STRUCTURE
GEOTECHNICAL REPORT

RAMP B OVER RAMP C
(STATION 223+43.16)
Proposed SN: 010-1005

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

1.0 Project Description

The purpose of this geotechnical study is to explore the existing subsurface conditions present at the proposed structure location (SN 010-1005) (Station 223+43.16 – 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.

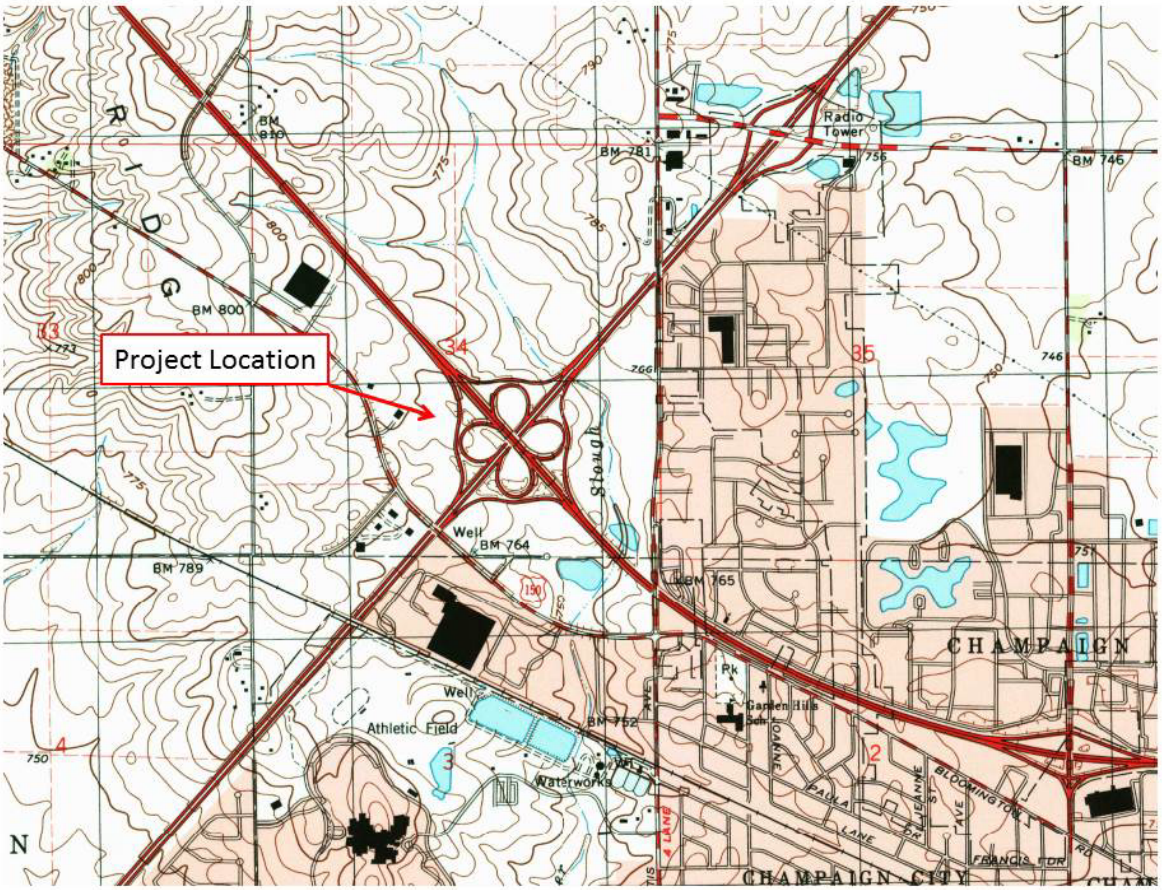


Exhibit 1: Project Location Map

2.0 Proposed Structure Information

Proposed Structure (SN 010-1005)

Based on the preliminary TS&L, the proposed structure (SN 010-1005), Station 223+43.16 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 7/8". 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. 769.92 to 770.07. Embankments heights of between approximately 35 to 38 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 drillers. 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 14 to January 15, 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 **Boring Location Map** provided in Appendix A.

Table 1 – Summary of Subsurface Exploration Ramp B over C

Boring ID	Location	Station	Offset (feet)	Depth (feet)	Surface Elevation (feet)
B-5	North Abutment	222+52.50	8.84 LT	80	770.88
B-6	South Abutment	224+17.07	14.06 LT	85	770.18
B-34/35	Pier (N/A)	223+02.36	10.42 RT	75	770.68

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

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 located in Appendix C.

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-5, B-6 and B-34/35 were advanced in support of Proposed Structure 010-1005 from January 14 to January 15, 2015 along the proposed ramp alignment. Borings B-34 and B-35, were originally intended as separate pier location boring but were combined to one boring B-34/35 located at Station 223+02.36.

Bridge Abutments

Boring **B-5** was advanced near the proposed north abutment located at Station 222+52.50 (Elev. 770.88'). 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-5** is described as brown stiff silty clay with gravel and with loose brown fine clayey sand, which extends to approximately 8.0 feet deep (Elev. 762.88'), where the material transitions to a loose fine-medium gray silty sand. The upper soils had SPT N-values in the range of 4 to 5 and an unconfined compressive strength (Qu) of 0.54. At 10.5 feet deep (Elev. 760.38'), the soil transitions to a stiff gray silty clay loam till that extended to approximately 32 feet. The silt clay loam till soils had SPT N-values ranging from 8 to 28 and unconfined compressive strength (Qu) values from 1.24 to 1.81. At about 32 feet deep (Elev. 738.88'), a gray stiff silty clay with trace gravel is encountered, extending to approximately 40 feet deep (Elev.

730.88'). At this depth, the material changes to a gray medium dense fine to medium gravelly sand, continuing to approximately 52 feet (Elev. 718.88'), where the material changes to a very hard gray silty clay loam till and continues to boring completion depth of 80 feet deep (Elev. 690.88'). The silty clay loam till soils had SPT N-values ranging from 15 to 35 and unconfined compressive strength (Qu) values from 1.03 to 6.3.

Boring **B-6** was advanced near the proposed south abutment at Station 224+17.07 (Elev. 770.18'). In boring **B-6**, underlying the 2.5-ft thick topsoil layer, is a soft brown to light brown silty clay loam that extends to 10.5 feet deep (Elev. 759.68'). The upper soils had SPT N-values of 3 to 12 and an unconfined compressive strength (Qu) of 0.39. At approximately 10.5 feet deep, the material changes to a stiff gray silty clay loam till with aggregate. The till had SPT N-values in the range of 8 to 16. The till continues deeper, with a 6" sand layer situated at the bottom of this formation, where at 35 feet deep (Elev. 735.18'), the soil changes to a gray stiff silty clay loam till with no aggregate. The till continues deeper to 40 feet deep (Elev. 730.18'), exhibiting SPT N-values of 20 and a Qu of 1.03, where the soil changes to a medium dense coarse sand and fine gravel. The sand and gravel had SPT N-values of 16 to 29. By approximately 52 feet deep (Elev. 718.18'), the soil changes to a gray stiff silty clay loam till that continued to boring completion depth to approximately 85 feet deep (Elev. 685.18'). The silty clay loam till soils had SPT N-values in the range of 8 to 27 and unconfined compressive strengths (Qu) ranging from 1.81 to 3.50.

Borings **B-34 and B-35** were originally intended as separate pier location boring but were combined to one boring **B-34/35** located at Station 223+02.36. Based on the preliminary TS&L the structure now has a single span and therefore no pier will be used. Boring **B-34/35** is presented for additional soils data. In boring **B-34/35**, underlying the topsoil layer is a soft to stiff brown silty clay to approximately 10.5 feet deep (Elev. 760.18'). Underlying this clay is a gray stiff silty clay loam till that continues to approximately 40 feet deep (Elev. 730.68'), where a gray coarse sand is encountered. The sand is encountered with some gray silty clay loam till, continuing to 52 feet deep (Elev. 718.68'), where the soil changes to a brown to gray stiff to hard silty clay loam till, continuing to boring completion depth of 75 feet deep (Elev. 695.88'). The soil had SPT N-values ranging from 2 to 30, and unconfined compressive strength values (Qu) of 0.74 to 4.12.

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 (@ boring completion)
B-5 (North Abut)	728.4	N/A (washed)
B-6 (South Abut)	735.7	N/A (washed)
B-34/35	728.2	N/A (washed)

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 Settlement

The new approach slabs on either end of the bridge will be supported by new engineered fill. It is anticipated that approximately 35 feet (at the North abutment) and 38 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 and consolidation data obtained from laboratory analysis from soil borings, B-5 and B-6. 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 9 to 11 inches, respectively the northern and southern embankments. Based on settlement calculations we estimate that it will take approximately 16 and 88 days to achieve 50% of the total settlement and 2.5 and 13 months to achieve 90% of the total consolidation settlement for the embankment heights of 35 (northern) and 38 (southern) feet, respectively.

Designer should note on 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 abutments. The estimated time to achieve 0.4 inches or less of settlement is 3.5 months for the northern abutment and 17 months for the southern abutment.

If times for 90% consolidation of the soil underlying the embankment is in excess of the project demands, additional remedial methods such as undercut and replacement of the softer upper soils or the use of wick drains may be required. Undercut and replacement remediation option would include the removal of approximately the upper 9 feet of soft in-situ soils and replacement of properly compacted engineered fill. This effort would reduce the amount of total settlement in the range of 3 to 4 inches. The use of wick drains would not lessen the amount of settlement but decrease the time to 90% consolidation by providing drainage pathways.

Piles are anticipated 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 222+50 Offset 9' Lt. for the northern abutment and Station 224+19 Offset 14.5' Lt for the southern abutment. Settlement Platforms shall be installed prior to embankment construction for monitoring the rate and amount of settlement throughout the embankment construction. 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 are integral 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-5, North Abut	2H:1V	2.9	1.8	1.5
B-6, South Abut	2H:1V	2.9	1.8	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 LRFD 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 155 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 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. (S_{DS})	0.233 g
Design Spectral Acceleration at 1.0 sec. (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, As equal to or greater than 0.15. The subject site is in SPZ 1 with a As 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 010-1005), Station 223+43.16 will be constructed of IL63-3838 precast beams on integral abutments with an estimated abutment length of 49'-8 3/8". The superstructure will consist of tangent girders on a curved alignment with back to back abutment distances of 154'-3 7/8". 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 IDOT 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. 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 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.

Pile Capacity Tables (Tables 7 & 8)

(IL63 – 3838 Beam – Integral Abutment)

Table 7 – North Abutment

Piling Driven at North Abutment (B-5 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 14" Φ w/0.25" walls		
370	204	71
392	216	74
406	223	76
407	224	79
413*	227*	80*
Metal Shell 14" Φ w/0.312 walls		
477	263	91
484	266	94
494	272	96
510	280	99
513*	282*	100*
Metal Shell 16" Φ w/0.312" walls		
531	292	89
549	302	91
555	305	94
566	311	96
586	322	99
588*	323*	100*
Metal Shell 16" Φ w/0.375" walls		
549	302	91
555	305	94
566	311	96
586	322	99
601	331	101
635	349	104
HP 12 x 53		
345	190	101
371	204	104
HP 12 x 74		
342	188	99
352	194	101
379	209	104
HP 14 x 73		
401	221	99
413	227	101
447	246	104

Table 8 – South Abutment

Piling Driven at South Abutment (B-6 data)		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft)
Metal Shell 14" Φ w/0.25" walls		
275	151	61
293	161	64
296	163	66
306	168	69
413*	227*	72*
Metal Shell 14" Φ w/0.312 walls		
429	236	74
433	238	81
449	247	84
478	263	86
500	275	89
513*	282*	90*
Metal Shell 16" Φ w/0.312" walls		
489	269	71
508	280	74
498	274	81
517	285	84
552	303	86
588*	323*	90*
Metal Shell 16" Φ w/0.375" walls		
552	303	86
577	317	89
597	328	91
633	348	96
683	376	101
704*	387*	103*
HP 12 x 53		
342	188	96
391	215	106
HP 12 x 74		
350	192	96
400	220	107
HP 14 x 73		
411	226	96
469	258	106

*- Maximum Nominal Required Bearing

The pile cutoff elevations used for analysis were Elev. 796.12 and Elev. 798.48 for the North and South abutments, respectively. The pile cutoff elevation included a 2 feet embedment into the integral abutment as required by the Bridge Manual.

The presence of gravels and cobbles was noted in the soil boring logs from other nearby structures below elevations of 729. Therefore, pile shoes are recommended to be used for both metal shell and HP piles due to presence of cobbles within the area.

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.

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.

Table 6: Structural Loadings

I-57 - I 74 INTERCHANGE STRUCTURES Information for Geotechnical Engineering SGR's				
Structure: S.N. No. of Spans:		RAMP B over RAMP C 010-1005 1	Station **223+43.17**	
Option No.		**Superstructure Type / Option**	**Substructure**	
1	Details	**PPC BULB TEE IL63-3838**		
		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	794.12	796.48
		Est. Abutment Length	49'-8 3/8"	49'-8 3/8"
		Est. Pier Bottom of Footing	n/a	n/a
		Est. Pier Footing Dimensions	n/a	n/a
		Total Factored Vertical DL + LL	2,364 Kips *	2,364 Kips *
		Additional Notes / Comments	Single row of vertical steel piles.	
			* Dynamic Load Allowance (IM) included for integral abutment.	

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

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 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.

7.2 Temporary Sheeting and Soil Retention

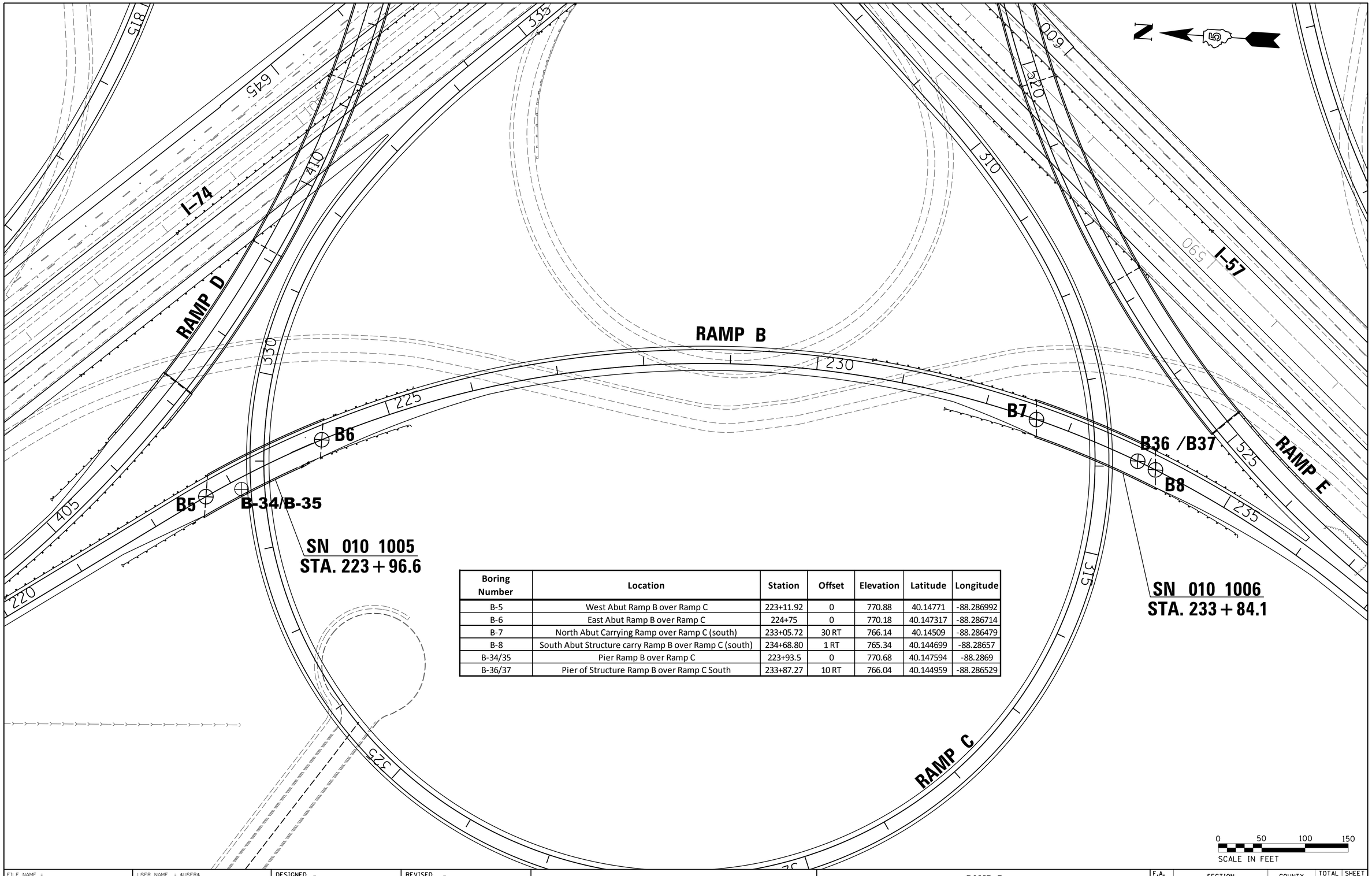
Ramp B over Ramp G is new construction and will not encounter traffic until completion therefore, temporary sheeting and/or soil retention will not be required for this structure.

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		

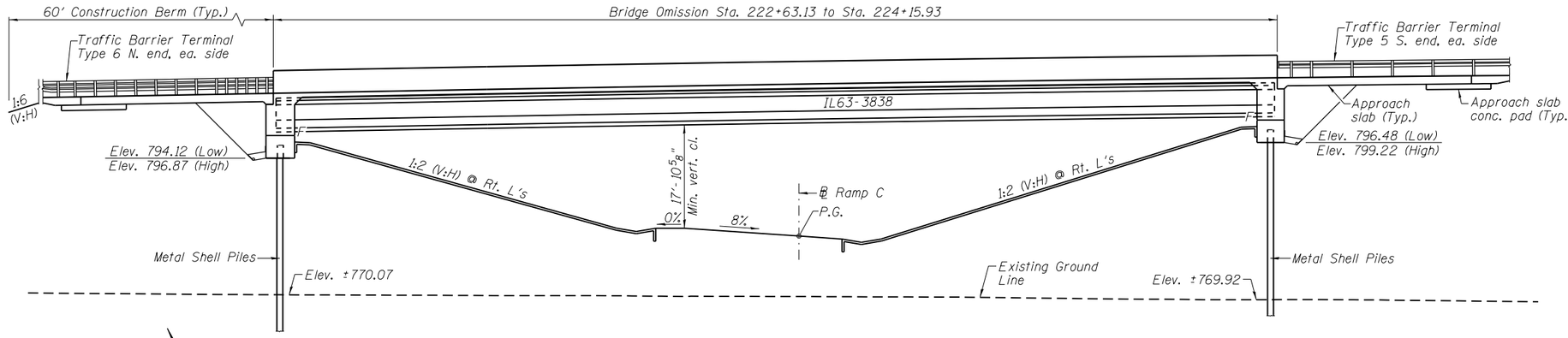
Appendix B

Preliminary TS&L

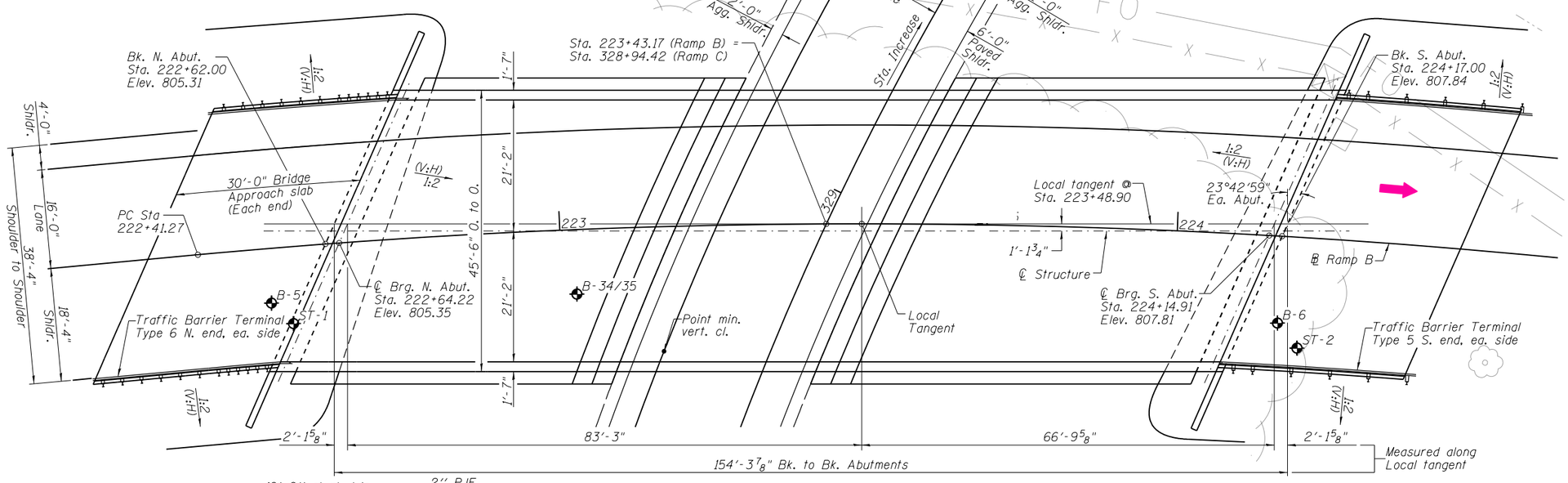
Bench Mark: Chiseled "□" on top of S.W. corner of SW parapet wall of I-74 west bound bridge over FAI 57. Sta. 1059+99.73, -12.54'.

Existing Structure: None

No Salvage

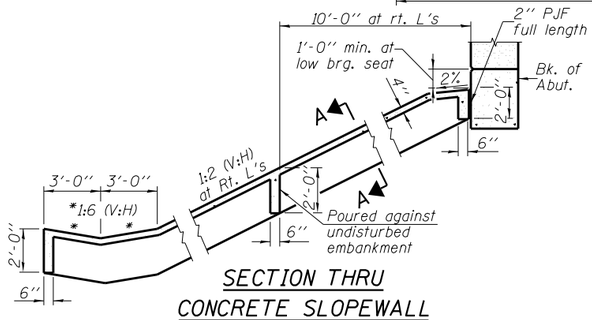


ELEVATION

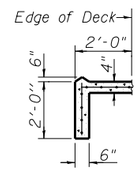


PLAN

◆ Boring Location



SECTION THRU CONCRETE SLOPEWALL



SECTION A-A

DRAFT
06.24.2015

DESIGN STRESSES

FIELD UNITS

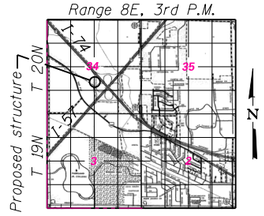
f'c = 3,500 psi (Cast-in-Place)
f'c = 4,000 psi (Superstructure Concrete)
fy = 60,000 psi (Reinforcement)

PRECAST PRESTRESSED UNITS

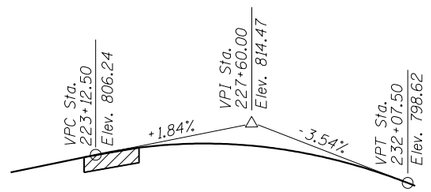
f'c = 8,500 psi
fci = 7,000 psi
fpu = 270,000 psi (½" ϕ low lax strands)
fpbt = 201,960 psi (½" ϕ low lax strands)

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

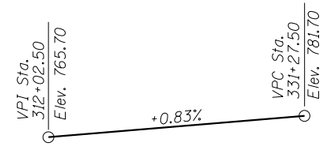


PROFILE GRADE RAMP B

(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 w/2015 Interims

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 223+43.16
STRUCTURE NO. 010-1005

L:\IDOT\186682\Draw\CADD_Sheets\Structural Sheets\TSLs\...

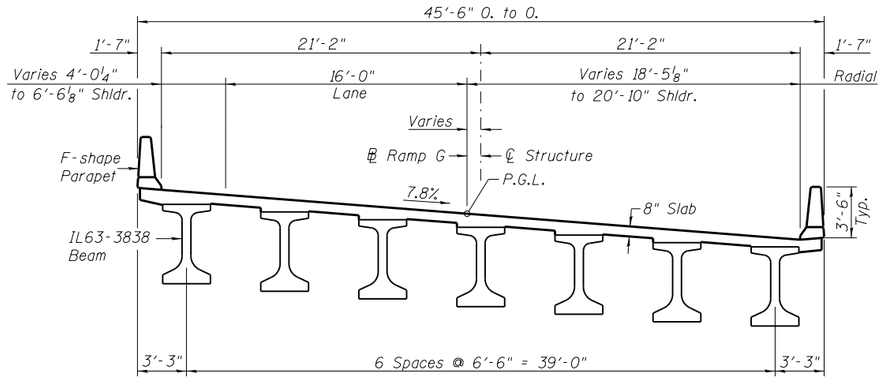
CMT

USER NAME = Rich Kerhlikar	DESIGNED M. LACHECKI	REVISED	
...\D570897-TSL-(1)_Ramp B over C-3.dgn	CHECKED W. BAILEY	REVISED	
PLOT SCALE =	DRAWN G. DAVIS	REVISED	
PLOT DATE =	CHECKED M. LACHECKI	REVISED	

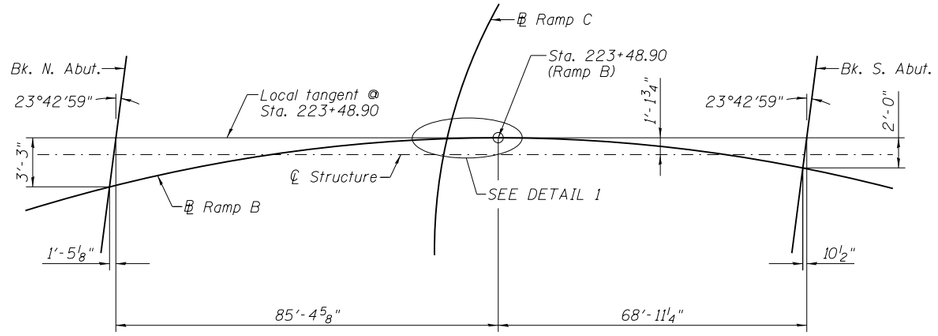
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

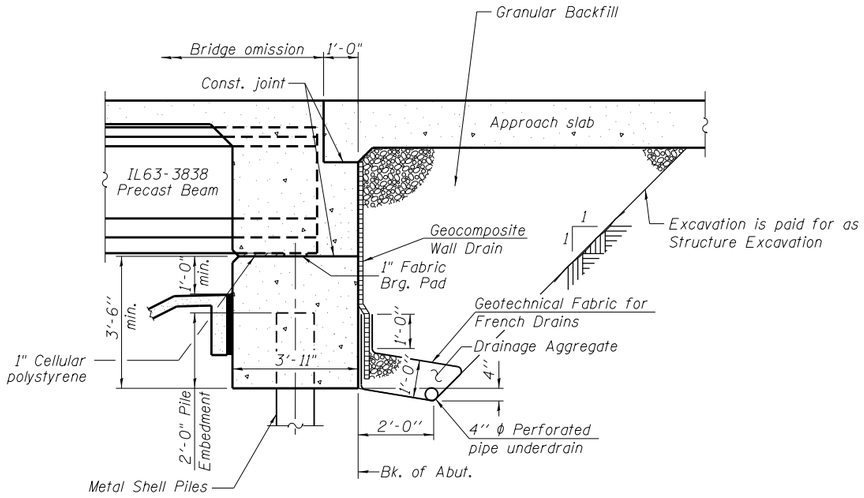
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			



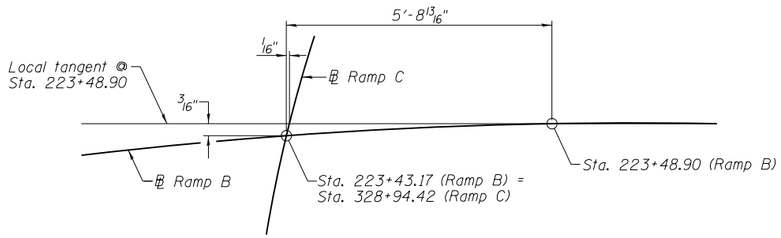
CROSS SECTION
(Looking South)



OFFSET SKETCH



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



DETAIL 1

DRAFT
06.24.2015

L:\IDOT\186802\Draw\CADD_Sheets\Structural Sheets\TSLs\...

CMT	USER NAME = Rich Kerhlskar	DESIGNED M. LACHECKI	REVISED
	...\D570897-TSL-(2)_Ramp B over C-3.dgn	CHECKED W. BAILEY	REVISED
	PLOT SCALE =	DRAWN G. DAVIS	REVISED
	PLOT DATE =	CHECKED M. LACHECKI	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

I-57 & I-74 INTERCHANGE
STRUCTURE NO. 010-1005 - GENERAL DETAILS
SHEET NO. 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
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 1/15/15

ROUTE I-57/74 **DESCRIPTION** North Abut Ramp B over Ramp C **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.147710, **Longitude** -88.286992

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

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-5
Station 222+52.50
Offset 8.8 ft LT
Ground Surface Elev. 770.88 ft

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

Groundwater Elev.:
First Encounter 728.4 ft ▼
Upon Completion washed ft
After ____ **Hrs.** ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL: Silty Clay, dark brown to black
769.38	2			
	2	1.5	29	SILTY CLAY: Brown, stiff
	3	P		
767.88				
	1			CLAYEY SAND: Brown, loose, fine
	1		21	
-5	2			
765.38				
	1			SILTY CLAY: Brown, soft with rounded gravel pieces
	1	0.5	17	
	3	B		
762.88				
	3			SILTY SAND: Gray, loose, fine to medium
	3		15	
-10	6			
760.38				
	5			SILTY CLAY LOAM TILL: Gray, stiff with limestone pieces
	13	1.8	12	
	15	B		
	3			
	4	1.4	12	
-15	6	B		
755.38				
	3			SILTY CLAY TILL: Gray, stiff
	4	1.5	13	
	6	B		
	2			
	4	1.2	13	
-20	7	B		
				1" Sand seam at 19.5 ft.
				SILTY CLAY TILL: Gray, stiff *(continued)*
748.88				
				SILTY CLAY LOAM: Gray, stiff
	2			
	7	1.2	13	
-25	7	B		
	2			
	3	1.7	12	
-30	5	B		
738.88				
				SILTY CLAY: Gray, stiff, trace gravel, rounded gravel pieces up to 3/8"
	3			
	6	1.4	12	
-35	8	B		
731.88	2			
	4	0.7	17	SILT: Gray, loose
730.88 -40	6	B		1" Sand seam at 39.5 ft.

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 1/15/15

ROUTE I-57/74 **DESCRIPTION** North Abut Ramp B over Ramp C **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.147710, **Longitude** -88.286992

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

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-5
Station 222+52.50
Offset 8.8 ft LT
Ground Surface Elev. 770.88 ft

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

Groundwater Elev.:
First Encounter 728.4 ft ▼
Upon Completion washed ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND: Gray, medium dense, fine to medium (clean)
	4			
-45	4 7		17	
723.88				
				GRAVELLY SAND: Gray, medium dense, coarse to fine
	4			
-50	6 7		14	
718.88				
				SILTY CLAY LOAM TILL: Gray, very hard
	4			
-55	7 13	6.3 B	12	
713.88				
				SILTY CLAY LOAM TILL: Gray, very stiff
	6			
-60	7 8	3.4 B	13	
708.88				
				SILTY CLAY LOAM TILL: Gray, very stiff *(continued)*
				SILTY CLAY LOAM TILL: Gray, stiff
	5			
-65	6 10	1.8 B	13	
	3			
-70	6 10	1.0 B	14	
	10			
-75	18 17	1.5 B	12	
	7			
690.88 -80	10 13	2.7 B	13	

End of Boring

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 1/14/15

ROUTE I-57/74 **DESCRIPTION** South Abut Ramp B over Ramp C **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.147317, **Longitude** -88.286714

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

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-6
Station 224+17.07
Offset 14.1 ft LT
Ground Surface Elev. 770.18 ft

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

Groundwater Elev.:
First Encounter 735.7 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			TOPSOIL: Silty Clay, dark brown to black
	4 4	Frost	49	
767.18				
	2			SILTY CLAY: Brown, soft
-5	1 1		24	
764.68				
	1			SILTY CLAY LOAM: Light Brown, soft
	1 2	0.4 B	17	
762.18				
	4			SILTY CLAY LOAM TILL: Light Brown, soft
-10	5 7	0.7 B	15	
759.68				
	3			SILTY CLAY LOAM TILL: Gray, stiff, aggregate pieces up to 1/4"
	6 9	1.5 B	12	
	4			
	6 9	2.1 B	12	
-15				
754.68				
	2			SILTY CLAY LOAM TILL: Gray, stiff, aggregate pieces up to 3/8"
	3 6	1.2 B	13	
	5			
	8 8	1.0 P	13	
-20				
	3			SILTY CLAY LOAM TILL: Gray, stiff, aggregate pieces up to 3/8" *(continued)*
-25	4 4	1.1 B	13	
743.18				
	4			SILTY CLAY LOAM TILL: Gray, stiff, angular aggregate pieces up to 3/4"
-30	6 7	1.4 B	12	
	4			
735.68 ▼	8 11	2.3 B	12	
735.18 -35				SAND: 6" medium dense, coarse with fine gravel
				SILTY CLAY LOAM TILL: Gray, stiff
	4			
730.18 -40	8 12	1.0 B	9	

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

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

SOIL BORING LOG

Date 1/14/15

ROUTE I-57/74 **DESCRIPTION** South Abut Ramp B over Ramp C **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.147317, **Longitude** -88.286714

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

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-6
Station 224+17.07
Offset 14.1 ft LT
Ground Surface Elev. 770.18 ft

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

Groundwater Elev.:
First Encounter 735.7 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND & GRAVEL: Medium dense, coarse sand and fine gravel
	2			
-45	6 10		15	
				Washed sample
	8			
-50	12 17		48	
718.18				
				SILTY CLAY LOAM TILL: Gray, stiff
	4			
-55	3 5	2.0 P	12	
713.18				
				SILTY CLAY LOAM TILL: Gray, very stiff
	5			
-60	8 11	3.0 B	13	
				SILTY CLAY LOAM TILL: Gray, very stiff *(continued)*
	7			
-65	10 16	2.7 B	12	
703.18				
				SILTY CLAY LOAM TILL: Gray, stiff
	9			
-70	7 12	2.0 B	13	
698.18				
				SILTY CLAY LOAM TILL: Gray, very stiff
	4			
-75	6 6	2.8 B	13	
693.18				
				SILTY CLAY LOAM TILL: Gray, stiff
	8			
-80	10 13	1.8 B	13	

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

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

SOIL BORING LOG

Date 1/14/15

ROUTE I-57/74 **DESCRIPTION** South Abut Ramp B over Ramp C **LOGGED BY** TLM

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.147317, **Longitude** -88.286714

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

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-6
Station 224+17.07
Offset 14.1 ft LT
Ground Surface Elev. 770.18 ft

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

Groundwater Elev.:
First Encounter 735.7 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY LOAM TILL: Gray, stiff *(continued)*				
	688.18			
SILTY CLAY LOAM TILL: Gray, very stiff		8		
		10	3.5	12
	685.18 -85	17	B	
End of Boring				
	-90			
	-95			
	-100			

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 1/15/15

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

SECTION 10(5-1-RS-1, 14-1,6)R **LOCATION** , **SEC.** 34, **TWP.** 20N, **RNG.** 8E, 3rd **PM**,
Latitude 40.147594, **Longitude** -88.286900

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

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-34/35
Station 223+02.36
Offset 10.4 ft RT
Ground Surface Elev. 770.68 ft

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

Groundwater Elev.:
First Encounter 728.2 ft ▼
Upon Completion washed ft
After ____ **Hrs.** ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			TOPSOIL: Silty Clay, dark brown to black
	2 2		31	
767.68				
	1			SILTY CLAY: Brown, soft
-5	1 1	0.3 P	22	
765.18				
	2			SILTY CLAY: Brown, stiff
	6 7	1.7 B	14	
	2			
-10	4 7	2.5 P	15	
760.18				
	2			SILTY CLAY LOAM TILL: Gray, stiff
	3 7	2.3 B	12	
	2			
-15	4 7	1.7 B	13	
	2			
	6 9	2.3 B	11	
	3			
-20	4 7	1.9 B	13	
	2			SILTY CLAY LOAM TILL: Gray, stiff *(continued)*
-25	3 5	0.7 B	14	
	2			
-30	4 7	1.6 B	12	
738.68				
	3			SILTY CLAY LOAM TILL: Gray, very stiff
-35	6 8	2.1 B	11	
733.68				
	2			SILTY CLAY LOAM TILL: Gray, stiff
	5 8	2.0 B	11	2" Sand seam at 39 ft.
730.68 -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 1/15/15

ROUTE I-57/74 DESCRIPTION Pier Ramp B over Ramp C LOGGED BY TLM

SECTION 10(5-1-RS-1, 14-1,6)R LOCATION , SEC. 34, TWP. 20N, RNG. 8E, 3rd PM,
Latitude 40.147594, Longitude -88.286900

COUNTY Champaign DRILLING METHOD HSA HAMMER TYPE Auto

STRUCT. NO. 010-1005
Station 223+43.16

BORING NO. B-34/35
Station 223+02.36
Offset 10.4 ft RT
Ground Surface Elev. 770.68 ft

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

Groundwater Elev.:
First Encounter 728.2 ft ▼
Upon Completion washed ft
After ____ Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND: Gray, coarse
	5			
-45	6 10		16	
723.68				
				SILTY CLAY LOAM TILL: Gray, hard, angular aggregate pieces up to 1/2"
	10			
	12 18	4.5 P	13	2" Sand seam at 49.5 ft.
-50				
718.68				
				SILTY CLAY LOAM TILL: Brown, hard
	12			
-55	13 9	4.1 B	13	
713.68				
				SILTY CLAY LOAM: Gray, stiff
	10			
710.68 -60	7 6	1.6 B	13	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY LOAM: Gray, very stiff
	8			
-65	11 15	3.1 B	12	
	6			
-70	9 11	2.3 B	13	
	5			
695.68 -75	7 10	2.5 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)

BBS, form 137 (Rev. 8-99)

Appendix D

Boring Profile Sheet

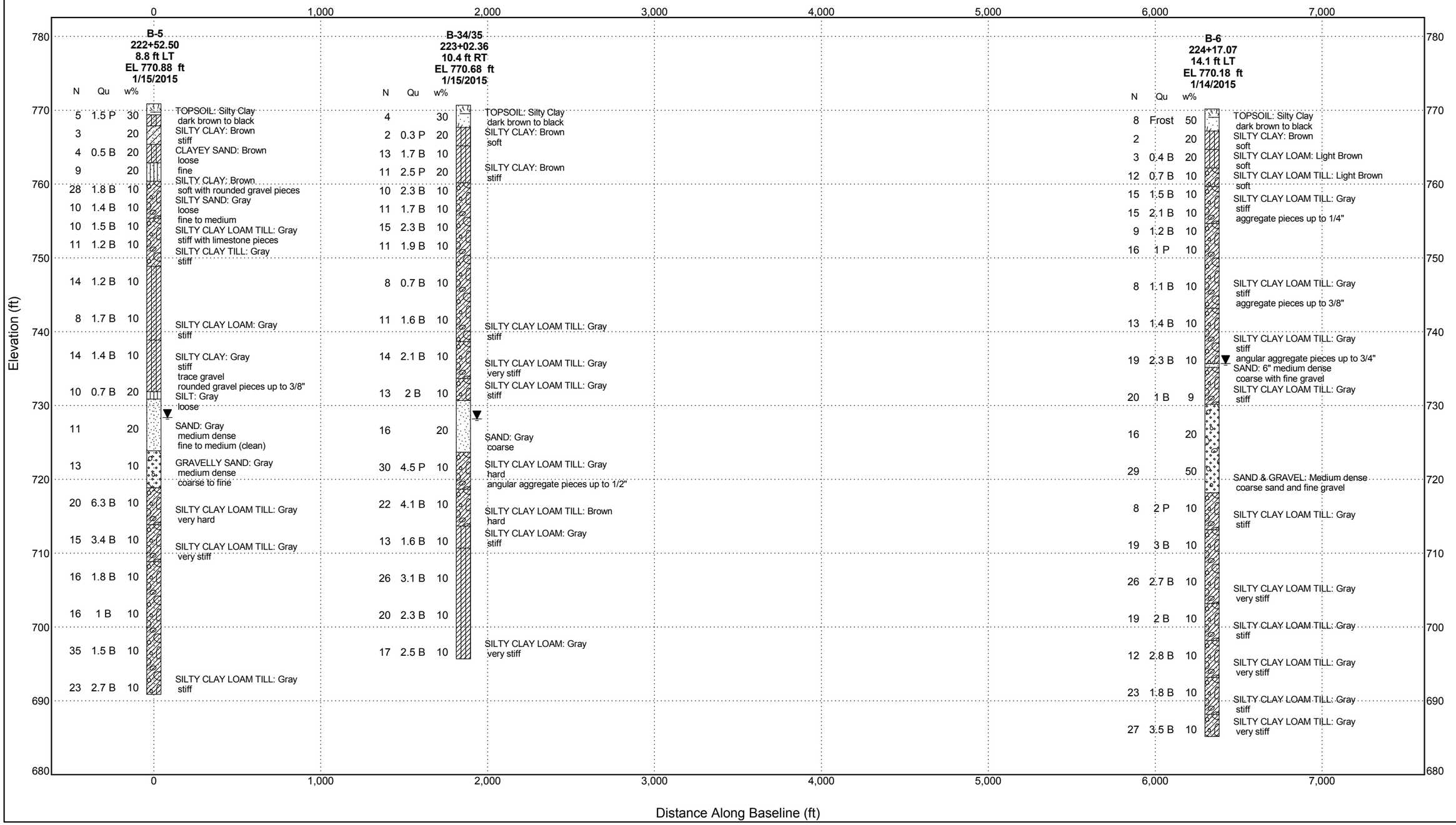
Illinois Department of Transportation
Division of Highways
Bacone Farmer Workmand Engineering & Testing, LLC

ROUTE I-57/74
SECTION 10(5-1-RS-1, 14-1,6)R
COUNTY Champaign
PROJECT LOCATION SN 010-1005 STA 223+43.16

SUBSURFACE PROFILE
STRUCTURE NO. 010-1005

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 9/4/15

Appendix E

Pile Tables (North Abutment, South Abutment)

Pile Design Table for North Abutment utilizing Boring #5

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 16"Φ w/.312" walls		
225	124	46
238	131	49
252	138	51
273	150	54
290	159	56
303	166	59
318	175	61
322	177	64
330	182	66
425	234	69
435	239	71
463	254	74
477	262	79
501	275	84
528	291	86
531	292	89
549	302	91
555	305	94
566	311	96
586	322	99
Metal Shell 16"Φ w/.375" walls		
225	124	46
238	131	49
252	138	51
273	150	54
290	159	56
303	166	59
318	175	61
322	177	64
330	182	66
425	234	69
435	239	71
463	254	74
477	262	79
501	275	84
528	291	86
531	292	89
549	302	91
555	305	94
566	311	96
586	322	99
601	331	101
635	349	104
Metal Shell 14"Φ w/.25" walls		
218	120	51
236	130	54
251	138	56
262	144	59
276	152	61
280	154	64
288	158	66
361	199	69

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
194	106	76
236	130	79
242	133	84
254	140	89
263	145	91
265	146	94
271	149	96
282	155	99
290	159	101
310	170	104
Steel HP 12 X 53		
233	128	76
291	160	79
292	161	84
303	167	89
314	173	94
321	177	96
335	184	99
345	190	101
371	204	104
Steel HP 12 X 63		
232	128	74
235	129	76
294	162	79
295	162	84
306	168	89
317	174	94
324	178	96
338	186	99
348	191	101
374	206	104
Steel HP 12 X 74		
229	126	71
236	130	74
239	131	76
299	164	79
299	165	84
310	171	89
321	177	94
328	180	96
342	188	99
352	194	101
379	209	104
Steel HP 12 X 84		
232	127	71
239	131	74
242	133	76
304	167	84
315	173	89
325	179	94
332	183	96
347	191	99

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
232	127	64
238	131	66
268	147	69
270	149	71
279	154	74
283	156	76
357	196	84
365	201	89
375	206	94
383	211	96
401	221	99
413	227	101
447	246	104
Steel HP 14 X 89		
234	129	64
240	132	66
271	149	69
274	151	71
283	156	74
287	158	76
361	199	84
369	203	89
379	209	94
388	213	96
406	223	99
417	230	101
453	249	104
Steel HP 14 X 102		
229	126	59
237	130	64
243	134	66
275	151	69
277	152	71
286	158	74
290	160	76
366	201	84
374	205	89
383	211	94
392	216	96
411	226	99
422	232	101
458	252	104
Steel HP 14 X 117		
232	127	59
239	132	64
246	135	66
278	153	69
280	154	71
290	159	74
294	161	76
370	204	84
378	208	89

370	204	71
392	216	74
406	223	76
407	224	79
Metal Shell 14"Φ w/.312" walls		
218	120	51
236	130	54
251	138	56
262	144	59
276	152	61
280	154	64
288	158	66
361	199	69
370	204	71
392	216	74
406	223	76
407	224	79
432	238	84
456	251	86
462	254	89
477	263	91
484	266	94
494	272	96
510	280	99

357	196	101
384	211	104

388	213	94
396	218	96
415	228	99
427	235	101
463	255	104
Precast 14"x 14"		
233	128	44
248	136	46
263	145	49
Timber Pile		
150	82	36

Pile Design Table for South Abutment utilizing Boring #6

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 16"Φ w/.312" walls		
158	87	36
179	98	39
203	112	41
209	115	44
220	121	46
231	127	49
245	135	51
257	141	54
274	151	56
289	159	59
318	175	61
339	186	64
340	187	66
352	193	69
489	269	71
508	280	74
517	285	84
552	303	86
577	317	89
Metal Shell 16"Φ w/.375" walls		
108	60	22
132	72	27
143	78	31
148	81	34
158	87	36
179	98	39
203	112	41
209	115	44
220	121	46
231	127	49
245	135	51
257	141	54
274	151	56
289	159	59
318	175	61
339	186	64
340	187	66
352	193	69
489	269	71
498	274	81
517	285	84
552	303	86
577	317	89
597	328	91
621	341	94
633	348	96
652	359	99
683	376	101
Metal Shell 14"Φ w/.25" walls		
114	63	27
124	68	31
129	71	34

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
115	63	46
121	66	49
128	70	51
134	74	54
144	79	56
151	83	59
168	92	61
177	97	66
183	100	69
207	114	71
210	115	74
217	120	81
227	125	84
247	136	86
260	143	89
270	148	91
282	155	94
287	158	96
296	163	99
314	173	101
326	180	104
329	181	106
361	199	110
Steel HP 12 X 53		
115	63	39
132	73	44
137	76	46
144	79	49
153	84	51
161	88	54
172	95	56
181	100	59
203	112	61
210	116	66
217	119	69
250	137	71
253	139	74
260	143	81
272	150	84
297	164	86
313	172	89
324	178	91
338	186	94
342	188	96
354	194	99
376	207	101
391	215	104
391	215	106
Steel HP 12 X 63		
116	64	39
133	73	44
139	76	46

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
109	60	34
119	65	36
140	77	39
160	88	44
166	91	46
174	96	49
184	101	51
193	106	54
208	115	56
219	120	59
247	136	61
252	139	66
260	143	69
304	167	71
309	170	74
315	173	81
328	181	84
361	199	86
379	209	89
391	215	91
408	224	94
411	226	96
425	234	99
454	250	101
469	258	106
524	288	110
Steel HP 14 X 89		
111	61	34
120	66	36
142	78	39
162	89	44
168	92	46
176	97	49
187	103	51
196	108	54
211	116	56
222	122	59
250	138	61
255	140	66
263	145	69
308	170	71
313	172	74
318	175	81
332	183	84
366	201	86
384	211	89
396	218	91
413	227	94
416	229	96
430	236	99
460	253	101
474	261	106

137	75	36
154	85	39
175	96	41
181	100	44
191	105	46
201	110	49
212	117	51
223	123	54
238	131	56
251	138	59
275	151	61
293	161	64
296	163	66
306	168	69
412	227	71
Metal Shell 14"Φ w/.312" walls		
137	75	36
154	85	39
175	96	41
181	100	44
191	105	46
201	110	49
212	117	51
223	123	54
238	131	56
251	138	59
275	151	61
293	161	64
296	163	66
306	168	69
412	227	71
429	236	74
433	238	81
449	247	84
478	263	86
500	275	89
Steel HP 8 X 36		
113	62	56
119	65	59
131	72	61
139	77	64
140	77	66
145	80	69
161	89	71
164	90	74
171	94	81
179	98	84
193	106	86
203	112	89
212	116	91
221	122	94
226	125	96
234	129	99
247	136	101
257	141	104
260	143	106
284	156	110
Steel HP 10 X 42		
112	62	46
146	80	49
154	85	51
162	89	54
174	96	56
183	101	59
205	113	61
212	117	66
219	121	69
252	139	71
256	141	74
263	145	81
275	151	84
300	165	86
315	174	89
327	180	91
341	187	94
345	190	96
357	196	99
380	209	101
394	217	104
395	217	106
437	241	110
Steel HP 12 X 74		
101	55	36
118	65	39
135	74	44
141	77	46
148	81	49
156	86	51
164	90	54
176	97	56
186	102	59
208	114	61
215	118	66
222	122	69
256	141	71
260	143	74
267	147	81
278	153	84
304	167	86
320	176	89
331	182	91
346	190	94
350	192	96
362	199	99
385	212	101
400	220	104
400	220	106
444	244	110
Steel HP 12 X 84		
102	56	36
119	66	39
137	75	44
143	78	46
150	82	49
159	87	51
166	92	54
179	98	56
531	292	110
Steel HP 14 X 102		
112	61	34
122	67	36
144	79	39
164	90	44
170	93	46
178	98	49
189	104	51
198	109	54
213	117	56
224	123	59
253	139	61
258	142	66
266	146	69
312	172	71
317	174	74
322	177	81
336	185	84
370	204	86
389	214	89
401	221	91
418	230	94
421	232	96
435	239	99
465	256	101
480	264	106
537	295	110
Steel HP 14 X 117		
113	62	34
123	68	36
146	80	39
166	91	44
172	94	46
180	99	49
191	105	51
200	110	54
216	119	56
227	125	59
257	141	61
261	143	66
269	148	69
316	174	71
320	176	74
326	179	81
340	187	84
375	206	86
393	216	89
406	223	91
423	233	94
426	234	96
440	242	99
470	259	101
485	267	106
543	299	110
Precast 14"x 14"		
93	51	17
119	65	22

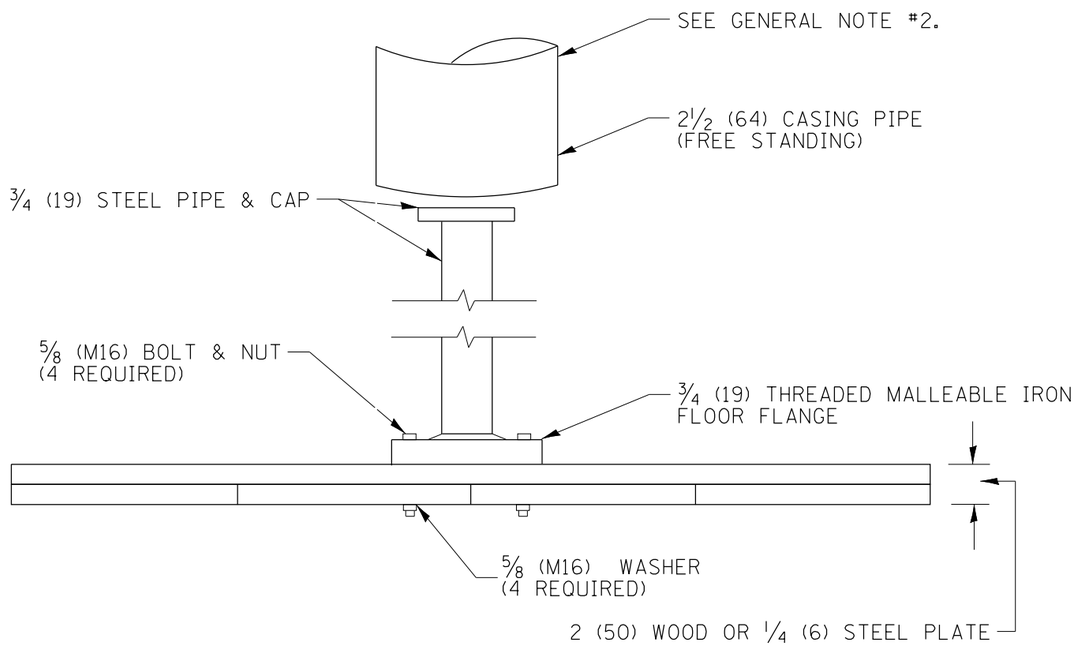
118	65	49
125	69	51
131	72	54
141	77	56
148	81	59
164	90	61
173	95	66
179	98	69
202	111	71
205	113	74
213	117	81
222	122	84
242	133	86
254	140	89
264	145	91
276	152	94
281	154	96
290	160	99
308	169	101
320	176	104
322	177	106

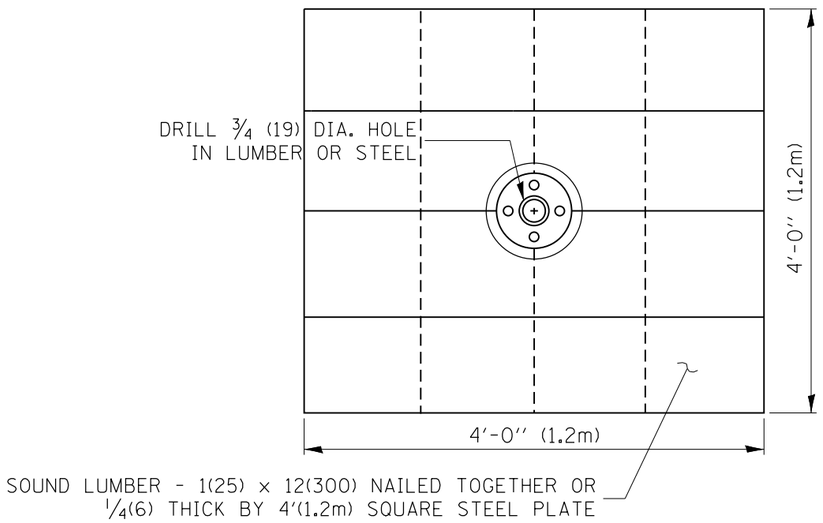
188	103	59
211	116	61
218	120	66
225	124	69
259	143	71
263	145	74
270	149	81
282	155	84
309	170	86
324	178	89
336	185	91
350	193	94
355	195	96
366	202	99
390	215	101
405	223	104
405	223	106
450	247	110

145	80	27
158	87	31
164	90	34
174	96	36
196	108	39
222	122	41
231	127	44
243	133	46
256	141	49
Timber Pile		
96	53	22
119	66	27
138	76	31
143	79	34
149	82	36

Appendix F

Settlement Platform Drawing





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.

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.

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

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SETTLEMENT PLATFORM

NOT TO SCALE

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