STRUCTURE GEOTECHNICAL REPORT

RAMP G OVER RAMP F
(STATION 724+26.33)
Proposed SN: 010-1002

FAI RTE. 57/74
Section 10 (5-1-RS-1, 14-1,6) R
Champaign County

Contract No.: 70897
P-95-030-11
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Attachments: Boring Location Map
Preliminary TS&L
Subsurface Boring Logs
Boring Profile Sheet
Pile Tables
Est. Factored Loadings

1.0 Introduction

The purpose of this geotechnical study is to explore the existing subsurface conditions present at the proposed structure location (SN 010-1002) (Station 724+26.33 – Ramp G) carrying I-74 over I-57 (Ramp G over Ramp F) in Section 10R, Township 20 North, Range 8 East of the 3rd PM in the city of Champaign, Champaign County, Illinois.

The purpose of the investigation was to explore the subsurface conditions, to determined engineering properties of the subsurface soil, and develop design and construction recommendations for the project.

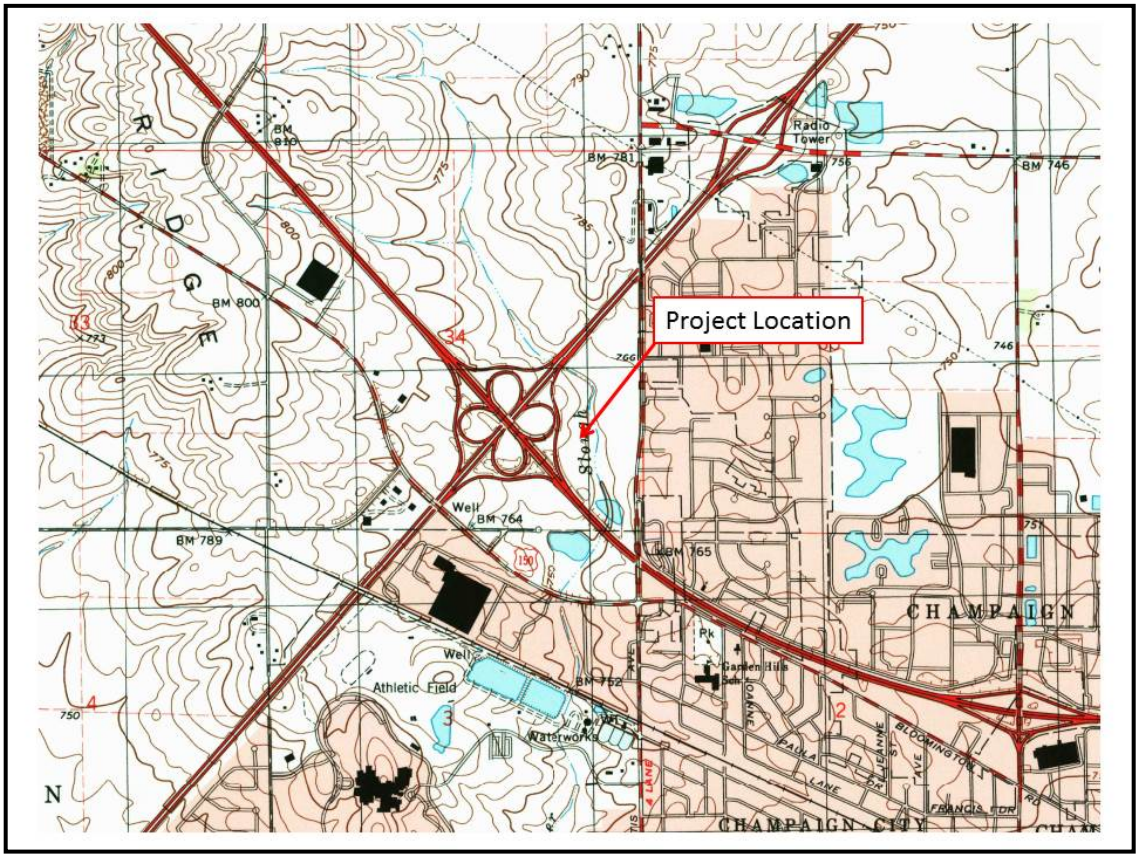


Exhibit 1: Project Location Map

2.0 Proposed Structure Information

Proposed Structures (SN 010-1002)

Based on the preliminary TS&L, the proposed structure (SN 010-1002), Station 724+26.33 will consist of a single span supported by one of two abutment options that are being considered. Two new 30 feet long approach slabs will be constructed on either end of the bridge.

The first abutment option is a PPC Bulb Tee (IL63-2438) on integral abutments with an estimated abutment length of 35' – 8". The superstructure will consist of tangent girders on a curved alignment with back to back abutment distances of 128'-1 ¼". Abutments will bear on single row of vertical steel piles.

The second abutment option is Steel Plate Girder with a 60 inch web depth on stub abutments with an abutment length of 34' – 0". The superstructure for this option would include a curved girder on curved alignment with back to back abutment distances of 129'-1 ¼". Abutments for this type of abutment will bear on two rows of piles with vertical back row and 12:3 battered pile front.

Final abutment type will be chosen based on efficiency, cost and district preference. The Type, Size and Location (TS&L) plan for the Ramp G over Ramp F has been included in the Appendix.

3.0 Existing Site Conditions

The existing location of the proposed structure is currently vacant land with elevation ranges from Elev. 753.34 to 753.94. Embankments heights of between approximately 37 to 38 feet in height are proposed in the general area.

3.1 Regional Geology

According to the Illinois State Geological Survey, "Bedrock Geology of Illinois" map, the site and surrounding area is situated in the Illinois Basin and is underlain by the Pennsylvanian-aged Tradewater Formation. The Illinois Basin is a Paleozoic depositional and structural basin centered in and underlying most of the state of Illinois. An Illinois Basin study reveals that the Tradewater Formation is composed of 70 to 80 percent shale and siltstone, 20 to 30 percent sandstone, and generally less than 5 percent coal and limestone. The Tradewater Formation is overlain by the Wedron Group, which is composed of mostly glacial till (an unsorted mixture of clay, silt, sand, and gravel) in broad ridges (last glaciation), and forms end moraines. The Wedron Group is finally capped by the

Peoria and Roxana Silts, which are composed of windblown silt (loess) generally thicker than 20 feet blankets upland surfaces in these areas.

4.0 Subsurface Exploration and Generalized Subsurface Conditions

This section describes the subsurface exploration program and laboratory testing program completed as part of this Structure Geotechnical Report (SGR). The locations and subsurface data were provided by McCleary Engineering and were completed based on field conditions and accessibility. Therefore, no site observations have been made by BFW relative to existing conditions of the structure, roadway or of subsurface sample conditions. The locations of the soil borings are shown on the Boring Location Map located in the Appendix. The subsurface exploration program was performed in accordance with applicable IDOT geotechnical manuals and procedures.

4.1 Subsurface Exploration

The site subsurface exploration was conducted from January 29, 2015 and included advancing a total of three (3) standard penetration test (SPT) borings within the vicinity of the proposed abutments and bridge pier locations. The locations of the soil borings are shown on the **Boring Location Map** provided in the Appendix.

Table 1 – Summary of Subsurface Exploration US 150

Boring ID	Location	Station	Offset	Depth (feet)	Surface Elevation (feet)
B-28	South Abutment	723+35.1	0 .0	75	753.34
B-29	North Abutment	724+83.83	0.0	75	753.94
B-38/39	Pier (N/A)	723+94.08	2.92 LT	75	753.44

The soil borings were drilled using a track mounted drill rig. All of the borings were drilled using 3¼ - inch I.D. hollow stem augers. Soil sampling was performed according to AASHTO T 206, "Penetration Test and Split Barrel Sampling of Soils." Soil samples were obtained at 2.5 foot intervals to a minimum depth of 20 feet below existing grade and 5 foot intervals thereafter. McCleary Engineering field representative inspected, visually classified and logged the soil samples during the subsurface exploration activities, and performed unconfined compressive strength tests on cohesive soil samples using a calibrated Rimac compression tester and a calibrated hand penetrometer in accordance with IDOT procedures and requirements. Representative soil samples were collected from each sample interval, and were placed in jars and returned to the laboratory for further testing and evaluation.

4.2 Laboratory Testing

All samples were inspected in the laboratory to verify the field classifications. A laboratory testing program was undertaken to characterize and determine engineering properties of the subsurface soils encountered in the area of the proposed bridge.

The following laboratory tests were performed on representative soil samples:

- Moisture content ASTM D2216 / AASHTO T-265
- Grain Size Analysis ASTM C136 / AASHTO T-88 / AASHTO T-90
- Unconfined compression ASTM D2166 / AASHTO T-208

The laboratory tests were performed in accordance with test procedures outlined in the IDOT Geotechnical Manual (1999) and per ASTM and AASHTO requirements. Based on the laboratory test results, the soils encountered were classified according to the AASHTO classification system. The results of the laboratory testing program are included in the Appendix and are shown along with the field test results in the Soil Boring Logs also located in the appendix.

4.3 Subsurface Conditions

This section provides a brief description of the soils encountered in the borings performed in the vicinity of the proposed improvements. Variations in the general subsurface soil profile were noted during the drilling activities. Detailed descriptions of the subsurface soils are provided in the Soil Boring Logs located in the Appendix and are shown graphically in the Subsurface Profiles. The soil boring logs provide specific soil conditions encountered at each soil boring location. The soil boring logs include soil descriptions, stratifications, penetration resistance, elevations, location of the samples and laboratory test data. Unless otherwise noted, soil descriptions indicated on boring logs are visual identifications. The stratifications shown on the boring logs represent the conditions only at the actual boring locations, and represent the approximate boundary between subsurface materials; however, the actual transition may be gradual.

Subsurface information was obtained during a geotechnical investigation conducted over the entire proposed I-57 / I-74 interchange modifications. Borings B-29, B-28 and B-38/39 were advanced in support of Proposed Structure 010-1002 on January 29, 2015 along the proposed ramp alignment.

Bridge Abutments

Boring **B-28**, was advanced near the proposed south abutment, located at Station 723+35.10 (Elev. 753.34'). The boring was advanced in a relatively flat area, with approximately 12 inches of topsoil overlying the soil at each location. The soil profile underlying the topsoil in boring **B-28** is described as a black stiff silty clay with organics, which extends to approximately 3 feet deep (Elev. 750.34'), where the material transitions to a soft brownish gray silty clay loam. The soils had SPT N-values ranging from 5 to 7 and unconfined compressive strength (Qu) values from 0.49 to 1.71 By approximately 6 feet (Elev. 747.34'), the soil transitions to a medium brown coarse to fine brown sand with firm to very firm consistency. The sand continues with depth, becoming saturated. This soil had SPT N-values ranging from 10 to 29. By approximately 16.5 feet deep (Elev. 736.84'), a gray stiff silty clay till is encountered, extending deeper to approximately 32 feet deep (Elev. 721.34'). The soil had SPT N-values ranging from 13 to 15 and unconfined compressive strength (Qu) values from 1.81 to 2.37. At this depth, the material changes to a gray dense clayey sand and continues to approximately 37.5 feet deep (Elev. 715.84') where the material changes back to a gray silty clay till, very stiff with trace gravel. By approximately 39.5 feet, the gravel is no longer evident and the stiff gray silty clay till extends to boring completion depth of 75 feet deep (Elev. 678.34'). The soil had SPT N-values ranging from 13 to 21 and unconfined compressive strength (Qu) values from 0.99 to 2.55.

Boring **B-29**, advanced near the proposed north abutment was located at Station 724+83.83 (Elev. 753.94'). In boring **B-29**, underlying the topsoil layer is a moist stiff gray to brown silty clay is encountered. By approximately 1 feet deep (Elev. 752.94'), the material changes to a soft brown silty clay loam. At approximately 5.5 feet deep (Elev. 748.44'), the soil changes to a brown medium dense, wet, coarse, sand. The soil had SPT N-values ranging from 5 to 24. By approximately 13 feet deep, the coarse sand becomes mixed with fine gravel, with medium dense consistency, and extends to approximately 16 feet deep (Elev. 737.94'), where the soil changes to a gray stiff silty clay. This silty clay, with some sand and gravel layering, continues with depth to approximately 33 feet deep (Elev. 720.94'), The soil had SPT N-values ranging from 13 to 22 and unconfined compressive strength (Qu) values from 2.27 to 2.89. From this depth the soil changes to a gray loose wet coarse sand. This sand continues with depth to approximately 44 feet deep (Elev. 709.94'). The soil had SPT N-values ranging from 8 to 14. The soil changed to a gray stiff silty clay till. This clay till soil continues with depth to boring completion depths of 75 feet deep (Elev. 678.94'). The soil had SPT N-values ranging from 17 to 30 and unconfined compressive strength (Qu) values from 1.81 to 3.60.

Borings **B-38 and B-39**, were originally intended as separate pier location boring but were combined to one boring **B-38/39** located at Station 724+09.29. Based on the preliminary TS&L the structure now has a single span and therefore no pier will be used. Boring **B-38/39** is presented for additional soils data. In boring **B-38/39**, underlying the topsoil layer is a moist stiff gray to brown silty clay is encountered. By approximately 3.5 feet deep (Elev. 749.94'), the material changes to a loose brown silty sand which increase in density with depth. At approximately 9.5 feet deep (Elev. 743.94'), the soil changes to a brown clayey silt where it transitions rapidly between clayey silt to sand to clayey silt loam and sand and gravel within the next 5 feet. The soil had SPT N-values ranging from 17 to 21. By approximately 14.5 feet deep, a stiff, wet gray silty clay is encountered and extends to approximately 27 feet deep (Elev. 726.44'), where the soil changes to a stiff gray silty clay till. This silty clay till had SPT N-values ranging from 14 to 55 and unconfined compressive strength (Qu) values from 1.98 to 2.89. This silty clay till soil continues with depth to boring completion depths of 75 feet deep (Elev. 678.44').

4.4 Groundwater Conditions

Water levels were checked in each boring to determine the general groundwater conditions present at the site and were measured while drilling and after each boring was completed.

Groundwater was identified in each boring as follows:

Table 2 – Groundwater Elevations

Boring	Groundwater Elevation (At time of drilling)	Groundwater Elevation (24-hours)
B-28 (South Abut)	746.3	N/A
B-29 (North Abut)	743.9	N/A

No 24-hour groundwater readings were noted. No streambed elevations or surface water elevations were noted.

Water level readings were made in the boreholes at times and under conditions shown on the boring logs and stated in the text of this report. However, it should be noted that fluctuations in groundwater level may occur due to variations in rainfall, other climatic conditions, or other factors not evident at the time measurements were made and reported.

5.0 Geotechnical Evaluations

The section provides geotechnical analysis and recommendations for the design of the proposed bridge based on the results of the field exploration, laboratory testing, and geotechnical analysis.

5.1 Derivation of Soil Parameters for Design

Unit weights, friction angles and shear strength parameters were estimated using soil shear strength values and standard penetration test (SPT) using published correlations for N values results. **Table 3** - presents generalized soil parameters to be used based for designs on the laboratory and in-situ testing data:

Table 3 – Summary of Soil Parameters

Approximate Depth / Elevation (feet)	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained	
			Cohesion c (psf)	Friction Angle Φ (degrees)	Cohesion c (psf)	Friction Angle Φ (degrees)
748' to surface	Silty Clay	120	500	0	100	28
737 - 748	Sand / Sand & Gravel	130	0	34	0	34
728 – 737	Silty Clay	125	2,500	0	125	28

5.2 Settlement

The new approach slabs on either end of the bridge will be supported by new engineered fill. It is anticipated that approximately 38 feet (at the North abutment) and 37 feet (at the South abutment) will be placed at the new embankment approaches. Based on preliminary settlement calculations, the increase in stress due to the increase in fill would produce settlements in the range of less than 4-inch near the north and south abutments due to the consolidated nature of the site with interspersed dense sand lenses. The anticipated settlement should not adversely affect the approach pavements due to due primary settlement occurring during construction activities.

Piles are anticipated to be used at the bridge abutments and it is necessary to ensure by the use of settlement plates, enough settlement has taken place such that 0.4-inches or less of settlement remain prior to the installation of the piles to minimize the effects of any down drag forces on the piles. If this is not acceptable under an accelerated construction schedule, the SGR author should be contacted in order to provide alternate solutions that deal with downdrag issues. These solutions may include the use of wick drains to speed up settlement, or the use of precoring, or accounting for downdrag in the pile design (if possible.)

It is recommended that Settlement Platforms be constructed near Station 723+30 Offset 15' Rt. for the south abutment and Station 724+90 Offset 15' Lt for the northern abutment.

Settlement plates shall be installed prior to embankment construction for monitoring the rate and amount of settlement throughout the embankment construction.

5.3 Slope Stability – Bridge Abutments

The proposed construction of Ramp G over Ramp F involves the construction of new abutments with end slopes. The proposed abutments types being considered are integral or stub with endslopes at 2 horizontal to 1 vertical (2H:1V). Slope stability of the bridge abutments was evaluated using a slope stability analysis software: *GSTABL7 with STEDwin.*

The proposed side slopes were analyzed based on the grading and the soils encountered during subsurface exploration. Three analyses were evaluated using the Bishop and Janbu analyses methods for the proposed slope geometry: end-of-construction (short term - undrained), long-term (drained) and a design seismic event. The analyses were performed using the soil parameters in Table 3 above. A critical factor of safety (FOS) was calculated for each condition. According to the current standard of practice, the target FOS is 1.5 for end-of-construction and long-term slope stability and 1.0 for the design seismic event.

In an effort to model the end-of-construction conditions, full cohesion we used with a friction angle of 0 degrees assumed. Nominal values for cohesion were used with full friction angle to model the long-term and seismic conditions to analyze the condition where pore water pressure has dissipated. The results of the analysis are shown on the following page in Table 4.

Based on the analysis performed, the proposed slopes meet the minimum required factor of safety of 1.5 (end-of-construction, long-term) and 1.0 (seismic).

Table 4 – Stability Analysis Results – Bridge Abutments

Boring Location	Slope	Calculated Critical FOS		
		End-of-Construction	Long Term	Seismic
B-28, South Abut	2H:1V	2.8	1.7	1.5
B-29, North Abut	2H:1V	2.8	1.6	1.5

5.4 Seismic Parameters

The seismic hazard for the site was analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRDF Bride Design Specifications. The Seismic Soil Site Class was determined per the requirements of All Geotechnical Manual Users (AGMU) Memo 9.1, Design Guide for Seismic Site Class Determination, and the "Seismic Site class Determination" Excel spreadsheet provided by IDOT.

The proposed bridge has a total length less than 130 feet, with no single span longer than 200 feet, therefore, a global Site Class Definition was determined for this project. Based on the seismic hazard maps the following coefficients should be used in design:

$\mathbf{S_s}$=0.146 g, $\mathbf{F_a}$=1.60; therefore Design Spectral Accelerations at 0.2 sec, ($\mathbf{S_{Ds}}$)=0.233g
$\mathbf{S_1}$=0.056 g, $\mathbf{F_v}$=2.40; therefore Design Spectral Accelerations at 1.0 sec, ($\mathbf{S_{D1}}$)=0.135g

According to Table 3.10.3.1-1 (Site Class Definitions) of the 2008 AASHTO LRFD Manual, the project site soil profile is most accurately described as the AASHTO Soil Site Class D. According to Table 3.10.6-1 (Seismic Zones) of the 2008 AASHTO LRFD Manual, the Seismic Performance Zone is most accurately described as (SPZ)=1 (F_vS_1#0.15)

Liquefaction analysis was conducted using Design Guide AGMU Memo 10.1 – Liquefaction Analysis. As noted in the previous paragraph the Seismic Performance Zone (SPZ) is SPZ – 1 and the Peak Ground Acceleration (PGA) modified by the zero-period site factor, F_{pga} is less than 0.15. Therefore, no liquefaction of soil layers is anticipated to occur.

Table 5 – Seismic Coefficients Summary Table

Seismic Performance Zone (SPZ)	1
Design Spectral Acceleration at 0.2 sec. ($\mathbf{S_{DS}}$)	0.233 g
Design Spectral Acceleration at 1.0 sec. ($\mathbf{S_{D1}}$)	0.135 g
Soil Site Class	D

5.5 Scour

The proposed bridge structure carrying Ramp G will cross over Ramp F and no waterways are in the vicinity of the proposed project; therefore, scour will not be a concern for this project.

5.6 Mining Activity

Based on a review of the Illinois State Geological Survey's on-line collection of County Coal Maps and Directories, the proposed structure is not located over a mine or mined out area.

5.7 Liquefaction

Based on the AGMU Memo 10.1 – Liquefaction Analysis Seismic Performance Zones 3 and 4 required liquefaction analysis, as well as, SPZ 2 with a Peak Seismic Ground Surface Acceleration, As equal to or greater than 0.15. The subject site is in SPZ 1 with a less than 0.15. Therefore liquefaction was not considered as a reduction for the pile design capacity or other foundation considerations included herein.

5.8 Approach Slabs

Based on information from the structural engineer, the approach slabs are 30 feet in length and will be cast-in-place. In accordance with the IDOT Bridge Manual, BFW evaluated the foundation soils at the approach slabs for bearing capacity and excessive settlement. With proper compaction of the approach subgrades, the bearing capacity and settlement requirements of the IDOT Bridge manual will be satisfied.

6.0 Foundation Type Evaluation and Design Recommendations

6.1 Foundation Type Feasibility

Based on the preliminary TS&L, the proposed structure (SN 010-1002), Station 724+26.33 will consist of a single span supported by one of two abutment options that are being considered. Two new 30 feet long approach slabs will be constructed on either end of the bridge.

The first abutment option is a PPC Bulb Tee (IL63-2438) on integral abutments with an estimated abutment length of 35' – 8". The superstructure will consist of tangent girders on a curved alignment with back to back abutment distances of 128'-1 ¼". Abutments will bear on single row of vertical steel piles.

The second abutment option is Steel Plate Girder with a 60 inch web depth on stub abutments with an abutment length of 34' – 0". The superstructure for this option would include a curved girder on curved alignment with back to back abutment distances of 129'-1 ¼". Abutments for this type of abutment will bear on two rows of piles with vertical back row and 12:3 battered pile front.

The proposed abutment type for this structure is either integral or stub depending on the type of superstructure chosen. According to the IDOT Bridge manual, Section 3.8.3 on Integral Abutments, metal shell or HP-piles are permitted based on the overall length of the bridge. Metal shell or HP-piles are also permitted for stub abutment.

6.2 Driven Pile Supported Foundations

Piles considered for this site include HP-piles and metal shell piles. The Modified IDOT static method Excel spreadsheet was used to estimate the pile lengths at various axial geotechnical resistances for driven piles per AGMU Memo 10.2. Tables 7 and 8 summarize the estimated pile lengths at various axial resistances for metal shell piles and HP-piles various sizes piles for the integral abutment option (Tangent Girder on Curved Alignment)

Tables 9 and 10 summarize the estimated pile lengths for various metal shell piles and HP-piles for the stub abutment option (Curved Girder on Curved Alignment). The complete IDOT Pile Design Tables for each substructure are included in the Appendix.

The factored resistance includes reduction for the geotechnical resistance of 0.55 for the pile installation. Based on the results of the subsurface investigation no geotechnical losses due to down drag or liquefaction were included in the axial pile capacity calculations. The anticipated factored structural loadings were obtained from the structural engineer and are provided in Table 6 on the following page.

The Nominal Required Bearing (R_N) represents the resistance the pile will experience during driving as well as assists the contractor in selecting a proper hammer size. The Factored Resistance Available (RF) documents the net long-term axial factored pile capacity available at the top of the pile to support factored substructure loads.

The pile cutoff elevations used for analysis were Elev. 782.51 and Elev. 785.04 for the North and South abutments, respectively for the PPC Bulb Tee option and Elev. 781.73 and 784.03 for the Steel Plate Girder option. The pile cutoff elevation included a 2 feet embedment into the integral abutment for the PPC Bulb Tee option and a 1 feet embedment into the abutment for the stub abutment as required by the Bridge Manual.

Pile shoes should be used for the metal shell due to presence of cobbles within the borings. Pile shoes HP piles should not be required due to the subsurface conditions and the absence of bedrock

Due to the relative consistency between the soil test borings, only one test pile should be required for abutments. A test pile is performed prior to production driving so that actual, on-site field data can be gathered to further evaluate pile driving requirements for the project. This is also the time in which the contractor's proposed equipment and methodologies identified in their Pile Installation Plan can be assessed.

Table 6: Structural Loadings

I-57 - I 74 INTERCHANGE STRUCTURES Information for Geotechnical Engineering SGR's 03.24.2015				
Structure: RAMP G over RAMP F S.N. 010-1002 No. of Spans: 1			Station 724+26.33	
Option No.	**Superstructure Type / Option**		**Substructure**	
1	Details	**PPC BULB TEE IL63-2438** Superstructure: Tangent Girder on Curved Alignment		
		Substructure Element	ABUT 1	ABUT 2
		Abutment Type: (Integral, Semi Integral, Stub, etc.)	Integral *	Integral *
		Pier Type	n/a	n/a
		Deck Joints	n/a	n/a
		Bearing Type	Fixed	Fixed
		Est. Bottom of Abutment Elevation	780.51	783.04
		Est. Abutment Length	35'-8"	35'-8"
		Est. Pier Bottom of Footing	n/a	n/a
		Est. Pier Footing Dimensions	n/a	n/a
		Total Factored Vertical DL + LL	2,000 Kips *	2,000 Kips *
		Additional Notes / Comments	Single row of vertical steel piles. * Dynamic Load Allowance (IM) included for integral abutment.	
2	Details	**STEEL PLATE GIRDER, WEB DEPTH = 60 IN.** Superstructure: Curved Girder on Curved Alignment	**Substructure**	
		Substructure Element	ABUT 1	ABUT 2
		Abutment Type: (Integral, Semi Integral, Stub, etc.)	Stub	Stub
		Pier Type	n/a	n/a
		Deck Joints	Strip Seal	Strip Seal
		Bearing Type	Elastomeric	Elastomeric
		Est. Bottom of Abutment Elevation	780.73	783.03
		Est. Abutment Length	34'-0"	34'-0"
		Est. Pier Bottom of Footing	n/a	n/a
		Est. Pier Footing Dimensions	n/a	n/a
		Total Factored Vertical DL + LL	1,382 Kips **	1,382 Kips **
		Additional Notes / Comments	Two rows of piles. Vertical back row, 12:3 battered front row. ** Dynamic Load Allowance (IM) not included.	

6.3 Shallow Foundations

Based on the soils encountered, the new span lengths and the amount of embankment fill, shallow foundations are not a feasible option for the proposed substructures of the bridge. It is anticipated that shallow foundations designed for the loads provided will undergo settlement and therefore will not be a feasible option and are not discussed in the report.

Design Capacity Limitations

There are no downdrag, liquefaction, scour, or settlement issues at this structure that would result in the loss of capacity of the piling. Therefore, no design capacity limitations are necessary.

6.4 Lateral Load Resistance

Lateral loadings applied to pile foundations are typically resisted by battering selected piles, the soil/structure interaction, pile flexure, or a combination of these factors. Based on information provided by the structural engineer the lateral loads were anticipated to be less than 3 kips.

Section 3.10.1.10 of the 2012 IDOT Bridge manual requires performing detailed structure interaction analysis if the factored lateral loading per pile exceeds 3 kips. The analysis shall determine actual pile moment and deflection to determine the selected pile adequacy for the existing loadings. Generally, the geotechnical engineer provides soil parameters to the structural engineer so that an L-Pile program, or other approved software, can be used for the lateral or displacement analysis of the foundations. **Table 7** is included for the structural engineer's use in determining lateral pile response, if required. The values were estimated based on the descriptions listed on the boring logs, SPT and laboratory data.

Table 7 - Soil Parameters for Static Lateral Load Analysis

Soil Type	Angle of Internal Friction (degrees)	Undrained Shear Strength (psf)	Static Soil Modulus, k (pci)	Soil Strain Parameter E50	Effective Unit Weight (pcf)	Moist Unit Weight (pcf)
Silty Clay Loam	28	1500	300	0.010	57.6	120
Silty Clay Till	28	2000	500	0.005	62.6	125

Pile Capacity Tables (Tables 8 & 9)
(PPC Bulb Tee Option – Integral Abutment)

Table 8 – North Abutment

Piling Driven at North Abutment (B-29 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 12" Φ w/0.25 walls		
203	112	37
204	112	47
217	119	50
233	128	52
353*	194*	54
Metal Shell 14" Φ w/0.25" walls		
139	76	34
243	134	47
257	142	50
275	151	52
413*	227*	54
Metal Shell 14" Φ w/0.312 walls		
139	76	34
243	134	47
257	142	50
275	151	52
513*	282*	54
HP 12 x 53		
275	151	85
297	163	90
327	180	95
354	195	100
368**	202**	102
HP 12 x 74		
303	167	90
334	184	95
363	199	100
376	207	102
430**	237**	105
HP 14 x 73		
357	196	90
395	217	95
427	235	100
444	244	102
513**	282**	105

Table 9 – South Abutment

Piling Driven at South Abutment (B-28 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 12" Φ w/0.25 walls		
219	121	50
247	136	55
264	145	58
279	153	60
353*	194*	62
Metal Shell 14" Φ w/0.25" walls		
260	143	50
292	160	55
311	171	58
329	181	60
413*	227*	62
Metal Shell 14" Φ w/0.312 walls		
260	143	50
292	160	55
311	171	58
329	181	60
513*	282*	62
HP 12 x 53		
299	165	85
314	173	90
354	194	95
381	209	100
368**	202**	103
HP 12 x 74		
306	168	85
321	176	90
362	199	95
389	214	100
393**	216**	103
HP 14 x 73		
359	197	85
375	206	90
427	235	95
459	252	100
460**	253**	103

*- Maximum Nominal Required Bearing
** - Nominal Required Bearing at End of Boring Data

Pile Capacity Tables (Tables 10 & 11)

(Steel Plate Girder Option – Stub Abutment)

Table 10 – North Abutment

Piling Driven at North Abutment (B-29 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 12" Φ w/0.25 walls		
203	112	36
204	112	46
217	119	49
233	128	51
353*	194*	53
Metal Shell 14" Φ w/0.25" walls		
139	76	33
243	134	46
257	141	49
275	151	51
413*	227*	53
Metal Shell 14" Φ w/0.312 walls		
139	76	33
243	134	46
257	141	49
275	151	51
513*	282*	55
HP 12 x 53		
286	158	86
308	169	91
340	187	96
355	195	99
368**	202**	101
HP 12 x 74		
293	161	86
315	173	91
348	191	96
363	200	99
430**	237**	104
HP 14 x 73		
345	190	86
371	204	91
411	226	96
428	235	99
514**	283**	104

Table 11 – South Abutment

Piling Driven at South Abutment (B-28 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 12" Φ w/0.25 walls		
233	128	52
248	136	54
264	145	57
280	154	59
353*	194*	61
Metal Shell 14" Φ w/0.25" walls		
276	152	52
293	161	54
312	172	57
330	182	59
413*	227*	61
Metal Shell 14" Φ w/0.312 walls		
276	152	52
293	161	54
312	172	57
330	182	59
513*	282*	61
HP 12 x 53		
306	168	87
341	187	92
368	202	97
381	210	99
385**	212**	102
HP 12 x 74		
313	172	87
349	192	92
376	207	97
390	215	99
393**	216**	102
HP 14 x 73		
366	201	87
411	226	92
443	244	97
459	253	99
461**	254**	102

*- Maximum Nominal Required Bearing
** - Nominal Required Bearing at End of Boring Data

6.5 Wingwall Foundation Recommendations

Based on information provided by the structural engineer and the preliminary TS&L the wing walls for the integral abutment will be cantilever in design and will not rely on soil bearing.

7.0 Construction Considerations

All work performed for the proposed project should conform to the requirements in the IDOT Standard Specifications for Road and Bridge Construction (2012) and the Supplemental Specifications and Recurring Special Provisions (2015). Any deviation from the requirements in the manuals above should be approved by the design engineer.

7.1 Groundwater Management

Based on the depth of groundwater observed in the borings, significant groundwater management is not anticipated for bridge construction. The contactor should control groundwater and surface water infiltration to provide construction in dry condition. Temporary ditches, sumps, granular drainage blankets, stone ditch protection, or hand-laid riprap with geotextile underlayment could be used to divert groundwater if significant seepage is encountered during construction. If water seepage occurs during footing or where wet conditions are encountered such that the water cannot be removed with conventional sumping, we recommend placing open grade stone similar to IDOT CA-7 to stabilize the bottom of the excavation.

The CA-7 stone should be placed to 12 inches about the water table, in 12-inch lifts, and should be compacted with the use of a heavy smooth drum roller or heavy vibratory plate compactor until stable. The remaining portion of the excavation beneath the footing should be backfilled using approved structural fill.

7.5 Temporary Sheeting and Soil Retention

Ramp G over Ramp F is new construction and will not encounter traffic until completion therefore, temporary sheeting and/or soil retention will not be required for this structure

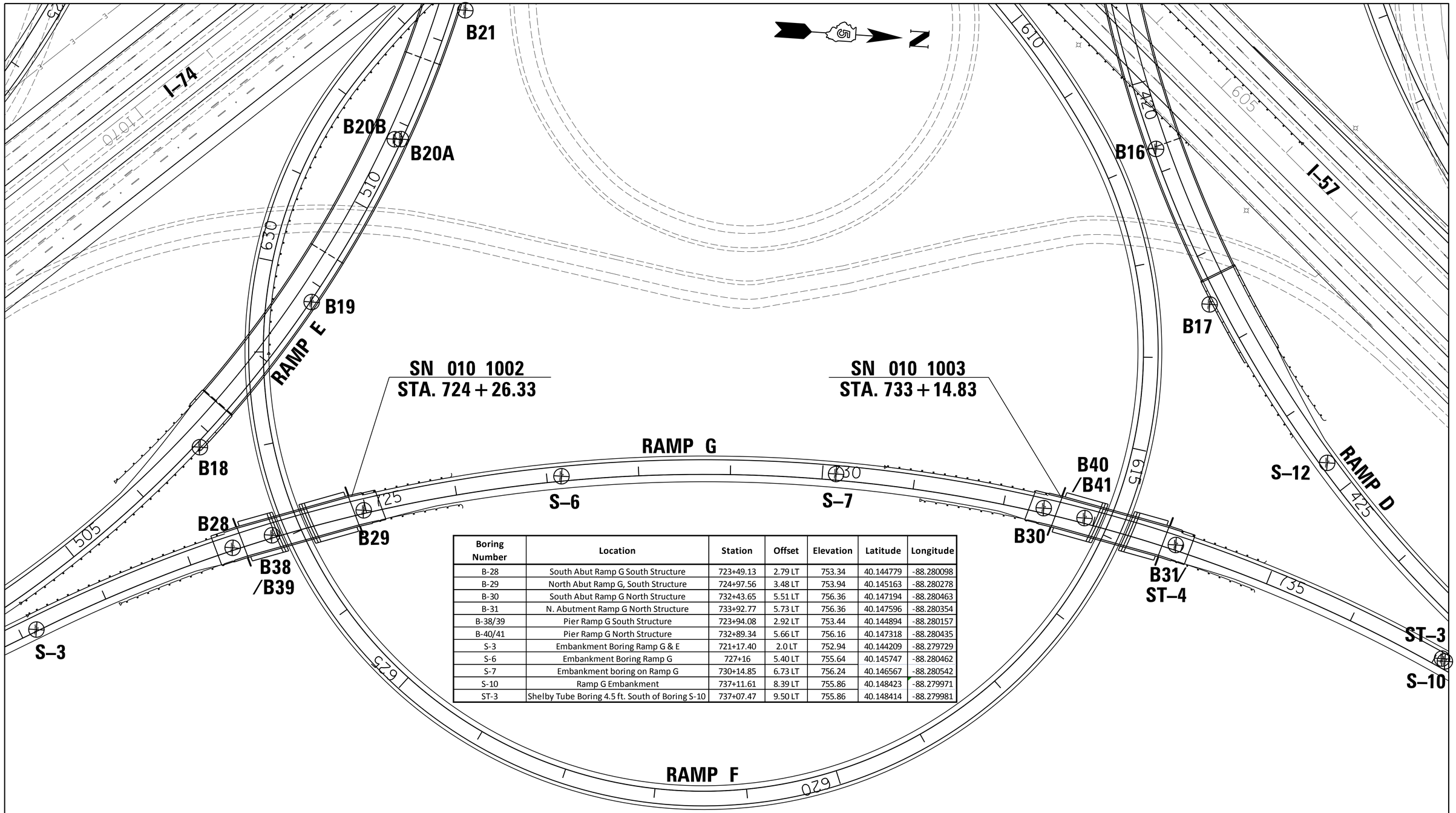
8.0 Limitations

This report has been prepared for the exclusive use of the Illinois Department of Transportation and its structural consultant. The recommendations provided in the repot are specific to the project described herein, and are based on the information obtained from the soil boring locations within the project limits. The analysis have been performed and the

recommendations have been provided in this report are based on subsurface conditions determined at the location of the borings. The report may not reflect all variations that may occur between boring locations or at some other time, the nature and extend of which may not become evident until during the time of construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and review the recommendations provided herein in light of the new conditions

Appendix A

Soil Boring Location Map



Boring Number	Location	Station	Offset	Elevation	Latitude	Longitude
B-28	South Abut Ramp G South Structure	723+49.13	2.79 LT	753.34	40.144779	-88.280098
B-29	North Abut Ramp G, South Structure	724+97.56	3.48 LT	753.94	40.145163	-88.280278
B-30	South Abut Ramp G North Structure	732+43.65	5.51 LT	756.36	40.147194	-88.280463
B-31	N. Abutment Ramp G North Structure	733+92.77	5.73 LT	756.36	40.147596	-88.280354
B-38/39	Pier Ramp G South Structure	723+94.08	2.92 LT	753.44	40.144894	-88.280157
B-40/41	Pier Ramp G North Structure	732+89.34	5.66 LT	756.16	40.147318	-88.280435
S-3	Embankment Boring Ramp G & E	721+17.40	2.0 LT	752.94	40.144209	-88.279729
S-6	Embankment Boring Ramp G	727+16	5.40 LT	755.64	40.145747	-88.280462
S-7	Embankment boring on Ramp G	730+14.85	6.73 LT	756.24	40.146567	-88.280542
S-10	Ramp G Embankment	737+11.61	8.39 LT	755.86	40.148423	-88.279971
ST-3	Shelby Tube Boring 4.5 ft. South of Boring S-10	737+07.47	9.50 LT	755.86	40.148414	-88.279981

0 50 100 150
SCALE IN FEET

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED –	REVISED –
		DRAWN –	REVISED –
$MODELNAME$	PLOT SCALE = $SCALE$	CHECKED –	REVISED –
	PLOT DATE = $DATE$	DATE –	REVISED –

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RAMP G
(I–57/I–74 INTERCHANGE)

SCALE: | SHEET OF SHEETS | STA. | TO STA.

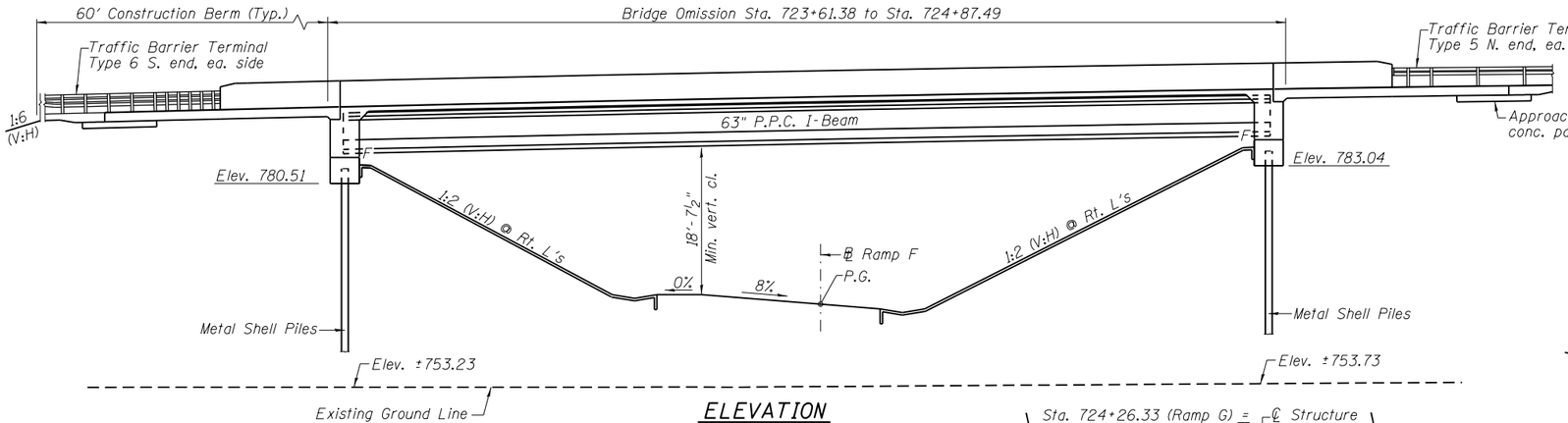
F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57/74	10(5-1-RS-1, 14-1, 6)R	CHAMPAIGN		
		CONTRACT NO. 70897		
	ILLINOIS	FED. AID PROJECT		

Appendix B

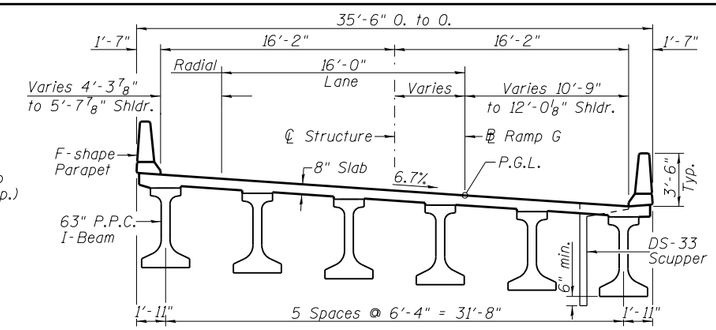
Preliminary TS&L

Bench Mark: Chiseled "□" on top of N.W. corner of light pole foundation #50-107 on Ramp DB, Sta. 1068+46.46 Elev. 769.173

Existing Structure: None No Salvage

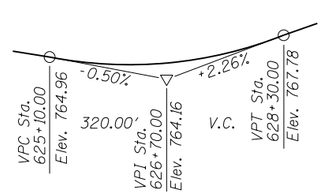


ELEVATION



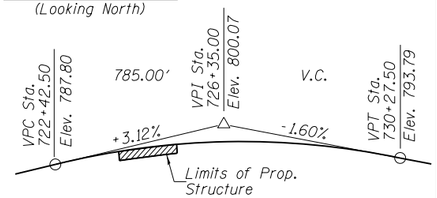
CROSS SECTION

(Looking North)



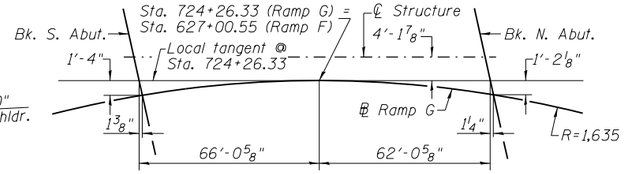
PROFILE GRADE RAMP F

(Along ℄ Roadway)



PROFILE GRADE RAMP G

(Along ℄ Roadway)



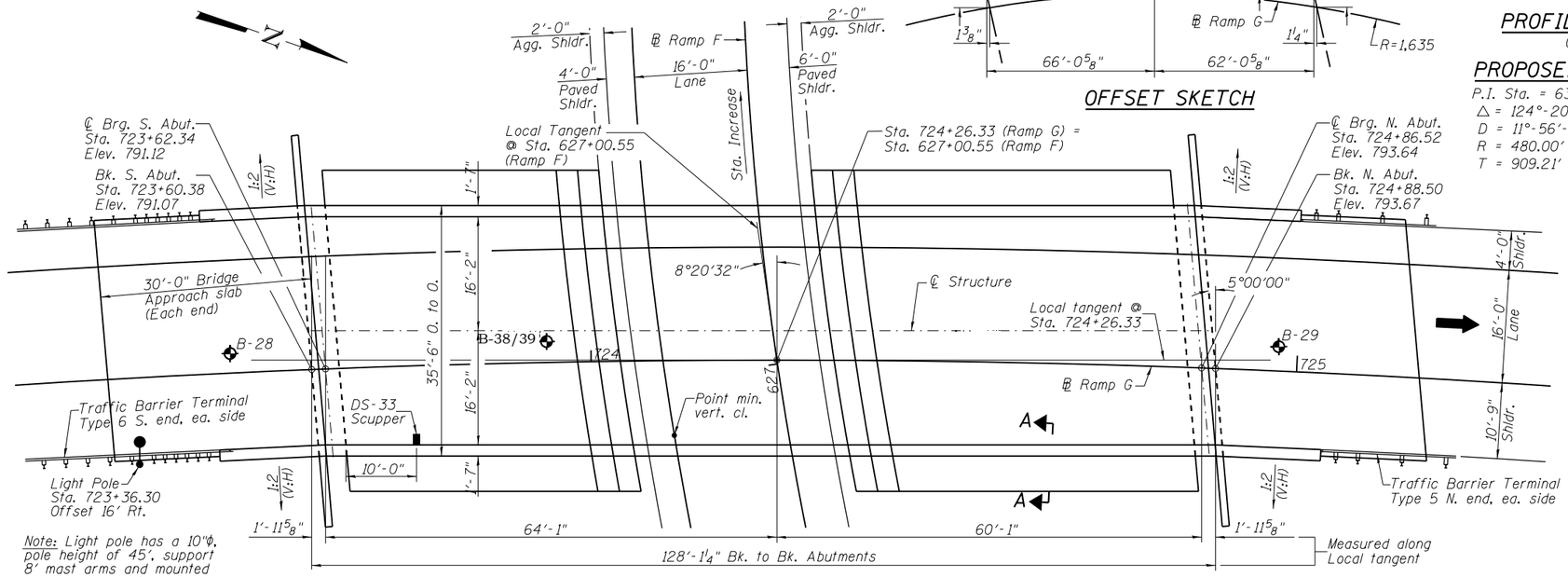
OFFSET SKETCH

PROPOSED RAMP F CURVE DATA

P.I. Sta. = 630+93.16
△ = 124°-20'-18" (Rt.)
D = 11°-56'-12"
R = 480.00'
T = 909.21'
L = 1041.65'
E = 548.14'
S.E. = 8.0%
P.C.C. Sta. = 621+83.95
P.C.C. Sta. = 632+25.60

PROPOSED RAMP G CURVE DATA

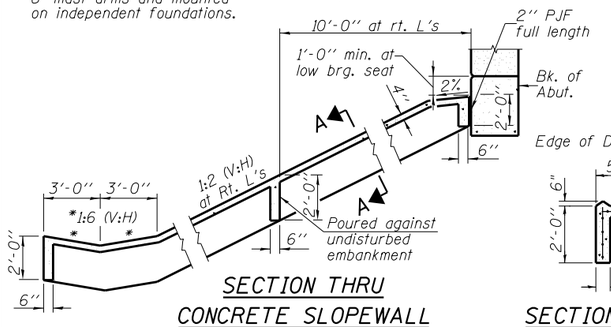
P.I. Sta. = 730+86.74
△ = 60°-51'-35" (Rt.)
D = 3°-30'-16"
R = 1,635'
T = 960.40'
L = 1,736.70'
E = 261.20'
S.E. = 6.7%
P.C. Sta. = 721+26.34
P.T. Sta. = 738+63.05



Note: Light pole has a 10"ϕ, pole height of 45', support 8' mast arms and mounted on independent foundations.

PLAN

Boring Location



SECTION THRU CONCRETE SLOPEWALL

SECTION A-A

LOADING HL-93

Allow 50 psf for future wearing surface

DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Specifications, 7th Edition

HIGHWAY CLASSIFICATION

FAI 57/74 -Ramp F
Functional Class: Interstate Ramp
ADT: 3,300 (2013); 4,950 (2040)
ADTT: 901 (2013); 1,351 (2040)
DHV: 360
Design Speed: 40 m.p.h.
Posted Speed: 40 m.p.h.
One-Way Traffic
Directional Distribution: 100% NB

FAI 57/74 -Ramp G
Functional Class: Interstate Ramp
ADT: 2,100 (2013); 2,650 (2040)
ADTT: 365 (2013); 461 (2040)
DHV: 235
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
One-Way Traffic
Directional Distribution: 100% WB

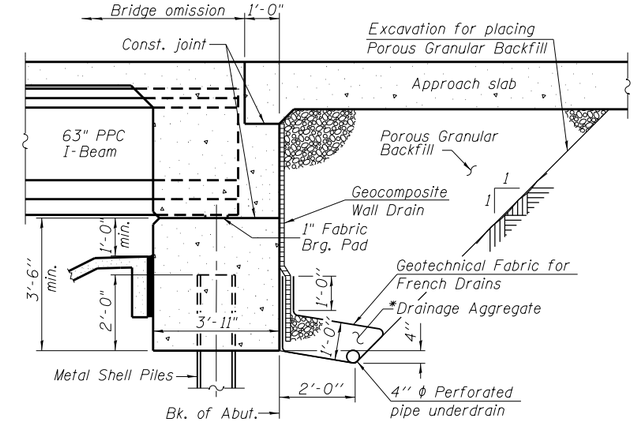
DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi (Cast-in-Place)
fy = 60,000 psi (Reinforcement)

PRECAST PRESTRESSED UNITS
f'c = 6,000 psi
fci = 5,000 psi
fpu = 270,000 psi (½" ϕ low lax strands)
fpbt = 201,960 psi (½" ϕ low lax strands)

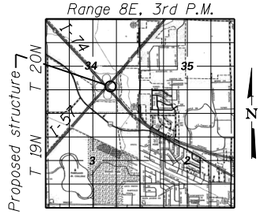
SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec (SD1) = 0.135g
Design Spectral Acceleration at 0.2 sec (SDS) = 0.233g
Soil Site Class = D



SECTION THRU INTEGRAL ABUTMENT

(Horiz. dim. @ Rt. L's)



LOCATION SKETCH

GENERAL PLAN
RAMP G OVER RAMP F
F.A.I. RTE. 57/74
SECTION 10 (5-1-RS-1, 14-1.6) R
CHAMPAIGN COUNTY
STATION 724+26.33
STRUCTURE NO. 010-1002

CMT

USER NAME =	DESIGNED - CJW	REVISED
	CHECKED - WLB	REVISED
PLOT SCALE =	DRAWN - GLD	REVISED
PLOT DATE =	CHECKED - RJK	REVISED

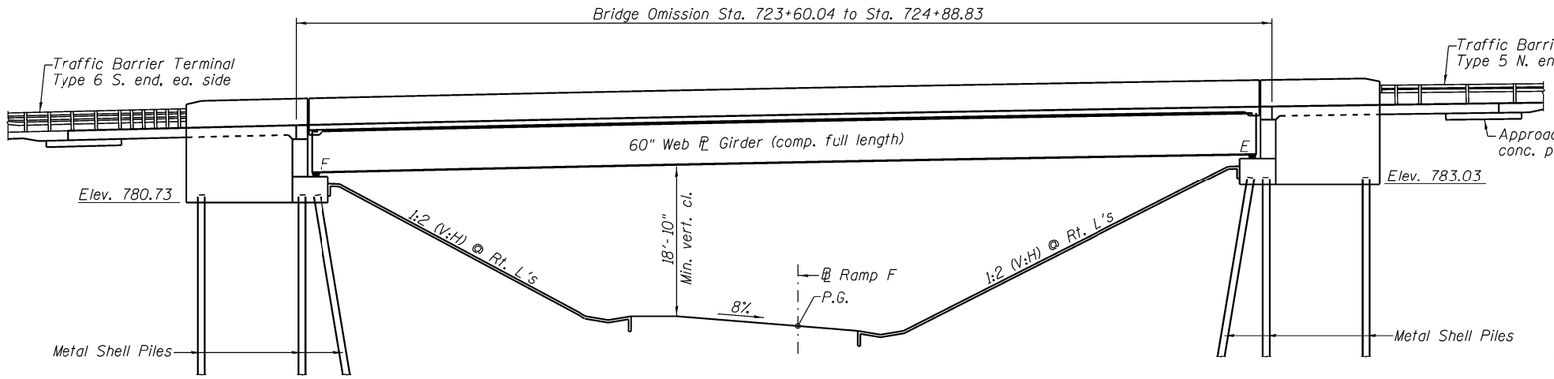
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. OF SHEETS

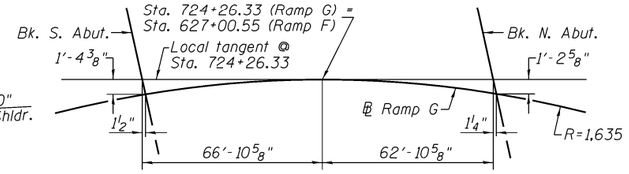
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57/74				
		CONTRACT NO.		
ILLINOIS FED. AID PROJECT				

Bench Mark:

Existing Structure: None No Salvage

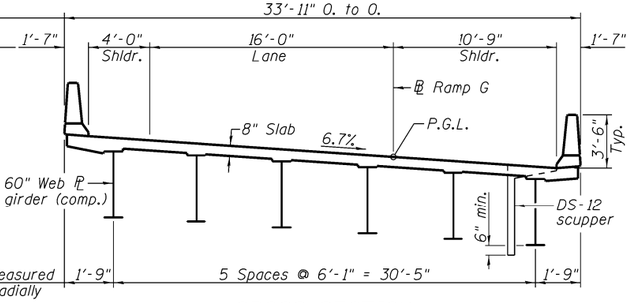


ELEVATION



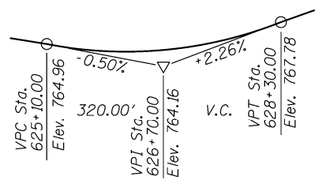
OFFSET SKETCH

PLAN



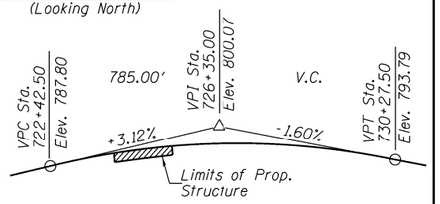
CROSS SECTION

(Looking North)



PROFILE GRADE RAMP F

(Along ℄ Roadway)



PROFILE GRADE RAMP G

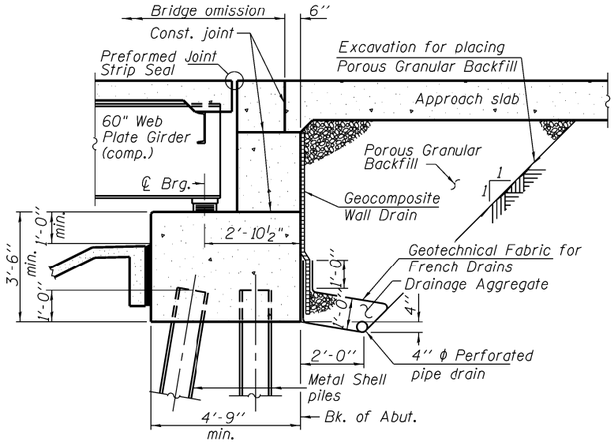
(Along ℄ Roadway)

PROPOSED RAMP F CURVE DATA

P.I. Sta. = 630+93.16
△ = 124°-20'-18" (Rt.)
D = 11°-56'-12"
R = 480.00'
T = 909.21'
L = 1041.65'
E = 548.14'
S.E. = 8.0%
P.C.C. Sta. = 621+83.95
P.C.C. Sta. = 632+25.60

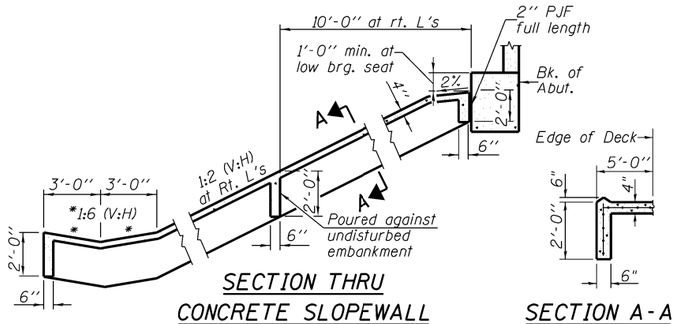
PROPOSED RAMP G CURVE DATA

P.I. Sta. = 730+86.74
△ = 60°-51'-35" (Rt.)
D = 3°-30'-16"
R = 1,635'
T = 960.40'
L = 1,736.70'
E = 261.20'
S.E. = 6.7%
P.C. Sta. = 721+26.34
P.T. Sta. = 738+63.05



SECTION THRU PILE SUPPORTED STUB ABUTMENT

(Horiz. dim. @ Rt. L's)



SECTION THRU CONCRETE SLOPEWALL

SECTION A-A

LOADING HL-93

Allow 50 psf for future wearing surface

DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Specifications, 7th Edition

HIGHWAY CLASSIFICATION

FAI 57/74 -Ramp F
Functional Class: Interstate Ramp
ADT: 3,300 (2013); 4,950 (2040)
ADTT: 901 (2013); 1,351 (2040)
DHV: 360
Design Speed: 40 m.p.h.
Posted Speed: 40 m.p.h.
One-Way Traffic
Directional Distribution: 100% NB

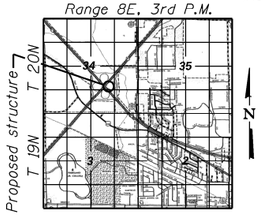
FAI 57/74 -Ramp G
Functional Class: Interstate Ramp
ADT: 2,100 (2013); 2,650 (2040)
ADTT: 365 (2013); 461 (2040)
DHV: 235
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
One-Way Traffic
Directional Distribution: 100% WB

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi (Cast-in-Place)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec (SD1) = 0.135g
Design Spectral Acceleration at 0.2 sec (SDS) = 0.233g
Soil Site Class = D



LOCATION SKETCH

GENERAL PLAN
RAMP G OVER RAMP F
F.A.I. RTE. 57/74
SECTION 10 (5-1-RS-1, 14-1,6) R
CHAMPAIGN COUNTY
STATION 724+26.33
STRUCTURE NO. 010-1002

FILE NAME =	USER NAME =	DESIGNED -	REVISED	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CHECKED -	REVISED			57/74				
	PLOT SCALE =	DRAWN -	REVISED						CONTRACT NO.	
	PLOT DATE =	CHECKED -	REVISED		SHEET NO. OF SHEETS			ILLINOIS	FED. AID PROJECT	

Appendix C

Subsurface Boring Logs

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering Group

SOIL BORING LOG

Date 1/29/15

ROUTE I-57/74 **DESCRIPTION** South Abut Ramp G South Structure **LOGGED BY** MLL, TC

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3 **PM**

COUNTY Champaign **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO.
Station

BORING NO. B-28
Station 723+35.10
Offset 0.0ft
Ground Surface Elev. 753.34 ft

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

Groundwater Elev.:
▽ **First Encounter** 746.3 ft
▽ **Upon Completion** washed ft
▼ **After** Hrs. ft

DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)	Material
				TOPSOIL: Silty Clay, black
				752.34
	2			SILTY CLAY: Black, stiff, organics
	3	1.71	18.3	
	4	B		
				750.34
				SILTY CLAY LOAM: Brown/Gray, soft
	1			
				748.84
	2	0.49	21.5	SILTY CLAY LOAM: Gray, soft
-5	3	B		
				747.34
	1			SAND: Brown, medium, course (washed auger) ▽
	3	0.33	12.8	
	7	B		
				744.84
	4			SAND: Brown, medium, fine
	6		13.6	
-10	9			
	8			
	16		14.9	
	13			
	14			
	8		11.6	
-15	9			
	3			
				736.84
	7	1.81	9.9	SILTY CLAY TILL: Gray, stiff
	8	B		
				734.84
	4			SILTY CLAY TILL: Gray, very stiff
	5	2.37	9.7	
-20	10	B		

DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)	Material
				SILTY CLAY TILL: Gray, very stiff *(continued)*
	4			
	5	2.06	10.2	
-25	8	B		
	4			
	6	2.27	9.7	
-30	9	B		
				721.34
	7			CLAYEY SAND: Gray, dense
	14		10.0	
-35	16			
				715.84
	5			SILTY CLAY TILL: Gray, very stiff, trace gravel
	4	3.5	7.4	
-40	6	P		
				713.69

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
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)

File Name P:\CINT\PROJECTS\I 57 74 CHAMPAIGN COUNTY.GPJ Data Template D6TEMPLT.GDT Date Printed 3/2/15
Latitude 40.144779 Longitude -88.280098 Datum Job Number MCE-14044

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering Group

SOIL BORING LOG

Date 1/29/15

ROUTE I-57/74 **DESCRIPTION** South Abut Ramp G South Structure **LOGGED BY** MLL, TC

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3 **PM**

COUNTY Champaign **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO.
Station

BORING NO. B-28
Station 723+35.10
Offset 0.0ft
Ground Surface Elev. 753.34 ft

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

Groundwater Elev.:
First Encounter 746.3 ft
Upon Completion washed ft
After Hrs. ft

DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
SILTY CLAY TILL: Gray, stiff			
	4		
	5	1.24	11.4
-45	8	B	
704.84			
SILTY CLAY TILL: Gray, medium	5		
	6	0.99	12.1
-50	9	B	
699.84			
SILTY CLAY TILL: Gray, stiff	4		
	6	1.48	11.1
-55	8	B	
	4		
	6	1.24	10.8
-60	10	B	
SILTY CLAY TILL: Gray, stiff *(continued)*			
689.84			
SILTY CLAY TILL: Gray, very stiff	4		
	7	2.55	10.7
-65	11	B	
	5		
	9	2.55	10.6
-70	9	B	
	5		
	9	1.81	10.6
678.34 -75	12	B	
End of Boring			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
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)

File Name P:\GINT\PROJECTS\I 57 74 CHAMPAIGN COUNTY.GPJ Data Template D6TEMPLT.GDT Date Printed 3/2/15
Latitude 40.144779 Longitude -88.280098 Datum Job Number MCE-14044

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering Group

SOIL BORING LOG

Date 1/29/15

ROUTE I-57/74 **DESCRIPTION** North Abut Ramp G, South Structure **LOGGED BY** TC, MLL

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3 **PM**

COUNTY Champaign **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO.
Station

BORING NO. B-29
Station 724+83.83
Offset 0.0ft
Ground Surface Elev. 753.94 ft

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

Groundwater Elev.:
▽ **First Encounter** 743.9 ft
▽ **Upon Completion** washed ft
▼ **After** Hrs. ft

DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL: Silty Clay
				752.94
	2			SILTY CLAY: Gray to Brown, stiff, moist
	2	1.24	28.4	
	4	B		
				750.94
				SILTY CLAY LOAM: Brown, soft, moist
	2			
	2	0.49	21.8	
-5	3	B		
				748.44
				SAND: Brown, medium dense, wet, coarse
	5			
	5		16.7	
	12			
				745.94
				CLAYEY SAND LOAM: Gray, moist, medium dense
	5			
	9		16.9	
-10	13			▽
				743.44
				SAND: Brown, medium dense, wet, coarse (washed auger)
	4			
	4		20.8	
	20			
				740.44
	6			SAND AND GRAVEL: Coarse sand, fine gravel, medium dense
	7		18.5	
-15	8			
				737.94
	9			SILTY CLAY: Gray, stiff
	10	2.89	10.8	
	12	B		
	4			
	5	2.27	12.2	
-20	8	B		
				SILTY CLAY: Gray, stiff *(continued)*
				732.44
				SAND AND GRAVEL: Gray coarse sand and fine gravel, dense (washed auger)
	12			
				729.44
	17		11.8	SILTY CLAY: Gray
-25	16			
				728.44
				SAND AND GRAVEL: Gray, coarse sand and fine gravel
	10			
				724.94
	7	2.0	12.3	SILTY CLAY: Gray, medium
-30	6	P		
				720.94
	11			SAND: Gray, loose, wet, coarse
	2		20.4	
-35	6			
				715.94
	7			SAND: Gray/Black/Brown, medium dense, fine (washed auger)
	7		17.2	
-40	7			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
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)

File Name P:\GINT\PROJECTS\I 57 74 CHAMPAIGN COUNTY.GPJ Data Template D6TEMPLT.GDT Date Printed 3/2/15
Latitude 40.145163 Longitude -88.280278 Datum Job Number MCE-14044

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering Group

SOIL BORING LOG

Date 1/29/15

ROUTE I-57/74 **DESCRIPTION** North Abut Ramp G, South Structure **LOGGED BY** TC, MLL

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3 **PM**

COUNTY Champaign **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO.
Station

BORING NO. B-29
Station 724+83.83
Offset 0.0ft
Ground Surface Elev. 753.94 ft

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

Groundwater Elev.:
▽ **First Encounter** 743.9 ft
▽ **Upon Completion** washed ft
▼ **After** Hrs. ft

DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
SAND: Gray/Black/Brown, medium dense, fine (washed auger) *(continued)*			
709.94	5		
SILTY CLAY TILL: Gray, stiff	5	1.81	13.1
-45	7	B	
706.94			
SILTY CLAY TILL: Gray, very stiff	20		
	17	2.27	12.0
-50	13	B	
701.94			
SILTY CLAY TILL: Gray, stiff	5		
	7	1.98	14.1
-55	10	B	
	5		
	10	1.90	13.8
-60	15	B	

DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
SILTY CLAY TILL: Gray, stiff *(continued)*			
691.94			
SILTY CLAY TILL: Gray, very stiff	5		
	12	2.47	12.5
-65	16	B	
	25		
	12	2.55	13.1
-70	16	B	
	12		
	18	3.60	12.1
678.94 -75	22	B	
End of Boring			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
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)

File Name P:\CINT\PROJECTS\I 57 74 CHAMPAIGN COUNTY.GPJ Data Template D6TEMPLT.GDT Date Printed 3/2/15
Latitude 40.145163 Longitude -88.280278 Datum Job Number MCE-14044

Illinois Department of Transportation

Division of Highways
Bacone Farmer Workmand Engineering & Testing, LLC

SOIL BORING LOG

Date 1/29/15

ROUTE I-57/74 DESCRIPTION Pier Ramp G South Structure LOGGED BY MLL

SECTION 10(5-1-RS-1, 14-1,6)R LOCATION , SEC. 34, TWP. 20N, RNG. 8E, 3rd PM,
Latitude 40.144894, Longitude -88.280157

COUNTY Champaign DRILLING METHOD HSA HAMMER TYPE Auto

STRUCT. NO.
Station

BORING NO. B-38/39
Station 723+94.08
Offset 2.9 ft LT
Ground Surface Elev. 753.44 ft

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

Groundwater Elev.:
First Encounter 747.4 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL: Silty Clay, dark brown
				752.44
	2			SILTY CLAY: Gray/Brown
	3 4	1.0 B	20	
				749.94
	1			SILTY SAND: Brown, loose, wet, fine
-5	1 3	0.5 P	17	
				747.94
	5			SAND: Brown, medium dense, wet ▼
	10 12		12	
	5			
				743.94
-10	8 9	0.6 B	15	CLAYEY SILT: Brown, wet
				742.44
	4			SAND: Medium dense, wet, coarse
	10 11	1.1 B	12	741.44
				CLAYEY SILT LOAM: Gray, wet
				739.94
	4			SAND AND GRAVEL: Wet
	7 5	1.5 B	9	738.94
-15				SILTY CLAY: Gray, stiff, wet
	6			
	7 7	2.7 B	10	
	4			
	6 8	2.7 B	10	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY: Gray, stiff, wet *(continued)*
	4			
	6 9	3.1 B	9	
-25				
				726.44
				SILTY CLAY TILL: Gray, wet
	7			
	8 8	1.5 P	7	
-30				
				721.44
				SILTY CLAY TILL: Gray, very stiff
	4			
	5 9	2.0 B	11	
-35				
	4			
	9 10	2.1 B	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)

Illinois Department of Transportation
Division of Highways
Bacone Farmer Workmand Engineering & Testing, LLC

SOIL BORING LOG

Date 1/29/15

ROUTE I-57/74 DESCRIPTION Pier Ramp G South Structure LOGGED BY MLL

SECTION 10(5-1-RS-1, 14-1,6)R LOCATION , SEC. 34, TWP. 20N, RNG. 8E, 3rd PM,
Latitude 40.144894, Longitude -88.280157

COUNTY Champaign DRILLING METHOD HSA HAMMER TYPE Auto

STRUCT. NO. _____
Station _____

BORING NO. B-38/39
Station 723+94.08
Offset 2.9 ft LT
Ground Surface Elev. 753.44 ft

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

Groundwater Elev.:
First Encounter 747.4 ft ▼
Upon Completion _____ ft
After _____ Hrs. _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY TILL: Gray, very stiff *(continued)*				
		4		
		6	2.0	10
	-45	10	B	
		6		
6" gravelly seam, wet		11	2.0	10
	-50	15	B	
		6		
		8	2.1	11
	-55	11	B	
	694.44	6		
SILTY CLAY TILL: Reddish Gray, very stiff	-60	10 15	2.9 B	10
SILTY CLAY TILL: Reddish Gray, very stiff *(continued)*	692.44			
SILTY CLAY TILL: Gray, very stiff to stiff		5		
	-65	10 11	2.5 B	9
		7		
	-70	15 14	2.3 B	13
		14		
	678.44 -75	20 35	1.5 P	11
End of Boring	-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)

Appendix D

Boring Profile Sheet

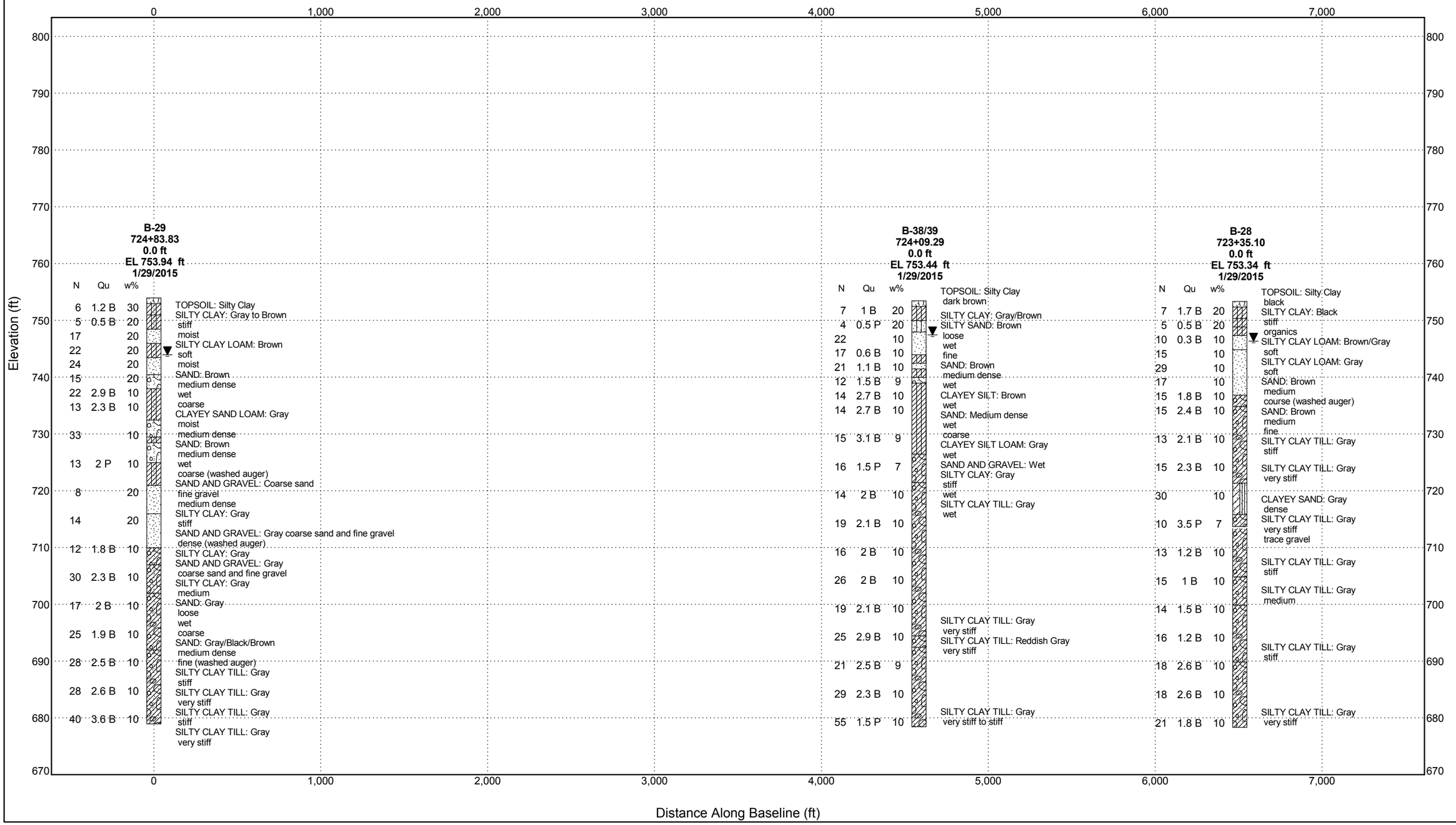
Illinois Department of Transportation
Division of Highways
BFW Engineering & Testing Inc.

ROUTE I-57/74
SECTION 10(5-1-RS-1, 14-1,6)R
COUNTY Champaign
PROJECT LOCATION

SUBSURFACE PROFILE
SN 010-1002

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

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



ROADWAY PROFILE - BETA I 57 74 CHAMPAIGN COUNTY.GPJ IL_DOT_D4_9-15-10.GDT 3/23/15

Appendix E

Pile Tables (North and South Abutments)

Pile Design Table for South Abutment - Integral utilizing Boring #28

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.179" walls		
118	65	35
174	96	37
Metal Shell 12"Φ w/.25" walls		
118	65	35
174	96	37
185	102	45
203	112	48
219	121	50
233	128	53
247	136	55
264	145	58
279	153	60
Metal Shell 14"Φ w/.25" walls		
138	76	35
214	118	37
219	120	45
241	133	48
260	143	50
275	151	53
292	160	55
311	171	58
329	181	60
Metal Shell 14"Φ w/.312" walls		
138	76	35
214	118	37
219	120	45
241	133	48
260	143	50
275	151	53
292	160	55
311	171	58
329	181	60
Steel HP 8 X 36		
137	76	60
161	89	68
170	94	73
176	97	75
180	99	78
185	102	80
192	106	83
199	109	85
204	112	88
209	115	90
223	123	93
233	128	95
242	133	98
251	138	100
255	141	103
Steel HP 10 X 42		
143	79	53
153	84	55
165	91	58
176	97	60
208	115	68
215	118	73
222	122	75
226	125	78
232	128	80
243	134	83
251	138	85
257	141	88
264	145	90
284	156	93
295	163	95
307	169	98
318	175	100
323	177	103
Steel HP 12 X 53		
152	83	48
165	91	50
173	95	53
185	102	55
200	110	58
212	117	60
253	139	68
256	141	73
264	145	75
269	148	78
276	152	80
290	159	83
299	165	85
305	168	88
314	173	90
340	187	93
354	194	95
367	202	98
381	209	100
384	211	103
Steel HP 12 X 63		
135	74	45
153	84	48
166	91	50
175	96	53
187	103	55
202	111	58
214	118	60
256	141	68
258	142	73
152	83	37
163	90	45
187	103	48
202	111	50
211	116	53
225	124	55
243	134	58
258	142	60
307	169	73
317	174	75
322	177	78
330	182	80
348	191	83
359	197	85
366	201	88
375	206	90
411	226	93
427	235	95
443	243	98
459	252	100
460	253	103
Steel HP 14 X 89		
118	65	35
154	85	37
165	91	45
189	104	48
205	113	50
214	118	53
228	126	55
246	136	58
261	144	60
310	171	73
320	176	75
325	179	78
334	184	80
352	193	83
363	200	85
370	203	88
380	209	90
415	229	93
432	237	95
448	246	98
464	255	100
466	256	103
Steel HP 14 X 102		
119	65	35
156	86	37
168	92	45
192	106	48

150	82	55
162	89	58
172	95	60
204	112	68
210	116	73
217	120	75
222	122	78
228	125	80
238	131	83
246	135	85
252	138	88
259	142	90
278	153	93
289	159	95
301	165	98
312	171	100
316	174	103

267	147	75
271	149	78
278	153	80
292	161	83
302	166	85
308	169	88
316	174	90
343	189	93
357	196	95
371	204	98
384	211	100
387	213	103
Steel HP 12 X 74		
137	75	45
156	86	48
169	93	50
177	98	53
190	104	55
205	112	58
217	120	60
259	143	68
262	144	73
270	149	75
275	151	78
282	155	80
296	163	83
306	168	85
312	172	88
321	176	90
348	191	93
362	199	95
376	207	98
389	214	100
393	216	103
Steel HP 12 X 84		
139	76	45
158	87	48
171	94	50
180	99	53
192	106	55
207	114	58
220	121	60
263	145	68
265	146	73
274	150	75
279	153	78
286	157	80
300	165	83
310	170	85
316	174	88
325	179	90
353	194	93
367	202	95
381	209	98
395	217	100

207	114	50
217	119	53
231	127	55
250	137	58
265	146	60
314	173	73
324	178	75
329	181	78
337	186	80
356	196	83
367	202	85
374	206	88
384	211	90
420	231	93
437	240	95
453	249	98
470	258	100
471	259	103
Steel HP 14 X 117		
120	66	35
158	87	37
170	93	45
194	107	48
210	116	50
220	121	53
234	129	55
253	139	58
268	147	60
317	175	73
328	180	75
333	183	78
341	188	80
360	198	83
371	204	85
378	208	88
388	214	90
425	234	93
442	243	95
458	252	98
475	261	100
476	262	103
Precast 14"x 14"		
67	37	12
167	92	29
171	94	32
176	97	35
Timber Pile		
137	76	37

Pile Design Table for South Abutment - Stub utilizing Boring #28

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.179" walls		
110	61	28
115	63	31
119	65	34
175	96	36
Metal Shell 12"Φ w/.25" walls		
110	61	28
115	63	31
119	65	34
175	96	36
186	102	44
204	112	47
220	121	49
233	128	52
248	136	54
264	145	57
280	154	59
Metal Shell 14"Φ w/.25" walls		
52	29	11
132	72	28
135	75	31
139	77	34
215	118	36
220	121	44
242	133	47
261	143	49
276	152	52
293	161	54
312	172	57
330	182	59
Metal Shell 14"Φ w/.312" walls		
52	29	11
132	72	28
135	75	31
139	77	34
215	118	36
220	121	44
242	133	47
261	143	49
276	152	52
293	161	54
312	172	57
330	182	59
Steel HP 8 X 36		
105	58	49
112	62	52
120	66	54
129	71	57
138	76	59
162	89	67

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
110	61	44
125	69	47
136	75	49
144	79	52
154	85	54
166	91	57
176	97	59
209	115	67
215	118	72
222	122	74
227	125	77
233	128	79
244	134	82
252	138	84
257	142	87
264	145	89
284	156	92
296	163	94
307	169	97
319	175	99
323	178	102
Steel HP 12 X 53		
98	54	34
124	68	36
134	74	44
152	84	47
165	91	49
174	96	52
186	102	54
200	110	57
213	117	59
254	139	67
256	141	72
265	146	74
270	148	77
277	152	79
290	160	82
300	165	84
306	168	87
314	173	89
341	187	92
354	195	94
368	202	97
381	210	99
385	212	102
Steel HP 12 X 63		
99	54	34
125	69	36
135	74	44

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
52	28	11
116	64	31
117	64	34
153	84	36
164	90	44
188	103	47
203	112	49
212	117	52
226	124	54
244	134	57
259	142	59
308	169	72
317	175	74
322	177	77
331	182	79
349	192	82
360	198	84
366	201	87
376	207	89
411	226	92
427	235	94
443	244	97
459	253	99
461	254	102
Steel HP 14 X 89		
53	29	11
117	64	31
118	65	34
155	85	36
166	91	44
190	105	47
206	113	49
215	118	52
229	126	54
247	136	57
262	144	59
311	171	72
321	177	74
326	179	77
334	184	79
353	194	82
364	200	84
370	204	87
380	209	89
416	229	92
432	238	94
449	247	97
465	256	99
466	257	102

171	94	72
176	97	74
180	99	77
185	102	79
193	106	82
199	110	84
204	112	87
210	115	89
224	123	92
233	128	94
242	133	97
251	138	99
256	141	102
Steel HP 10 X 42		
108	59	44
122	67	47
133	73	49
141	77	52
150	83	54
162	89	57
173	95	59
204	112	67
211	116	72
218	120	74
222	122	77
228	126	79
239	131	82
247	136	84
252	139	87
259	143	89
279	153	92
290	159	94
301	166	97
312	172	99
317	174	102

154	85	47
167	92	49
176	97	52
187	103	54
202	111	57
215	118	59
256	141	67
259	142	72
267	147	74
272	150	77
279	154	79
293	161	82
303	166	84
309	170	87
317	174	89
344	189	92
358	197	94
371	204	97
385	212	99
388	213	102
Steel HP 12 X 74		
100	55	34
127	70	36
137	75	44
156	86	47
169	93	49
178	98	52
190	105	54
205	113	57
218	120	59
260	143	67
262	144	72
271	149	74
276	152	77
283	156	79
297	163	82
307	169	84
313	172	87
321	177	89
349	192	92
362	199	94
376	207	97
390	215	99
393	216	102
Steel HP 12 X 84		
102	56	34
129	71	36
139	77	44
159	87	47
172	95	49
181	99	52
193	106	54
208	114	57
221	122	59
264	145	67

Steel HP 14 X 102		
53	29	11
118	65	31
120	66	34
157	86	36
168	93	44
193	106	47
208	115	49
218	120	52
232	127	54
250	138	57
265	146	59
315	173	72
325	179	74
330	181	77
338	186	79
357	196	82
368	202	84
375	206	87
385	212	89
421	232	92
438	241	94
454	250	97
470	259	99
472	259	102
Steel HP 14 X 117		
54	30	11
120	66	31
121	67	34
159	87	36
170	94	44
195	107	47
211	116	49
220	121	52
235	129	54
253	139	57
269	148	59
318	175	72
328	181	74
333	183	77
342	188	79
361	198	82
372	205	84
379	208	87
389	214	89
426	234	92
443	243	94
459	253	97
476	262	99
477	262	102
Precast 14"x 14"		
67	37	11
168	92	28
173	95	31
177	97	34

	266	146	72
	274	151	74
	279	154	77
	286	158	79
	301	165	82
	311	171	84
	317	174	87
	325	179	89
	353	194	92
	367	202	94
	381	210	97
	395	217	99
	398	219	102

Timber Pile		
101	55	28
113	62	31
117	64	34
138	76	36

Pile Design Table for North Abutment - Integral utilizing Boring #29

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.179" walls		
118	65	34
203	112	37
Metal Shell 12"Φ w/.25" walls		
118	65	34
203	112	37
204	112	47
217	119	50
233	128	52
Metal Shell 14"Φ w/.25" walls		
139	76	34
243	134	47
257	142	50
275	151	52
Metal Shell 14"Φ w/.312" walls		
139	76	34
243	134	47
257	142	50
275	151	52
Steel HP 8 X 36		
148	81	75
155	85	77
166	91	80
174	96	82
181	99	85
188	104	87
196	108	90
203	112	92
215	118	95
224	123	97
233	128	100
242	133	102
269	148	105
Steel HP 10 X 42		
137	75	52
160	88	60
170	93	62
174	96	65
175	96	67
184	101	75
193	106	77
207	114	80
217	119	82
225	124	85
234	129	87
243	134	90
252	139	92
267	147	95
278	153	97
290	159	100

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
140	77	52
164	90	60
174	95	62
178	98	65
179	98	67
188	104	75
197	109	77
211	116	80
222	122	82
230	126	85
239	132	87
248	137	90
258	142	92
273	150	95
284	156	97
296	163	100
308	169	102
347	191	105
Steel HP 12 X 53		
151	83	47
157	86	50
170	93	52
197	108	60
209	115	62
212	117	65
214	118	67
226	124	75
236	130	77
254	140	80
266	146	82
275	151	85
286	157	87
297	163	90
308	169	92
327	180	95
340	187	97
354	195	100
368	202	102
Steel HP 12 X 63		
146	80	45
152	84	47
159	87	50
171	94	52
199	110	60
211	116	62
214	118	65
216	119	67
228	125	75
239	131	77

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
118	65	34
172	95	37
174	96	39
179	98	45
187	103	47
193	106	50
208	114	52
240	132	60
253	139	62
256	141	65
258	142	67
273	150	75
286	157	77
307	169	80
322	177	82
331	182	85
345	190	87
357	196	90
370	204	92
395	217	95
410	226	97
427	235	100
444	244	102
513	282	105
Steel HP 14 X 89		
120	66	34
174	96	37
176	97	39
181	100	45
190	104	47
195	107	50
210	116	52
243	133	60
257	141	62
259	142	65
261	143	67
276	152	75
289	159	77
311	171	80
326	179	82
335	184	85
349	192	87
361	199	90
375	206	92
399	220	95
415	228	97
433	238	100
449	247	102
520	286	105

301	166	102

256	141	80
269	148	82
277	152	85
289	159	87
299	165	90
311	171	92
330	181	95
343	189	97
358	197	100
371	204	102
424	233	105
Steel HP 12 X 74		
148	81	45
155	85	47
161	89	50
174	96	52
202	111	60
214	118	62
217	119	65
219	120	67
231	127	75
242	133	77
260	143	80
272	150	82
281	155	85
293	161	87
303	167	90
315	173	92
334	184	95
348	191	97
363	199	100
376	207	102
430	237	105
Steel HP 12 X 84		
150	83	45
157	86	47
163	90	50
176	97	52
205	113	60
217	119	62
220	121	65
222	122	67
234	129	75
245	135	77
263	145	80
276	152	82
285	157	85
297	163	87
307	169	90
319	175	92
339	186	95
353	194	97
367	202	100
381	210	102
436	240	105

Steel HP 14 X 102		
121	67	34
177	97	37
179	98	39
184	101	45
193	106	47
198	109	50
213	117	52
246	135	60
260	143	62
262	144	65
264	145	67
279	154	75
292	161	77
315	173	80
330	182	82
339	187	85
353	194	87
365	201	90
379	208	92
404	222	95
420	231	97
438	241	100
454	250	102
527	290	105
Steel HP 14 X 117		
123	67	34
179	99	37
181	100	39
186	102	45
195	107	47
200	110	50
216	119	52
249	137	60
263	145	62
265	146	65
267	147	67
283	155	75
296	163	77
319	175	80
334	184	82
343	189	85
357	197	87
370	203	90
383	211	92
409	225	95
425	234	97
443	244	100
459	253	102
533	293	105
Precast 14"x 14"		
90	50	17
170	93	31
177	97	34
Timber Pile		

Pile Design Table for North Abutment - Stub utilizing Boring #29

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.179" walls		
59	33	16
112	62	30
118	65	33
203	112	36
Metal Shell 12"Φ w/.25" walls		
59	33	16
112	62	30
118	65	33
203	112	36
204	112	46
217	119	49
233	128	51
Metal Shell 14"Φ w/.25" walls		
71	39	16
133	73	30
139	76	33
243	134	46
257	141	49
275	151	51
Metal Shell 14"Φ w/.312" walls		
71	39	16
133	73	30
139	76	33
243	134	46
257	141	49
275	151	51
Steel HP 8 X 36		
108	60	51
128	70	59
136	75	61
140	77	64
141	78	66
148	81	74
155	85	76
166	91	79
174	96	81
181	99	84
189	104	86
196	108	89
204	112	91
215	118	94
224	123	96
233	128	99
242	133	101
269	148	104
Steel HP 10 X 42		
110	61	38
115	63	44
120	66	46

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
83	46	33
111	61	36
113	62	38
118	65	44
123	68	46
129	71	49
140	77	51
164	90	59
174	95	61
178	98	64
179	98	66
188	104	74
198	109	76
211	116	79
222	122	81
230	126	84
239	132	86
248	137	89
258	142	91
273	150	94
284	156	96
296	163	99
308	169	101
347	191	104
Steel HP 12 X 53		
99	54	33
137	76	36
139	77	38
144	79	44
151	83	46
157	86	49
169	93	51
197	108	59
209	115	61
212	117	64
214	118	66
226	124	74
237	130	76
254	140	79
266	147	81
275	151	84
286	158	86
297	163	89
308	169	91
327	180	94
340	187	96
355	195	99
368	202	101
Steel HP 12 X 63		

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
68	37	16
118	65	33
172	95	36
174	96	38
179	98	44
187	103	46
193	106	49
208	114	51
240	132	59
253	139	61
256	141	64
258	142	66
273	150	74
286	157	76
308	169	79
322	177	81
332	182	84
345	190	86
357	197	89
371	204	91
395	217	94
411	226	96
428	235	99
444	244	101
514	283	104
Steel HP 14 X 89		
69	38	16
120	66	33
174	96	36
176	97	38
181	100	44
190	104	46
195	107	49
210	116	51
243	133	59
256	141	61
259	142	64
261	143	66
276	152	74
289	159	76
311	171	79
326	180	81
336	185	84
349	192	86
362	199	89
375	206	91
400	220	94
415	228	96
433	238	99

126	69	49
137	75	51
160	88	59
170	93	61
174	96	64
175	96	66
184	101	74
193	106	76
207	114	79
217	119	81
225	124	84
234	129	86
243	134	89
253	139	91
267	147	94
278	153	96
290	160	99
301	166	101

100	55	33
139	76	36
141	77	38
146	80	44
152	84	46
159	87	49
171	94	51
199	110	59
211	116	61
214	118	64
216	119	66
228	125	74
239	131	76
256	141	79
269	148	81
277	153	84
289	159	86
300	165	89
311	171	91
330	182	94
343	189	96
358	197	99
372	204	101
424	233	104
Steel HP 12 X 74		
101	56	33
141	78	36
143	79	38
148	81	44
155	85	46
161	89	49
174	96	51
202	111	59
214	118	61
217	119	64
219	120	66
231	127	74
242	133	76
260	143	79
273	150	81
281	155	84
293	161	86
304	167	89
315	173	91
335	184	94
348	191	96
363	200	99
377	207	101
430	237	104
Steel HP 12 X 84		
102	56	33
143	79	36
145	80	38
150	83	44
157	86	46

449	247	101
520	286	104
Steel HP 14 X 102		
70	38	16
121	67	33
177	97	36
179	98	38
184	101	44
193	106	46
198	109	49
213	117	51
246	135	59
260	143	61
262	144	64
264	145	66
280	154	74
293	161	76
315	173	79
330	182	81
340	187	84
353	194	86
366	201	89
379	209	91
404	222	94
420	231	96
438	241	99
454	250	101
527	290	104
Steel HP 14 X 117		
71	39	16
123	67	33
179	99	36
181	100	38
186	102	44
195	107	46
200	110	49
216	119	51
249	137	59
263	145	61
265	146	64
267	147	66
283	156	74
296	163	76
319	175	79
334	184	81
344	189	84
358	197	86
370	203	89
384	211	91
409	225	94
425	234	96
443	244	99
460	253	101
534	293	104
Precast 14"x 14"		

	163	90	49
	176	97	51
	205	113	59
	217	119	61
	220	121	64
	222	122	66
	234	129	74
	246	135	76
	264	145	79
	276	152	81
	285	157	84
	297	163	86
	308	169	89
	319	176	91
	339	187	94
	353	194	96
	368	202	99
	382	210	101
	437	240	104

	90	50	16
	169	93	30
	177	97	33
Timber Pile			
	105	58	30
	115	64	33
	147	81	36

Appendix F

Estimated Factored Structural Loadings

I-57 - I 74 INTERCHANGE STRUCTURES

Information for Geotechnical Engineering SGR's **03.24.2015**

Structure:	RAMP G over RAMP F	Station
S.N.	010-1002	724+26.33
No. of Spans:	1	

Option No.		Superstructure Type / Option	Substructure	
1	Details	**PPC BULB TEE IL63-2438**		
		Superstructure: Tangent Girder on Curved Alignment		
		Substructure Element	ABUT 1	ABUT 2
		Abutment Type: (Integral, Semi Integral, Stub, etc.)	Integral *	Integral *
		Pier Type	n/a	n/a
		Deck Joints	n/a	n/a
		Bearing Type	Fixed	Fixed
		Est. Bottom of Abutment Elevation	780.73	783.03
		Est. Abutment Length	35'-8"	35'-8"
		Est. Pier Bottom of Footing	n/a	n/a
		Est. Pier Footing Dimensions	n/a	n/a
		Total Factored Vertical DL + LL	2,000 Kips *	2,000 Kips *
		Additional Notes / Comments	Single row of vertical steel piles.	
			* Dynamic Load Allowance (IM) included for integral abutment.	
2	Details	**STEEL PLATE GIRDER, WEB DEPTH = 60 IN.**	**Substructure**	
		Superstructure: Curved Girder on Curved Alignment		
		Substructure Element	ABUT 1	ABUT 2
		Abutment Type: (Integral, Semi Integral, Stub, etc.)	Stub	Stub
		Pier Type	n/a	n/a
		Deck Joints	Strip Seal	Strip Seal
		Bearing Type	Elastomeric	Elastomeric
		Est. Bottom of Abutment Elevation	780.73	783.03
		Est. Abutment Length	34'-0"	34'-0"
		Est. Pier Bottom of Footing	n/a	n/a
		Est. Pier Footing Dimensions	n/a	n/a
		Total Factored Vertical DL + LL	1,382 Kips **	1,382 Kips **
		Additional Notes / Comments	Two rows of piles. Vertical back row, 12:3 battered front	
			** Dynamic Load Allowance (IM) not included.	