STRUCTURE
GEOTECHNICAL REPORT

RAMP B OVER RAMP C
(STATION 233+32.80)
Proposed SN: 010-1006

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

Contract No.: 70897
P-95-030-11
PTB: 161-28

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October 28, 2015 (Revision 1)
October 28, 2015 (Original)

Attachments: Soil Boring Location Map
Preliminary TS&L
Subsurface Boring Logs
Boring Profile Sheet
Pile Tables
Settlement Platform Detail

1.0 Project Description

The purpose of this geotechnical study is to explore the existing subsurface conditions present at the proposed structure location (SN 010-1006) (Station 233+32.80 – Ramp B) carrying I-74 over I-57 (Ramp B over Ramp C) in Section 10R, Township 20 North, Range 8 East of the 3rd PM in the city of Champaign, Champaign County, Illinois. Based on the geotechnical data obtained, engineering properties of the subsurface soils were determined with design and construction recommendations being provided for the project.

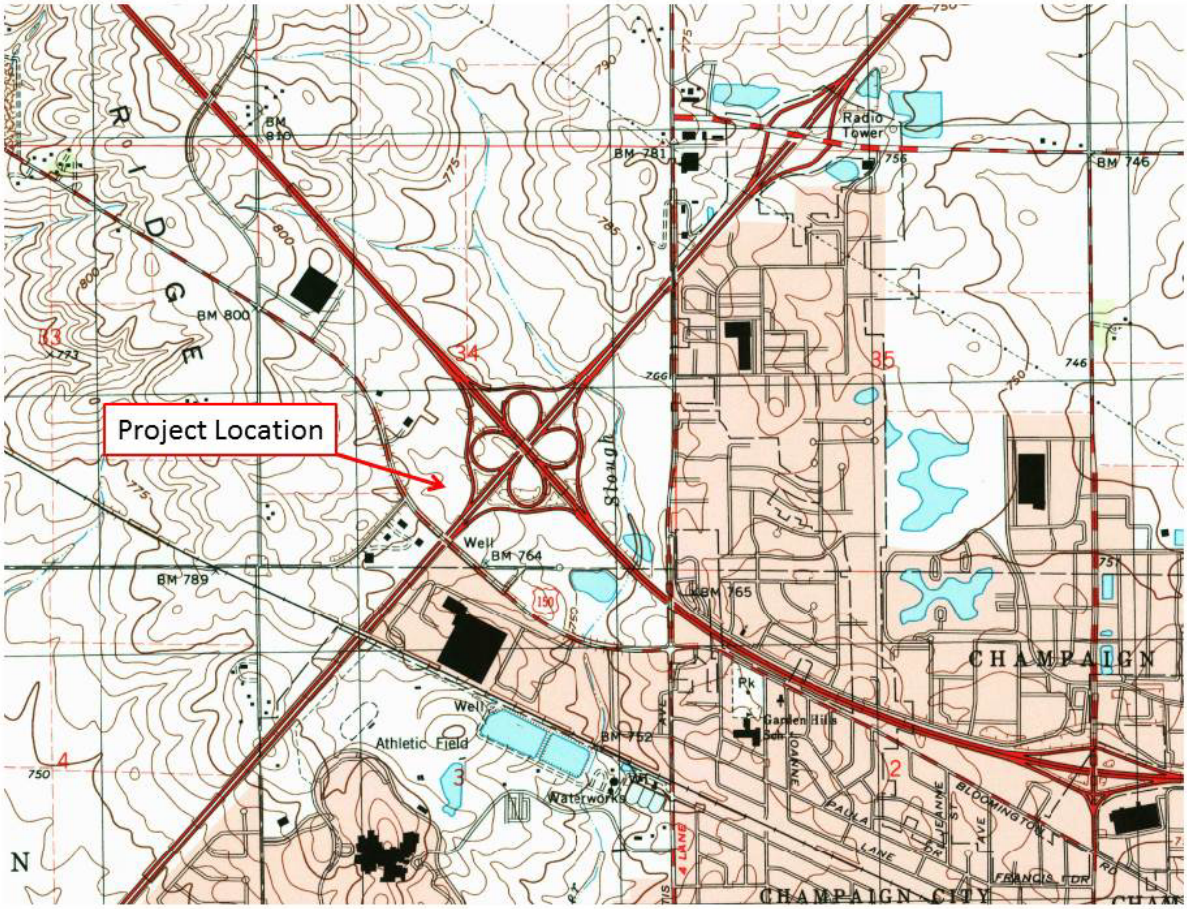


Exhibit 1: Project Location Map

2.0 Proposed Structure Information

Proposed Structure (SN 010-1006)

Based on the preliminary TS&L, the proposed structure (SN 010-1006), Station 233+32.80 will consist of a single span supported by integral abutments. Two new 30-foot-long approach slabs will be constructed on either end of the bridge. The superstructure will consist of tangent girders (IL63-3838 Beam) on a curved alignment with back to back abutment distances of 154'-3". Abutments will bear on a single row of vertical piles. A copy of the Type, Size and Location (TS&L) plan for the Ramp B over Ramp C has been included in Appendix B.

3.0 Existing Site Conditions

The existing location of the proposed structure is currently vacant land with elevation ranges from Elev. 765.34 to 766.14. Embankments heights of between approximately 26 to 32 feet 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 Appendix A and were plotted based on location data obtained by Midland. 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 16 to January 19, 2015 and included advancing a total of three (3) standard penetration test (SPT) borings within the vicinity of the proposed abutment locations. The locations of the soil borings are shown on the **Soil Boring Location Map** provided in Appendix A.

Table 1 – Summary of Subsurface Exploration US 150

Boring ID	Location	Station	Offset (feet)	Depth (feet)	Surface Elevation (feet)
B-7	North Abutment	232+63.57	25.13 LT	75	766.14
B-8	South Abutment	234+08.30	2.47 RT	75	765.34
B-36/37	Pier (N/A)	233+14.40	27.72 RT	75	766.04

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 representatives 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 Field and Laboratory Testing

A field and laboratory testing program was undertaken by McCleary Engineering 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
- RIMAC Compression Test – IDOT Method
- Standard Penetration Test (SPT) and Split-Barrel Sampling – ASTM D1586 / T-206

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 field and laboratory testing are shown on the Soil Boring Logs and Boring Profile Sheet located in Appendix C and D, respectively.

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 Appendix C and are shown graphically in the Subsurface Profiles located in Appendix D. 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-7, B-8 and B-36/37 were advanced in support of Proposed Structure 010-1006 from January 16 to January 19, 2015 along the proposed ramp alignment. Borings B-36 and B-37, were originally intended as separate pier location boring but were combined to one boring B-36/37 located at Station 233+14.40.

Bridge Abutments

Boring **B-7** was advanced near the proposed north abutment located at Station 232+63.57 (Elev. 766.14'). The boring was advanced in a relatively flat area, with approximately 18 inches of topsoil overlying the soil. The soil profile underlying the topsoil in boring **B-7** is described as brown firm silty clay with brown loose silty sand, which extends to approximately 8.0 feet deep (Elev. 758.14'), where the material transitions to a very stiff gray silty clay loam till. The upper soils had SPT N-values in the range of 2 to 6 and an unconfined compressive strength (Qu) of 0.5 to 1.7. The silty clay loam till continues with depth to approximately 39.5 feet deep (Elev. 726.64') where the soil changes to a gray medium dense fine sand and gravel and continues with depth to 50 feet deep (Elev. 716.14'), at which point the soil changes to a gray very stiff silty clay loam till that continues to boring

completion depths. The silt clay loam till soils had SPT N-values ranging from 12 to 22 and unconfined compressive strength (Qu) values from 2.3 to 3.3.

Boring **B-8**, was advanced near the proposed south abutment, located at Station 234+08.30 (Elev. 765.34'). In boring **B-8**, underlying the 12 inches thick topsoil layer, is a soft to stiff brown silty clay that extends to 10.5 feet deep (Elev. 754.84'). The upper soils had SPT N-values of 3 to 14 and an unconfined compressive strength (Qu) of 0.3 to 1.8. At approximately 10.5 feet deep, the material changes to a stiff gray silty clay loam till with some aggregate. The till had SPT N-values in the range of 5 to 18. The till continues deeper, where at 41.5 feet deep (Elev. 723.84'), the soil changes to a gray medium dense sand and gravel. The sand and gravel continues deeper to 47 feet deep (Elev. 718.34'), where the soil changes to a gray stiff to very stiff silty clay loam till that continues to boring completion depth of 75 feet deep (690.34'). The lower till had SPT N-values of 15 to 27 and Qu values from 1.5 to 4.5.

Borings **B-36 and B-37**, were originally intended as separate pier location borings but were combined to one boring **B-36/37** located at Station 233+14.40. Based on the preliminary TS&L the structure now has a single span and therefore no pier will be used. Boring **B-36/37** is presented as additional soils data. In this boring, underlying the topsoil layer is a soft to stiff brown silty clay with fine loose sand to approximately 10.5 feet deep (Elev. 755.54'). Underlying this clay is a gray stiff silty clay loam till that continues to approximately 37 feet deep (Elev. 729.04'), where a medium dense coarse sand to fine gravel is encountered. The sand and gravel continues to 47 feet deep (Elev. 719.04'), where the soil changes to a gray silt followed by a gray hard silty clay loam till, continuing to boring completion depth of 75 feet deep (Elev. 691.04'). The boring had SPT N-values ranging from 4 to 30, and unconfined compressive strength values (Qu) of 0.8 to 4.0.

4.4 Groundwater Conditions

Water levels were checked in each boring to determine the general groundwater conditions present at the site and were measured at the time of drilling. Groundwater was identified in each boring as follows:

Table 2 – Groundwater Elevations

Boring	Groundwater Elevation (At time of drilling)	Groundwater Elevation (@ boring completion)
B-7 (North Abut)	760.6 (perched condition shown on boring log)	N/A (washed)
B-8 (South Abut)	723.8	N/A
B-36/37	724.0	N/A (washed)

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

In boring, B-7 a groundwater elevation (at the time of drilling) was shown on the boring log. However, based on information from the driller, this groundwater elevation is most likely a temporary perched groundwater condition. Based on the subsurface data from B-7 and groundwater depths from the remaining borings a groundwater elevation of approximately 724 is anticipated.

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 Settlement

The new approach slabs on either end of the bridge will be supported by new engineered fill. It is anticipated that approximately 32 feet (at the North abutment) and 26 feet (at the South abutment) will be placed at the new embankment approaches. The approach embankments will have 1:2 concrete slopewalls. The placement of fill for the north and south approaches will result in settlements of the underlying natural soils.

For the settlement analysis, we considered the general soil profile from the soil borings Preliminary settlement analysis was performed using the settlement analysis procedure as defined in the IDOT Geotechnical Manual – Appendix IV.

Potential elastic and consolidation settlement will be on the order of 3 to 3.5 inches, respectively the northern and southern embankments. We estimate that by the time the proposed northern and southern embankments are built to the bottom of abutment footing, the soil would undergo about 90% of the maximum elastic settlement.

Piles are to be used at the bridge abutments and it is necessary to ensure that any settlement has taken place prior to the installation of the piles to minimize the effects of any down drag forces on the piles. It is recommended that Settlement Platforms be constructed near Station 232+50 Offset 15' Lt. for the northern abutment and Station 234+20 Offset 14.5' Lt

for the southern abutment. The designer should show on both TS&L and final plans that "Settlement plates shall be used to verify that 0.4 inches or less of settlement remains prior to installation of the piles or pavement at the abutment". Settlement platforms construction requirement shall be per latest IDOT Standard Specifications for Road and Bridge Construction Section 204.06. A general settlement platform detail is provided in Appendix F.

5.2 Slope Stability – Bridge Abutments

The proposed construction of Ramp B over Ramp C involves the construction of new abutments with concrete slopewalls. 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.

End-of-construction conditions was modeled using full cohesion with a friction angle of 0 degrees. 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 below 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-7, North Abut	2H:1V	2.8	1.8	1.5
B-8, South Abut	2H:1V	2.9	1.9	1.5

5.3 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 of 154' 3", 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 AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 7th Edition, 2014, with 2015 Interim Revisions, the project site soil profile is most accurately described as the AASHTO Soil Site Class D.

According to Table 3.10.6-1 "Seismic Performance Zones" (SPZ) of the AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 7th Edition, 2014, with 2015 Interim Revisions, the site is most accurately described as (SPZ)=1 ($\mathbf{S_{D1}} \leq 0.15$g).

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

5.4 Scour

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

5.5 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.

5.6 Liquefaction

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

5.7 Approach Slabs

Based on information from the structural engineer, the approach slabs are 30 feet in length and will be cast-in-place. The approach slabs will bear on the abutment on one side and an approach slab concrete pad on the other end. 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 010-1006), Station 233+32.80 will be constructed of IL63-3838 precast beams on integral abutments with an estimated abutment length of 48'-10". The superstructure will consist of tangent girders on a curved alignment with back to back abutment distances of 154'-3". Abutments will bear on single row of vertical steel piles.

Two new 30 feet long approach slabs will be constructed on either end of the bridge. According to the ABD Memo 12.3, metal shell or HP-piles are permitted based on the use of integral abutments.

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 (including 16" MS piles) was used to estimate the pile lengths at various axial geotechnical resistances for driven piles per AGMU Memo 10.2.

The factored resistance includes reduction for the geotechnical resistance of 0.55 for the pile installation. Pile axial capacities were designed with no geotechnical losses due to down drag as per Section 5.1 or liquefaction. The anticipated factored structural loadings were obtained from the structural engineer and are provided in Table 6 on the following page.

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 abutments. The complete IDOT Pile Design Tables for each substructure are included in Appendix E.

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. 787.60 and Elev. 782.20 for the northern and southern abutments, respectively. The pile cutoff elevation included a 2 feet embedment into the integral abutment as required by the Bridge Manual.

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.

6.3 Shallow Foundations

Based on the soils encountered 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 therefore not discussed in this report.

Table 6: Structural Loadings

I-57 - I 74 INTERCHANGE STRUCTURES Information for Geotechnical Engineering SGR's Updated 06.26.2015				
Structure: RAMP B over RAMP C S.N. 010-1006 No. of Spans: 1			Station 233+32.80	
Option No.	**Superstructure Type / Option**		**Substructure**	
1	Details	**PPC BULB TEE IL63-3838**		
		Superstructure: Tangent Girder on Curved Alignment		
		Substructure Element	ABUT N	ABUT S
		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	786.7± **	781.4± **
		Est. Abutment Length	48.10 ±	48.10 ±
		Est. Pier Bottom of Footing	n/a	n/a
		Est. Pier Footing Dimensions	n/a	n/a
		Total Factored Vertical DL + LL	2,333 Kips *	2,333 Kips *
			Single row of vertical steel piles.	
		Additional Notes / Comments	* Dynamic Load Allowance (IM) included for integral abutment. ** Bottom of abutment is stepped. See DRAFT TSL 06.25.2015 for high and low step elevations.	

6.4 Lateral Load Resistance

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. Based on information provided by the structural engineer the lateral loads were anticipated to be less than 3 kips.

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 option 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 (2016) and the Supplemental Specifications and Recurring Special Provisions (2016) and-or its successor specifications. Any deviation from the requirements in the manuals above should be approved by IDOT.

7.1 Groundwater Management

As discussed previously in this report, perched groundwater was observed in soil boring B-7 at elevation 760.64. However, the actual anticipated static groundwater elevation is approximately 724 based on other nearby borings.

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 pumping, 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 above 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.

Pile Capacity Tables (Tables 7 & 8)

(IL63-3838 Beam – Integral Abutment)

Table 7 – North Abutment

Piling Driven at North Abutment (B-7 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 14" Φ w/0.25 walls		
268	148	50
283	156	52
326	180	55
354	195	57
413*	227*	59*
Metal Shell 14" Φ w/0.312" walls		
326	180	55
354	195	57
470	258	65
483	266	67
513*	282*	76*
Metal Shell 16" Φ w/0.312 walls		
381	209	55
413	227	57
550	303	65
565	311	67
588*	323*	76*
Metal Shell 16" Φ w/0.375 walls		
565	311	67
585	322	75
624	343	80
675	371	85
699	384	87
704*	387*	88*
HP 12 x 53		
394	217	92
402	221	94
HP 12 x 74		
403	222	92
411	226	94
HP 14 x 73		
474	261	92
483	266	94

Table 8 – South Abutment

Piling Driven at South Abutment (B-8 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 14" Φ w/0.25" walls		
306	169	65
320	176	67
369	203	70
399	219	72
413*	227*	74*
Metal Shell 14" Φ w/0.312 walls		
459	252	77
481	265	80
508	279	82
509	280	85
513*	282*	86*
Metal Shell 16" Φ w/0.312 walls		
431	237	70
499	274	75
558	307	80
585	322	85
588*	323*	86*
Metal Shell 16" Φ w/0.375 walls		
499	274	75
558	307	80
585	322	85
602	331	87
653	359	90
HP 12 x 53		
347	191	87
363	199	92
HP 12 x 74		
399	219	90
414	227	92
HP 14 x 73		
473	260	90
490	270	92

*- Maximum Nominal Required Bearing

7.2 Temporary Sheeting and Soil Retention

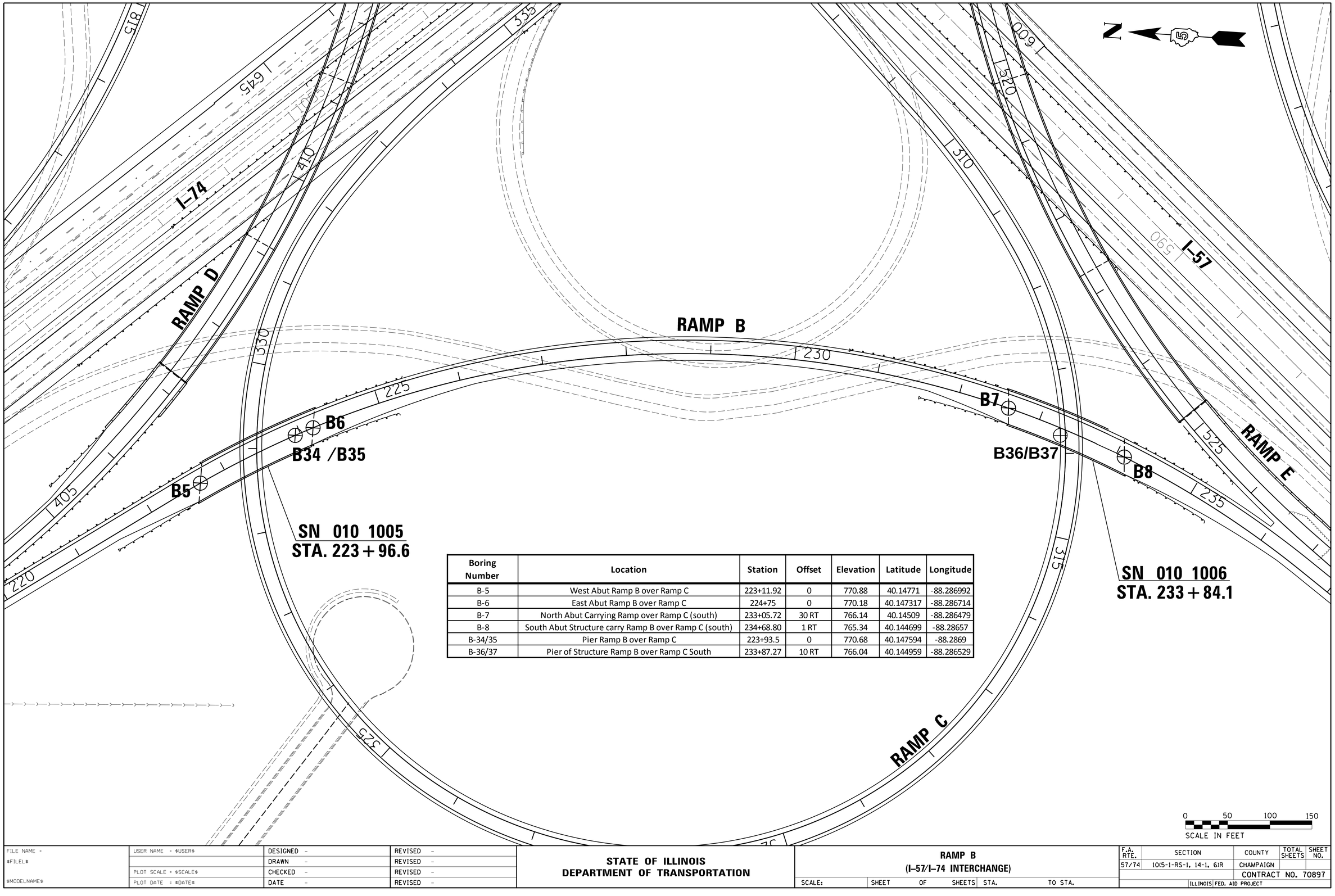
Ramp B over Ramp G is new construction and will not encounter traffic until completion therefore, temporary sheeting and/or soil retention will not be required for this structure.

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 this report 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. This 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-5	West Abut Ramp B over Ramp C	223+11.92	0	770.88	40.14771	-88.286992
B-6	East Abut Ramp B over Ramp C	224+75	0	770.18	40.147317	-88.286714
B-7	North Abut Carrying Ramp over Ramp C (south)	233+05.72	30 RT	766.14	40.14509	-88.286479
B-8	South Abut Structure carry Ramp B over Ramp C (south)	234+68.80	1 RT	765.34	40.144699	-88.28657
B-34/35	Pier Ramp B over Ramp C	223+93.5	0	770.68	40.147594	-88.2869
B-36/37	Pier of Structure Ramp B over Ramp C South	233+87.27	10 RT	766.04	40.144959	-88.286529

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

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RAMP B
(I–57/I–74 INTERCHANGE)

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

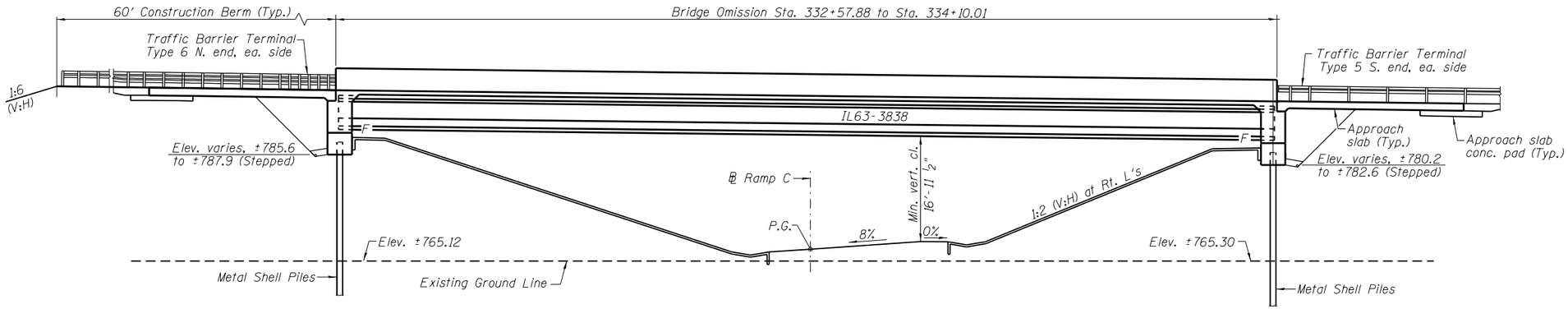
F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57/74	10(5-1-RS-1, 14-1, 6)R	CHAMPAIGN		
		CONTRACT NO. 70897		
	ILLINOIS	FED. AID PROJECT		

Appendix B

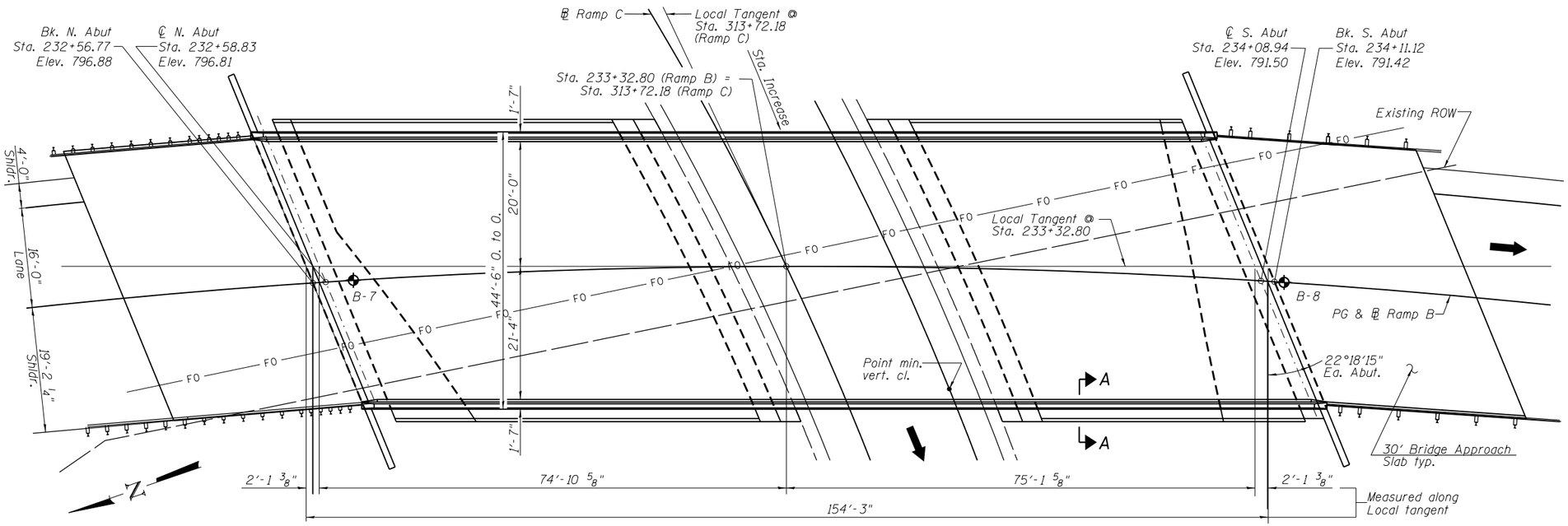
Preliminary TS&L

Bench Mark: Chiseled "□" on top of S.W. corner of S.W. Parapet Wall of I-74 W.B. Bridge over I-57, Sta. 1059+99.73, 12.5 Left
Elev. 787.789

Existing Structure: None

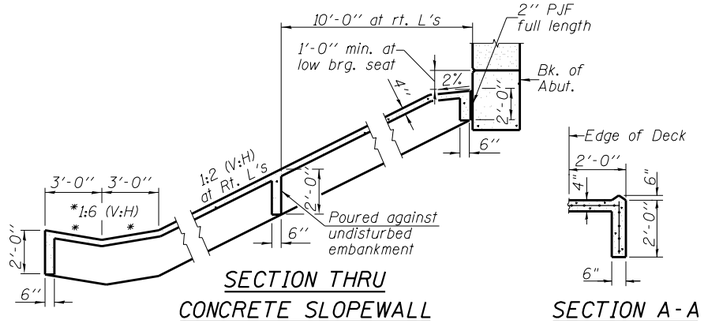


ELEVATION



PLAN

◆ Boring Location



SECTION THRU CONCRETE SLOPEWALL

SECTION A-A

DRAFT
06.25.2015

DESIGN STRESSES

FIELD UNITS

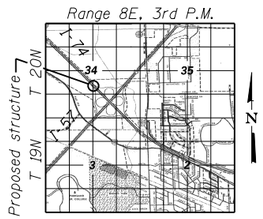
f'c = 3,500 psi (Cast-in-Place)
f'c = 4,000 psi (Superstructure Concrete)
fy = 60,000 psi (Reinforcement)

PRECAST PRESTRESSED UNITS

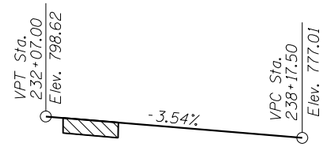
f'c = 6,000 psi
fci = 5,000 psi
fpu = 270,000 psi (½" ϕ low lax strands)
fpbt = 201,960 psi (½" ϕ low lax strands)

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



LOCATION SKETCH

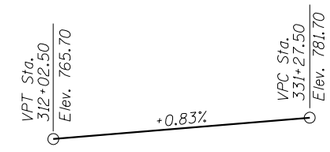


PROFILE GRADE RAMP B

(Along ℄ Roadway)

PROPOSED RAMP B CURVE DATA

P.I. Sta. = 230+56.25	L = 1,420.88'
△ = 70°-10'-53" (Rt.)	E = 257.67'
D = 4°-56'-21"	S.E. = 7.8%
R = 1,160.00'	P.C. Sta. = 222+41.27
T = 814.98'	P.T. Sta. = 236+62.15



PROFILE GRADE RAMP C

(Along ℄ Roadway)

PROPOSED RAMP C CURVE DATA

P.I. Sta. = 330+93.16	L = 1,041.65'
△ = 124°-20'-18" (Rt.)	E = 548.14'
D = 11°-56'-12"	S.E. = 8.0%
R = 480.00'	P.C.C. Sta. = 321+83.95
T = 909.21'	P.C.C. Sta. = 332+25.60

HIGHWAY CLASSIFICATION

FAI 57/74 -Ramp B
Functional Class: Interstate Ramp
ADT: 2,800 (2013); 4,550 (2040)
ADTT: 795 (2013); 1,292 (2040)
DHV: 320
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
One-Way Traffic
Directional Distribution: 100% EB

FAI 57/74 -Ramp C
Functional Class: Interstate Ramp
ADT: 2,100 (2013); 2,650 (2040)
ADTT: 376 (2013); 474 (2040)
DHV: 215
Design Speed: 40 m.p.h.
Posted Speed: 40 m.p.h.
One-Way Traffic
Directional Distribution: 100% SB

DESIGN SPECIFICATIONS

2014 AASHTO LRFD Bridge Specifications, 7th Edition

LOADING HL-93

Allow 50 psf for future wearing surface

GENERAL PLAN
RAMP B OVER RAMP C
F.A.I. RTE. 57/74
SECTION 10 (5-1-RS-1, 14-1,6) R
CHAMPAIGN COUNTY
STATION 233+32.80
STRUCTURE NO. 010-1006

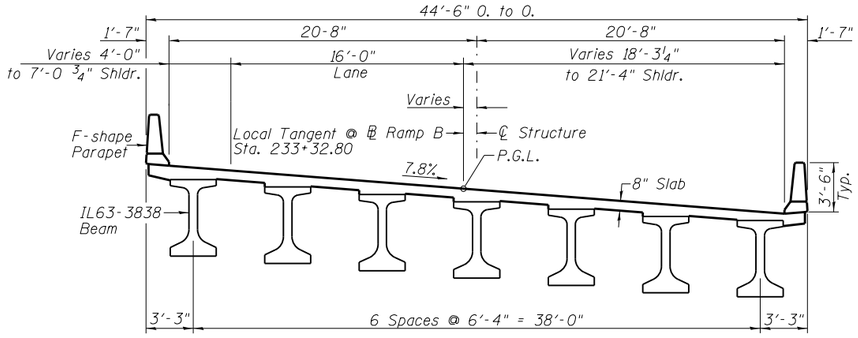
FUHRMANN ENGINEERING INC.
2852 SOUTH 11th STREET
SPRINGFIELD, IL. 62703
(217) 529-5577

USER NAME = rob	DESIGNED -	REVISED	
FILE NAME = Ramp B over Ramp C.dgn	DRAWN -	REVISED	
PLOT SCALE = 20.0000 ' / in.	CHECKED -	REVISED	
PLOT DATE = 6/25/2015	DATE -	REVISED	

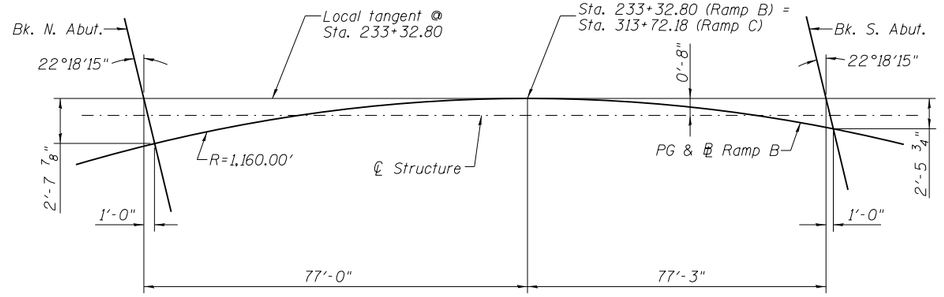
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

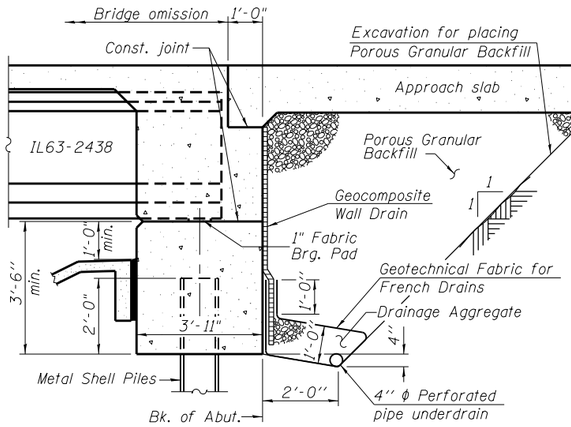
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
I-57 & I-74	10(5-1-RS-1,14-1,6)R	CHAMPAIGN	$TOT	
		CONTRACT NO. 70897		
		ILLINOIS	FED. AID PROJECT	



CROSS SECTION
(Looking South)



OFFSET SKETCH



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

DRAFT
06.25.2015

DETAILS
RAMP B OVER RAMP C
F.A.I. RTE. 57/74
SECTION 10 (5-1-RS-1, 14-1.6) R
CHAMPAIGN COUNTY
STATION 233+32.80
STRUCTURE NO. 010-1006

FUHRMANN ENGINEERING INC.
2852 SOUTH 11th STREET
SPRINGFIELD, IL. 62703
(217) 529-5577

USER NAME = rob	DESIGNED -	REVISED	
FILE NAME = Ramp B over Ramp C.dgn	DRAWN -	REVISED	
PLOT SCALE = 20.0000 ' / In.	CHECKED -	REVISED	
PLOT DATE = 6/25/2015	DATE -	REVISED	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
I-57 & I-74	10(5-1-RS-1,14-1.6)R	CHAMPAIGN	$TOT	
		CONTRACT NO. 70897		
	ILLINOIS FED. AID PROJECT			

Appendix C

Subsurface Boring Logs

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

SOIL BORING LOG

Date 1/16/15

ROUTE I-57/74 **DESCRIPTION** North Abut Structure Carrying Ramp B over Ramp C (South Bridge) **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.145090, **Longitude** -88.286479

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

STRUCT. NO. 010-1006
Station 233+32.80

BORING NO. B-7
Station 232+63.57
Offset 25.1 ft LT
Ground Surface Elev. 766.14 ft

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

Groundwater Elev.:
First Encounter 760.6 ft ▼
Upon Completion washed ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				TOPSOIL: Silty Clay, dark brown
	3			
764.64				
	3	1.7	29	SILTY CLAY: Brown
	3	B		
	1			
	2	0.5	25	
-5	1	B		
760.64 ▼				
	1			SILTY SAND: Brown, very loose, wet
	1		24	
	1			
758.14				
	1			SILTY CLAY LOAM TILL: Gray, very stiff
	4	2.7	13	
-10	6	B		
	2			
	6	2.7	12	
	8	B		
	3			
	6	2.9	12	
-15	6	B		
	3			
	6	3.1	12	
	10	B		
	4			
	7	2.5	12	
-20	7	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				SILTY CLAY LOAM TILL: Gray, very stiff *(continued)*
744.64				
	2			SILTY CLAY LOAM TILL: Gray, stiff
	3	1.0	13	
-25	4	B		
	3			
	5	1.7	13	
-30	7	B		
734.14				
	3			SILTY CLAY LOAM TILL: Gray, hard
	6	4.1	11	
-35	8	B		
	12			
727.14				
726.64	24	4.5	23	SILTY LOAM TILL: Dense
726.14	12	P		SAND: Gray, medium dense, fine
-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 1/16/15

ROUTE I-57/74 **DESCRIPTION** North Abut Structure Carrying Ramp B over Ramp C (South Bridge) **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.145090, **Longitude** -88.286479

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

STRUCT. NO. 010-1006
Station 233+32.80

BORING NO. B-7
Station 232+63.57
Offset 25.1 ft LT
Ground Surface Elev. 766.14 ft

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

Groundwater Elev.:
First Encounter 760.6 ft ▼
Upon Completion washed ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND and GRAVEL: Medium dense coarse sand and fine to medium gravel (clean)
	3			
-45	5 7		14	
719.14				
				SAND and GRAVEL: Medium dense, cobbly
	10			
-50	12 12		15	
716.14				Silty Clay Loam Till in tip of shoe
				SILTY CLAY LOAM TILL: Gray, very stiff
	6			
-55	7 8	3.3 B	13	
	7			
-60	6 6	2.3 B	13	
				SILTY CLAY LOAM TILL: Gray, very stiff *(continued)*
	4			
-65	6 9	2.9 B	13	
	3			
-70	6 10	2.5 B	13	
	4			
691.14 -75	9 13	2.3 B	13	
				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)

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

SOIL BORING LOG

Date 1/19/15

ROUTE I-57/74 **DESCRIPTION** South Abut Structure Carrying Ramp B over Ramp C (South Bridge) **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.144699, **Longitude** -88.286570

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

STRUCT. NO. 010-1006
Station 233+32.80

BORING NO. B-8
Station 234+08.30
Offset 2.5 ft RT
Ground Surface Elev. 765.34 ft

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

Groundwater Elev.:
First Encounter 723.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL: Silty Clay, black/dark brown
				764.34
	1			SILTY CLAY: Brown, soft
	2 1	0.3 B	22	
				762.34
	1			SILTY CLAY: Brown, stiff
-5	3 3	1.2 B	17	
	4			
	5 9	1.8 B	17	
	2			
-10	5 8	1.6 B	15	
				754.84
	4			SILTY CLAY LOAM TILL: Gray, stiff
	6 6	1.3 B	13	
	5			
-15	7 8		18	
	2			
	5 6	1.0 B	12	
	3			
-20	3 5	1.2 B	13	
				SILTY CLAY LOAM TILL: Gray, stiff *(continued)*
				many rounded aggregate pieces up to 5/8"
-25	3 4	0.8 B	14	
	2			
-30	5 5	0.7 B	11	
	2			
-35	2 3	1.0 B	12	
	4			
-40	6 12	0.9 B	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)

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

SOIL BORING LOG

Date 1/19/15

ROUTE I-57/74 **DESCRIPTION** South Abut Structure Carrying Ramp B over Ramp C (South Bridge) **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.144699, **Longitude** -88.286570

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

STRUCT. NO. 010-1006
Station 233+32.80

BORING NO. B-8
Station 234+08.30
Offset 2.5 ft RT
Ground Surface Elev. 765.34 ft

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

Groundwater Elev.:
First Encounter 723.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY LOAM TILL: Gray, stiff *(continued)*			
723.84 ▼			
SAND and GRAVEL: Gray, medium dense			
	11		
-45	14 12		12
718.34			
SILTY CLAY LOAM TILL: Gray, stiff			
	5		
-50	11 4	1.5 B	17
	12		
No Recovery (Qu estimated by comparing N-values with the next sample below)			
-55	10 12	4.5 E	17
	7		
-60	9 14	4.5 B	12
SILTY CLAY LOAM TILL: Gray, stiff *(continued)*			
	4		
-65	12 14	3.9 B	11
698.84			
SILTY CLAY LOAM TILL: Stiff to very stiff			
	8		
-70	12 15	1.7 B	14
Sample Disturbed			
	5		
690.34 -75	8 12	3.9 B	13
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)

Illinois Department of Transportation
Division of Highways
BACON | FARMER | WORKMAN ENGINEERING & TESTING INC.

SOIL BORING LOG

Date 1/19/15

ROUTE I-57/74 **DESCRIPTION** Pier of Structure Ramp B over Ramp C South Bridge **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.144959, **Longitude** -88.286529

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

STRUCT. NO.
Station

BORING NO. B-36/37
Station 233+14.40
Offset 27.7 ft RT
Ground Surface Elev. 766.04 ft

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

Groundwater Elev.:
First Encounter 724.0 ft ▼
Upon Completion washed ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL: Silty Clay, black to dark brown, stiff
	2			764.54
	2 3	2.1 B	33	SILTY CLAY: Brown, stiff
	2			
-5	2 2	1.0 P	22	
				760.54
	1			SILTY SAND: Loose, fine
	2 3		17	
				757.54
	2			SILTY CLAY: Gray, stiff
-10	7 8	1.7 B	19	
				755.54
	2			SILTY CLAY TILL: Gray, stiff
	7 6	1.7 B	11	Aggregate pieces up to 3/8"
				753.04
	2			SILTY CLAY TILL: Gray, very stiff
-15	4 11	2.5 B	14	
				750.54
	3			SILTY CLAY TILL: Gray, stiff
	6 10	1.7 B	11	
				748.04
	3			SILTY CLAY TILL: Gray, very stiff
-20	4 7	3.3 B	12	
				SILTY CLAY TILL: Gray, very stiff *(continued)*
				745.04
				SILTY CLAY TILL: Gray, stiff
	2			
-25	5 7	1.4 B	12	
	2			
-30	4 7	0.8 B	12	
	2			
-35	4 7	1.5 B	12	
	2			
				729.04
	4			SAND AND GRAVEL: Medium dense, coarse sand to fine gravel
-40	6 11		15	

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
BACON | FARMER | WORKMAN ENGINEERING & TESTING INC.

SOIL BORING LOG

Date 1/19/15

ROUTE I-57/74 **DESCRIPTION** Pier of Structure Ramp B over Ramp C South Bridge **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.144959, **Longitude** -88.286529

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

STRUCT. NO.
Station

BORING NO. B-36/37
Station 233+14.40
Offset 27.7 ft RT
Ground Surface Elev. 766.04 ft

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

Groundwater Elev.:
First Encounter 724.0 ft ▼
Upon Completion washed ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND AND GRAVEL: Medium dense, coarse sand to fine gravel *(continued)*				SILTY CLAY LOAM TILL: Gray, hard *(continued)*			
724.04 ▼				704.54			
SAND AND GRAVEL: Loose, coarse sand to fine gravel	1			SILTY CLAY LOAM TILL: Gray, very stiff	6		
	1		17		10	2.2	12
-45	7			-65	15	B	
(washed sample)							
719.04							
SILT: Gray, medium dense	5				5		
	9		15		6	2.3	12
-50	10			-70	13	B	
714.04							
SILTY CLAY LOAM TILL: Gray, hard	6				5		
	7	4.0	12		13	1.9	12
-55	13	B		691.04 -75	17	B	
				End of Boring			
	7						
No Recovery Pushed spoon immediately below to get marginal sample	10	4.0	15				
-60	14	E		-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

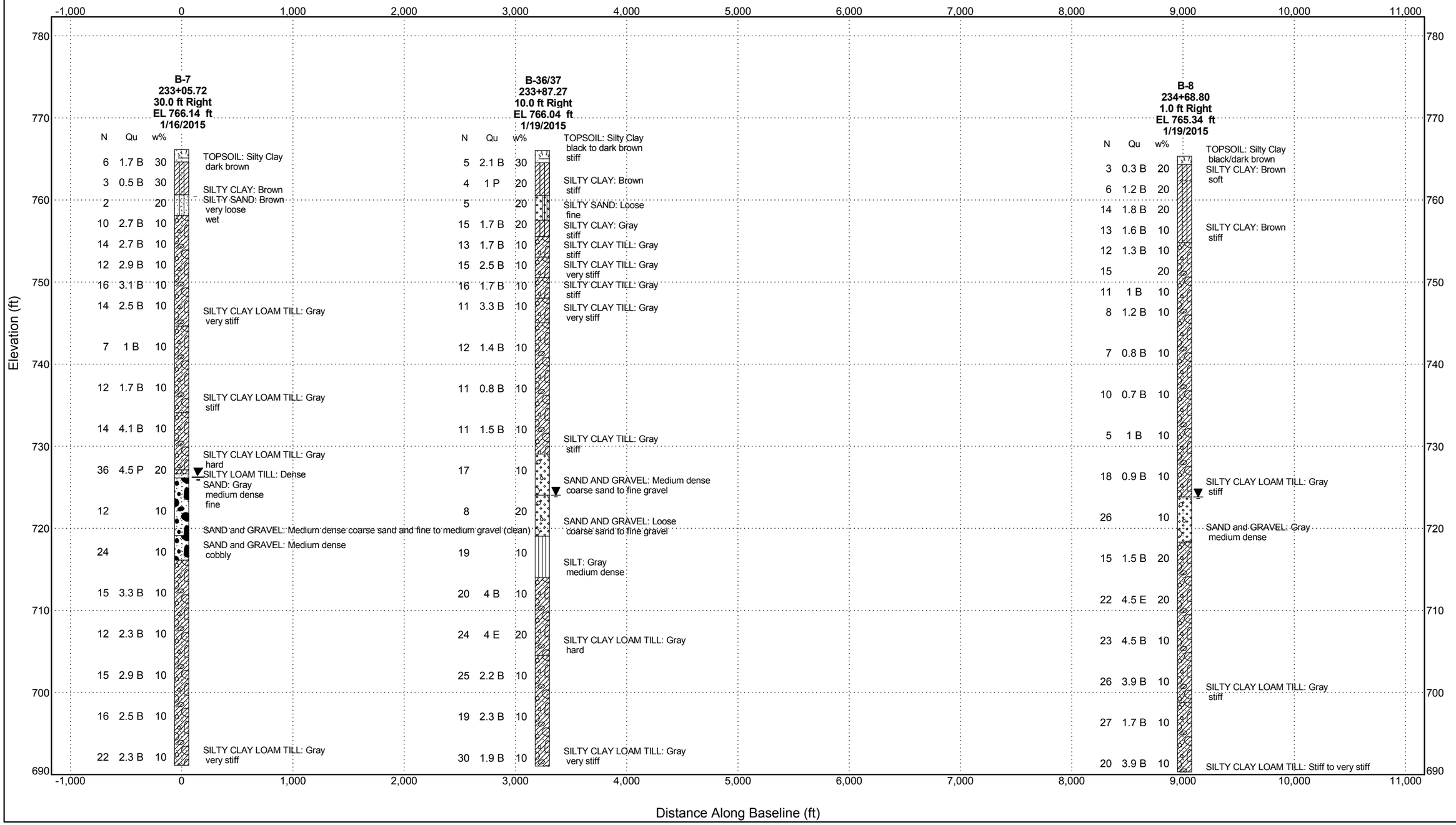
Illinois Department of Transportation
Division of Highways
BFW Engineering & Testing Inc.

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

SUBSURFACE PROFILE
SN 010-1006

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 Abutment, South Abutment)

Pile Design Table for North Abutment utilizing Boring #7

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 16"Φ w/.312" walls		
119	65	25
135	74	27
161	89	30
184	101	32
211	116	35
238	131	37
255	140	40
276	152	45
287	158	47
310	170	50
327	180	52
381	209	55
413	227	57
Metal Shell 16"Φ w/.375" walls		
119	65	25
135	74	27
161	89	30
184	101	32
211	116	35
238	131	37
255	140	40
276	152	45
287	158	47
310	170	50
327	180	52
381	209	55
413	227	57
550	303	65
565	311	67
Metal Shell 14"Φ w/.25" walls		
117	64	27
136	75	30
157	86	32
179	99	35
203	112	37
219	120	40
238	131	42
240	132	45
250	137	47
268	148	50
283	156	52
326	180	55
354	195	57
Metal Shell 14"Φ w/.312" walls		
117	64	27
136	75	30
157	86	32
179	99	35
203	112	37
219	120	40
238	131	42
240	132	45

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
128	70	37
135	74	40
143	79	45
149	82	47
162	89	50
171	94	52
203	112	55
220	121	57
226	124	65
229	126	67
252	139	70
252	139	75
266	146	77
270	148	80
281	154	82
297	163	85
310	170	87
318	175	90
330	181	92
337	185	94
Steel HP 12 X 53		
123	68	32
140	77	35
157	87	37
165	91	40
171	94	45
178	98	47
194	107	50
205	113	52
248	136	55
267	147	57
271	149	65
274	151	67
304	167	75
320	176	77
323	178	80
336	185	82
356	196	85
371	204	87
381	209	90
394	217	92
402	221	94
Steel HP 12 X 63		
124	68	32
141	78	35
159	87	37
166	91	40
172	95	45
179	99	47
196	108	50
207	114	52
251	138	55

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
132	72	30
154	85	32
174	96	35
196	108	37
202	111	40
205	113	45
213	117	47
235	129	50
248	136	52
306	168	55
328	180	65
331	182	67
370	204	75
390	214	80
404	222	82
431	237	85
449	247	87
458	252	90
474	261	92
483	266	94
Steel HP 14 X 89		
92	51	27
134	74	30
156	86	32
177	97	35
198	109	37
205	113	40
208	114	45
216	119	47
238	131	50
251	138	52
310	171	55
332	182	65
335	184	67
375	206	75
394	217	80
409	225	82
436	240	85
454	250	87
464	255	90
480	264	92
489	269	94
Steel HP 14 X 102		
93	51	27
135	74	30
158	87	32
179	99	35
201	111	37
208	114	40
210	115	45
218	120	47
241	133	50

250	137	47
268	148	50
283	156	52
326	180	55
354	195	57
Steel HP 8 X 36		
127	70	50
134	74	52
156	86	55
169	93	57
178	98	65
180	99	67
195	107	70
197	108	75
208	114	77
212	117	80
221	122	82
233	128	85

270	149	57
274	151	65
277	152	67
307	169	75
324	178	77
326	179	80
339	186	82
360	198	85
375	206	87
384	211	90
398	219	92
405	223	94
Steel HP 12 X 74		
126	69	32
144	79	35
162	89	37
169	93	40
174	96	45

254	140	52
315	173	55
336	185	65
339	186	67
380	209	75
399	219	80
414	228	82
441	243	85
459	253	87
469	258	90
485	267	92
494	272	94
Steel HP 14 X 117		
94	52	27
137	76	30
160	88	32
182	100	35
204	112	37

Pile Design Table for SOUTH ABUTMENT utilizing Boring #8

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 16"Φ w/.312" walls		
118	65	22
133	73	25
145	80	27
154	85	30
166	91	32
181	99	35
194	107	37
201	111	40
211	116	42
219	121	45
228	125	47
241	133	50
253	139	52
263	145	55
274	150	57
353	194	65
369	203	67
431	237	70
465	256	72
499	274	75
533	293	77
558	307	80
585	322	85
588	323	86
Metal Shell 16"Φ w/.375" walls		
118	65	22
133	73	25
145	80	27
154	85	30
166	91	32
181	99	35
194	107	37
201	111	40
211	116	42
219	121	45
228	125	47
241	133	50
253	139	52
263	145	55
274	150	57
353	194	65
369	203	67
431	237	70
465	256	72
499	274	75
533	293	77
558	307	80
585	322	85
602	331	87
653	359	90
Metal Shell 14"Φ w/.25" walls		
124	68	27
133	73	30
144	79	32

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
132	72	52
137	75	55
142	78	57
163	90	65
171	94	67
209	115	70
227	125	72
244	134	75
262	144	77
273	150	80
283	155	85
291	160	87
322	177	90
Steel HP 12 X 53		
131	72	42
136	75	45
141	78	47
150	83	50
157	87	52
163	90	55
170	93	57
195	108	65
205	113	67
256	141	70
277	152	72
297	163	75
318	175	77
330	182	80
337	185	85
347	191	87
388	213	90
Steel HP 12 X 63		
127	70	40
133	73	42
137	75	45
142	78	47
152	83	50
159	87	52
165	91	55
171	94	57
197	109	65
207	114	67
259	142	70
279	154	72
300	165	75
321	177	77
333	183	80
340	187	85
350	193	87
391	215	90
Steel HP 12 X 74		
128	71	40

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
127	70	32
140	77	35
149	82	37
151	83	40
158	87	42
163	90	45
169	93	47
181	100	50
190	104	52
196	108	55
204	112	57
236	130	65
247	136	67
317	174	70
341	188	72
366	201	75
390	214	77
403	222	80
404	222	85
416	229	87
471	259	90
Steel HP 14 X 89		
129	71	32
141	78	35
151	83	37
153	84	40
160	88	42
165	91	45
171	94	47
183	101	50
192	105	52
198	109	55
206	113	57
239	131	65
250	138	67
321	177	70
346	190	72
370	204	75
395	217	77
408	224	80
409	225	85
421	232	87
477	262	90
Steel HP 14 X 102		
130	72	32
143	79	35
153	84	37
155	85	40
162	89	42
167	92	45
173	95	47
185	102	50

156	86	35
168	92	37
175	96	40
183	101	42
191	105	45
198	109	47
209	115	50
220	121	52
229	126	55
238	131	57
306	169	65
320	176	67
369	203	70
399	219	72
413	227	74

Metal Shell 14"Φ w/.312" walls

124	68	27
133	73	30
144	79	32
156	86	35
168	92	37
175	96	40
183	101	42
191	105	45
198	109	47
209	115	50
220	121	52
229	126	55
238	131	57
306	169	65
320	176	67
369	203	70
399	219	72
429	236	75
459	252	77
481	265	80
508	279	82
509	280	85
513	282	86

134	74	42
139	76	45
144	79	47
154	85	50
161	89	52
167	92	55
173	95	57
200	110	65
210	115	67
263	144	70
284	156	72
305	168	75
326	179	77
338	186	80
344	189	85
355	195	87
397	218	90

Steel HP 12 X 84

194	107	52
201	110	55
208	115	57
242	133	65
253	139	67
325	179	70
350	193	72
375	206	75
400	220	77
413	227	80
413	227	85
426	234	87
483	266	90

Steel HP 14 X 117

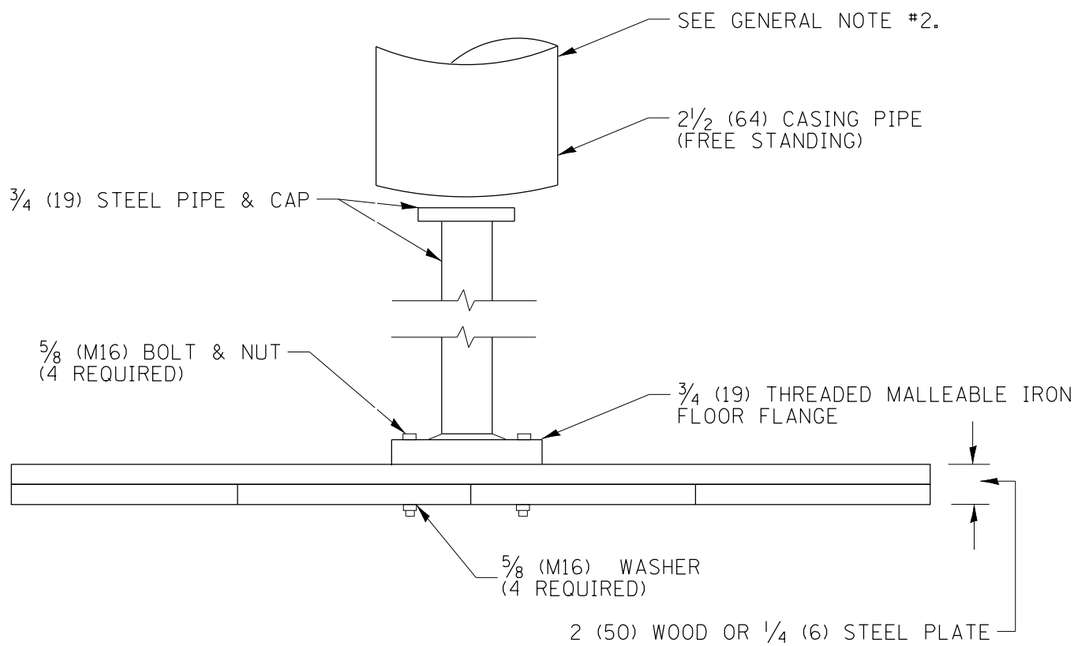
132	73	32
145	80	35
155	85	37
156	86	40

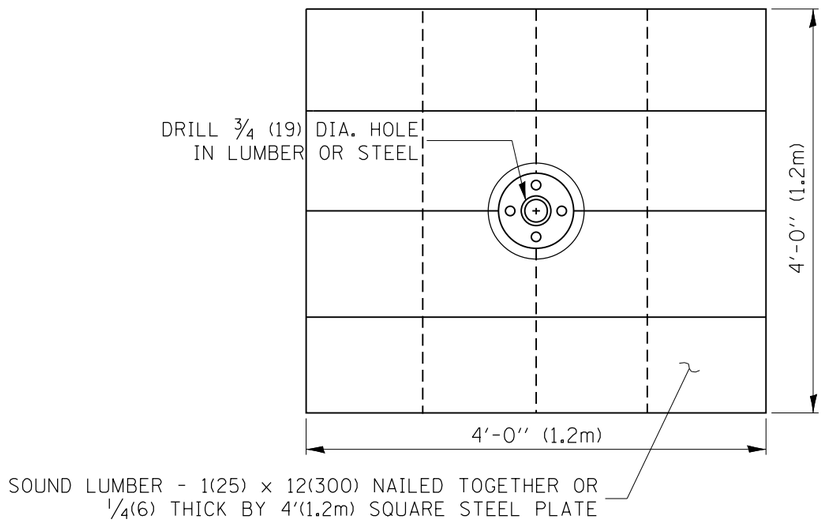
Appendix F

Settlement Platform Detail

DESIGNER NOTES:

1. SEE SOILS REPORT AND BUREAU OF MATERIALS FOR USAGE, LOCATIONS, AND SETTLEMENT RATES.
2. CONSIDER USE ON BRIDGE EMBANKMENT AND OTHER SETTLEMENT SENSITIVE FILLS.
3. THIS DRAWING ALLOWS FOR WOODBASE PLATE OPTION.





GENERAL NOTES:

1. Settlement Platform shall be in accordance with the appicable portions of Article 204.06 of the Standard Specifications.

2. Do Not install casing pipe until after one section of ¾"(19 mm) has been covered with earth. The casing pipe should not rest on platform.

All dimensions are in inches (millimeters) unless otherwise noted.

1-1-97	RENUM. L-5.04. NEW REVISION BOX. REVISED NOTES.	T.P.	8-23-01	UPDATE FOR NEW SPEC.	M.A.	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	SETTLEMENT PLATFORM
	REVISED TITLE BOX		10-16-06	REVISED TO 2007 SPEC.	M.A.		
4-14-99	ADDED "CASING PIPE" REQUIREMENT	J.A.					NOT TO SCALE CADD STD. 205101-D4
5-19-99	CORRECTIONS TO CASING PIPE	J.A.					

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		