Speed Letter

Illinois Department of Transportation

Bureau of Bridges & Structures • 2300 S. Dirksen Parkway • Springfield, Illinois 62764

To: American Geoengineering, Inc.
399-A Wall Street
Glendale Heights, IL. 60139-1987

Attention: Ramesh C. Patel

Date: June 13, 2008	**Job No.:** P-92-007-06
SN: 101-0186,0187	**Contract No.:**
Route: FAP 301	
Section: 3 HBR	
County: Winnebago	
Other: US 20 over IL 2	

Subject: **Structure Geotechnical Report (SGR) Review**

We are Sending:

☐ Structure Geotechnical Report ☐ Foundation/Wall Design Details ☐ Settlement/Stability Analysis
☒ Approval ☐ Comments ☐ Special Provisions ☐

These Are:

☐ Approved As Submitted ☒ Approved Subject to Changes & Comments Below
☐ Returned for Revisions and Re-submittal ☐ For Your Use ☐ For Review and Comments
☐

Remarks:
Following our discussion with Ramesh Patel on, 06/13/08 it is our understanding that American Geoengineering, Inc. will revise the SGR to address the issue(s) below.

- Seismic data should be provided in accordance with 2008 AASHTO Interims.
- A subsurface data profile should be included with the SGR in accordance with AGMU 05.2.

Please provide our office with a copy of the revised SGR to verify completion of the above and for future reference. If you have any questions or need further assistance, please contact Nicholas H. Beckmann at (217)-558-2298 or Riyad M. Wahab at (217)-782-2704 of our Central Geotechnical Unit.

Copies To: Ie Consultants, Inc.

By _____
For The Engineer of Bridges & Structures

rmw/nhb

11/13/07
BBSF 710-002

STRUCTURE GEOTECHNICAL REPORT

Route: U.S. RTE 20 OVER IL RTE 2 (FAP 301)
Section: 3 HBR
County: Winnebago

Contract No.: P-92-007-06
PTB: 141
Item: 5

Existing Structure No.: S.N. 101-0055-E.B. Lanes, S.N. 101-0056-W.B. Lanes

Proposed Structure No.: S.N. 101-0186-E.B. Lanes, S.N. 101-0187-W.B. Lanes

Prepared by:

Author: Ramesh C. Patel, P.E.

Consultant: American GeoEngineering, Inc.
Address: 399-A Wall Street, Glendale Heights, IL 60139
Phone: (630) 894-9800

Date: November 15, 2007

Prepared for:

I.E. Consultants, Inc.

Structural Engineer: David Booher, PE, SE
Phone: (217) 529-8027

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Structure Geotechnical Report Responsibility Checklist

(1): Project Description/Project Structure Information:

The scope of the project includes reconstruction /redevelopment of a full access interchange at US 20 over IL 2 near Rockford. The work will also include to increase vertical clearance of US 20 over IL 2. The Illinois Department of Transportation (IDOT) project number for this project is P-92-007-06, FAP 301 (US 20 Bypass). The project is located in Township 43 North, Range 1 East, in Winnebago County, Illinois, as shown on the Exhibit 1, Site Vicinity Map, attached in the Appendix A. The proposed structures S.N. 101-0186 (EB) and S.N. 101-0187 (WB) are proposed dual structures consisting of a two span reinforced concrete deck on pre stressed concrete beams spaces 6 feet apart.

The vertical clearance of US-20 over IL-2 is proposed to be 16'10". According to the TSL plan, preliminary sub-structure elevation at east abutment is 741.63 feet, at west abutment it is 743.57 feet. The WB Pier footing elevation is 724.87 and the EB Pier footing elevation is 723.97 feet. According to the cross-sections, about 3 to 4 feet of additional fill will be required to increase the vertical clearance near Stations 893+00 and 896+00.

(2): Existing Structure Information:

The existing structures S.N. 101-0055 (E.B.) and S.N. 101-0056 (W.B.) built in 1961 as F.A.P. 194, Section 3HB, each dual structure consists of a three span reinforced concrete deck on wide flange steel beams. The existing abutments are supported on 25 feet long pre-cast concrete piles of 30 ton capacity. The existing wing walls are supported on 25 feet long wooden piles of 20 ton capacity. The existing piers are supported on shallow foundations with allowable bearing pressure of 4500 psf. The Pier 1 is established at Elevation 723.7 feet and the Pier 2 is established at Elevation 719.6 feet. The back-to-back of abutments distance is 198'0". The E.B. out-to-out width varies 50'-0 1/4" to 53'-4 3/8" and W.B. out-to-out width varies 50'-4 1/4" to 54'-0 3/8". The existing minimum vertical clearance of US-20 over IL-2 is 14'-3".

(3): Site Investigation, Subsurface Exploration, and Generalized Subsurface Conditions:

A total of 4 (four) Structure Borings, B-1 through B-4 were drilled to the maximum depth of 61.5 feet for these structures, to investigate the subsurface conditions at the site during the month of April, 2007. The subsurface exploration, field engineering, and laboratory testing were performed by Illinois Department of Transportation, District 2. The typed boring logs were provided to American GeoEngineering, Inc. (AGI) to prepare Structure Geotechnical Report (SGR). The boring locations are shown on the Exhibit 2-1 attached in the Appendix B. The boring stations, offsets, and ground elevations are given on Exhibit 3-1 attached in the Appendix C.

The Structure Borings B-1 and B-2 were drilled near existing piers at Station 894+79.4 and Station 893+65.9 respectively. The proposed pier is located at Station 894+32.17, thus both borings are 33 to 47 feet away from proposed pier location. Borings B-1 and B-2 were drilled for the proposed piers to a depth 41.5 feet and 41 feet below ground surface and the existing ground elevation is +728.50 and +729.00 respectively.

Boring B-1 was drilled through surficial silty clay loam and B-2 was drilled through sandy loam to a depth of about 2 feet. The bottom elevation of this stratum range from +726.5 to +727.5 feet.

The unconfined compressive strength of these materials range from 0.3 tsf to 0.6 tons per square foot (tsf).

Underneath surficial layer, medium dense to dense, sand and gravel was encountered to the depth explored. The bottom elevation of this stratum is range from +687 to +688. The SPT N value range from 20 to 40 blows per foot (bpf) with some values occasionally higher and some lower.

The Structure Borings B-3 and B-4 were drilled at west and east abutments at Station 892+81.9 and Station 895+52.9 to a depth of 56.5 feet and 61.5 feet respectively. The existing ground elevation is +748.00 and +748.60 respectively.

Boring B-3 was drilled through soft silty clay loam to a depth of about 2 feet, a bottom elevation of +746.00. Boring B-4 was drilled through medium stiff to very stiff silty clay loam and sandy loam to a depth of about 7 feet, a bottom elevation of +741.6.

Underneath this cohesive layer, loose to medium dense sand and gravel was encountered, extending to depths ranging from an elevation of +739.10 to 741.00. The SPT N value range from 9 to 20 bpf.

Beneath sand and gravel, medium stiff to very stiff, gray loam, sandy loam and silty clay loam was encountered, extending to depths ranging from an elevation of +724.10 to 728.50. The unconfined compressive strength of these materials range from 0.8 tsf to 2.0 tsf.

Underneath this cohesive layer, medium dense to dense, sand and gravel was encountered to the depth explored. The bottom elevation of this stratum range from +687.10 to +691.50. The SPT N value range from 15 to 40 bpf with some values occasionally higher and some lower.

Water level readings taken while drilling and after completion of the drilling operation are noted on the boring logs. The groundwater was encountered in Borings B-1, B-2, and B-4 between Elevation +688.5 and 689.5, while Boring B-3 appeared to be dry. It is expected that the groundwater levels will vary from the observed in the future on a seasonal basis, depending upon the precipitation, infiltration, and the amount of surface runoff. The detailed soil descriptions, visual soil classification, generalized subsurface conditions and Groundwater Elevations are shown on Exhibit 4-1, Logs of Subsurface Data attached in the Appendix D.

(4): Geotechnical Evaluations:

(a) Settlement

The new fill of about 3 to 4 feet is proposed on existing embankments to increase the vertical clearance of US-20 over IL Route 2. Based on 4-foot of new structural fill and soil parameters from Boring B-4, the estimated settlement is about 1.4 inches. The majority of the settlement is due to soft cohesive soil layer encountered at the surface to a depth of 2 to 3 feet. We recommend removing surfacial soft soil to a depth of 2 feet at the west abutment and to a depth of 3 feet at the east abutment. The excavated area be backfilled with compacted embankment material preferably granular soil.

(b) Slope Stability

According to the cross-sections, the existing side slope in the vicinity of Station 893+00 and Station 896+00 is about 3H:1V and 2.7H:1V respectively. The new fill of about 3 to 4 feet is proposed to increase the vertical clearance of US-20 over IL Route 2. The new side slope at both west and east abutments is proposed as 4H:1V. Also the proposed end slope at Station 250+00 of IL Route 2 is 2H:1V same as the existing end slope. Considering additional fill of 3 to 4 feet global slope stability analysis was performed for both side and end slopes. The slope stability analysis results are given in the following section.

The STABLE for Windows program developed by Purdue University was used for this analysis. The modified Janbu Method was utilized using soil parameter obtained from soil borings to conduct the slope stability analysis. The Geometry and Boundary Conditions with minimum factor of safety is shown on Exhibit 7.1, attached in Appendix F.

Side Slope:

The soil information from Borings B-3 and B-4 was used for the slope stability analysis to check the global stability of the proposed embankment. For the given geometry, the factor of safety obtained in the vicinity of Station 893+00 was 3.012 and in the vicinity of Station 896+00 was 3.445.

End Slope:

The soil information from Borings B-2 and B-3 was used for the slope stability analysis to check the global stability of the proposed embankment. For the given geometry, the factor of safety obtained in the vicinity of Station 250+00 was 1.724.

(c) Seismic Considerations

We recommend the following seismic data. The Seismic Performance Zone (SPZ) =1, Bedrock Acceleration Coefficient (A) = 0.035g, and Site Coefficient (S) = 1.2. The project site lies in Seismic Zone "0" or on the border line of Seismic Zone "0" and "1" according to Seismic Zone Map of USA. The location of Seismic Zone and encountered dense soil condition may not lead to liquefaction.

(d) Scour

It is not applicable since proposed structure will not be over a water course.

(e) Mining Activity

According the ISGS-County Coal Map Series, the proposed structure is not located over mapped mines.

(f) Downdrag

We do not anticipate any downdrag load on the piles at the abutments considering recommendation in settlement section of this report.

(5) Foundation Evaluations and Design Recommendations:

(a) Shallow Foundation:

Abutments:

We recommend that the integral abutments be supported on driven piles.

Pier:

We evaluated possibility of supporting pier on the spread footing foundation. The pier can be supported on spread footings established at Elevation 723.00 feet for the eastbound and westbound structure. We recommend considering the nominal bearing resistance (Qult) of 15000 psf in the design of the footings.

$q_{ult} = 5$ ksf

We recommend to consider the nominal coefficient of sliding resistance of 0.55 between soil and foundation. Settlement calculations can be performed based on the footing size.

If the spread footing foundation is not feasible, pier can be supported on driven piles.

(b) Deep Foundation

The proposed structure may be founded on Driven Piles such as 12-inch or 14 inch Metal Shell Piles filled with concrete or steel H-piles. The estimated pile tip elevation for 12-inch and 14-inch diameter Metal Shell Pile and 12x42 and 12x53 H piles are given in Exhibit 6.1, attached in Appendix F.

The estimated driven pile capacities and lengths should be verified by driving one test pile at each substructure in accordance with *Section 512 Piling, Article 512.10 Driving Piles, Article 512.14 Determination of Bearing Values* and *Article 512.15 Test Piles* of the *Standard Specifications for Road and Bridge Construction, January 2007,* adopted by IDOT. To estimate the driven pile capacities and lengths, FHWA approved DRIVEN 1.0 computer program was used.

Lateral loading can be resisted by battering piles. After battering, the remaining factored (LRFD) lateral loading can be resisted by considering 3 kips per pile. However, to ensure the accuracy of lateral capacity of pile, a detailed lateral capacity analysis based on actual loading conditions is recommended. There is no pile capacity reduction due to downdrag or liquefaction. There is no need for pile pre-coring at the abutments considering soft soil removal as recommended earlier. The pile spacing and number of piles per row should be finalized by the structural engineer.

(6) Construction Considerations:

(a) Seepage:

The groundwater was encountered below 39 feet during drilling operation. But the groundwater levels will vary from the observed in the future on a seasonal basis, depending upon the precipitation, infiltration, and the amount of surface runoff.

For the placement of pile cap, the site will be excavated to about 8 feet depths. Any excavation above the water table will result in minor seepage, which may be handled by usual sump and pump method. However excavation below the water table may encounter significant seepage and will require lowering the ground water table temporarily by installing dewatering wells. However, the actual amount of seepage will also depend on the elevation of ground water table at the time of construction.

Care should be taken during the pumping process to assure that soil particles from the granular layers are not removed along with the seepage water. Removal of significant quantities of soil particles from the granular layers could affect the stability of the excavations.

(b) Excavation Slopes and Temporary Support System:

The soils on this site should not be excavated with side slopes steeper than two horizontal to one vertical (2:1) in granular and one horizontal to one vertical (1:1) in clayey soils unless temporary sheeting and bracing are used. Piles of excavated soil and heavy construction equipment should not be permitted closer to the top of any excavation than a distance equal to the depth of the excavation, in order to reduce the possibilities of cave-ins.

In our opinion, the site will be excavated to the depth of nearly 7 to 8 feet, and may require temporary support system. It is anticipated that the steel sheet piling would be required. Depending on the depth of excavation, surcharge and site conditions, tie backs may be required. It is our understanding that all temporary support systems will be designed by Registered Structural Engineer employed by the Contractor.

(7) Computations:

The final output of slope stability analysis is included in Appendix.

(8) Geotechnical Data:

(a) Soil Borings and Laboratory Test Results

The detailed soil descriptions, visual soil classification, generalized subsurface conditions and Groundwater Elevations are shown on Exhibit 4-1, Logs of Subsurface Data attached in the Appendix D

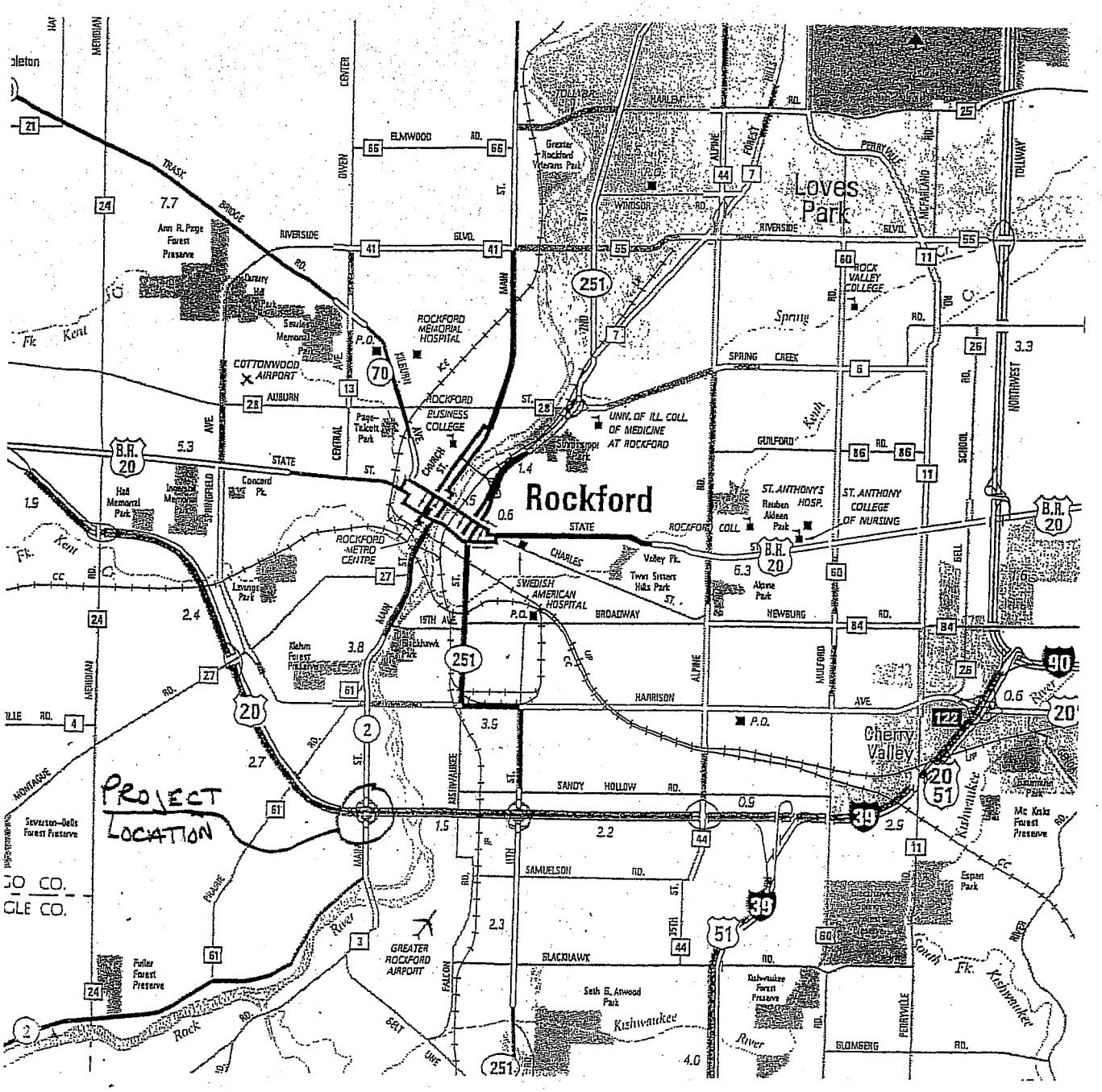
(b) Subsurface Data Profile:

The generalized subsurface profile is not applicable for this project.

APPENDIX A

SITE VICINITY MAP

SITE VICINITY MAP



American GeoEngineering, Inc.

APPENDIX B

BORING LOCATION MAP

PROJECT NO. P-92-007-06

BM - #

EXISTING STRUCTURE:
S.N. 101-0055 (EB) & 0056 (WB) built in 1961 as F.A..P. 194, Section 3HB.
Each dual structure consists of a three span reinforced concrete deck on wide flange steel beams supported by pile bent split thru abutments and multi -column piers. 198'-0" back-to-back of abutments. EB out-to-out width varies 50'-0¼" to 53'-4⅜". WB out-to-out width varies 50'-4¼" to 54'-0⅜".
No Salvage.

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

ROUTE NO.	SECTION	COUNTY	SHEET NO.	TOTAL SHEETS
F.A.P. 301 (US 20)	3HBR	WINNEBAGO		
TOTAL PROJECT NO.		ILLINOIS FED. AID PROJECT		

Contract # 64887

Bridge Omission Sta. 893+07.47 to Sta. 895+18.13

Traffic Barrier Terminal STD. 631020, Type 5 (Exit Ends)

Traffic Barrier Terminal STD. 631031, Type 6 (Appr. Ends)

Elev. 743.75 (EB. & WB.)

12'-0" Rdwy

63" Bulb-T

16'-10" Min Cl.

2.5% 2.0% 2.0% 2.5%

Elev. 742.41 (EB. & WB)

EX 36" PIPE CULVERT

Elev. 727.96 (W.B.)
Elev. 727.96 (E.B.)

EX 36" PIPE CULVERT

ELEVATION

210'-8" Bk to Bk Abutments

115'-11" - Span 1

94'-9" - Span 2

Sta. 894+23.39 US 20 =
Sta. 249+31.38 IL 2

Bridge Appr. Shldr. Drain STD 609001 (Typ. East end only)

B-1

3"-1" CL.

1'-7"

10'-0" Shldr.

24'-0" Rdwy

6'-0" Shldr.

6'-0" Shldr.

10'-0" Shldr.

Bk W. Abut. Sta. 893+16.23 Elev. 753.33

PGL W.B.L.

43'-2" O. to O.

40'-0" F. to F.

℄ Pier. Sta. 894+32.16 Elev. 752.83

Bk. E. Abut. Sta. 895+26.11 Elev. 751.99

23'-4"

23'-4"

1'-7"

1'-7"

90°

9'-11⅜"

B-3

B-4

℄ U.S. 20

90°6'58"

895+00

Station Increase

PGL E.B.L.

Bk W. Abut. Sta. 893+16.23 Elev. 753.33

℄ I.L. Rte. 2

℄ Pier. Sta. 894+32.16 Elev. 752.83

Bk. E. Abut. Sta. 895+26.11 Elev. 751.99

30' Bridge Appr. Pavement STD 420401 (Typ.)

B-2

3'-2" CL.

16' 16'

PGL

36'-0" Rdwy

32'-0" Median & Turn Lane

36'-0" Rdwy

12'-7"

12'-7"

PLAN

VPI STA. 250+00.00
EL 730.00

1.33% 0.35%

400.00' V.C.

PROPOSED PROFILE - IL 2

VPI STA. 893+00.00
EL 755.00

Structure Location

1.66% -2.53%

1,040' V.C.

PROPOSED PROFILE - US 20

3RD P.M.

Project Location

T-43-N

R-1-E

US 20

LOCATION SKETCH

HIGHWAY CLASSIFICATION

F.A.P. Rte. 301- U.S.Rte. 20
Functional Class: Freeway and Expressway
ADT: 36,950 (2010); 60,400 (2030)
ADTT: 11.4%
DHV:
Design Speed: 70 m.p.h.
Posted Speed: 65 m.p.h.

F.A.U. Rte. 5128- IL Rte. 2 (11th St.)
Functional Class: Minor Arterial (Urban)
ADT: 17,650 (2010); 26,450 (2030)
ADTT: 11.3%
DHV:
Design Speed: 45 m.p.h.
Posted Speed: 40 m.p.h.

DESIGN SPECIFICATIONS

2007 AASHTO LRFD Bridge Design Specifications 4th-ed

DESIGN STRESSES

FIELD UNITS

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

LOADING HL 93

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

SEISMIC DATA

Seismic Performance Zone (SPC) = A
Bedrock Acceleration Coefficient (A) = .035g
Site Coefficient (S) = 1.2

DESIGNED	DRB
CHECKED	SO
DRAWN	THW
CHECKED	-

GENERAL PLAN
U.S. RTE. 20 OVER IL RTE. 2
WINNEBAGO COUNTY
SECTION 3HBR
STA. 894+23.39
S.N. 101-0186 (EB)
S.N. 101-0187 (WB)

APPENDIX C

SUMMARY OF STRUCTURE BORINGS

PROJECT: US-20 & IL-2 INTERCHANGE, WINNEBAGO COUNTY, DISTRICT ONE, ILLINOIS

IDOT JOB NO.: P-92-007-06

STRUCTURE: ABUTMENTS AND CENTRAL PIERS

STRUCTURE NO.: 101-0186 (EB) & 101-0187 (WB)

Boring Number	Station	Offset Feet	Ground Elevation	Depth Feet	Bottom Elevation	Ground Water		Remarks
						Depth, Feet	Elevation	
B-1	894+79.4	75.00 LT	728.50	41.5	687.00	40.0	688.50	
B-2	893+65.9	74.00 RT	729.00	41	688.00	39.5	689.50	
B-3	892+81.9	2.00 RT	748.00	56.5	691.50	DRY	N/A	
B-4	895+52.9	3.00 LT	748.60	61.5	687.10	60.0	688.60	

EXHIBIT 3-1, SUMMARY OF STRUCTURE BORINGS

APPENDIX D

BORING LOGS

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 4/23/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC., TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO.
Station

BORING NO. B-1
Station (894+79.4) 455+91
Offset 75.00ft Lt CL
(728.5) Ground Surface Elev. 79.50 ft

Surface Water Elev. ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter 39.5 ft ▼
Upon Completion 39.5 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
		0.6 P	18.0	MEDIUM brown SILTY CLAY LOAM (726.5) 77.50
	8			MEDIUM tan medium SAND
	9 10			(724.5) 75.50
-5	8			MEDIUM tan clean medium coarse SAND
	12 14			(722) 73.00
				MEDIUM tan clean medium coarse SAND
				(719.5) 70.50
-10	14			DENSE tan clean medium coarse SAND
	23 26			(717) 68.00
	14			DENSE tan SAND & GRAVEL
	17 18			(714.5) 65.50
-15	10			MEDIUM tan SAND & GRAVEL
	14 14			(712) 63.00
	13			DENSE tan SAND & GRAVEL
	16 17			(709.5) 60.50
-20				MEDIUM tan clean medium coarse SAND with medium GRAVEL
	12			(707) 58.00
	13 15			
	14			DENSE tan clean medium coarse SAND with medium GRAVEL
	16 20			(704.5) 55.50
-25	9			DENSE Same as above
	18 17			(702) 53.00
	10			MEDIUM tan clean medium coarse SAND
	13 15			(699.5) 50.50
-30	15			DENSE tan clean medium coarse SAND
	17 18			(697) 48.00
	8			MEDIUM tan clean medium coarse SAND
	10 14			(694.5) 45.50
-35	6			MEDIUM tan fine SAND
	9 12			(692) 43.00
	10			MEDIUM DENSE tan fine SAND
	14 16			(689.5) 40.50
-40				(688.5) ▼

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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 4/23/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC., TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-1
Station (894+71.4) 455+91
Offset 75.00ft Lt CL
(728.5) Ground Surface Elev. 79.50 ft

Surface Water Elev. _____ ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter 39.5 ft ▼
Upon Completion 39.5 ft ▽
After ____ Hrs. _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
MEDIUM tan fine SAND	7			
	10			
(687) 38.00	17			
End of Boring				

-45
-50
-55
-60

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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 4/24/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC. , TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO.
Station

BORING NO. B-2
Station (893+65.9) 454+77
Offset 74.00ft Rt CL
(729) Ground Surface Elev. 80.00 ft

Surface Water Elev. ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter 40.5 ft ▼
Upon Completion 40.5 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
		0.3 P	17.0	SOFT brown SANDY LOAM
(727.5) 78.50				
	2			MEDIUM tan dirty SAND & GRAVEL
	4			
(725.5) 76.50	8			
-5	14			DENSE tan SAND & GRAVEL
	17			
(723) 74.00	19			
	12			DENSE tan SAND & GRAVEL
	20			
(720.5) 71.50	21			
-10	12			DENSE tan SAND & GRAVEL
	15			
(718) 69.00	17			
(715.5) 66.50				
-15	9			DENSE tan SAND & GRAVEL
	13			
(713) 64.00	18			
(710.5) 61.50				
-20	14			
	16			MEDIUM tan clean medium coarse SAND with medium GRAVEL (continued)
	12			
59.00 (708)				
(705.5) 56.50				
-25	10			MEDIUM tan clean medium coarse SAND
	13			
(703) 54.00	15			
(700.5) 51.50				
-30	13			DENSE tan clean medium coarse SAND with medium GRAVEL
	18			
(698) 49.00	25			
(695.5) 46.50				
-35	8			MEDIUM tan clean medium coarse SAND
	13			
(693) 44.00	16			
(690.5) 41.50				
(688.5) ▼				
-40	5			MEDIUM tan fine SAND

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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 4/24/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC. , TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO.
Station

BORING NO. B-2
Station (893+59.) 454+77
Offset 74.00ft Rt CL
(729) Ground Surface Elev. 80.00 ft

Surface Water Elev. ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter 40.5 ft ▼
Upon Completion 40.5 ft ▽
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
MEDIUM tan fine SAND (continued) (685) 39.00		9 12		
End of Boring	-45 -50 -55 -60			

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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 4/27/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC. , TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO.
Station

BORING NO. B-3
Station (892+81.9) 453+93
Offset 2.00ft Rt CL
(740) Ground Surface Elev.: 99.00 ft

Surface Water Elev. ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter None ft
Upon Completion Dry ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SOFT brown SILTY CLAY LOAM				
			0.3 P	18.0
(746) 97.00				
MEDIUM gray dirty medium SAND		4		
		8		
(744) 95.00		8		
LOOSE gray dirty SAND and medium GRAVEL	-5	3		
		4		
		5		
(741) 92.00				
STIFF dark gray LOAM		1		
		2	1.1	19.0
(739) 90.00		6	P	
MEDIUM gray LOAM	-10	2		
		5	0.8	13.0
(736.5) 87.50		8	P	
STIFF gray LOAM		3		
		4	1.3	14.0
(734) 85.00		6	B	
MEDIUM brown SILTY CLAY LOAM	-15	3		
		4	0.8	16.0
(731.5) 82.50		5	P	
MEDIUM brown SILTY CLAY LOAM		3		
		3	0.8	19.0
(728.5) 79.50		7	B	
	-20			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
DENSE tan dry SAND & GRAVEL		12		
		17		
		20		
(724) 75.00				
DENSE tan SAND & GRAVEL	-25	14		
		17		
		24		
(719) 70.00				
MEDIUM tan SAND & GRAVEL	-30	3		
		12		
		16		
(714) 65.00				
MEDIUM tan clean medium coarse SAND	-35	4		
		5		
		10		
(709) 60.00				
	-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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 4/27/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC. , TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO. _____
Station _____

BORING NO. B-3
Station (892+81.9) 453+93
Offset 2.00ft Rt CL
(748) Ground Surface Elev. 99.00 ft

Surface Water Elev. _____ ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter None ft
Upon Completion Dry ft
After ____ Hrs. _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
DENSE tan SAND & GRAVEL		12		
		19		
		25		
(704)	55.00			
	-45			
DENSE tan dry clean medium coarse SAND with GRAVEL		14		
		22		
		28		
(699)	50.00			
	-50			
DENSE tan fine SAND		12		
		18		
		19		
(694)	45.00			
	-55			
MEDIUM tan clean medium coarse SAND		10		
		16		
		17		
(691.5)	42.50			
End of Boring				
	-60			

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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 5/4/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC. , TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO.
Station

BORING NO. B-4
Station (895+52.9) 456+54
Offset 3.00ft Lt CL
(748.6) Ground Surface Elev. 99.40 ft

Surface Water Elev. ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter 39.4 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
MEDIUM dark brown SILTY CLAY LOAM			0.5 P	19.0
(746.1) 96.90				
VERY STIFF dark brown SILTY CLAY LOAM		4		
		5 7	2.1 P	21.0
(744.6) 95.40				
STIFF gray SANDY LOAM	-5	3		
		7 9	1.3 S	8.0
(741.6) 92.40				
MEDIUM gray SAND & GRAVEL		5		
		9 11		
(739.1) 89.90				
MEDIUM/STIFF dark gray LOAM with SAND lens	-10	5		
		6 8	1.0 B	13.0
(737.1) 87.90				
MEDIUM/STIFF dark gray LOAM		2		
		4 6	1.0 P	14.0
(734.6) 85.40				
STIFF gray SANDY LOAM	-15	3		
		5 7	1.1 B	10.0
(732.1) 82.90				
STIFF gray LOAM with SAND lens		2		
		3 8	1.4 B	14.0
(729.6) 80.40	-20			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
STIFF brown LOAM		4		
		5 7	2.0 P	24.0
(727.1) 77.90				
MEDIUM brown SANDY LOAM		2		
		3 4	0.8 P	10.0
(724.1) 74.90				
MEDIUM brown dirty coarse SAND	-25	2		
		5 5		
(722.1) 72.90				
MEDIUM tan SAND & GRAVEL		2		
		3 10		
(719.6) 70.40				
DENSE tan SAND & GRAVEL	-30	8		
		13 21		
(714.6) 65.40				
MEDIUM tan SAND & GRAVEL	-35	6		
		12 13		
(709.6) 60.40	-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
Illinois Department of Transportation/D-2

SOIL BORING LOG

Date 5/4/07

ROUTE FAP 301 DESCRIPTION P92-007-06 Bridge on US Bypass 20 over IL 2 in Rockford LOGGED BY W. Garza

SECTION 3 HBR LOCATION Rockford Twp. - 10 NW, SEC. , TWP. 43N, RNG. 1E

COUNTY Winnebago DRILLING METHOD Hollow Stem Auger HAMMER TYPE B-53 Diedrich Automatic

STRUCT. NO.
Station

BORING NO. B-4
Station (895+52.9) 456+54
Offset 3.00ft Lt CL
(748.6) Ground Surface Elev. 99.40 ft

Surface Water Elev. ft
Stream Bed Elev. 82.00 ft

Groundwater Elev.:
First Encounter 39.4 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
DENSE tan SAND & GRAVEL	8		
	17		
	24		
(704.6) 55.40			
-45			
DENSE tan clean medium coarse SAND with medium GRAVEL	9		
	15		
	16		
(699.6) 50.40			
-50			
MEDIUM tan clean medium coarse SAND	18		
	13		
	13		
(694.6) 45.40			
-55			
MEDIUM tan clean medium coarse SAND	7		
	12		
	13		
(689.6) 40.40			
(688.6) ▼ -60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
MEDIUM tan fine SAND	7		
	9		
(687.1) 37.90	14		
End of Boring			
-65			
-70			
-75			
-80			

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

BBS, from 137 (Rev. 8-99)

APPENDIX E

GENERALIZED SOIL PROFILE

NOT APPLICABLE FOR THIS REPORT

APPENDIX F

EXHIBIT 6-1, NOMINAL REQUIRED BEARING & PILE TIP ELEVATION
EXHIBIT 7-1, COMPUTER OUTPUT, SLOPE STABILITY ANALYSES

PROJECT: US-20 & IL-2 INTERCHANGE, WINNEBAGO COUNTY, DISTRICT ONE, ILLINOIS
IDOT JOB NO.: P-92-007-06
STRUCTURE: ABUTMENTS AND CENTRAL PIERS
STRUCTURE NO.: 101-0186 (EB) & 101-0187 (WB)

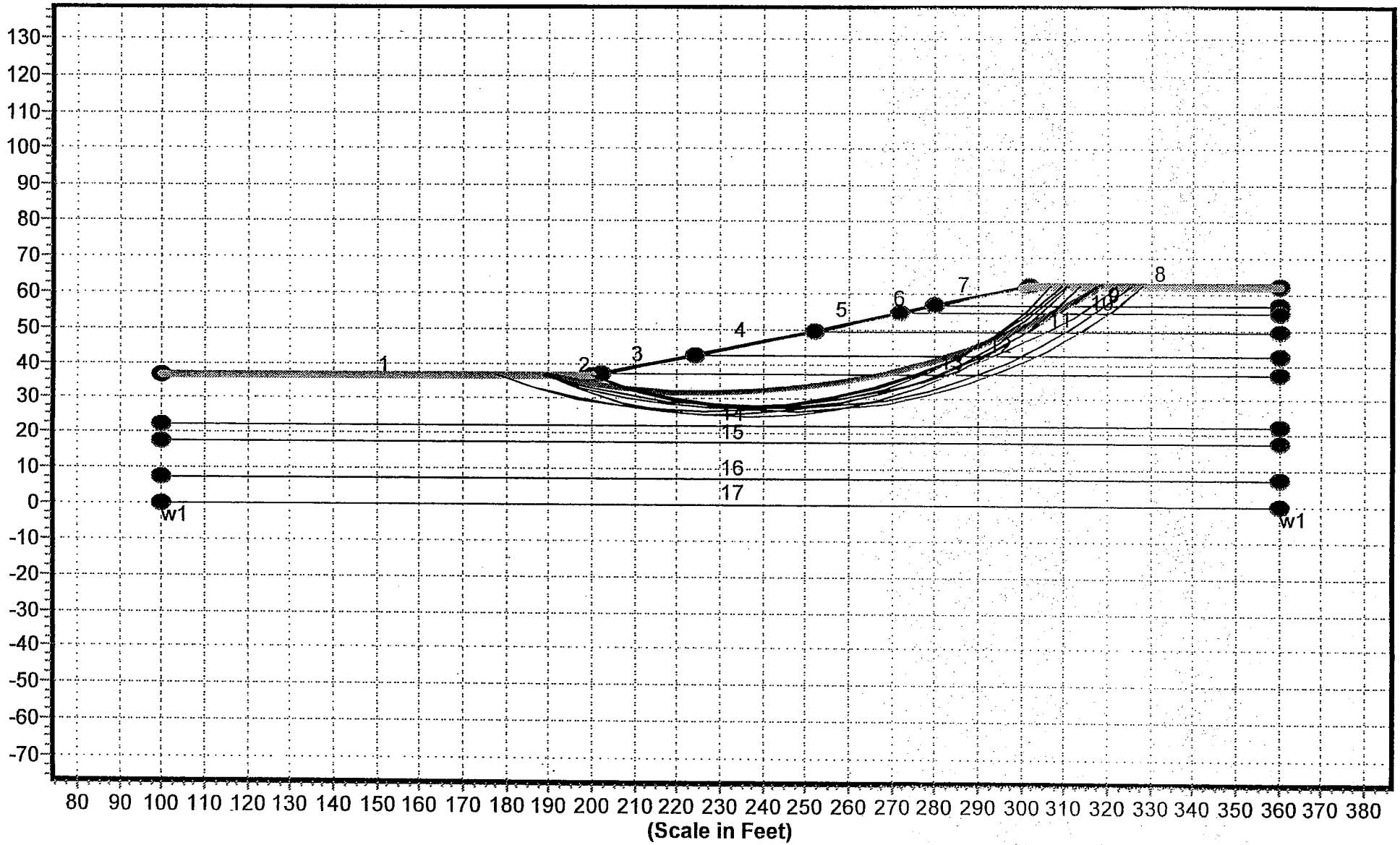
Nominal Required Bearing (NRB)

Type of Pile	Boring	Structure	Pile Cap Elevation	Estimated Pile Tip Elevation, Feet Nominal Required Bearing (NRB) Kips							
				170	210	240	270	300	330	360	390
12" Dia. Metal Shell Pile	B-1	WB Pier	724.87	695	693	689					
	B-2	EB Pier	723.97	695	693	689					
	B-3	W. Abutment	743.75			709	708	703	698		
	B-4	E. Abutment	742.4	698.6		689.6	688.6				
14" Dia. Metal Shell Pile	B-1	WB Pier	724.87	710	700	699			689		
	B-2	EB Pier	723.97	710	700	699			689		
	B-3	W. Abutment	743.75	728	718	709	708	708	708	708	708
	B-4	E. Abutment	742.4	718.6	709.6	708.6		698.6	698.6	698.6	688.6
10x42 H Pile	B-1	WB Pier	724.87		699	689					
	B-2	EB Pier	723.97		699	689					
	B-3	W. Abutment	743.75	718	709	708	708	708	708	703	703
	B-4	E. Abutment	742.4	713.6		709.6	708.6	698.6	698.6	688.6	688.6
12x53 H Pile	B-1	WB Pier	724.87	709		700	699	689			
	B-2	EB Pier	723.97	709		700	699	689			
	B-3	W. Abutment	743.75	728	728	713	708	708	708	708	708
	B-4	E. Abutment	742.4	718.6	713.6	713.6	709.6	708.6	704	698	698

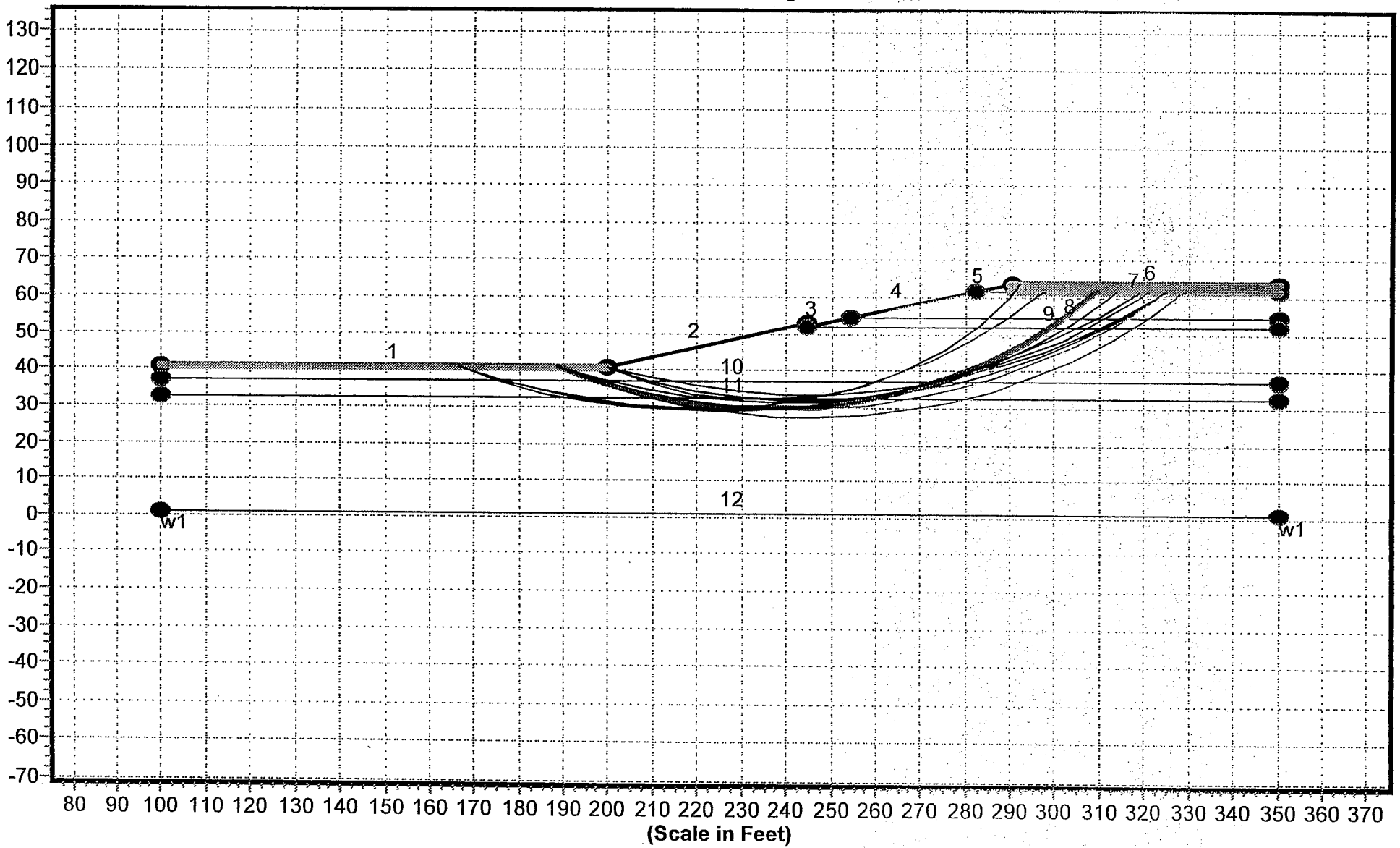
EXHIBIT 6-1, PILE NOMINAL REQUIRED BEARING & PILE TIP ELEVATION

Note: Factored Resistance Available (Rf) can be calculated considering geotechnical resistance factor of 0.5

Geometry and Boundary Conditions
Problem: US-20 & IL-2 Sta. 893 Boring B-3 - FS Min = 3.012

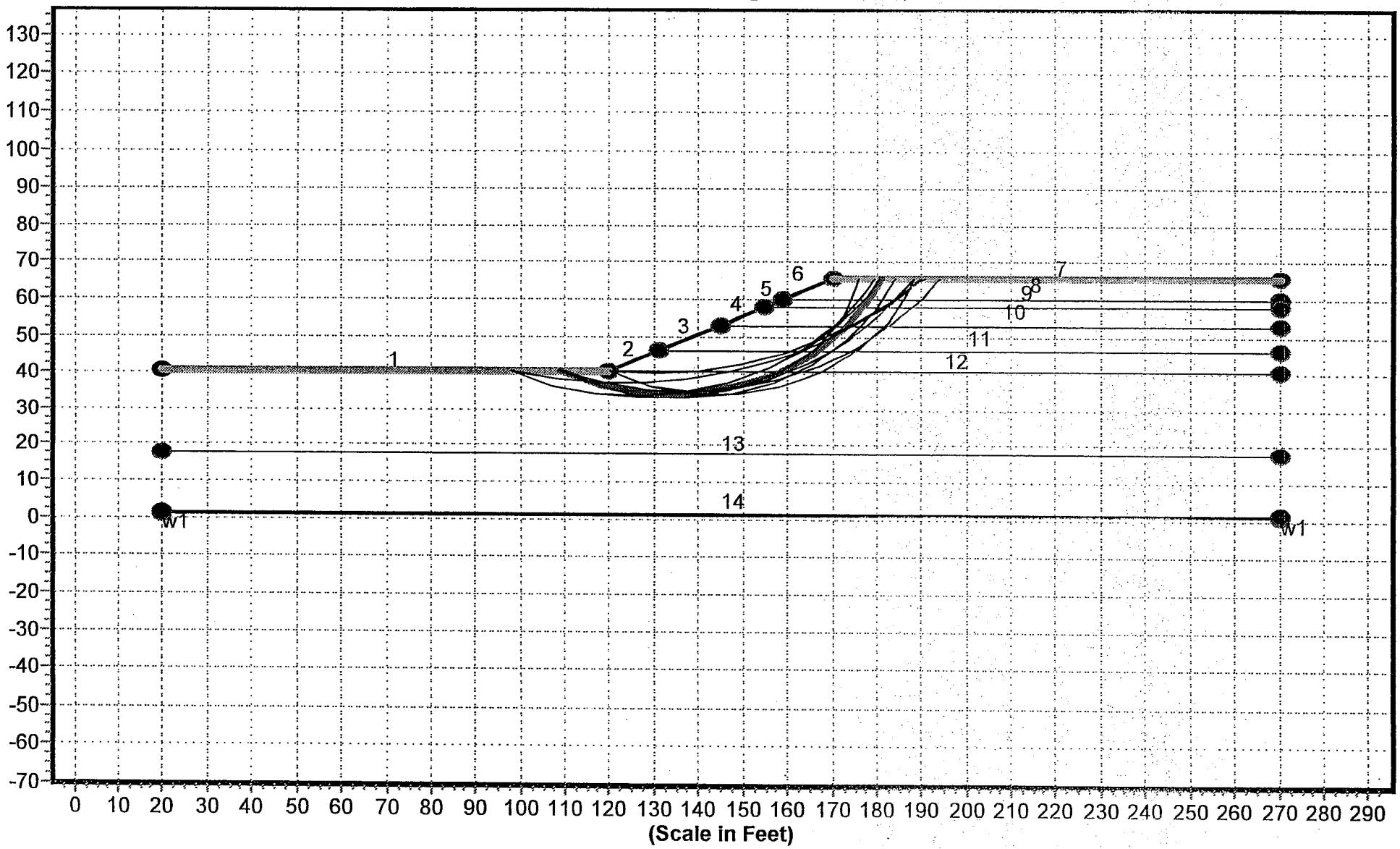


Geometry and Boundary Conditions
Problem: US-20 & IL-2 Sta. 896 Boring B-4 - FS Min = 3.445



Geometry and Boundary Conditions

Problem: US-20 & IL-2 Sta. 250 Boring B-2 & B-3 - FS Min = 1.724



APPENDIX G

STRUCTURE GEOTECHNICAL REPORT RESPONSIBILITY CHECKLIST

Illinois Department of Transportation

Structure Geotechnical Report Responsibility Checklist

Structure Number: 101-0186 (EB) 101-0055 (EB) 101-0187 (NB) (prop.) 101-0056 (WB) (exist.) Contract Number: P-92-007-06 Date: 12-03-07

Route: FAP 301 Section: 3 HBR County: WINNEBAGO

TSL plans by: I. E. CONSULTANTS

Structure Geotechnical Report and Checklist by: AMERICAN GEOENGINEERING, INC.

IDOT Structure Geotechnical Report Approval Responsibility : ☐ Qualified District Geotechnical Personnel ☐ BBS Central Geotechnical Unit

Geotechnical Data, Subsurface Exploration and Testing	Yes	No	N/A
All pertinent existing boring data, pile driving data, site inspection information included in the report?	■	☐	☐
Are the preliminary substructure locations, foundation needs, and project scope discussions between Geotechnical Engineer and Structure Planner included in the report?	■	☐	☐
All ground and surface water elevations shown on all soil borings and discussed in the report?	■	☐	☐
Has all existing and new exploration and test data been presented on a subsurface data profile?	■	☐	☐
Is the exploration and testing in accordance with the IDOT Geotechnical Manual policy?	■	☐	☐
Are the number, locations, depths, sampling, testing, and subsurface data adequate for design?	■	☐	☐
Geotechnical Evaluations			
Have structure or embankment settlement amounts and times been discussed in report?	■	☐	☐
Does the report provide recommendations/treatments to address settlement concerns?	■	☐	☐
Has the critical factor of safety against slope instability been identified and discussed in the report?	■	☐	☐
Does the report provide recommendations/treatments to address stability concerns?	■	☐	☐
Is the seismic design data (PGA, amplification, category, etc.) noted in the report?	■	☐	☐
Have the vertical and horizontal limits of any liquefiable layers been identified and discussed?	☐	☐	■
Has seismic stability been discussed and have any slope deformation estimates been provided?	☐	☐	■
Has the report discussed the proximity of ISGS mapped mines or known subsidence events?	■	☐	■
Has scour been discussed, any Hydraulics Report depths reported & soil type reductions made?	☐	☐	■
Do the Factors of Safety meet AASHTO and IDOT policy requirements?	■	☐	☐
Geotechnical Analyses and Design Recommendations			
When spread footings are recommended, has a bearing capacity and footing elevation been provided for each substructure or footing region?	■	☐	☐
Has footing sliding capacity been discussed?	■	☐	☐
When piles are recommended, does the report include a table indicating estimated pile lengths vs. a range of feasible required bearings and design capacities for each pile type recommended?	■	☐	☐
Have any downdrag, scour, and liquefaction reductions in pile capacity been addressed?	■	☐	☐
Will piles have sufficient embedment to achieve fixity and lateral capacity?	■	☐	☐
Have the diameters & elevations of any pile pre-coring been specified (when recommended)?	■	☐	☐
Has the need for test piles been discussed and the locations specified (when recommended)?	■	☐	☐
Has the need for metal shoes been discussed and specified (when recommended)?	☐	☐	■
When drilled shafts are recommended, have side friction and/or end-bearing values been provided?	☐	☐	■
Has the feasibility of using belled shafts been discussed when terminating above rock, or have estimated top of rock elevations been provided when extending into rock?	☐	☐	■
Have shaft fixity, lateral capacity, and min. embedment been discussed?	☐	☐	■
When retaining walls are required, has feasibility and relative costs for various wall types been discussed?	☐	☐	■
Have lateral earth pressures and backfill drainage recommendations been discussed?	☐	☐	■
Has ground modification been discussed as a way to use a less expensive foundation or address feasibility concerns?	☐	☐	■
Have any deviations from IDOT Geotechnical Manual or Bridge Manual policy been recommended?	■	☐	☐
Construction Considerations			
Has the need for cofferdams, seal coat, or underwater structure excavation protection been discussed?	☐	☐	■
Has stability of temporary construction slopes vs. the need for temporary walls been discussed?	■	☐	☐
Has the feasibility of cantilevered sheeting vs. a temporary soil retention system been discussed?	■	☐	☐
Has the feasibility of using a geotextile wall vs. a temp. MSE for any temp fill retention been noted?	☐	☐	■

"In order to aid in determining the level of departmental review, please attach additional documentation or reference specific portions of the SGR to clarify any checklist responses that reflect deviation from IDOT policy/practice."