STRUCTURE GEOTECHNICAL REPORT
INTERSTATE 80 (FAI 80) BRIDGES OVER US ROUTE 30, METRA ROCK ISLAND DISTRICT, AND HICKORY CREEK, IDOT D-91-046-10
SN 099-0068 AND SN 099-0069, PTB 153
SECTION 99-4-1VB-1-R, CONTRACT 60N87
WILL COUNTY, ILLINOIS

for

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Technical Report Documentation Page

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10. Abstract

The existing, twin nine-span bridges carrying Interstate 80 over US Route 30, the Metra Rock Island District, and Hickory Creek will undergo partial replacement and a full widening into the existing median. The bridges will be removed, replaced, and widened over US 30 and Metra RID between the southwest abutment and Pier 3; between Pier 4 and the northeast abutment the structures will be widened on new substructures. This report provides geotechnical recommendations for the design of proposed bridge foundations and stage construction using temporary soil retention systems.

The existing embankment material consists of medium stiff to hard clay, silty clay, and clay loam fill. Beneath the fill the native soils include sand and gravel overlying shallow, moderately to heavily weathered dolostone bedrock. We recommend no reductions to the predicted 100-year scour depths at the piers to be widened within Hickory Creek. The site classifies in the Seismic Class C.

The profile grade will be increased in the median by approximately 12 to 18 inches, and we do not anticipate settlement concerns. External stability analyses show suitable factors of safety. The proposed abutments could be supported on 15- to 38-foot long H-piles (size HP12x53 or HP14x73); the new piers and pier widenings should be supported on 3.0- to 4.0-foot diameter drilled shafts socketed into the shallow underlying bedrock; required rock socket thicknesses vary from about 4 to 8 feet. We provide geotechnical parameters for pile and shaft analysis under lateral load.

Stage construction should be supported by flexible steel sheet piling, designed according to *Design Guide 3.13.1* of the IDOT *Bridge Manual*. The piers to be constructed within Hickory Creek will require underwater excavation protection but are not deep enough to require cofferdams. The drilled shafts for all piers should include temporary casing installed to the top of bedrock to prevent issues related to groundwater and granular soil conditions.

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FOR
CIORBA GROUP, INC.

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, and geotechnical evaluations for the partial replacement and widening of the Interstate 80 (FAI 80) Bridges over US Route 30, the Metra Rock Island District (RID) rail lines, and Hickory Creek in Will County, Illinois. A *Site Location Map* is presented as Exhibit 1.

1.1 Proposed Structure

Wang Engineering, Inc. (Wang) understands Ciorba Group, Inc. (Ciorba) envisions twin, nine-span structures with pile-supported stub abutments and drilled shaft-supported piers; spans 1, 2, and 3 over US 30 and the Metra RID tracks will be removed and replaced with twin structures widened into the existing median, whereas spans 4 through 9 over Hickory Creek will be widened to the inside of the existing structures only. The proposed back-to-back of abutment lengths will measure 660.0 feet; the out-to-out width will measure 150.7 feet. The preliminary abutment design service loads, provided by Ciorba, are 120 kips at the southwest abutment and 150 kips at the northeast abutment; the preliminary design service shaft loads are shown in Table 5, Section 5.2.2.

Relative to the existing substructures, the southwest abutment will be moved back approximately 30 to 40 feet, Pier 1 will be reconstructed to the southwest of the existing one and Pier 2 will be reconstructed to the northeast of the existing. The pier replacements will provide greater clear distance from the centerline of US 30. The profile grade will remain virtually unchanged. The new end and side slopes at the southwest abutment will be graded at 1:2 (V:H). The improvements will be constructed in two stages with traffic maintained at all times; we anticipate that temporary steel sheet piling will be required to facilitate the stage construction. The widening of Piers 6 and 7 will be performed within Hickory Creek and will require underwater structure excavation protection.

The purpose of our investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of structure foundations and temporary soil retention systems.

1.2 Existing Structure

According to the Bridge Condition Report, provided by Ciorba, the existing structures were built in 1964 as three continuous three-span structures with pile-supported stub abutments and hammerhead pier footings supported on shallow bedrock. The structures have back-to-back lengths of 616.8 and 629.7 feet and variable out-to-out widths. The beams are W33 curved steel and the deck width is 7.5 inches. A median separates the eastbound and westbound lanes along the approach embankments and the existing bridges have an approximately 60-foot gap between them. The structure was widened in 1996.

2.0 SITE CONDITIONS AND GEOLOGICAL SETTING

The site is located in northwest Will County, about 30 miles southwest of Chicago. On the USGS *Mokena 7.5 minute Quadrangle* map the bridge is located in the NE ¼ of Section 17 of Tier35 N, Range 11 E of the 3rd Principal Meridian.

The following review of the published geologic data, with emphasis on factors that might influence the design and construction of the proposed engineering works, is meant to place the project area within a geological framework and, thus, to confirm the dependability and consistency of the present subsurface investigation results. For the study of the regional geologic framework, Wang considered western Illinois area in general and Will County in particular. Exhibit 2 illustrates the *Site and Regional Geology*.

2.1 Physiography

The project area is part of the Wheaton Morainal Country, a morainic area of the Great Lake Section including a series of broad parallel morainic ridges, which encircle Lake Michigan. The project area is characterized now by a variety of elongated hills, mounds, basins, sags and valleys. At the bridge site, outlet valleys carved through the moraine reaching the bedrock and are filled with outwash deposits showing a fairly flat relief. Today, a thin glacial drift covers shallow bedrock (McLean and Smith 1995, Hansel and Johnson 1996, Willman et al. 1975). The surface elevation slopes gently from east to west, from as high as 650 feet to as low as 600 feet. Hickory Creek runs east to west cutting a channel through the West Chicago Moraine as it flows to the Des Plaines River in Joliet.

2.2 Surficial Cover

Quaternary glacigenic deposits unconformably overlie the Paleozoic bedrock. During the Michigan Subepisode (26,000 to 11,000 B.P.) of the Wisconsin glaciation, a glacial lobe extended over northeastern and north central Illinois (Hansel and Johnson 1996). Will County was under the influence of an extrusion of this lobe, the Joliet sublobe, ultimately responsible for the formation of a series of arcuate, end moraine ridges, separated by low-relief till plains, lake plains, and outlet valleys (Johnson and Hansel 1999, Willman 1971).

The investigated area was built on outwash deposits of the Henry Formation of the Mason Group. Specifically, the bridge spans over valley train like outwash deposits, which consist predominantly of stratified sand and gravel with lenses of silt, clay, and occasional organic debris. At the project area the drift thickness is less than 25 feet (Hansel and Johnson, 1996).

2.3 Bedrock

According to Willman et al. (1975), the uppermost bedrock unit in most of the Will County consists of Silurian-age, red to light gray to white, thin- to medium-bedded dolostones of the Joliet Formation. In the project area, the bedrock top waves between 590 and 625 feet (McLean and Smith 1995) and may be encountered between the ground surface and 25 feet below the ground surface (bgs). Bedrock outcrops may be seen in the cuts along the I-80/US 30 ramps.

No underground mines are known in the area. The nearest coal mines are located about 16 miles southwest, in the vicinity of Morris, Grundy County.

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed that under man-made fill, the native sediments at the project site consist of gravel and sand of the Henry Formation and gray dolostone of the Joliet Formation. The borings encountered the top of the bedrock between 3 and 49 feet bgs.

3.0 METHODS OF INVESTIGATION

The following section outlines the subsurface and laboratory investigations performed by Wang and others. The additional subsurface information was provided by Ciorba in November 2009.

3.1 Subsurface Investigation

The subsurface investigation performed by Wang consisted of two structure borings, designated as SB-201 and SB-202, drilled in May 2010 between Piers 4 and 5. The borings were drilled from elevations of 622.6 and 617.0 feet to depths of 28.5 to 33.5 feet bgs. The northing and easting coordinates were surveyed with a mapping-grade GPS; the boring elevations, stations, and offsets were measured from design drawings provided by Ciorba. In addition, a series of 10 borings, designated as SB-101 through SB-110, were drilled in December 1994 at each of the substructure locations. The 1994 logs were drilled from elevations of 646.2 to 603.3 feet to depths of 22.0 to 50.0 feet bgs. These borings provided station, offset, and elevation information; northing and easting coordinates were approximated from drawings provided by Ciorba. The boring location data are shown in the *Boring Logs* (Appendix A), and the as-drilled locations are shown in the *Boring Location Plan* (Exhibit 3).

In Borings SB-201 and SB-202, a truck-mounted drill rig, equipped with hollow stem augers, was used to advance and maintain an open borehole. Soil sampling was performed according to AASHTO T 1587, "*Penetration Test and Split Barrel Sampling of Soils*." The soil was sampled at 2.5-foot intervals to the top of bedrock. Soil samples from each interval were placed in sealed jars for further laboratory testing. In both borings the bedrock was cored in two 5-foot runs using a NX-sized barrel. The bedrock cores were classified in the field and returned to the laboratory for testing. Bedrock core exhibits are shown in Appendix B.

The borings provided by Ciorba show sampling at 2.5-foot intervals to the top of bedrock. Bedrock cores were taken in each boring and descriptions of the soil and rock were included.

Field boring logs, prepared and maintained by a Wang engineer, include lithological descriptions, visual-manual soil classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, and results of Standard Penetration Tests (SPT), recorded as blows per 6 inches of penetration.

Groundwater observations were made during and after drilling operations. The borings were backfilled with soil cuttings after completion. The 1994 logs also include groundwater elevations.

3.2 Laboratory Testing

The soil samples were tested in the laboratory for moisture content (AASHTO T 265). The soils were classified according to the IDH Textural Classification system and field visual-manual descriptions were verified in the laboratory. The laboratory results are shown in the *Boring Logs* (Appendix A).

4.0 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

Detailed descriptions of the soil conditions encountered during the subsurface investigation are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 4). Please note that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

4.1 Soil Conditions

In descending order, the general lithologic succession encountered along the I-80 Bridge includes: 1) medium stiff to hard clay, silty clay, and clay loam fill; 2) loose to very dense sand and gravel; and 3) very poor to very good quality dolostone.

(1) Man-made Ground (Fill)

Immediately beneath the surface the borings revealed 3.5 to 38.0 feet of medium stiff to hard, brown and gray clay, silty clay, and clay loam fill; the approach embankments are constructed entirely of fill materials. Less fill was placed along US 30 and the Metra RID, whereas the Hickory Creek streambed is made up of natural deposits (see **Layer 2**). The fill has unconfined compressive strength (Q_u) values of 0.8 to 4.0 tsf with an average of 2.0 tsf; 50% of the samples have Q_u values between 1.5 and 2.5 tsf. The fill has moisture contents of 11 to 27% with an average of 19%; 64% of the samples show moisture content between 18 and 22%.

(2) Loose to Dense Sand and Gravel

Beneath the fill and within Hickory Creek, at elevations of approximately 620.7 to 604.4 feet, the borings advanced through 3.0 to 12.5 feet of loose to dense, brown and gray, sand and gravel. The sand and gravel has SPT (N)-values between 6 blows/foot and spoon refusal at the top of bedrock. The N-values of the material not achieving spoon refusal range from 5 to 57 blows/foot and average 25 blows/foot.

(3) Very Poor to Very Good Quality dolostone

At elevations of 608.4 to 594.1 feet, the borings encountered very poor to very good, strong, heavily to moderately fractured dolostone bedrock with some clay and silt partings within the jointing. The dolostone has an average rock quality designation (RQD) value of 46%. In Boring SB-105, adjacent to Pier 4, the 3 cores (19 feet) indicated an RQD of 0%; coring in the other locations indicated the rock generally has fair to good quality. The rock also increases in quality after the initial core run, with several borings showing 100% RQD about 10 to 12 feet below the top of bedrock. Three uniaxial compressive strength tests were performed on intact rock samples from Borings SB-201 and SB-202. These tests show compressive strength values of approximately 8,700 to 13,500 psi.

4.2 Groundwater Conditions

Groundwater was encountered while drilling between elevation of 600.4 and 608.2 feet (43 feet bgs at the embankments and 0.9 to 13.5 feet bgs along the piers). The average groundwater elevation was measured at 604.7, which corresponds relatively well to the water surface elevation in Hickory Creek. Our analyses account for a water table elevation of 604.7 feet.

4.3 Scour Considerations

Based on the results of a hydraulic report dated August 1995 and the preliminary GPE provided by Ciorba, Hickory Creek has a design high water elevation (DHWE) of 610.84 feet and an estimated water surface elevation (EWSE) of 605.9 feet. For the 100-yr flood, the hydraulic report estimates 4 feet contraction scour and 7 feet of pier scour.

The subsurface investigation showed the streambed is made up of primarily of loose to medium dense sand and gravel (**Layer 2**). We recommend no reductions to the predicted scour depths be made for Piers 6 and 7; thus design scour elevations will be established at the top of bedrock. At the remaining piers, the DHWE either does not reach the elevation of the ground surface at the front face (Piers 1 through 4), or the piers are protected by concrete slopewalls (Piers 5 and 8). For these piers the design scour elevations should be established at the ground surface along either side of the pier. At the abutments, the design scour elevations should be established at the base of the required pile encasements (IDOT, 2008). The design scour elevations to be shown on the plans are summarized in Table 1.

Table 1: Design Scour Elevations for SN 099-0068 and SN 099-0069

Design Scour	Pier 5	Pier 6	Pier 7	Pier 8
Elevation (feet)	613.6	601.2	598.0	614.5

4.4 Seismic Design Considerations

Wang estimates the sand and gravel deposit overlying the bedrock has a factor of safety (FOS) against liquefaction greater than the AASHTO required value of 1.1. For design based on the 2002 AASHTO *Specifications for Road and Bridge Design,* the horizontal bedrock acceleration coefficient is 4.0%, with a 90% probability of not being exceeded in 50 years (AASHTO, 2002). The Site Coefficient (S) is 1.0, corresponding the Soil Type I; the structure is located in Seismic Performance Category A (AASHTO, 2002).

5.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the approach embankments, approach slabs, and structure foundations are included in the following sections. Wang concurs that the proposed combination of driven pile foundations at the abutments and drilled shafts at the piers shown in the preliminary GPE are appropriate for the support of the bridge substructures.

The abutment foundations should be supported on steel H-piles (IDOT 2010). Given the overall bridge length, shallow foundations and concrete-filled metal shell piles are not appropriate for stub abutment support. The pier foundations should consist of 3.0 to 4.0-foot diameter drilled shafts socketed into the underlying bedrock. Shallow foundations would require excavations as deep as 10.0 feet to reach the top of bedrock, and driven steel piles would not have sufficient overburden to fix the pile tip prior to encountering bedrock.

5.1 Approach Embankments and Slabs

Wang has performed settlement and global stability analyses for the approach embankments and slabs based on the soil conditions encountered in the borings and the preliminary geometry presented on the GPE plan. We do not anticipate excessive settlements, and the global stability meets the IDOT-required FOS.

5.1.1 Settlement

The relocated southwest abutment is proposed within a cut section and there is no significant proposed raise in profile; therefore we do not anticipate any settlement concerns. Both abutments will be widened to the inside of the existing twin structures. The profile grade in the existing median ditches along the approach embankment will be raised by approximately 12 to 18 inches; it will also not present a settlement concern.

5.1.2 Global Stability

The global stability of the southwest end slope was analyzed based on the soil profile described in Section 4.1 and the information provided in the preliminary GPE. The slope of the proposed approach embankment is anticipated at 1:2 (V:H) and the maximum slope height, from the top of pavement to the base of the slope, will measure approximately 29.0 feet. The slopes are considered structure-supporting cuts; therefore, the minimum required FOS for both short and long-term conditions is 1.5 (IDOT 2009). The analyses were performed with *Slide 5.0*, and evaluation exhibits are shown in Appendix C. For the undrained (short-term) condition, Wang estimates the slopes have an FOS of 2.6 (Appendix C-1); for the drained (long-term) condition, Wang estimates the slopes have an FOS of 1.5 (Appendix C-2). Both conditions meet the IDOT-required FOS.

5.2 Structure Foundations

Wang recommends supporting the abutments on steel H-piles and the piers on drilled shafts socketed into bedrock.

5.2.1 Driven Piles

Information provided by Ciorba indicates the bridge will be designed based on Allowable Stress Design (ASD); however, Wang understands all piles designed for projects with letting dates after April 2010 will be designed for pile load testing via the Washington State DOT method based on the methods and empirical equations presented in *AGMU Memorandum 10.2 – Geotechnical Pile Design* (IDOT, 2009). In AGMU 10.2, IDOT specifies the maximum nominal required bearing (R_{NMAX}) for each pile (IDOT 2009). To adjust this method to the use of ASD, Wang will assess the nominal (ultimate) required bearing with the AGMU 10.2 method and apply a FOS of 3.0 to obtain the allowable resistance available (R_A) to match the service loading provided by Ciorba. The service design loads are 120 kips at the southwest abutment (360 kips ultimate) and 150 kips at the northeast abutment (450 kips ultimate). The R_A, R_N, estimated pile tip elevations, and pile lengths for HP12x53 and HP14x73 steel H-piles are summarized in Tables 3 (HP12x53) and 4 (HP14x73). The designer should note the HP12x53 does not provide enough ultimate capacity (450 kips) to achieve a service design load of 150 kips; therefore, if HP12x53 piles are planned for the northeast abutment the design load will have to be decreased to 140 kips maximum. The lengths shown in the tables include a 1-foot pile embedment into the abutments. In addition, all H-piles should include a 3-foot pile encasement.

The R_F estimates are governed by the relationship $R_F = \phi_G R_N - \phi_G(DD_R+S_C+L_{iq})I_G - (\gamma_p)(\lambda_{IS})DD_L$ (IDOT 2009). We do not anticipate any load or geotechnical losses due to settlement-induced downdrag (see Section 5.1), scour (see Section 4.3), or liquefaction (see Section 4.4).

Table 3: Estimated Pile Lengths and Tip Elevations for HP12x53 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Required Nominal Bearing, R_N (kips)	Allowable Geotechnical Loss (kips)	Allowable Geotechnical Load Loss (kips)	Allowable Resistance Available, R_A (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
Southwest Abutment (SB-101)	636.8	300	0.0	0.0	100	19	618.3
		360	0.0	0.0	120	26	611.5
		420	0.0	0.0	140	28	609.0
Northeast Abutment (SB-110)	636.9	300	0.0	0.0	100	30	607.9
		360	0.0	0.0	120	36	602.4
		420	0.0	0.0	140	38	599.9

Table 4: Estimated Pile Lengths and Tip Elevations for HP14x73 Steel H-Piles

Structure Unit	Pile Cap Base Elevations (feet)	Required Nominal Bearing, R_N (kips)	Allowable Geotechnical Loss (kips)	Allowable Geotechnical Load Loss (kips)	Allowable Resistance Available, R_A (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
Southwest Abutment (SB-101)	636.8	300	0.0	0.0	100	15	622.3
		360	0.0	0.0	120	19	61.5
		420	0.0	0.0	140	26	611.5
		480	0.0	0.0	160	28	609.0
Northeast Abutment (SB-110)	636.9	300	0.0	0.0	100	24	613.9
		360	0.0	0.0	120	30	607.9

	420	0.0	0.0	150	38	599.9
	480	0.0	0.0	180	38	599.9

5.2.2 *Drilled Shafts*

The foundations for new Piers 1, 2, and 3 and the widened portions of Piers 4 through 8 should be supported on drilled shafts socketed into the underlying bedrock. The drilled shafts are analyzed using the methodology described in the AASHTO *Standard Specifications for Bridge Design* (2002), which indicates the shafts should be designed for a minimum FOS of 2.5 for shafts socketed in rock. Rock socketed shafts should be designed for side friction only, unless sufficient settlement is anticipated to mobilize the end bearing (AASHTO 2002); we do not anticipate settlements large enough to consider end bearing.

The R_F, R_N, and estimated rock socket thickness required for 3.0-, 3.5-, and 4.0-foot diameter drilled shafts are summarized in Table 5. The table also includes the anticipated design loads provided by Ciorba. The drilled shafts will require temporary casing to protect from groundwater infiltration, which is discussed in Section 5.3.

Table 5: Estimated Rock Socket Thicknesses and Tip Elevations for Drilled Shafts

Structure Unit	Top of Rock Elevation (feet)	Anticipated Shaft Load (kips)	Shaft Diameter (feet)	Ultimate Shaft Resistance, R_N (kips)	Allowable Resistance Available, R_F (kips)	Total Socket Thickness (feet)	Estimated Shaft Tip Elevation (feet)
Pier 1 (SB-102)	606.4	390	3.0	975	390	5.8	600.6
			3.5	975	390	4.9	601.5
			4.0	975	390	4.3	602.1
Pier 2 (SB-103)	601.2	410	3.0	1,025	410	6.4	594.7
			3.5	1,025	410	5.6	595.5
			4.0	1,025	410	5.0	596.1
Pier 3 (SB-104)	605.7	400	3.0	1,000	400	7.2	598.5
			3.5	1,000	400	6.2	599.5
			4.0	1,000	400	5.4	600.3

Pier 4 (SB-105)	607.7	400	3.0	1,000	400	7.2	600.5
			3.5	1,000	400	6.2	601.5
			4.0	1,000	400	5.4	602.3
Pier 5 (SB-202)	593.5	400	3.0	1,000	400	5.4	588.1
			3.5	1,000	400	4.6	588.9
			4.0	1,000	400	4.0	589.5
Pier 6 (SB-107)	601.2	410	3.0	1,025	410	7.4	593.8
			3.5	1,025	410	6.3	594.9
			4.0	1,025	410	5.5	595.7
Pier 7 (SB-108)	595.9	380	3.0	950	380	5.8	590.1
			3.5	950	380	4.9	591.0
			4.0	950	380	4.3	591.6
Pier 8 (SB-109)	598.8	380	3.0	950	380	5.8	593.0
			3.5	950	380	4.9	593.9
			4.0	950	380	4.3	594.5

5.2.3 Lateral Loading

Lateral loads on piles and shafts should be analyzed for maximum moments and lateral deflections. Recommended lateral soil modulus and strain parameters required for analysis via the p-y curve method are included in Table 6.

Table 6: Recommended Soil Parameters for Lateral Load Analysis

Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
M Stiff to hard CLAY and CLAY LOAM (1)	120	1800	0	800	0.5
Loose to dense SAND and GRAVEL (2)	63	0	32	60	--

Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
Rock Type (Layer)	Total Unit Weight, γ (pcf)	Young's Modulus (ksi)	Uniaxial Comp. Strength (ksi)	RQD (%)	Lateral Rock Modulus Parameter
V Good to Fair Quality Dolostone (3)	130	1,100	7.0	50	0.0005
Fair to V Poor Quality Dolostone (3)	130	480	7.0	10	0.0005

5.3 Stage Construction Design Recommendations

Wang understands the partial replacement and widening of the I-80 Bridges will be performed in stages with I-80 remaining open to traffic. Stage one will include the construction of the new bridge portions within the existing 60-foot wide median for the full length of the improvement. Stage two will involve removing and replacing the existing substructures between the southwest abutment and Pier 3. The location of the new southeast abutment shown on the preliminary GPE suggests complete removal of the existing abutment; partial removal of the exiting H-piles will be required to establish the proposed end slope. To accommodate the stage construction, flexible cantilever steel sheet pile walls may be required along the stage-line behind the existing southwest abutment and along Piers 1 and 2 to accommodate substructure removal. Temporary soil retention with steel sheet piling is a feasible and effect method at this location, and the sheeting should be designed based on the charts included in *Design Guide 3.13.1* of the IDOT *Bridge Manual* (2009). Wang assumes that all required cut sections will be 1:2.5 (V:H), and the geometry should be checked for stability prior to construction.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation

All vegetation, surface topsoil, existing pavement, and debris should be cleared and stripped where foundations and structural fills will be placed. The exposed subgrade should be proofrolled. To aid in locating unstable and unsuitable materials, the proofrolling should be observed by a qualified engineer. Any unstable or unsuitable materials should be removed and replaced with compacted structural fill as described in Section 6.3.

6.2 Excavation

Foundation excavations should be performed in accordance with local, State, and federal regulations. The potential effect of ground movements upon nearby utilities should be considered during construction.

6.3 Filling and Backfilling

Fill material and to attain the final design elevations should be structural fill material. Coarse aggregate of IDOT gradation CA-6 or pre-approved, compacted, cohesive or granular soil conforming to IDOT Section 204 would be acceptable as structural fill (IDOT, 2010). The fill material should be free of organic matter and debris. Fill should be placed in lifts and compacted according to IDOT Section 205, *Embankment* (IDOT, 2010).

All backfill materials must be pre-approved by the site engineer. To backfill the abutments and piers we recommend porous granular material, such as crushed stone or crushed gravel that conforms to the gradation requirements specified in IDOT Articles 1004.01 or 1004.05 (IDOT, 2010). Backfill material should be placed and compacted in accordance with the IDOT Section 205, *Embankment* (IDOT, 2010). Estimated design parameters for granular structural backfill materials are presented in Table 8.

Table 8: Estimated Granular Backfill Parameters

Soil Description	Porous Granular Material Backfill
Unit Weight	125 lbs/ft^3
Angle of Effective Internal Friction	32 degrees
Active Earth Pressure Coefficient	0.31
Passive Earth Pressure Coefficient	3.26
At-Rest Earth Pressure Coefficient	0.5

6.4 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Moisture and traffic will cause deterioration of exposed subgrade soils. Precautions should be taken by the contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion.

Earth moving operations should be scheduled to not coincide with excessive cold or wet weather (early spring, late fall or winter). Any soil allowed to freeze or soften due to the standing water should be removed. Wet weather can cause problems with subgrade compaction.

It is recommended that an experienced geotechnical engineer be retained to inspect the exposed subgrade, monitor earthwork operations, and provide material inspection services during the construction phase of this project.

6.5 Pile Installation

The driven piles shall be furnished and installed according to the requirements of IDOT Section 512, *Piling* (IDOT 2010). Wang recommends that at a minimum of one test pile be performed at each substructure location. The test piles shall be driven to 110 percent of the nominal required bearing indicated in Section 5.2.1, Tables 3, 4, and 5. Since hard driving is expected near the termination depth, the piles should be installed with metal shoes. The steel H-piles shall be according to AASHTO M270M, Grade 50.

6.6 Drilled Shafts

The drilled shaft installation along Piers 6 and 7 will be performed within Hickory Creek. Due to the water level, the installation will require underwater structure excavation protection; however, the EWSE is not high enough to warrant cofferdam protection. In addition, shafts drilled outside Hickory Creek will likely encounter groundwater within granular soils that will cause caving and running issues. Therefore, we recommend the drilled shaft locations be protected with temporary casing installed to the top of bedrock elevation at each location. The casing can be removed after the placement of concrete.

7.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design and/or location of the bridge are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Ciorba Group, Inc. and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

Mickey L. Snider, P.E.	Jerry W.H. Wang, Ph.D., P.E.
Senior Geotechnical Engineer	QA/QC Reviewer

REFERENCES

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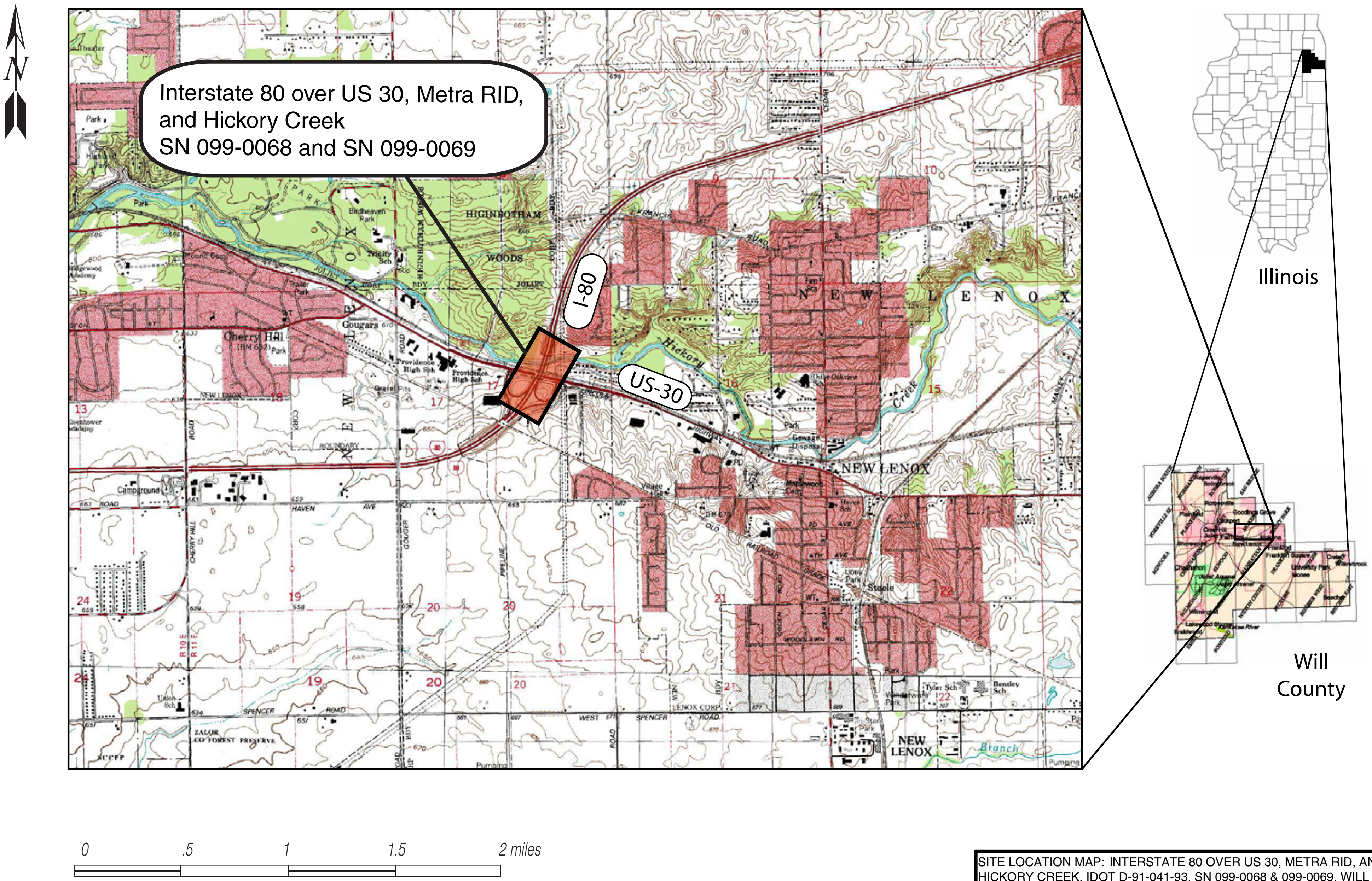
EXHIBITS



SITE LOCATION MAP: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: A. Bohac CHECKED BY: L. Iordache

Wang Engineering

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Lombard, IL 60148
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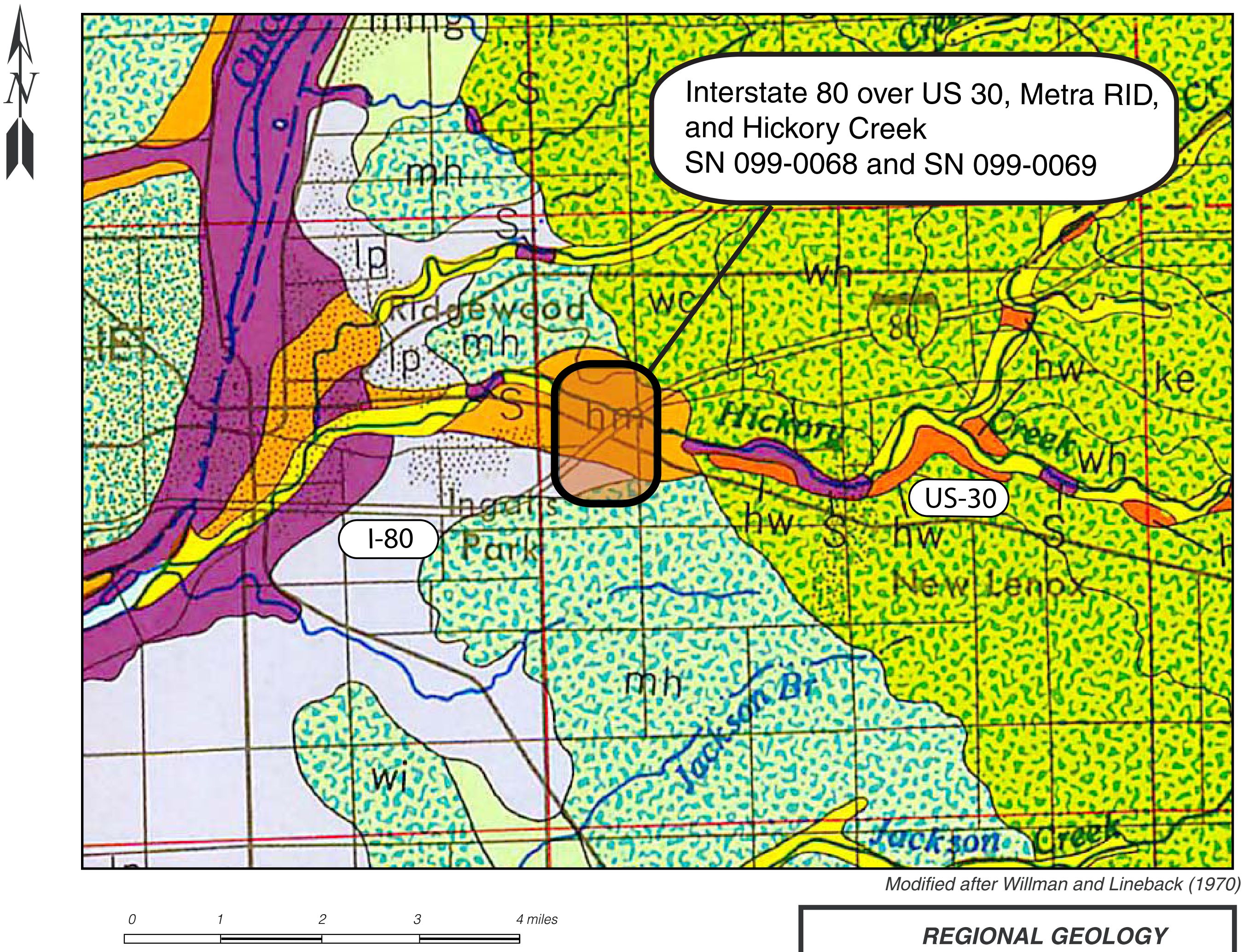
FOR CIORBA GROUP, INC.

775-13-01



Modified after Willman and Lineback (1970)

LEGEND

🟥 **Proposed I-80 improvement**

Postglacial Deposits

c — **Cahokia Alluvium**
Mostly poorly sorted silt and sand containing local deposits of sany gravel;

Glacial Cover

Mason Group

Equality Formation
Lake deposits; largely silt with sand facies near the shorelines;

lp — **Lake plain**
Floor of glacial lakes flattened by wave erosion and minor depositions;

Henry Formation
Outwash and localy outlet river deposits; sand and gravel with minor and local beds of silt;

hm — **Mackinaw facies**
Valley trains; outwash deposits

hw — **Wasco facies**
Ice-contact deposits; kames, eskers and deltas

Wedron Group

Wadsworth Formation
Mostly gray to dark gray clayey till, low content of pebbles, cobbles and boulders; contains local lenses of silt;

Valparaiso Morainic System

ke, wh — ke - Keeneyville Moraine
wh - Wheaton Moraine

Lemont Formation, Yorkville Member
Mostly gray to dark gray clayey till, localy silty clayey till; containe abundant small pebbles, local lenses of silt, and less commonly lenses of sand and gravel.

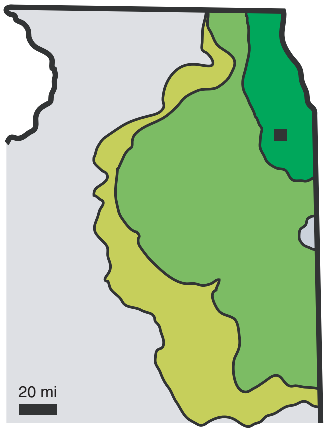
mh, wi — mh - Manhattan Moraine
wi - Wilton Center Moraine

Bedrock

S — **Silurian**
Largely dolomite, slightly to moderately argilaceous with scattered chert nodules.

Willman and Lineback, 1970.

REGIONAL GEOLOGY



Wedron Group

🟩 Wadsworth Formation

🟩 Lemont Formation

🟩 Tiskilwa Formation

Modified after Hansel and Johnson (1996)

SITE & REGIONAL GEOLOGY: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: A. Bohac CHECKED BY: L. Iordache

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FOR CIORBA GROUP, INC.

775-13-01

Benchmark: B.M. #6 - Chiseled "☐" in base of traffic control box on north side of US-30 across from EB I-80 ramps.
Sta. 671+94, offset 766′ LT, Elev. 612.38

Existing Structures: S.N. 099-0068 (WB) and S.N. 099-0069 (EB) Built under Sec. 99-4-IVB-1 in 1964; superstructure replaced and substructure widened under Sec. 99 (5,5-1;5VB R and Sec. 99-4-1VB-1-BR. Superstructure consists of three (3) continuous 3-span segments separated by expansion joints over Piers 3 and 6. Superstructure consists of a curved R.C. deck on curved W33 beams (composite). 50′-2" and varies o-o deck, 629′-8¾" bk. to bk. of abut. EB. 42′-2" and widens to 55′-8¼" o-o deck, 616′-10½" bk. to bk. of abut. WB. Substructure consists of multi-column piers and pile-bent abutments. Existing structure to be removed and replaced in Spans 1-3, and widened in Spans 4-9. Traffic to maintained using stage construction.

No salvage

WATERWAY INFORMATION

Drainage Area = 79 Sq. Mi. Low Grade Elev. 633.19 @ Sta. 658+40

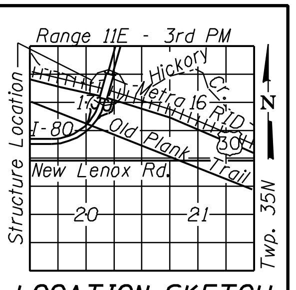
Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft.		Nat. H.W.E.	Head - Ft.		Headwater Elev.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
	10	5000	1408	1408	609.37	0.25	0.25	609.62	609.62
Design	50	7400	1625	1625	610.66	0.18	0.18	610.84	610.84
Base	100	8600	1734	1734	611.30	0.12	0.12	611.42	611.42
Overtopping									
Max. Calc.	500	11200	1902	1902	612.36	0.00	0.00	612.36	612.36

DESIGN SCOUR ELEVATION TABLE

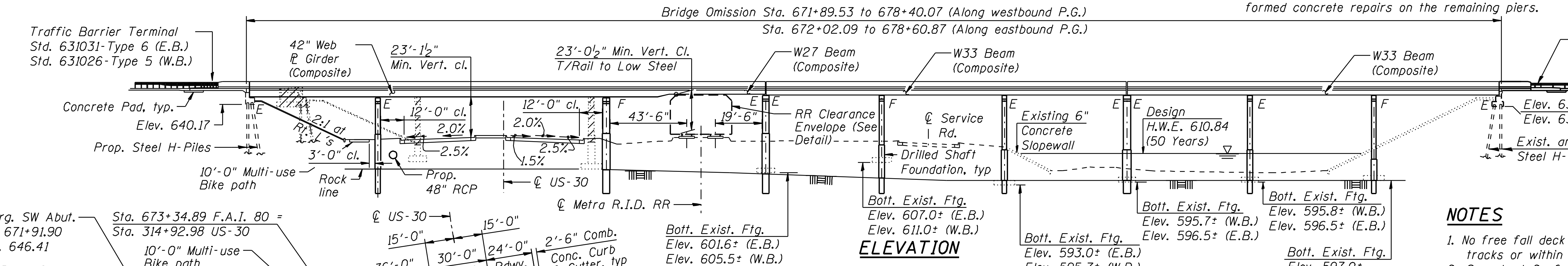
Design Scour Elevation (ft.)	Pier 5	Pier 6	Pier 7	Pier 8
	617.0	601.2	595.9	603.3

SCOPE OF WORK

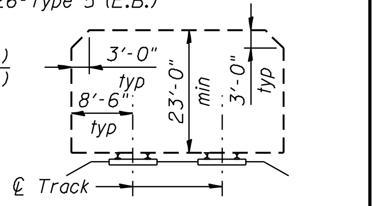
1. Remove and replace Spans 1-3, Piers 1 and 2, and the south abutment.
2. Widen structure in Spans 4-9
3. Replace expansion joints in the remaining existing deck over Pier 3, Pier 6 and the north abutment.
4. Scarify and overlay existing deck using Thin Polymer Overlay.
5. Extend slopewalls as needed, and perform slopewall repairs and formed concrete repairs on the remaining piers.



LOCATION SKETCH



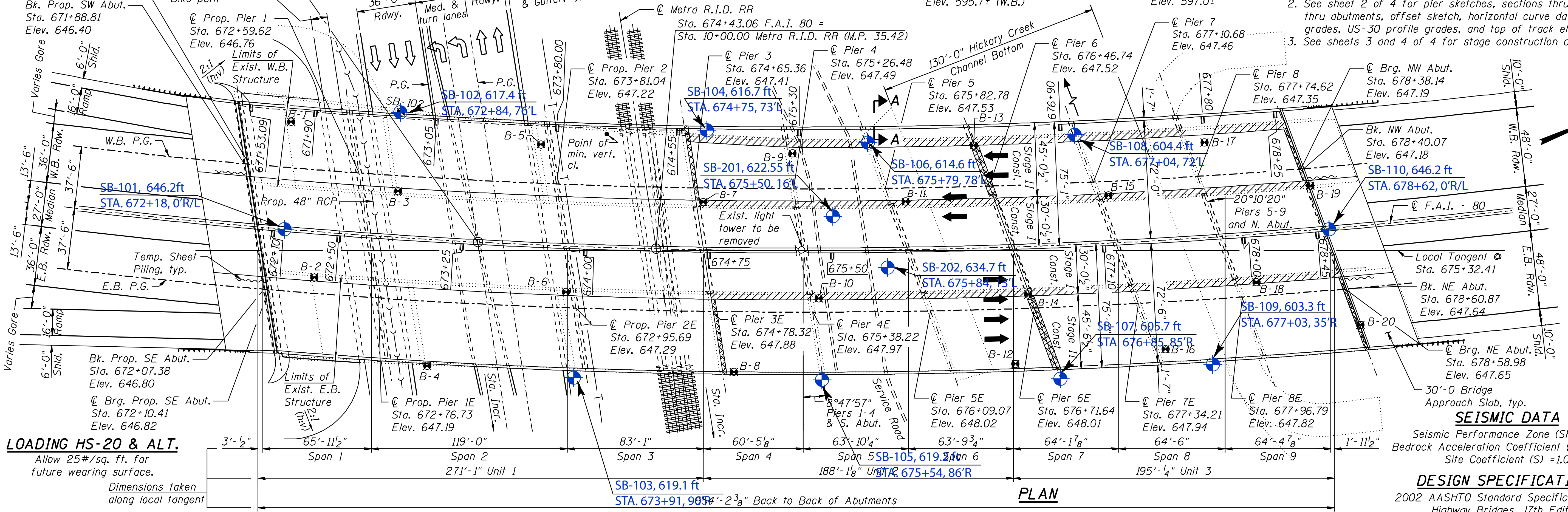
ELEVATION



RR CLEARANCE ELVELOPE

NOTES

1. No free fall deck drains will be permitted in the span over the tracks or within 10 feet of cross arms of a railroad pole line.
2. See sheet 2 of 4 for pier sketches, sections thru piers, sections thru abutments, offset sketch, horizontal curve data, I-80 profile grades, US-30 profile grades, and top of track elevations.
3. See sheets 3 and 4 of 4 for stage construction cross-sections.



PLAN

LOADING HS-20 & ALT.

Allow 25#/sq. ft. for
future wearing surface.

SEISMIC DATA

Seismic Performance Zone (SPZ) =A
Bedrock Acceleration Coefficient (A) =0.04g
Site Coefficient (S) =1.0

DESIGN SPECIFICATIONS

2002 AASHTO Standard Specifications for
Highway Bridges, 17th Edition
2003 AASHTO Guide Specifications for
Horizontally Curved Highway Bridges

HIGHWAY CLASSIFICATION

F.A.I. Rte. 80 - I-80

Functional Class: Interstate
ADT: 80,500 (2008); 121,000 (2030)
ADTT: 16%
DHV: 4,220 (2030) E.B.; 4,090 (2030) W.B.
Design Speed: 70 m.p.h.
Posted Speed: 65 m.p.h.
Two-Way Traffic

F.A.P. Rte. 607 - US-30

Functional Class: Other Principal Arterial
ADT: 30,200 (2008); 40,000 (2030)
ADTT: 5%
DHV: 1710 (2030)
Design Speed: 45 m.p.h.
Posted Speed: 40 m.p.h.
Two-Way Traffic

DESIGN STRESSES

EXISTING CONDITIONS

fc = 1,400 psi
fy = 40,000 psi (1964 Reinforcement)
fy = 60,000 psi (1996 Reinforcement)
fy = 36,000 psi (Exist. M270 Grade 36)

FIELD UNITS

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

◆ Mile Post #35 Sta. 30+00.00

LEGEND

☒ Existing Soil Boring Location
⊕ Soil Boring Location
▨ Limits of partial superstructure removal
⊠ Expansion Joint replacement
E.B. Eastbound
W.B. Westbound
R.I.D. Rock Island District

BORING LOCATION PLAN: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: SEE PLAN	EXHIBIT 3	DRAWN BY: C. MARIN CHECKED BY: M. SNIDER

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FOR CIORBA GROUP, INC.	775-13-01

GENERAL PLAN
I-80 OVER US-30, METRA R.I.D. AND HICKORY CR.
F.A.I. RTE. 80-99-4-1VB-1-R
WILL COUNTY
STATION 675+32.41
S.N. 099-0068 (W.B.) & 099-0069 (E.B.)

FILE NAME = $FILES$

Ciorba Group, Inc.
CONSULTING ENGINEERS
5507 North Cumberland Avenue
Suite 402 Chicago, Illinois 60656
Tel. 773.775.4009
Fax 773.775.4014
Email chicago@ciorba.com

USER NAME = akhan	DESIGNED -	REVISED -
	CHECKED -	REVISED -
PLOT SCALE = 64.000000 ′/ IN.	DRAWN -	REVISED -
PLOT DATE = 3/24/2011	CHECKED -	REVISED -

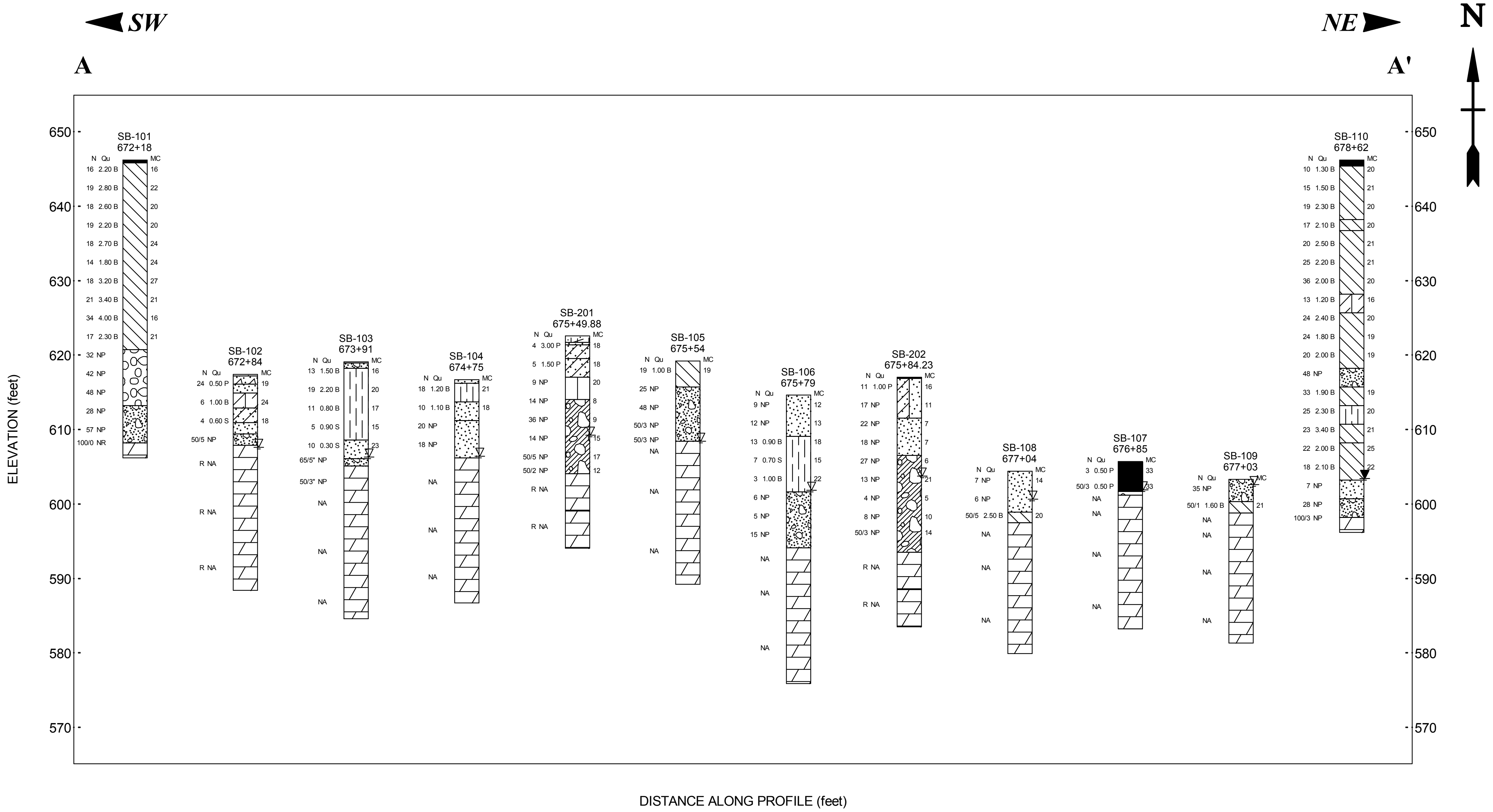
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

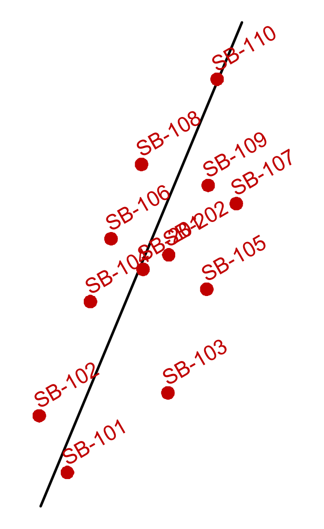
SHEET NO. 1 OF 4 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	99-4-1VB-1-R	WILL	93	$S-1

CONTRACT NO. 60N87
ILLINOIS FED. AID PROJECT

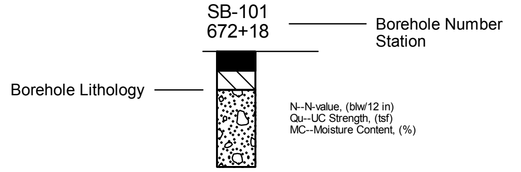
N:\PROJ\3384\4_US 30\Design\Structural\CAD\3384 US30 TSL 1.dgn





Site Map Scale 1 inch equals 295 feet

Explanation:



▽ Water Level Reading at time of drilling.

▼ Water Level Reading 24-hr after drilling or at end of drilling

0 80

Horizontal Scale (feet)

Vertical Exaggeration: 5x

Lithology Graphics

■ Topsoil

▨ Dolomite or Dolomitic Limestone

▨ IDH Clay Loam

▥ IDH Silt, Silty Loam

▧ IDH Clay

▦ Pavement

▨ IDH Sandy Clay, Sandy Clay Loam

▨ Weathered bedrock

▨ Gravel

▨ Crushed stone

▥ IDH Silty Clay, Silty Clay Loam

▨ IDH Loam

▨ Gravelly sand, sandy gravel

▨ IDH Sand, Sandy Loam

▨ Boulders and cobbles

Wang Engineering, Inc.
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Lombard, IL 60148

Soil Profile A-A'
SN 099-0068 and SN 099-0069
Section 99-4-1VB-1-R

WEI
SINCE 1982

FAI-80 from US 30 to US 45
Will County

JOB NUMBER	PLATE NUMBER
775-13-01	EXHIBIT 4

APPENDIX A

Wang Engineering

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BORING LOG SB-201

WEI Job No.: 775-13-01

Client: **Ciorba Group, Inc.**
Project: **FAI-80 from US 30 to US 45**
Location: **Will County**

Datum: NGVD
Elevation: 622.55 ft
North: 1768116.98 ft
East: 1077832.44 ft
Station: 675+49.88
Offset: 15.93 L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
621.7	10-inch thick, ASPHALT --PAVEMENT--						
621.4	4-inch thick, CRUSHED STONE --AGGREGATE BASE--						
619.5	Very stiff, brown SANDY CLAY LOAM, trace gravel --FILL--			1	3 2 2	3.00 P	18
617.0	Stiff, brown SANDY CLAY LOAM, trace gravel	5		2	2 2 3	1.50 P	18
614.0	Loose, brown SILT with gravel --HARD DRILLING--			3	3 3 6	NP	20
	Medium dense to very dense, light brown, weathered and fragmented DOLOSTONE --HARD DRILLING--	10		4	38 6 8	NP	8
				5	8 20 16	NP	9
		▽ 15		6	6 6 8	NP	15
604.0				7	11 8 50/5	NP	17
	Very poor quality, medium strong, slightly weathered to fresh, light brown to gray			8	50/2 C	NP	12
		20					
599.0	DOLOSTONE Run #1 18.5' to 23.5' Recovery=54/60=90% RQD=5/60=8%			1	CORE		
594.0	Good quality, strong, fresh, gray DOLOSTONE Run #2 23.5' to 28.5' Recovery=60/60=100% RQD=45/60=75%	25		2	CORE		
	Boring terminated at 28.50 ft	30					
		35					
		40					

GENERAL NOTES

Begin Drilling	**05-18-2010**	Complete Drilling	**05-18-2010**
Drilling Contractor	**WTS**	Drill Rig	**B-57 TMR**

Driller **K&J** Logger **B. Wilson** Checked by **M. Snider**
Drilling Method **3.25 IDA HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling	▽	**13.50 ft**
At Completion of Drilling	▼	**Washed**
Time After Drilling		**NA**
Depth to Water	▼	**NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-202

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 617.00 ft
North: 1768138.92 ft
East: 1077871.86 ft
Station: 675+84.23
Offset: 13.31 R

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	616.8	2-inch thick, dark brown SILTY CLAY LOAM --TOPSOIL--						
		Medium dense to stiff, brown LOAM to CLAY LOAM, little to some gravel --FILL--			1	4 5 6	1.00 P	16
			5		2	7 9 8	NP	11
	611.5	Medium dense, brown SANDY LOAM, some gravel and rock fragments --HARD DRILLING--			3	3 9 13	NP	7
			10		4	5 8 10	NP	7
	606.5	Loose to very dense, light brown weather and fragmented DOLOSTONE --HARD DRILLING--			5	10 14 13	NP	6
			▽					
			15		6	4 5 8	NP	21
					7	2 2 2	NP	5
			20		8	2 3 5	NP	10
					9	4 50/3	NP	14
	593.5	Fair quality, strong, slightly weathered to fresh, light brown to gray DOLSTONE Run #1 23.5' to 28.5' Recovery=60/60=100% RQD=35.25/60=59%	25		1	C O R E		
	588.5	Good quality, strong, fresh, gray DOLOSTONE Run #2 28.5' to 33.5' Recovery=60/60=100% RQD=50/60=83%	30		2	C O R E		
	583.5	Boring terminated at 33.50 ft	35					
			40					

GENERAL NOTES

Begin Drilling **05-18-2010** Complete Drilling **05-18-2010**
Drilling Contractor **WTS** Drill Rig **B-57 TMR**
Driller **K&J** Logger **B. Wilson** Checked by **M. Snider**
Drilling Method **3.25 IDA HSA; Boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **13.50 ft**
At Completion of Drilling ▼ **Washed**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-101

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 646.20 ft
North: 1767806.44 ft
East: 1077716.54 ft
Station: 672+18
Offset: 0 RT/LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	645.8	Black CLAY --TOPSOIL--						
		Stiff to very stiff, brown and gray CLAY with trace GRAVEL --FILL--			1	5 7 9	2.20 B	16
			5		2	4 7 12	2.80 B	22
					3	6 8 10	2.60 B	20
			10		4	6 9 10	2.20 B	20
					5	5 9 9	2.70 B	24
			15		6	3 6 8	1.80 B	24
					7	8 8 10	3.20 B	27
			20		8	8 10 11	3.40 B	21
					9	14 19 15	4.00 B	16
			25		10	4 8 9	2.30 B	21
	620.7	Dense, brown GRAVEL with some SAND and SILTY CLAY						
					11	22 20 12	NP	
			30		12	20 16 26	NP	
					13	17 29 19	NP	
	613.2	Medium dense to very dense, brown and gray SAND and GRAVEL						
			35		14	21 11 17	NP	
					15	50 27 30	NP	
	608.2	Fractured and weathered DOLOMITE --HARD DRILLING--			16	100/0	NR	
	606.2	Boring terminated at 40.00 ft	40					

GENERAL NOTES

Begin Drilling **12-15-1994** Complete Drilling **12-15-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ▽ **DRY**
At Completion of Drilling ▼ **DRY**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-102

WEI Job No.: 775-13-01

Client: **Ciorba Group, Inc.**
Project: **FAI-80 from US 30 to US 45**
Location: **Will County**

Datum: NGVD
Elevation: 617.40 ft
North: 1767893.23 ft
East: 1077673.59 ft
Station: 672+84
Offset: 76 L

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	617.2	2.4-inch thick CONCRETE --PAVEMENT--						
	616.1	Dark brown SAND and GRAVEL --AGGREGATE BASE--			1	7 11 13	0.50 P	19
	614.9	Soft, brown SANDY LOAM with trace GRAVEL --FILL--						
		Stiff, dark brown CLAY LOAM --FILL--			2	3 3 3	1.00 B	24
	612.9	Medium stiff, brown SANDY CLAY --FILL--	5					
	610.9	Very loose, brown fine, SAND with trace CLAY			3	2 2 2	0.60 S	18
	609.4	Very dense, brown SAND and GRAVEL with occasional SILT seams			4	13 50/5	NP	
	607.9	Light gray, weathered DOLOMITE	10 ▽					
		Run #1 11' to 14' Recovery=100%, RQD=40%			5	CORE		
		Run #2 14' to 24' Recovery=100%, RQD=48%	15			CORE		
					6			
			20					
		Run #3 24' to 29' Recovery =100%, RQD=68%	25			CORE		
		Heavily fractured from 11' to 12'			7			
		Moderately fractured with occasional clay partings and vertical fractures from 12' to 17'						
	588.4	Moderately fractured from 17' to 26.5'						
		Lightly to moderately fractured from 26.5' to 29'	30					
		Boring terminated at 29.00 ft						
			35					
			40					

GENERAL NOTES

Begin Drilling **12-16-1994** Complete Drilling **12-16-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ▽ **10.00 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**
The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-103

WEI Job No.: 775-13-01

Client: **Ciorba Group, Inc.**
Project: **FAI-80 from US 30 to US 45**
Location: **Will County**

Datum: NGVD
Elevation: 619.10 ft
North: 1767928.26 ft
East: 1077870.67 ft
Station: 673+91
Offset: 90 R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
618.9	2.4-inch thick CONCRETE --PAVEMENT--						
618.2	10.8-inch thick SAND and GRAVEL --AGGREGATE BASE--			1	4 6 7	1.50 B	16
	Stiff, brown CLAY LOAM to SANDY LOAM with trace GRAVEL --FILL--						
		5		2	7 7 12	2.20 B	20
				3	3 5 6	0.80 B	17
		10		4	3 2 3	0.90 S	15
608.6	Medium stiff, brown SANDY CLAY			5	3 5 5	0.30 S	23
606.1	Very dense, brown SAND and GRAVEL with occasional SILT seams	∇		6	65/5"	NP	
605.1	Light gray DOLOMITE, weathered to tan/buff at 17' --WEATHERED BEDROCK--	15		7	15 19 50/3"	NP	
	Run #1 18' to 21' Recovery=100%, RQD=0%	20		8			
	Run #2 21' to 31' Recovery=100%, RQD=51%						
	Heavily fractured from 18' to 24.5'	25					
	Moderately fractured below 24.5'			9			
	Mottled dark gray from 31.2' to 31.9'						
		30					
	Run #3 31' to 34.5' Recovery=100%, RQD=50%			10			
584.6	Boring terminated at 34.50 ft	35					
		40					

GENERAL NOTES

Begin Drilling **12-14-1994** Complete Drilling **12-14-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ∇ **13.00 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG SB-104

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 616.70 ft
North: 1768067.53 ft
East: 1077751.93 ft
Station: 674+75
Offset: 73 L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
616.2	6-inch thick CRUSHED STONE					
	Stiff, brown CLAY LOAM --FILL--		1	5 7 11	1.20 B	21
613.7	Stiff, brown SANDY LOAM	5	2	4 4 6	1.10 B	18
611.2	Dense, brown SAND with little GRAVEL		3	7 9 11	NP	
		10	4	7 9 9	NP	
606.2 ▽	Light gray, DOLOMITE, weathered to tan/buff color to 27.5' Run #1 11' to 17.5' Recovery=94%, RQD=17%	15	5			
	Run #2 17.5' to 24' Recovery=100%, RQD=14%	20				
	Moderate to heavily fractured from 10.5' to 22.9' lightly to moderately fractured from 22.9' to 30' Fractures frequently contain some silt/clay from 10.5' to 23' Fragmented zones: 17' to 17.5' and 22.1' to 22.9' Run #3 24' to 30' Recovery=100%, RQD=67%	25	6			
	3-inch thick SILT/CLAY layer at 28.1'		7			
586.7		30				
	Boring terminated at 30.00 ft	35				
		40				

GENERAL NOTES

Begin Drilling **01-17-1995** Complete Drilling **01-17-1995**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ▽ **10.50 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG SB-105

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 619.20 ft
North: 1768086.46 ft
East: 1077929.93 ft
Station: 675+54
Offset: 86 R

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	Stiff, dark brown CLAY with some GRAVEL and trace ORGANICS		1	12 12 7	1.00 B	19
615.7	Medium dense to very dense, brown SAND and GRAVEL with some COBBLES and BOULDERS	5	2	7 11 14	NP	
			3	19 23 25	NP	
		10	4	12 32 50/3	NP	
608.4	Run #1 11.3' to 14' Recovery=100%, RQD=0%		5	50/3	NP	
			6			
	Run #2 14' to 22' Recovery=100%, RQD=0%	15				
	Light gray DOLOMITE, mostly weathered to tan/buff color, heavily fractured, some fractures filled with SILT, occasional CLAY partings	20	7			
	Run #3 22' to 30' Recovery=100%, RQD=0%	25	8			
589.2	Boring terminated at 30.00 ft	30				
		35				
		40				

GENERAL NOTES

Begin Drilling **12-12-1994** Complete Drilling **12-12-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ∇ **11.00 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG SB-106

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 614.60 ft
North: 1768163.65 ft
East: 1077783.59 ft
Station: 675+79
Offset: 78 L

SOIL AND ROCK DESCRIPTION

Elevation (ft)	Depth (ft)	Description
614.60	0	Loose to medium dense, brown SANDY LOAM with GRAVEL --FILL--
609.1	5.5	Medium stiff to very stiff, brown and gray CLAY LOAM with occasional SAND seam
601.6	13.0	Loose to medium dense, brown SAND and GRAVEL with occasional SILT seams below 18'
594.1	20.5	Run #1 21' to 24' Recovery=72%, RQD=72% Run #2 24' to 30.2' Recovery=100%. RQD=74% Light gray to gray DOLOMITE, upper zone weathered to tan/buff color along bedding planes and joints, lightly fractured Run #3 30.2' to 38.7' Recovery=100%, RQD=96%
575.9	38.7	Boring terminated at 38.70 ft

Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
1	3 3 6	NP	12
2	6 5 7	NP	13
3	3 6 7	0.90 B	18
4	4 2 5	0.70 S	15
5	1 1 2	1.00 B	22
6	4 3 3	NP	
7	2 2 3	NP	
8	4 6 9	NP	
9			
10			
11			

GENERAL NOTES

Begin Drilling **12-13-1994** Complete Drilling **12-13-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ∇ **13.00 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG SB-107

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 605.70 ft
North: 1768217.17 ft
East: 1077975.28 ft
Station: 676+85
Offset: 85 R

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Soft, dark brown and black SILTY CLAY with occasional SAND seams --TOPSOIL--			1	1 1 2	0.50 P	33
	601.7		▽		2	2 50/3	0.50 P	33
	601.2	Brown GRAVEL, COBBLES and fractured DOLOMITE	5					
		Run #1 4.5' to 6.5' Recovery=100%, RQD=0%			3			
		Run #2 6.5' to 8.5' Recovery=100%, RQD=0%			4			
		Run #3 8.5' to 17.5' Recovery=100%, RQD=67%	10					
		Light gray DOLOMITE, weathered to tan/buffcolor to 17', some fractures filled with silt between 4.5' and 7.5', occasional clay partings between 10' and 17'			5			
		Heavily fractured from 4.5' to 10'						
		Moderately fractured from 10' to 12'	15					
		Lightly fractured from 12' to 22.5'						
		Run #4 17.5' to 22.5' Recovery=100%, RQD=100%	20		6			
	583.2	Boring terminated at 22.50 ft						
			25					
			30					
			35					
			40					

GENERAL NOTES

Begin Drilling 12-20-1994 Complete Drilling 12-20-1994
Drilling Contractor TSC Drill Rig
Driller Logger Checked by A. Bohac
Drilling Method Boring log provided by Ciorba Group and IDOT

WATER LEVEL DATA

While Drilling ▽ 4.00 ft
At Completion of Drilling ▼ WASHED
Time After Drilling NA
Depth to Water ▼ NA
The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-108

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 604.40 ft
North: 1768277.14 ft
East: 1077830.08 ft
Station: 677+04
Offset: 72 L

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	Loose, brown SILTY SAND and GRAVEL with some SILT layers			1	2 3 4	NP	14
		▽		2	3 5 1	NP	
		5					
598.9	Very stiff, gray CLAY			3	4 50/5	2.50 B	20
597.5	Light gray DOLOMITE, weathered to tan/buff color to 11' Run #1 7.5' to 10.5' Recovery=100%, RQD=58%			4			
		10					
	Run #2 10.5' to 16.5' Recovery=100%, RQD=61%						
	Moderately fractured from 7.5' to 13' Lightly fractured below 13' Vertical fracture from 22.3' to 23.5'			5			
		15					
	Run #3 16.5' to 24.5' Recovery=100%, RQD=86%						
		20		6			
579.9	Boring terminated at 24.50 ft	25					
		30					
		35					
		40					

GENERAL NOTES

Begin Drilling **12-21-1994** Complete Drilling **12-21-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ▽ **4.00 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG SB-109

WEI Job No.: 775-13-01

Client: **Ciorba Group, Inc.**
Project: **FAI-80 from US 30 to US 45**
Location: **Will County**

Datum: NGVD
Elevation: 603.30 ft
North: 1768245.18 ft
East: 1077932.17 ft
Station: 677+03
Offset: 35 R

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Dense, brown and gray SILTY SAND and GRAVEL with occasional COBBLES and SILT	▽		1	6 10 25	NP	
	600.3	Stiff, gray CLAY			2	4 5 50/1	1.60 B	21
	598.8	Run #1 5' to 7' Recovery=100%,RQD=21%	5		3			
		Run #2 7' to 9' Recovery=100%, RQD=33%			4			
		Run #3 9' to 17' Recovery=100%, RQD=43%	10					
		Light gray DOLOMITE, weathered to tan/buff color to 8.5' Heavily fractured from 5' to 12' Moderate to lightly fractured below 12'			5			
			15					
		Run #4 17' to 22' Recovery=100%, RQD=100%			6			
			20					
	581.3	Boring terminated at 22.00 ft						
			25					
			30					
			35					
			40					

GENERAL NOTES

Begin Drilling **12-21-1994** Complete Drilling **12-21-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ▽ **0.90 ft**
At Completion of Drilling ▼ **WASHED**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG SB-110

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 646.20 ft
North: 1768407.45 ft
East: 1077945.74 ft
Station: 678+62
Offset: 0 RT/LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
■	645.4	Black CLAY --TOPSOIL--						
▨		Stiff to very stiff, brown CLAY with trace GRAVEL --FILL--		☒	1	4 4 6	1.30 B	20
▨			5	☒	2	4 6 9	1.50 B	21
▨	638.2			☒	3	7 8 11	2.30 B	20
▨	636.7	Very stiff, gray CLAY with trace GRAVEL and ORGANICS --FILL--		☒	4	7 8 9	2.10 B	20
▨		Very stiff, brown CLAY with trace GRAVEL --FILL--	10					
▨				☒	5	6 9 11	2.50 B	21
▨			15	☒	6	11 12 13	2.20 B	21
▨	628.2			☒	7	11 13 23	2.00 B	20
▦		Stiff, brown and gray CLAY LOAM with trace ORGANICS --FILL--	20	☒	8	7 6 7	1.20 B	16
▦	625.7							
▨		Stiff to very stiff, brown CLAY with trace GRAVEL --FILL--		☒	9	7 11 13	2.40 B	20
▨			25	☒	10	7 9 15	1.80 B	19
▨	618.2			☒	11	7 9 11	2.00 B	19
░	615.7	Dense, brown SAND and GRAVEL with occasional COBBLES --FILL--	30	☒	12	20 23 25	NP	
▨	613.2	Stiff, brown CLAY with trace GRAVEL --FILL--		☒	13	16 18 15	1.90 B	19
▥	610.7	Very stiff, dark gray and black SILTY CLAY with trace ORGANICS and GRAVEL --FILL--	35	☒	14	8 11 14	2.30 B	20
▨	608.2	Very stiff, brown and gray CLAY --FILL--		☒	15	8 11 12	3.40 B	21
▨		Very stiff, brown CLAY	40	☒	16	8 9 13	2.00 B	25

GENERAL NOTES

Begin Drilling **12-15-1994** Complete Drilling **12-15-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ∇ **43.00 ft**
At Completion of Drilling ▼ **43.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SB-110

WEI Job No.: 775-13-01

Client **Ciorba Group, Inc.**
Project **FAI-80 from US 30 to US 45**
Location **Will County**

Datum: NGVD
Elevation: 646.20 ft
North: 1768407.45 ft
East: 1077945.74 ft
Station: 678+62
Offset: 0 RT/LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
				17	11 8 10	2.10 B	22
603.2	Loose, brown SILTY SAND with trace GRAVEL	▼		18	2 3 4	NP	
		45					
600.7	Medium dense, brown SILTY SAND and GRAVEL			19	11 13 15	NP	
598.2	Fractured and weathered DOLOMITE --WEATHERED BEDROCK-- --HARD DRILLING--			20	100/3	NP	
596.2	Boring terminated at 50.00 ft	50					
		55					
		60					

GENERAL NOTES

Begin Drilling **12-15-1994** Complete Drilling **12-15-1994**
Drilling Contractor **TSC** Drill Rig
Driller Logger Checked by **A. Bohac**
Drilling Method **Boring log provided by Ciorba Group and IDOT**

WATER LEVEL DATA

While Drilling ▽ **43.00 ft**
At Completion of Drilling ▼ **43.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

APPENDIX B

Boring SB-01:
Run #1, 18.5' to 23.5', RECOVERY=90%, RQD=8%
Run #2, 23.5' to 28.5', RECOVERY=100%, RQD=75%

BEDROCK CORE: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: GRAPHICAL

APPENDIX B-1

DRAWN BY: A. Bohac
CHECKED BY:

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FOR CIORBA GROUP, INC.

775-13-01

Boring SB-02:
Run #1, 23.5′ to 28.5′, RECOVERY=100%, RQD=5%
Run #2, 28.5′ to 33.5′, RECOVERY=100%, RQD=83%

BEROCK CORE: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: GRAPHICAL

APPENDIX B-2

DRAWN BY: A. Bohac
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FOR CIORBA GROUP, INC.

775-13-01

Rock Core Breaks

Project: Interstate 80 Bridges over US Route 30, Metra RID, and Hickory Creek

Client: Ciorba Group, Inc.

WEI Job No.: 775-13-01

IDOT D-91-041-93
Section 99-4-1 VB-1-R
SN 099-0068 and SN 099-0069

Field Sample ID	Lab Specimen ID	Break Date	Location	Length			Diameter	Total Pressure (lbs)	Total Pressure (psi)	Break Type	Tested By	Area (in^2)
				Total Core	Before Capping	After Capping						
SB-201, Run #2 23.5' to 28.5'	8577	3/2/2011	I-80 at US 30		5.43	5.66	2.07	35890	10650	3	RG	3.37
SB-202, Run #1 23.5' to 28.5'	8578	3/2/2011	I-80 at US 30		6.02	6.25	2.05	44660	13530	3	RG	3.30
SB-202, Run #2 28.5' to 33.5'	8579	3/2/2011	I-80 at US 30		5.12	5.45	2.05	28900	8760	3	RG	3.30

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Illinois Department of Transportation

ROCK CORE LOG

Page 1 **of** 1

Date 03/02/2011

ROUTE FAI 80 **DESCRIPTION** Structure Boring **LOGGED BY** Brandon Wilson

SECTION 99-4-1VB-1-R **LOCATION** US Route 30, Metra RID **SEC.** 17 **TWP.** 36N **RNG.** 11E **PM**

COUNTY WILL **CORING METHOD** **Conventional 5' run**

STRUCT. NO. 099-0068/099-0069 **CORING BARREL TYPE & SIZE** **NWD4 2,985x2.060**

Station 673+32.40

Core Diameter 2.1 **in**

Top of Rock Elev. 604.0 **ft**

Begin Core Elev. 604.0 **ft**

BORING NO. SB-201

Station 675+49.88

Offset 15.93 LT

Ground Surface Elev. 622.55 **ft**

		DEPTH (ft)	**CORE (#)**	**RECOVERY (%)**	**R.Q.D. (%)**	**CORE TIME (min/ft)**	**STRENGTH (tsf)**
Medium strong, slightly weathered to fresh, very poor quality, brown to gray DOLOSTONE	Run 1	18.5	1	90	8	2.1	
Strong, fresh, good quality brown to gray DOLOSTONE	Run 2	23.5	2	100	75	1.9	

Color pictures of the cores Yes

Cores will be stored for examination until __________

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation

ROCK CORE LOG

Page 1 **of** 1

Date 03/02/2011

ROUTE FAI 80 **DESCRIPTION** Structure Boring **LOGGED BY** Brandon Wilson

SECTION 99-4-1VB-1-R **LOCATION** US Route 30, Metra RID **SEC.** 17 **TWP.** 36N **RNG.** 11E **PM**

COUNTY WILL **CORING METHOD** **Conventional 5' run**

STRUCT. NO. 099-0068/099-0069 **CORING BARREL TYPE & SIZE** **NWD4 2,985x2.060**

Station 673+32.40

Core Diameter 2.1 **in**

Top of Rock Elev. 604.0 **ft**

Begin Core Elev. 604.0 **ft**

BORING NO. SB-202

Station 675+84.23

Offset 13.31 RT

Ground Surface Elev. 617.0 **ft**

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Strong, slightly weathered, fair quality , brown to gray DOLOSTONE	Run 1	23.5	1	100	59	2.8	
Strong fresh, good quality brown to gray DOLOSTONE	Run 2	28.5	2	100	83	3.1	

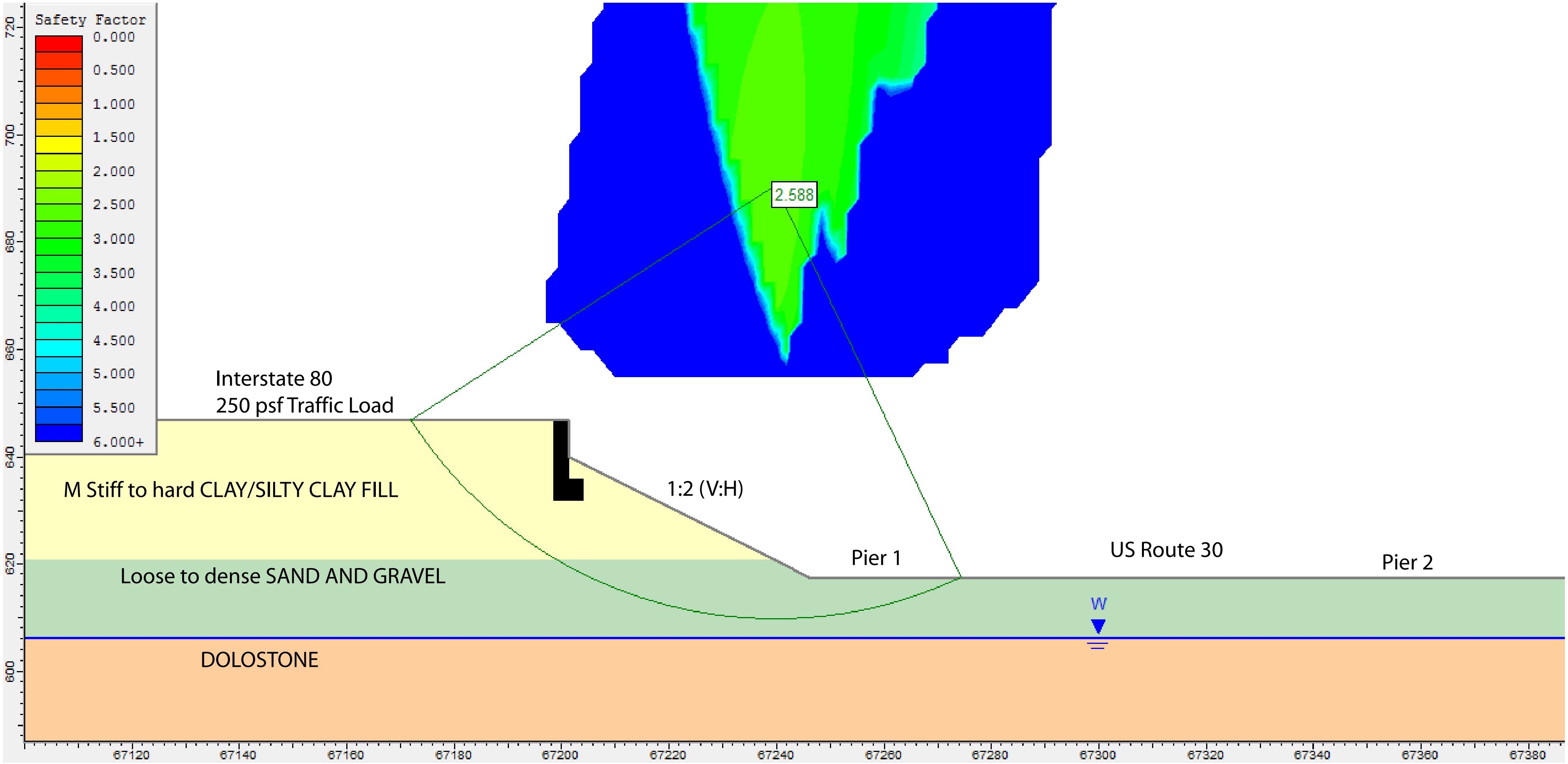
Color pictures of the cores Yes

Cores will be stored for examination until _______________

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS 138 (Rev. 3/01)

APPENDIX C



Undrained (Short Term) Analysis

Layer ID	Description	Unit Weight (lb/ft^3)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	M Stiff to Hard CLAY.SILTY CLAY FILL	120	2000	0
2	Loose to dense SAND AND GRAVEL	125	0	32
3	DOLOSTONE	130	--	--

GLOBAL STABILITY ANALYSIS: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: AS SHOWN

APPENDIX C-1

DRAWN BY: MLS
CHECKED BY: LMI

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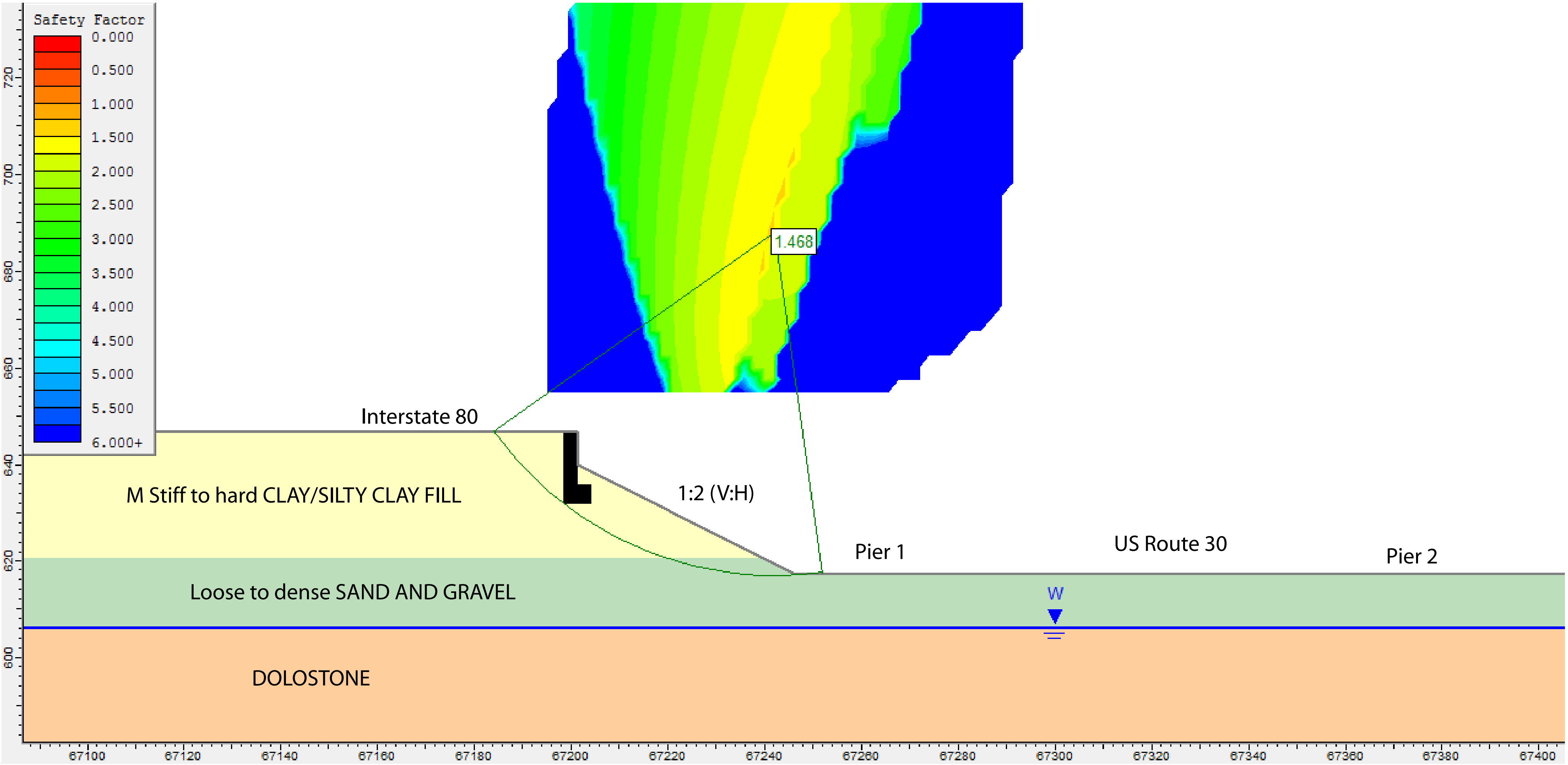

Drained (Long Term) Analysis

Layer ID	Description	Unit Weight (lb/ft^3)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	M Stiff to Hard CLAY.SILTY CLAY FILL	120	100	30
2	Loose to dense SAND AND GRAVEL	125	0	32
3	DOLOSTONE	130	--	--

GLOBAL STABILITY ANALYSIS: INTERSTATE 80 OVER US 30, METRA RID, AND HICKORY CREEK, IDOT D-91-041-93, SN 099-0068 & 099-0069, WILL COUNTY

SCALE: AS SHOWN

APPENDIX C-2

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