STRUCTURE GEOTECHNICAL REPORT

009-0504

Existing SN 009-0001

US 67 Expressway over the Illinois River

Route: FAP 310
Section: 9-4; 85-1
Cass and Schuyler Counties

D-96-543-02

Contract Number Not Assigned

Revised November 18, 2011 to include consolidation test data, revise north abutment pile analysis and construction recommendations, revise design scour elevation information and related analyses, and correct typographical errors in some COM624 input data tables. Also refer to the attached Addendum discussing pile supported footing analyses for Piers 10-16.

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Revised May 30, 2012

Date: 1-6-12

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Attachments:
Preliminary TSL
Subsurface Profile
Geophysical Survey Profiles
Soil Boring Logs
Rock Core Logs
Special Provisions

This Report has been prepared based on a preliminary TSL from July 2010. Contact the author if there are any questions regarding this Report or if there are modifications to structure location, size, geometry, or vertical alignment.

Electronic copies of boring logs are available upon request for inclusion in the plans.

This report has been prepared according to the 2009 IDOT Bridge Manual and the AASHTO LRFD Bridge Design Specifications 4th Edition – 2007 with 2008 interim revisions.

Project Description and Proposed Structure Information

The proposed structure carries the US 67 Expressway over the Illinois River, Coal Creek Island, and Curry Lake. The proposed structure is 3,557 ft long and approximately 95 ft wide. The main span at the Illinois River is a 542 ft long tied arch. Remaining steel plate girder spans vary in length from 150 ft to 320 ft. Approach embankments are 40 to 56 ft high, and proposed end slopes incorporate the existing levees. The proposed structure is located approximately 200 ft downstream of the existing US 67 structure. It is our understanding the proposed project will be constructed under multiple contracts. This Report is applicable to contracts covering grading and substructure construction operations. This work is part of the US 67 Expressway Beardstown By-Pass project. A Roadway Geotechnical Report and Structure Geotechnical Reports for nearby structures will also be available for reference.

Site Investigation

The Illinois River valley in the project area is 9 to 12 miles wide. The proposed structure location is approximately 2 miles downstream of the confluence of the Illinois and Sangamon Rivers. The main river channel is 1000± ft wide. Coal Creek Island separates the main river channel from a backwater lake, Curry Lake. The river and backwater lake are constrained by levees on both sides. Between the south abutment and river channel, and on Coal Creek Island, existing ground is predominantly timber and marsh. A barge loading facility is located along the river bank immediately upstream of the proposed structure, and barges are frequently moored along the river bank. Water elevation on Curry Lake can be moderately controlled during non-flood conditions by gated pipes south of the project location. There is no significant connection between the river channel and Curry Lake.

No stability or erosion problems have been identified on existing levee slopes. The South Beardstown levee at the proposed south abutment location has 3H:1V slopes and is 20± ft high. The Coal Creek levee at the proposed north abutment location has 4H:1V slopes and is 28± ft high. It is our understanding since their construction in the 1930s, there have been no levee breaches in the area during flood events

The existing structure was originally built between 1953 and 1955. Existing piers outside the truss spans are predominantly supported on 5 to 7 rows of 20 ton timber piles 30 ft long. Piers supporting the truss spans are supported on 6 to 12 rows of 16” to 18”, 45 ton, pre-cast concrete piles 30 to 45 ft long. The plans show cofferdam seal coats 3 to 7 ft thick depending on proximity to the river. It is our understanding some pre-cast concrete piles were jetted into place prior to driving. No driving data is available. Boring data is available for the existing structure, but the depth and sampling methods are not adequate for use in proposed design.

Underwater inspection report information from 2001 to 2008 has been reviewed to determine scour characteristics at the existing main channel piers. The data indicates variable ground elevation with alternating scour and deposition from year to year. The maximum scour depth recorded is 8 ft below prevailing streambed elevation at the time of inspection in 2008 at existing pier 11 (north side of main navigation channel).

The subsurface investigation consisted of a combination of borings and geophysical surveys. Borings were advanced by Geo Services, Inc. using mud rotary methods according to AASHTO T 206, AASHTO T 225, and the IDOT Geotechnical Manual. One boring with rock coring was performed at each proposed substructure location. Supplemental borings were obtained at Piers 2, 3, and 4 to provide additional near-surface information for major cofferdam design. The boring data generally indicates approximately 80 ft of granular materials over limestone

bedrock. Most borings were allowed to collapse upon withdrawal of casing. Exceptions included borings adjacent to or on levees, which were grouted upon completion. Boring and rock core logs are attached. Shelby tube samples were obtained by the District 6 drill crew on the land side of the levee at the north abutment. Samples were tested at the BMPR Soils Lab.

Geophysical surveys, performed by Geotechnology, Inc., were used to supplement boring data at each substructure. Seismic refraction or seismic reflection (Piers 3 and 4) were primarily used to identify variations in top of rock elevation over the width of each substructure. Sub-bottom profiling was used at the piers adjacent to the navigation channel to identify any potential near-surface buried obstructions that may affect pier construction. Beardstown has over 150 years of history as a major river port, so there is potential for buried debris or sunken barges at proposed river pier locations. In most cases, the geophysical survey was performed prior to drilling. Drilling locations were occasionally altered to investigate anomalies identified by the geophysical methods. In all cases, geophysical data was interpreted based on boring data at the location. Seismic refraction sections are attached.

Sub-bottom profiling identified anomalies at Piers 3 and 4. Subsequent drilling at selected anomalies did not identify obstructions. Geophysical data indicates relatively uniform subsurface conditions with a few exceptions. The following table lists significant anomalies identified by seismic refraction and their likely cause and treatment.

Pier 1	A low velocity anomaly extending 25 ft below prevailing project top of rock elevation. This is attributed to localized erosion in the rock. Refer to the section discussing the Pier 1 foundation.
Pier 5	A high velocity anomaly offset between 40 and 50 ft LT extending 15± ft above prevailing top of rock. The data is consistent with dense gravel overlying rock.
Pier 10	A high velocity anomaly offset between 30 & 50 ft LT beginning 20± below ground surface.
Pier 14	A high velocity anomaly offset between 10 and 50 ft LT extending 20± ft above prevailing top of rock. The data is consistent with dense gravel overlying rock.
N. Abut.	A low velocity anomaly offset 20 ft RT extending 20 ft below prevailing top of rock. An additional test pile will be specified at this location.

Ground water elevation generally corresponds with the top of granular materials or river elevation. Water elevation measurements were not made after 24 hours because of hole collapse or the need to grout upon completion.

Geotechnical Evaluation

Settlement. Estimates of settlement magnitude have been calculated at both abutments. At the north abutment, the estimate is based on a combination of laboratory consolidation tests and the empirical relationship between moisture content and compression index. The empirical calculation also incorporates a correction based on soil strength. At the south abutment, an estimate of settlement in granular materials was made using 1986 NAVFAC DM7.01 Figure 6 on page 7.1-219. The results are shown in the table on the next page.

Location	Fill Height	Settlement Estimate	Est. Time to 90%Settlement, t_{90}
South Abutment	56 ft	2 inches	-
North Abutment*	17 ft*	3 to 8 inches**	6 months
N. Abut. Approach Footing*	24.5 ft*	4 to 11 inches**	6 months

* North abutment is located above the land-side slope of an existing levee.

** The first value shown corresponds to the empirical result and the second value corresponds to the laboratory test.

At the north abutment, a weak, high moisture content compressible layer below the existing levee contributes a majority of the settlement magnitude. The bottom elevation of compressible materials is 412 ft. Primary settlement is not anticipated to be complete prior to foundation construction without a waiting period. Significant downdrag forces may need to be considered in foundation design.

At the south abutment, settlement in granular materials is anticipated to occur during fill placement. Due to the proposed fill height, some internal consolidation may occur within the embankment.

Slope Stability. Slope stability analyses have been performed modeling each abutment end slope including existing levee geometry. The models utilize granular materials as fill at both abutments. Granular fill was assumed to have a phi angle of 34°and a unit weight of 120 pcf. Remolded UU triaxial tests on local granular materials likely to be used as fill verify a phi angle of 34°is achievable at 95% compaction. At the sou th abutment, there is 38 ft of additional fill above the levee. At this fill height, cohesive materials can become more critical, so additional analyses were performed modeling cohesive materials.

In addition to a global analysis with water at a “nominal” elevation near the toe of the levee, an analysis also models a rapid draw down condition following a sustained major flood event. Another analysis examines the 2H:1V fill above the levee. A cohesive soil slope cap was included in the analysis. The resulting factors-of-safety are shown in the table below:

Analysis	North Abutment	South Abutment
Global Granular Fill – Nominal Pool	1.8	1.6
Global Granular Fill – Rapid Draw Down	1.7	1.3
Granular Fill Above Levee	2.1	1.8
Global Cohesive Fill – Nominal Pool	-	1.4
Global Cohesive Fill - Rapid Draw Down	-	1.1
Cohesive Fill Above Levee	-	1.4

The results indicate all granular cases show satisfactory factors of safety. A factor-of-safety of 1.3 for a rapid draw down case is acceptable. The results for the cohesive material cases at the south abutment show unacceptable factors-of-safety. For cohesive materials, the typical assumption for cohesion is 1000 psf. Additional analyses indicate a cohesion of 1300 psf is required to increase the global cohesive fill rapid draw down case factor-of-safety to 1.3 and the other FOS above 1.5. Experience indicates a cohesion of 1,300 psf is readily obtainable with modern construction equipment and techniques. *Note: Granular materials will be specified as fill at the south abutment. Refer to the south abutment foundation evaluation section later in this report.*

At the North Abutment, the potential for lateral squeeze has been evaluated as described in Section 5.11 of the 2000 FHWA Soils and Foundations Workshop Manual. A weak, high moisture content layer of silty clay is located between approximate elevations 423 and 412 ft. This compressible layer is responsible for a majority of settlement described in the previous section. An empirical check comparing the change in load to 3 times the cohesion of the weak layer indicates there is potential for lateral squeeze. However using 25% of the estimated vertical settlement magnitude, the resulting horizontal movement is only estimated at 0.6". Because of the low estimated horizontal movement and the likely conservatism inherent in the empirical calculations applied to this case, lateral squeeze is not a significant design consideration.

Seismic Considerations. The following table shows recommended seismic design data based on a 1000 year return period event.

Seismic Performance Zone (SPZ)	1
Spectral Acceleration at 1 second (S_{D1})	0.129
Design Spectral Acceleration at 0.2 Seconds (S_{DS})	0.214
Soil Site Class	D

No additional seismic analysis is required.

Scour. The design scour elevation has been determined for each substructure based on the total scour resulting from a 100 year event. No geotechnical reductions in scour depth are appropriate given subsurface conditions. More complete scour analysis information is included in the November 2009 Hydraulic Report for the proposed structure. The first table below shows the ground elevation references used to determine the design scour elevations. The second table is the design scour elevation table.

Ground Elevation Reference for Design Scour Elevation Determination

Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	Pier 8
432.0	420.0*	416.0*	416.0*	435.5	435.0	434.0	433.2

Pier 9	Pier 10	Pier 11	Pier 12	Pier 13	Pier 14	Pier 15	Pier 16
429.2	428.0	428.6	428.0	427.9	427.9	427.0	428.5

* Design streambed elevation.

Design Scour Elevation Table

S. Abut	Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	Pier 8
477.3±	426.5	410.2	404.5	405.1	428.2	429.5	428.4	428.0

Pier 9	Pier 10	Pier 11	Pier 12	Pier 13	Pier 14	Pier 15	Pier 16	N. Abut.
423.9	422.6	423.3	422.6	422.5	422.5	421.6	423.3	455.4±

Design scour elevation for abutments should correspond to the bottom of abutment elevation. Revisions to the abutment elevations shown in the table are likely during final design.

Mining Activity. ISGS records indicate no mines located near the proposed project location.

Foundation Evaluation

The following table shows preliminary loading information used in foundation analyses.

Substructure	Axial Service II	Longitudinal Strength I	Longitudinal Strength III	Transverse Extreme Event II (Impact)
South Abut.	3,465	-	-	-
Pier 1	10,155	-	335	-
Pier 2	12,115	-	479	1,500
Pier 3	22,725	-	990	5,000
Pier 4	22,725	-	990	5,000
Pier 5	8,725	428	-	-
Pier 6	8,725	-	319	-
Pier 7	5,250	-	157	-
Pier 8	5,400	-	157	-
Pier 9	4,870	217	-	-
Pier 10	4,870	217	-	-
Pier 11	5,400	-	157	-
Pier 12	4,535	-	157	-
Pier 13	5,400	-	157	-
Pier 14	4,720	217	-	-
Pier 15	4,720	217	-	-
Pier 16	5,250	-	157	-
North Abut.	2,750	-	-	-

Driven Piles

Axial load analyses for driven piles have been performed using the Modified IDOT Static method for estimating nominal pile resistance. A geotechnical resistance factor (ϕ_G) of 0.55 has been used for piles. A downdrag load factor of 1.05 has been included where appropriate. Refer to IDOT BBS AGMU 10.2 for additional information.

Piles will reach their maximum nominal required bearing (NRB) in either dense granular soils or on limestone. Where piles terminate in dense granular soils, no pile group settlement analysis is required according to AASHTO C10.7.2.3.1. At some pier locations, the number of piles may be controlled by horizontal loading. In these cases, driving piles to their maximum nominal required bearing is not required. Driving piles to bedrock is not required. The estimated pile length shown in the plans should be in multiples of 5 ft. The pile length determined from figures should be increased to the nearest 5 ft increment.

The use of battered piles is anticipated to resist horizontal forces. Unless otherwise noted for a specific substructure, the maximum batter should be 3" in 12".

Any seal coats required for cofferdam construction are not included in the driven pile analysis.

Drilled Shafts

Drilled shafts supported by a combination of side resistance in granular materials and tip resistance in granular intermediate geomaterials have been considered. A preliminary analysis indicates the magnitude of total factored resistance available is marginally adequate to support the required axial loading, even with large diameter shafts. Boring data also indicates the consistency and thickness of the intermediate geomaterial is not uniform. Because of the uncertainty associated with the subsurface conditions combined with the marginally adequate resistance, drilled shafts supported entirely in granular materials above rock will not be considered.

Rock core data indicates limestone with variable jointing conditions. Joints are typically spaced at intervals less than 1 ft and are weathered to varying degrees. Occasionally, 0.25 to 0.5 inch open joints are filled with clay. Specific jointing conditions are considered at each pier.

Based on the limestone strength and jointing conditions, base resistance is assumed to be the primary mode of axial resistance in rock. Unit base resistance at each shaft location is determined using the Geologic Strength Index (GSI) and Turner equation (13-25) described in *Drilled Shafts: Construction Procedures and LRFD Design Methods* (FHWA-NHI-10-016 May 2010). Rock properties within the top 10 ft are used to determine unit base resistance. This is assumed to be within a depth of 1 diameter of the largest proposed shaft's rock socket. Based on the rock core jointing data, GSI is assumed to be between 30 and 40. The lower bound is used when clay is present in joints within the top 10 ft.

All materials above rock are ignored in determining geotechnical resistance. No axial group effects are considered in rock.

Side resistance within a rock socket will only be evaluated if base resistance is insufficient to support the required loading. In some cases, the limestone strength is high enough that side resistance will be controlled by the 28-day compressive strength. A 28-day compressive strength of 4 ksi is used in the analysis.

Geotechnical resistance factors of 0.55 for side resistance and 0.5 for base resistance were used in the analyses. If warranted, a shaft load test at the poorest quality rock location may allow the resistance factor to increase to 0.70.

Minimum shaft spacing should be 3 shaft diameters. *End bearing drilled shafts should have a minimum 2 ft long rock socket.* A rock socket is needed to enable the construction inspectors to verify top of rock and ensure removal of weathered surface material. Rock socket diameters should be 6" less than the shaft diameter above rock.

Horizontal Load COM624 Analyses

The structure designer should be aware that all COM624 analyses results shown in this Report are based on simplified or assumed models, and they should only be used for preliminary pile or shaft sizing and layout.

All horizontal load analyses have been performed using the Reese COM624 method. Models utilize a single, constant cross-section, vertical pile or shaft with a pinned (free) connection to

the footing or pier cap. The pile or shaft is unsupported to the design scour elevation where applicable. Any required cofferdam seal coat is not included in the analysis. An appropriate range of horizontal loads are applied to the top of pile or shaft, but no axial loads are included. In most cases, the loads are applied in the more critical longitudinal direction. Loads are also applied in the transverse direction in the case of barge impact forces. In all cases, H-Piles are modeled using their strong axis. Drilled shaft analyses consider a constant diameter, unreinforced shaft and ignore the rock socket.

Group deflection is estimated at piers using the average p-multiplier method. The average p-multiplier method enables a single pile or shaft to approximate the behavior of the group. The average p-multiplier for each analysis is based on an assumed pile or shaft group configuration and the direction of force application. P-multipliers can be found in Table 10.7.2.4-1 of the AASHTO LRFD Bridge Design Specifications.

Recommended COM624 soil layer input data is shown for each substructure for use by the structure designer in more detailed analyses of soil-structure interaction. When considering group effects, P-multipliers affect the phi angle, k value, and cohesion. The k value and cohesion are adjusted by directly multiplying the k and c values by the appropriate p-multiplier. The phi angle is adjusted using the normalized resistance approach. The following table can be used to adjust phi angles for a given p-multiplier.

Phi Angles Adjusted for P Multiplier

Phi	Pm=0.9	Pm=0.8	Pm=0.7	Pm=0.6	Pm=0.5	Pm=0.4	Pm=0.3
24	23	22	21	19	17	15	13
25	24	23	22	20	19	16	14
26	25	24	23	21	20	17	15
27	26	25	24	22	21	19	16
28	27	26	25	23	22	20	17
29	28	27	26	25	23	21	18
30	29	28	27	26	24	22	20
31	30	29	28	26	25	23	21
32	31	30	29	27	26	24	21
33	32	31	30	28	27	25	23
34	33	32	31	30	28	26	24
35	34	33	32	31	29	27	25
36	35	34	33	32	30	28	26
37	36	35	34	33	31	29	27
38	37	36	35	34	32	30	28
39	38	37	36	35	33	31	29
40	39	38	37	36	35	32	30
45	45	45	44	42	40	38	36

North Abutment

The proposed north abutment is a typical stub abutment design. The proposed grade at the north abutment is located on 17 ft of fill above the existing levee. Because of the likely girder depth combined with the abutment seat depth, the bottom of abutment elevation is approximately 2 ft above existing ground elevation. The use of granular or cohesive fill material should not have a significant impact on the abutment foundation. A driven pile foundation is recommended. Drilled shafts are feasible, but are not recommended because of construction difficulties associated embankment construction and long shaft excavation through high strength materials transitioning into granular materials. Drilled shafts are also likely not economical when compared to driven piles.

Driven pile foundation design is complicated by the significant downdrag resistance loss and additional load from strong cohesive levee materials overlying a weak compressible material layer.

A typical method of mitigating downdrag is pre-coring through the existing levee. Tom Mack, Chief of the Geotechnical Branch of the USCOE Rock Island District, indicated precoring through the levee should not be problematic given subsurface conditions and the proposed new embankment. The following table shows nominal required bearing (NRB), total factored downdrag (FDD) resistance loss and load, factored resistance available (FRA), and estimated length for two pile sizes. The information assumes pre-coring to elevation 432 ft. The bottom of pre-coring elevation considers the capabilities of typical pre-coring equipment and a desire to avoid pre-coring below the levee. A typical stub abutment design consists of one vertical row and one battered row of piles. A maximum batter of 2" in 12" is recommended to maintain the effectiveness of pre-coring.

North Abutment Pile Information Based on Pre-Coring to Elevation 432 ft.

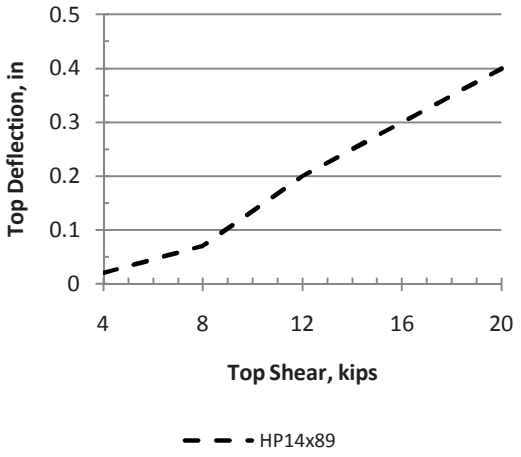
Pile Size	NRB, kps	FDD, kips	FRA, kips	Est. Length*
HP 14x89	705	265	123	100
HP 14x117	929	270	241	100

*Estimated length based on a cutoff elevation of 456 ft

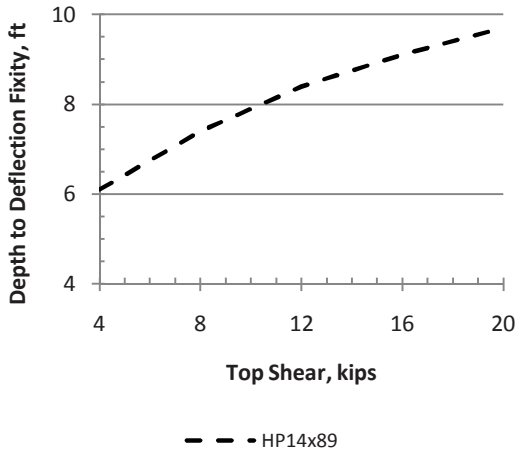
A second option for mitigating downdrag is to specify a waiting period between embankment construction and pile driving. However at this early stage in design, there is uncertainty regarding the letting schedule of the multiple contracts that would be involved in guaranteeing an adequate waiting period. Preloading or wick drains are sometimes used in conjunction with a waiting period to reduce its length. Preloading may have a detrimental impact on slope stability and preload materials can be difficult to dispose of depending on the status of grading contracts. Wick drain installation would be prohibitively expensive because auguring would be required to advance the wicks through the high strength cohesive materials in the levee.

Because of the uncertainty with coordinating a waiting period among multiple contracts and the need for a waiting period exceeding 6 months, the use of a waiting period is not recommended.

The horizontal load analysis models a single vertical pile with a pinned (free) connection to the abutment. A range of loading was applied to the top of pile (Elev. 454.1 ft) in a direction towards the front of abutment. The sloping ground in front of the abutment was included in the model. No p-multipliers were used in this analysis. The following graphs show top deflection and depth to deflection fixity for an HP 14x89.



N. Abut. Deflection vs. Shear



N. Abut. Depth to Fixity vs. Shear
Below Estimated Cutoff Elev. 454.1 ft.

The following table includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

North Abutment COM624 Layer Input Data

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
423	Stiff Clay Above W.T.*	120	-	2036	677	0.006
412	Soft Clay	52.6	-	550	60	0.014
403	Sand	57.6	33	-	40	-
373	Sand	67.6	40	-	85	-
356	Sand	67.6	40	-	190	-

* Analyses indicate stiff clay above water table p-y criteria results in more critical deflection than stiff clay below water table.

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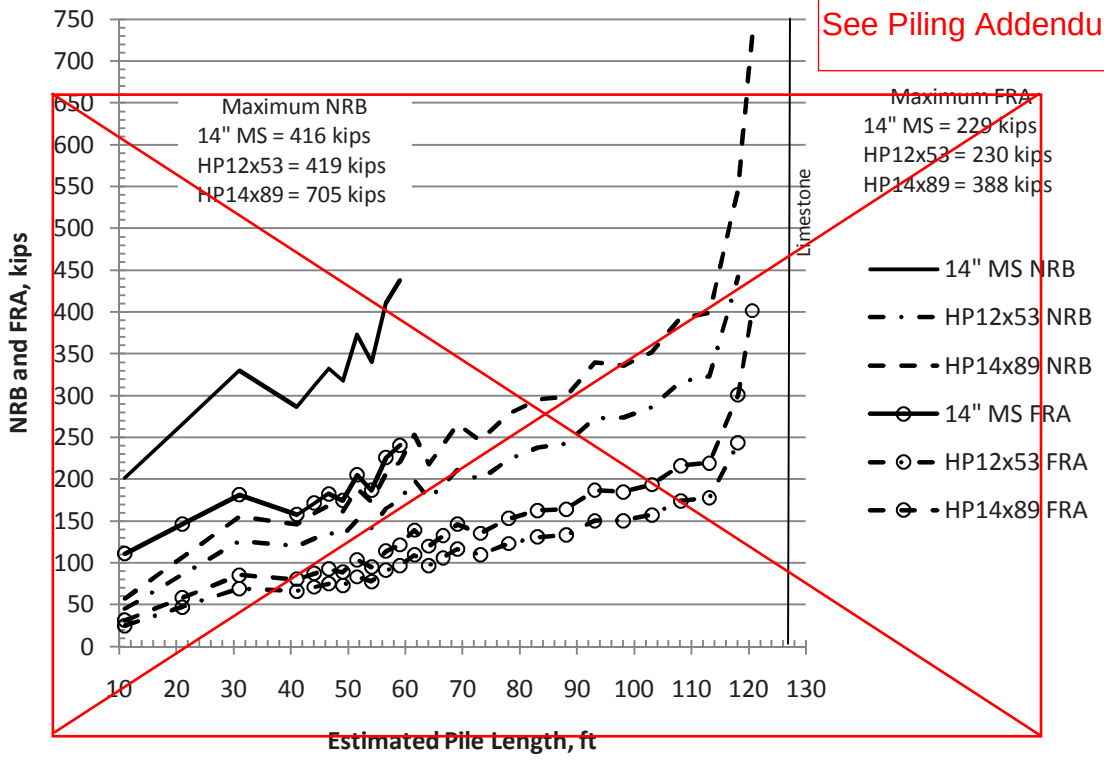
South Abutment

The proposed south abutment is a typical stub abutment design. The south abutment is on 41 ft of fill underlain by existing granular materials. Drilled shafts are feasible, but are not recommended because of construction difficulties associated embankment construction and long shaft excavation through high strength materials transitioning into granular materials. Drilled shafts are also likely not economical when compared to driven piles. If granular fill materials are required, a spread footing may become feasible. A basic evaluation indicates the granular fill would provide adequate bearing capacity. However, footing settlement could be approximately 2 inches and placement of layered, horizontal geosynthetic reinforcement would be required to maintain slope stability. Because of these issues, a spread footing is not recommended. A driven pile foundation is recommended.

As described earlier, consolidation of underlying soils will occur during fill placement. In the case of granular fill materials, pre-coring is not required, but it will be required for cohesive materials to mitigate any potential downdrag resulting from internal fill consolidation. This potential variation in fill material type makes determining static resistance and estimating pile length difficult. The attached special provision and detail should be included in the grading contract requiring granular fill in the south abutment approach embankment. The following graph shows NRB and FRA versus pile length for a variety of pile sizes. The data shown in the graph is based on granular fill with no downdrag.

Revised.
See Piling Addendum #2

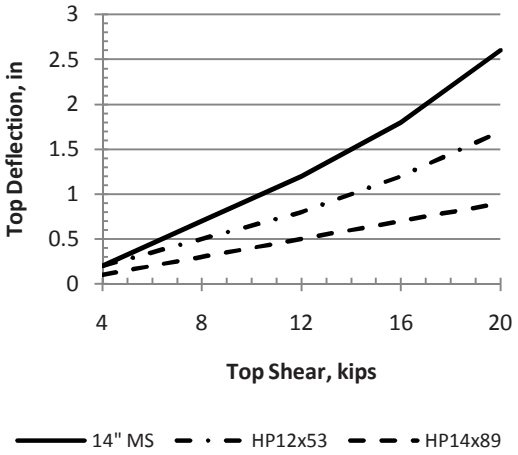


Estimated pile length is based on a cutoff elevation of 478.0 ft.

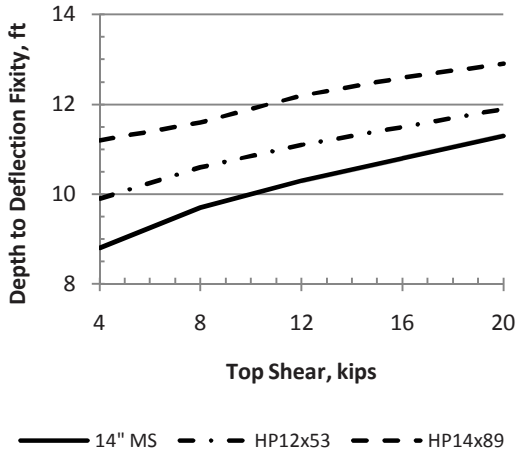
South Abutment Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length Assuming Granular Fill

The data shown in the previous figure shows all piles will reach their nominal required bearing above bedrock. When determining the estimated length for a given NRB and FRA, select the longest pile length shown on the graph. For example if a 350 kip NRB is desired for a 14" MS, select 55 ft as the estimated length. A minimum tip elevation of 425 ft should be shown in the plans to ensure piles penetrate sufficiently into existing ground. The Standard Specifications require a pile be driven to a penetration that satisfies both the nominal required bearing and minimum tip elevation shown in the plans.

The horizontal load analysis models a single vertical pile with a pinned (free) connection to the abutment. A range of loading was applied to the top of pile (Elev. 478 ft) in a direction towards the front of abutment. The sloping ground in front of the abutment was included in the model. No p-multipliers were used in this analysis. The following graphs show top deflection and depth to deflection fixity for a variety of pile types and sizes.



S. Abut. Deflection vs. Shear



S. Abut. Depth to Fixity vs. Shear
Below Estimated Cutoff Elev. 478 ft

The following table includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

South Abutment COM624 Layer Input Data

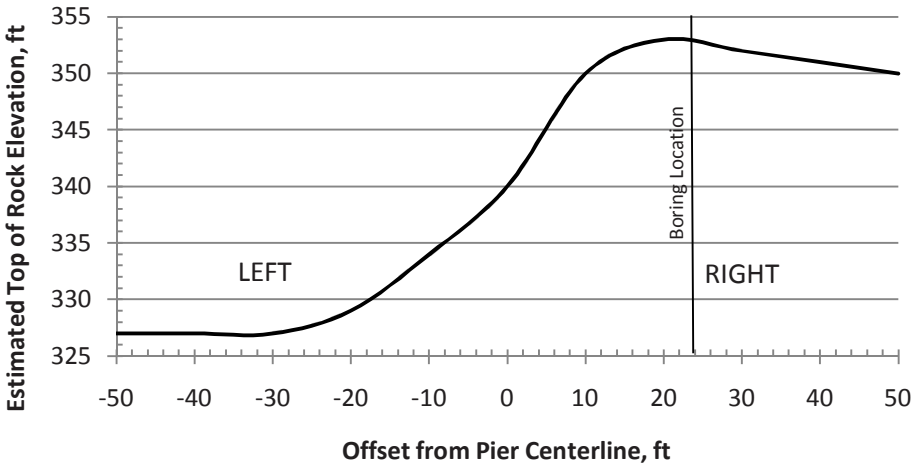
Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ', pcf	Φ°	c, psf	k, pci	E_{50}
437	Sand	120	34	-	25	-
426	Sand	47.6	28	-	15	-
360	Sand	62.6	36	-	45	-
349	Sand	67.6	40	-	190	-

A typical stub abutment design consists of one vertical row and one battered row of piles. A maximum batter of 3" in 12" is recommended.

Pier 1

Pier 1 Drilled Shaft Supported Pier Cap Configuration

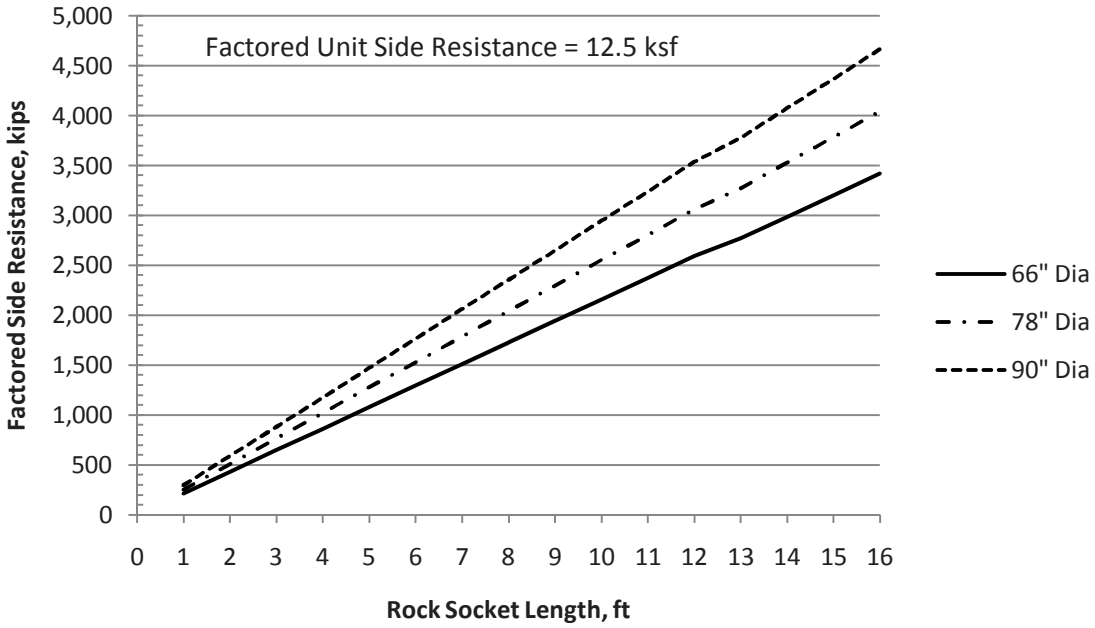
Rock core data shows highly jointed limestone with clay seams beginning approximately 10 ft below top of rock at the boring location. This reduces the GSI from 40 to 30. As shown in the figure below, seismic refraction data indicates 25± ft of variation in top of rock elevation over the substructure width. The variation in rock quality with the presence of clay seams, combined with the variation in elevation significantly increases uncertainty regarding a contribution from shaft end bearing. Drilled shafts at pier 1 should consider side resistance only.



Pier 1 Estimated Top of Rock Elevations

The plans should indicate a top of rock elevation for each shaft determined from the above figure. Plan top of rock elevation should be shown to the nearest foot.

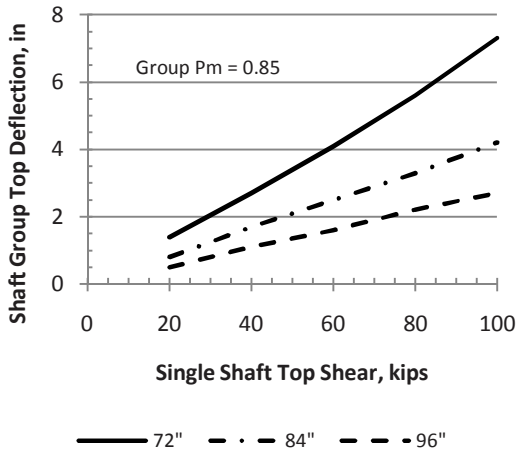
The rock socket side resistance is controlled by the concrete compressive strength over its entire length based on the unconfined compressive strength of limestone, including jointing reduction factors. The following figure shows factored side resistance versus rock socket length for a variety of rock socket diameters.



Pier 1 Factored Rock Socket Side Resistance vs. Rock Socket Length.

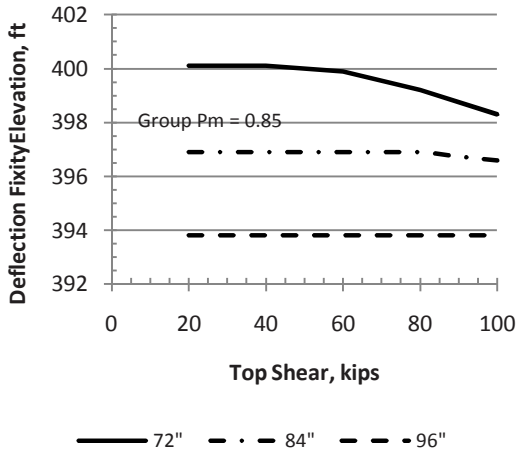
Rock socket lengths should be specified to the nearest foot.

The drilled shaft supported pier cap COM624 model includes an unsupported shaft between a top of shaft elevation of 484 ft and the design scour elevation of 426.5 ft. The shaft is also modeled with a free (pinned) connection to the pier cap. The horizontal load is applied at the pier cap elevation 481 ft. Soil properties used in the analysis were reduced to reflect an average group p-multiplier of 0.85 representing a shaft spacing of 4B. The following graphs show shaft group deflection, deflection fixity elevation, and maximum average moment for a range of longitudinal horizontal forces and shaft diameters. Soil property information for use in more detailed soil-structure interaction analyses during final design are presented following the pile supported footing discussion.

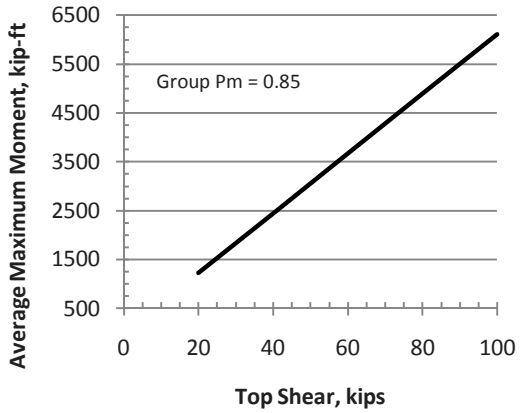


Pier 1 Drilled Shaft Group Deflection vs. Shear

Deflection is at elevation 481 ft.



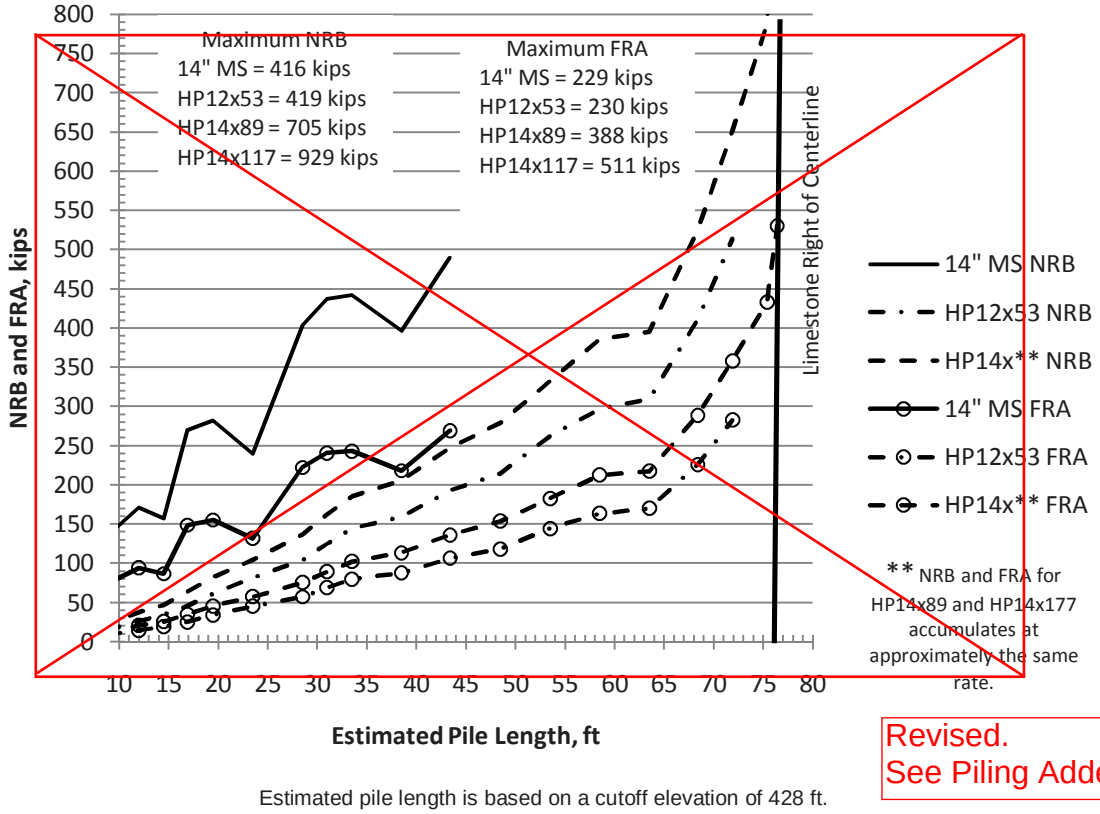
Pier 1 Drilled Shaft Fixity Elevation vs. Shear



Pier 1 Shaft Average Maximum Moment vs. Shear

Pier 1 Pile Supported Footing Configuration

The bottom of footing elevation is 427 ft, which is above the design scour elevation of 426.5 ft. The 0.5ft of scour is negligible and no reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



Revised.
See Piling Addendum #2

Estimated pile length is based on a cutoff elevation of 428 ft.

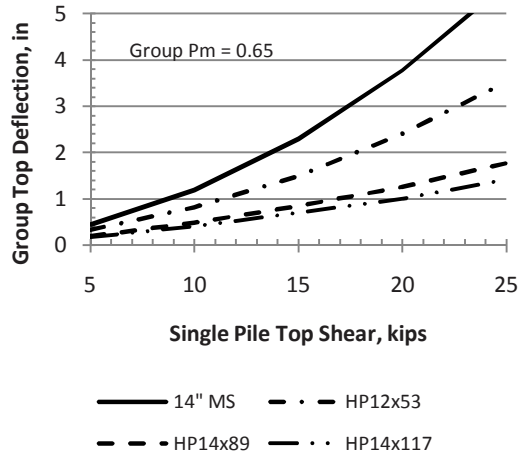
Pier 1 Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length (Right of Centerline Case)

If an HP section is selected and will be driven to its maximum nominal required bearing, provide separate estimated length values for each side of the pier. For H-piles right of centerline use

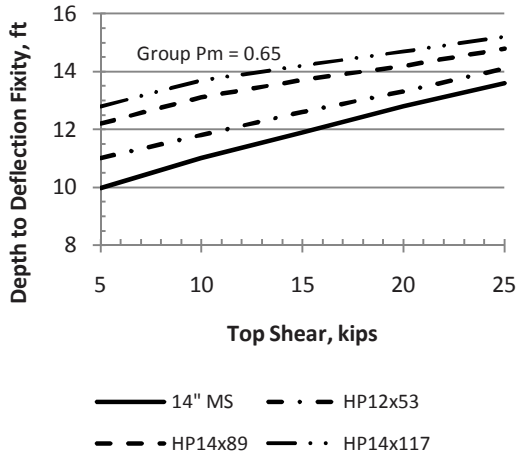
the estimated length shown in the above graph. For H-piles left of centerline, add 20 ft to the lengths shown in the graph.

If a metal shell pile is selected, the estimated length should correspond to the maximum length shown for a given bearing in the above figure. The estimated length for a metal shell is the same over the width of the pier.

The pile supported footing COM624 model includes a single vertical pile with a free (pinned) connection to the footing. The horizontal load is applied at the bottom of footing elevation 427 ft. Soil properties used in the analysis have been reduced to reflect an average group p-multiplier of 0.65 representing a pile row spacing of 4B. The assumed pile group includes 4 pile rows with 16 piles per row. The following graphs show group deflection and depth to fixity for a range of horizontal forces applied in the longitudinal direction.

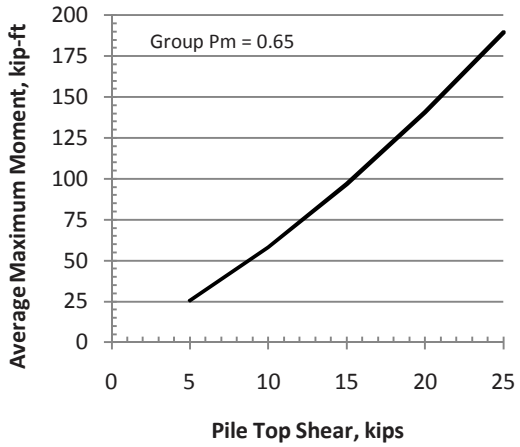


Pier 1 Pile Group Deflection vs. Shear



Pier 1 Pile Depth to Fixity vs. Shear

Depth to fixity is below bottom of footing elevation 427 ft.



Pier 1 Average Maximum Moment vs. Shear

The following table includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 1 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
419.0	Sand	47.6	28	-	15	-
411.1	Sand	57.6	33	-	40	-
374.0	Sand	62.6	36	-	70	-
552.6	Sand	67.6	45	-	190	-

Pier 2

Pier 2 will likely be combination solid wall and column pier located at the tip of a peninsula separating the Illinois River and the Sanitary District Outflow channel. Future plans include upgrading the outflow channel to accommodate a barge terminal facility. Future barge traffic in the outflow channel combined with the probability barges would be moored on the river bank next to the pier creates the potential of barge impact during periods of high water.

A permanent sheet pile protection cell surrounding the pier has been proposed. However, District experience with other sheet pile protection cells shows them to be maintenance intensive due to sheet pile ripping during some impact events. The District Bridge Engineer recommends designing the pier to accommodate barge impact consistent with the barge movements anticipated in the area. No protection cell will be analyzed.

The pier 2 foundation will likely consist of a footing supported by multiple rows of driven piles or drilled shafts.

Pier 2 Drilled Shaft Supported Footing Configuration

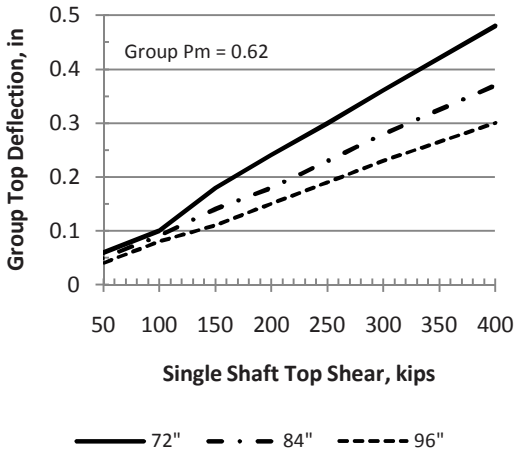
Note: The drilled shaft supported footing configuration is not recommended unless there is a significant economic advantage over the pile supported footing configuration. Refer to the construction considerations section at the end of this Report.

As a basis for preliminary analysis, the drilled shaft supported footing configuration is assumed to be two rows of 5 shafts. The rock joint spacing and condition results in a GSI of 30. The nominal unit base resistance is 402 ksf. The following table shows factored tip resistance for a variety of rock socket diameters.

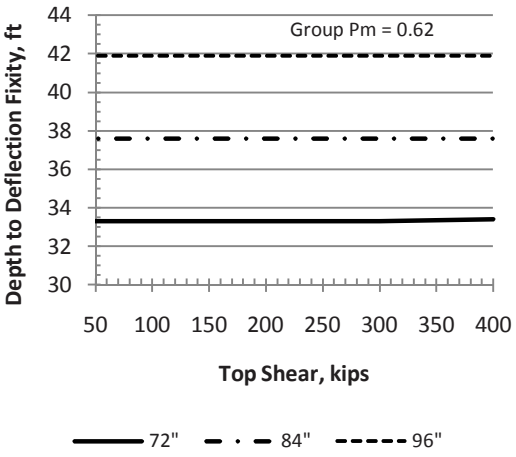
Pier 2 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	4768	6675
6	5674	7943
6.5	6659	9322
7.0	7723	10,812
7.5	8865	12,411

A COM624 horizontal load analysis was performed assuming a 4B shaft spacing in the transverse direction. The shaft is modeled as fixed to the bottom of footing. No longitudinal analysis was performed because a transverse loading is more critical. The transverse load is applied at the bottom of footing elevation 410 ft. The following figures show group deflection, depth to deflection fixity below the footing, and average maximum moment versus top of shaft shear.

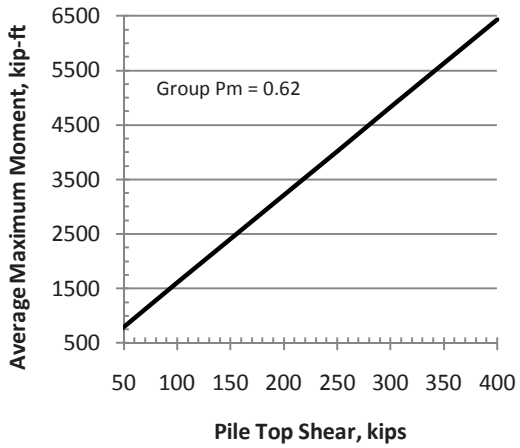


Pier 2 Shaft Transverse Group Deflection vs. Shear



Pier 3 Shaft Maximum Depth to Fixity vs. Shear

Depth to fixity is below bottom of footing elevation 410 ft.

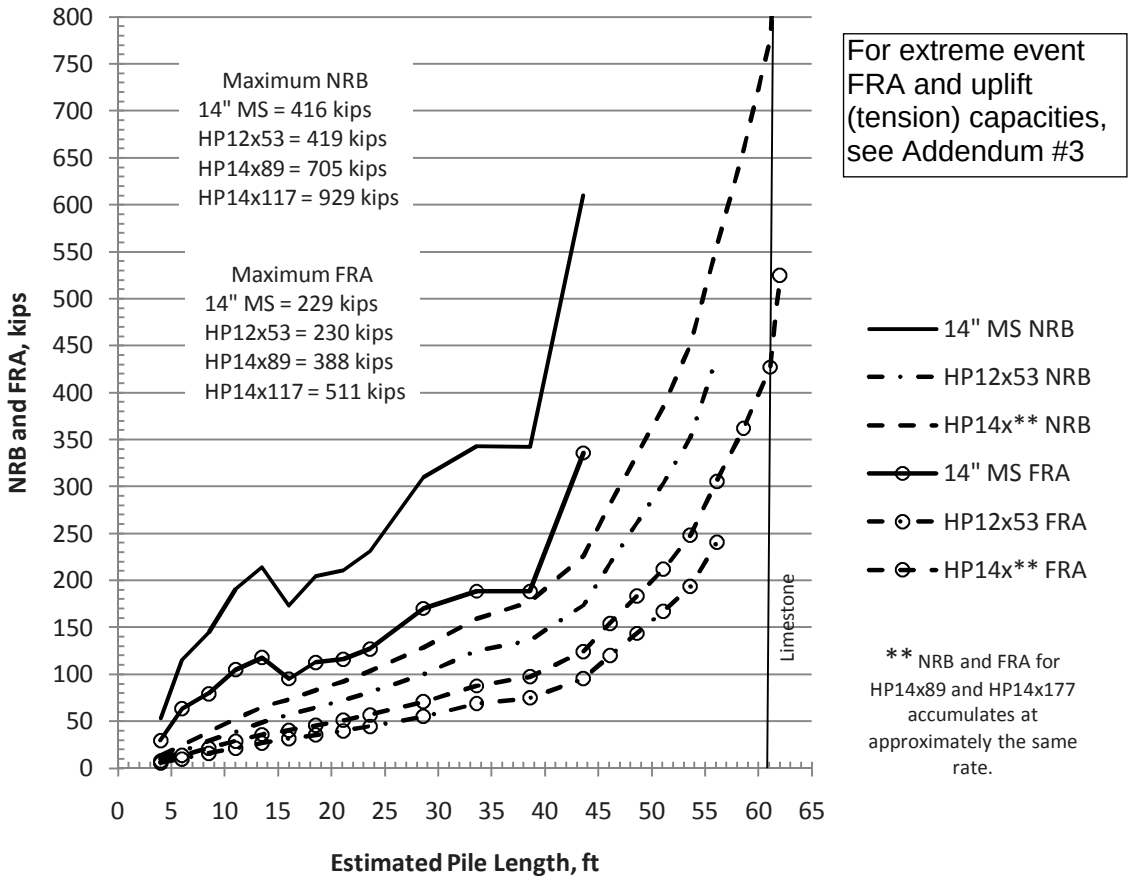


Pier 2 Shaft Average Maximum Moment vs. Shear

Soil property information for use in more detailed soil-structure interaction analyses during final design are presented following the pile supported footing discussion below.

Pier 2 Pile Supported Footing Configuration

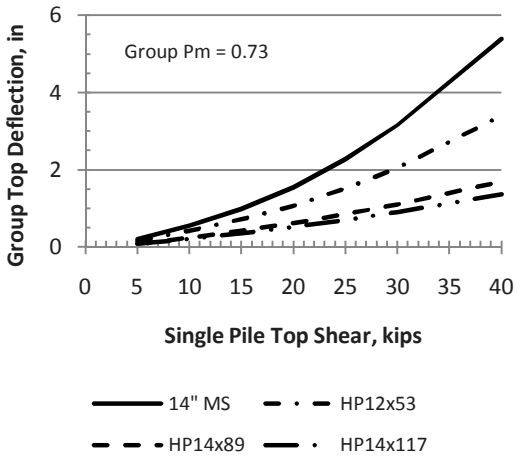
As a basis for preliminary analysis, the pile supported footing configuration is assumed to include 4 pile rows in the longitudinal direction with 16 piles in each row. The actual pile configuration will change as final design progresses. The number and size of piles will likely be controlled by resistance to horizontal loading. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes. The preliminary bottom of footing elevation is 410 ft, which is below the design scour elevation. No scour loss is included.



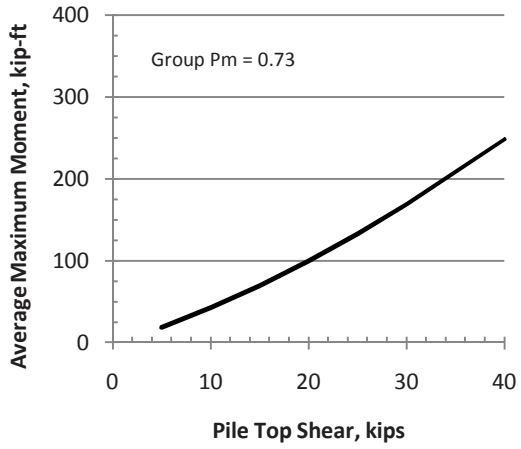
Pier 2 estimated pile length is based on a cutoff elevation of 411.0 ft.

Pier 2 Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length

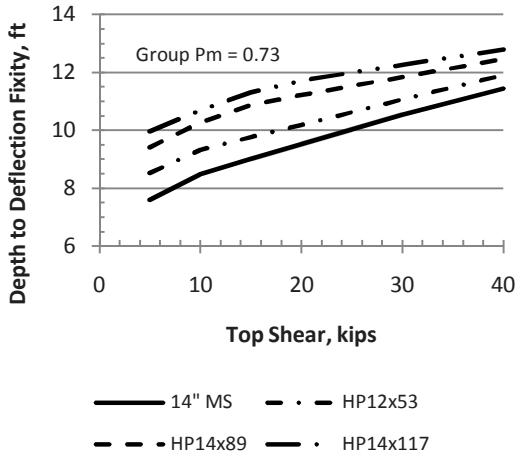
The pile supported footing COM624 model includes a single vertical pile with a free (pinned) connection to the footing. The piles are unsupported to the design scour elevation. Horizontal loads are applied at the bottom of footing elevation 410 ft. Soil properties used in the analysis have been reduced to reflect an average group p-multiplier of 0.73 representing a transverse force application on a 16-pile row with pile spacing of 5B. The longitudinal force application was not analyzed because transverse application is more critical. The following graphs show group deflection, average maximum moment, and depth to fixity for a range of horizontal loads.



Pier 2 Pile Group Deflection vs. Shear <u>Transverse</u> Force Direction



Pier 2 Pile Average Maximum Moment vs. Shear



Pier 2 Pile Maximum Depth to Fixity vs. Shear

Depth to fixity is below bottom of footing elevation 410 ft.

The following table includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 2 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ°	c, psf	k, pci	E_{50}
368.0	Sand	62.4	36	-	55	-
350.0	Sand	67.6	45	-	175	-

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Piers 3 and 4

Piers 3 and 4 are solid wall piers supporting the main tied arch span. The pier will be founded on a footing supported by multiple rows of driven piles or drilled shafts.

Piers 3 and 4 Drilled Shaft Supported Footing Configuration

Note: The drilled shaft supported footing configuration is not recommended unless there is a significant economic advantage over the pile supported footing configuration. Refer to the construction considerations section at the end of this Report.

As a basis for preliminary analysis, the drilled shaft supported footing configuration is assumed to include 2 shaft rows in the longitudinal direction with 5 shafts in each row.

Rock core data indicates high strength, but highly fractured limestone at the Pier 3 and Pier 4 locations. The GSI is 40 resulting in a nominal unit base resistance of 535 ksf at Pier 3 and 516 ksf at Pier 4. The following tables show factored tip resistance for a variety of rock socket diameters at both pier locations.

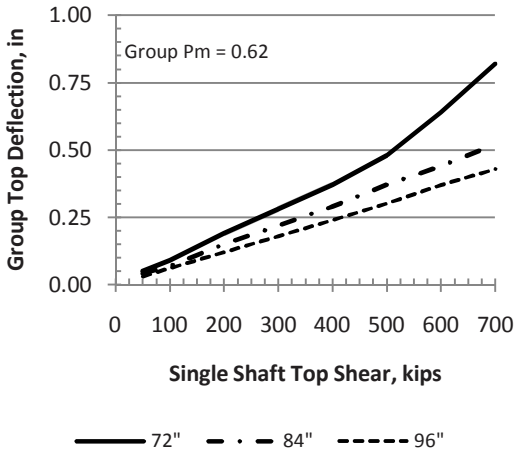
Pier 3 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	6,347	8,886
6	7,554	10,575
6.5	8,865	12,411
7.0	10,282	14,394
7.5	11,803	16,524

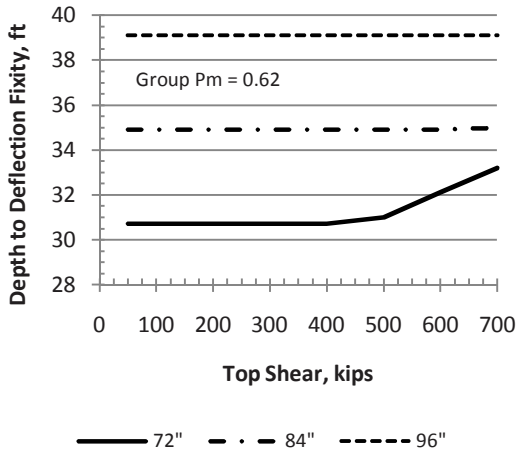
Pier 4 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	6,125	8,575
6	7,290	10,206
6.5	8,555	11,977
7.0	9,922	13,891
7.5	11,390	15,946

The drilled shaft supported footing COM624 model includes a single, constant diameter vertical drilled shaft with a fixed connection to the footing. The horizontal loads are applied at a bottom of footing elevation of 405 ft. The shaft is unsupported to the design scour elevation where applicable, and the rock socket portion is ignored. The average p-multiplier used in each analysis was determined using the preliminary 2 row – 5 shaft per row configuration described earlier. This results in a transverse pile spacing of approximately 4B. Force has been applied in the more critical transverse direction. The following figures show group deflection, average maximum moment, and maximum depth to fixity for a range of horizontal loads.

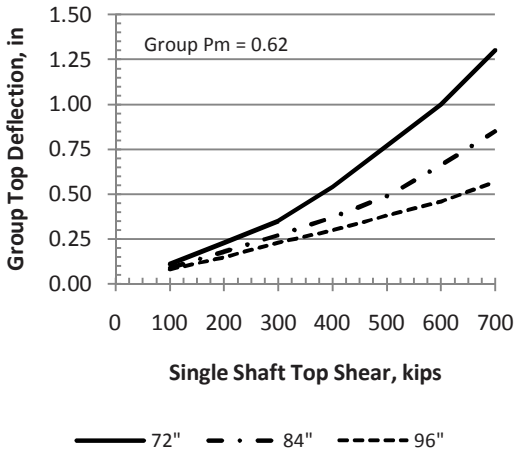


Pier 3 Shaft Group Deflection vs. Shear <u>Transverse</u> Force Direction

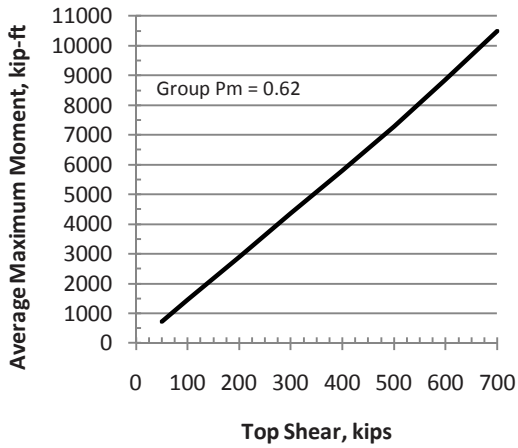


Pier 3 Shaft Maximum Depth to Fixity vs. Shear

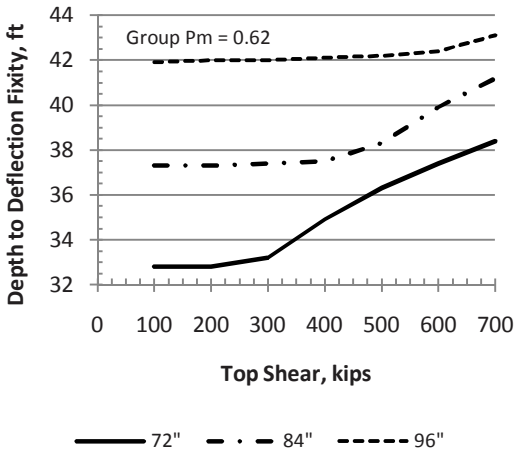
Depth to fixity is below bottom of footing elevation 405 ft.



Pier 4 Shaft Group Deflection vs. Shear <u>Transverse</u> Force Direction

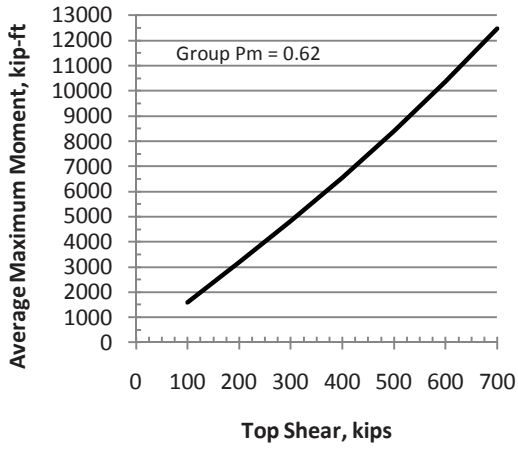


Pier 3 Shaft Average Maximum Moment vs. Shear



Pier 4 Shaft Maximum Depth to Fixity vs. Shear

Depth to fixity is below bottom of footing elevation 405 ft.

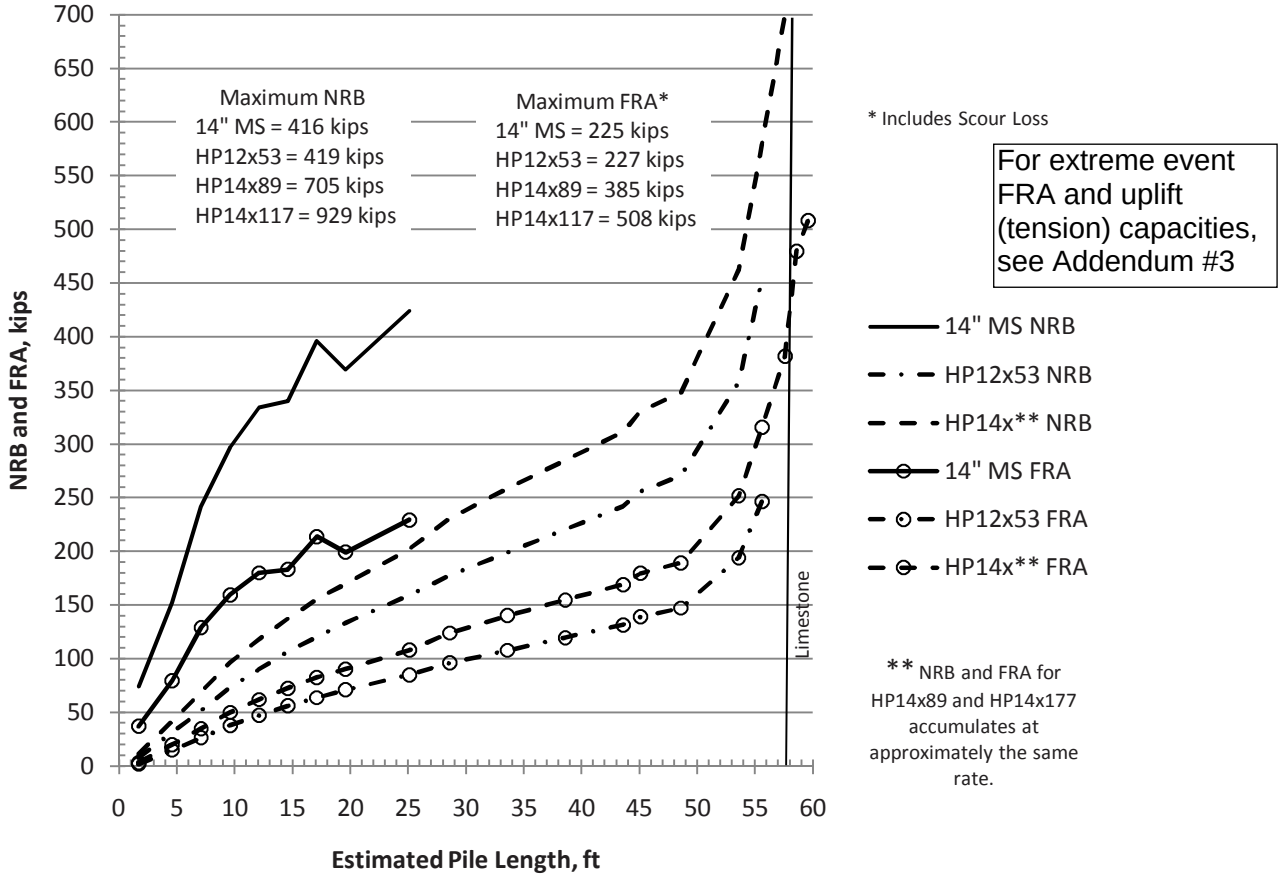


Pier 4 Shaft Average Maximum Moment vs. Shear

Soil property and p-multiplier information are summarized following the discussion on the pile supported footing configuration below. The information can be used in more detailed analyses of soil-structure interaction during final design.

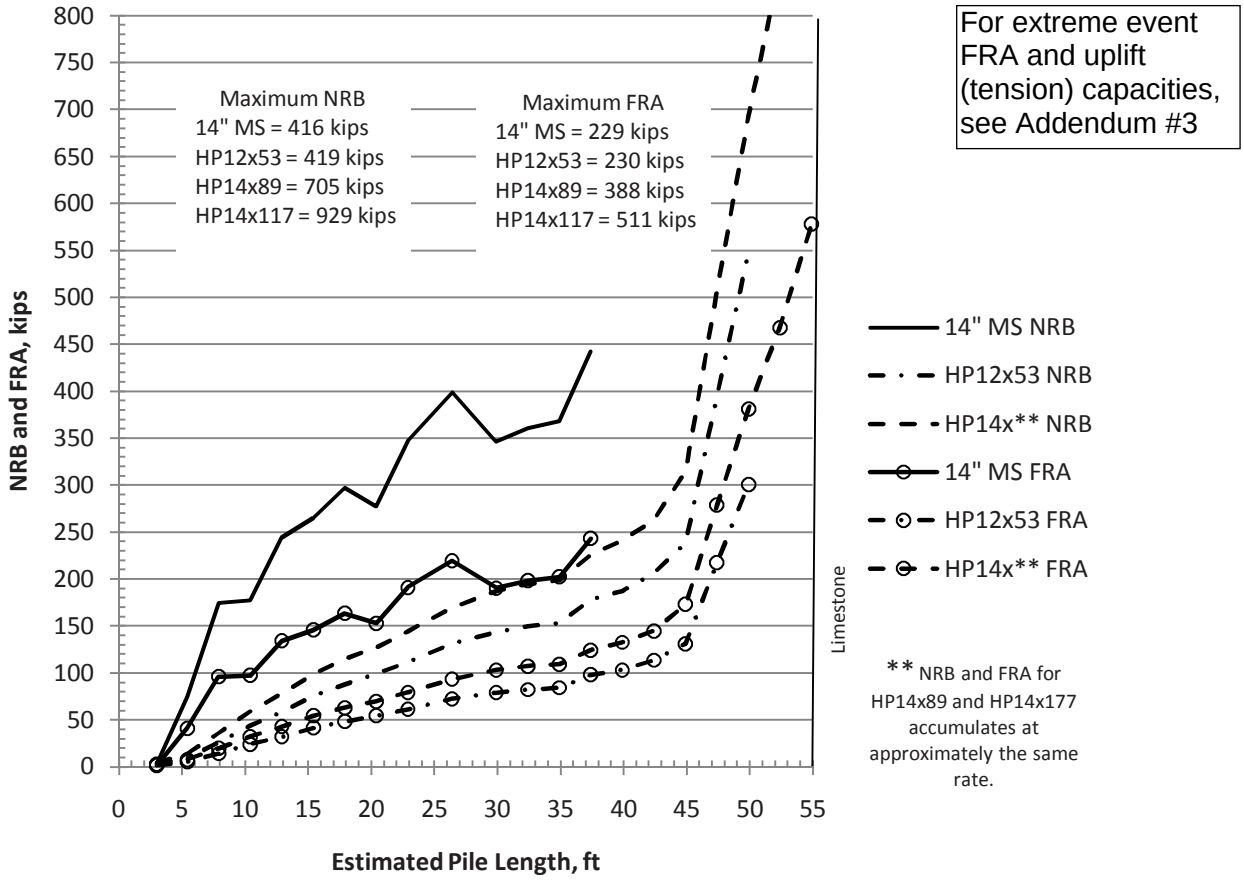
Piers 3 and 4 Pile Supported Footing Configuration

As a basis for preliminary analysis, the pile supported footing configuration is assumed to include 6 pile rows in the longitudinal direction with 16 piles in each row. The actual pile configuration will change as final design progresses. The number and size of piles will likely be controlled by resistance to horizontal loading. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes. The FRA shown in the following figures includes the factored scour loss where appropriate.



Pier 3 estimated pile length is based on a cutoff elevation of 406 ft.

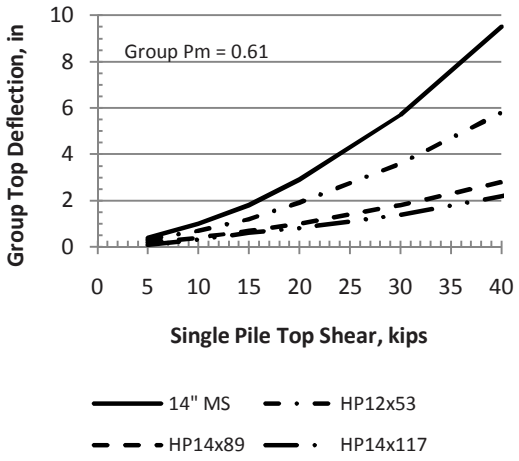
Pier 3 Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length



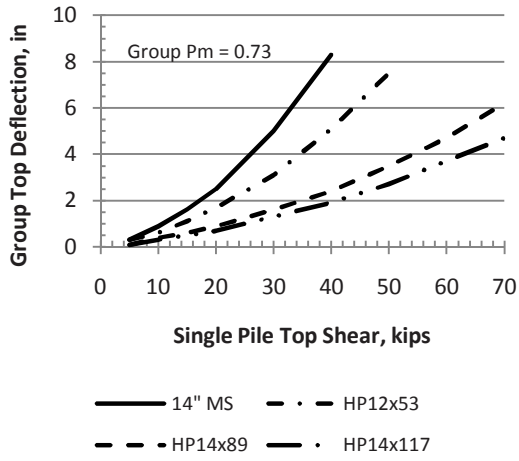
Pier 4 estimated pile length is based on a cutoff elevation of 406 ft.

Pier 4 Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length

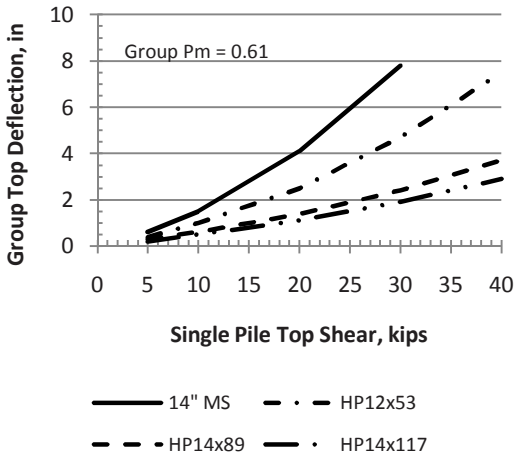
The pile supported footing COM624 model includes a single vertical pile with a free (pinned) connection to the footing. Two basic analyses were performed. The first analysis applies force in the longitudinal direction and the second applies force in the transverse direction. In both cases, the analysis models H-piles along their strongest axis. Horizontal loads are applied at a bottom of footing elevation of 405 ft. The average p-multiplier used in each analysis was determined using the preliminary 6 row – 16 pile per row configuration described earlier. The following figures show group deflection, average maximum moment, and maximum depth to fixity for a range of horizontal loads.



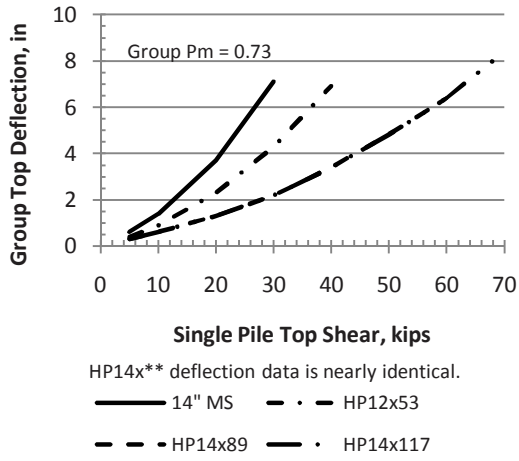
Pier 3 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



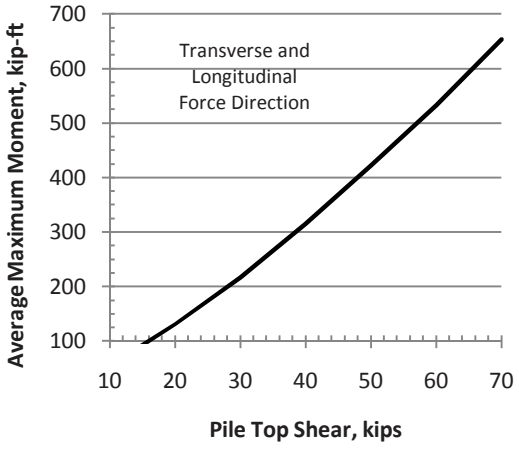
Pier 3 Pile Group Deflection vs. Shear
<u>Transverse</u> Force Direction



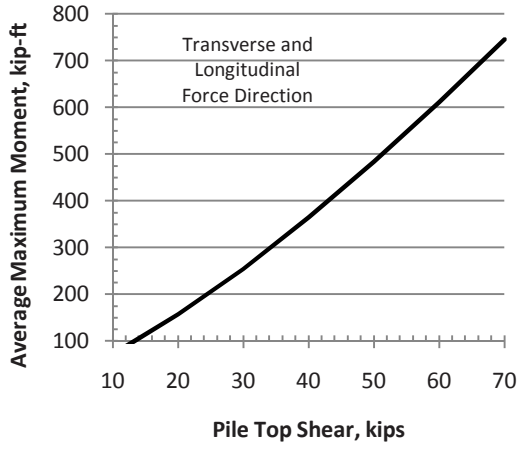
Pier 4 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



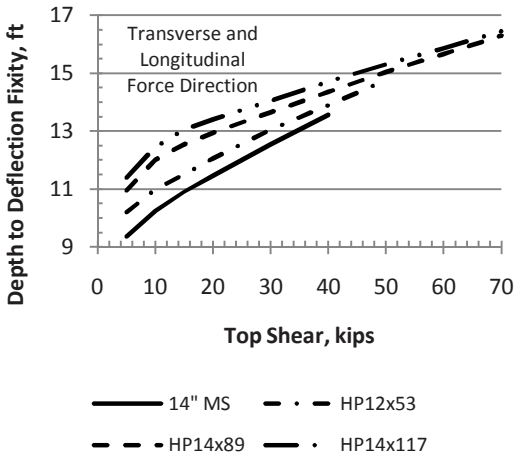
Pier 4 Pile Group Deflection vs. Shear
<u>Transverse</u> Force Direction



Pier 3 Pile Average Maximum Moment vs. Shear

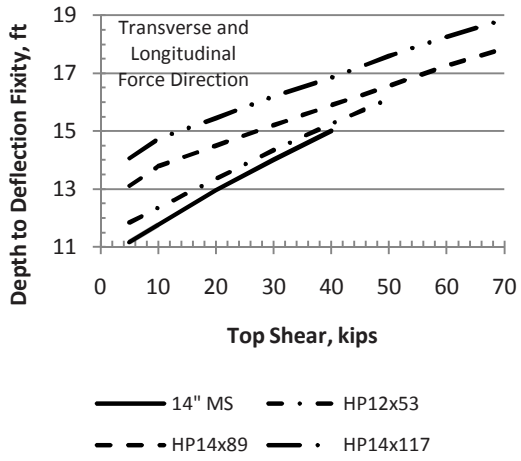


Pier 4 Pile Average Maximum Moment vs. Shear



Pier 3 Pile Maximum Depth to Fixity vs. Shear

Depth to fixity is below bottom of footing elevation 405 ft.



Pier 4 Pile Maximum Depth to Fixity vs. Shear

Depth to fixity is below bottom of footing elevation 405 ft.

The following tables include recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 3 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
352.4	Sand	62.6	36	-	65	-
348.4	Sand	67.6	45	-	200	-

Pier 4 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
400.6	Soft Clay	42.6	-	100	10	0.03
363.6	Sand	62.6	36	-	60	-
351.0	Sand	67.6	45	-	210	-

Pier 5

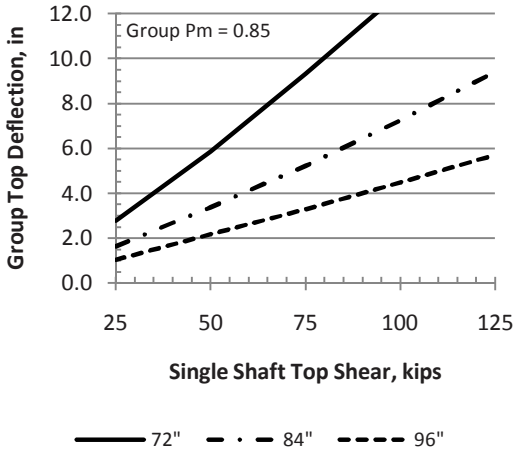
Pier 5 Drilled Shaft Supported Pier Cap Configuration

The rock core data indicates this location has the weakest limestone identified on the project site. It also indicates thin (<0.25") clay filled joints within the top 5 ft. The GSI is 30 resulting in a nominal unit base resistance of 322 ksf. *A top of rock elevation of 349 ft should be shown in the plans.* The following table shows factored tip resistance for a variety of rock socket diameters.

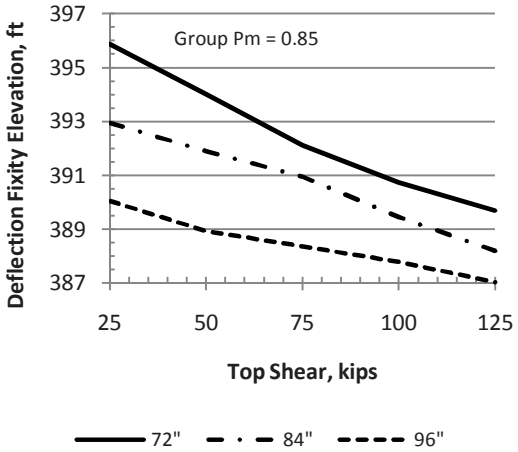
Pier 5 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	3,827	5,358
6	4,555	6,377
6.5	5,346	7,484
7.0	6,200	8,680
7.5	7,117	9,964

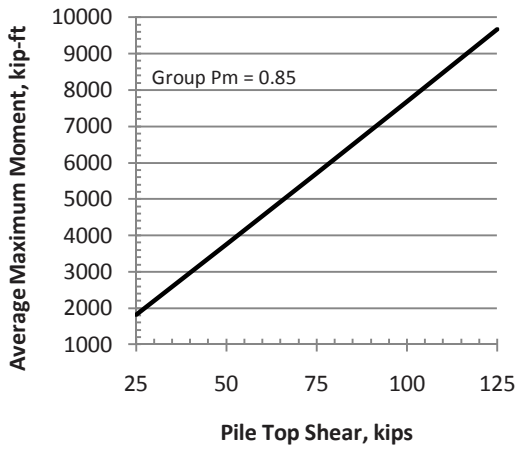
The drilled shaft supported pier cap COM624 model includes an unsupported shaft between a top of shaft elevation of 491 ft and the design scour elevation of 428.2 ft. The shaft is also modeled with a free (pinned) connection to the pier cap. Horizontal loads are applied at the pier cap elevation of 491 ft. Soil properties used in the analysis were reduced to reflect an average group p-multiplier of 0.85 representing a shaft spacing of 4B. The following graphs show shaft group deflection, deflection fixity elevation, and maximum average moment for a range of longitudinal horizontal forces and shaft diameters. Soil property information for use in more detailed soil-structure interaction analyses during final design are presented following the pile supported footing discussion.



Pier 5 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at Elevation 491 ft



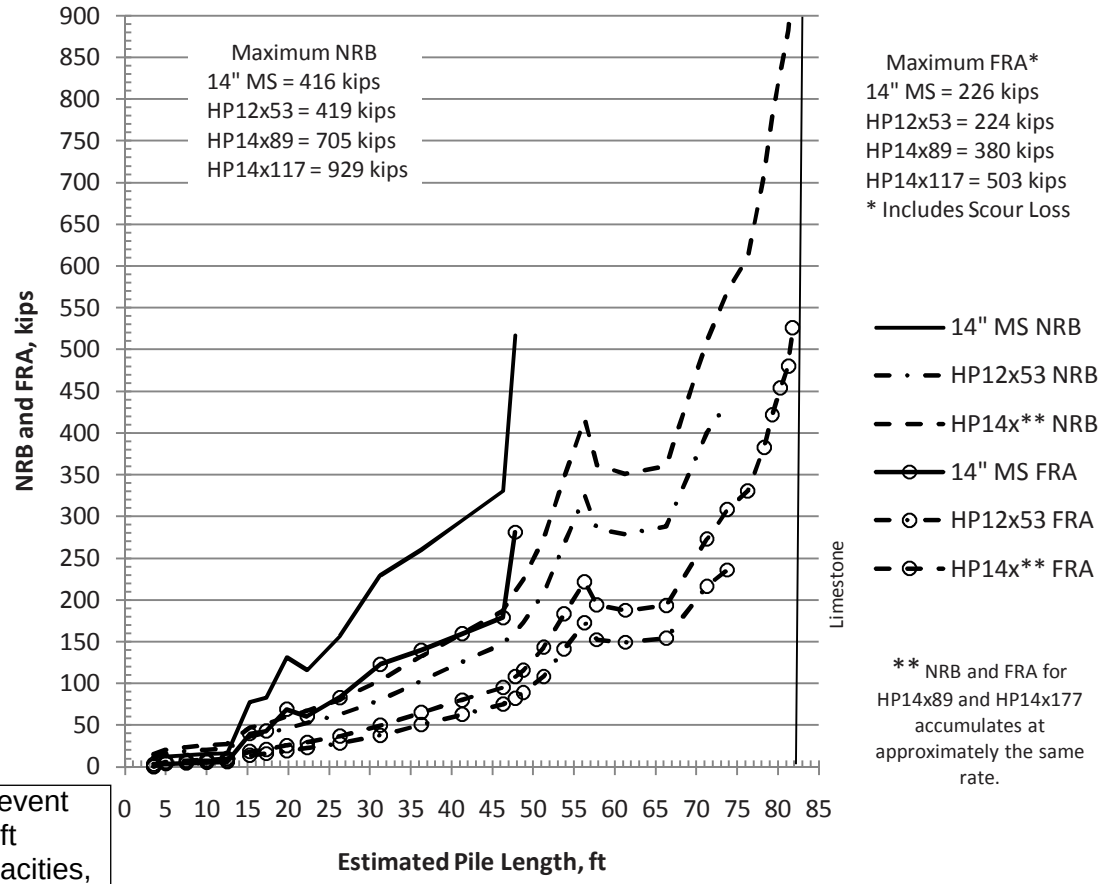
Pier 5 Shaft Deflection Fixity Elevation vs. Shear



Pier 5 Shaft Average Maximum Moment vs. Shear

Pier 5 Pile Supported Footing Configuration

The pile supported footing analysis assumes a bottom of footing elevation of 430 ft, which is above the design scour elevation of 428.2. With an EWSE of 434 ft, a cofferdam is not required to facilitate footing construction. However if the bottom of footing elevation is lowered to match the design scour elevation, a cofferdam would be required. A preliminary analysis indicates a 3 ft thick seal coat would be required. The figure on the next page shows NRB and FRA versus estimated length for a variety of pile sizes.

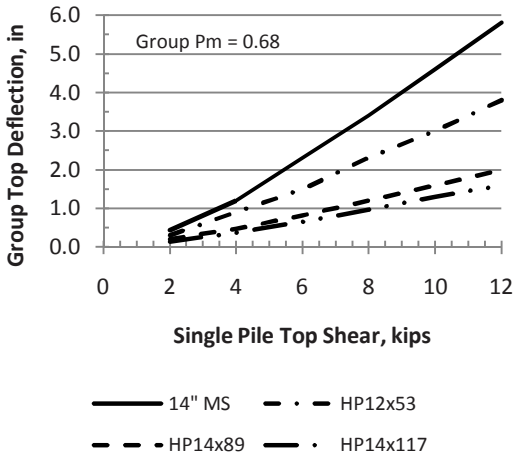


For extreme event FRA and uplift (tension) capacities, see Addendum #3

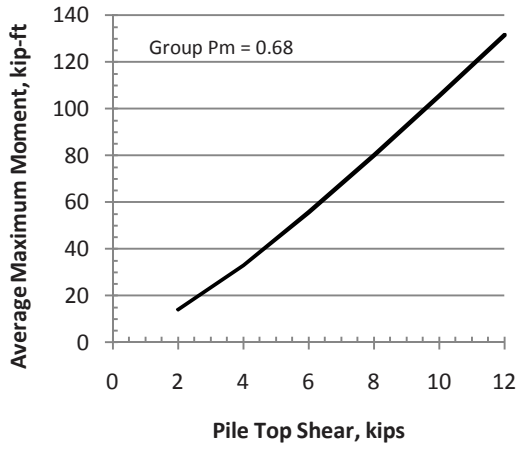
Estimated pile length based on a cutoff elevation of 431 ft.

Pier 5 Nominal Required Bearing and Factored Resistance Available versus Estimated Pile Length.

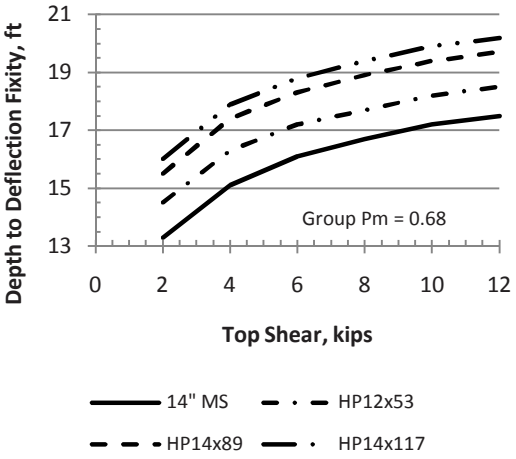
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. Piles are modeled with a free(pinned) connection to the footing. Horizontal loads are applied at the bottom of footing elevation 430 ft. The piles are unsupported to the design scour elevation. The analysis evaluates the more critical longitudinal force direction. The following figures show group deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 5 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction

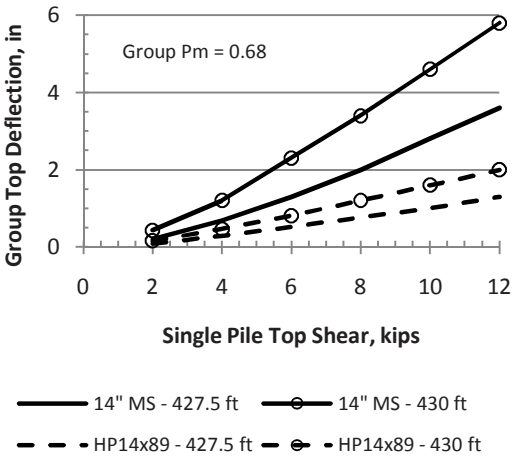


Pier 5 Pile Average Maximum Moment vs. Shear



Pier 5 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 430 ft.

An additional analysis was performed to model a footing elevation corresponding to the design scour elevation. The following figure shows a comparison between the pile group deflection for a bottom of footing elevation of 430 ft and a bottom of footing elevation of 427.5 ft



Pier 5 Pile Group Deflection vs. Top Shear Showing Effect of Footing Elevation

The following table includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 5 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ°	c, psf	k, pci	E_{50}
415.7	Soft Clay	42.6	-	250	20	0.028
400.0	Sand	57.6	33	-	30	-
383.2	Sand	62.6	36	-	60	-
373.2	Sand	67.6	40	-	125	-
349.2	Sand	62.6	36	-	55	-

Pier 6

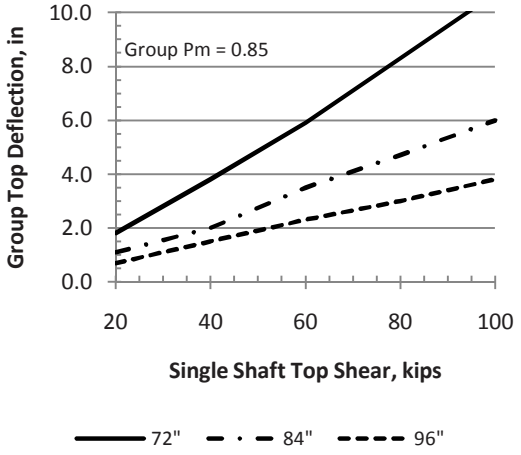
Pier 6 Drilled Shaft Supported Pier Cap Configuration

The GSI used in the analysis is 30. The resulting nominal unit base resistance is 427 ksf. *The plans should indicate a top of rock elevation of 350 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

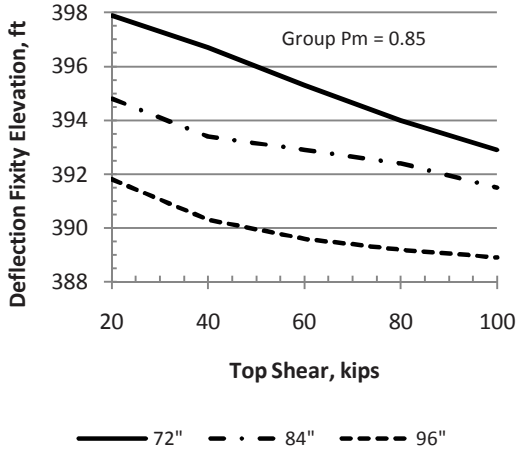
Pier 6 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	5,075	7,104
6	6,039	8,455
6.5	7,088	3,323
7.0	8,220	11,508
7.5	9,436	13,211

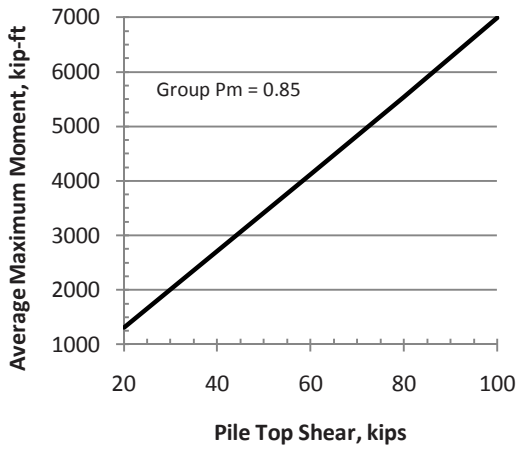
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 429.5. The analysis evaluates the more critical longitudinal force direction. The horizontal loads are applied at the pier cap elevation 487 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 6 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection is at elevation 487 ft.



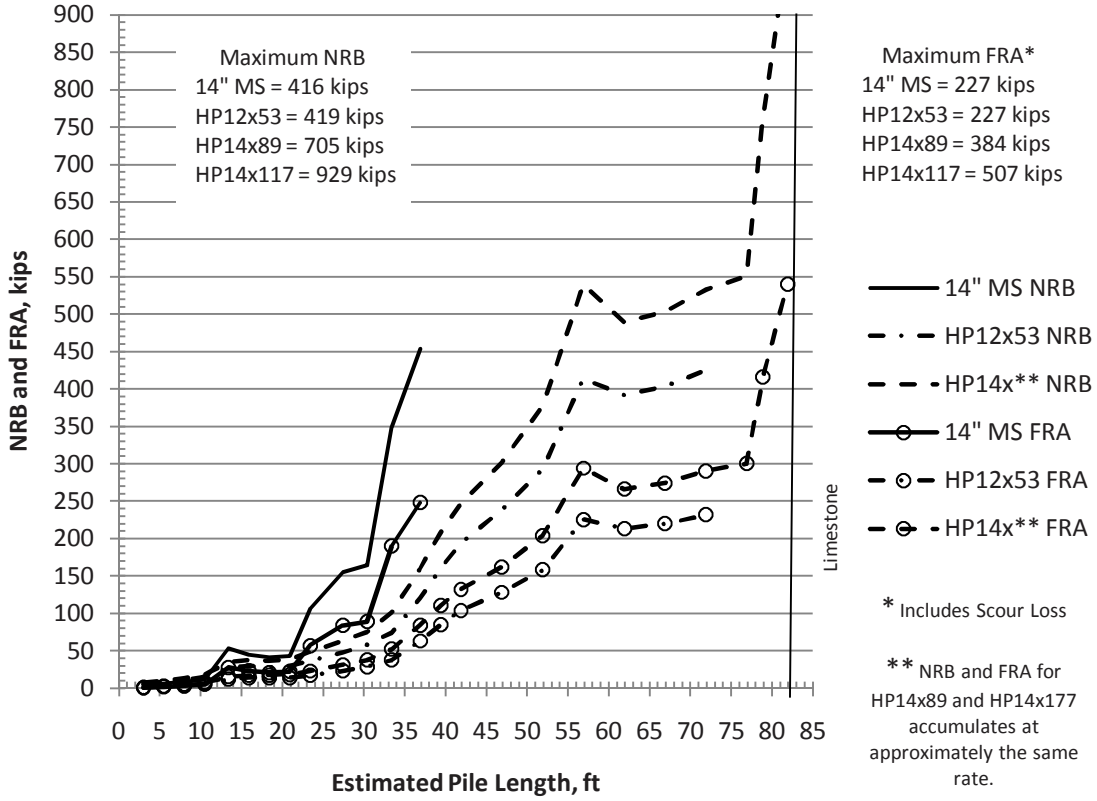
Pier 6 Shaft Deflection Fixity Elevation vs. Shear



Pier 6 Shaft Average Maximum Moment vs. Shear

Pier 6 Pile Supported Footing Configuration

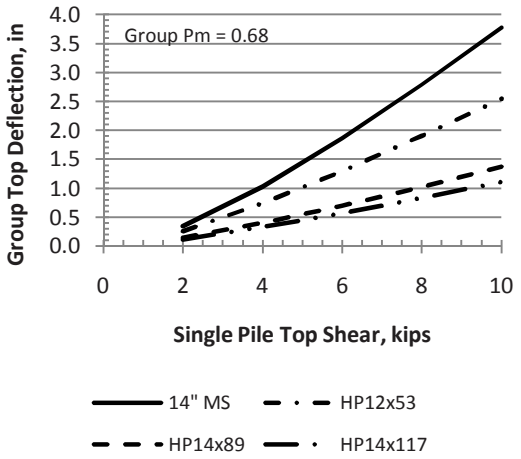
The pile supported footing analysis assumes a bottom of footing elevation of 431 ft. The design scour elevation is 429.5 ft. A scour loss is included in the FRA. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



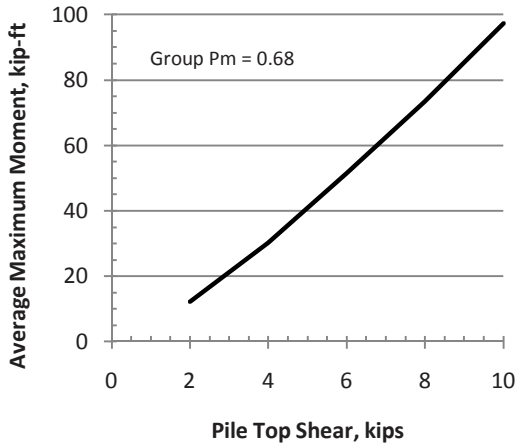
Estimated pile length based on a cutoff elevation of 432 ft.

Pier 6 Nominal Required Bearing and Factored Resistance Available versus Estimated Pile Length.

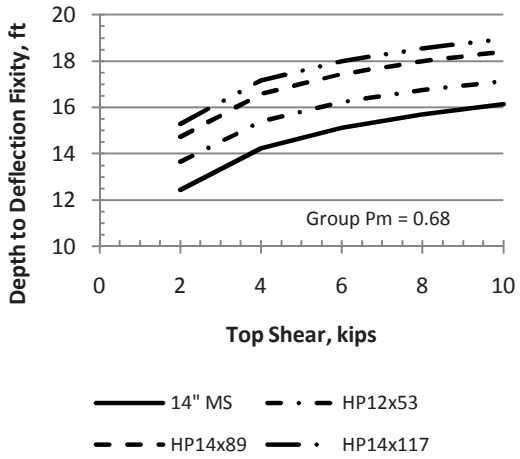
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 431 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 6 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 6 Pile Average Maximum Moment vs. Shear



Pier 6 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 431 ft.

The table on the next page includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 6 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
418.6	Soft Clay	47.6	-	200	15	0.028
398.6	Sand	52.6	30	-	20	-
380.1	Sand	67.6	40	-	115	-
370.1	Sand	67.6	45	-	200	-
350.1	Sand	62.6	36		65	

Pier 7

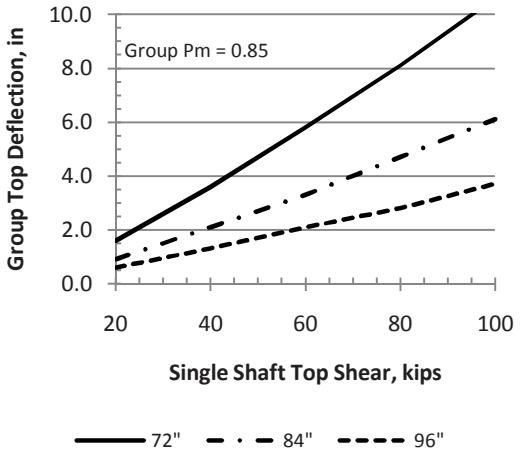
Pier 7 Drilled Shaft Supported Pier Cap Configuration

The rock core data indicates the limestone has a more favorable jointing condition. The GSI used in the analysis is 40. The resulting nominal unit base resistance is 424 ksf. *The plans should indicate a top of rock elevation of 351 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

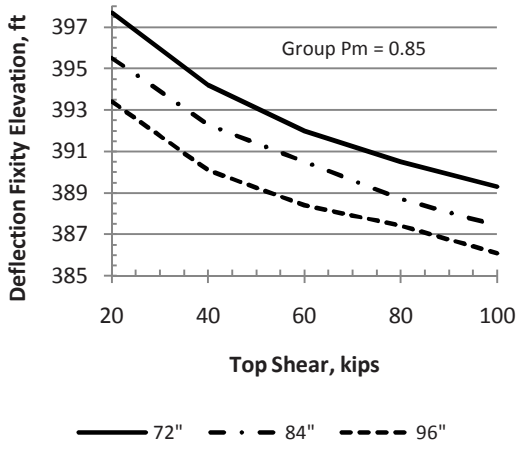
Pier 6 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	5,036	7,051
6	5,994	8,391
6.5	7,034	9,848
7.0	8,158	11,422
7.5	9,365	13,111

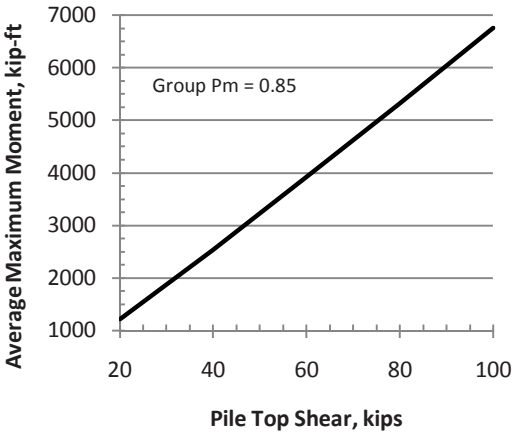
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 428.4 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 483 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 7 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection is at elevation 483 ft.



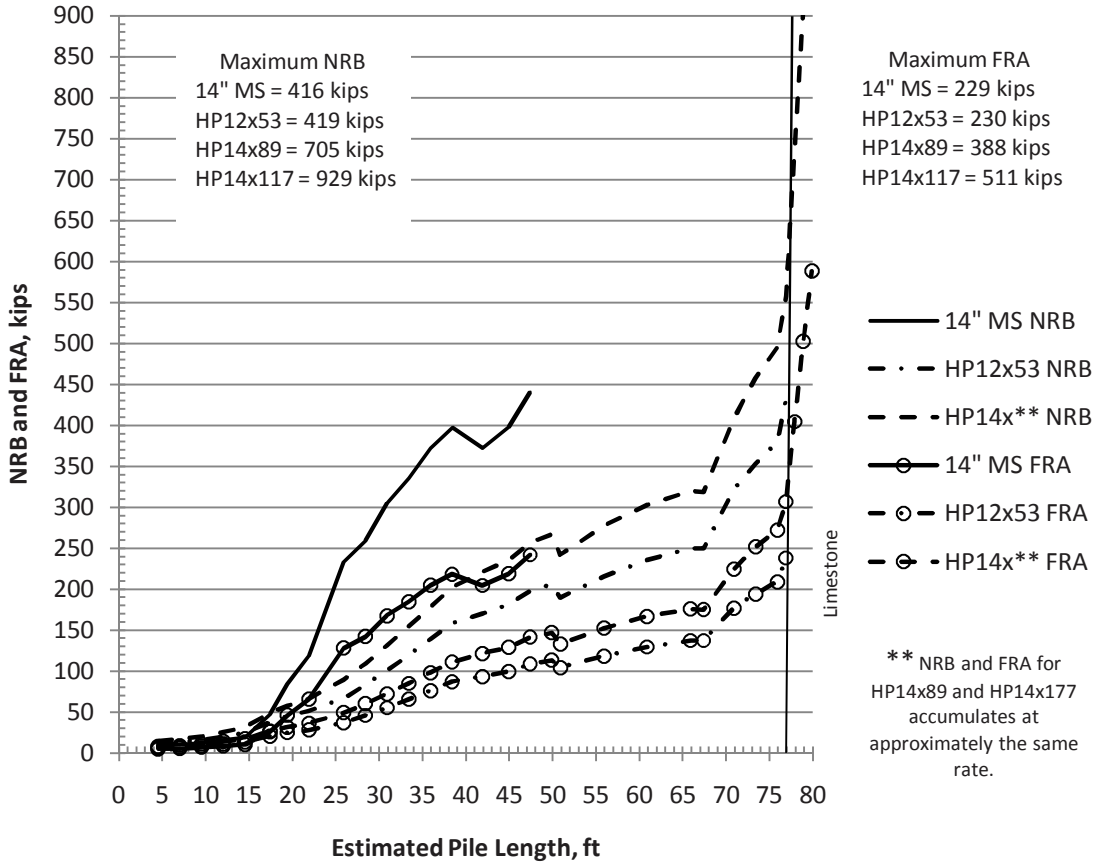
Pier 7 Shaft Deflection Fixity Elevation vs. Shear



Pier 7 Shaft Average Maximum Moment vs. Shear

Pier 7 Pile Supported Footing Configuration

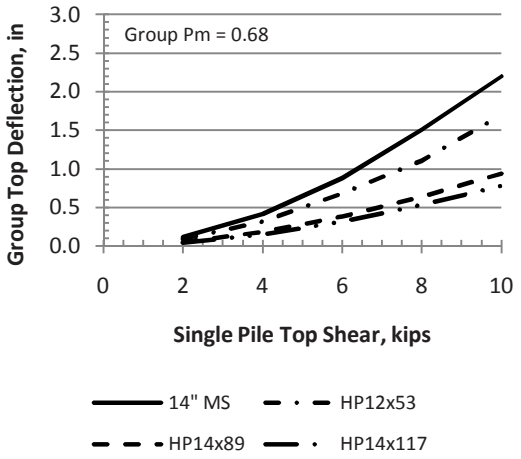
The pile supported footing analysis assumes a bottom of footing elevation of 427 ft, which is below the design scour elevation of 428.4. No scour loss is included in the analysis. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



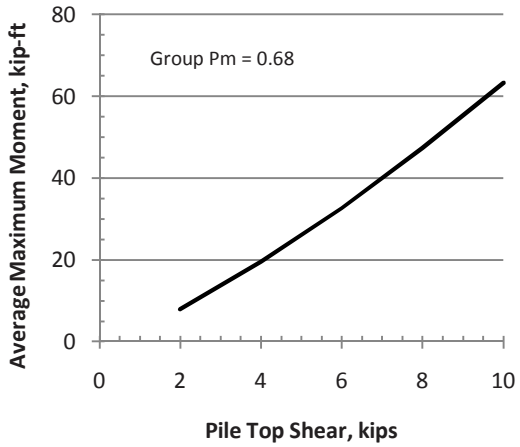
Estimated pile length based on a cutoff elevation of 428 ft.

Pier 7 NRB and FRA versus Estimated Pile Length.

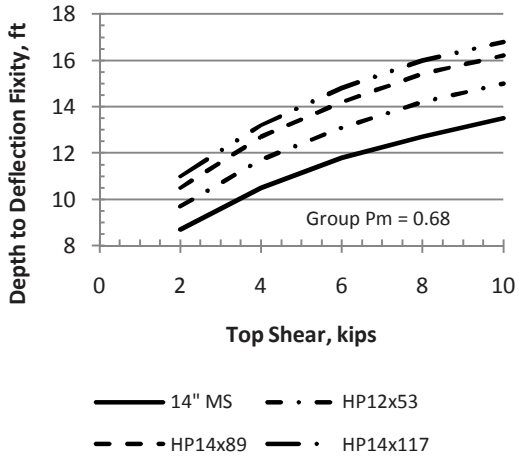
The COM624 horizontal load analysis assumes a free (pinned) connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at bottom of footing elevation 427 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 7 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 7 Pile Average Maximum Moment vs. Shear



Pier 7 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 427 ft.

The table on the next page includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 7 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
410.6	Soft Clay	42.6	-	357	30	0.020
402	Sand	52.6	30	-	25	-
357	Sand	62.6	36	-	70	-
351	Sand	67.6	45	-	190	-

Pier 8

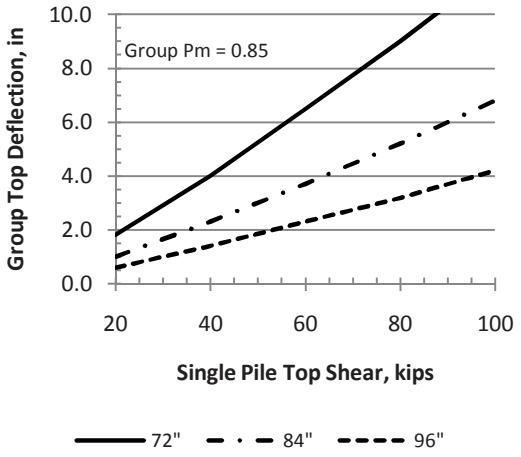
Pier 8 Drilled Shaft Supported Pier Cap Configuration

The rock core data indicates the limestone has a more favorable jointing condition. The GSI used in the analysis is 40. The resulting nominal unit base resistance is 655 ksf. *The plans should indicate a top of rock elevation of 351 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

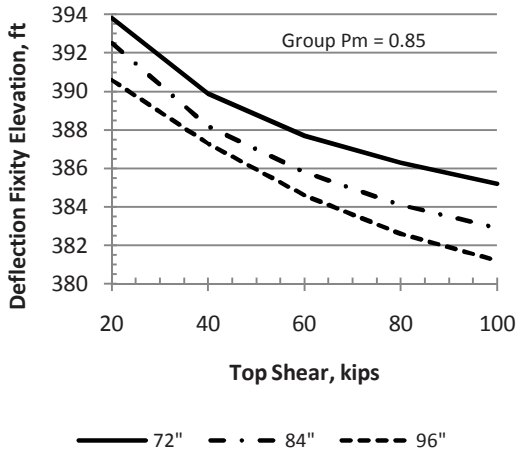
Pier 6 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	7,781	10,893
6	9,260	12,964
6.5	10,867	15,214
7.0	12,604	17,645
7.5	14,469	20,256

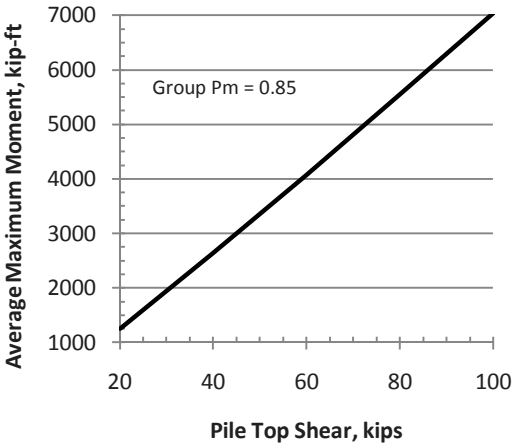
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 428 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 482 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 8 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 482 ft



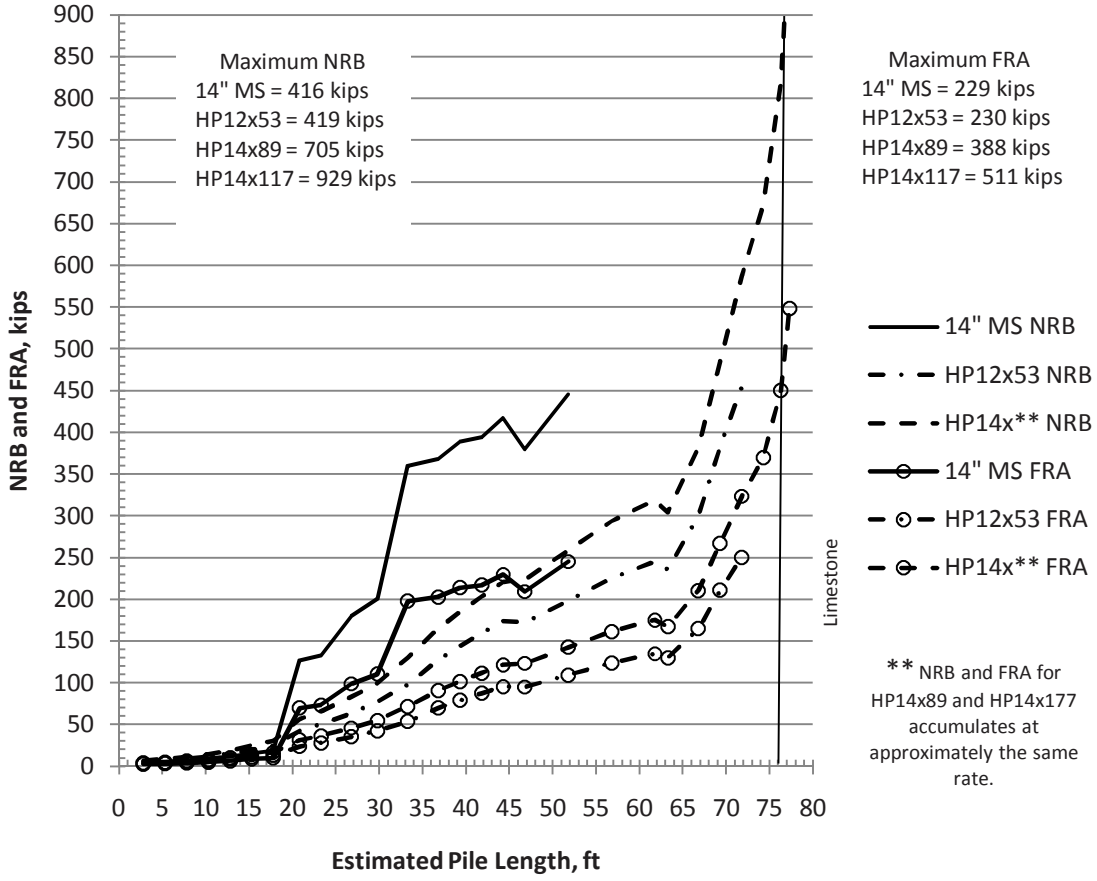
Pier 8 Shaft Deflection Fixity Elevation vs. Shear



Pier 8 Shaft Average Maximum Moment vs. Shear

Pier 8 Pile Supported Footing Configuration

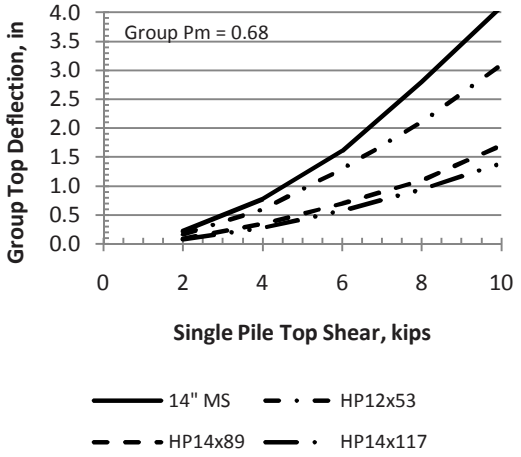
The pile supported footing analysis assumes a bottom of footing elevation of 427 ft, which is below the design scour elevation of 428 ft. No scour loss is included in the analysis. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



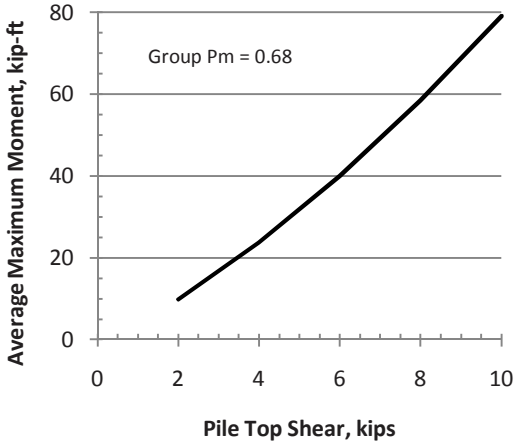
Estimated pile length based on a cutoff elevation of 428 ft.

Pier 8 NRB and FRA versus Estimated Pile Length.

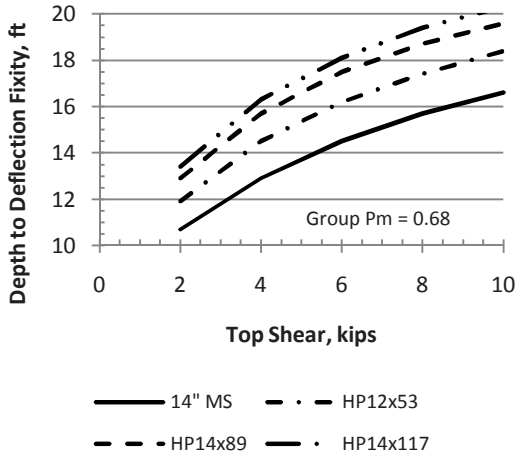
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 427 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 8 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 8 Pile Average Maximum Moment vs. Shear



Pier 8 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 427 ft.

The table on the next page includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 8 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
407.2	Soft Clay	42.6	-	222	20	0.022
394.7	Sand	57.6	33	-	55	-
361.2	Sand	62.6	36	-	85	-
351.7	Sand	67.6	45	-	215	-

Pier 9

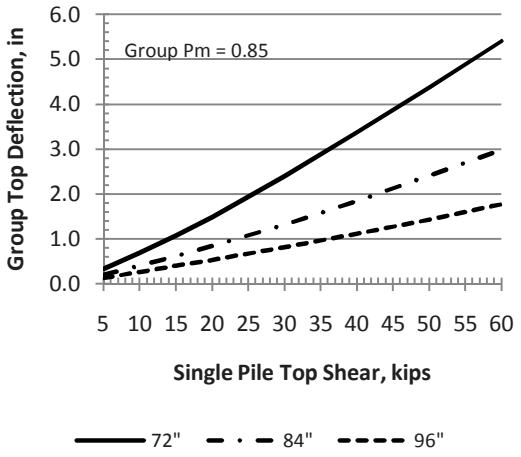
Pier 9 Drilled Shaft Supported Pier Cap Configuration

The rock core data indicates a more favorable jointing condition. The GSI used in the analysis is 40. The resulting nominal unit base resistance is 717 ksf. *The plans should indicate a top of rock elevation of 354 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

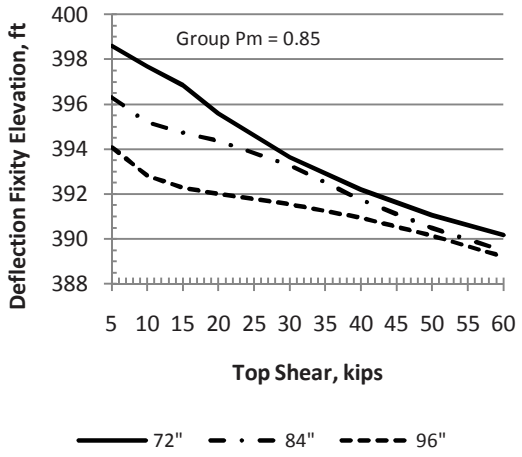
Pier 9 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	8,518	11,925
6	10,137	14,192
6.5	11,897	16,656
7.0	13,798	19,317
7.5	15,839	22,175

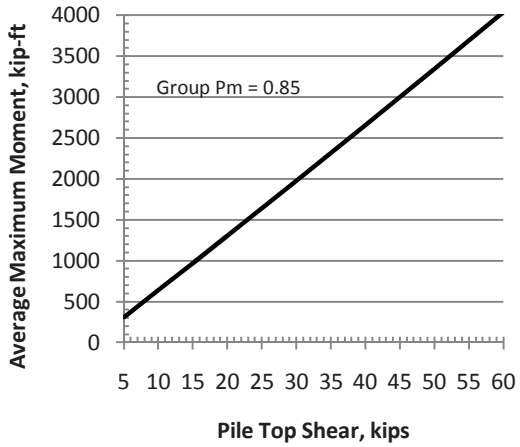
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 423.9. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 479 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 9 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 479 ft.



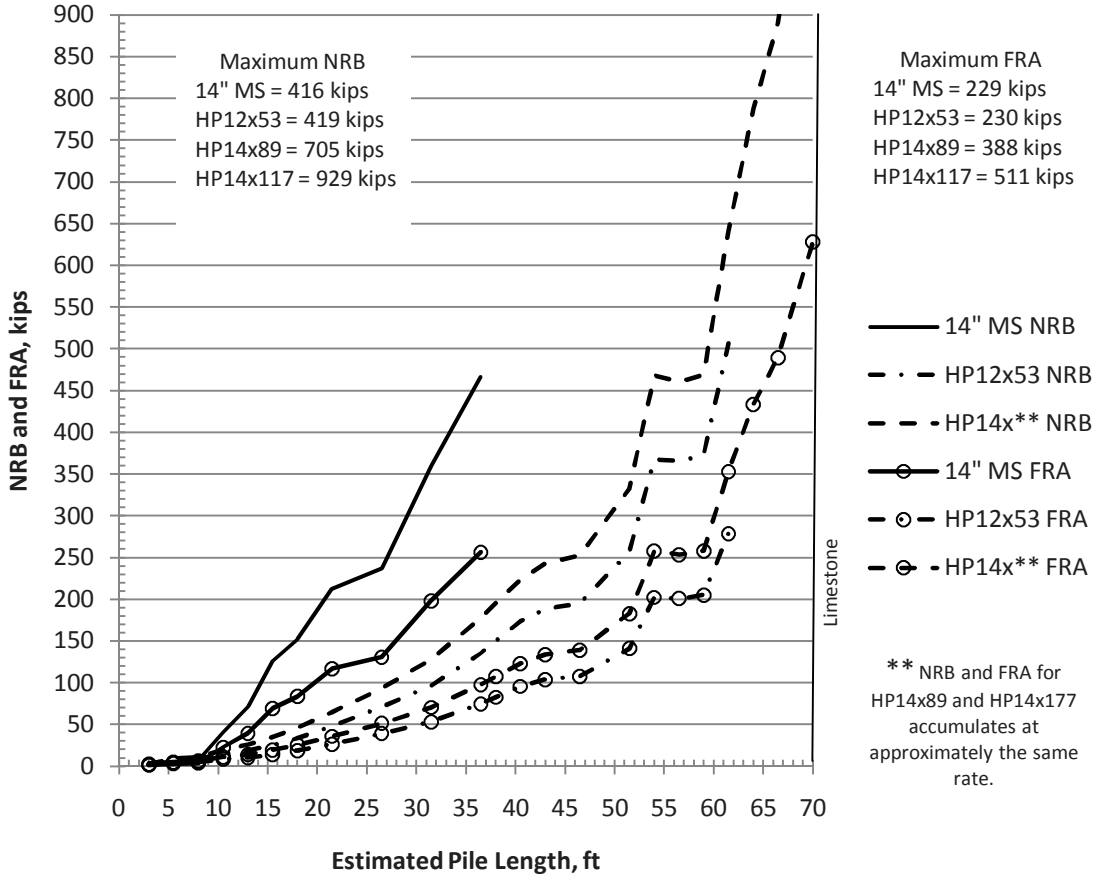
Pier 9 Shaft Deflection Fixity Elevation vs. Shear



Pier 9 Shaft Average Maximum Moment vs. Shear

Pier 9 Pile Supported Footing Configuration

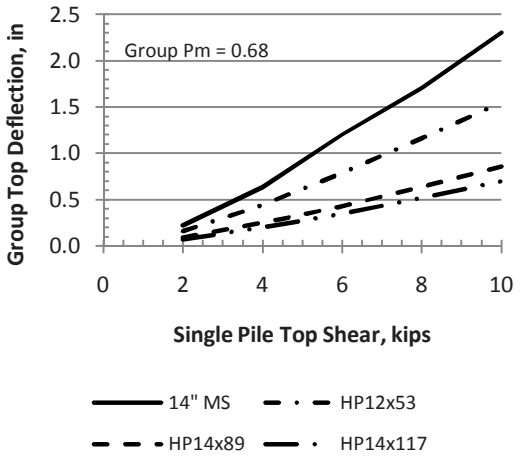
The pile supported footing analysis assumes a bottom of footing elevation of 423 ft, which is below the design scour elevation of 423.9 ft. No scour loss is included in the analysis. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



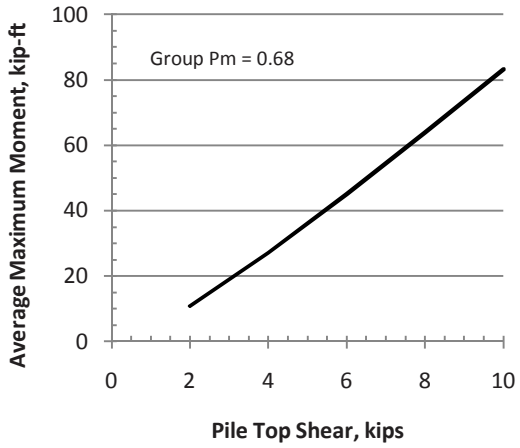
Estimated pile length based on a cutoff elevation of 424 ft.

Pier 9 NRB and FRA versus Estimated Pile Length.

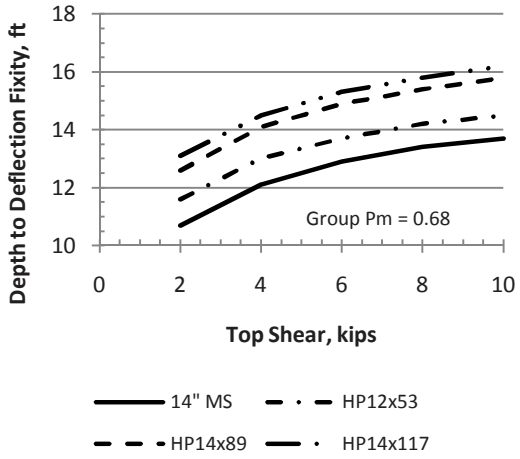
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 423 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 9 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 9 Pile Average Maximum Moment vs. Shear



Pier 9 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 423 ft.

The table on the next page includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 9 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
413.5	Soft Clay	42.6	-	200	15	0.030
402.5	Sand	57.6	33	-	100	-
372.5	Sand	62.6	36	-	110	-
354.0	Sand	67.6	45	-	140	-

PIERS 10 to 16

Refer to the November 16, 2011 SGR Addendum for information regarding pile supported footings at piers 10-16.

Pier 10

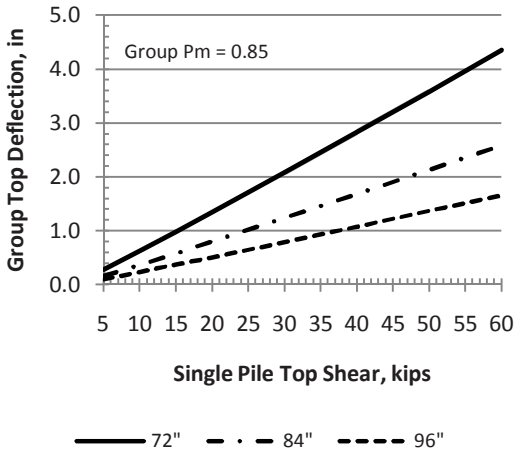
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with slightly weathered horizontal fractures. A 0.25" thick clay seam is located within the top 10 ft. The GSI used in the analysis is 30. The resulting nominal unit base resistance is 446 ksf. *The plans should indicate a top of rock elevation of 354 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

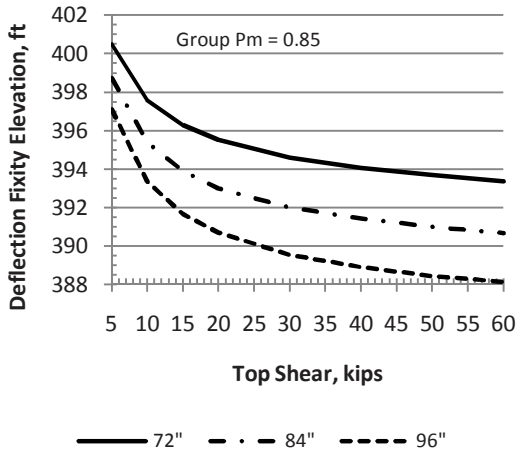
Pier 10 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	5,295	7,413
6	6,302	8,822
6.5	7,396	10,354
7.0	8,577	12,008
7.5	9,847	13,785

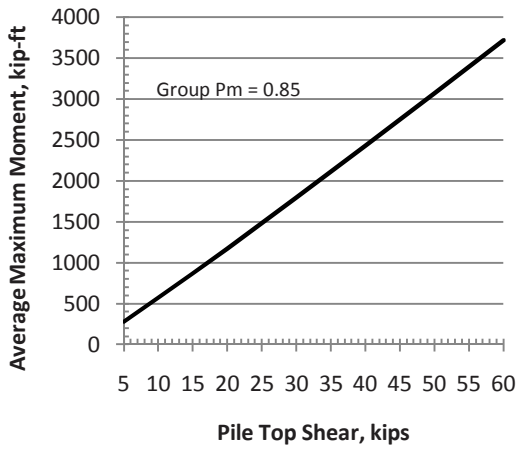
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 422.6 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 476 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 10 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 476 ft.



Pier 10 Shaft Deflection Fixity Elevation vs. Shear



Pier 10 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 10 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
412.8	Soft Clay	47.6	-	500	50	0.015
399.3	Sand	57.6	33	-	30	-
374.3	Sand	67.6	40	-	100	-
353.8	Sand	67.6	40	-	155	-

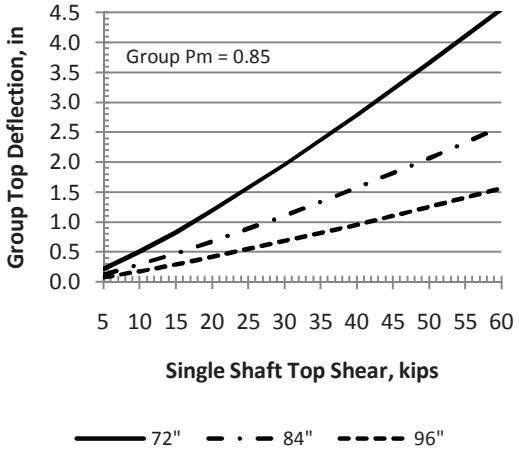
Pier 11
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with slightly weathered horizontal fractures with no clay seams. The GSI used in the analysis is 40. The resulting nominal unit base resistance is 325 ksf. *The plans should indicate a top of rock elevation of 354 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

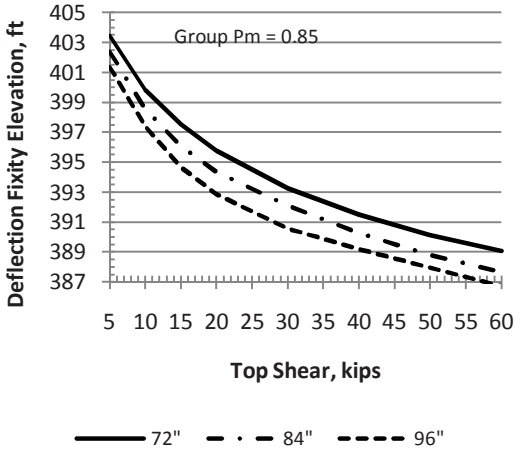
Pier 11 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	3,857	5,400
6	4,590	6,426
6.5	5,387	7,542
7.0	6,248	8,747
7.5	7,172	10,041

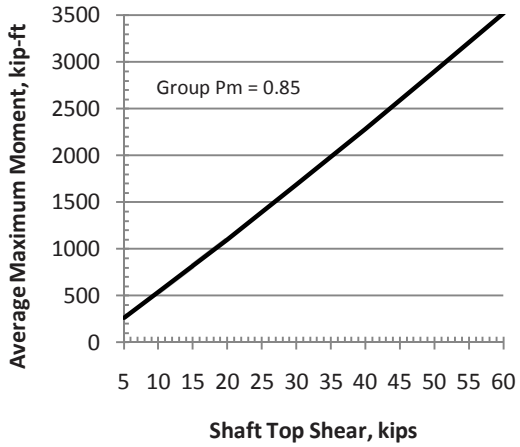
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 423.3 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 473 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 11 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 473 ft.



Pier 11 Shaft Deflection Fixity Elevation vs. Shear



Pier 11 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 11 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
401.7	Soft Clay	47.6	-	525	60	0.015
366.7	Sand	62.6	36	-	100	-
353.7	Sand	67.6	45	-	190	-

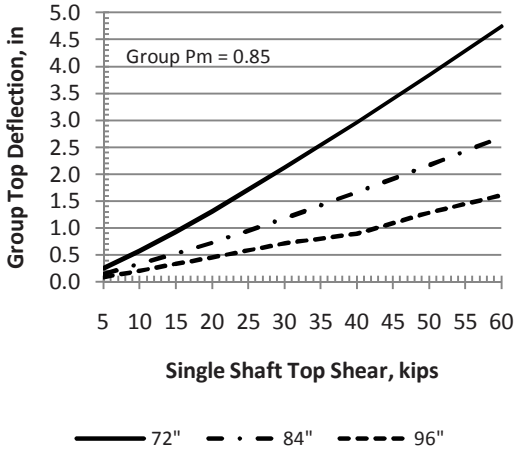
Pier 12
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with horizontal fractures and two 0.25” clay seams within the top 10 ft. The GSI used in the analysis is 30. The resulting nominal unit base resistance is 366 ksf. *The plans should indicate a top of rock elevation of 353 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

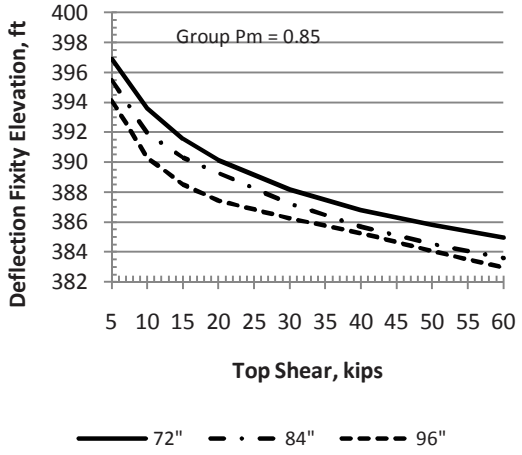
Pier 12 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	4,347	6,086
6	5,174	7,243
6.5	6,072	8,500
7.0	7,042	9,859
7.5	8,084	11,317

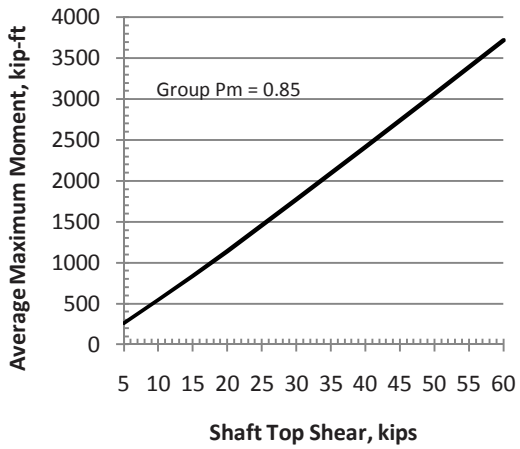
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 422.6 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 470 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 12 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 470 ft.



Pier 12 Shaft Deflection Fixity Elevation vs. Shear



Pier 12 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 12 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
403.1	Soft Clay	47.6	-	257	20	0.024
387.1	Sand	67.6	40	-	125	-
372.1	Sand	62.6	36	-	65	-
353.1	Sand	67.6	45	-	220	-

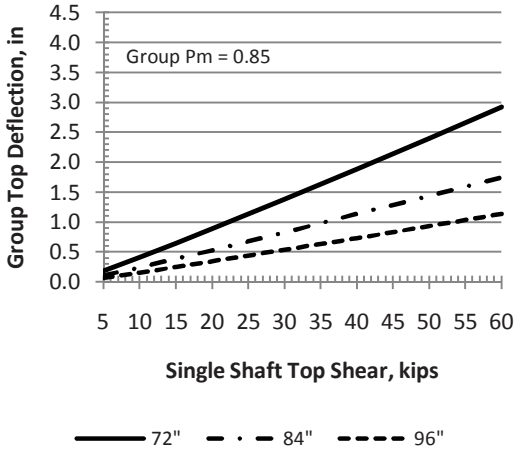
Pier 13
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with slightly weathered horizontal fractures with no clay seams within the top 10 ft. The GSI used in the analysis is 40. The resulting nominal unit base resistance is 468 ksf. *The plans should indicate a top of rock elevation of 356 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

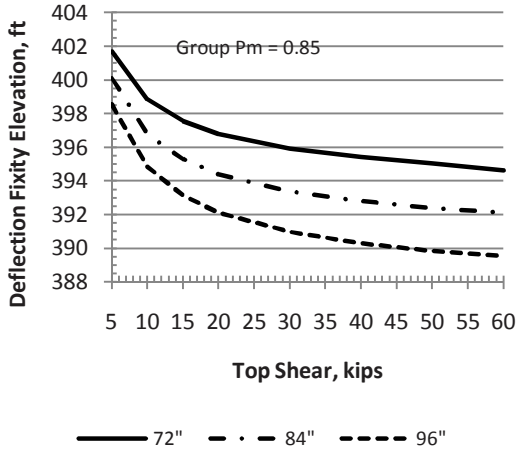
Pier 13 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	5,555	7,777
6	6,611	9,256
6.5	7,759	10,863
7.0	8,999	12,598
7.5	10,330	14,462

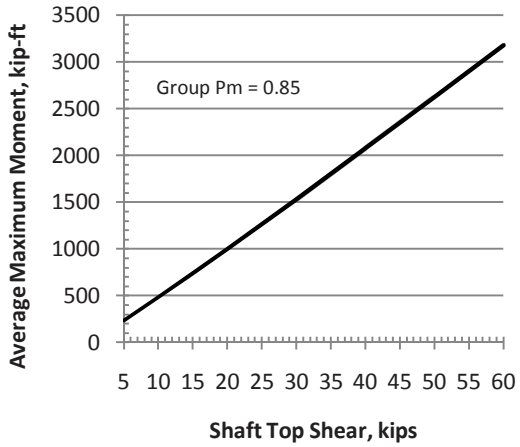
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 422.5 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 467 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 13 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 467 ft.



Pier 13 Shaft Deflection Fixity Elevation vs. Shear



Pier 13 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 13 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ°	c, psf	k, pci	E_{50}
412.9	Soft Clay	47.6	-	600	75	0.014
402.4	Sand	57.6	33	-	40	-
355.9	Sand	67.6	40	-	90	-

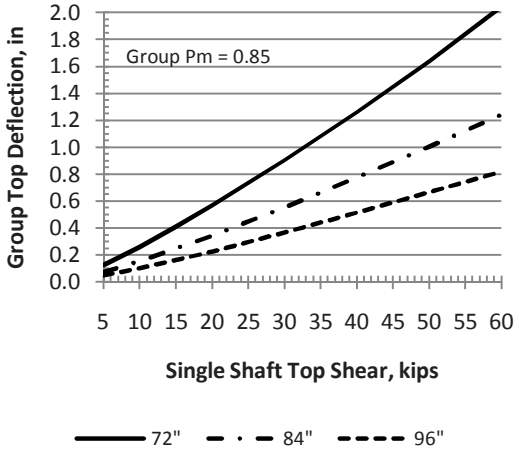
Pier 14
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with weathered horizontal fractures with one 0.5” clay seam at 9 ft. The GSI used in the analysis is 35. The resulting nominal unit base resistance is 570 ksf. *The plans should indicate a top of rock elevation of 357 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

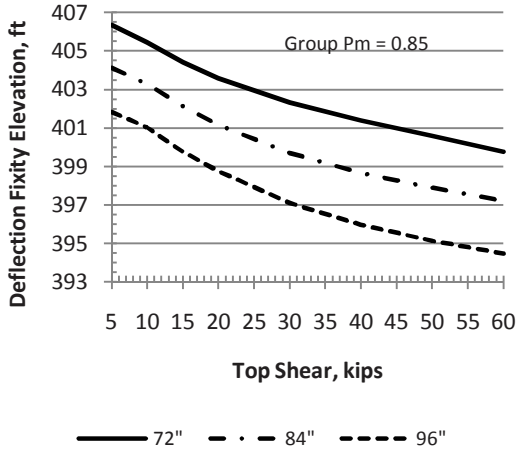
Pier 14 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	6,769	9,476
6	8,055	11,277
6.5	9,454	13,235
7.0	10,964	15,349
7.5	12,586	17,621

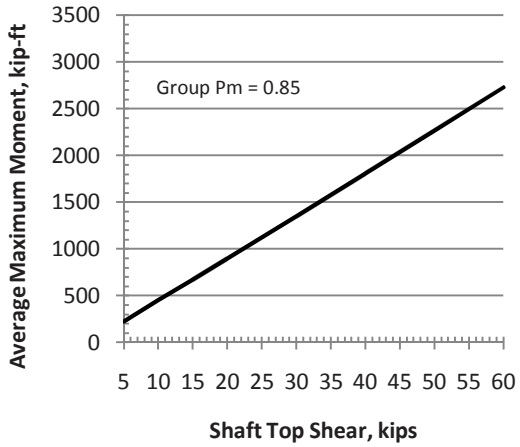
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 422.5 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 464 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 14 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 464 ft.



Pier 14 Shaft Deflection Fixity Elevation vs. Shear



Pier 14 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 14 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
412.4	Stiff Clay Below W.T.	52.6	-	1420	465	0.007
406.4	Sand	57.6	33	-	40	-
356.9	Sand	62.6	36	-	80	-

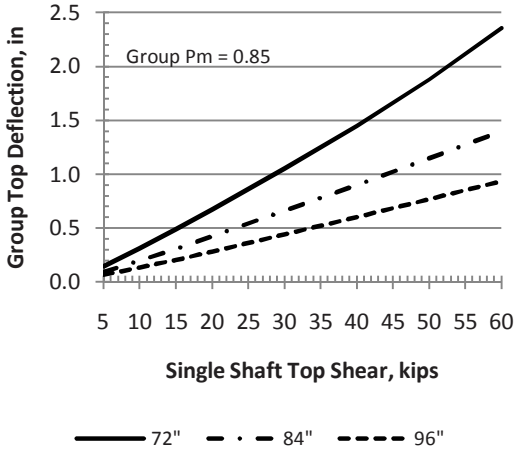
Pier 15
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with weathered horizontal fractures with one 0.5” clay seam at 8 ft. The GSI used in the analysis is 35. The resulting nominal unit base resistance is 485 ksf. *The plans should indicate a top of rock elevation of 356 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

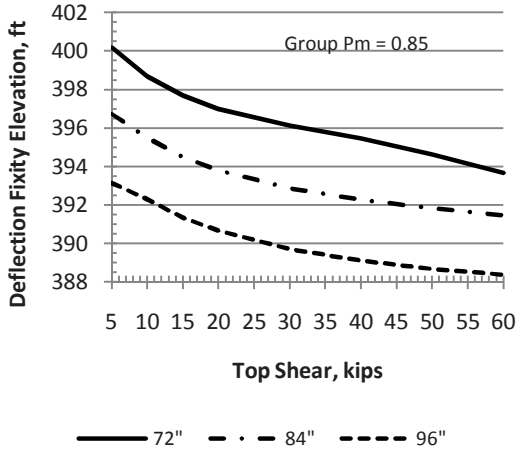
Pier 15 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	5,759	8,063
6	6,854	9,595
6.5	8,044	11,261
7.0	9,329	13,060
7.5	10,709	14,993

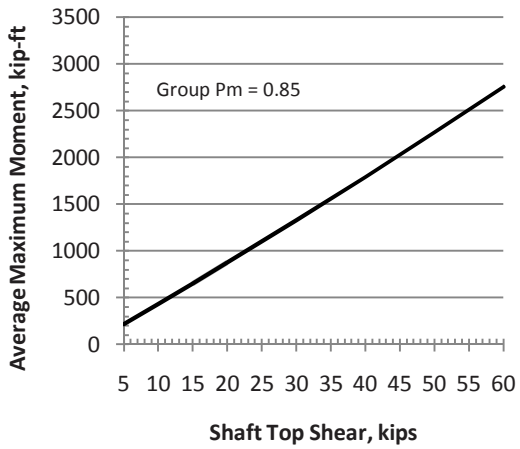
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 421.6 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 461 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 15 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 461 ft.



Pier 15 Shaft Deflection Fixity Elevation vs. Shear



Pier 15 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 15 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ°	c, psf	k, pci	E_{50}
414.2	Stiff Clay Below W.T.	47.6	-	875	160	0.010
405.2	Sand	57.6	33	-	40	-
364.2	Sand	62.6	36	-	70	-
356.2	Sand	67.6	45	-	210	-

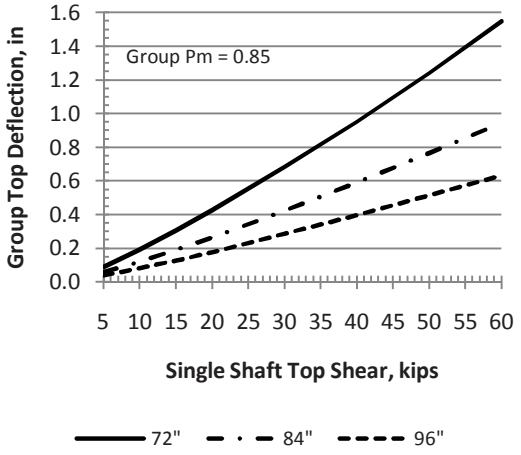
Pier 16
Drilled Shaft Supported Pier Cap Configuration

Rock core data indicates limestone with slightly weathered horizontal fractures with no clay seams in the top 10 ft. The GSI used in the analysis is 40. The resulting nominal unit base resistance is 551 ksf. *The plans should indicate a top of rock elevation of 357 ft.* The following table shows factored tip resistance available for a variety of rock socket diameters.

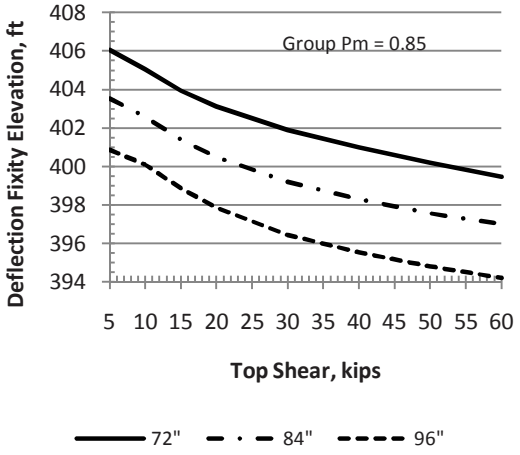
Pier 16 Drilled Shaft Factored Tip Resistance

Rock Socket Diameter, ft	Factored Tip Resistance, kips ϕ=0.5	Factored Tip Resistance, kips ϕ=0.7
5.5	6,547	9,165
6	7,791	10,908
6.5	9,144	12,801
7.0	10,605	14,846
7.5	12,174	17,043

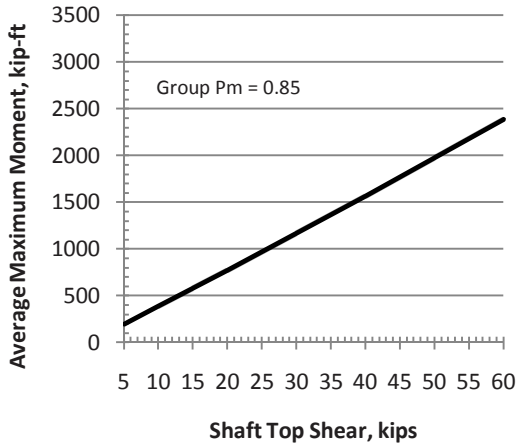
The COM624 horizontal load analysis assumes a free (pinned) connection to the superstructure. The shaft is unsupported to a design scour elevation of 423.3 ft. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the pier cap elevation 458 ft. The following figures show deflection, fixity elevation, and average maximum moment versus top of shaft shear.



Pier 16 Shaft Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction
Deflection at elevation 458 ft.



Pier 16 Shaft Deflection Fixity Elevation vs. Shear



Pier 16 Shaft Average Maximum Moment vs. Shear

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 16 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φ^o	c, psf	k, pci	E_{50}
413.1	Stiff Clay Below W.T.	52.6	-	1160	320	0.008
364.6	Sand	62.6	36	-	75	-
356.6	Sand	67.6	45	-	220	-

Approach Pavement

The approach pavement footing will be constructed on compacted embankment. The soil conditions beneath the footing are anticipated to provide adequate bearing capacity. To limit the potential for approach pavement settlement, the attached special provision for Bridge Approach Pavement Construction Sequence should be included.

Construction Considerations

Stage Construction. The project will be constructed on new alignment a sufficient distance from the existing alignment to not require temporary retention.

Ground Improvement. No ground improvement is required.

Earthwork. Granular fill is required at the south abutment approach embankment. A special provision for South Abutment Approach Embankment is attached. There are no other special earthwork considerations.

Estimated Water Surface Elevation. The recommended estimated water surface elevation (EWSE) is 434 ft. The EWSE is based on USCOE stream gage data with an effort to accommodate frequent minor flood stage events. This EWSE is not adequate to accommodate moderate and large flood events.

Cofferdams. The BBS Manual indicates a Cofferdam (Type 2) is not required where there is less than 10 ft between the EWSE and bottom of excavation. However at this location, the presence of granular materials makes dewatering and maintaining excavation stability difficult without a seal coat. A cofferdam (Type 2) is recommended where excavation of 6 ft or more below EWSE in granular materials is required to facilitate footing construction. The following table shows the preliminary bottom of footing elevation and estimated seal coat thickness for pile or drilled shaft supported footing option. The estimated seal coat thickness shown in the table is subject to refinement in final design.

Cofferdam (Type 2) Information for Pile or Shaft Supported Footing Pier Configuration

Pier	Bottom of Footing Elev., ft	Estimated Seal Coat Thickness, ft
1	427	3
2	410	10
3	405	10
4	405	10
5	427*	3
7 - 8	427	3
9 - 11	423	5
12 - 14	422	6
15	421	6
16	422	6

* If proposed footing elevation of 430 ft is used, no cofferdam is required.

A Cofferdam (Type 1) is required at Pier 6 for the pile supported footing configuration. Cofferdams are not required for drilled shafts transitioning to columns supporting the pier cap.

Pile Foundation Construction Considerations.

All piles anticipated to be driven to limestone should include pile shoes. Pile shoes should not be specified on any pile size or type anticipated to reach its nominal required bearing above limestone.

Test piles are required at each pile supported foundation location. Where the pile type and size is anticipated to reach its nominal required bearing above limestone, one test pile at each end of the foundation should be specified. Where the piles are anticipated to be driven to limestone, one test pile on the side of the pier opposite the boring location should be specified. At the north abutment, one of the two test piles driven to rock should be specified offset 25 ft right to check the anomaly identified in the geophysical survey.

A large quantity of piling combined with likely variation in subsurface conditions has the potential to create large additional costs during construction if the estimated quantities are not sufficient based on test pile data. This potential increases for piles driven to an elevation above bedrock. An estimated quantity of Furnishing Piles equal to 5 ft times half the total number of piles should be included in the contract. The following note should be included, "An additional estimated quantity of Furnishing Piles has been included to account for variation in subsurface conditions and test pile information."

Drilled Shaft Foundation Construction Considerations

Constructability should be a significant consideration when evaluating the drilled shaft option. Permanent casing will be required at all locations. Typically, permanent casing would extend to bedrock. However at this project location, a 5 to 20 ft thick dense granular layer directly above the limestone will likely not permit casing installation to top of rock. As a result, slurry drilling methods will likely be used to excavate the lower 25% ± of shaft length. A contractor may install permanent casing to refusal, attempt to advance the excavation with slurry drilling, and then continue to advance the permanent casing to bedrock.

The subsurface investigation in this area has been carried out using mud rotary drilling methods. Mud rotary investigative drilling can provide some insight into the effectiveness of slurry drilling. Discussions with the Geo Services drilling supervisors and the District 6 drill crew's experience drilling for interchange structures near the proposed 009-0504 structure, indicate difficulty maintaining an open hole in the dense gravel. Drilling fluid loss and hole collapse were experienced in the dense gravel layer. According to the FHWA Drilled Shaft Construction Procedures and Design Methods publication indicates the depth of excavation on this project is close to the anecdotal limit of some slurry types. It also indicates the large diameter shafts proposed on this project are more difficult to stabilize than smaller diameter shafts. Successful slurry drilling would also require the slurry head to be 5 to 10 ft above the prevailing water elevation.

At piers 2, 3, and 4, the configuration would include a group of drilled shafts supporting a footing. A cofferdam is required for both the pile and drilled shaft supported option. Because of the potential difficulties with drilled shaft construction combined with integrating the shafts into a cofferdam with a footing significantly below the EWSE, <u>the use of drilled shafts at piers 2, 3, and 4 is not recommended.</u> Contact the SGR author if drilled shafts would provide a significant cost savings over a pile supported footing at these piers.

At the remaining piers, the use of drilled shafts has the potential to be significantly more economical than piles. Drilled shaft construction at these piers transition the shaft directly into a column supporting the pier cap. The use of shafts in these locations do not require cofferdams or underwater structure excavation protection. Permanent casing should be specified from top of drilled shaft section to top of rock elevation.

Because potential constructability problems utilizing slurry to maintain stability of large diameter shafts, the diameter of drilled shafts should be kept at a minimum. Shaft diameters should not exceed 7 ft with a recommended diameter of 6 ft. Contact the SGR author if analyses of smaller shaft diameters are needed.

If the structure designer would like to utilize a 0.7 resistance factor in drilled shaft design, a test shaft is recommended at Pier 5. Pier 5 has been selected because it is the location with the lowest unconfined compressive strength and most unsatisfactory jointing conditions. The test shaft should be one of the interior shafts. A special provision for Drilled Shaft Load Test can be developed if required.

Include the following note on all boring log sheets, “During the subsurface investigation, there was difficulty maintaining an open hole in coarse sands and gravels with bentonite drilling fluid.”

STRUCTURE GEOTECHNICAL REPORT

ADDENDUM

009-0504

Existing SN 009-0001

US 67 Expressway over the Illinois River

Route: FAP 310
Section: 9-4;85-1
Cass and Schuyler Counties

D-96-543-02

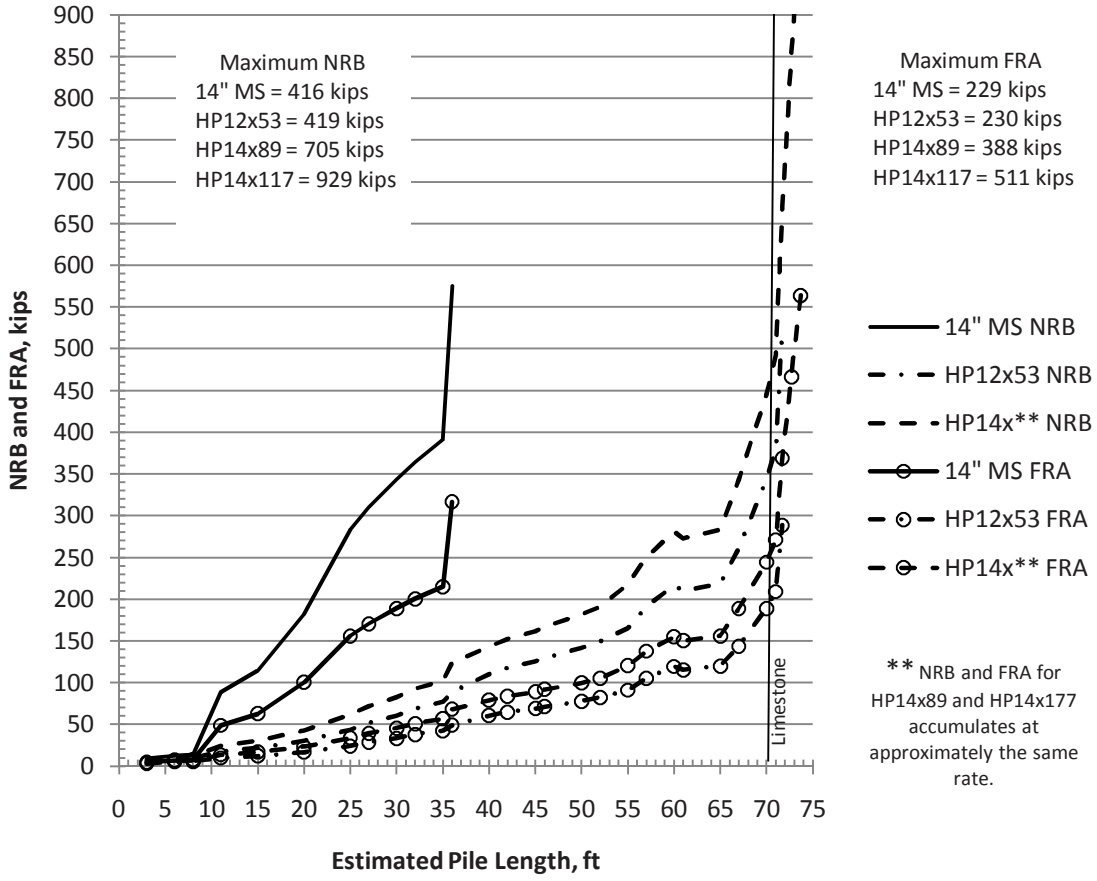
Contract Number Not Assigned

This addendum includes pile supported footing analysis information for Piers 10 to 16 and information regarding the use of HP 16 and HP 18 sections.

November 16, 2011

Pier 10 Pile Supported Footing Configuration

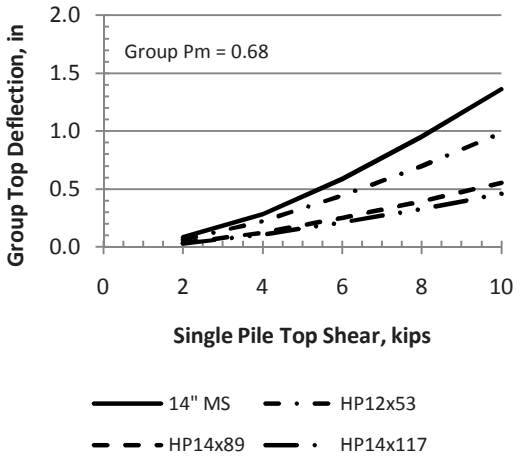
The pile supported footing analysis assumes a bottom of footing elevation of 423 ft, which is slightly above the design scour elevation of 422.6 ft. The 0.4 ft of scour is negligible and no scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



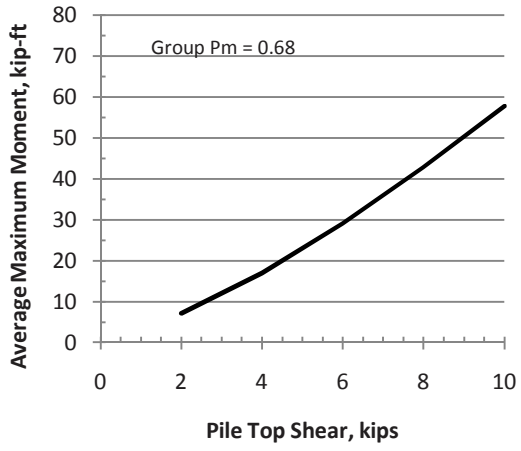
Estimated pile length based on a cutoff elevation of 424 ft.

Pier 10 NRB and FRA versus Estimated Pile Length.

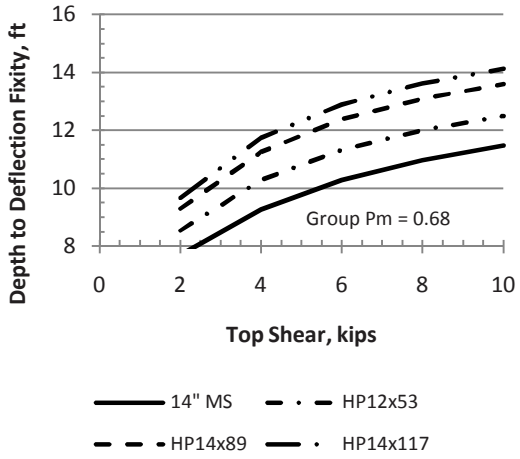
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 423 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 10 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 10 Pile Average Maximum Moment vs. Shear



Pier 10 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 423 ft.

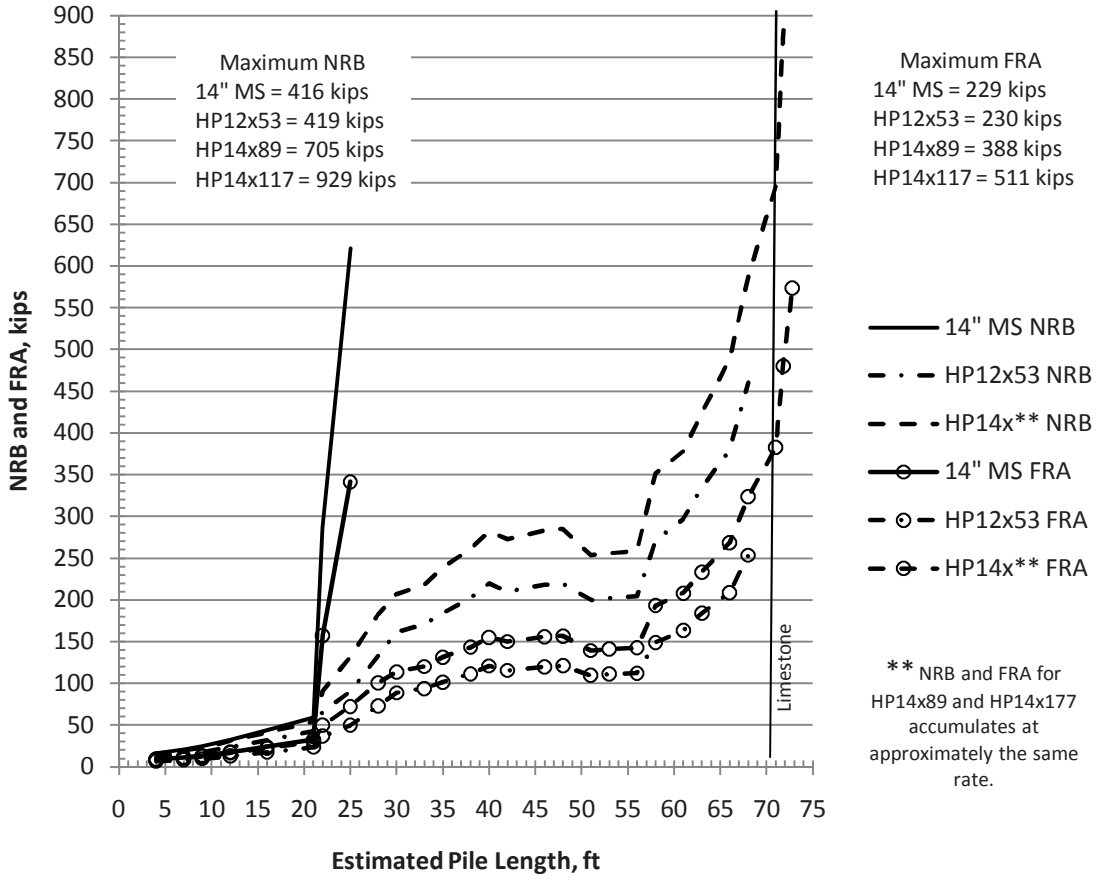
The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 10 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
412.8	Soft Clay	47.6	-	500	50	0.015
399.3	Sand	57.6	33	-	30	-
374.3	Sand	67.6	40	-	100	-
353.8	Sand	67.6	40	-	155	-

Pier 11 Pile Supported Footing Configuration

The pile supported footing analysis assumes a bottom of footing elevation of 423 ft, which is below the design scour elevation of 423.3 ft. No scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.

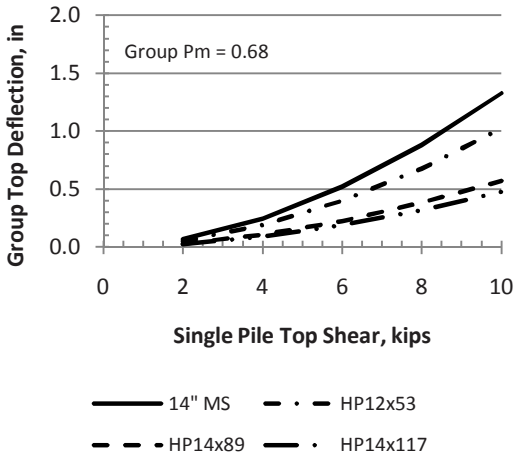


Estimated pile length based on a cutoff elevation of 424 ft.

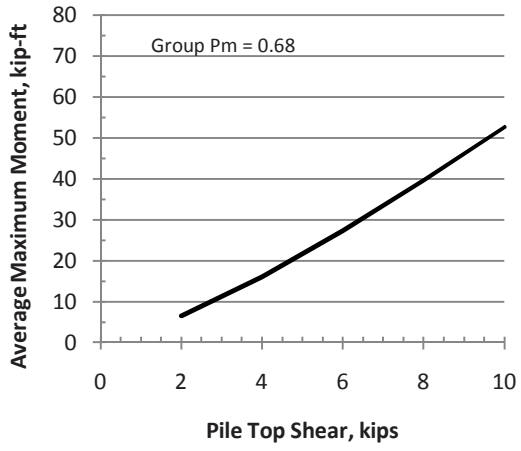
Pier 11 NRB and FRA versus Estimated Pile Length.

The above figure indicates metal shell piles do not accumulate significant side resistance prior to encountering very hard driving conditions in what is likely a dense gravel seam within the sand. Because of the likelihood of damage during driving and the limited accumulation of side resistance, a metal shell pile is not recommended at this location.

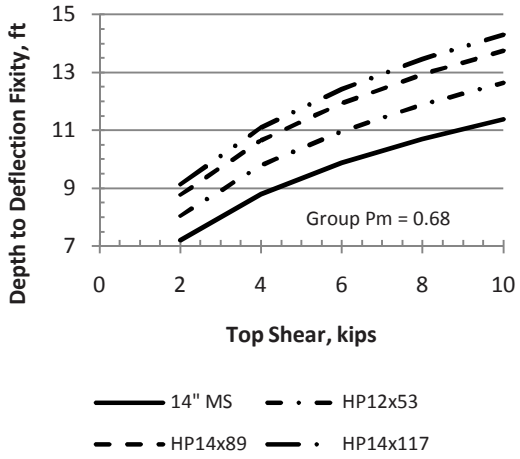
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 423 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 11 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 11 Pile Average Maximum Moment vs. Shear



Pier 11 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 423 ft.

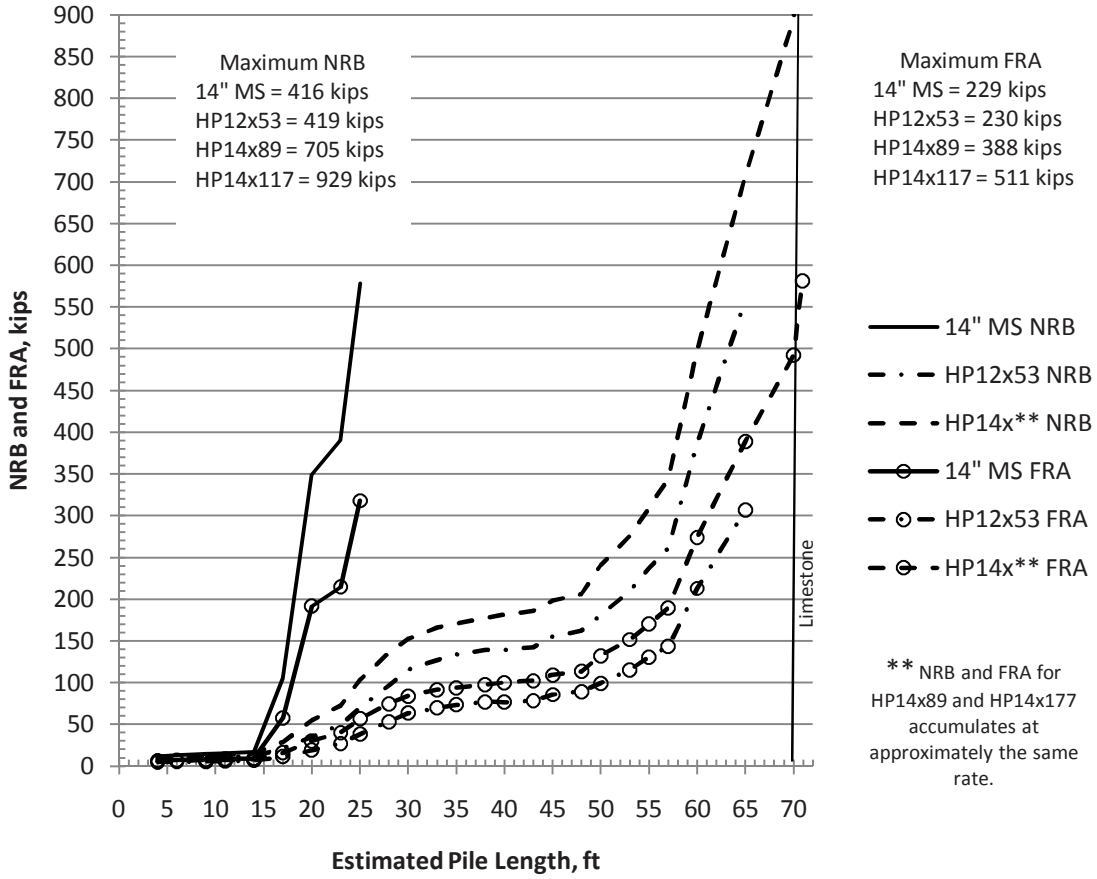
The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 11 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
401.7	Soft Clay	47.6	-	525	60	0.015
366.7	Sand	62.6	36	-	100	-
353.7	Sand	67.6	45	-	190	-

Pier 12 Pile Supported Footing Configuration

The pile supported footing analysis assumes a bottom of footing elevation of 423 ft, which is slightly above the design scour elevation of 422.6 ft. The 0.4 ft of scour is negligible and no scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.

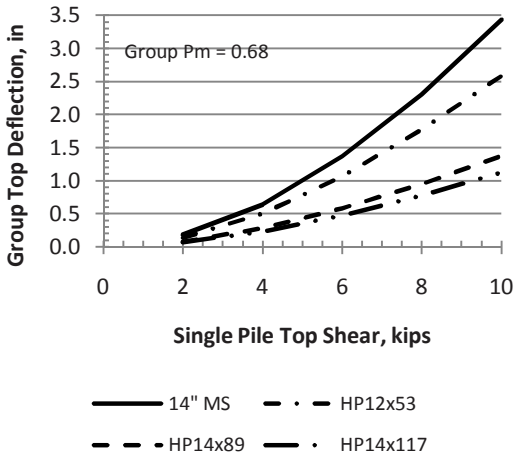


Estimated pile length based on a cutoff elevation of 423 ft.

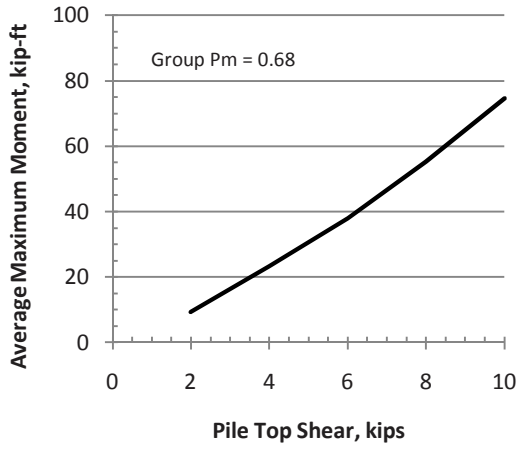
Pier 12 NRB and FRA versus Estimated Pile Length.

The above figure indicates metal shell piles do not accumulate significant side resistance prior to encountering very hard driving conditions in what is likely a dense gravel seam within the sand. Because of the likelihood of damage during driving and the limited accumulation of side resistance, a metal shell pile is not recommended at this location.

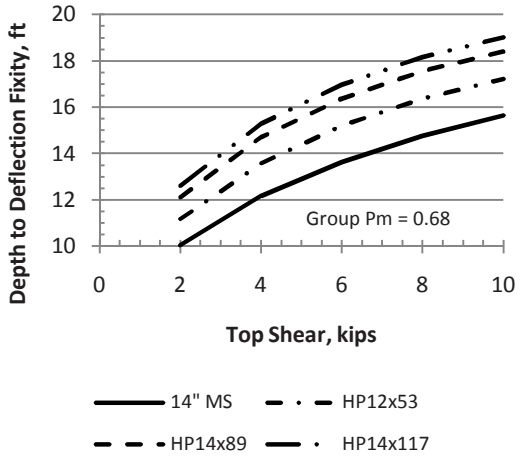
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 422 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 12 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 12 Pile Average Maximum Moment vs. Shear



Pier 12 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 422 ft.

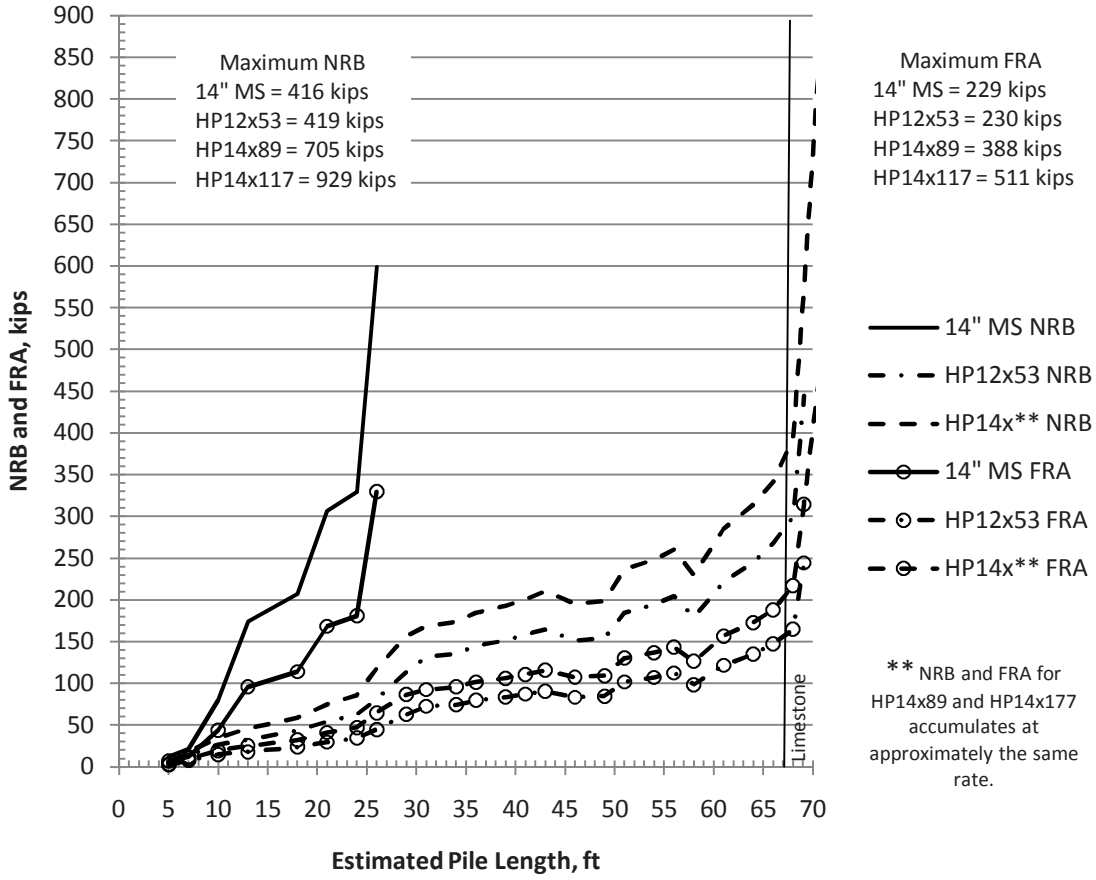
The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 12 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
403.1	Soft Clay	47.6	-	257	20	0.024
387.1	Sand	67.6	40	-	125	-
372.1	Sand	62.6	36	-	65	-
353.1	Sand	67.6	45	-	220	-

Pier 13 Pile Supported Footing Configuration

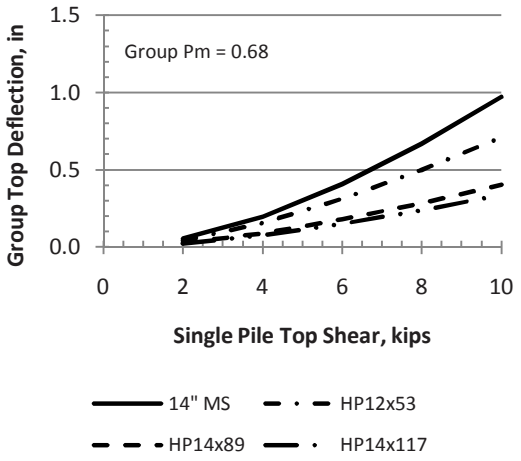
The pile supported footing analysis assumes a bottom of footing elevation of 422 ft, which is below the design scour elevation of 422.5 ft. No scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



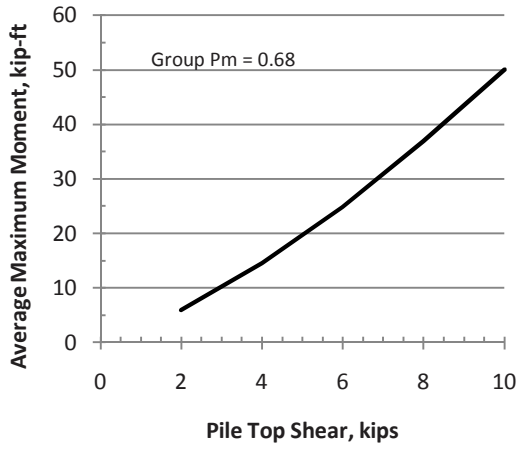
Estimated pile length based on a cutoff elevation of 423 ft.

Pier 13 NRB and FRA versus Estimated Pile Length.

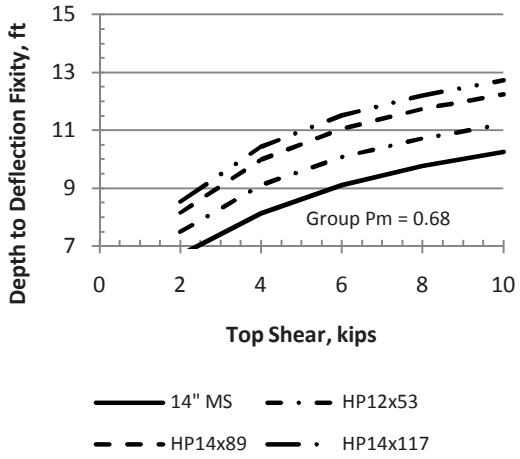
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 422 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 13 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 13 Pile Average Maximum Moment vs. Shear



Pier 13 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 422 ft.

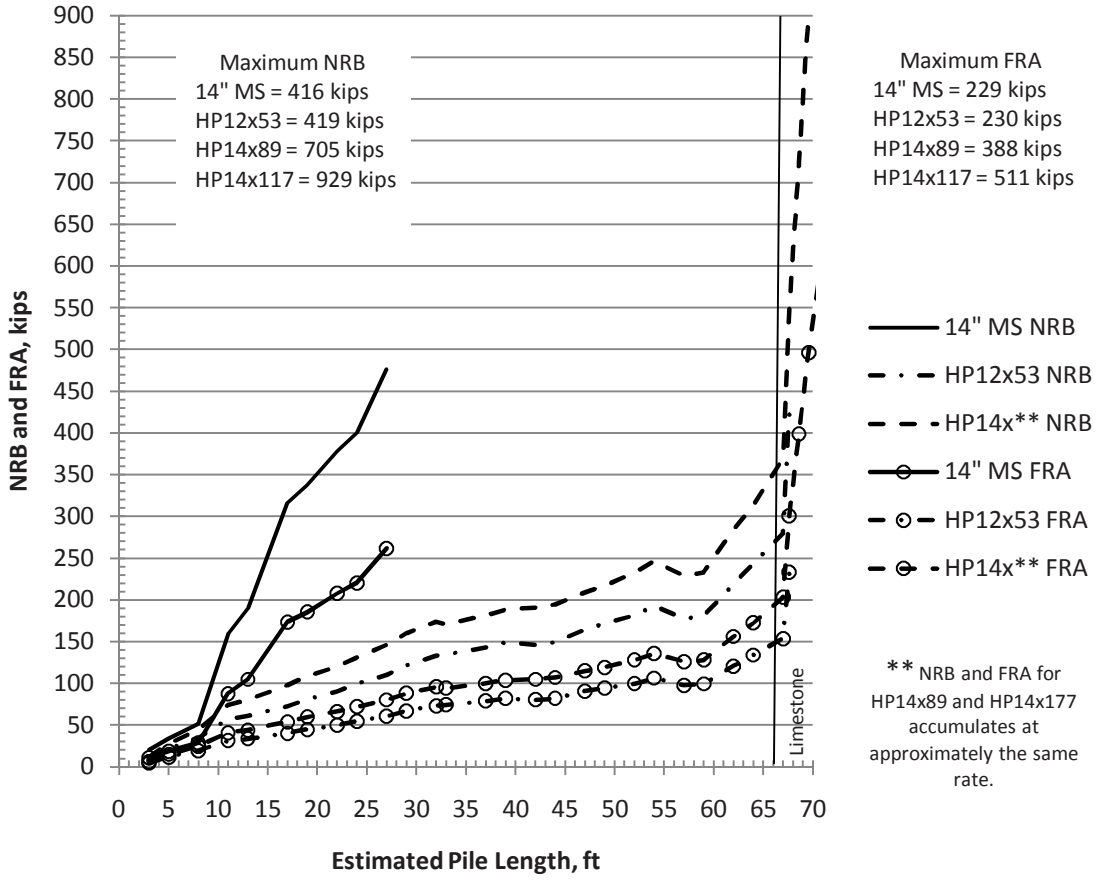
The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 13 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
412.9	Soft Clay	47.6	-	600	75	0.014
402.4	Sand	57.6	33	-	40	-
355.9	Sand	67.6	40	-	90	-

Pier 14 Pile Supported Footing Configuration

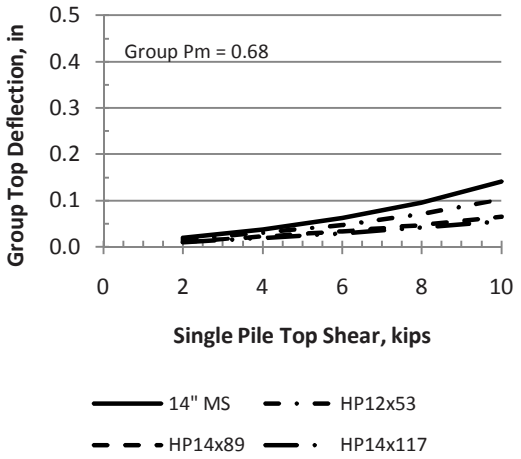
The pile supported footing analysis assumes a bottom of footing elevation of 422 ft, which is below the design scour elevation of 422.5 ft. No scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



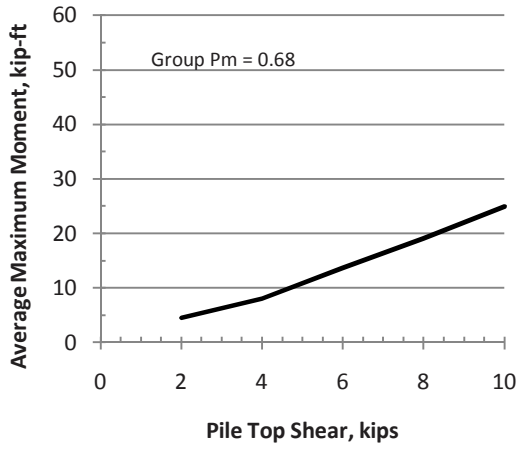
Estimated pile length based on a cutoff elevation of 423 ft.

Pier 14 NRB and FRA versus Estimated Pile Length.

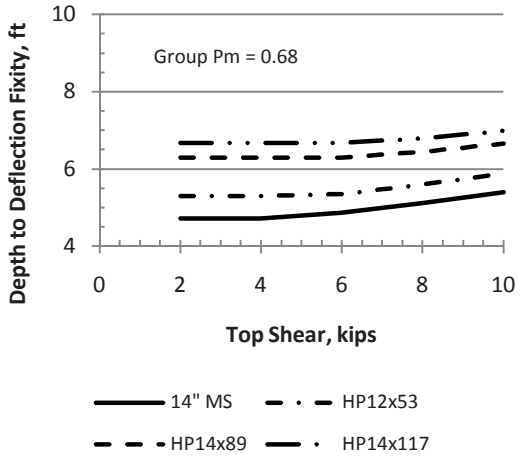
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 422 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 14 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 14 Pile Average Maximum Moment vs. Shear



Pier 14 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 422 ft.

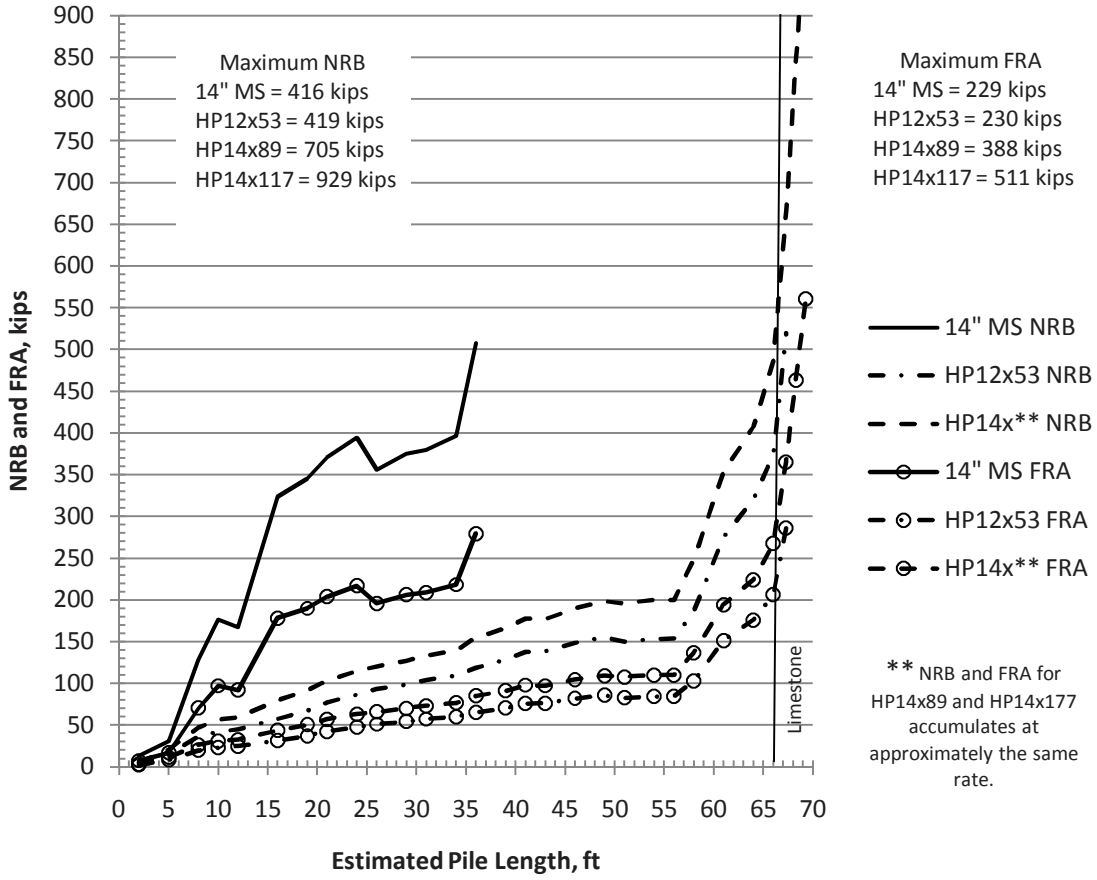
The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 14 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
412.4	Stiff Clay Below W.T.	52.6	-	1420	465	0.007
406.4	Sand	57.6	33	-	40	-
356.9	Sand	62.6	36	-	80	-

Pier 15 Pile Supported Footing Configuration

The pile supported footing analysis assumes a bottom of footing elevation of 421 ft, which is slightly above the design scour elevation of 421.6 ft. No scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.

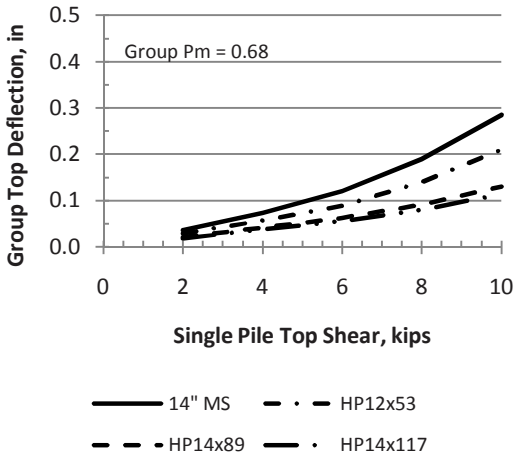


Estimated pile length based on a cutoff elevation of 422 ft.

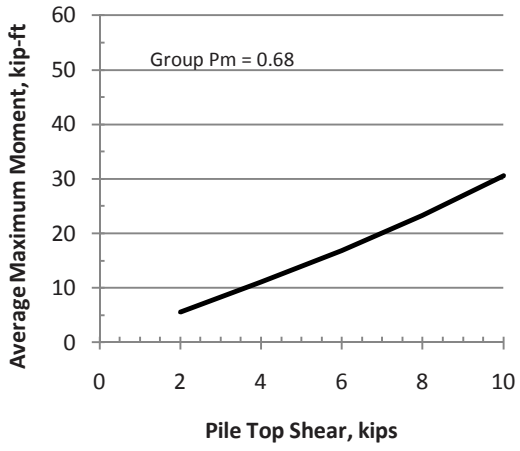
Pier 15 NRB and FRA versus Estimated Pile Length.

If a metal shell pile is selected, the estimated length should correspond to the maximum length shown for a given bearing in the above figure.

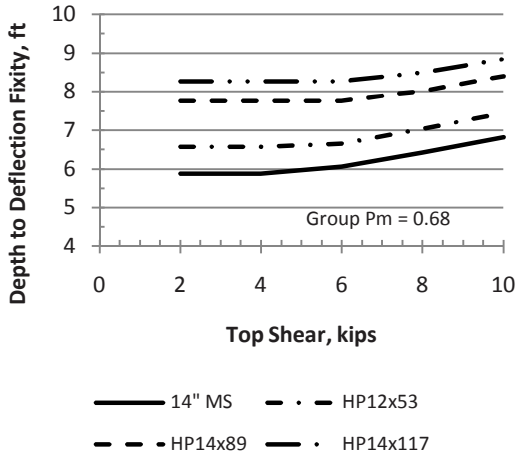
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 421 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 15 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 15 Pile Average Maximum Moment vs. Shear



Pier 15 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 421 ft.

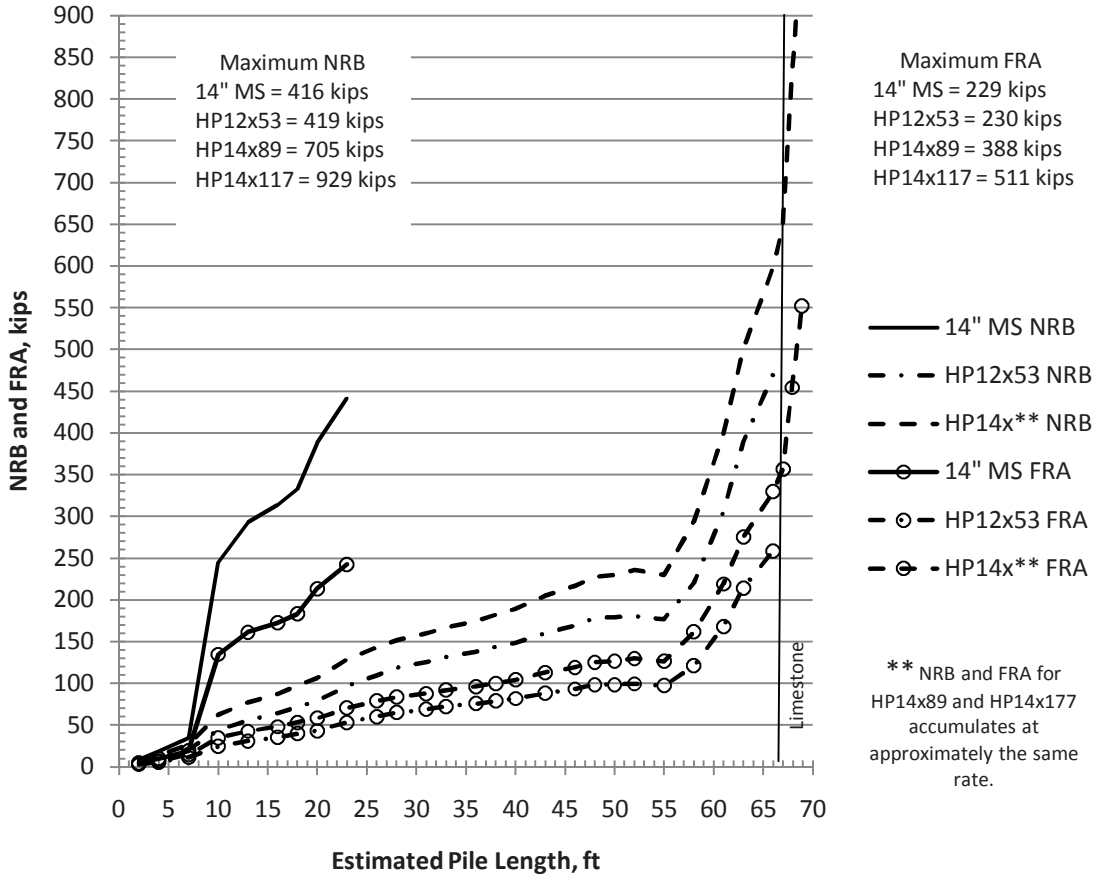
The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 15 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
414.2	Stiff Clay Below W.T.	47.6	-	875	160	0.010
405.2	Sand	57.6	33	-	40	-
364.2	Sand	62.6	36	-	70	-
356.2	Sand	67.6	45	-	210	-

Pier 16 Pile Supported Footing Configuration

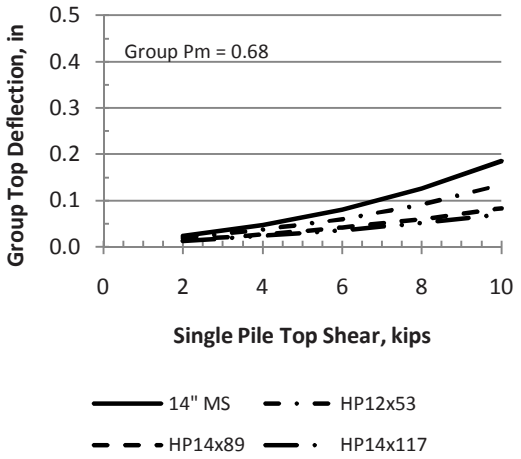
The pile supported footing analysis assumes a bottom of footing elevation of 422 ft, which is below the design scour elevation of 423.3 ft. No scour reduction in FRA is required. The following figure shows NRB and FRA versus estimated length for a variety of pile sizes.



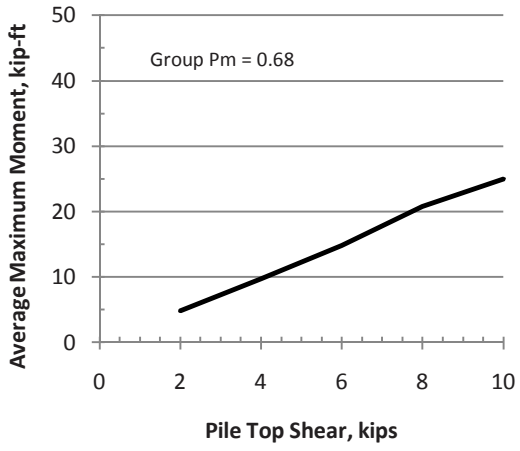
Estimated pile length based on a cutoff elevation of 423 ft.

Pier 16 NRB and FRA versus Estimated Pile Length.

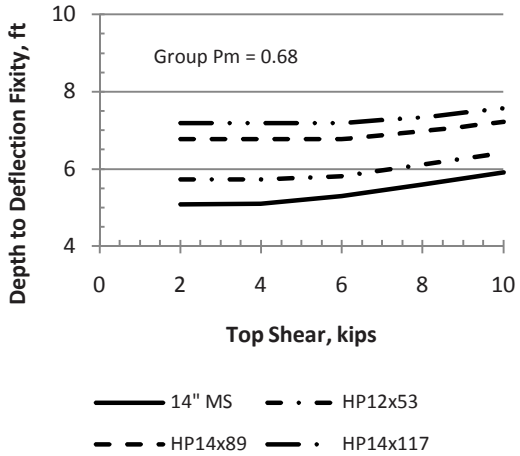
The COM624 horizontal load analysis assumes a free connection to the footing. The assumed pile group consists of 3 pile rows with 16 piles per row. The analysis evaluates the more critical longitudinal force direction. Horizontal loads are applied at the bottom of footing elevation 422 ft. The following figures show deflection, fixity depth, and average maximum moment versus top of pile shear.



Pier 16 Pile Group Deflection vs. Shear
<u>Longitudinal</u> Force Direction



Pier 16 Pile Average Maximum Moment vs. Shear



Pier 16 Pile Maximum Depth to Fixity vs. Shear
Depth to fixity is below bottom of footing elevation 422 ft.

The table below includes recommended COM624 soil layer input data for use by the structure designer in more detailed soil-structure interaction analyses as final design progresses.

Pier 16 COM624 Input Data – No P-Multiplier

Bottom of Layer Elevation, ft	p-y Curve Criteria	γ ‘, pcf	Φº	c, psf	k, pci	E_{50}
413.1	Stiff Clay Below W.T.	52.6	-	1160	320	0.008
364.6	Sand	62.6	36	-	75	-
356.6	Sand	67.6	45	-	220	-

HP 16 and HP 18 Sections

Larger H-Pile sections have been developed and are being used with increasing frequency. They are currently only available by special rolling and require specially manufactured splice plates and hammer drive caps. These piles may become more commonly used by the time the proposed structure is actually constructed. An economic analysis may be appropriate to determine the benefit of using these larger HP sections.

A representative from Skyline Steel indicated an HP16x141 is the most commonly used section and is rolled most frequently. All the HP18 sections would be specially rolled to order. The following table shows the Maximum Nominal Required Bearing, Factored Resistance Available, Geotechnical Losses, and Estimated Length of the larger HP sections at select substructures for information.

Substructure	**HP 16x141**			**HP 18x181**			
	NRB	**Losses**	**FRA**	**NRB**	**Losses**	**FRA**	**Est Length**
Pier 2	1126 kips	N/A	563 kips	1436 kips	N/A	790 kips	65 ft
Pier 3		3 kips	560 kips		4 kips	786 kips	65 ft
Per 4		N/A	563 kips		N/A	790 kips	60 ft
Pier 11		N/A	563 kips		N/A	790 kips	75 ft
Pier 12		N/A	563 kips		N/A	790 kips	75 ft
N. Abut.		297 kips	322 kips		397 kips	393 kips	100 ft

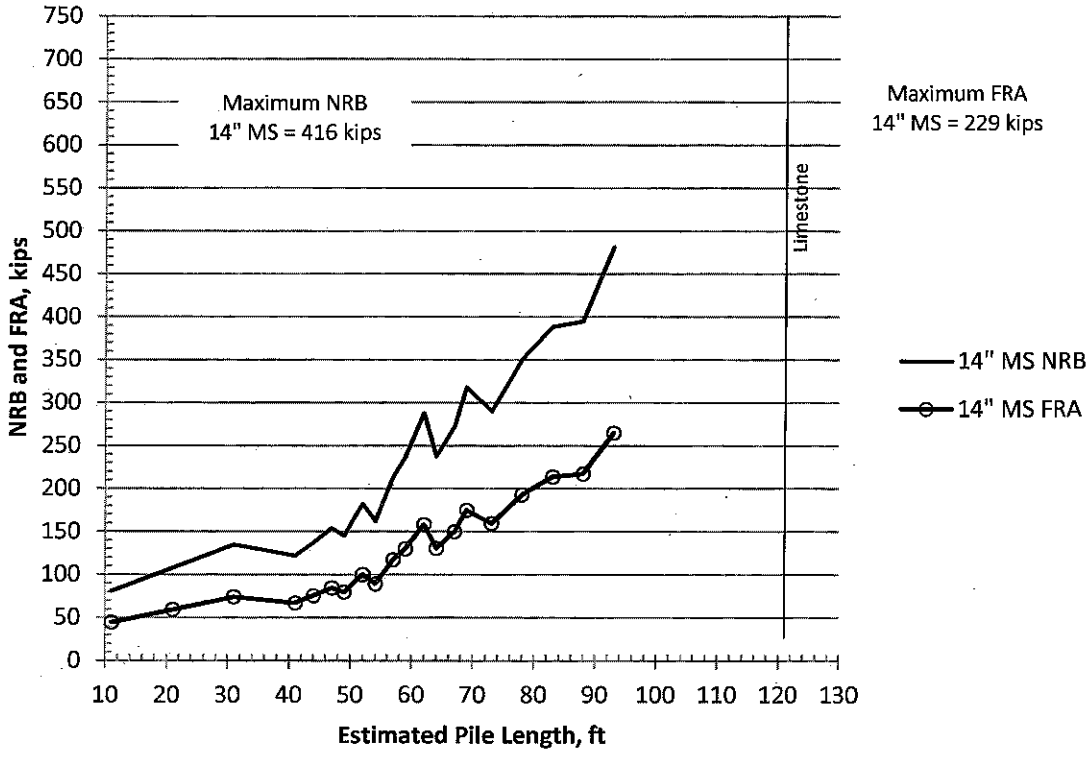
Estimated lengths are based on the cutoff elevations shown in the SGR for the substructures shown.

Contact the SGR author if additional information is needed

Structure Geotechnical Report
SN 009-0504
US 67 Expressway over the Illinois River
Pilling Addendum #2
May 30, 2012

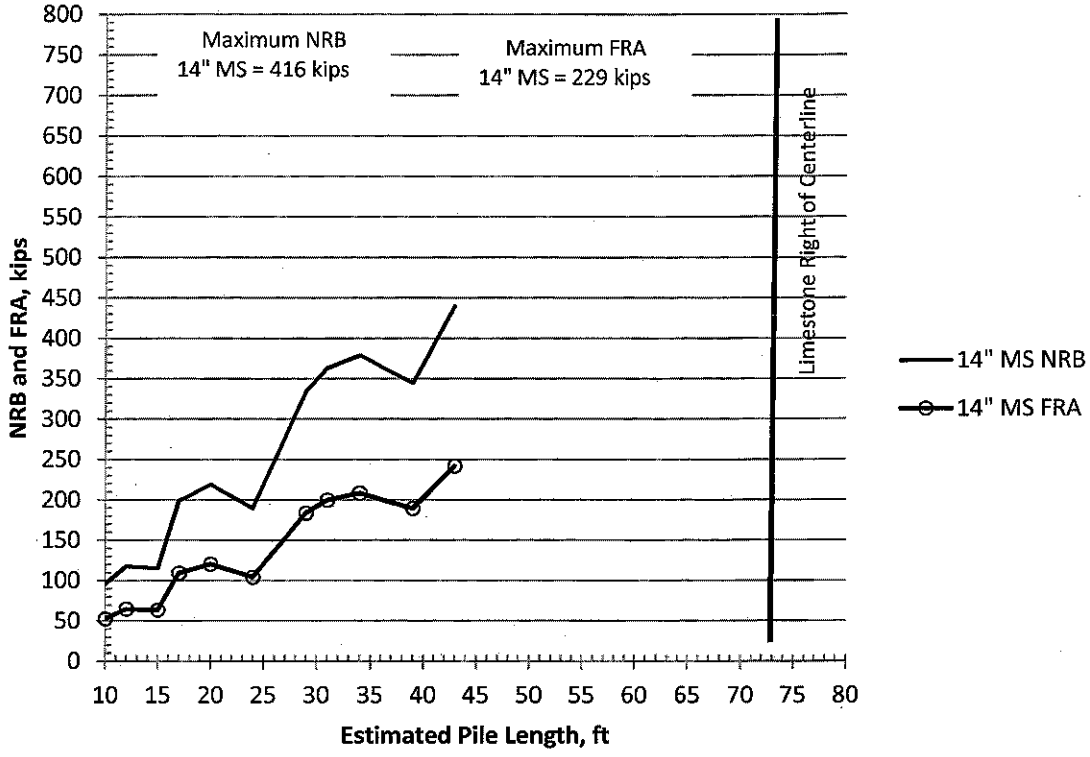
This piling addendum replaces charts shown on pages 11 and 15 of the November 18, 2011 Structure Geotechnical Report for the South Abutment and Pier 1. The charts have been modified for metal shell piles to reflect changes to soil type factors used in determining pile side resistance. The revised charts are based on an October 18, 2011 version of the IDOT Static Method of Estimating Pile Length spreadsheet.

At this time, the structure designer is only proposing metal shell piles at the south abutment and pier 1. If metal shell piles will be considered at other substructure units, contact the SGR author to determine if additional updates are required.



Estimated pile length is based on a cutoff elevation of 478.0 ft.

South Abutment Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length Assuming Granular Fill



Estimated pile length is based on a cutoff elevation of 428 ft.

Pier 1 Nominal Required Bearing (NRB) and Factored Resistance Available (FRA) versus Estimated Pile Length (Right of Centerline Case)

Approved: _____

Greg Heckel, PE
SGR Author
5-30-12
217-785-5330

STRUCTURAL GEOTECHNICAL REPORT
ADDENDUM #3

009-0504

Existing SN 009-0001

US 67 Expressway over the Illinois River

Route: FAP 310
Section: 9-4; 85-1
Cass and Schuyler Counties

D-96-543-02

Contract Number Not Assigned

This addendum provides:

- ***pile compression capacities for Piers 2 - 5, Extreme Event limit state***
- ***pile tension capacities for Piers 2 - 5, Extreme Event limit state***
- ***pile tension capacities for Piers 2 - 5 in the Strength limit state***

May 30, 2012

Introduction

Exp (formerly Teng & Associates) has prepared supplemental calculations to the Structure Geotechnical Report for US 67 over the IL River, SN 009-0504, dated 9/8/2010, revised 11/18/2011. These calculations provide pile capacities appropriate to Extreme Event load combination design at Piers 2 through 5. Compression and tension capacities are reported. In addition, tensile capacities for Piers 2 through 5 appropriate to the Strength limit state are provided.

Calculation Approach

Pile Compression

- (Strength Limit State. Not applicable – Factored Resistance Available for compression piles under the Strength limit state is addressed in the SGR.*)*

- Extreme Event Limit State. Nominal required bearing (NRB) as well as factored resistance available (FRA) are estimated using 'IDOT Static Method of Estimating Pile Length (modified 10/18/2011)' spreadsheet, with load case set to 'Seismic'. The use of load case "Seismic" sets the geotechnical resistance factor to 1.0, appropriate to the Extreme Event limit states (vessel collision, not seismic in this case).

Pile Tension

- Strength Limit State. Nominal side resistance is estimated using 'IDOT Static Method of Estimating Pile Length (modified 10/18/2011)' spreadsheet. At foundation locations where borings indicated a possible presence of dense soil layers (SPT (N) values greater than 50), it is conservatively assumed that piles may not drive the full depth of the layer, limiting the length of piles available for side resistance. Partial penetration depths of such layers ranging from 2 to 5 were used for side resistance. No tip resistance component is counted for uplift capacity, and no side resistance is counted in conjunction with any apparent penetration of limestone bedrock. The geotechnical resistance factor for nominal side resistance to uplift in the Strength limit state is 0.2, in accordance IDOT AGMU Memo 10.2.

- Extreme Event Limit State. For the Extreme Event limit states, the nominal uplift capacity calculation is again based on side resistance (only) as described above. The geotechnical resistance factor for nominal side resistance to uplift in the Extreme Event limit state is 0.8, in accordance with IDOT AGMU Memo 10.2.

Lateral Resistance (Extreme Event Limit State)

- Lateral resistance of piles will be same for Strength as well as Extreme Event limit state, as p-y resistance of soil is always taken at ultimate limit state as per AASHTO C10.7.3.12. The lateral resistance values recommended in the SGR will be used for extreme event limit state.

Upper Bound Results

Piers 2 through 5 are exposed to very large vessel collision loads in the Extreme Event II load combination. Foundations of these piers may be controlled by these large loads, and both compression and tension pile capacities may control foundation design. Complete pile capacity data versus driven length will be provided below. But for the sake of reference values, we consider here suitable common, upper-bound design values for compression and tension across these 4 piers.

Soil borings at these piers indicate approximately 80 feet of granular material over limestone. Soil strength parameters are generally consistent across these borings. At piers 2, 4 and 5, high SPT (N) values near bottom layers of select borings are observed. To recognize the possibility of premature pile refusal where such a dense layer is indicated, only 2 to 5 feet of such layers are

included (as mentioned above). Under the assumption that high loads will warrant piles driven to rock (or refusal), attention is restricted to HP 14 shapes, in 89 and 117 pound weights.

To reflect the possibility that dense layers may be encountered (as suggested by borings at P2, P4 and P5) or may not be encountered (as suggested by P3 boring), we identify maximum values for common use on piers 2 to 5 by taking a conservative envelope of the individual capacities predicted at piers 2 to 5. The resulting values are shown in Table A2-1.

Table A2-1 – Upper Bound Pile Capacities for Piers 2 to 5

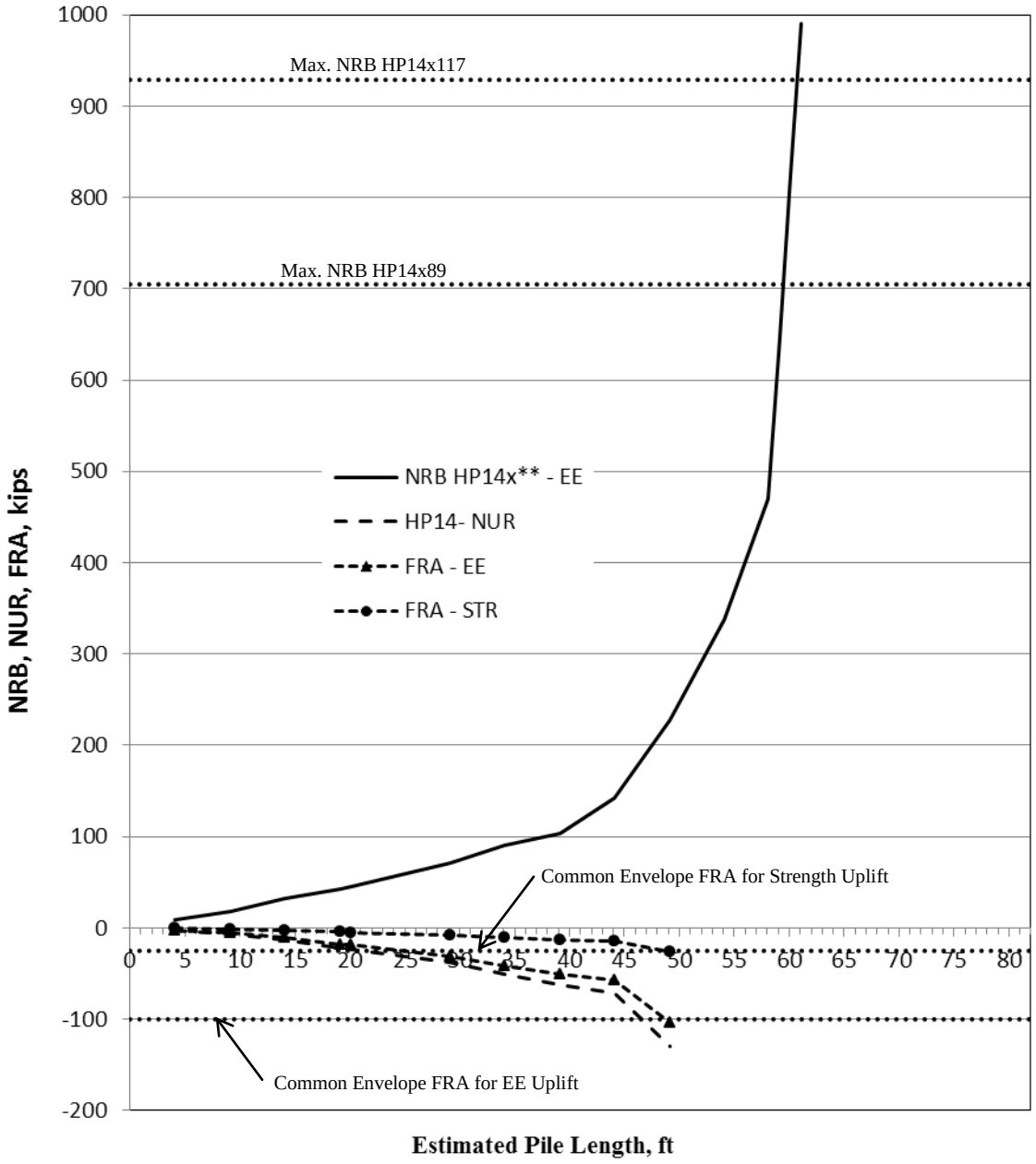
	HP 14x117		HP 14x89	
	Strength (k/pile)	Extreme Event (k/pile)	Strength (k/pile)	Extreme Event (k/pile)
Compression	**See SGR Recommendations**	**929**	**See SGR Recommendations**	**705**
Uplift	**25**	**100**	**25**	**100**

Piers 2 to 5: Nominal and Factored Resistance versus Pile Length

The following figures show NRB and FRA bearing in the extreme event limit state for HP 14x89 and 14x117 piles, at each of piers 2 through 5. Note that maximum NRB (in compression) is unchanged from the original SGR as the structural capacity of the pile is developed when rock is reached. Prior to reaching rock, the rates at which side resistance accumulates into pile capacity do differ, as a result of changes to the soil type factors in the spreadsheets. Figures in this addendum are based on an October 18, 2011 version of the IDOT Static Method of Estimating Pile Length spreadsheet. Note also that FRA (in compression) equals NRB for the extreme event limit states, in which the geotechnical resistance factor is set to 1.0. On the tension side, the figures show nominal uplift resistance (NUR) and FRA for both strength and extreme event limit states. For uplift resistance, which is governed by plugged and unplugged side resistance only, there is little distinction between the 89 and 117 pile shapes. A single curve for generic HP 14 is shown.

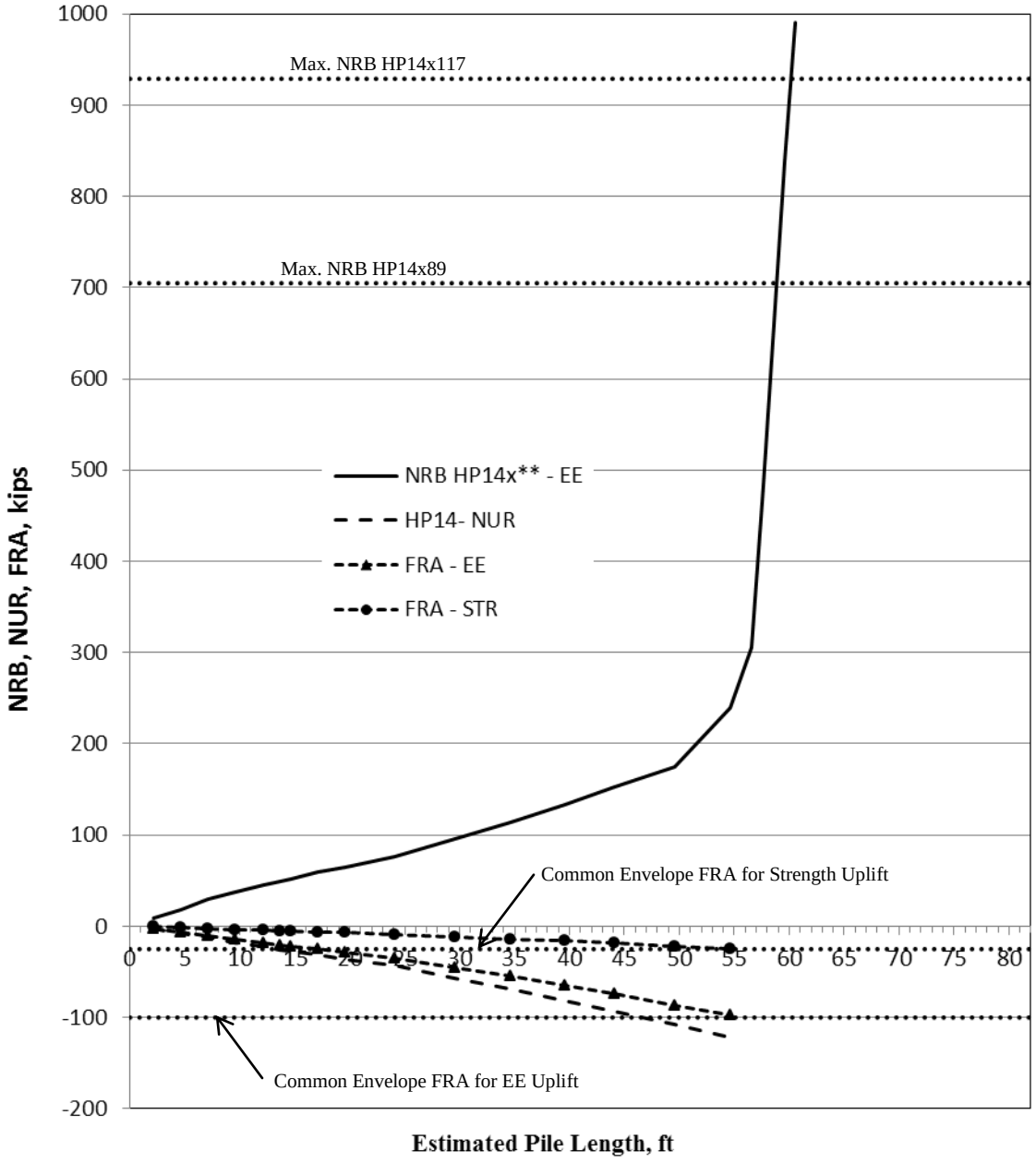
Prepared by: Kamlesh Kumar
Project Engineer
exp

Accepted by: Greg Heckel, PE
SGR Author
IDOT D6



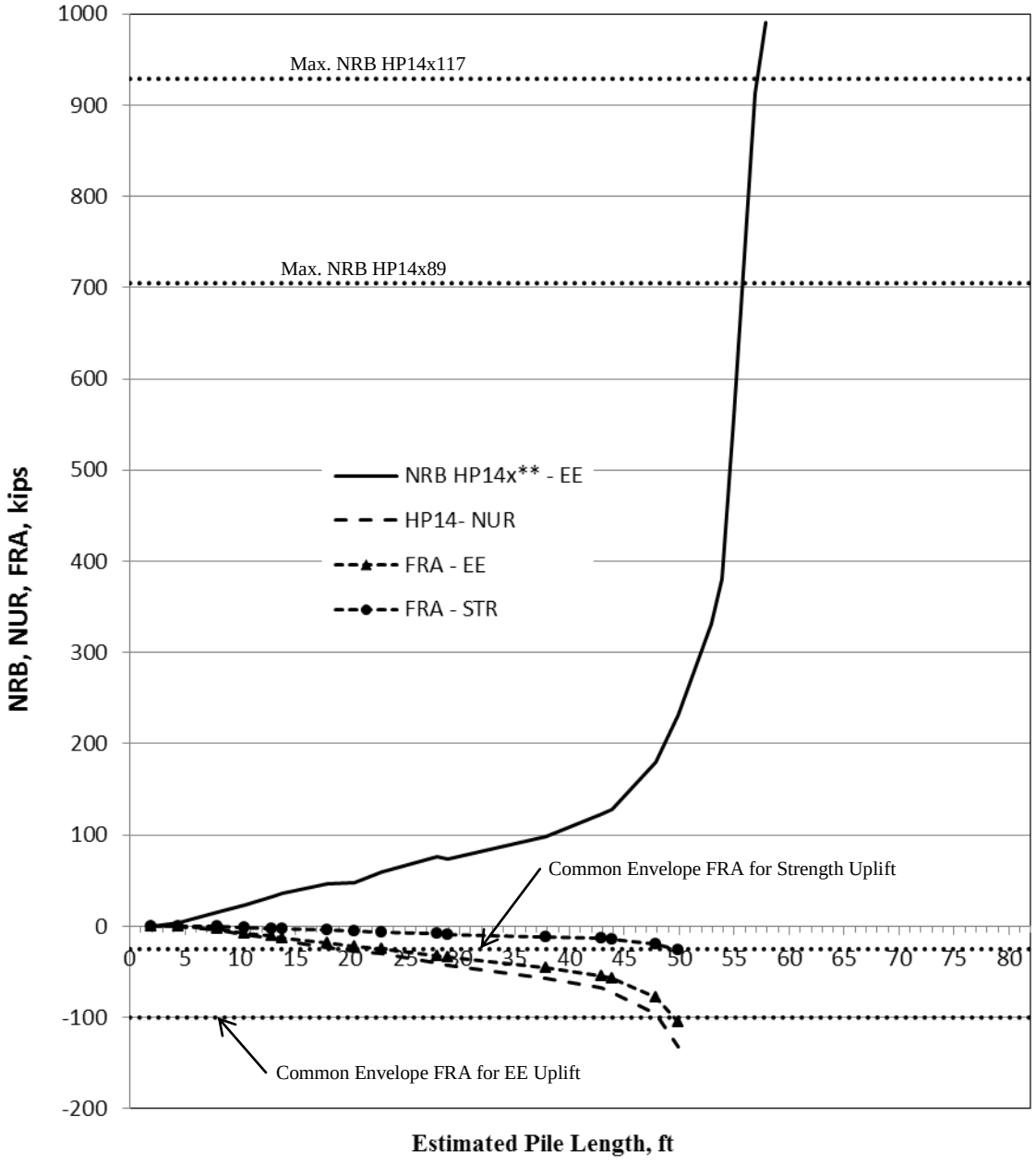
Pier 2 Nominal and Factored Resistances in Compression and Uplift versus Estimated Pile Length

** NRB for HP14x89 and HP14x117 accumulates at approximately the same rate.



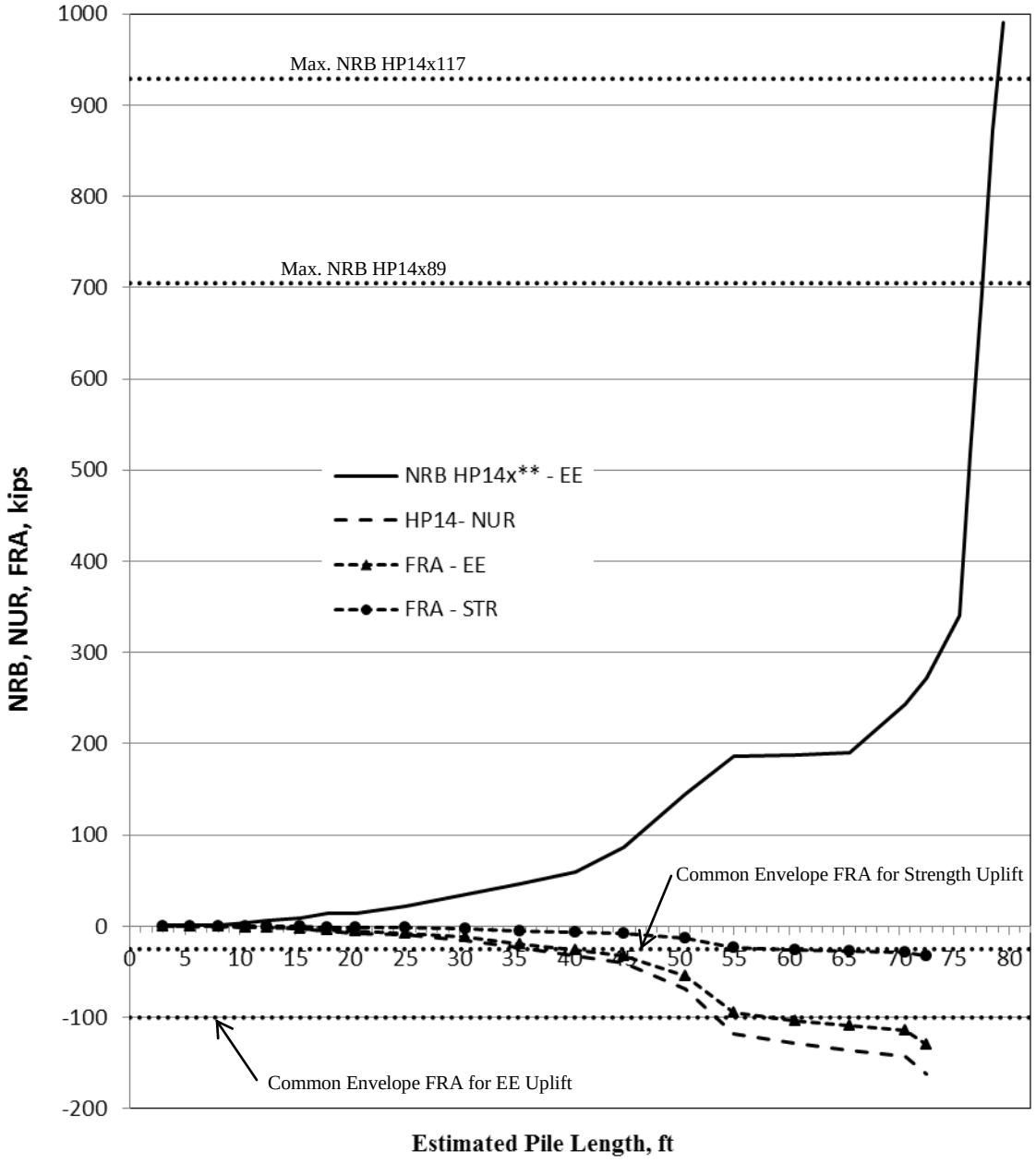
Pier 3 Nominal and Factored Resistances in Compression and Uplift versus Estimated Pile Length

** NRB for HP14x89 and HP14x117 accumulates at approximately the same rate.



Pier 4 Nominal and Factored Resistances in Compression and Uplift versus Estimated Pile Length

** NRB for HP14x89 and HP14x117 accumulates at approximately the same rate.



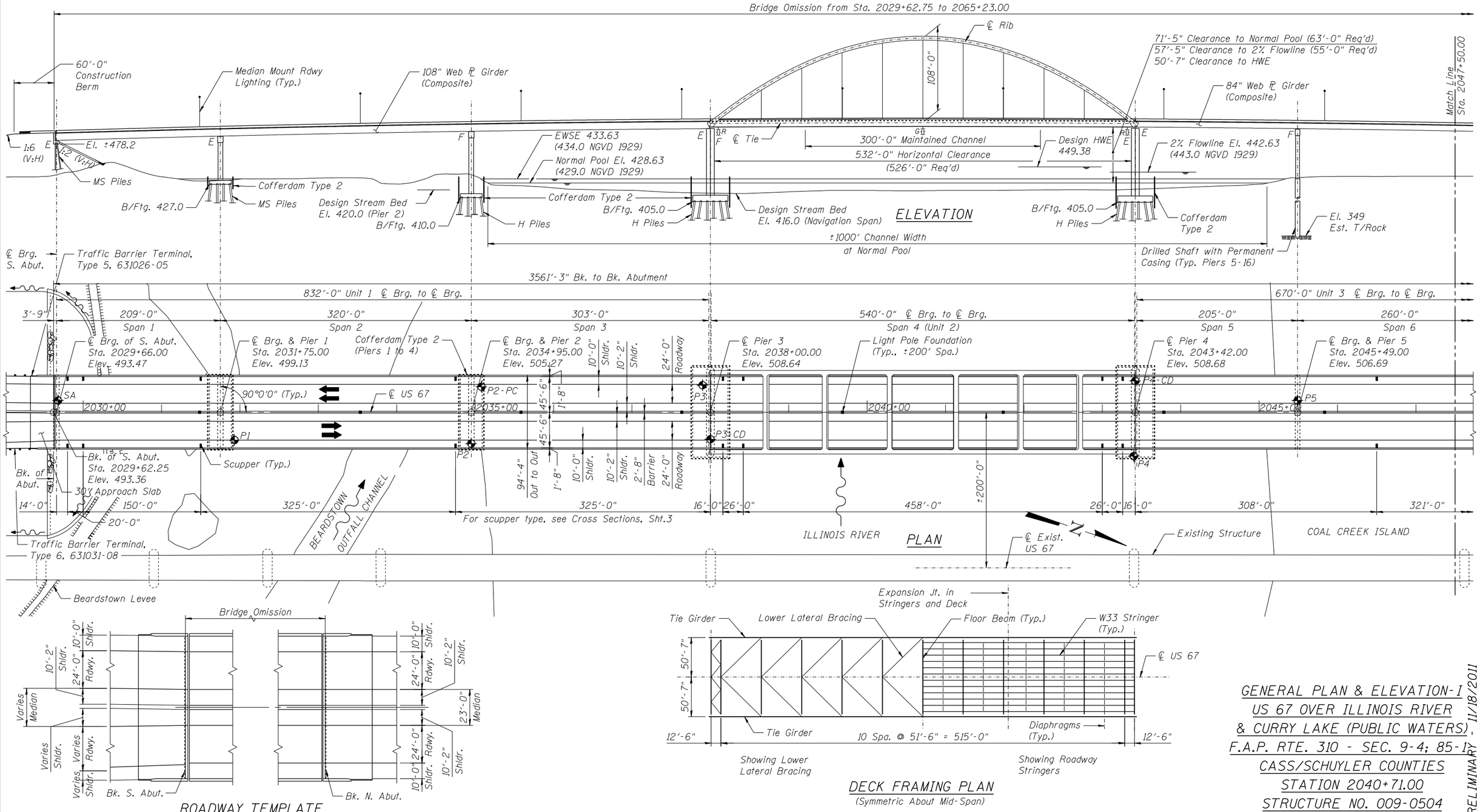
Pier 5 Nominal and Factored Resistances in Compression and Uplift versus Estimated Pile Length

** NRB for HP14x89 and HP14x117 accumulates at approximately the same rate.

Benchmark:
BM 3958 - Brass disk set in South end of SE. Abutment of Illinois River Bridge SN 009-0001 on US 67/IL 100 @ Beardstown @ Sta. 2028+55.6; Offset 215.7' Rt. NAVD 88 = 475.675 Ft.

Existing Structure: SN 009-0001 Truss & girder bridge 200' upstream. Constructed 1955.
To be removed after new structure is complete.
Traffic Control: None
No Salvage

Notes:
1. All Elevations are given in NAVD 1988 Datum unless noted. At Beardstown, NAVD 1988 = NGVD 1929 - 0.37'.
2. EWSE = Estimated Water Surface Elevation.
3. HWE = High Water Elevation.
4. For ground elevations see Sheet 3
5. ⌖ Denotes soil boring



ROADWAY TEMPLATE

DECK FRAMING PLAN
(Symmetric About Mid-Span)

GENERAL PLAN & ELEVATION-I
US 67 OVER ILLINOIS RIVER
& CURRY LAKE (PUBLIC WATERS)
F.A.P. RTE. 310 - SEC. 9-4; 85-1
CASS/SCHUYLER COUNTIES
STATION 2040+71.00
STRUCTURE NO. 009-0504

PRELIMINARY - 11/18/2011

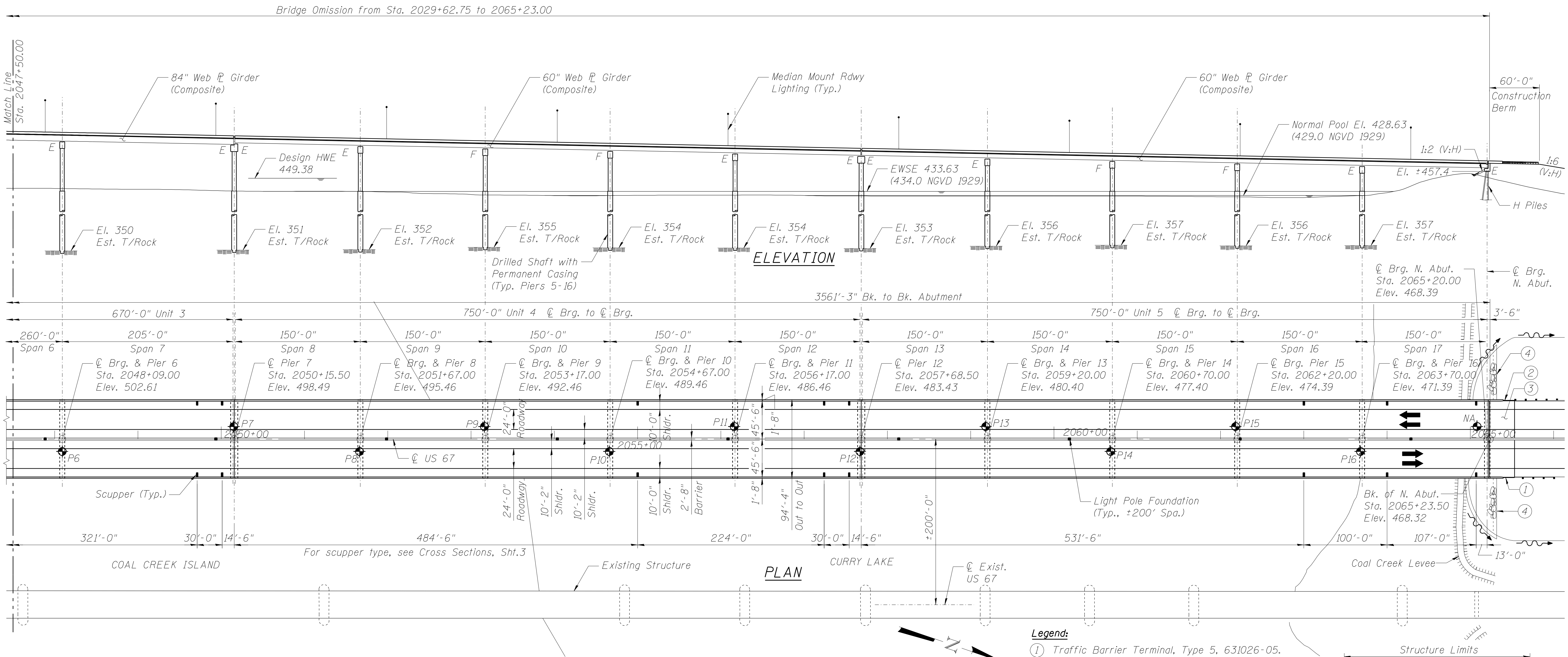
FILE NAME =	USER NAME =	DESIGNED - RSN	REVISED -
	DATE - >DATE	CHECKED - TCU	REVISED -
	PLOT SCALE =	DRAWN - MKD	REVISED -
TENG & ASSOCIATES, INC. ENGINEERS/ARCHITECTS/PLANNERS CHICAGO, ILLINOIS	PLOT DATE =	CHECKED - TCU	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 4 SHEETS

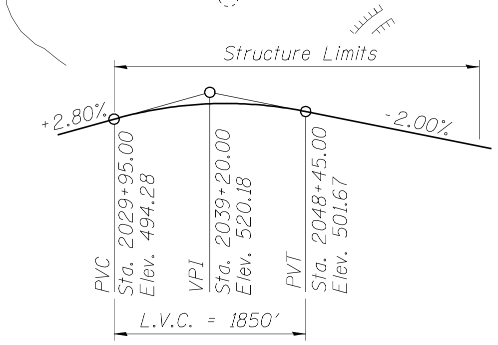
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
310	9-4; 85-1	CASS/SCHUYLER		
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

..\VA_991A001.DGN ..\VK580IA301.DGN ..\GP80IA302.DGN ..\BD991A002.DGN ..\VK580IA301.DGN ..\PL991A001.DGN ..\XP991A001.DGN ..\DP993I301.DGN
11-18-2011, 12:42:58 U:ETC \\FS-6044\VAH\VAUL_FJ-TRANS.07\2282\28265-00R\STRUCTURAL\CAD\SB TSL\IA TENG\SHEET\TLE80IA301.SHT



Legend:

1. Traffic Barrier Terminal, Type 5, 631026-05.
2. Traffic Barrier Terminal, Type 6, 631031-08.
3. 30' Approach Slab
4. Limits of Stone Riprap



PROFILE GRADE - US 67

DESIGN SCOUR ELEVATION TABLE

(Tr = 100 yr.)

Location	S. Abut.	Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	Pier 8
Scour Elev.	478.2	427.5	410.2	404.5	405.1	428.2	430.5	429.3	429.0

Location	Pier 9	Pier 10	Pier 11	Pier 12	Pier 13	Pier 14	Pier 15	Pier 16	N. Abut.
Scour Elev.	424.9	423.6	424.3	423.6	423.5	423.5	422.6	424.3	457.4

WATERWAY INFORMATION TABLE

Drainage Area= 24,277 sq. mi
Low Grade Elev. = 468.39 ft Sta. 2065+20.0
Max. Recorded H.W.E. = 449.13 ft

Flood	Frequency (yr.)	Discharge (cfs.)	Waterway Opening (sf)		Natural HWE	Created Head		Headwater Elevation	
			Existing	Proposed		Existing	Proposed	Existing	Proposed
	10	89,000	39,142	42,682	445.85	0.00	0.01	445.85	445.86
Design	50	112,000	51,361	54,602	449.38	0.00	0.00	449.38	449.38
Base	100	119,000	55,211	58,306	450.47	0.00	0.00	450.47	450.47
Max. Calc.	500	146,500	60,327	63,240	451.91	0.00	0.01	451.91	451.92

HIGHWAY CLASSIFICATION

US 67 (FAP 310)

Functional Class: Expressway
2-way ADT: 6,300 (2007)
12,500 (2030)
ADTT: 15%
1-way DHV: 625 (2030)
Design Speed: 70 mph
Posted Speed: 65 mph
Two-way traffic.
Directional Distribution: 50-50

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
fy = 60,000 psi (Reinf.)
fy = 50,000 psi (M270 Grade 50W)
fy = 70,000 psi (M270 Grade HPS 70W, Unit 2 tie girder, Unit 1 girder flanges)

DESIGN SPECIFICATION

AASHTO LRFD Bridge Design Specification 5th ed. 2010 with 2010 interim revisions

SEISMIC DATA

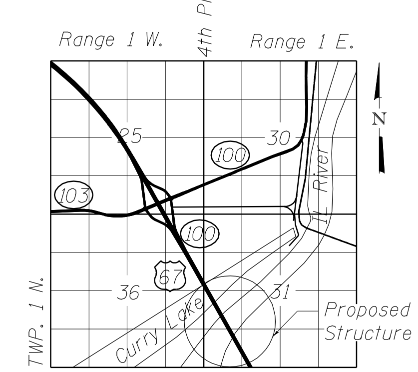
Seismic Performance Zone (SPZ) = 1
Spectral Acceleration at 1 Second (SD1) = 0.129
Spectral Acceleration at 0.2 Seconds (SDS) = 0.214
Soil Site Class = D

LOADING

Live: HL-93
Future Wear Surf: 50 psf

LIVE LOAD DEFLECTION LIMIT

Girder Units: Span/800
Arch Span: Span/800

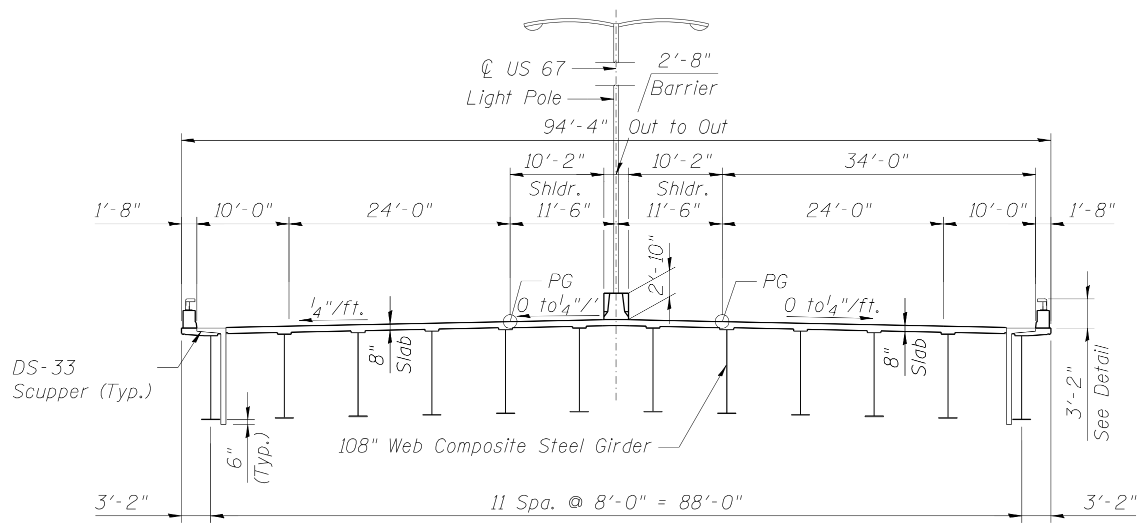


LOCATION SKETCH

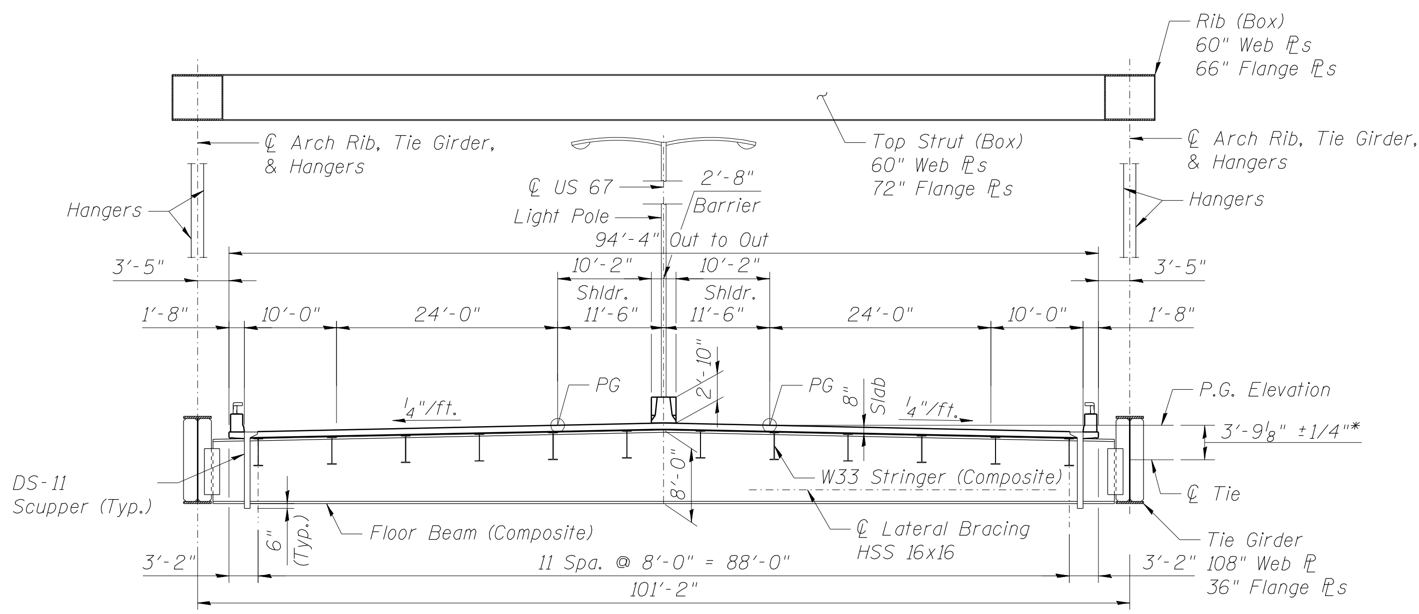
GENERAL PLAN & ELEVATION-II
US 67 OVER ILLINOIS RIVER
& CURRY LAKE (PUBLIC WATERS)
F.A.P. RTE. 310 - SEC. 9-4; 85-1R
CASS/SCHUYLER COUNTIES
STATION 2040+71.00
STRUCTURE NO. 009-0504

PRELIMINARY 11/18/2011

FILE NAME =	USER NAME =	DESIGNED - RSN	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	F.A.P. RTE. 310	SECTION 9-4; 85-1	COUNTY CASS/SCHUYLER	TOTAL SHEETS	SHEET NO.
TENG & ASSOCIATES, INC. ENGINEERS/ARCHITECTS/PLANNERS CHICAGO, ILLINOIS	DATE - >DATE	CHECKED - TCU	REVISED -				CONTRACT NO.		
	PLOT SCALE =	DRAWN - MKD	REVISED -						
	PLOT DATE =	CHECKED - TCU	REVISED -	SHEET NO. 2 OF 4 SHEETS			ILLINOIS FED. AID PROJECT		

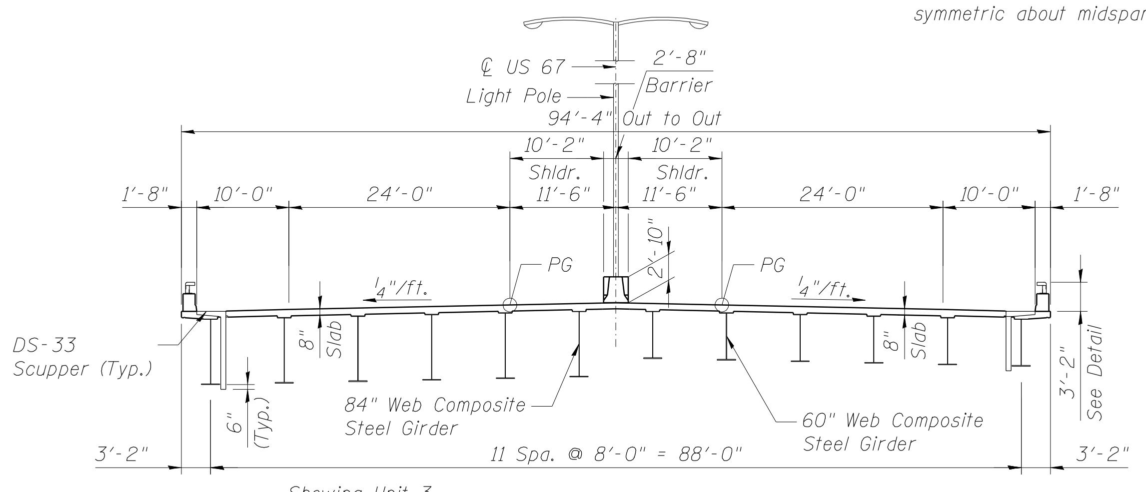


UNIT 1



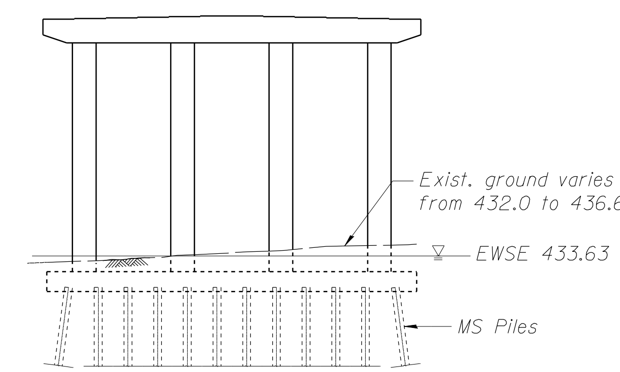
UNIT 2

* The 1/4" variation allows the steel arch structure to be symmetric about midspan.

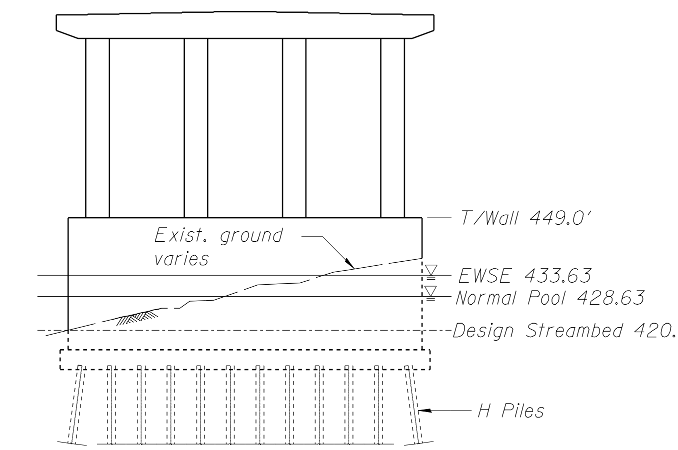


UNIT 3, 4 & 5

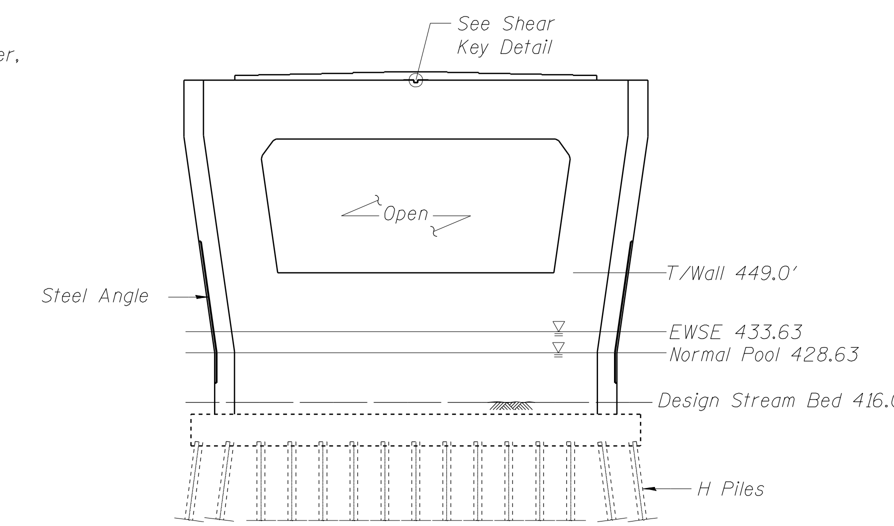
(Symmetric About ℄)



PIER 1

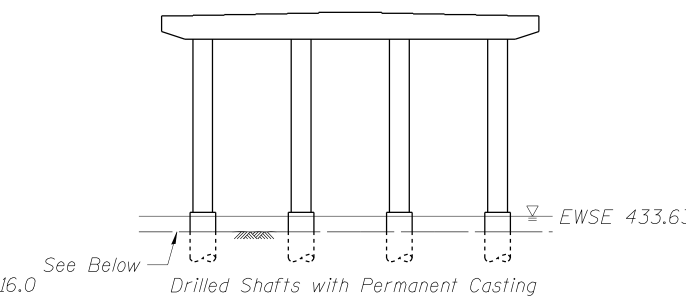


PIER 2



PIER 3 & 4

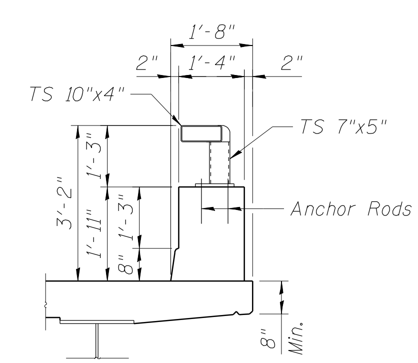
(Pier 4 shown, looking north)



PIERS 5 to 16

Pier	Ground El.	Pier	Ground El.
5	435.5	11	428.6
6	435.0	12	428.0
7	434.1	13	427.9
8	433.2	14	427.9
9	430.5	15	427.0
10	429.2	16	428.5

EWSE = Estimated Water Surface Elevation.



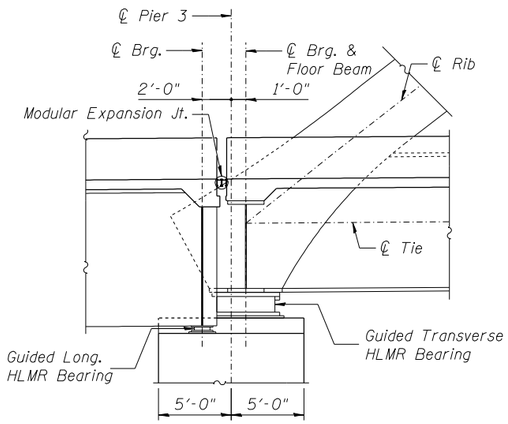
MN SINGLE RAIL PARAPET

(Test Level 4)

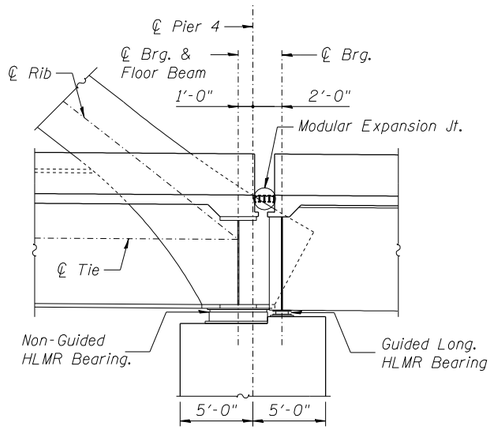
DETAILS - I
US 67 OVER ILLINOIS RIVER
& CURRY LAKE (PUBLIC WATERS)
F.A.P. RTE. 310 - SEC. 9-4; 85-1
CASS/SCHUYLER COUNTIES
STATION 2040+71.00
STRUCTURE NO. 009-0504

PRELIMINARY - 11/18/2011

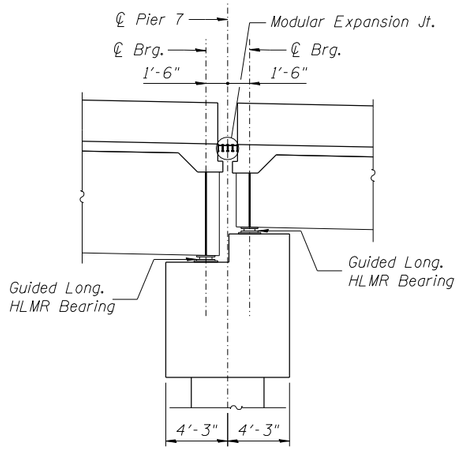
FILE NAME =	USER NAME =	DESIGNED - RSN	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	DATE - >DATE	CHECKED - TCU	REVISED -			310	9-4; 85-1	CASS/SCHUYLER		
TENG & ASSOCIATES, INC. ENGINEERS/ARCHITECTS/PLANNERS CHICAGO, ILLINOIS	PLOT SCALE =	DRAWN - MKD	REVISED -					CONTRACT NO.		
	PLOT DATE =	CHECKED - TCU	REVISED -		SHEET NO. 3 OF 4 SHEETS		ILLINOIS FED. AID PROJECT			



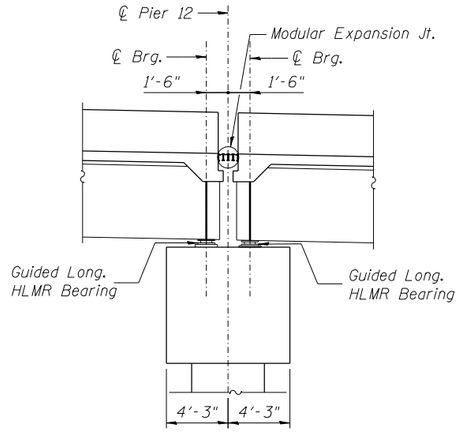
SECTION THROUGH EXPANSION JOINT
PIER 3



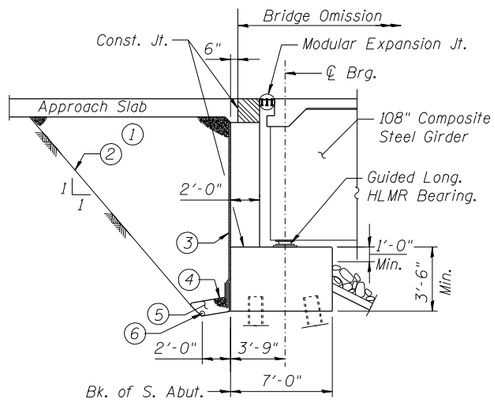
SECTION THROUGH EXPANSION JOINT
PIER 4



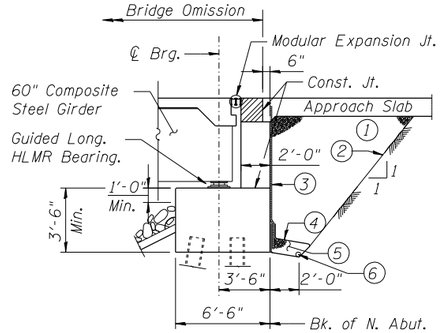
SECTION THROUGH EXPANSION JOINT
PIER 7



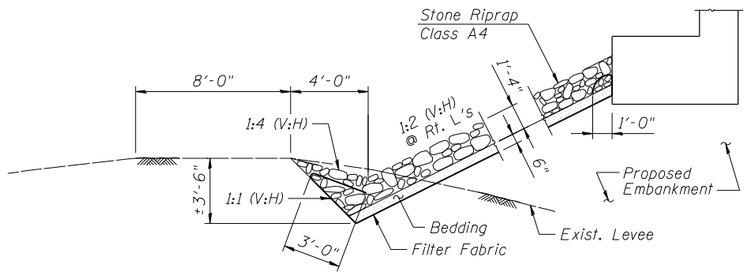
SECTION THROUGH EXPANSION JOINT
PIER 12



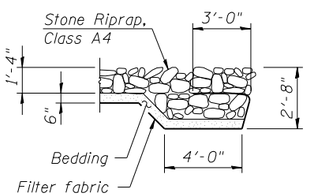
SECTION THROUGH PILE SUPPORTED
SOUTH ABUTMENT



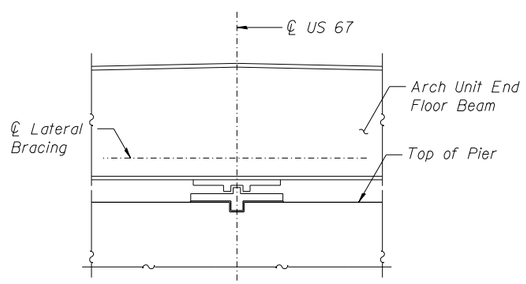
SECTION THROUGH PILE SUPPORTED
NORTH ABUTMENT



TYPICAL SECTION THRU SLOPEWALL



FLANK STONE RIPRAP DETAIL



SHEAR KEY DETAIL

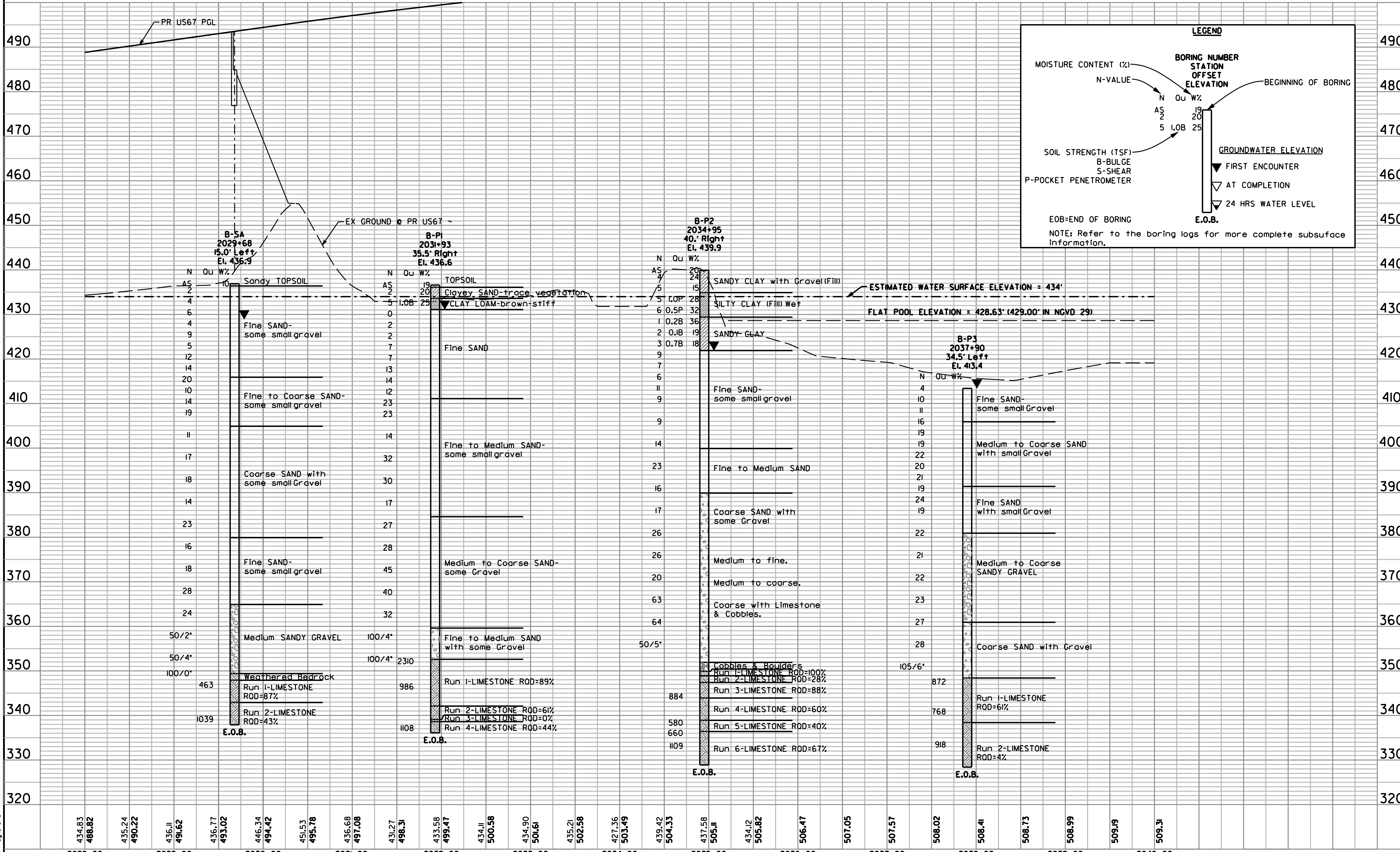
① Backfill with Porous Granular Embankment (Special)
② Excavation for Placing Granular Embankment (Special) is paid for as Structure Excavation.
③ Geocomposite Wall Drain
④ Geotechnical Fabric for French Drains
⑤ Drainage Aggregate
⑥ 4" ϕ Perforated Pipe Drain

DETAILS - II
US 67 OVER ILLINOIS RIVER & CURRY LAKE (PUBLIC WATERS)
F.A.P. RTE. 310 - SEC. 9-4; 85-1
CASS/SCHUYLER COUNTIES
STATION 2040+71.00
STRUCTURE NO. 009-0504

PRELIMINARY - 11/18/2011

FILE NAME =	USER NAME =	DESIGNED - RSN	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION			
	DATE - >DATE	CHECKED - TCU	REVISED -				
TENG & ASSOCIATES, INC. ENGINEERS/ARCHITECTS/PLANNERS CHICAGO, ILLINOIS	PLOT SCALE =	DRAWN - MKD	REVISED -		SHEET NO. 4 OF 4 SHEETS		
	PLOT DATE =	CHECKED - TCU	REVISED -				

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
310	9-4; 85-1	CASS/SCHUYLER		
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		



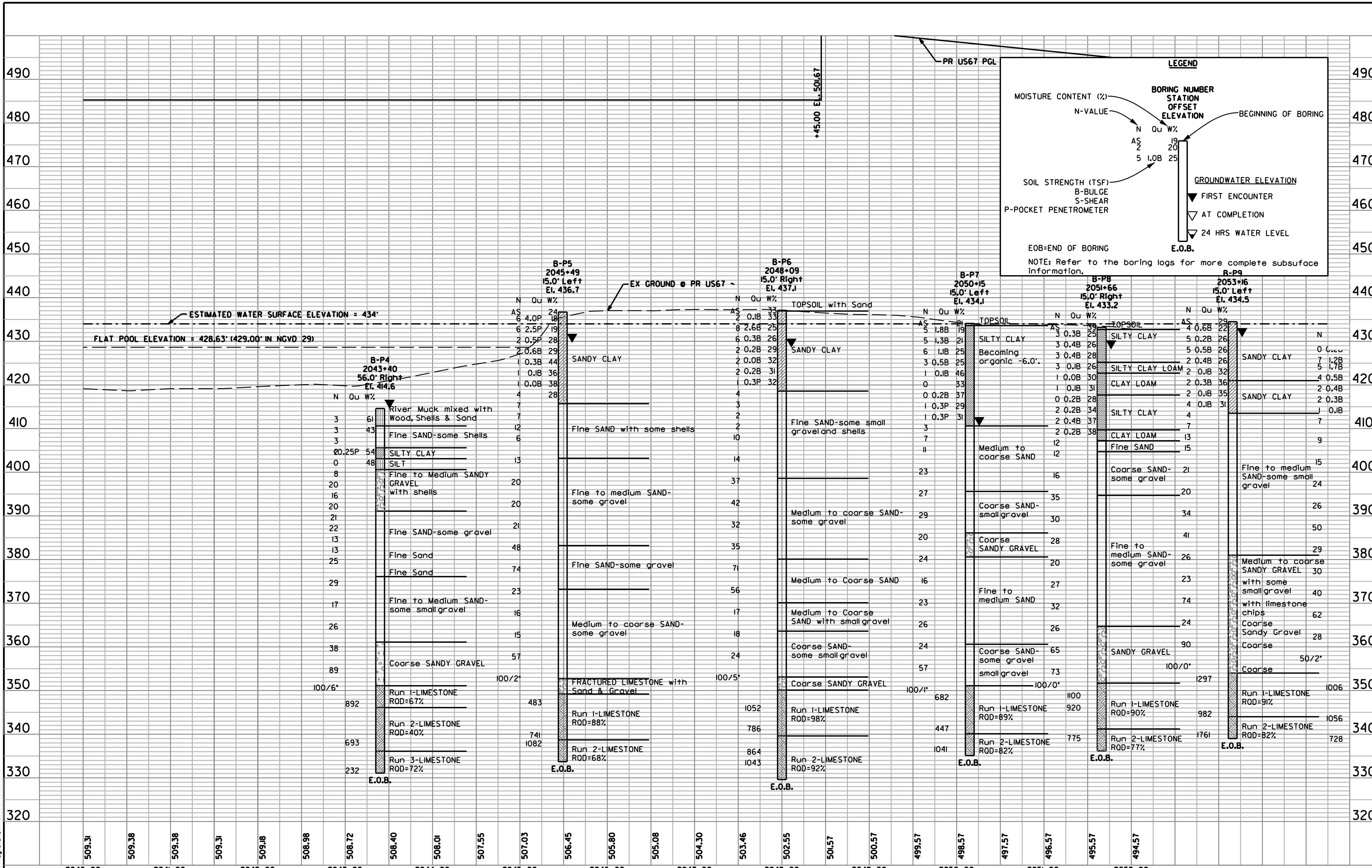
FILE NAME =	USER NAME =	DESIGNED - RWC	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
$FILEL$		DRAWN - RWC	REVISED -	FAP ROUTE 310 / US ROUTE 67
Geo Services, Inc.	PLOT SCALE =	CHECKED - AJP	REVISED -	
	PLOT DATE =	DATE - 7/14/2010	REVISED -	

FAP ROUTE 310 / US ROUTE 67
SN 009-0504 SUBSURFACE PROFILE

SCALE: HORIZ. 1"=50' VERT. 1"=10' STA. 2028+00 TO STA. 2040+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
310	9-4; 85-1	CASS & SCHUYLER	3	1
		CONTRACT NO. 99		

FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT



FILE NAME =	USER NAME =	DESIGNED - RWC	REVISED -
$FILEL$		DRAWN - RWC	REVISED -
Geo Services, Inc.	PLOT SCALE =	CHECKED - AJP	REVISED -
	PLOT DATE =	DATE - 7/14/2010	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
FAP ROUTE 310 / US ROUTE 67

FAP ROUTE 310 / US ROUTE 67
SN 009-0504 SUBSURFACE PROFILE

SCALE: HORIZ. 1"=50' VERT. 1"=10' STA. 2040+00 TO STA. 2052+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
310	9-4; 85-1	CASS & SCHUYLER	3	
		CONTRACT NO. 99		

FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT

LEGEND

MOISTURE CONTENT (%)
N-VALUE
BORING NUMBER
STATION
OFFSET
ELEVATION
BEGINNING OF BORING
SOIL STRENGTH (TSF)
B-BULGE
S-SHEAR
P-POCKET PENETROMETER
GROUNDWATER ELEVATION
FIRST ENCOUNTER
AT COMPLETION
24 HRS WATER LEVEL
EOB=END OF BORING
E.O.B.

NOTE: Refer to the boring logs for more complete subsuface information.

PR US67 PGL

EX GROUND @ PR US67

ESTIMATED WATER SURFACE ELEVATION = 434'
LAKE WATER LEVEL (VARIES)

B-P9
2053+16
15.0' Left
El. 434.5

N Qu W%
AS 29
4 0.6B 22
5 0.2B 26
5 0.5B 26
2 0.4B 26
2 0.1B 32
2 0.3B 36
2 0.1B 35
4 0.1B 31
4
7
13
15
21
20
34
41
26
23
74
24
90
100/0"
1297
982
1761

SANDY CLAY
SANDY CLAY
Fine to medium SAND-some small gravel
Medium to coarse SANDY GRAVEL with some small gravel with limestone chips
Coarse Sandy Gravel
Coarse
Coarse
Run 1-LIMESTONE RQD=91%
Run 2-LIMESTONE RQD=82%
1006
1056
728
E.O.B.

B-P10
2054+66
40.0' Right
El. 429.3

N Qu W%
0 0.2B 38
7 1.2B 26
5 1.7B 26
4 0.5B 27
2 0.4B 34
2 0.3B 34
1 0.1B 29
7
9
15
24
26
50
29
30
40
62
28
50/2"
337
467
1108
1003
E.O.B.

SILTY CLAY
becoming very silty & sandy
Fine to Medium SAND
Medium to Coarse SAND with Gravel
Fine to Medium SAND with Gravel
Medium to Coarse SAND with Gravel
SANDY GRAVEL
Run 1-LIMESTONE RQD=90%
Run 2-LIMESTONE RQD=83%

B-P11
2056+16
15.0' Left
El. 430.7

N Qu W%
0 65
3 0.6B 23
5 0.9B 21
5 0.9B 24
3 0.4B 28
2 0.4B 26
2 0.3B 29
2 0.7B 32
2
9
35
53
34
21
17
27
71
50/5"
50/4"
912
460
971
799
E.O.B.

CLAY LOAM
Medium to Coarse SAND with Gravel
Fine to Medium SAND with Gravel
SANDY GRAVEL
Run 1-LIMESTONE RQD=83%
Run 2-LIMESTONE RQD=52%

B-P12
2057+67
15.0' Right
El. 429.1

N Qu W%
2 26
2 0.4B 31
2 0.1B 29
4 0.8B 31
1 0.2B 34
1 0.1B 26
5 0.1B 32
4 0.1B 33
9
16
25
55
16
24
32
15
38
17
57
826
404
785
1025
E.O.B.

SILTY CLAY
Fine to Medium SAND with some small Gravel
Medium to Coarse SAND with Gravel
Run 1-LIMESTONE RQD=82%
Run 2-LIMESTONE RQD=91%

B-P13
2059+18
15.0' Left
El. 429.4

N Qu W%
0 0.0P 33
5 0.4B 32
6 1.2B 27
6 0.2B 34
5 0.9B 37
6 0.9B 32
7
15
25
29
36
20
22
18
25
41
20
65
1145
1078
435
E.O.B.

SILTY CLAY
Clayey SAND
Fine to Medium SAND
Medium to Coarse SAND with small Gravel
Fine to Medium Sand with small Gravel
Coarse SAND with small Gravel
Run 1-LIMESTONE RQD=83%
Run 2-LIMESTONE RQD=81%

B-P14
2060+68
30.0' Right
El. 430.4

N Qu W%
4 0.9B 27
7 1.4B 28
4 1.1B 27
7 1.3B 28
7 1.4B 31
8 1.9B 28
11
14
27
19
18
32
19
29
19
84
67
857
708
1121
E.O.B.

SILTY CLAY
Fine to Medium Coarse SAND with Gravel
Medium to Coarse SAND with Gravel
Run 1-LIMESTONE RQD=87%

B-P15
2062+18
15.0' Left
El. 430.2

N Qu W%
0 0.4B 32
2 0.3B 30
3 0.4B 29
5 1.1B 31
7 1.7B 26
12
14
12
27
30
30
21
20
26
33
25
22
50/6"
687
1037
779
643
E.O.B.

SILTY CLAY
Fine to Medium Sand
Medium To Coarse SAND with Gravel
Fine to Medium SAND with small Gravel
SANDY GRAVEL
Run 1-LIMESTONE RQD=88%

B-P16
2063+68
15.0' Right
El. 429.6

N Qu W%
20 1.8B 25
22 3.5B 25
10 1.6B 25
6 1.3B 25
5 0.4B 30
4 0.9B 32
9 1.6B 27
22
24
30
35
30
33
32
32
22
57
50/3"
802
50/1"
953
435
761
E.O.B.

SILTY CLAY
Fine to Medium SAND with some small Gravel
Coarse SAND with some Gravel
with Limestone
Medium to Coarse SAND with some Gravel
Fine to Medium SAND with some small Gravel
SANDY GRAVEL
Run 1-LIMESTONE RQD=91%
Run 2-LIMESTONE RQD=88%

B-NA
2065+68
15.0' Left
El. 455.0

N Qu W%
AS 28
12 4.5P 16
12 2.5B 19
13 2.3B 22
11 1.75B 22
9 1.5B 21
12 2.1B 27
12 2.0B 25
11 1.4B 25
10 1.4B 28
9 1.8B 28
20 2.3B 24
17 3.3B 24
6 0.8B 30
70.25B 28
E.O.B.

TOPSOIL
SILTY CLAY (FILL)
SILTY CLAY (Wet)
Medium to coarse SAND
Fine to Medium SAND
GRAVEL
Run 1-LIMESTONE RQD=88%
Run 2-LIMESTONE RQD=87%

494.57 493.57 492.57 491.57 490.57 489.57 488.57 487.57 486.57 485.57 484.57 483.57 482.57 481.57 480.56 479.56 478.56 477.56 476.56 475.56 474.56 473.56 472.56 444.13 471.56 431.92 470.56 447.21 469.56 454.94 468.56 443.35 467.56 432.81 466.56

2052+00 2053+00 2054+00 2055+00 2056+00 2057+00 2058+00 2059+00 2060+00 2061+00 2062+00 2063+00 2064+00 2065+00 2066+00

490 480 470 460 450 440 430 420 410 400 390 380 370 360 350 340 330 320

PLAN
SURVEYED
PLOTTED
HORIZ. CHECKED
R/T. OF WAY CHECKED
CADD FILE NAME
NOTE BOOK
NO.
BY
DATE

PROFILE
SURVEYED
PLOTTED
VERT. CHECKED
BM. NOTED
STRUCTURE NO.
NOTE BOOK
NO.
BY
DATE

FILE NAME = $FILEL$
USER NAME = $user$
PLOT SCALE = $data.time$
PLOT DATE = $date$
dgn_name

Geo Services, Inc.
Consulting Environmental Engineering
805 Kenilworth Court Suite 208
Naperville, Illinois 60563
(630) 355-2020

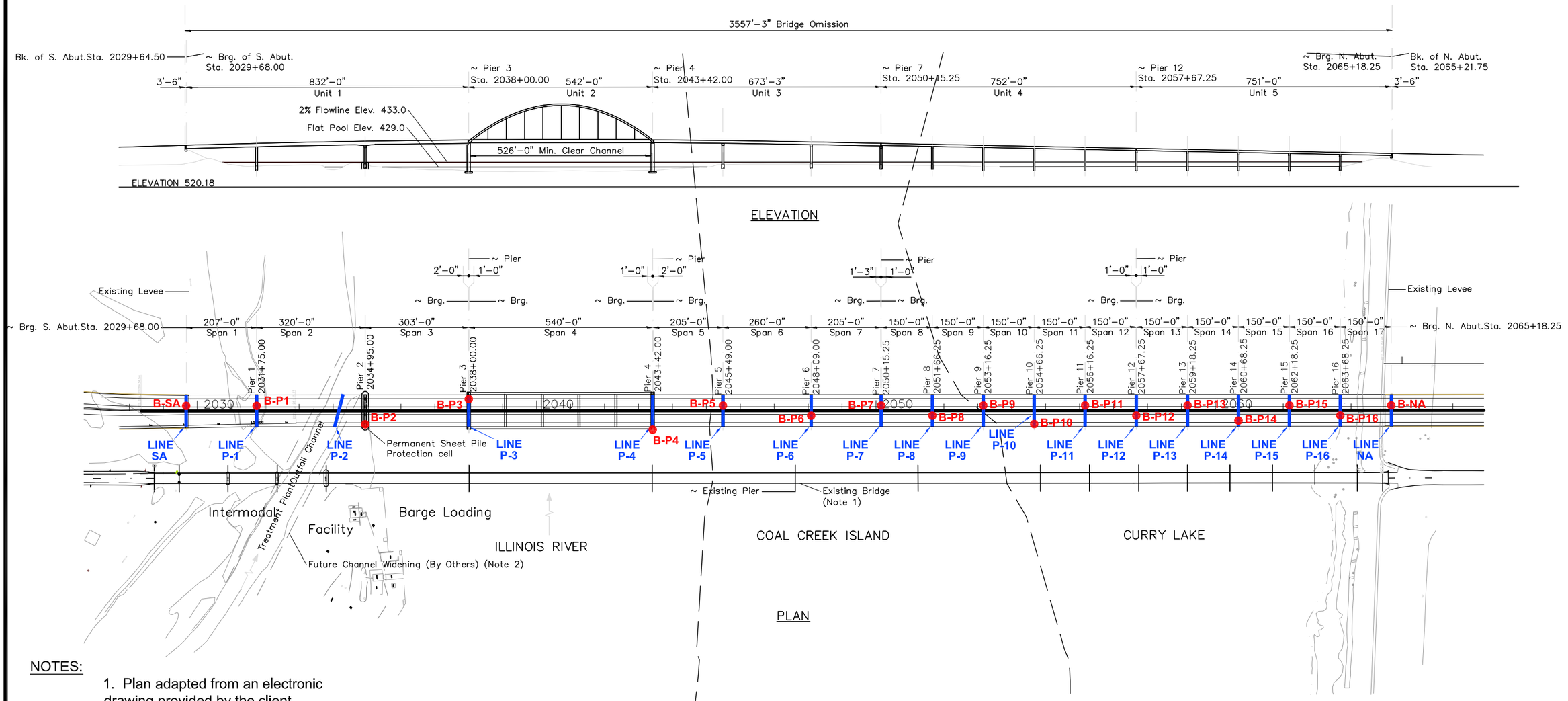
DESIGNED - RWC REVISED -
DRAWN - RWC REVISED -
CHECKED - AJP REVISED -
DATE - 7/14/2010 REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
FAP ROUTE 310 / US ROUTE 67

FAP ROUTE 310 / US ROUTE 67
SN 009-0504 SUBSURFACE PROFILE

SCALE: HORIZ. 1"=50' VERT. 1"=10' STA. 2052+00 TO STA. 2066+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
310	9-4; 85-1	CASS & SCHUYLER	3	>p20#
		CONTRACT NO. 99		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		



NOTES:

1. Plan adapted from an electronic drawing provided by the client.

2. Survey lines were located in the field with reference to survey stakes provided by others.

3. Boring locations are shown based on data provided by the client.

LEGEND:

Boring Location

Geophysical Survey Line

0 300 600

SCALE IN FEET

Drawn By: SLC	Ck'd By: GLA	App'vd By: DWL
Date: 08-17-10	Date: 08-18-10	Date: 08-19-10

GEOTECHNOLOGY INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
ST. LOUIS • COLLINSVILLE • KANSAS CITY

Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

PLAN OF SITE AND SURVEY LINE LOCATIONS

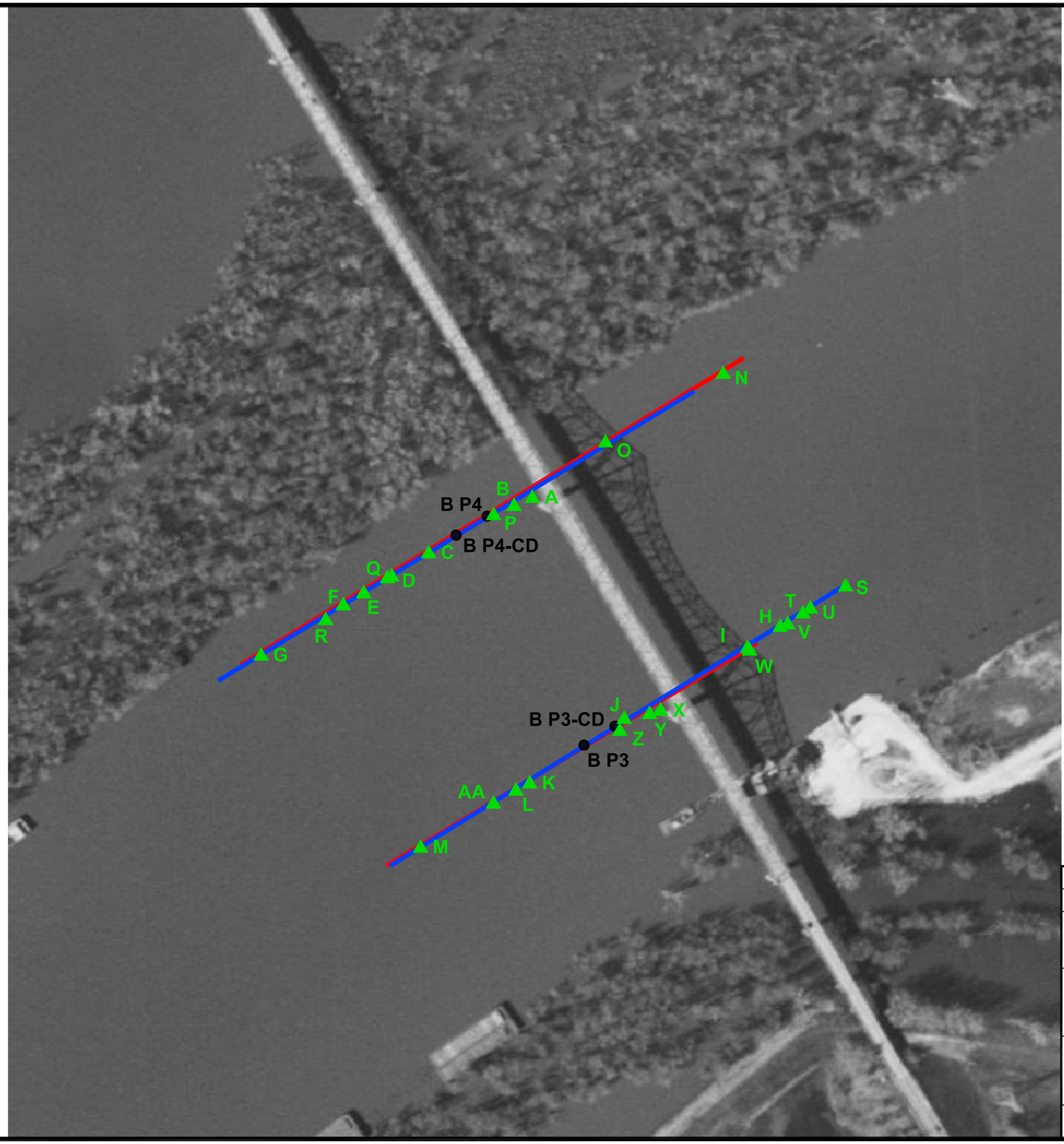
Project Number 1090201.95TS

PLATE 2

IL River Survey Anomalies

Feature	North	East
A	1219745	2217921
B	1219728	2217880
C	1219630	2217689
D	1219582	2217606
E	1219547	2217543
F	1219522	2217497
G	1219416	2217312
H	1219444	2218458
I	1219399	2218384
J	1219252	2218108
K	1219116	2217895
L	1219101	2217864
M	1218982	2217650
N	1220005	2218350
O	1219862	2218086
P	1219710	2217835
Q	1219578	2217596
R	1219490	2217457
S	1219542	2218622
T	1219471	2218509
U	1219482	2218526
V	1219448	2218475
W	1219393	2218389
X	1219267	2218188
Y	1219261	2218164
Z	1219226	2218097
AA	1219074	2217814
Boring P3	1219193	2218017
Boring P3-CD	1219232	2218087
Boring P4	1219704	2217820
Boring P4-CD	1219665	2217750

Coordinate System:
State Plane IL West
Nad83



NOTES

1. Plan adapted from an aerial photograph courtesy of U.S.G.S.

2. Refer to Plates 4 and 5 for profiles.

LEGEND

- Boring Location
- Approximate Anomaly Location
- Sub-bottom Profile
- Reflection Line

N

0 250 500

SCALE IN FEET

Drawn By: SLC	Ck'd By: GLA	App'vd By: DWL
Date: 08-17-10	Date: 08-18-10	Date: 08-19-10

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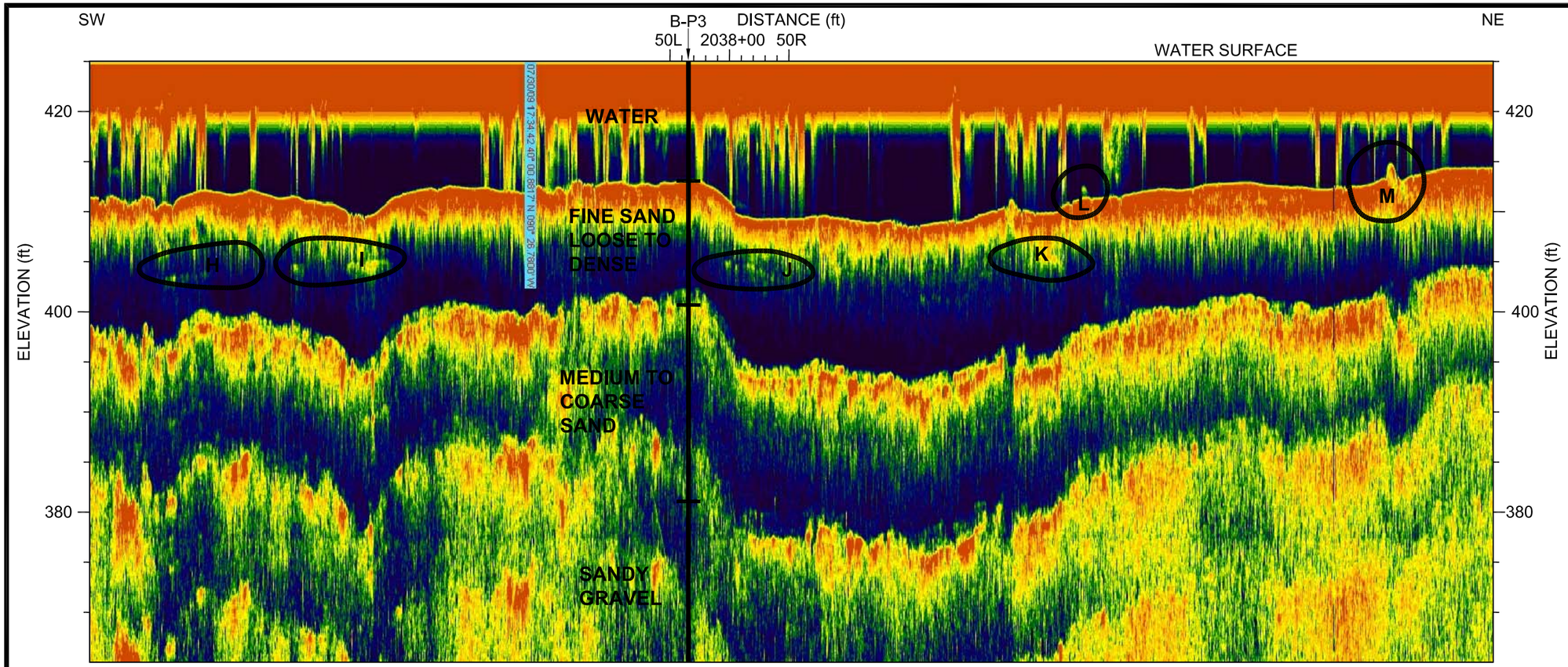
ENGINEERING AND ENVIRONMENTAL SERVICES
ST. LOUIS • COLLINSVILLE • KANSAS CITY

Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

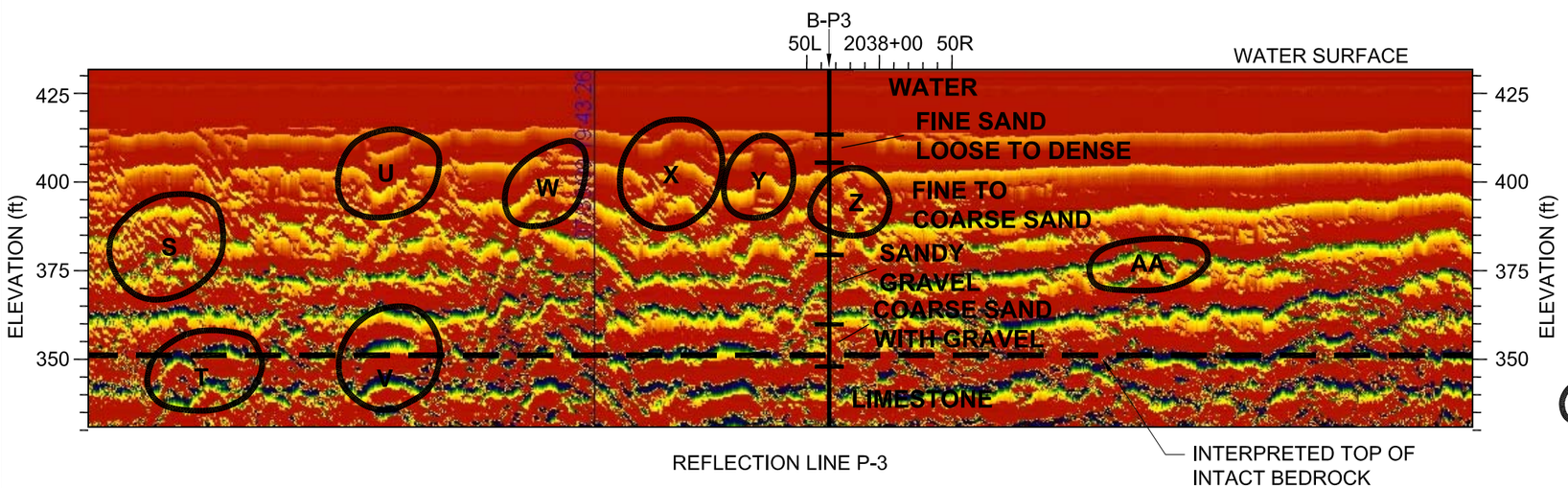
ILLINOIS RIVER
SURVEY LINE AND
ANOMALY LOCATIONS

Project Number
1090201.95TS

PLATE 3



SUB-BOTTOM PROFILE P-3



REFLECTION LINE P-3

NOTES:

1. Geophysical survey lines were oriented southwest to northeast and aligned over the pier locations.
2. The interpreted top of intact bedrock elevation shown on the profiles may not correspond to the top of rock elevation shown on the bridge plans. Refer to Structure Geotechnical Report for additional information.
3. Boring locations and log data provided by others.

LEGEND:

H — Anomaly (possible debris)

(see Plate 3 for locations)

SCALE IN FEET
Horizontal 1" = 100'

Drawn: SLC
Checked: GLA
Approved: DWL
Date:08-19-10

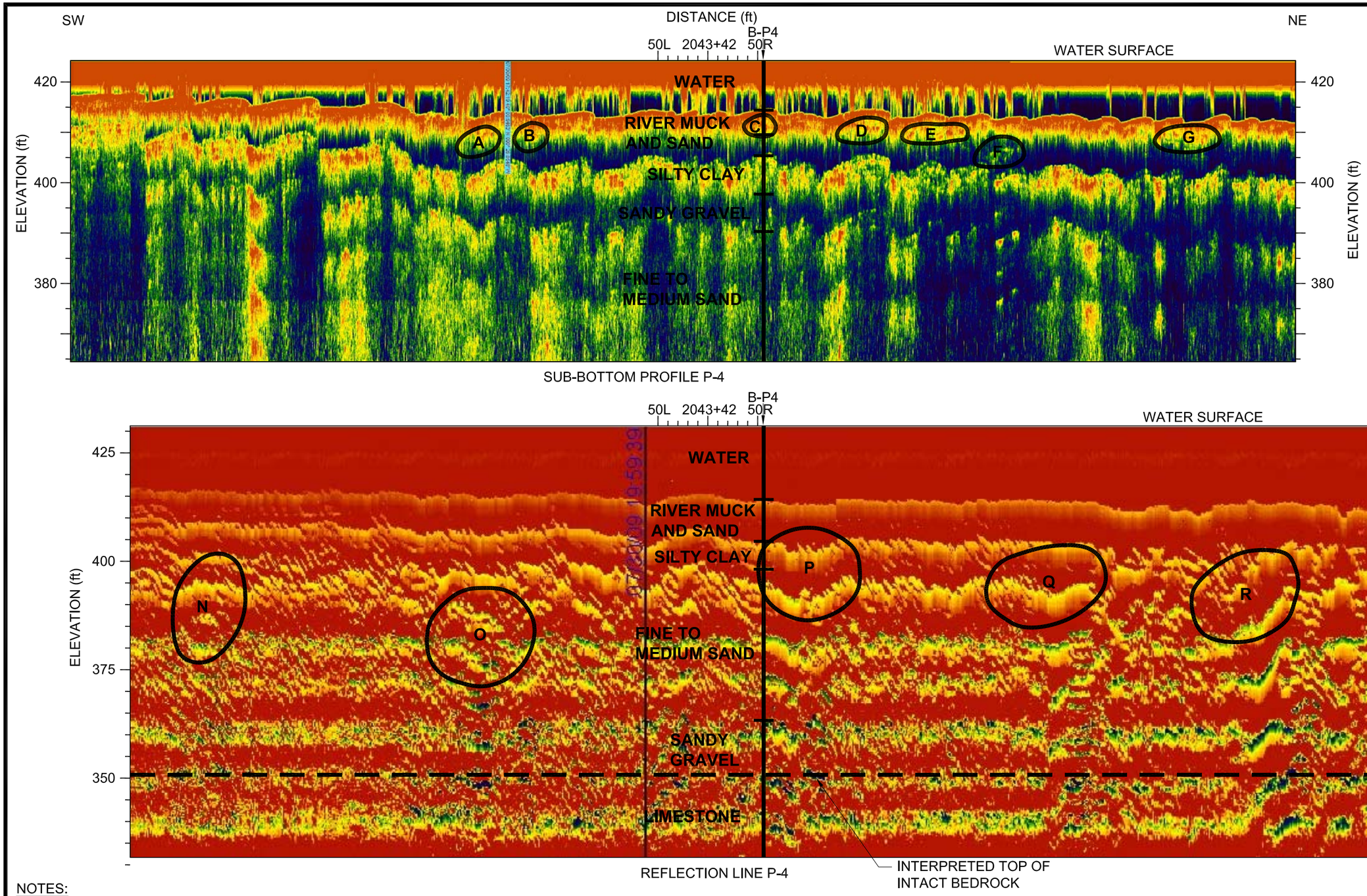
GEOTECHNOLOGY INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
ST. LOUIS • COLLINSVILLE • KANSAS CITY

Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

ILLINOIS RIVER SURVEY
LINE P-3

Project Number
1090201.95TS

PLATE 4



NOTES:

1. Geophysical survey lines were oriented southwest to northeast and aligned over the pier locations.
2. The interpreted top of intact bedrock elevation shown on the profiles may not correspond to the top of rock elevation shown on the bridge plans. Refer to Structure Geotechnical Report for additional information.
3. Boring locations and log data provided by others.

LEGEND:

A — Anomaly (possible debris)

(see Plate 3 for locations)

SCALE IN FEET
Horizontal 1" = 100'

Drawn: SLC | Checked: GLA | Approved: DWL | Date: 08-19-10

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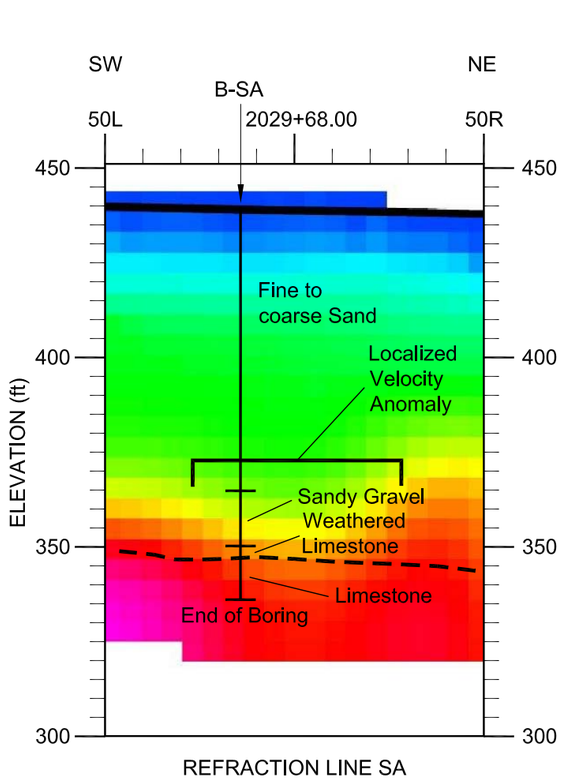
ST. LOUIS • COLLINSVILLE • KANSAS CITY

Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

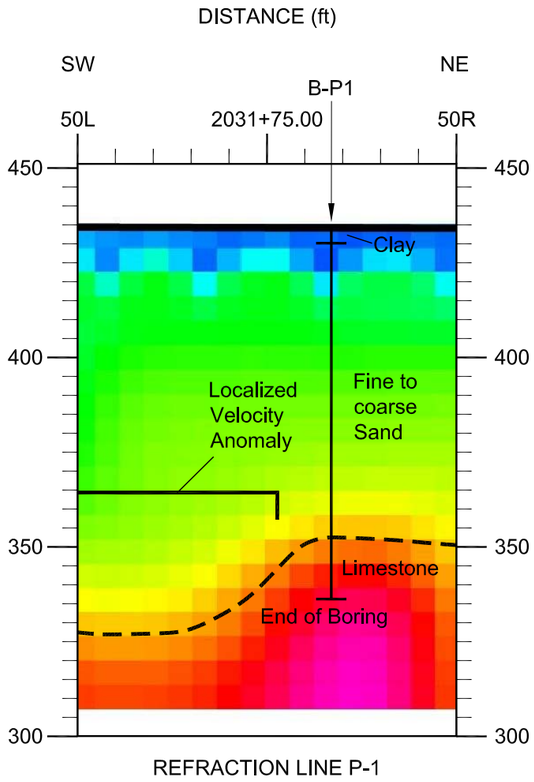
ILLINOIS RIVER SURVEY
LINE P-4

Project Number
1090201.95TS

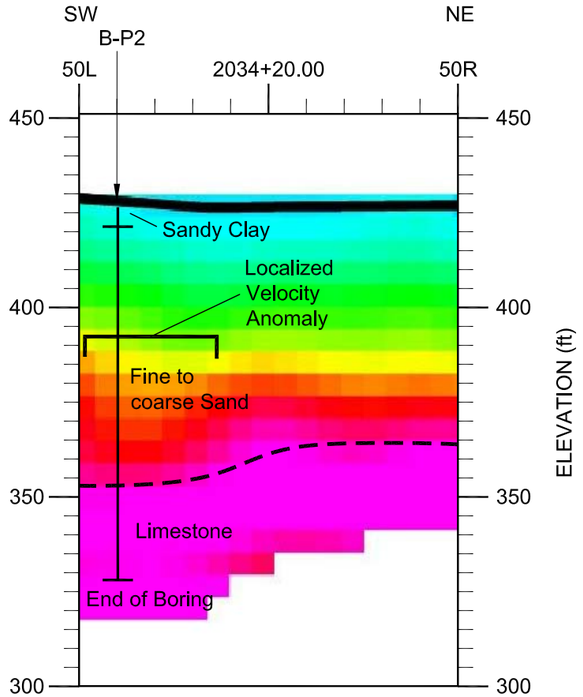
PLATE 5



REFRACTION LINE SA



REFRACTION LINE P-1



REFRACTION LINE P-2

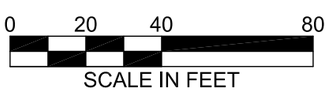
NOTES:

1. Geophysical survey lines were centered on pier centerline stakes.
2. Refraction Line P-2 was located approximately 75 feet southeast of Pier 2 (and Boring P-2) due to surface obstructions. See Plate 2 for actual location.
3. The interpreted top of intact bedrock elevation shown in the profiles may not correspond to the top of rock elevation shown on the bridge plans. Refer to Structure Geotechnical Report for additional information.
4. Lithology information was copied from boring logs and top of intact bedrock was interpreted from geophysical data.
5. Boring locations and log data provided by others.

COMPRESSIONAL WAVE VELOCITY (fps)

LEGEND:

- Interpreted Top of Intact Bedrock
- Surveyed Ground Surface



SCALE IN FEET

Drawn By: SLC	Ck'd By: GLA	App'vd By: DWL
Date: 08-17-10	Date: 08-18-10	Date: 08-19-10

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Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

SOUTHEAST LEVEE TO RIVER BANK
LINES SA, P-1 AND P-2

Project Number
1090201.95TS

PLATE 6

DISTANCE (ft)

SW B-P5 2045+49.00 NE
50L 50R

SW B-P6 2048+09.00 NE
50L 50R

SW B-P7 2050+15.25 NE
50L 50R

SW B-P8 2051+66.25 NE
50L 50R

SW B-P9 2053+16.25 NE
50L 50R

ELEVATION (ft)

450
400
350
300

Sandy Clay
Localized Velocity Anomaly
Fine Sand w/ some Gravel
Medium to coarse Sand w/ some Gravel
Fractured Limestone
Limestone
End of Boring

Sandy Clay
Fine Sand w/ some Gravel
Medium to coarse Sand w/ some Gravel
Coarse Sand Sandy Gravel
Limestone
End of Boring

Sandy Clay
Localized Velocity Anomaly
Fine to coarse Sand
Coarse Sand w/ some Gravel
Limestone
End of Boring

Silty Clay
Fine to coarse Sand
Localized Velocity Anomaly
Limestone
End of Boring

Sandy Clay
Localized Velocity Anomaly
Fine to medium Sand
Sandy Gravel (coarse)
Limestone
End of Boring

REFRACTION LINE P-5 | REFRACTION LINE P-6 | REFRACTION LINE P-7 | REFRACTION LINE P-8 | REFRACTION LINE P-9

NOTES:

1. Geophysical survey lines were centered on pier centerline stakes.
2. The interpreted top of intact bedrock elevation shown in the profiles may not correspond to the top of rock elevation shown on the bridge plans. Refer to Structure Geotechnical Report for additional information.
3. Lithology information was copied from boring logs and top of intact bedrock was interpreted from geophysical data.
4. Boring locations and log data provided by others.

0 5000 10000 15000

COMPRESSIONAL WAVE VELOCITY (fps)

LEGEND:

Interpreted Top of Intact Bedrock

Surveyed Ground Surface

0 20 40 80

SCALE IN FEET

Drawn By: SLC	Ck'd By: GLA	App'vd By: DWL
Date: 08-17-10	Date: 08-18-10	Date: 08-19-10

GEOTECHNOLOGY INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
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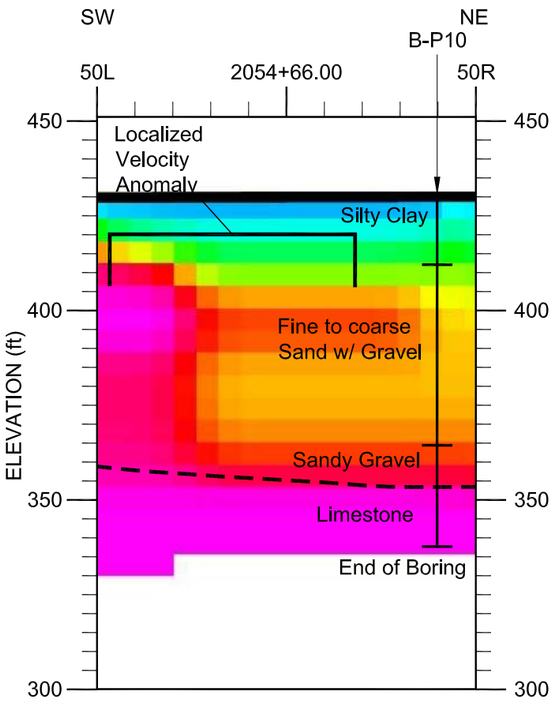
Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

SOUTHEAST LEVEE TO RIVER BANK
LINES P-5 THROUGH P-9

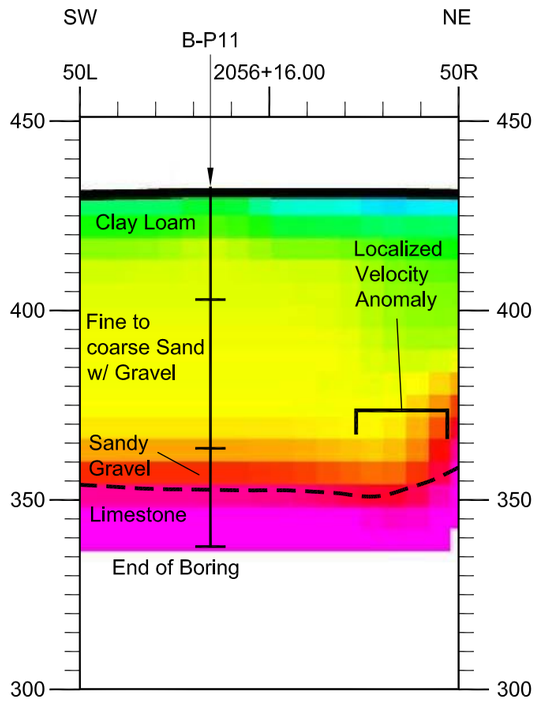
Project Number
1090201.95TS

PLATE 7

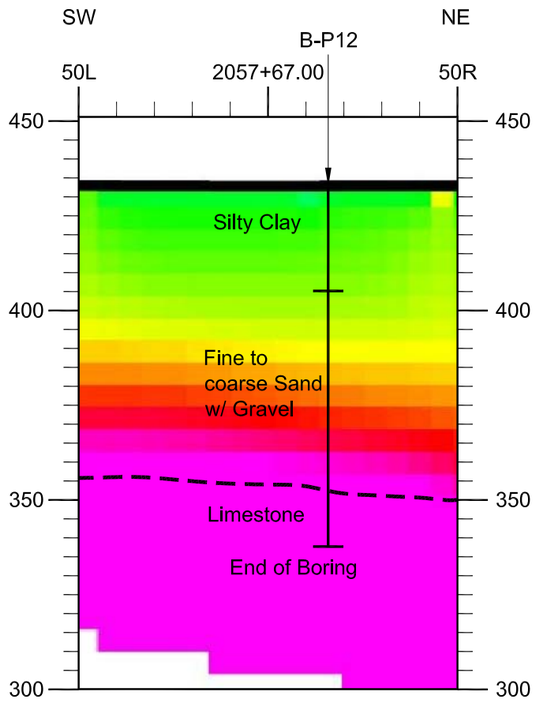
DISTANCE (ft)



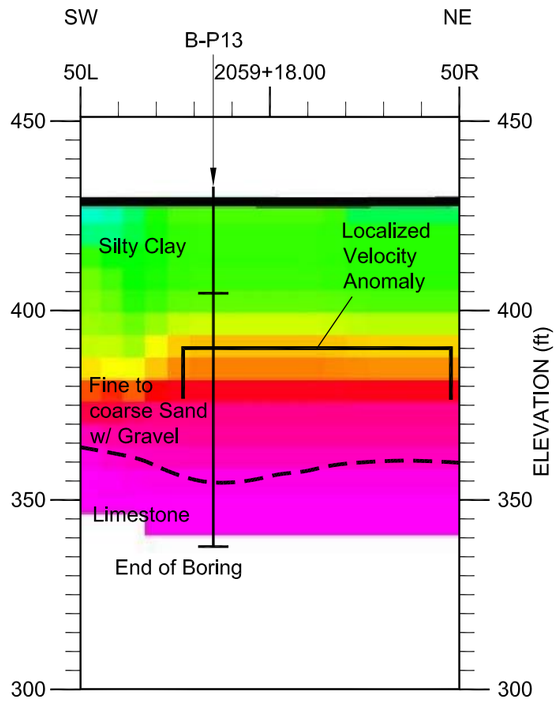
REFRACTION LINE P-10



REFRACTION LINE P-11



REFRACTION LINE P-12



REFRACTION LINE P-13

NOTES:

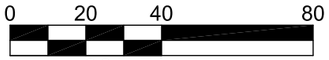
1. Geophysical survey lines were centered on pier centerline stakes.
2. The interpreted top of intact bedrock elevation shown in the profiles may not correspond to the top of rock elevation shown on the bridge plans. Refer to Structure Geotechnical Report for additional information.
3. Lithology information was copied from boring logs and top of intact bedrock was interpreted from geophysical data.
4. Boring locations and log data provided by others.

COMPRESSIONAL WAVE VELOCITY (fps)

LEGEND:

Interpreted Top of Intact Bedrock

Surveyed Ground Surface



SCALE IN FEET

Drawn By: SLC	Ck'd By: GLA	App'vd By: DWL
Date: 08-17-10	Date: 08-18-10	Date: 08-19-10

GEOTECHNOLOGY INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
ST. LOUIS • COLLINSVILLE • KANSAS CITY

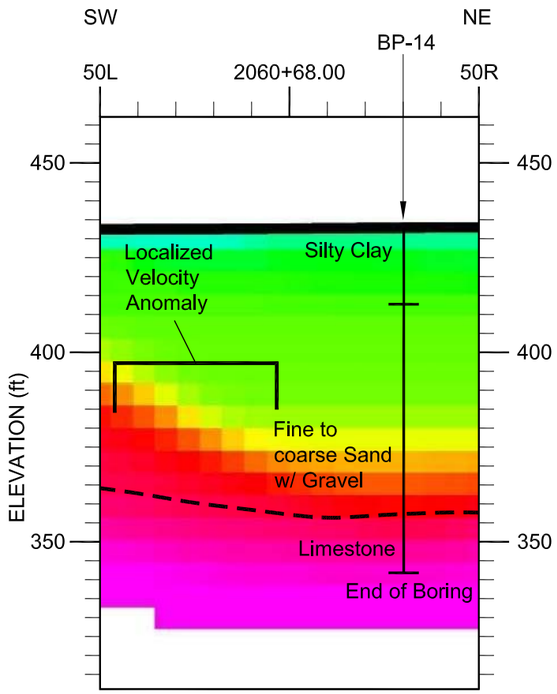
Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

EAST CURRY LAKE
LINES P-10 THROUGH P-13

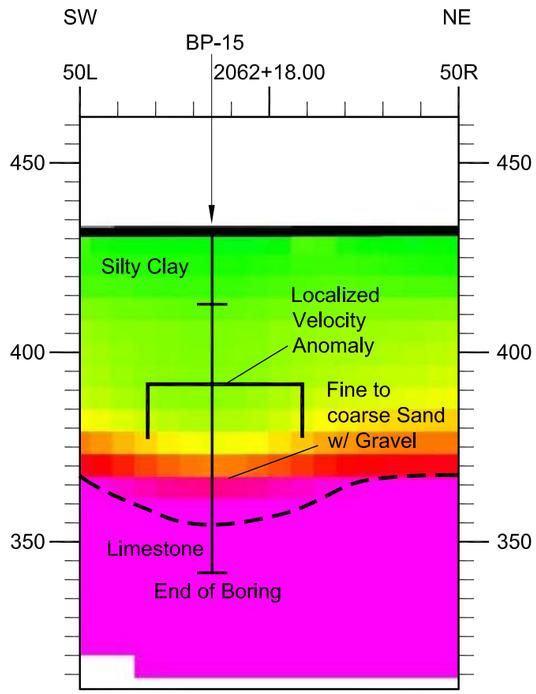
Project Number
1090201.95TS

PLATE 8

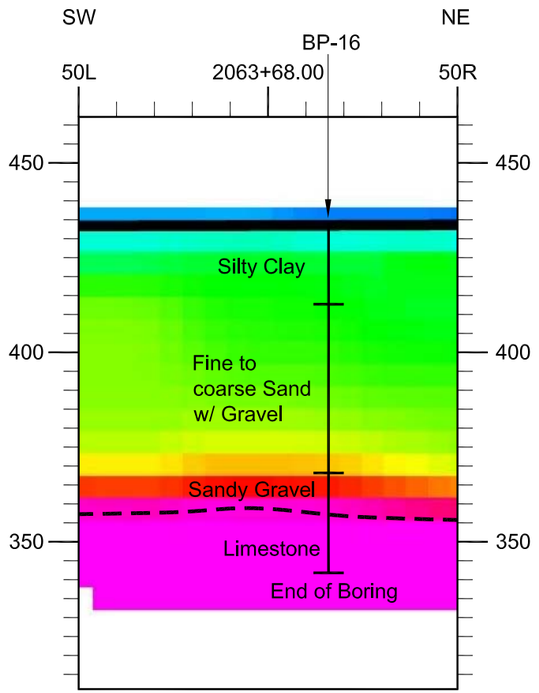
DISTANCE (ft)



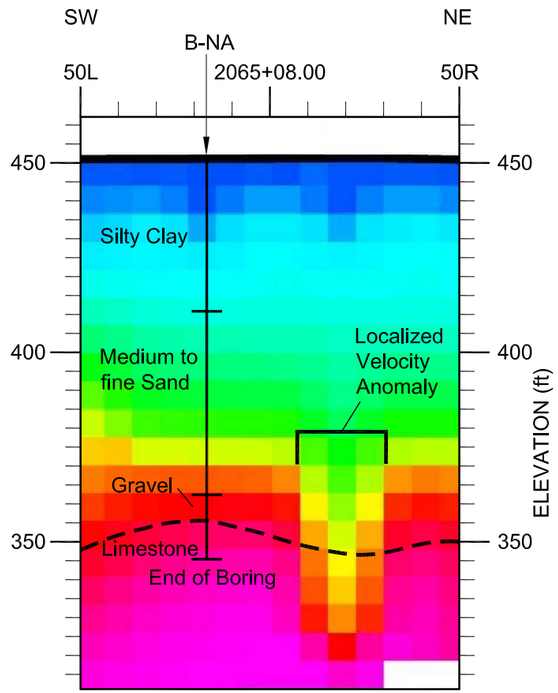
REFRACTION LINE P-14



REFRACTION LINE P-15



REFRACTION LINE P-16



REFRACTION LINE NA

NOTES:

1. Geophysical survey lines were centered on pier centerline stakes.
2. The interpreted top of intact bedrock elevation shown in the profiles may not correspond to the top of rock elevation shown on the bridge plans. Refer to Structure Geotechnical Report for additional information.
3. Lithology information was copied from boring logs and top of intact bedrock was interpreted from geophysical data.
4. Boring locations and log data provided by others.

LEGEND:

- Interpreted Top of Intact Bedrock
- Surveyed Ground Surface

Drawn By: SLC	Ck'd By: GLA	App'vd By: DWL
Date: 08-17-10	Date: 08-18-10	Date: 08-19-10

GEOTECHNOLOGY INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
ST. LOUIS • COLLINSVILLE • KANSAS CITY

Geophysical Survey
US 67 over Illinois River
Beardstown, Illinois

WEST CURRY LAKE TO NW LEVEE LINES P-14 THROUGH P-16 AND NA

Project Number 1090201.95TS

PLATE 9

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

GSI Job No. 08212

SOIL BORING LOG

Date 8/25/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P1
Station 2031+93
Offset 35.50ft R
Ground Surface Elev. 436.60 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 431.1 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL-black 436.10
	AS		19	Clayey SAND-trace roots and vegetation-brown-very loose
	2			
	1		20	
	1			
				433.60
				CLAY LOAM-brown-stiff
	1			
	2	1.0	25	
-5	3	B		
				431.10 ▼
				Fine SAND-brown-very loose to medium dense
	0			
	0			
	0			
	1			
	1			
-10	1			
				GRADATION SAMPLE P1-1
	1			
	1			
	1			
	2			
-15	5			
	2			
	3			
	4			
	3			
	5			
-20	8			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine SAND-brown-very loose to medium dense *(continued)*
	4			
	6			
	8			
	5			
	5			
-25	7			
				411.10
				Fine to Medium SAND-some small gravel-gray-medium dense to dense
	9			
	9			
	14			
	8			
	11			
-30	12			
				GRADATION SAMPLE P1-2
	5			
	7			
-35	7			
	14			
	15			
-40	17			

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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)

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(630) 355-2838

GSI Job No. 08212

SOIL BORING LOG

Date 8/25/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P1
Station 2031+93
Offset 35.50ft R
Ground Surface Elev. 436.60 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 431.1 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to Medium SAND-some small gravel-gray-medium dense to dense *(continued)*			
	11		
	14		
-45	16		
	10		
	7		
-50	10		
384.60			
Medium to Coarse SAN-some Gravel-gray-medium dense to dense			
	11		
	13		
-55	14		
GRADATION SAMPLE P1-3			
	9		
	12		
-60	16		
Medium to Coarse SAN-some Gravel-gray-medium dense to dense *(continued)*			
	10		
	10		
-65	35		
	13		
	17		
-70	23		
	11		
	14		
-75	18		
Boring Stopped 8/25/09 Boring Resumed 8/26/09			
359.60			
Fine to Medium SAND with some Gravel-gray-very dense			
	29		
GRADATION SAMPLE P1-4	100/4"		
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/25/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P1
Station 2031+93
Offset 35.50ft R
Ground Surface Elev. 436.60 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 431.1 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
Fine to Medium SAND with some Gravel-gray-very dense *(continued)*				
352.60	100/4"			
Rotary Drilling From -84.0' to -84.5'. Driller's Observation: Apparent Bedrock				
352.10 -85				
Borehole continued with rock coring.				
-90				
-95				
-100				

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/17/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2
Station 2034+95
Offset 40.00ft R
Ground Surface Elev. 439.90 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 421.9 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SANDY CLAY with Gravel-brown & gray-loose (Fill)
	AS		20	
	1			
	2		24	
	2			
	1			
	2		15	
-5	3			
434.90				
				SILTY CLAY-brown, gray & black-medium stiff to stiff (Fill) Wet
	1			
	2	1.0	28	
	3	P		
	2			
	2	0.5	32	
-10	4	P		
429.40				
				SANDY CLAY-gray-very soft to medium stiff
	0			
	0	0.2	36	
	1	B		
	0			
	1	0.1	19	
-15	1	B		
	1			
	1	0.7	18	
	2	B		
421.90 ▼				
				Fine SAND-some small gravel-brown-loose to medium dense
	3			
	4			
-20	5			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine SAND-some small gravel-brown-loose to medium dense *(continued)*
	3			
	3			
	4			
	2			
	2			
-25	4			
	3			
	4			
	7			
	3			
	4			
-30	5			
	4			
	4			
-35	5			
	4			
	6			
399.90 -40	8			

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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 8/17/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2
Station 2034+95
Offset 40.00ft R
Ground Surface Elev. 439.90 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 421.9 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to Medium SAND-brown-medium dense		9		
		13		
	-45	10		
		6		
		7		
389.90	-50	9		
Coarse SAND with some Gravel-brown & gray-medium dense to very dense		8		
		8		
	-55	9		
		9		
		13		
	-60	13		
Coarse SAND with some Gravel-brown & gray-medium dense to very dense *(continued)*		11		
		13		
Medium to fine.	-65	13		
		9		
		9		
Medium to coarse.	-70	11		
		20		
		37		
Coarse with Limestone & Cobbles.	-75	26		
		22		
		36		
	-80	28		

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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/17/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2
Station 2034+95
Offset 40.00ft R
Ground Surface Elev. 439.90 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 421.9 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Coarse SAND with some Gravel-brown & gray-medium dense to very dense *(continued)*				
		50/5"		
	-85			
Boring Stopped 8/17/09 Boring Resumed 8/20/09				
351.90				
Borehole continued with rock coring.				
	-90			
	-95			
	-100			

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 10/6/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2-PC
Station 2035+08
Offset 32.50ft L
Ground Surface Elev. 427.50 ft

Surface Water Elev. 429.50 ft
Stream Bed Elev. 427.50 ft

Groundwater Elev.:
First Encounter 427.5 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine SAND-some Shells-gray-loose to medium dense				Fine to Medium SANDY GRAVEL-gray-medium dense *(continued)*	8		
				with some small gravel	7		
					10		
				with some gravel	8		
	4				4		
-5	6			-25	9		
	5				11		
	3				5		
	4				9		
	3				12		
				398.50			
	1			Medium to Coarse SAND-some small gravel-gray-medium dense to dense	7		
-10	3			-30	8		
	3				12		
416.00							
Medium to Coarse SANDY GRAVEL-gray-medium dense	2				5		
	3				9		
	5				9		
				393.50			
	5			Coarse SAND-some small gravel-gray-medium dense	5		
-15	7			-35	5		
	12				8		
411.00							
Fine to Medium SANDY GRAVEL-gray-medium dense	5				9		
	9				13		
	9			389.50	20		
				End Of Boring @ -38.0'			
	5						
-20	5			-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 9/29/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P3
Station 2037+90
Offset 34.50ft L
Ground Surface Elev. 413.40 ft

Surface Water Elev. 429.40 ft
Stream Bed Elev. 413.40 ft

Groundwater Elev.:
First Encounter 413.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine SAND-some small Gravel-gray-loose to medium dense	2		
	1		
	3		
	1		
	3		
	7		
GRADATION SAMPLE P3-1			
-5	2		
	5		
	6		
405.90			
Medium to Coarse SAND-with small Gravel-gray-medium dense	4		
	6		
	10		
-10	3		
	7		
GRADATION SAMPLE P3-2	12		
	5		
	6		
	13		
-15	7		
	8		
	14		
	5		
	9		
	11		
-20			
Medium to Coarse SAND-with small Gravel-gray-medium dense *(continued)*	6		
	8		
	13		
391.40			
Fine SAND-with small Gravel-gray-medium dense	5		
	10		
	9		
-25			
	8		
	11		
GRADATION SAMPLE P3-3	13		
	7		
	9		
	10		
-30			
380.90			
Medium to Coarse SANDY GRAVEL-gray-medium dense	8		
	10		
	12		
-35			
GRADATION SAMPLE P3-4			
	6		
	11		
	10		
-40			

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 9/29/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P3
Station 2037+90
Offset 34.50ft L
Ground Surface Elev. 413.40 ft

Surface Water Elev. 429.40 ft
Stream Bed Elev. 413.40 ft

Groundwater Elev.:
First Encounter 413.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium to Coarse SANDY GRAVEL-gray-medium dense *(continued)*				
		5		
		9		
		13		
End 09-29-09 Begin 09-30-09	-45			
		6		
		8		
		15		
	-50			
	360.90	7		
Coarse SAND with Gravel-gray-dense to very dense		10		
		17		
	-55			
GRADATION SAMPLE P3-5		9		
		13		
		15		
	-60			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Coarse SAND with Gravel-gray-dense to very dense *(continued)*				
		52		
		105/6"		
Boring Stopped 9/29/09 Boring Resumed 10/5/09	348.40 -65			
Borehole continued with rock coring.	-70			
	-75			
	-80			

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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)

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GSI Job No. 08212

SOIL BORING LOG

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Date 9/29/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P3-CD
Station 2038+00
Offset 34.50ft R
Ground Surface Elev. 413.40 ft

Surface Water Elev. 429.40 ft
Stream Bed Elev. 413.40 ft

Groundwater Elev.:
First Encounter 413.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SANDY GRAVEL-gray-very loose to medium dense	1		
	1		
	2		
	3		
	6		
with some small gravel	7		
408.40			
-5 SANDY GRAVEL-gray-medium dense	2		
	5		
	9		
	3		
	7		
	8		
-10	4		
	9		
	5		
	6		
	3		
	8		
-15	5		
	2		
	10		
	4		
	3		
	12		
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SANDY GRAVEL-gray-medium dense *(continued)*	3		
	6		
	10		
	2		
	9		
389.40	6		
SANDY GRAVEL-gray-medium dense			
-25	5		
	7		
	8		
385.90			
SANDY GRAVEL-gray-medium dense	7		
	9		
	12		
-30	6		
	8		
381.90	14		
End Of Boring @ -31.5'			
-35			
-40			

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

BBS, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 10/7/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P4
Station 2043+40
Offset 56.00ft R
Ground Surface Elev. 414.60 ft

Surface Water Elev. 429.60 ft
Stream Bed Elev. 414.60 ft

Groundwater Elev.:
First Encounter 414.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				River Muck mixed with Wood, Shells & Sand-dark gray-very loose
	1			
	2		61	
	1			
410.60				
-5	1			Fine SAND-some Shells-gray-very loose
	1		43	
	2			
	1			
	1			
	2			
405.60				
-10	1			SILTY CLAY-gray-very soft
	1	<0.25	54	
	1	P		
403.10				
	0			SILT-dark brown & gray-very loose
	0		48	
	0			
400.60				
-15	1			Fine to Medium SANDY GRAVEL-gray-medium dense
	1			
	7			with shells
	3			GRADATION SAMPLE P4-1
	7			
	13			
				with shells
-20	4			
				Fine to Medium SANDY GRAVEL-gray-medium dense *(continued)*
	6			
	10			
	7			
	8			
391.10	12			
				Fine SAND-some gravel-gray-medium dense
-25	6			
	8			
	13			
	6			GRADATION SAMPLE P4-2
	10			
	12			
-30	5			
	6			
	7			
	7			
	13			
	12			Fine Sand
-35				
	7			
	12			
376.10	17			Fine Sand
				Fine to Medium SAND-some small gravel-gray-medium dense to dense
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 10/7/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P4
Station 2043+40
Offset 56.00ft R
Ground Surface Elev. 414.60 ft

Surface Water Elev. 429.60 ft
Stream Bed Elev. 414.60 ft

Groundwater Elev.:
First Encounter 414.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine to Medium SAND-some small gravel-gray-medium dense to dense *(continued)*
	7			
	8			
	9			
-45				GRADATION SAMPLE P4-3
	12			
	14			
	12			
-50				
	9			
	18			
361.10	20			
				Coarse SANDY GRAVEL-gray-dense to very dense
-55				
				GRADATION SAMPLE P4-4
	18			
	57			
	32			
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Coarse SANDY GRAVEL-gray-dense to very dense *(continued)*
	45			
	100/6"			
				Boring Stopped 10/7/2009
351.10				Boring Resumed 10/8/2009
				Borehole continued with rock coring.
-65				
-70				
-75				
-80				

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

BBS, from 137 (Rev. 8-99)

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Naperville, Illinois 60565
(630) 355-2838

GSI Job No. 08212

SOIL BORING LOG

Date 10/6/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P4-CD
Station 2043+42
Offset 40.00ft L
Ground Surface Elev. 420.50 ft

Surface Water Elev. 429.50 ft
Stream Bed Elev. 420.50 ft

Groundwater Elev.:
First Encounter 420.5 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				Fine SAND-some small Gravel & Shells-gray-very loose to loose
	4			
	3			
	2			
-5				
	3			
	2			
	2			
413.00				
				Fine Sandy SILT-dark gray-very loose
	1			
	1		83	
	1			
-10				
	1			
	1		37	
	1			
407.50				
				SILTY CLAY-gray-very soft
	1			
	2	0.3	46	
	2	P		
-15				
	1			
	2	0.3	51	
	3	P		
402.50				
	3			Fine to Medium SAND-some small Gravel & Shells-gray-medium dense
	3			
	5			
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				Fine to Medium SAND-some small Gravel & Shells-gray-medium dense *(continued)*
	3			
	6			
	12			
	7			
	10			
	12			
-25				
	5			
	5			
	8			
	6			
	8			
	12			
-30				
	6			
	9			
	11			
	7			
	10			
	13			
-35				
	6			
	10			
	12			
383.50				
				End Of Boring @ 37.0'
-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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/2/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P5
Station 2045+49
Offset 15.00ft L
Ground Surface Elev. 436.70 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 429.7 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				SANDY CLAY-brown-very loose to loose
	AS		24	
	1			
	3	4.0	18	
	3	P		
	1			
	3	2.5	19	
-5	3	P		
	1			
▼	1	0.5	28	
	1	P		
	1			
	1	0.6	29	
-10	1	B		
	1			
	0	0.3	44	
	1	B		
	1			
	0	0.1	36	
-15	1	B		
	0			
	0	0.0	38	
	1	B		
	2			
	2		28	
-20	2			
				SANDY CLAY-brown-very loose to loose *(continued)*
				415.70
				Fine SAND with some shells-gray-loose to medium dense
	1			
	2			
	5			
	3			
	4			
-25	3			
	3			
	6			
	6			
	3			
	3			
-30	3			
				403.20
	4			Fine to medium SAND-some gravel-gray-medium dense
	6			
-35	7			
	9			
	10			
-40	10			

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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/2/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P5
Station 2045+49
Offset 15.00ft L
Ground Surface Elev. 436.70 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 429.7 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to medium SAND-some gravel-gray-medium dense *(continued)*			
	9		
	10		
-45	10		
	7		
	9		
-50	12		
383.20			
Fine SAND-some gravel-gray-dense to very dense	13		
	22		
-55	26		
	25		
	37		
-60	37		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine SAND-some gravel-gray-dense to very dense *(continued)*			
373.20			
Medium to coarse SAND-some gravel-gray-medium dense to dense	11		
	12		
-65	11		
	8		
	8		
-70	8		
	6		
	7		
-75	8		
	11		
	18		
-80	39		

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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/2/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P5
Station 2045+49
Offset 15.00ft L
Ground Surface Elev. 436.70 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 429.7 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

Material Description	Elevation	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium to coarse SAND-some gravel- gray-medium dense to dense *(continued)*					
	352.70		27		
FRACTURED LIMESTONE with Sand & Gravel- gray-very dense Boring Stopped 9/2/09 Boring Resumed 9/3/09		-85	100/2"		
	349.20				
Rotary Drilling From -87.5' to -88.0'. Driller's Observation: Apparent Bedrock	348.70				
Borehole continued with rock coring.		-90			
		-95			
		-100			

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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)

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SOIL BORING LOG

GSI Job No. 08212

Date 8/31/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P6
Station 2048+09
Offset 15.00ft R
Ground Surface Elev. 437.10 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL with Sand-dark brown 436.93
	AS		33	SANDY CLAY-dark brown-very soft to very stiff
	1			
	1	0.1	33	
	1	B		
	2			
	3	2.6	25	
-5	5	B		
	2			
	3	0.3	26	
	3	B		
▼	0			
	1	0.2	29	
-10	1	B		
	0			
	1	0.0	32	
	1	B		
	0			
	1	0.2	31	
-15	1	B		
	1			
	0	0.3	32	
	1	P		
				418.60
	2			Fine SAND-some small gravel and shells-gray- very loose to medium dense
	2			
-20	2			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine SAND-some small gravel and shells-gray- very loose to medium dense *(continued)*
	1			
	1			
	2			
	1			
	1			
-25	1			
	1			
	1			
	1			
	1			
	5			
	5			
-30	5			
	4			
	7			
-35	7			
				398.60
	12			Medium to coarse SAND-some gravel- gray-medium dense-to very dense
	18			
-40	19			

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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/31/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P6
Station 2048+09
Offset 15.00ft R
Ground Surface Elev. 437.10 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium to coarse SAND-some gravel-gray-medium dense-to very dense *(continued)*			
	11		
	18		
-45	24		
	11		
	15		
-50	17		
	9		
	14		
-55	21		
380.10			
Medium to Coarse SAND-gray-very dense			
	21		
	34		
-60	37		
Medium to Coarse SAND-gray-very dense *(continued)*			
	18		
	25		
-65	31		
370.10			
Medium to Coarse SAND with small gravel-gray-medium dense			
	6		
	8		
-70	9		
363.60			
Coarse SAND-some small gravel-gray-medium dense			
	5		
	11		
-75	7		
	14		
	11		
-80	13		

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)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/31/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P6
Station 2048+09
Offset 15.00ft R
Ground Surface Elev. 437.10 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Coarse SAND-some small gravel-gray-medium dense *(continued)*
353.10	41			
	100/5"			Coarse SANDY GRAVEL-gray-very dense
-85				Boring Stopped 8/31/09 Boring Resumed 9/1/09
350.10				
349.60				Rotary Drilling From -87.0' to -87.5'. Driller's Observation: Apparent Bedrock
				Borehole continued with rock coring.
-90				
-95				
-100				

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 9/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P7
Station 2050+15
Offset 15.00ft L
Ground Surface Elev. 434.10 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 410.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL-dark brown 433.60
	AS		21	SILTY CLAY-brown to dark gray-very soft to stiff
	2			
	2	1.8	19	
	3	B		
	1			
-5	2	1.3	21	
	3	B		
	2			Becoming organic @ -6.0'.
	3	1.1	25	
	3	B		
	1			
	1	0.5	25	
-10	2	B		
	0			
	0	0.1	46	
	1	B		
	0			
	0		33	
-15	0			
	0			
	0	0.2	37	
	0			
	0			
-20	1	0.3	29	
		P		
				SILTY CLAY-brown to dark gray-very soft to stiff *(continued)*
	0			
	0	0.3	31	
	1	P		
				410.60 ▼
	0			Medium to coarse SAND-gray-very loose to medium dense
	0			
-25	3			
	1			GRADATION SAMPLE P7-1
	3			
	4			
	1			
	4			
-30	7			
	9			
	11			
-35	12			
				395.60
	9			Coarse SAND-small gravel-gray-medium dense
	13			
-40	14			

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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P7
Station 2050+15
Offset 15.00ft L
Ground Surface Elev. 434.10 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 410.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Coarse SAND-small gravel-gray-medium dense *(continued)*			
GRADATION SAMPLE P7-2			
	11		
	13		
-45	16		
386.10			
Coarse SANDY GRAVEL-gray-medium dense	11		
	9		
-50	11		
380.60			
Fine to medium SAND-gray-medium dense	8		
	10		
-55	14		
GRADATION SAMPLE P7-3			
	7		
	8		
-60	8		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to medium SAND-gray-medium dense *(continued)*			
	7		
	9		
-65	14		
	11		
	13		
-70	13		
360.60			
Coarse SAND-some gravel-gray-medium dense to dense	12		
	10		
-75	14		
GRADATION SAMPLE P7-4			
	40		
	25		
small gravel -80	32		

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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P7
Station 2050+15
Offset 15.00ft L
Ground Surface Elev. 434.10 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 410.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Coarse SAND-some gravel-gray-medium dense to dense *(continued)*				
Boring Stopped 9/4/09 Boring Resumed 9/8/09	351.10			
Driller's Observation: Apparent Bedrock	350.10	100/0"		
Borehole continued with rock coring.	-85			
	-90			
	-95			
	-100			

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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)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/9/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P8
Station 2051+66
Offset 15.00ft R
Ground Surface Elev. 433.20 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.2 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				TOPSOIL-dark brown 432.70
	1			
	AS		39	SILTY CLAY-brown-very soft to soft
	1			
	1	0.3	25	
	2	B		
	1			
	1	0.4	26	
▼ -5	2	B		
	1			
	1	0.4	28	
	2	B		
				425.20
	1			SILTY CLAY LOAM-brown -very soft
	1	0.1	26	
-10	2	B		
				422.70
	0			CLAY LOAM-brown-very soft
	0	0.0	30	
	1	B		
	0			
	0	0.1	31	
-15	1	B		
				417.70
	0			SILTY CLAY-dark gray-very soft to soft
	0	0.2	28	
	0	B		
	0			
	1	0.2	34	
-20	1	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				SILTY CLAY-dark gray-very soft to soft *(continued)*
	0			
	1	0.4	37	
	1	B		
	0			CLAY LOAM-dark gray-very soft
	1	0.2	38	
-25	1	B		
				407.20
	2			Fine SAND-gray-medium dense
	5			
	7			
				404.70
	8			Coarse SAND-some gravel-gray-medium dense
	6			
-30	6			
	8			
	8			
-35	8			
				394.70
	8			Fine to medium SAND-some gravel- gray-medium dense to dense
	15			
-40	20			

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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)

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SOIL BORING LOG

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P8
Station 2051+66
Offset 15.00ft R
Ground Surface Elev. 433.20 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.2 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to medium SAND-some gravel- gray-medium dense to dense *(continued)*				Fine to medium SAND-some gravel- gray-medium dense to dense *(continued)*			
	12				10		
	17				14		
-45	13			-65	18		
	20			364.70 SANDY GRAVEL-gray- medium dense to very dense	11		
	18				15		
-50	10			-70	11		
	7				68		
	9				37		
-55	11			-75	28		
	8				37		
	12				31		
-60	15			-80	42		

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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 9/9/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P8
Station 2051+66
Offset 15.00ft R
Ground Surface Elev. 433.20 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.2 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
SANDY GRAVEL-gray-medium dense to very dense *(continued)*				
351.70				
Rotary Drilling From 81.5 to -82.0'.	100/0"			
351.20				
Driller's Observation: Apparent Bedrock				
Boring Stopped 9/9/09 Boring Resumed 9/10/09				
Borehole continued with rock coring.				
-85				
-90				
-95				
-100				

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 9/14/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P9
Station 2053+16
Offset 15.00ft L
Ground Surface Elev. 434.50 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 431.0 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				SANDY CLAY-brown-very soft to medium stiff
	AS		29	
	1			
	2	0.6	22	
	2	B		
▼				
	1			
	2	0.2	26	
-5	3	B		
	2			
	2	0.5	26	
	3	B		
	1			
	1	0.4	26	
-10	1	B		
	1			
	1	0.1	32	
	1	B		
421.00				
	1			SANDY CLAY-gray-very soft to soft
	1	0.3	36	
-15	1	B		
	1			
	1	0.1	35	
	1	B		
	1			
	2	0.1	31	
-20	2	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				SANDY CLAY-gray-very soft to soft *(continued)*
413.50				
	1			Fine to medium SAND-some small gravel-gray-loose to dense
	2			
	2			
	2			
-25	3			
	4			
	4			
	6			
	7			
	7			
	7			
-30	8			
	6			
	9			
-35	12			
	7			
	9			
-40	11			

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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 9/14/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P9
Station 2053+16
Offset 15.00ft L
Ground Surface Elev. 434.50 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 431.0 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to medium SAND-some small gravel-gray-loose to dense *(continued)*				Medium to coarse SANDY GRAVEL-gray-medium dense to very dense *(continued)*			
	13				16		
	17			with limestone chips	33		
-45	17			-65	41		
	14			Coarse Sandy Gravel	12		
	22				13		
-50	19			-70	11		
381.00							
Medium to coarse SANDY GRAVEL-gray-medium dense to very dense	11			Coarse	40		
	15				52		
-55	11			-75	38		
	8				85		
with some small gravel	10			Coarse	100/0"		
-60	13			-80			

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 9/14/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P9
Station 2053+16
Offset 15.00ft L
Ground Surface Elev. 434.50 ft

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

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 431.0 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

354.00
Boring Stopped 9/14/09
Boring Resumed 9/15/09
Borehole continued with rock coring.

-85
-90
-95
-100

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 3/26/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P10
Station 2054+66
Offset 40.00ft R
Ground Surface Elev. 429.30 ft

Surface Water Elev. 439.44 ft
Stream Bed Elev. 429.30 ft

Groundwater Elev.:
First Encounter 429.3 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	W			SILTY CLAY-dark brown-very soft to stiff
	O H	0.2 B	38	
	2			
	3 4	1.2 B	26	
	1			becoming brown & gray
-5	2 3	1.7 B	26	
	1			
	2 2	0.5 B	27	
	1			
-10	1 1	0.4 B	34	
	1			becoming gray
	1 1	0.3 B	34	
	1			becoming very silty & sandy
-15	0 1	0.1 B	29	
412.80				
	2			Fine to Medium SAND-gray-loose
	3 4			
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine to Medium SAND-gray-loose *(continued)*
	3			
	4 5			
-25				
402.80				
	7			Medium to Coarse SAND with Gravel-gray-medium dense
	7 8			
-30				
	7			
	10 14			
-35				
	7			
	11 15			
-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, from 137 (Rev. 8-99)

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SOIL BORING LOG

Date 3/26/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P10
Station 2054+66
Offset 40.00ft R
Ground Surface Elev. 429.30 ft

Surface Water Elev. 439.44 ft
Stream Bed Elev. 429.30 ft

Groundwater Elev.:
First Encounter 429.3 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Medium to Coarse SAND with Gravel-gray-medium dense *(continued)*
				387.80
	13			Fine to Medium SAND with Gravel-gray-medium dense to dense
	23			
	27			
-45				
	12			
	13			
	16			
-50				
				377.80
	9			Medium to Coarse SAND with Gravel-gray-medium dense to dense
	13			
	17			
-55				
	8			
	19			
	21			
-60				
				Medium to Coarse SAND with Gravel-gray-medium dense to dense *(continued)*
	25			
	29			
	33			
-65				
				362.80
	9			SANDY GRAVEL-gray-medium dense to very dense
	11			
	17			
-70				
	29			
	38			
	50/2"			
				Boring Stopped 3/26/2010 Boring Resumed 3/29/2010
-75				
				353.80
				353.30
				Driller's Observation: Apparent Top Of Bedrock.
				Borehole continued with rock coring.
-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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 3/30/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P11
Station 2056+16
Offset 15.00ft L
Ground Surface Elev. 430.70 ft

Surface Water Elev. 438.73 ft
Stream Bed Elev. 430.70 ft

Groundwater Elev.:
First Encounter 430.7 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	W			CLAY LOAM-dark brown-very soft to medium stiff
	O H		65	
	1			
-5	1 2	0.6 B	23	
	1			
	2 3	0.9 B	21	
	2			becoming dark brown & gray
-10	2 3	0.9 B	24	
	1			
	1 2	0.4 B	28	
	1			becoming dark gray
-15	1 1	0.4 B	26	
	1			
	1 1	0.3 B	29	
	1			
-20	1	0.7	32	
	1			CLAY LOAM-dark brown-very soft to medium stiff *(continued)*
				Boring Stopped 3/30/2010
				Boring Resumed 3/31/2010
	1			
-25	1 1			
				401.70
	13			Medium to Coarse SAND with Gravel-brown-medium dense to dense
-30	15 12			GRADATION SAMPLE P11-1
	15			
-35	31 33			
	17			
-40	15			

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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)

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SOIL BORING LOG

GSI Job No. 08212

Date 3/30/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P11
Station 2056+16
Offset 15.00ft L
Ground Surface Elev. 430.70 ft

Surface Water Elev. 438.73 ft
Stream Bed Elev. 430.70 ft

Groundwater Elev.:
First Encounter 430.7 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium to Coarse SAND with Gravel-brown-medium dense to dense *(continued)*		14		
		21		
	-45	21		
		23		
	381.70			
Fine to Medium SAND-brown-medium dense		11		
	-50	12		
GRADATION SAMPLE P11-2		12		
		10		
	-55	12		
		13		
		6		
	-60	6		
Fine to Medium SAND-brown-medium dense *(continued)*		9		
with Gravel		15		
	-65	28		
		50/5"		
	363.20			
SANDY GRAVEL-brown-very dense		23		
	-70	29		
GRADATION SAMPLE P11-3		31		
		40		
	-75	50/2"		
Boring Stopped 3/31/2010 Boring Resumed 4/2/2010				
	353.70			
	353.20			
Driller's Observation: Apparent Top Of Bedrock.				
Borehole continued with rock coring.				
	-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 4/2/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P12
Station 2057+67
Offset 15.00ft R
Ground Surface Elev. 429.10 ft

Surface Water Elev. 438.11 ft
Stream Bed Elev. 429.10 ft

Groundwater Elev.:
First Encounter 429.1 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	0			SILTY CLAY-dark brown-very soft to medium stiff
	1 1		26	
	0			
	1 1	0.4 B	31	
-5				
	2			becoming brown & gray
	1 1	0.1 B	29	
	1			
	2 2	0.8 B	31	
-10				
	0			becoming gray
	0 1	0.2 B	34	
	0			
	0 1	0.1 B	26	
-15				
	1			
	2 3	0.1 B	32	
	0			
	1 3	0.1 B	33	
-20				Boring Stopped 4/2/2010

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Boring Resumed 4/5/2010 SILTY CLAY-dark brown-very soft to medium stiff *(continued)*
				406.10
	3			Fine to Medium SAND-gray-loose to very dense
	4 5			
-25				
	21			
	19 16			with some gravel
-30				
	13			
	26 27			No Recovery
-35				
	17			
	15 19			with some gravel
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 4/2/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P12
Station 2057+67
Offset 15.00ft R
Ground Surface Elev. 429.10 ft

Surface Water Elev. 438.11 ft
Stream Bed Elev. 429.10 ft

Groundwater Elev.:
First Encounter 429.1 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to Medium SAND-gray-loose to very dense *(continued)*				Fine to Medium SAND-gray-loose to very dense *(continued)*			
	8			366.10 Medium to Coarse SAND with	17		
	9			Gravel-gray-very dense	50/5"		
with some gravel	12						
-45				-65			
	5				40		
	8				50/4"		
with small gravel	9						
-50				-70			
	9				21		
	13				50/4"		
with small gravel	14			with small gravel			
-55				Boring Stopped 4/5/2010 Boring Resumed 4/6/2010 -75			
				353.10 Borehole continued with rock coring.			
	13						
	21						
with small gravel	50						
-60				-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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 4/6/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P13
Station 2059+18
Offset 15.00ft L
Ground Surface Elev. 429.40 ft

Surface Water Elev. 437.44 ft
Stream Bed Elev. 429.40 ft

Groundwater Elev.:
First Encounter 429.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY-dark brown-very soft to stiff
	W			
	O H	0.0 P	33	
	1			becoming gray
-5	2 3	0.4 B	32	
	2			
	3 3	1.2 B	27	
	2			
-10	3 3	0.2 B	34	
	1			Boring Stopped 4/6/2010 Boring Resumed 4/7/2010
	2 3	0.9 B	37	
	2			becoming brown
-15	3 3	0.9 B	32	
412.90				
	2			Clayey SAND-brown-loose
	3 4			
410.40				
	5			Fine to Medium SAND-brown-medium dense
-20	7			
				Fine to Medium SAND-brown-medium dense *(continued)*
	8			
405.40				
	5			Medium to Coarse SAND with small Gravel-brown-medium dense to dense
-25	7 9			
	10			
-30	12 13			
	35			
-35	33 22			with gravel
-40	9			

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, from 137 (Rev. 8-99)

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805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

GSI Job No. 08212

SOIL BORING LOG

Date 4/6/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P13
Station 2059+18
Offset 15.00ft L
Ground Surface Elev. 429.40 ft

Surface Water Elev. 437.44 ft
Stream Bed Elev. 429.40 ft

Groundwater Elev.:
First Encounter 429.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium to Coarse SAND with small Gravel-brown-medium dense to dense *(continued)* with gravel	7		
Boring Stopped 4/7/2010 Boring Resumed 4/8/2010	8		
-45 with gravel	12 12		
380.40 Fine to Medium SAND-brown-medium dense to dense	8		
-50 with small gravel	13 19		
	6		
-55 with small gravel	7 8		
	9		
-60	17		
Fine to Medium SAND-brown-medium dense to dense *(continued)*	21		
365.40 Coarse SAND with small Gravel-brown-medium dense to dense	6		
-65	8 11		
becoming gray	15		
-70	25 32		
355.90 Driller's Observation: Apparent Top Of Bedrock. 354.90			
-75 Borehole continued with rock coring.			
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 4/9/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P14
Station 2060+68
Offset 30.00ft R
Ground Surface Elev. 430.40 ft

Surface Water Elev. 436.90 ft
Stream Bed Elev. 430.40 ft

Groundwater Elev.:
First Encounter 430.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Notes
				SILTY CLAY-gray-medium stiff to stiff
	2			
	2	0.9	27	
	2	B		
-5				
	3			
	3	1.4	28	
	4	B		
	1			becoming brown & gray
	2	1.1	27	
	2	B		
-10				
	2			
	3	1.3	28	
	4	B		
	2			
	3	1.4	31	
	4	B		
-15				
	2			
	3	1.9	28	
	5	B		
412.40				
	2			Fine to Medium Coarse SAND with Gravel-brown-medium dense to dense
	5			
	6			
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Notes
	4			Fine to Medium Coarse SAND with Gravel-brown-medium dense to dense *(continued)*
	6			
	8			
				GRADATION SAMPLE P14-1
-25				
	5			
	9			
	17			
-30				
	17			
	17			
	12			
-35				
	24			
	21			
	15			
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 4/9/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P14
Station 2060+68
Offset 30.00ft R
Ground Surface Elev. 430.40 ft

Surface Water Elev. 436.90 ft
Stream Bed Elev. 430.40 ft

Groundwater Elev.:
First Encounter 430.4 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
389.90			
Medium to Coarse SAND with Gravel-brown-medium dense to dense	8		
	9 11		
GRADATION SAMPLE P14-2			
-45			
	9		
	10 12		
-50			
	6		
	7 11		
-55			
	8		
	11 14		
-60			
Medium to Coarse SAND with Gravel-brown-medium dense to dense *(continued)*	20		
	23 18		
-65			
	6		
	8 12		
-70			
	25		
	31 34		
Boring Stopped 4/9/2010 Boring Resumed 4/12/2010			
356.90 Driller's Observation: Apparent Top Of Bedrock. 356.40 Borehole continued with rock coring.			
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 4/13/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P15
Station 2062+18
Offset 15.00ft L
Ground Surface Elev. 430.20 ft

Surface Water Elev. 436.23 ft
Stream Bed Elev. 430.20 ft

Groundwater Elev.:
First Encounter 430.2 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				SILTY CLAY-brown & gray-soft to stiff
	W			
-5	O H	0.4 B	32	
	1			
	1 1	0.3 B	30	
	1			
-10	1 2	0.4 B	29	
	2			
	2 3	1.1 B	31	
	2			
-15	3 4	1.7 B	26	
414.20				
	5			Fine to Medium SAND-brown-medium dense
	6 6			
411.70				
	5			Medium To Coarse SAND with small Gravel-medium dense to dense
-20	6 8			
				Medium To Coarse SAND with small Gravel-medium dense to dense *(continued)*
	5			
	5 7			
-25				
	10			
	15 12			
-30				
	8			
	13 14			
-35				
	8			
	9 10			
-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, from 137 (Rev. 8-99)

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SOIL BORING LOG

GSI Job No. 08212

Date 4/13/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P15
Station 2062+18
Offset 15.00ft L
Ground Surface Elev. 430.20 ft

Surface Water Elev. 436.23 ft
Stream Bed Elev. 430.20 ft

Groundwater Elev.:
First Encounter 430.2 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium To Coarse SAND with small Gravel-medium dense to dense *(continued)*			
	11		
	8		
	10		
-45			
	13		
	17		
	15		
-50			
379.20			
Fine to Medium SAND with small Gravel-brown-medium dense	11		
	9		
	10		
-55			
	8		
	12		
	17		
-60			
Fine to Medium SAND with small Gravel-brown-medium dense *(continued)*	9		
	8		
	11		
-65			
364.20			
SANDY GRAVEL-brown-very dense	14		
	34		
	50		
-70			
	41		
	32		
	35		
Boring Stopped 4/13/2010 Boring Resumed 4/14/2010			
356.20			
Driller's Observation: Apparent Top Of Bedrock. 355.70			
-75			
Borehole continued with rock coring.			
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 3/26/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P16
Station 2063+68
Offset 15.00ft R
Ground Surface Elev. 429.60 ft

Surface Water Elev. 440.15 ft
Stream Bed Elev. 429.60 ft

Groundwater Elev.:
First Encounter 429.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	6			SILTY CLAY-dark brown-soft to very stiff
	10	1.8	25	
	10	B		
	6			
	10	3.5	25	
	12	B		
	2			becoming brown & gray
-5	5	1.6	25	
	5	B		
	2			
	3	1.3	25	
	3	B		
	1			Boring Stopped 3/22/2010 Boring Resumed 3/23/2010
-10	2	0.4	30	
	3	B		
	2			
	1	0.9	32	
	3	B		
	2			
-15	3	1.6	27	
	6	B		
413.10				
	5			Fine to Medium SAND with some small gravel-brown-medium dense
	10			
	12			
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine to Medium SAND with some small gravel-brown-medium dense *(continued)*
	6			
	10			
	14			Fine to Medium Coarse with some gravel.
-25				
403.10				
	8			Coarse SAND with some Gravel-brown-medium dense to dense
	13			
	17			
-30				
	7			
	14			
	16			with Gravel & Limestone
-35				
	8			with Gravel & Limestone
	11			
	10			
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 3/26/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P16
Station 2063+68
Offset 15.00ft R
Ground Surface Elev. 429.60 ft

Surface Water Elev. 440.15 ft
Stream Bed Elev. 429.60 ft

Groundwater Elev.:
First Encounter 429.6 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Coarse SAND with some Gravel-brown-medium dense to dense *(continued)*			
	12		
	10		
with Gravel & Limestone	10		
-45			
383.10			
Medium to Coarse SAND with some Gravel-brown-medium dense to dense	8		
	11		
	15		
-50			
	9		
	11		
with Gravel	22		
-55			
373.10			
Fine to Medium SAND with some small Gravel-brown-medium dense	11		
	12		
	13		
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Fine to Medium SAND with some small Gravel-brown-medium dense *(continued)*			
368.10			
SANDY GRAVEL-brown-medium dense to very dense	12		
	11		
	11		
-65			
	20		
	50/6"		
-70			
	23		
Boring Stopped 3/23/2010	50/6"		
Boring Resumed 3/24/2010			
356.60			
Drillers Observation: Apparent Bedrock 356.10			
Borehole continued with rock coring.			
-75			
-80			

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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)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-NA
Station 2065+08
Offset 15.00ft L
Ground Surface Elev. 455.00 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 410.0 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				TOPSOIL-black 454.50
	AS		28	SILTY CLAY-brown-stiff to hard (Fill)
	4			
	6	4.5P	16	
	6			
	3			
	5	2.5B	19	
-5	7			
	4			
	6	2.3B	22	
	7			
	3			
	5	1.75B	22	
-10	6			
	2			
	3	1.5B	21	
	6			
	3			442.00 SILTY CLAY-brown and gray-medium stiff to stiff-wet
	5	2.1B	27	
-15	7			
	3			
	5	2.0B	25	
	7			
	3			
	4	1.4B	25	
-20	7			
	3			SILTY CLAY-brown and gray-medium stiff to stiff-wet *(continued)*
	4	1.4B	28	
	6			
	3			
	4	1.8B	28	
-25	5			
	4			
	8	2.3B	24	
	12			
	4			
	7	3.3B	24	
-30	10			
	2			
	3	0.8B	30	
-35	3			
	3			
	3	0.25B	28	
-40	4			

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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-NA
Station 2065+08
Offset 15.00ft L
Ground Surface Elev. 455.00 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 410.0 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY-brown and gray-medium stiff to stiff-wet *(continued)*			
	3		
	4		
410.00 ▼ -45	5		
Medium to coarse SAND-brown-medium dense to dense GRADATION SAMPLE NA-1			
	5		
	7		
-50	9		
	11		
	15		
-55	20		
	10		
	12		
-60	18		
Medium to coarse SAND-brown-medium dense to dense *(continued)*			
	12		
	15		
-65	18		
	14		
	14		
-70	18		
	9		
	14		
380.00 -75	18		
Fine to Medium SAND-brown to gray-medium dense to dense GRADATION SAMPLE NA-2			
	10		
	10		
-80	12		

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

BBS, from 137 (Rev. 8-99)

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SOIL BORING LOG

Date 8/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-NA
Station 2065+08
Offset 15.00ft L
Ground Surface Elev. 455.00 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 410.0 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Fine to Medium SAND-brown to gray-medium dense to dense *(continued)*
	16			
	25			
-85	32			
	18			
	28			
-90	50			
361.50				
	50/3"			GRAVEL-gray-very dense
-95				
				Rotary Drilling From -99.0' to -99.5'. Apparent Bedrock
				Drilling Stopped 8/4/09
356.00	50/1"			Drilling Resumed 8/7/09
-100				Borehole continued with rock coring.

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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/20/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-SA
Station 2029+68
Offset 15.00ft L
Ground Surface Elev. 436.90 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.9 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy TOPSOIL-brown 436.40			
Fine SAND-brown-some small gravel- very loose to medium dense	AS		10
	2		
	1		
	1		
	1		
-5	2		
	2		
	2		
	3		
	3		
▼			
	2		
-10	2		
	2		
	5		
	4		
	1		
-15	2		
	3		
	3		
	5		
	7		
	3		
-20	7		
	7		
415.90			
Fine to Coarse SAND-brown-some small gravel medium dense	6		
	8		
	12		
	3		
-25	4		
	6		
	4		
	6		
	8		
	7		
-30	7		
	12		
404.90			
Coarse SAND with some small Gravel- gray-medium dense	4		
	5		
-35	6		
	6		
	8		
-40	9		

Z:\PROJECTS\2008\08212 TENG, US 67 RECONSTRUCTION, BEARDSTOWN, IL\08212 BORING LOGS\08212_LOG.GPJ 6/24/10

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)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/20/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-SA
Station 2029+68
Offset 15.00ft L
Ground Surface Elev. 436.90 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.9 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Coarse SAND with some small Gravel-gray-medium dense *(continued)*			
	5		
	7		
-45	11		
	4		
	7		
-50	7		
	9		
	11		
-55	12		
379.90 Fine SAND-gray-some small gravel-medium dense			
	6		
	7		
-60	9		
Fine SAND-gray-some small gravel-medium dense *(continued)*			
	7		
	9		
-65	9		
	18		
	14		
-70	14		
364.90 Medium SANDY GRAVEL-gray-dense to very dense			
	41		
	12		
-75	12		
	50/2"		
-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, from 137 (Rev. 8-99)

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GSI Job No. 08212

SOIL BORING LOG

Date 8/20/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-SA
Station 2029+68
Offset 15.00ft L
Ground Surface Elev. 436.90 ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter 428.9 ft ▼
Upon Completion n/a ft
After ____ **Hrs.** n/a ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Medium SANDY GRAVEL-gray-dense to very dense *(continued)*				
		44		
		50/4"		
	-85			
Drilling Stopped 8/20/09 Drilling Resumed 8/24/09				
349.40				
Weathered Bedrock		100/0"		
347.90				
Borehole continued with rock coring.	-90			
	-95			
	-100			

Z:\PROJECTS\2008\08212 TENG, US 67 RECONSTRUCTION, BEARDSTOWN, IL\08212 BORING LOGS\08212_LOG.GPJ 6/24/10

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)

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 8/25/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P1
Station 2031+93
Offset 35.50ft R
Ground Surface Elev. 436.60 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 352.60 **ft**
Begin Core Elev. 352.10 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-light gray to gray with horizontal to wavy bedding and little to no weathering. Horizontal fracture with thin clay parting @ -93.7'	352.10	-85	1	100	89		2310.0
		-90					986.0
	342.10						
LIMESTONE-light gray to gray with horizontal to wavy bedding and lightly weathered. Highly fractured & weathered @ base.		-95	2	100	61		
	339.10						
LIMESTONE- Highly fractured & weathered throughout.	338.60		3	67	0		
LIMESTONE-light gray to gray with horizontal to wavy bedding and lightly weathered. 6" clay seam from -99.8' to -100.3'		-100	4	80	44		1108.0
	336.10						
End Of Boring @ -100.5' Boring Grouted Upon Completion							

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P1
Station: 2031+75 Offset: 15.0' Right Ground Surface Elevation: 436.56

RUN No. 1

RUN No. 2, 3 & 4

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ROCK CORE LOG

GSI Job No. 08212

Date 8/17/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2
Station 2034+95
Offset 40.00ft R
Ground Surface Elev. 439.90 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 349.90 **ft**
Begin Core Elev. 351.90 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Cobbles & Boulders	351.90		1				
	349.90	-90					
LIMESTONE-light gray with horizontal bedding. Weathered throughout.	349.40		1	100	100		
Rotary Drilling. Reset casing.	348.90						
LIMESTONE-light gray to gray with horizontal to wavy bedding. Slightly porous & weathered with some chert. Vertical fracture from -91.2' to -91.9'. Horizontal fracture spacing of 4.6".	347.40		2	100	28		
LIMESTONE-light gray to gray with horizontal to wavy bedding. Some lightly weathered horizontal fractures. Horizontal fracture spacing of 8.6".		-95	3	98	88		
	343.90						884.0
LIMESTONE-light gray to gray with horizontal to wavy bedding & some chert replacement. Some weathered horizontal fractures. 3/4" hard shale seam @ -96.8'. 1/2" soft clay parting @ -97.4'. Horizontal fracture spacing of 3.9".		-100	4	100	60		
	338.90						
LIMESTONE-light gray with horizontal to wavy bedding & some chert replacement. Some light weathering in fractures. Horizontal fracture spacing of 3.0".			5	100	40		580.0
	336.40						
LIMESTONE-light gray to gray with horizontal to wavy bedding & some chert replacement. Some weathering in fractures. 1/2" soft clay parting @ 104.4'. Horizontal fracture spacing of 4.6".			6	92	67		660.0
Drillers Note: Lost all water at -104.5'.		-105					
							1109.0

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE LOG

GSI Job No. 08212

Date 8/17/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2
Station 2034+95
Offset 40.00ft R
Ground Surface Elev. 439.90 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 349.90 **ft**
Begin Core Elev. 351.90 **ft**

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-light gray to gray with horizontal to wavy bedding & some chert replacement. Some weathering in fractures. 1/2" soft clay parting @ 104.4'. Horizontal fracture spacing of 4.6". Drillers Note: Lost all water at -104.5'. *(continued)*					402.0
-110					
328.90					
End Of Boring @ -111.0' Boring Backfilled with Cuttings Upon Completion					
-115					
-120					
-125					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P2
Station: 2034+95 Offset: 40.0' Right Ground Surface Elevation: 439.94

RUN No. 1, 2, 3 & 4

RUN No. 5

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P2
Station: 2034+95 Offset: 40.0' Right Ground Surface Elevation: 439.94

RUN No. 6

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ROCK CORE LOG

GSI Job No. 08212

Date 10/6/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD**

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2-PC
Station 2035+08
Offset 32.50ft L
Ground Surface Elev. 427.50 **ft**

CORING BARREL TYPE & SIZE
Core Diameter in
Top of Rock Elev. ft
Begin Core Elev. ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Fine SAND-some Shells-gray-loose to medium dense					
-5					
-10					
416.00					
Medium to Coarse SANDY GRAVEL-gray-medium dense					
-15					
411.00					
Fine to Medium SANDY GRAVEL-gray-medium dense					
-20					

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

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ROCK CORE LOG

GSI Job No. 08212

Date 10/6/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD**

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P2-PC
Station 2035+08
Offset 32.50ft L
Ground Surface Elev. 427.50 **ft**

CORING BARREL TYPE & SIZE
Core Diameter in
Top of Rock Elev. ft
Begin Core Elev. ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Fine to Medium SANDY GRAVEL-gray-medium dense *(continued)* with some small gravel					
with some gravel					
-25					
398.50					
Medium to Coarse SAND-some small gravel-gray-medium dense to dense					
-30					
393.50					
Coarse SAND-some small gravel-gray-medium dense					
-35					
389.50					
End Of Boring @ -38.0'					
-40					

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

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 9/29/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P3
Station 2037+90
Offset 34.50ft L
Ground Surface Elev. 413.40 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 348.40 **ft**
Begin Core Elev. 348.40 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-gray & lightly weathered becoming lighter gray @ -70.5' with horizontal to wavy bedding. Some chert replacement. Numerous horizontal fractures below -71.1'. Horizontal fracture spacing of 5.0".	348.40	1	93	61		872.0
	-70					
						768.0
	338.40 -75					
LIMESTONE-light gray to gray & weathered with horizontal to wavy bedding. Some chert replacement. Numerous horizontal fractures throughout. Horizontal fracture spacing of 2.5". End Of Boring @ -75.0'		2	97	4		
	-80					918.0
	328.40 -85					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

Page: 1 of 1
GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P3
Station: 2037+90 Offset: 34.5' L Stream Bed Elevation: 413.4

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Date 9/29/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD**

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P3-CD
Station 2038+00
Offset 34.50ft R
Ground Surface Elev. 413.40 **ft**

CORING BARREL TYPE & SIZE
Core Diameter in
Top of Rock Elev. ft
Begin Core Elev. ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
SANDY GRAVEL-gray-very loose to medium dense					
with some small gravel					
408.40 -5					
SANDY GRAVEL-gray-medium dense					
-10					
-15					
-20					

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

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ROCK CORE LOG

GSI Job No. 08212

Date 9/29/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD**

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P3-CD
Station 2038+00
Offset 34.50ft R
Ground Surface Elev. 413.40 **ft**

CORING BARREL TYPE & SIZE

Core Diameter in
Top of Rock Elev. ft
Begin Core Elev. ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
SANDY GRAVEL-gray-medium dense *(continued)*					
389.40					
SANDY GRAVEL-gray-medium dense					
-25					
385.90					
SANDY GRAVEL-gray-medium dense					
-30					
381.90					
End Of Boring @ -31.5'					
-35					
-40					

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

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 10/7/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P4
Station 2043+40
Offset 56.00ft R
Ground Surface Elev. 414.60 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 351.10 **ft**
Begin Core Elev. 351.10 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-light gray to gray with horizontal to wavy bedding. Weathered with numerous horizontal fractures throughout. Some chert replacement. Horizontal fracture spacing of 5.0".	351.10		1	87	67		
		-65					
	346.10						892.0
LIMESTONE-light gray to gray with horizontal to wavy bedding. Lightly weathered with numerous horizontal fractures throughout. Some chert replacement. Horizontal fracture spacing of 3.0".			2	100	40		
		-70					
		-75					693.0
	336.10						
LIMESTONE-light gray to gray with horizontal to wavy bedding. Weathered & slightly porous with numerous horizontal fractures throughout. Some chert replacement. Horizontal fracture spacing of 4.6".			3	100	72		
		-80					
End Of Boring @ -83.5'	331.10						232.0

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P4
Station: 2043+40 Offset: 56.0' R Stream Bed Elevation: 414.6

RUN No. 1

RUN No. 2

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ROCK CORE PHOTO LOG

Page: 2 of 2
GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P4
Station: 2043+40 Offset: 56.0' R Stream Bed Elevation: 414.6

RUN No. 3

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 2

Date 10/6/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD**

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P4-CD
Station 2043+42
Offset 40.00ft L
Ground Surface Elev. 420.50 **ft**

CORING BARREL TYPE & SIZE
Core Diameter in
Top of Rock Elev. ft
Begin Core Elev. ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Fine SAND-some small Gravel & Shells-gray-very loose to loose					
-5					
413.00					
Fine Sandy SILT-dark gray-very loose					
-10					
407.50					
SILTY CLAY-gray-very soft					
-15					
402.50					
Fine to Medium SAND-some small Gravel & Shells-gray-medium dense					
-20					

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

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ROCK CORE LOG

GSI Job No. 08212

Date 10/6/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD**

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P4-CD
Station 2043+42
Offset 40.00ft L
Ground Surface Elev. 420.50 **ft**

CORING BARREL TYPE & SIZE
Core Diameter in
Top of Rock Elev. ft
Begin Core Elev. ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Fine to Medium SAND-some small Gravel & Shells-gray-medium dense *(continued)*					
-25					
-30					
-35					
383.50					
End Of Boring @ 37.0'					
-40					

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

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 9/2/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P5
Station 2045+49
Offset 15.00ft L
Ground Surface Elev. 436.70 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 349.20 **ft**
Begin Core Elev. 348.70 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Gray with horizontal bedding, becoming lighter gray @ -91.3' and wavy bedding @ -93.8'. Some light weathering in fractures. Very thin clay partings @ -91.8', -92.0' & -93.8'. Horizontal fracture spacing of 6.6". *(continued)*	-90	1	95	88		483.0
	-95					741.0
	338.70					
LIMESTONE-light gray to gray with horizontal to wavy bedding. Lightly weathered with 1/2" clay parting @ -99.3'. 4.5 " clay seam from -100.0' to -100.4'. Horizontal fracture spacing of 5.0".	-100	2	100	68		1082.0
	333.70					
End Of Boring @ -103.0' Boring Backfilled with Cuttings Upon Completion	-105					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P5
Station: 2045+49 Offset: 15.0' Left Ground Surface Elevation: 436.66

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Date 8/31/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P6
Station 2048+09
Offset 15.00ft R
Ground Surface Elev. 437.10 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 350.10 **ft**
Begin Core Elev. 349.60 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding with little weathering. 1/2"clay parting @ -92.2'. Weathered fracture from -95.8' to -96.0'. Horizontal fracture spacing of 15.0".	349.60		1	100	98		
		-90					1052.0
		-95					786.0
	339.60						
LIMESTONE-light gray to gray with horizontal to wavy bedding & lightly weathered. 1/4" clay parting @ -100.5'. 1/2" clay partings @ -101.5' & -101.7'. Horizontal fracture spacing of 7.0".			2	97	92		
		-100					864.0
		-105					1043.0
End Of Boring @ -107.5' Boring Backfilled with Cuttings Upon Completion	329.60						

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

Page: 1 of 1
GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P6
Station: 2048+09 Offset: 15.0' Right Ground Surface Elevation: 437.09

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 9/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P7
Station 2050+15
Offset 15.00ft L
Ground Surface Elev. 434.10 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 351.10 **ft**
Begin Core Elev. 350.10 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding & lightly weathering. Horizontal joint spacings of approx. 0.67'.	350.10		1	100	89		
		-85					682.0
		-90					
	340.10						447.0
LIMESTONE-Light gray to gray with horizontal to wavy bedding becoming lighter gray with horizontal bedding @ -97.0'. Lightly weathered with 4.0" clay parting from -98.2' to -98.5'. Horizontal fracture spacing of 7.6".		-95	2	100	82		
	335.10						1041.0
End Of Boring @ -99.0' Boring Backfilled with Cuttings Upon Completion		-100					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P7
Station: 2050+15 Offset: 15.0' Left Ground Surface Elevation: 434.13

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Date 9/9/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P8
Station 2051+66
Offset 15.00ft R
Ground Surface Elev. 433.20 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 351.70 **ft**
Begin Core Elev. 351.20 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding & lightly weathering. Weathered fractures @ -88.1' & -88.2'. Horizontal fracture spacing of 8.0".	351.20		1	100	90		
		-85					1100.0
		-90					920.0
LIMESTONE-Light gray to gray with horizontal to wavy bedding. lightly weathered with 3.3" clay seam from -92.8' to -93.0'. Interstratified (1/4" to 1/2") clay seams from -93.0' to -93.6'. Horizontal fracture spacing of 6.0".	341.20		2	100	77		
		-95					775.0
End Of Boring @ -97.0' Boring Backfilled with Cuttings Upon Completion	336.20	-100					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P8
Station: 2051+66 Offset: 15.0' Right Ground Surface Elevation: 433.17

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 9/14/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P9
Station 2053+16
Offset 15.00ft L
Ground Surface Elev. 434.50 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 354.50 **ft**
Begin Core Elev. 354.00 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding & lightly weathering. Weathered fractures @ -88.1' & -88.2'. Horizontal fracture spacing of 8.0".	354.00		1	100	91		
		-85					1297.0
		-90					
	344.00						982.0
LIMESTONE-Light gray to gray with horizontal to wavy bedding. Weathered from -91.4' to -92.1'. 4.0" clay seam from -92.1' to -92.44'. Horizontal fracture spacing of 6.0".			2	100	82		
		-95					1761.0
	339.00						
End Of Boring @ -95.5' Boring Backfilled with Cuttings Upon Completion		-100					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 9/17/2009
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P9
Station: 2053+16 Offset: 15.0' Left Ground Surface Elevation: 434.51

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 3/26/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P10
Station 2054+66
Offset 40.00ft R
Ground Surface Elev. 429.30 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 353.80 **ft**
Begin Core Elev. 353.30 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal bedding to wavy bedding. Some light weathering in fractures. 1/4" clay parting @ -80.9'. Weathered horizontal fractures from -81.7' to -81.9'. Horizontal fracture spacing of 9.2".	353.30		1	99	90		1006.0
		-80					
		-85					1056.0
LIMESTONE-Light gray to gray with horizontal bedding to wavy bedding. Lightly weathered with some chert replacement. 1/4" clay parting @ -86.1'. Weathered horizontal fracture zone with 1" clay parting @ -87.3' & 1.5" clay parting @ -87.6'. Horizontal fracture spacing of 4.0".	343.30		2	100	83		
		-90					728.0
End Of Boring @ -91.0'	338.30						
		-95					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 3/26/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P10
Station: 2054+66 Offset: 40.00' R Stream Bed Elevation: 429.30

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Date 3/30/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P11
Station 2056+16
Offset 15.00ft L
Ground Surface Elev. 430.70 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 353.70 **ft**
Begin Core Elev. 353.20 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray becoming darker gray from -78.0' to -81.5' with horizontal bedding to wavy bedding. Lightly weathered with some chert replacement. Horizontal fracture spacing of 7.0".	353.20		1	98	83		
							337.0
		-80					
							467.0
		-85					
	343.20						1108.0
LIMESTONE-Light gray to gray with horizontal bedding to wavy bedding. Lightly weathered with some chert replacement @ numerous horizontal fractures throughout. Horizontal fracture spacing of 4.0".			2	92	52		
		-90					
							1003.0
	338.20						
End Of Boring @ -92.5'		-95					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 3/30/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P11
Station: 2056+16 Offset: 15.00' L Stream Bed Elevation: 430.70

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Date 4/2/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P12
Station 2057+67
Offset 15.00ft R
Ground Surface Elev. 429.10 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 353.10 **ft**
Begin Core Elev. 353.10 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding, becoming darker gray from -76.4' to -81.5'. Some chert nodules. 1/4" clay partings @ -81.4' & -81.5'. Becoming weathered @-82.2'. Horizontal fracture spacing of 8.6". 353.10		1	94	82		912.0
	-80					460.0
						971.0
	-85					
343.10						
LIMESTONE-Light gray to gray with wavy bedding. Weathered with some chert replacement. 1/2" clay parting @-86.2'. Vertical fracture from -87.0' to -88.2'. Horizontal fracture spacing of 6.0".		2	100	91		799.0
	-90					
338.10						
End Of Boring @ -91.0'						
	-95					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

Page: 1 of 1
GSI Job No.: 08212
Date: 4/2/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P12
Station: 2057+67 Offset: 15.00' R Stream Bed Elevation: 429.10

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 4/6/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P13
Station 2059+18
Offset 15.00ft L
Ground Surface Elev. 429.40 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 355.90 **ft**
Begin Core Elev. 354.90 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding, becoming darker gray from -77.0' to -80.7'. Lightly weathered with some chert replacement. Horizontal fracture spacing of 7.0".	354.90	1	94	83		826.0 404.0 785.0
LIMESTONE-Light gray to gray with horizontal to wavy bedding. Lightly weathered with 3/4" clay parting @-84.6', 1.75" clay parting @ -85.8' & 1/8" clay parting @ -86.4'. Horizontal fracture spacing of 10.0".	344.90	2	83	81		1025.0
End Of Boring @ -89.5'	339.90					

-75 -80 -85 -90

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

Page: 1 of 1
GSI Job No.: 08212
Date: 4/6/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P13
Station: 2059+18 Offset: 15.00' L Stream Bed Elevation: 429.40

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 4/9/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P14
Station 2060+68
Offset 30.00ft R
Ground Surface Elev. 430.40 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 356.90 **ft**
Begin Core Elev. 356.40 **ft**

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding, becoming darker gray from -80.3' to -82.8'. 1/2" clay parting @ -82.9'. Weathered with numerous horizontal fractures from -82.9' to -84.0'. Horizontal fracture spacing of 10.0". 356.40	1	98	87		
-75					1145.0
-80					1078.0
					435.0
346.40					
End Of Boring @ -84.0'					
-85					
-90					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

Page: 1 of 1
GSI Job No.: 08212
Date: 4/9/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P14
Station: 2060+68 Offset: 30.00' R Stream Bed Elevation: 430.40

RUN No. 1

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Geotechnical, Environmental & Civil Engineering
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Naperville, Illinois 60565
(630) 355-2038

ROCK CORE LOG

GSI Job No. 08212

Page 1 **of** 1

Date 4/13/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P15
Station 2062+18
Offset 15.00ft L
Ground Surface Elev. 430.20 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 356.20 **ft**
Begin Core Elev. 355.70 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding, becoming weathered below -80.2'. Some calcite replacement in vugs . 1/2" clay parting @ -82.4'. Horizontal fracture spacing of 6.3".	355.70	-75	1	100	88		857.0
		-80					708.0
	345.70						1121.0
End Of Boring @ -84.5'		-85					
		-90					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

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ROCK CORE PHOTO LOG

Page: 1 of 1
GSI Job No.: 08212
Date: 4/13/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P15
Station: 2062+18 Offset: 15.00' Left Stream Bed Elevation: 430.20

RUN No. 1

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ROCK CORE LOG

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Date 3/26/10

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-P16
Station 2063+68
Offset 15.00ft R
Ground Surface Elev. 429.60 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 356.60 **ft**
Begin Core Elev. 356.10 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-light gray to gray with horizontal to wavy bedding. Lightly weathered with some horizontal fractures throughout. Some chert replacement below -79.3'. Horizontal fracture spacing of 1.4".	356.10	1	97	91		
	-75					687.0
	-80					1037.0
	346.10					779.0
LIMESTONE-light gray to gray with horizontal to wavy bedding. Weathered with some horizontal fractures & chert replacement throughout. 1.125" clay parting @ -85.2'. Weathered horizontal fracture zone with thin clay partings from -85.9' to -86.2'. Horizontal fracture spacing of 2.0".		2	100	88		
	-85					643.0
	341.10					
End Of Boring @ -88.5' Boring Grouted Upon Completion	-90					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

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ROCK CORE PHOTO LOG

GSI Job No.: 08212
Date: 3/26/2010
Photo By: RWC
Checked By: AJP

ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-P16
Station: 2063+68 Offset: 15.00' R Stream Bed Elevation: 429.60

RUN No. 1

RUN No. 2

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ROCK CORE LOG

GSI Job No. 08212

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Date 8/4/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-NA
Station 2065+08
Offset 15.00ft L
Ground Surface Elev. 455.00 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 356.00 **ft**
Begin Core Elev. 355.50 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-light gray with horizontal bedding-some chert. Horizontal fracture spacing of 9.5".	-100	1	98	88		802.0
	350.50					953.0
LIMESTONE-light gray with horizontal bedding-some chert. Horizontal fracture spacing of 6.0".	-105	2	95	87		435.0
	345.50					761.0
End Of Boring @ -109.5' Boring Grouted Upon Completion	-110					
	-115					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

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ROCK CORE PHOTO LOG

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ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-NA
Station: 2065+08 Offset: 15.0' Left Ground Surface Elevation: 454.98

RUN No. 1 & 2

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ROCK CORE LOG

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Date 8/20/09

ROUTE US 67 (FAP 310) **DESCRIPTION** US 67 Expressway over Illinois River **LOGGED BY** VH

SECTION 9-4: 85-1 **LOCATION** SW 1/4, **SEC.** 31, **TWP.** 1, **RNG.** 1, 3rd **PM**

COUNTY Cass and Schuyler **CORING METHOD** NX-double tube

STRUCT. NO. 009-0504
Station 2040+71

BORING NO. B-SA
Station 2029+68
Offset 15.00ft L
Ground Surface Elev. 436.90 **ft**

CORING BARREL TYPE & SIZE Solid Barrel/NX
Core Diameter 2 **in**
Top of Rock Elev. 349.40 **ft**
Begin Core Elev. 347.90 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
LIMESTONE-Light gray to gray with horizontal to wavy bedding. Lightly weathered throughout with some chert replacement. Vertical fracture with thin clay parting from -91.8' to -92.3'. Highly fractured from -92.3' to -92.8'. Horizontal fracture spacing of 19.0".	347.90	-90	1	98	87		463.0
	342.90						
LIMESTONE-Light gray to gray with horizontal to wavy bedding. Lightly weathered throughout with some chert replacement. Thin clay partings @ -96.3', & -97.8'. Vertical fracture from -97.8' to -99.0'. Horizontal fracture spacing of 3.6".		-95	2	94	43		1039.0
	337.90						
End Of Boring @ -99.0' Boring Grouted Upon Completion		-100 -105					

Color pictures of the cores Yes
Cores will be stored for examination until 5 yrs after const.
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ROUTE US 67 (FAP 310)
SECTION 9-4: 85-1 DESCRIPTION US 67 Expressway over Illinois River
COUNTY Cass and Schuyler LOCATION SW 1/4, SEC. 31, TWP. 1, RNG. 1, 3rd PM
BORING No. B-SA
Station: 2029+68 Offset: 15.0' Left Ground Surface Elevation: 436.92

RUN No. 1 & 2

009-0504 Structure Geotechnical Report
District Special Provisions
March 2011

The special provisions shown below should be reviewed prior to letting.

BRIDGE APPROACH PAVEMENT CONSTRUCTION SEQUENCE 04/12/10

Construction of the concrete pad, bridge approach pavement, and bridge approach pavement transition or flexible pavement connector shall be performed in the sequence described below. The purpose of this sequence is to minimize the potential for bridge approach pavement settlement.

1. New embankment shall be completed to finished earth grade between the plan limits of abutment excavation and a point 300 ft behind the abutment.

2. A minimum waiting period of 4 months shall elapse between the completion of embankment and excavation for the approach pavement concrete pad.
   2a. An additional settlement waiting period may be included in a separate Settlement Waiting Period special provision. The 4 month period described in item 2 is considered part of the total settlement waiting period.
   2b. When paving in the vicinity of the structure will not immediately follow the waiting periods described in items 2 and 2a, the waiting period should be extended until 2 weeks prior to paving.

3. Excavation for the concrete pad and concrete pad construction shall be performed.

4. Bridge approach pavement and transition/connector pavement shall be constructed.

The waiting period described in items 2, 2a, and 2b does not apply to lime modification beneath the bridge approach transition/connector pavement. However, the lime modified soil shall not be trimmed until the end of the waiting period. The waiting period may be reduced by the Engineer based on settlement platform data.

This work will not be paid for separately but shall be included in the contract price for Bridge Approach Pavement. Settlement platforms will not be paid for separately but shall be included in the contract price for pay items associated with fill placement.

SN 009-0504 SOUTH APPROACH EMBANKMENT FILL RESTRICTION

Designer Note: A detail will be developed for the grading plans to accompany this special provision.

Granular material shall be used to construct embankment between STA 2028+00 and 2030+25. The granular material shall consist of sand with less than 20% passing the #200 sieve. Granular material is restricted to the interior of the embankment and shall be encapsulated according to the Special Provision for Embankment.

This work will not be paid for separately, but shall be included in the contract price for earth excavation, borrow, and/or furnished excavation.