 027-0070	Section:	(115)BR-4
Geotechnical Engineer: Terry McCleary of McCleary Engineering		County:	Ford
Structural Engineer: Derek Verhulst of Bureau of Bridges, IDOT		Contract:	66994

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): **Single span structure, 93 ft. in total length from back to back of abutments. There superstructure will be supported by integral abutments with no piers. Please refer to the draft TSL drawing for a more accurate picture of what is to be constructed.**

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): **Three borings were taken in 1978 and two new borings were taken in 2012. The new borings show much stronger soils than the 1978 borings. This could result in driving the piling short of estimated lengths or longer than estimated lengths depending on the set of borings chosen. See attached Pile Length Discussion.**

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: **Spread footings were not considered due to the weaker soils found in the 1978 borings. No new fill to be placed on this project.**

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. **No grade change is expected. The end slope on the stream side of the abutment will remain a 2:1 slope with a slope height of 10.5 ft. Slope stability is not considered an issue at this site as there are no visible problems with the existing slopes.**

Indicate at each substructure, the 100-year and 500-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. **No scour was accounted for at the abutments per IDOT policy. Since there are no piers, no scour depths are reported. The bottom of abutment elevation for both abutments are 779.00 ft. This would be, by default, considered the scour elevation.**

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. **Using the average of the 1978 and 2012 borings the seismic site class is C with an SPZ=1, SDs=0.150 and SD1=0.086. The seismic site class input data for the average of the two sets of borings and the individual 1978 and 2012 sets of borings are attached. The soils are not liquifiable.**

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 skin friction and end bearing values shall be indicated when drilled shafts are proposed.

See attached discussion of pile length analysis and estimated pile design table.

Calculate the estimated water surface elevation and determine the need for cofferdam(s) and seal coat: **There will be no need for a cofferdam as there will be no in stream pier work.**

Assess the need for sheeting/soil retention versus using a temporary construction slope and provide recommendation for the most feasible option. **At this time the author anticipates the structure to be constructed under closed road conditions therefore no sheet piling will be needed at a stage line. There will be no piers and therefore no in stream work is anticipated.**

Pile Length Analysis for 027-0102:

In 1978 two abutment borings and one pier boring were taken to design the foundations of the existing structure, SN027-0070. In December of 2012, two additional abutment borings were taken. There is a stark difference in the estimated unconfined compressive strengths between the two sets of borings. The 2012 borings show strengths nearly six times that of the 1978 borings. The pile driving data for the existing structure seem to correlate with the 1978 borings and for that reason were not rejected simply because newer data was available.

The SGR author performed analysis based on 1) the average of the data from the 2012 and the 1978 borings, 2) the data from the 1978 borings and, 3) the data from the 2012 borings. Pile length tables for all three analyses are included in this report. Taking an additional set of borings was discussed but with the project timeline being as it is we believe for pile quantities the table for the averaged data may be most reasonable. The attached driving data shows that metal shell piles were driven at this site in 1978. The benefit of using metal shell piles is that they should drive much shorter than the H-piles shown in Table 1.0. H-piles can be driven to support higher loads but will be driven much deeper than the metal shell piles therefore could increase the cost of the project. It may be necessary to increase the number of pile to support the same abutment loadings as supported with H-pile. After discussing this with the IDOT, Foundations and Geotechnical Unit, the author recommends using a 14 inch Metal Shell pile with wall thickness of 0.312 inches from the pile length table using the soil data averaged between the 1978 and 2012 boring logs, Table 1. The author believes the other two sets of pile length tables are valuable information and were included in this abbreviated report for discussion purposes during the review process.

To obtain the data to complete the pile length tables the boring data was extended beyond the actual boring depth by inserting the result of averaging the last three data points of the actual log. For argument sake, if the 1978 logs are used, the author recommends a metal shell pile is used as the H-piles extend well below the actual logs. There is some risk of driving the piling to depths different than that shown in the tables when driving beyond the data shown in the logs. If the 2012 logs are used solely or if they are averaged with the 1978 logs either a 14”metal shell or an H-pile may be used but an H-pile is recommended for the higher loads.

Per ABD 12.3, the MS 12 are allowed however because there is a chance the stronger soils shown in the IDOT borings from 2012 exist, we recommend using only MS14 piling of the metal shell family of piles or any of the HP piles listed in the table that fit the anticipated loading. Assumptions include: Bottom of Abutment elevation = 779.0 ft.; no geotechnical losses accounted for; and a 2.0 ft. pile embedment into the abutment is presumed. The preliminary loadings for this structure were estimated to be 1040 kips per abutment. Driving beyond the end of the boring involves an inherent risk for the owner. At least one test pile per foundation unit is recommended for this project. With this project being constructed under closed road conditions, two test piles should be sufficient if this remains the case.

It appears that the right side of the each abutment will conflict with the existing abutments. The author recommends removing the existing abutments in their entirety. The existing piling may remain however the new piling will need to be spaced appropriately to miss them.

Pile Length Tables

Table 1: Using Soil Data Averaged Between 1978 & 2012 Logs
Table 2: Using 2012 Logs
Table 3: Using 1978 Logs

Table 1: PILE LENGTH TABLES USING SOIL DATA AVERAGED BETWEEN THE 1978 BORINGS AND 2012 BORINGS

North Abutment, Using Data Averaged between Boring B-1 (2012) and Boring B-2 (1978)				South Abutment, Using Data Averaged between Boring B-2 (2012) and Boring B-3 (1978)		
Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)		Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)
MS 14 with 0.25" wall				MS 14 with 0.25"		
183	101	20		209	115	20
282	155	30		295	162	30
370	203	40		392	216	40
413	228	45		413	228	43
MS 14 with 0.312" wall				MS 14 with 0.312" wall		
183	101	20		209	115	20
282	155	30		295	162	30
370	203	40		392	216	40
513	283	55		513	283	50
HP 10x42				HP 10x42		
171	94	30		178	98	30
221	122	40		235	129	40
276	152	50		315	173	50
335	185	60		335	185	55
HP 12x53				HP 12x53		
213	117	30		221	122	30
273	150	40		291	160	40
340	187	50		391	215	50
418	229	62*		418	229	55
HP 12x63				HP 12x63		
276	152	40		294	162	40
344	189	50		395	217	50
414	227	60		467	257	60
497	273	72*		497	273	65*
HP 14x73				HP 14x73		
333	183	40		271	149	30
414	228	50		355	195	40
496	273	60		479	263	50
578	318	72*		578	318	62*
HP 14x89				HP 14x89		
502	276	60		485	267	50
583	321	70*		568	313	60
665	366	80*		667	367	70*
705	387	85*		705	387	74*

*Beyond the end of the boring.

Table 2: PILE LENGTH TABLES USING SOIL DATA from Borings taken in 2012

North Abutment, Using Boring B-1 (2012)				South Abutment, Using Boring B-2 (2012)		
Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)		Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)
MS 14 with 0.25" wall				MS 14 with 0.25"		
201	111	17		203	112	17
262	144	22		259	143	22
340	187	30		340	187	30
413	228	37		413	228	36
MS 14 with 0.312" wall				MS 14 with 0.312" wall		
201	111	17		203	112	17
318	175	27		310	170	27
390	215	35		407	224	35
513	283	45		513	283	43
HP 10x42				HP 10x42		
141	78	20		146	80	20
211	116	30		209	115	30
276	152	40		288	158	40
335	185	49		335	185	46
HP 12x53				HP 12x53		
169	93	20		174	96	20
266	146	30		262	144	30
344	189	40		360	198	40
418	229	49		418	229	46
HP 12x63				HP 12x63		
269	148	30		265	146	30
347	191	40		363	200	40
429	236	50		459	253	50
497	273	58		497	273	56
HP 14x73				HP 14x73		
331	182	30		325	179	30
423	233	40		444	244	40
470	285	50		559	307	50
578	318	56		578	318	52
HP 14x89				HP 14x89		
428	236	40		450	247	40
525	289	50		566	311	50
624	343	60		649	357	60
705	387	70*		705	387	66*

*Beyond the end of the boring.

Table 3: PILE LENGTH TABLES USING SOIL DATA FROM 1978 BORINGS

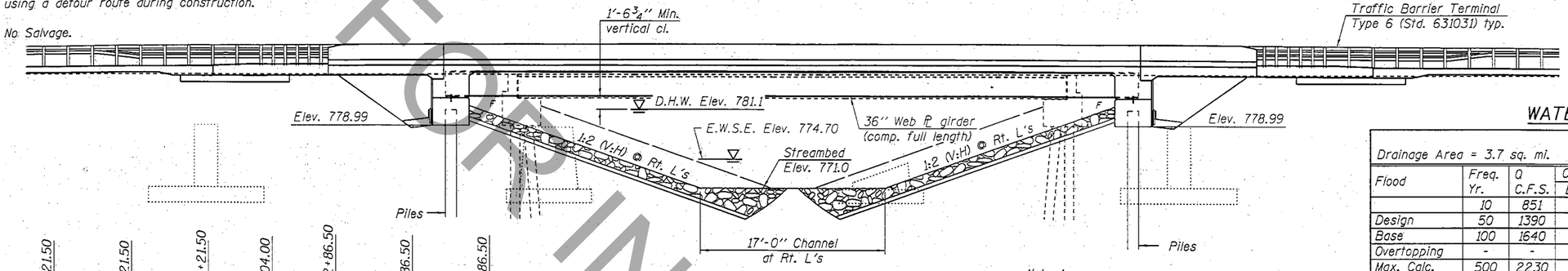
North Abutment, Using Boring B-2 (1978)				South Abutment, Using Boring B-3(1978)		
Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)		Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)
MS 14 with 0.25" wall				MS 14 with 0.25"		
191	105	30		179	99	30
238	131	40		235	130	40
306	168	50		337	186	50
413	228	67*		413	228	62*
MS 14 with 0.312" wall				MS 12 with 0312" wall		
191	105	30		179	99	30
238	131	40		235	130	40
295	168	50		337	186	50
513	283	82*		513	283	74*
HP 10x42				HP 10x42		
220	121	60*		233	128	60*
258	142	70*		277	153	70*
297	168	80*		322	177	80*
335	185	90*		335	185	84*
HP 12x53				HP 12x53		
269	148	60*		286	157	60*
315	173	70*		339	187	70*
361	199	80*		393	216	80*
418	229	93*		418	229	84*
HP 12x63				HP 12x63		
318	175	70*		342	188	70*
364	200	80*		396	218	80*
411	226	90*		450	248	90*
497	273	108*		497	273	98*
HP 14x73				HP 14x73		
379	209	70		409	225	70*
434	239	80		473	260	80*
489	269	90		536	295	90*
578	318	108*		578	318	95*
HP 14x89				HP 14x89		
439	241	80*		478	263	80*
522	287	95*		574	316	95*
577	317	105*		638	351	105*
705	387	125*		705	387	115*

*Beyond the end of the boring.

Benchmark: Chiseled "□" on Northwest wingwall of SN 027-0070; Sta. 681+50.71, 17.61' Rt.
Elev. 785.68

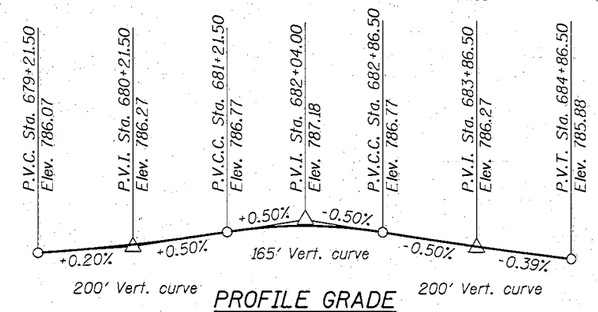
Existing Structure: SN 027-0070 built in 1979 as F.A. Route 71, Section 115BR at Sta. 682+04.00. A one span P.P.C. deck beam bridge 75'-0" back-to-back abutments and 33'-8" out-to-out on pile bent abutments. The existing structure is to be removed and replaced. Traffic will be maintained using a detour route during construction.

No Salvage.



ELEVATION

Note A:
Portions of original structure built in 1931 may be encountered.



PROFILE GRADE
(Along ℄ IL Rte. 54)

PLAN

LOCATION SKETCH

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevations (ft.)		
	E. Abut.	W. Abut.
0.100	778.99	778.99
0.500	778.99	778.99

WATERWAY INFORMATION

Drainage Area = 3.7 sq. mi.
Existing Low Grade Elev. 785.35 @ Sta. 682+00
Proposed Low Grade Elev. 785.85 @ Sta. 685+00

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	851	195	306	780.2	0.1	0.0	780.2	780.2
Design	50	1390	236	356	781.1	0.3	0.0	781.3	781.1
Base	100	1640	249	373	781.4	1.3	0.1	782.7	781.5
Overtopping	-	-	-	-	-	-	-	-	-
Max. Calc.	500	2230	274	405	782.0	1.3	1.0	783.2	782.9

10-year existing velocity = 4.2 ft./sec.
10-year proposed velocity = 2.8 ft./sec.

DESIGN SPECIFICATIONS

2012 AASHTO LRFD Bridge Design Specifications, 6th Edition

DESIGN STRESSES

FIELD UNITS

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

HIGHWAY CLASSIFICATION

F.A.P. Rte. 71 - IL Rte. 54
Functional Class: Minor Arterial (Non-urban)
ADT: 2,050 (2020[illegible]); 2,100 (2024)
ADTT: 328 (2014)
DHV: 205
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

LOADING HL-93

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

SEISMIC DATA

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

GENERAL PLAN & ELEVATION
ILLINOIS ROUTE 54 OVER DRAINAGE DITCH
F.A.P. RTE. 71 - SEC. (115)BR-4
FORD COUNTY
STATION 682+04.00
STRUCTURE NO. 027-0102

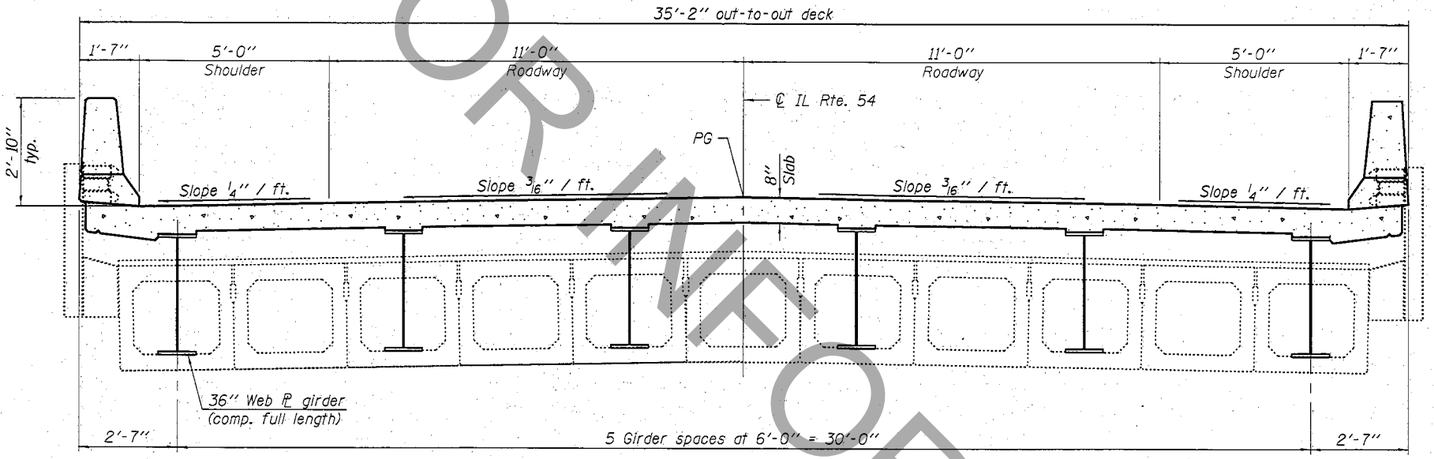
DESIGNED -	DEREK G. VERHULST
CHECKED -	___
DRAWN -	MICHAEL B. MOSSMAN
CHECKED -	___

1-23-2013

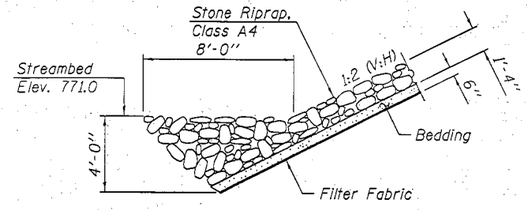
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

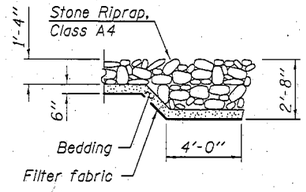
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
71	(115)BR-4	FORD	____	____
		CONTRACT NO. 66994		
	ILLINOIS FED. AID PROJECT			



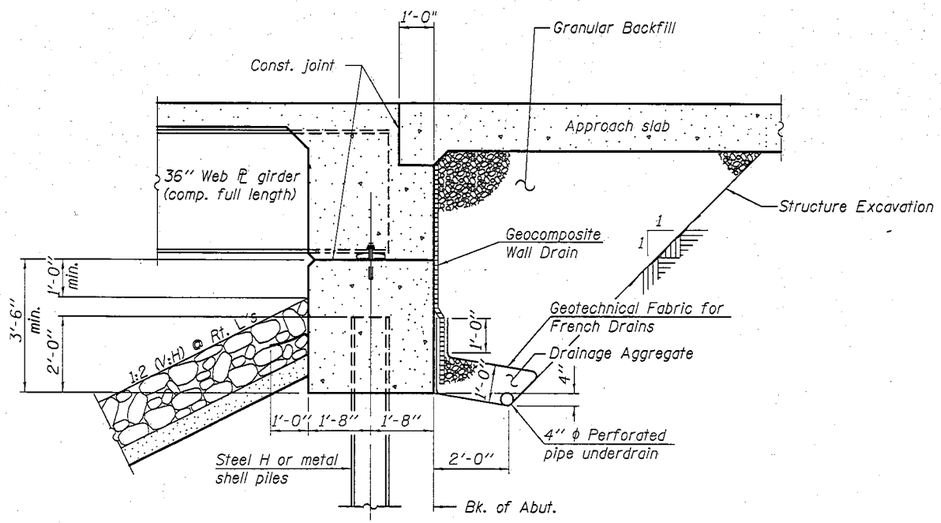
CROSS SECTION



SECTION A-A



SECTION B-B



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

GENERAL PLAN & ELEVATION
ILLINOIS ROUTE 54 OVER
DRAINAGE DITCH
F.A.P. RTE. 71 - SEC. (115)BR-4
FORD COUNTY
STATION 682+04.00
STRUCTURE NO. 027-0102

DESIGNED -	DEREK G. VERHULST
CHECKED -	---
DRAWN -	MICHAEL B. MOSSMAN
CHECKED -	---

1-23-2013

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

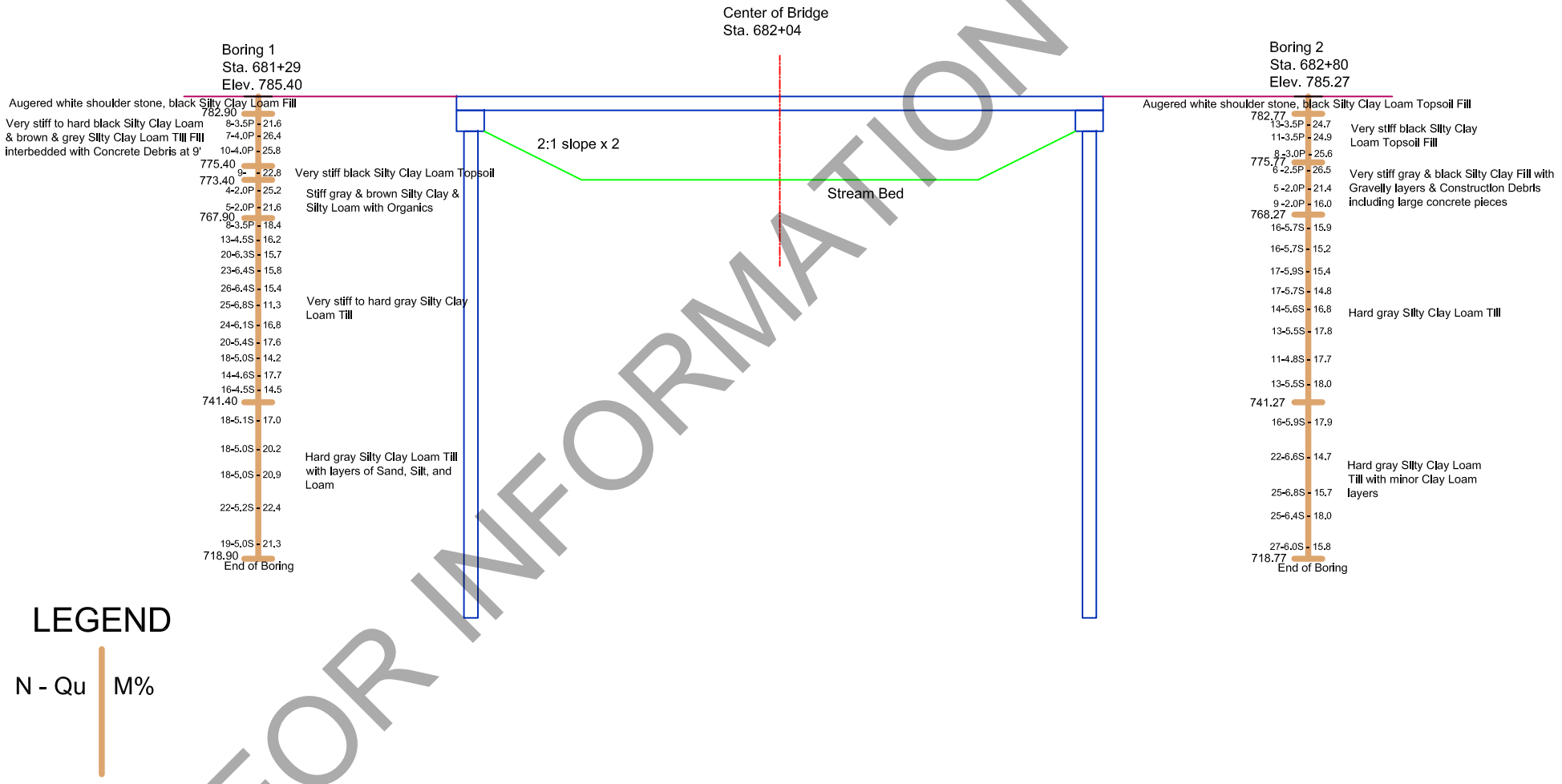
SHEET NO. 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
71	(115)BR-4	FORD	____	____
		CONTRACT NO. 66994		
	ILLINOIS FED. AID PROJECT			

McCleary Engineering

Project: Il 54 over drainage ditch Route: FAP 071 (ILL 54) County: Ford

Date: 12/18/12 Section: (115)BR-4 Bridge No.: 027-0070



LEGEND

N - Qu | M%

Boring Logs

1978 logs
2012 logs

T. R. Bright ATTN: C. E. Thunman, Jr.

R. H. Blasius BY: J. G. Gehler

Foundation Boring Logs*

April 4, 1978

*F. A. Route 71
Section 115 BR
Ford County
P-93-011-69

We are transmitting three (3) boring logs for the subject structure that carries State Route 54 over a fork of Dickerson Slough.

The bench mark used was a square chiseled in the SE corner of the hub rail for an elevation of 100.0.

JGG:WHB:pr

CC: R. A. Chlado
Soils File

Attachment: (3) Boring Logs
(1) Layout

FORM NO. B.D. 137 REV. 9-60

N.E. 1/4 Section 1, T23N R7E 3p.m.

Sh. 1 of 2 Sh.

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FA 71

SEC. 115 BR

COUNTY Ford

BRIDGE FA 71 over a Fork of Dickerson Slough

STA. 631 + 94

Date 1-17-78

Bored By J. Polen

Checked By F. R. Pickard

Boring No. 1 Pier 2

Station 681+68

Offset 25' RT

Surface Water El. 86.8

Groundwater El. at Completion 88.3

After 24 Hours 88.3

Elevation	N	Qu t/s.f.	w (%)	Description
92.8				Ground Surface
0				
				STIFF BLACK SILTY CLAY LOAM
90.3				
	12	2.7 S	21	VERY STIFF BROWN SILTY CLAY TILL
88.3				
-5				
	4	0.5 B	32	SOFT BROWN AND GRAY SILTY CLAY
86.3				
	3	-	26	SOFT GRAY CLAY LOAM
83.3				
-10				
	15	2.5 S	18	VERY STIFF GRAY SILTY CLAY TILL
	24	2.9 S	18	
78.3				
-15				
	25	4.5 B	18	HARD GRAY SILTY CLAY TILL
	28	5.6 S	15	
-20				
	37	-	-	
	37	5.0 B	14	HARD GRAY SILTY CLAY TILL
-25				
	36	4.5 B	17	
65.8				
	35	3.5 B	16	VERY STIFF GRAY SILTY CLAY TILL (SLIGHTLY STRATIFIED)
-30				
	28	3.5 B	17	
	17	2.7 B	18	
58.3				
-35				
	19	2.0 B	18	VERY STIFF GRAY SILTY CLAY TILL (STRATIFIED)
	20	2.0 B	18	
-40				
	24	2.3 B	18	
	20	2.0 B	22	
-45				

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

Qu – Unconfined Compressive Strength – t/sf

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

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

BRIDGE FOUNDATION BORING LOG

FA 71
Section 115 BR
Ford
Pier 2 Boring 1

	Elevation	N	Qu t/s.f.	w (%)
VERY STIFF GRAY SILTY CLAY TILL (STRATIFIED)	46.3	33	3.0 B	19

-45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FA 71

SEC. 115 BR

COUNTY Ford

BRIDGE FA 71 over a Fork of Dickerson Slough

STA. 631+94

Date 1-17-78

Bored By J. Polen

Checked By F.R. Pickard

Boring No. 2 N. Abut.

Station 681+38

Offset 14' LT

Surface Water El. 86.8

Groundwater El. at Completion 88.9

After 24 Hours 88.9

Elevation	Description	N	Qu t/s.f.	w (%)
98.9	Ground Surface			
0				
96.9	STIFF BLACK SILTY CLAY LOAM			
94.9	STIFF BLACK SILTY CLAY	8	1.2 B	29
-5				
89.9	STIFF BLACK SILTY CLAY WITH ORGANIC MATERIALS	12	1.1 B	29
		14	1.5 P	34
-10				
87.4	STIFF GRAY CLAY	7	1.1 B	31
	SOFT LIGHT GRAY CLAY	5	0.4 B	30
-15				
82.4	STIFF GRAY SANDY CLAY	9	-	20
	VERY STIFF OLIVE GRAY SILTY CLAY TILL	22	3.9 B	17
-20				
		21	3.3 B	17
	VERY STIFF OLIVE GRAY SILTY CLAY TILL	29	-	-
-25				
69.9		23	2.3 B	17
		24	3.4 B	17
-30	STIFF GRAY SILTY CLAY TILL			
64.9		14	1.6 B	20
		12	1.2 B	19
-35				
	STIFF GRAY SILTY CLAY TILL (SLIGHTLY STRATIFIED)	12	1.1 B	19
		14	1.2 B	19
-40				
		14	1.1 B	20
		20	1.3 B	20
-45				

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

Qu – Unconfined Compressive Strength – t/sf

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

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

BRIDGE FOUNDATION BORING LOG

FA 71
Section 115 BR
Ford
N. Abut Boring 2

Elevation	N	Qu t/s.f.	w (%)
-45			
STIFF GRAY SILTY CLAY (SLIGHTLY STRATIFIED)	13	1.1 B	17
	15	1.4 B	21
-50	17	1.0 B	22
47.4			
VERY STIFF GRAY SILTY CLAY TILL (STRATIFIED)	26	3.1 B	18
-55	19	2.1 B	18
42.9			
-60			
-65			
-70			

Elevation	N	Qu t/s.f.	w (%)
-75			
-80			
-85			
-90			
-95			

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FA 71

SEC. 115 BR

COUNTY Ford

BRIDGE FA 71 over a Fork of Dickerson Slough

STA. 631+94

Date 1-17-78

Bored By J. Polen

Checked By F. R. Pickard

Boring No. 3 S. Abut.
Station 682+97
Offset 15' RT

Surface Water El. 86.8
Groundwater El. at Completion 89.0
After 4 Hours 89.0

	Elevation	N	Qu t/s.f.	w (%)
Ground Surface	99.0			
MEDIUM BROWN SILTY CLAY LOAM	97.0			
SOFT BROWN SILTY CLAY AND GRAVEL MIXED	95.0	4	-	23
STIFF BROWN SILTY CLAY TILL	-5	9	1.1 B	26
	92.5			
STIFF DARK BROWN SILTY CLAY TILL	90.0	13	1.8 P	39
STIFF DARK GRAY SILTY CLAY TILL	-10	7	1.2 B	25
	87.5			
VERY SOFT GRAY CLAY	84.5	4	0.2 B	30
VERY LOOSE GRAY SAND AND MEDIUM GRAVEL	-15	3	-	29
	82.5			
VERY STIFF OLIVE GRAY SILTY CLAY TILL	80.0	22	3.5 P	16
VERY STIFF OLIVE GRAY SILTY CLAY TILL (STRATIFIED)	-20	26	3.1 B	15
VERY STIFF OLIVE GRAY SILTY CLAY TILL (STRATIFIED)	-25	28	3.3 B	14
		32	3.5 B	17
	70.0	20	2.1 B	17
STIFF OLIVE GRAY SILTY CLAY TILL (STRATIFIED)	-30	17	1.6 B	17
		12	1.2 B	20
	-35	15	1.2 B	20
		15	1.4 B	19
	-40	15	1.2 B	19
		17	1.9 B	18
	-45			

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

Qu – Unconfined Compressive Strength – t/sf

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

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

FORM NO. B. D. 137 REV. 9-00

BRIDGE FOUNDATION BORING LOG

FA 71
section 115 BR
Ford
S. Abut. Boring 3

	Elevation	N	Qu t/s.f.	w (%)
STIFF OLIVE GRAY SILTY CLAY TILL(STRATIFIED)	-45			
		18	-	-
	5.25			
VERY STIFF OLIVE GRAY SILTY CLAY TILL (STRATIFIED)				
		25	2.3 B	20
	-50			
		27	2.9 B	21
		28	2.7 B	21
	-55			
	43.0	25	3.9 B	18
	-60			
	-65			
	-70			

Elevation	N	Qu t/s.f.	(%) w
-75			
-80			
-85			
-90			
-95			

Illinois Department of Transportation
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SOIL BORING LOG

Date 12/17/12

ROUTE FAP 071 (IL 54) **DESCRIPTION** IL 54 over a drainage ditch, 2.33 miles north of IL 9 **LOGGED BY** Larry Myers

SECTION (115)BR-4 **LOCATION** NE 1/4, **SEC.** 1, **TWP.** 23N, **RNG.** 7E, 3rd **PM**

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

STRUCT. NO. 027-0070 (Exist)
Station 682+04

BORING NO. 1 (North Corner)
Station 681+29
Offset 14.00ft Rt.
Ground Surface Elev. 785.40 ft

Surface Water Elev. 773.07 ft
Stream Bed Elev. 772.32 ft

Groundwater Elev.:
First Encounter 770.4 ft ▼
Upon Completion 767.4 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Augered White Shoulder Stone, Black Silty Clay Loam Fill.
782.90				
	4			Very Stiff to Hard Black Silty Clay Loam and Brown and Gray Silty Clay Loam Till Fill Interbedded with Concrete Debris at 9 feet.
	4	3.5	21.6	
	4	P		
-5				
	3			
	3	4.0	26.4	
	4	P		
	4			
	5	4.0	25.8	
	5	P		
775.40 -10				
	3			Very Stiff Black Silty Clay Loam Topsoil.
	4		22.8	
	5			
773.40				
	1			Stiff Gray and Brown Silty Clay and Silty Loam with Organics.
	2	2.0	25.2	
	2	P		
▼-15				
	1			
	2	2.0	21.6	
	3	P		
767.90				
▽	1			Very Stiff to Hard Gray Silty Clay Loam Till.
	5	3.5	18.4	
	3	P		
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			Very Stiff to Hard Gray Silty Clay Loam Till. *(continued)*
	5	4.5	16.2	
	8	S		
	5			
	8	6.3	15.7	
	12	S		
-25				
	6			
	8	6.4	15.8	
	15	S		
	6			
	10	6.4	15.4	
	16	S		
-30				
	8			
	10	6.8	11.3	
	15	S		
	6			
	10	6.1	16.8	
	14	S		
-35				
	6			
	8	5.4	17.6	
	12	S		
	5			
	8	5.0	14.2	
	10	S		
-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)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 12/17/12

ROUTE FAP 071 (IL 54) **DESCRIPTION** IL 54 over a drainage ditch, 2.33 miles north of IL 9 **LOGGED BY** Larry Myers

SECTION (115)BR-4 **LOCATION** NE 1/4, **SEC.** 1, **TWP.** 23N, **RNG.** 7E, 3rd **PM**

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

STRUCT. NO. 027-0070 (Exist)
Station 682+04

BORING NO. 1 (North Corner)
Station 681+29
Offset 14.00ft Rt.
Ground Surface Elev. 785.40 ft

Surface Water Elev. 773.07 ft
Stream Bed Elev. 772.32 ft

Groundwater Elev.:
First Encounter 770.4 ft
Upon Completion 767.4 ft
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Gray Silty Clay Loam Till. *(continued)*	4		
	6	4.6	17.7
	8	S	
	5		
	7	4.5	14.5
741.40	9	S	
Hard Gray Silty Clay Loam Till with Layers of Sand, Silt, and Loam.			
-45	6		
	8	5.1	17.0
	10	S	
-50	6		
	8	5.0	20.2
	10	S	
-55	5		
	7	5.0	20.9
	11	S	
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay Loam Till with Layers of Sand, Silt, and Loam. *(continued)*	6		
	8	5.2	22.4
	14	S	
-65	6		
	8	5.0	21.3
718.90	11	S	
End of Boring			
-70			
-75			
-80			

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

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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SOIL BORING LOG

Date 12/18/12

ROUTE FAP 071 (IL 54) **DESCRIPTION** IL 54 over a drainage ditch, 2.33 miles north of IL 9 **LOGGED BY** Larry Myers

SECTION (115)BR-4 **LOCATION** NE 1/4, **SEC.** 1, **TWP.** 23N, **RNG.** 7E, 3rd **PM**

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

STRUCT. NO. 027-0070 (Exist)
Station 682+04

BORING NO. 2 (South Corner)
Station 682+80
Offset 13.00ft Lt.
Ground Surface Elev. 785.27 ft

Surface Water Elev. 773.07 ft
Stream Bed Elev. 773.02 ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Augered White Shoulder Stone, Black Silty Clay Loam Topsoil Fill.
782.77				
	4			Very Stiff Black Silty Clay Loam Topsoil Fill.
	5 8	3.5 P	24.7	
-5				
	4			
	5 6	3.5 P	24.9	
	3			
	3 5	3.0 P	25.6	
775.77				
-10				
	1			Very Stiff Gray and Black Silty Clay Fill with Gravelly Layers and Construction Debris Including Large Concrete Pieces.
	3 3	2.5 P	26.5	
	1			
	2 3	2.0 P	21.4	
-15				
	1			
	4 5	2.0 P	16.0	
768.27				
	5			Hard Gray Silty Clay Loam Till.
	7 9	5.7 S	15.9	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	5			Hard Gray Silty Clay Loam Till. *(continued)*
	7 9	5.7 S	15.2	
	5			
	7 10	5.9 S	15.4	
-25				
	5			
	7 10	5.7 S	14.8	
	5			
	6 8	5.6 S	16.8	
-30				
	5			
	6 7	5.5 S	17.8	
-35				
	5			
	5 6	4.8 S	17.7	
-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)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 12/18/12

ROUTE FAP 071 (IL 54) **DESCRIPTION** IL 54 over a drainage ditch, 2.33 miles north of IL 9 **LOGGED BY** Larry Myers

SECTION (115)BR-4 **LOCATION** NE 1/4, **SEC.** 1, **TWP.** 23N, **RNG.** 7E, 3rd **PM**

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

STRUCT. NO. 027-0070 (Exist)
Station 682+04

BORING NO. 2 (South Corner)
Station 682+80
Offset 13.00ft Lt.
Ground Surface Elev. 785.27 ft

Surface Water Elev. 773.07 ft
Stream Bed Elev. 773.02 ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay Loam Till. *(continued)*	5		
	6	5.5	18.0
	7	S	
741.27			
Hard Gray Silty Clay Loam Till with Minor Clay Loam Layers.			
-45	5		
	7	5.9	17.9
	9	S	
-50	6		
	8	6.6	14.7
	14	S	
-55	6		
	9	6.8	15.7
	16	S	
-60			

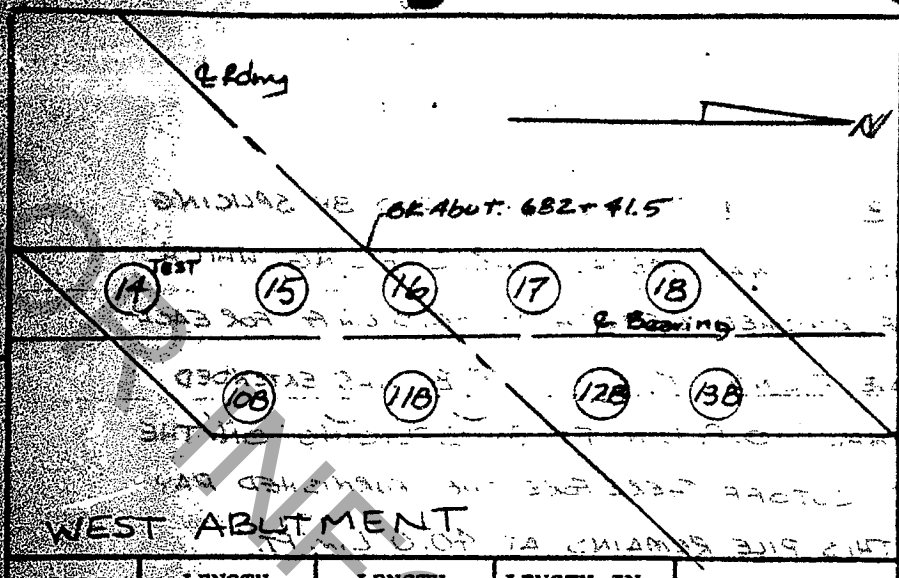
DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay Loam Till with Minor Clay Loam Layers. *(continued)*	5		
	10	6.4	18.0
	15	S	
-65	5		
	11	6.0	15.8
	16	S	
718.77			
End of Boring			
-70			
-75			
-80			

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

BBS, form 137 (Rev. 8-99)

027-0070 Pile Driving Records

PILING DIACRAM



PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	LENGTH IN STRUCTURE	BEARING
	FT.	FT.	FT.	TONS
10B	40.0	9.7	41.1 a/	48.5
11B	50.0	4.7	45.3 b/	45.7
12B	50.0	5.7	44.3 b/	45.2
13B	40.0	0.0	40.0	45.0
14		TEST		
15	40.0	2.0	38.0	45.0
16	40.0	0.6	39.4	47.1
17	50.0	6.0	44.0 b/	47.1
18	40.0	2.1	37.9	46.6
TOTAL	350.0	30.8	330.0	46.3

B INDICATES BATTER

BY R. Downs DATE 6-22
CHKD. BY JR DATE 6-22
SHEET NO. 2 OF 2

ROUTE FA 71
SECTION 115BR
PROJECT BR-F-71(17)
COUNTY FORD
JOB NO. C-93-071-78
LOCATION W. Abutment
Sta 682+41.5

TYPE PILE METAL SHELL
WEIGHT NOT APPL.

HAMMER DATA:
TYPE Vulcan 1
RAM WEIGHT 5000
STROKE 3

STROKES/MIN. 60
BATTER COEF. 2:12

FORMULA USED:
$P = \frac{2WH}{S+0.1}$

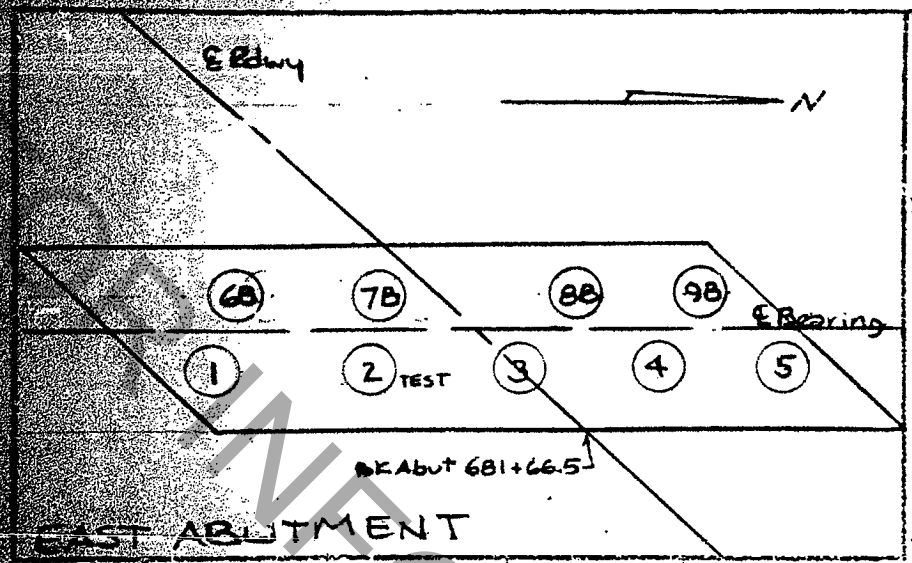
REQ. BEAR 45 T
PLAN LENGTH 53
ORDERED LENGTH 40
SEE LETTER DATED 6-6-

PAY QUANTITIES:
FURNISHING 350.0
DRIVING 330.0

REMARKS: Driven 6-567
a/ extended w/ test pile cut-
b/ extended w/ new piling s
FRC002 for pile splicing

bill 9/ See back of this sheet for add
information

PILING DIAGRAM



EAST ABUTMENT

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	LENGTH IN STRUCTURE	BEARING
	FT	FT	FT	TONS
1	38.0	7.2	32.0	46.6
2		TEST		
3	38.0	13.0	27.0	48.9
4	38.0	13.2	26.8	47.1
5	38.0	3.4	34.9	45.4
6B	38.0	12.8	27.2	49.1
7B	38.0	15.9	24.1	51.6
8B	38.0	13.0	27.0	47.9
9B	38.0	11.7	27.5	47.4
TOTAL	304.0	90.2	226.5	48.0

BY R. Downs DATE 6-22
CHKD. BY J.R. DATE 6-22-
SHEET NO. 1 OF 2

ROUTE FA 71
SECTION 115 BR
PROJECT BR-F-71(17)
COUNTY FORD
JOB NO. C-93-071-78
LOCATION E Abutmen
Sta 681+66.5

TYPE PILE METAL SHEL
WEIGHT NOT APPL.

HAMMER DATA:
TYPE VULCAN 1
RAM WEIGHT 5000
STROKE 3
STROKES/MIN. 60
BATTER CONF. 2:12

FORMULA USED:
$P = \frac{2WH}{S+0.1}$

REQ. BEAR 45
PLAN LENGTH 45
ORDERED LENGTH 38
SRE LETTER DATED 6-8-

PAY QUANTITIES:
FURNISHING 304.0
DRIVING 226.5

REMARKS: Driven 6-8,11
Piles numbered 3,
7B were moved 1' sou
and piles numbered <
8B moved 1' north to miss existing tumb

BBS-757 (Rev. 2-73)

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

Sh 1 of 2

Test Pile Driving Record

Project BR-F-71(17)
Route FA 71
Section 115 BR
County FORD (053)
Station of Structure 682+04

Station location at which pile was driven ℄ Abut. 681+75.5, 7.5' Lt. ℄
Elev. from which pile was driven 93.04

Type & Weight of Hammer 5000 Vulcan #1 Sgl. Act. Air Hamm
Length of Fall 3 feet
Type of Pile Metal shell
Required Bearing 45 ton
Elev. Top Pile 96.24
Elev. Tip of Pile 36.24
Elev. Cutoff 94.04
Estimated Plan Length 45 L.
Ordered Length 38 L.

Spl to Hercaf 6-8

Elev.	Feet Below Cut Off	Blows Per Foot	Blows Per Minute	Bearing In Tons	Remarks
79.04	15	10		11.5	little resistance
78.04	16	14		15.7	encountered in first 14
77.04	17	18		19.6	feet.
76.04	18	19	60	20.5	
75.04	19	23		24.1	
74.04	20	24		25.0	P= 2WH / S+0.1
73.04	21	30		30.0	
72.04	22	32		31.6	Date Driven: 6-8-79
71.04	23	35		33.9	
70.04	24	40		37.5	witnessed by:
69.04	25	44		40.2	R. Downs R.E.
68.04	26	44		40.2	
67.04	27	46		41.6	
66.04	28	48		42.9	
65.04	29	48		42.9	
64.04	30	47	60	42.3	
63.04	31	51		47.7	
62.04	32	52		45.4	
61.04	33	55		47.1	
60.04	34	58		48.9	
59.04	35	56		47.7	
58.04	36	65		52.7	
57.04	37	63		51.6	
56.04	38	64		52.2	
55.04	39	66		53.2	

BD-717 (Rev. 2-73)

STATE OF ILLINOIS

DEPARTMENT OF TRANSPORTATION

Sh 2 of 2

Test Pile Driving Record

Project BR-F-71(17)
Route FA 71
Section 115 BR
County FORD (053)
Station of Structure 682+04

Type & Weight of Hammer 5000 Vulcan #7 S/A Act. Air Hamm
Length of Fall 3 Feet
Type of Pile Metal Shell
Required Bearing 45 tons
Elev. Top Pile 96.24
Elev. Tip of Pile 36.24
Elev. Cutoff 94.04
Estimated Plan Length 45.0 F
Ordered Length 38.0 F
See letter of 6-8

Station location at which pile was driven E. Abut. 681+75.5; 7.5 Lt. C.L.
Elev. from which pile was driven 93.04

Elev.	Feet Below Cut Off	Blows Per Foot	Blows Per Minute	Bearing In Tons	Remarks
54.04	40	67		53.7	
53.04	41	75		57.7	
52.04	42	80		60.0	
51.04	43	86	60	62.8	
50.04	44	85		62.2	
49.04	45	85		62.2	
48.04	46	82		61.0	
47.04	47	89		63.6	
46.04	48	87		63.0	
45.04	49	87		63.0	
44.04	50	87		63.0	
43.04	51	77		58.6	
42.04	52	82		61.0	
41.04	53	72		56.3	
40.04	54	72		56.3	
39.04	55	74		57.2	
38.04	56	80		60.0	
37.04	57	94		65.8	
36.24	57.8	98+		67.6	150% over Plan Bearing

INFORMATION ONLY

54 1 of 2

BD 757 (Rev. 2-73)

STATE OF ILLINOIS

DEPARTMENT OF TRANSPORTATION

Test Pile Driving Record

Project BR-F-71(17)
Route FA 71
Section 115 BK
County FORD (053)
Station of Structure 683+01

Station location at which pile was driven W. Abut (682+54.7 15'Lt. C.L.
Elev. from which pile was driven 93.04

Type & Weight of Hammer Vulcan (4 1/2) 5000 Lbs.
Length of Fall 3 FT
Type of Pile Metal Shell
Required Bearing 45 Tons
Elev. Top Pile 104.84
Elev. Tip of Pile 44.84
Elev. Cutoff 94.04
Estimated Plan Length 53 L.F.
Ordered Length 50 L.F.

Elev.	Feet Below Cut Off	Blows Per Foot	Blows Per Minute	Bearing In Tons	Remarks
79.04	15	6		7.1	Very little resistance
78.04	16	9		10.5	encountered in first 14 Ft.
77.04	17	9		10.5	
76.04	18	11		12.6	
75.04	19	13		14.7	
74.04	20	14		15.7	Date Driven 6-5-79
73.04	21	15	600	16.7	
72.04	22	19		20.5	Witnessed by:
71.04	23	20		22.6	B. McKissick
70.04	24	34		33.1	R. Dawson
69.04	25	39		36.8	
68.04	26	39		36.8	
67.04	27	44		40.2	
66.04	28	45	600	40.9	
65.04	29	48		42.9	
64.04	30	49		43.5	
63.04	31	55		47.1	
62.04	32	56		44.1	
61.04	33	56	560	44.1	
60.04	34	57		44.7	
59.04	35	59		45.4	
58.04	36	64		52.2	
57.04	37	60		50	
56.04	38	67		53.7	
55.04	39	71		55.8	

SL 2

BD-747 (Rev. 2-73)

STATE OF ILLINOIS

DEPARTMENT OF TRANSPORTATION

Test Pile Driving Record

Project BR-F-71 (17)
Route FA 71
Section 115 BR
County LORD (053)
Station of Structure 1089 F 04

Type & Weight of Hammer Vulcan \ Air Steam 5-C
Length of Fall 3 FT
Type of Pile Metal Shell
Required Bearing 45 Tons
Elev. Top Pile 107.84
Elev. Tip of Pile 57.84
Elev. Cutoff 94.04
Estimated Plan Length [redacted]
Ordered Length 40' ± F

Station location at which pile was driven
Elev. from which pile was driven 93.04

Elev.	Feet Below Cut Off	Blows Per Foot	Blows Per Minute	Bearing In Tons	Remarks
54.04	40	82		61.0	
53.04	41	73		58.7	
52.04	42	77		58.0	
51.04	43	85		62.2	
50.04	44	82		61.0	
49.04	45	85		62.2	
48.04	46	86		62.8	
47.04	47	90		64.4	
46.04	48	93		65.5	
44.84	49.2	103		67.4	

Seismic Site Class Input and Results

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====SN 027-0070 using the data averaged from the1978 and the 2012 borings

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	779	ft.
Pile or Shaft Dia.	12	inches
Boring Number	1	
Top of Boring Elev.	785.4	ft.
Approximate Fixity Elev.	773	ft.

Individual Site Class Definition:

N (bar): 17 (Blows/ft.) Soil Site Class D

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

s_u (bar): 3.13 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	782.9	2.50	5	1.00	b
	780.4	2.50	8	2.30	
	777.9	2.50	9	2.50	
	775.4	2.50	12	2.70	b
	773.4	2.00	8	1.10	b
2.1	770.9	2.50	4	1.20	
5.1	767.9	3.00	7	1.00	b
7.6	765.4	2.50	15	3.70	
10.1	762.9	2.50	17	3.90	
12.6	760.4	2.50	24	4.50	
15.1	757.9	2.50	23	4.30	
17.6	755.4	2.50	25	4.90	
20.1	752.9	2.50	19	4.20	
22.6	750.4	2.50	18	3.60	
25.1	747.9	2.50	16	3.20	
27.6	745.4	2.50	16	3.30	
30.1	742.9	2.50	14	2.80	
31.6	741.4	1.50	18	2.90	b
36.6	736.4	5.00	15	3.10	
41.6	731.4	5.00	17	3.00	
46.6	726.4	5.00	18	3.50	
51.6	721.4	5.00	22	3.70	
54.1	718.9	2.50	19	3.50	
100.0	673.0	45.90	19	3.50	b

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	779	ft.
Pile or Shaft Dia.	12	inches
Boring Number	2	
Top of Boring Elev.	785.27	ft.
Approximate Fixity Elev.	773	ft.

Individual Site Class Definition:

N (bar): 19 (Blows/ft.) Soil Site Class D

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

s_u (bar): 4.02 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	782.8	2.50	5	1.00	b
	780.3	2.50	8	2.20	
	777.8	2.50	11	2.30	
	775.8	2.00	10	2.40	b
	773.3	2.50	6	1.80	
2.2	770.8	2.50	4	1.10	
4.7	768.3	2.50	6	2.00	b
7.2	765.8	2.50	19	4.60	
9.7	763.3	2.50	21	4.40	
12.2	760.8	2.50	23	4.60	
14.7	758.3	2.50	18	4.60	
17.2	755.8	2.50	17	3.80	
22.2	750.8	5.00	15	3.50	
27.2	745.8	5.00	13	3.00	
31.7	741.3	4.50	14	3.30	b
36.7	736.3	5.00	17	3.50	
41.7	731.3	5.00	24	4.70	
46.7	726.3	5.00	25	5.30	
51.7	721.3	5.00	25	4.70	
54.2	718.8	2.50	25	4.50	
100.0	673.0	45.80	25	4.80	b

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): 18 (Blows/ft.) Soil Site Class D

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

s_u (bar): 3.58 (ksf) Soil Site Class C <----Controls

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====SN 027-0070 using 2012 borings

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	779	ft.
Pile or Shaft Dia.	12	inches
Boring Number	1	
Top of Boring Elev.	785.4	ft.
Approximate Fixity Elev.	773	ft.

Individual Site Class Definition:

N (bar): 17 (Blows/ft.) Soil Site Class D

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

s_u (bar): 4.58 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	782.9	2.50	5	1.00	b
	780.4	2.50	8	3.50	
	777.9	2.50	7	4.00	
	775.4	2.50	10	4.00	b
	773.4	2.00	9	1.00	b
2.1	770.9	2.50	4	2.00	
5.1	767.9	3.00	5	2.00	b
7.6	765.4	2.50	8	3.50	
10.1	762.9	2.50	13	4.50	
12.6	760.4	2.50	20	6.30	
15.1	757.9	2.50	23	6.40	
17.6	755.4	2.50	26	6.40	
20.1	752.9	2.50	25	6.80	
22.6	750.4	2.50	24	6.10	
25.1	747.9	2.50	20	5.40	
27.6	745.4	2.50	18	5.00	
30.1	742.9	2.50	14	4.60	
31.6	741.4	1.50	16	4.50	b
36.6	736.4	5.00	18	5.10	
41.6	731.4	5.00	18	5.00	
46.6	726.4	5.00	18	5.00	
51.6	721.4	5.00	22	5.20	
54.1	718.9	2.50	19	5.00	
100.0	673.0	45.90	19	5.00	b

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	779	ft.
Pile or Shaft Dia.	12	inches
Boring Number	2	
Top of Boring Elev.	785.27	ft.
Approximate Fixity Elev.	773	ft.

Individual Site Class Definition:

N (bar): 18 (Blows/ft.) Soil Site Class D

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

s_u (bar): 4.66 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	782.8	2.50	5	1.00	b
	780.3	2.50	13	3.50	
	777.8	2.50	11	3.50	
	775.8	2.00	8	3.00	b
	773.3	2.50	6	2.50	
2.2	770.8	2.50	5	2.00	
4.7	768.3	2.50	9	2.00	b
7.2	765.8	2.50	16	5.70	
9.7	763.3	2.50	16	5.70	
12.2	760.8	2.50	17	5.90	
14.7	758.3	2.50	17	5.70	
17.2	755.8	2.50	14	5.60	
22.2	750.8	5.00	13	5.50	
27.2	745.8	5.00	11	4.80	
31.7	741.3	4.50	13	5.50	b
36.7	736.3	5.00	16	5.90	
41.7	731.3	5.00	22	6.60	
46.7	726.3	5.00	25	6.80	
51.7	721.3	5.00	25	6.40	
54.2	718.8	2.50	27	6.00	
100.0	673.0	45.80	25	6.40	b

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): 18 (Blows/ft.) Soil Site Class D

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

s_u (bar): 4.62 (ksf) Soil Site Class C <----Controls

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====SN 027-0070 using 1978 borings

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	779	ft.
Pile or Shaft Dia.	12	inches
Boring Number	2	
Top of Boring Elev.	785	ft.
Approximate Fixity Elev.	773	ft.

Individual Site Class Definition:

N (bar):	19 (Blows/ft.)	Soil Site Class D	
N_{ch} (bar):	NA (Blows/ft.)	NA	
s_u (bar):	1.71 (ksf)	Soil Site Class D <----Controls	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	782.5	2.50	5	1.00	b
	780.5	2.00	8	1.20	b
	778.0	2.50	12	1.10	b
	775.5	2.50	14	1.50	b
	773.0	2.50	7	1.10	b
2.5	770.5	2.50	5	0.40	b
5.0	768.0	2.50	9		b
7.5	765.5	2.50	22	3.90	
10.0	763.0	2.50	21	3.30	
12.5	760.5	2.50	29		
15.0	758.0	2.50	23	2.30	
17.5	755.5	2.50	24	3.40	b
20.0	753.0	2.50	14	1.60	
22.5	750.5	2.50	12	1.20	b
25.0	748.0	2.50	12	1.10	
27.5	745.5	2.50	14	1.20	
30.0	743.0	2.50	14	1.10	
32.5	740.5	2.50	20	1.30	b
35.0	738.0	2.50	13	1.10	
37.5	735.5	2.50	15	1.40	
40.0	733.0	2.50	17	1.00	
42.5	730.5	2.50	26	3.10	
45.0	728.0	2.50	19	2.10	b
100.0	673.0	55.00	24	2.00	b

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	779	ft.
Pile or Shaft Dia.	12	inches
Boring Number	2	
Top of Boring Elev.	785	ft.
Approximate Fixity Elev.	773	ft.

Individual Site Class Definition:

N (bar):	19 (Blows/ft.)	Soil Site Class D	
N_{ch} (bar):	NA (Blows/ft.)	NA	
s_u (bar):	1.93 (ksf)	Soil Site Class D <----Controls	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	782.5	2.50	5	1.00	b
	780.5	2.00	4		b
	778.0	2.50	9	1.10	b
	776.0	2.00	13	1.80	b
	773.5	2.50	7	1.20	b
2.5	770.5	3.00	4	0.20	b
4.5	768.5	2.00	3		b
7.0	766.0	2.50	22	3.50	b
9.5	763.5	2.50	26	3.10	
12.0	761.0	2.50	28	3.30	
14.5	758.5	2.50	32	3.50	
17.0	756.0	2.50	20	2.10	b
19.5	753.5	2.50	17	1.60	
22.0	751.0	2.50	12	1.20	
24.5	748.5	2.50	15	1.20	
27.0	746.0	2.50	15	1.40	
29.5	743.5	2.50	15	1.20	
32.0	741.0	2.50	17	1.90	
34.5	738.5	2.50	18		b
37.0	736.0	2.50	25	2.30	
39.5	733.5	2.50	27	2.90	
42.0	731.0	2.50	28	2.70	
44.5	728.5	2.50	25	3.90	
100.0	673.0	55.50	26	3.10	b

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):	19 (Blows/ft.)	Soil Site Class D
N_{ch} (bar):	(Blows/ft.)	NA, H < 0.1*H (Total)
s_u (bar):	1.82 (ksf)	Soil Site Class D <----Controls

Conterminous 48 States
2007 AASHTO Bridge Design Guidelines
AASHTO Spectrum for 7% PE in 75 years
Latitude = 40.485763
Longitude = -088.352582
Site Class B
Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.053	PGA - Site Class B
0.2	0.125	Ss - Site Class B
1.0	0.051	S1 - Site Class B

Conterminous 48 States
2007 AASHTO Bridge Design Guidelines
Spectral Response Accelerations SDs and SD1
Latitude = 40.485763
Longitude = -088.352582
As = FpgaPGA, SDs = FaSs, and SD1 = FvS1
Site Class C - Fpga = 1.20, Fa = 1.20, Fv = 1.70
Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.064	As - Site Class C
0.2	0.150	SDs - Site Class C
1.0	0.086	SD1 - Site Class C

Conterminous 48 States
2007 AASHTO Bridge Design Guidelines
Spectral Response Accelerations SDs and SD1
Latitude = 40.485763
Longitude = -088.352582
As = FpgaPGA, SDs = FaSs, and SD1 = FvS1
Site Class D - Fpga = 1.60, Fa = 1.60, Fv = 2.40
Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.085	As - Site Class D
0.2	0.201	SDs - Site Class D
1.0	0.121	SD1 - Site Class D