Structure Geotechnical Report

F.A.I. Route 74
Section 81-1-2
Rock Island County
Job No. P-92-032-01
Contract No. 64C08
PTB No. N/A
Retaining Wall IL-RW13
Structure Number 081-6020

May 2011

REVISED 12/02/11

Prepared for:
Illinois Department of
Transportation, District 2
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1. Project Description

This report provides geotechnical data and recommendations for the proposed Retaining Wall IL-RW13, which is part of the Central Section of the I-74 over the Mississippi River Project. The project includes reconstruction of I-74 between 14th Avenue in Moline, Illinois and Lincoln Road in Bettendorf, Iowa. The retaining wall covered by this structure geotechnical report will be a replacement structure, constructed to retain fill at the south abutments of the new I-74 over 12th Avenue Bridges.

Nearby project features that have an impact on the design or construction of the proposed retaining wall include the I-74 over 12th Avenue Bridges (S.N.'s 081-0182 and 081-0183), the north abutment retaining wall (IL-RW11, S.N. 081-6017), the I-74 median retaining wall (IL-RW12), the I-74 roadway, and the 12th Avenue roadway. Geotechnical recommendations for the bridges and Retaining Wall IL-RW11 are presented in separate structure geotechnical reports prepared by Hanson Professional Services Inc. (Hanson). The geotechnical data and recommendations for Retaining Wall IL-RW12 are presented in a structure geotechnical report prepared by CH2M HILL in September 2009. Geotechnical recommendations for the interstate and street will be contained in soil survey reports prepared by Hanson.

This report supersedes the structure geotechnical report prepared by CH2M HILL in September 2009.

2. Location

The proposed Retaining Wall IL-RW13 is located in the north central portion of Rock Island County, within Section 4 of Township 17 North, Range 1 West. It is located between I-74 Sta. 71+37 and 72+46. The wall separates I-74 and Ramp 7th-A on the high side from 12th Avenue on the low side.

3. Existing Structures

The existing structures, S.N. 081-0101 (Eastbound I-74) and S.N. 081-0102 (Westbound I-74), were constructed in 1973. They are single-span bridges with closed abutments. The abutment walls span the 50 feet wide median between the bridges. The profile grade line of the eastbound (southbound) bridge (Elev. 684.6) is approximately 7 feet higher than the westbound (northbound) bridge (Elev. 677.8). Due to the steep grade of 12th Avenue, the height of both bridges is approximately 26 feet. A considerable portion of the abutment wall is buried under a 1:2 spill slope. The exposed height of the abutment wall is approximately 12 feet. Portions of the existing structure plans are included in the Appendix for reference.

The structure is supported on vertical and batter piles. Concrete piles with a 90 kip allowable capacity were used under the abutments. Timber piles with a 48 kip allowable capacity were used for wall between the two abutments and the wingwalls. The pile tips are located in very stiff to hard clay (glacial till) at Elev. 611 to Elev. 635 for the concrete piles and Elev. 619 to Elev. 644 for the timber piles.

4. Proposed Structure

The general structure type was determined by a previous value engineering study. The proposed grade separation will be a single-span bridge with mechanically stabilized earth (MSE) walls serving as the abutments. The MSE walls have U-shaped configurations in plan, which is typical for Illinois Department of Transportation (IDOT) structures. The walls terminate in the existing abutment cones at three of the four corners, including both ends of IL-RW13. The face of the proposed abutment wall is approximately 15 feet in front of the existing abutment face. The wings are in the same location as the existing wingwalls.

The bridge and wall geometry are configured for a mixed abutment, where the vertical bridge loads are supported by piles passing through the reinforced soil mass. The MSE wall will resist lateral loads applied to the bridge abutments. Based on information provided by the structure designer, the bridge's lateral load applied to the abutment by the superstructure will be approximately 1.27 kips per foot width.

The proposed wall will be constructed in stages in order to allow traffic on I-74 and 12th Avenue throughout the construction period. The middle portion of the wall, located in the current I-74 median, will be constructed first, followed by the east side (WB I-74), then the west side (EB I-74).

A wall using precast panels with the minimum reinforced soil mass width is preferred for cost and construction schedule. The wall will have a height, measured from the theoretical top of leveling pad to the finished grade line, between 25 and 30 feet along the abutment and between 3.5 and 30 feet along the wings. With this range of heights, a typical MSE wall section would have an equivalent uniform bearing pressure varying from 4,000 to 4,900 psf under the bridges and 1,000 to 5,200 psf along the wings.

Construction of the wall will be governed by a performance specification. The MSE wall supplier will be responsible for the internal stability of the reinforced soil mass. This report provides geotechnical recommendations for external stability and global stability, which are the responsibility of the wall designer.

5. Site Investigation

The project site is located in the steeply sloping terrain of the bluffs along the Mississippi River. Existing I-74 is located on a terraced embankment. The profile grade of WB I-74 is at approximately Elev. 681, while the toe of the 1V:2.5H embankment is at Elev. 641. The EB I-74 side of the embankment slopes at 1V:3H from Elev. 688 to Elev. 671. Presently, 12th Avenue slopes down to the east at approximately 8% grade, while I-74 slopes down to the north at approximately 2% grade.

The footprint of the proposed retaining wall generally lies within the existing I-74 embankment and 12th Avenue Bridge abutment spill slope.

Test boring data was shown on the existing structure plans. It is presumed that these borings were drilled in the early 1970's. Eight borings were drilled to depths between 55 and 65 feet below grade. Standard penetration tests were generally performed at 2.5-feet intervals for the entire boring. Boring Numbers 3 and 4 were drilled near the existing bridges' south abutments. Although the soil strata logged in the upper part of these borings were likely disturbed by the original I-74 roadway and bridge construction, the data for the lower strata are useful for design of the new retaining wall.

The field exploration that was completed specifically for the current project was accomplished in three phases. The first two phases were completed in December 2005 and October 2007 by another consultant. IDOT provided the data collected from those two phases. The third phase was completed in June 2010 by Hanson. The primary purpose of the third phase was to collect additional samples of the shallow, softer soils for strength and consolidation testing. A representative from Hanson logged the boring and performed a general site reconnaissance during the third phase.

At this site, two borings were drilled in the first phase and two borings were drilled in the third phase. Locations of the borings were selected to avoid the numerous obstructions currently occupying the site. The maximum spacing between borings was approximately 75 feet. Standard Penetration Test samples were collected at 2.5 ft. to 10.0 ft. intervals in all borings. Several Shelby tube samples were collected at representative locations in cohesive strata. The boring depths ranged from 7.0 ft. to 97.0 ft.

The boring locations are shown on the Boring Location Plan included in the Appendix. Boring logs are included in the Appendix.

6. Laboratory Investigation

Soil samples from the 1970's borings and first phase borings were tested by others. Unconfined strength and moisture content test results, generally in accordance with current IDOT policies, are shown on the existing structure plans. The testing of samples collected from the first phase borings does not meet IDOT's current minimum requirements for structure borings. Unconfined strength and moisture content tests were completed on a small fraction of the samples. Index testing was completed on representative samples from two borings. One triaxial strength test and one consolidation test were completed.

The soil samples obtained from the third phase borings were delivered to Hanson's soils laboratory and subjected to a testing program. Natural moisture content and visual classification tests were competed on all samples. Unconfined compressive strength tests, using a Rimac spring tester, were also completed when possible.

The locations of the index tests, triaxial tests, and consolidation tests are indicated on the subsurface data profile. All laboratory test data is included in the Appendix.

7. Subsurface Profile

A subsurface data profile is presented in the Appendix for use by the structure designer. The data profile includes all of the borings that were recently drilled near the proposed structure and two of the older borings that were drilled behind the proposed structure.

The subsurface profile consists of deposits of fill material, loessial soils, and gumbotil overlying glacial till. The till was encountered in all of the borings between Elev. 655.2 and Elev. 635.8 or 7 to 16 ft below the grade of 12th Avenue. Boring RW801 encountered shale bedrock at Elev. 562.0 or 90 ft below grade.

Fill was encountered in Borings RW801 and RW601. It extended from the ground surface to the top of the gumbotil stratum or till stratum. The fill material was generally soft to stiff, brown silty clay with small quantities of debris. At Boring RW601, which is located on the outside shoulder of EB I-74, the fill was presumably placed during construction of the existing highway embankment.

The loessial soils were encountered in the other borings. Although similar in origin, these soils were quite variable in classification and consistency. Typically, they were soft to very stiff silty clays, clayey silts, or silts. Unconfined strengths ranged from 0.4 to 2.2 tsf, with an average of 1.0 tsf. A 12.5 ft thick layer of soft to medium stiff, wet silt was encountered in Boring 3. This softer material is significant because it is located immediately below the base of the proposed wall.

The gumbotil was encountered in Borings RW801, RW13-1A, and 4. It is located above the till and formed by weathering of the till. The gumbotil at this site was generally stiff to very stiff, brown, sandy clay or clayey silt.

The till stratum is typically very stiff, gray sandy lean clay. Unconfined strengths were between 1.8 and 5.8 tsf. Standard Penetration Test (SPT) values were between 13 and 50 blows per foot, with most values between 20 and 30. The SPT values from the 1970's borings were higher than those from the more recent borings, but the 1970's tests were probably run with older style drop hammers. Natural moisture contents ranged from 10 to 16 percent.

The groundwater elevations recorded on the boring logs are summarized in Table 7.1. Several of the logs had no indication of the groundwater condition. Stabilized readings were not taken in any of the borings. The groundwater encountered was located near the top of the till stratum, which could be a localized, perched condition. For comparison, the water level in the Mississippi River, approximately 0.9 miles to the north of the site, is usually about Elev. 561.0.

Table 7.1 Groundwater Elevations

Boring No.	During Drilling	At End of Boring	24-hour Reading
3	-	-	-
4	-	-	-
RW601	655.2	-	-
RW801	-	-	-
RW13-1	dry	dry	-
RW13-1A	-	647.1	-

The Illinois State Geological Survey Directory of Coal Mines does not list any mines in the immediate vicinity of the site.

8. Geotechnical Evaluations

A previous value engineering study determined that an MSE wall was preferred at this site. Due to the interdependence of this structure, the I-74 Over 12th Avenue Bridges, and the retaining wall supporting the bridges' south abutments, other types of retaining wall construction were not considered during the development of this SGR.

The native soils have an allowable bearing capacity of 1,200 psf in the northeast corner and 4,000 psf along the remainder of the wall. These capacities consider all soil layers within the zone of influence. The native soils have an undrained sliding resistance of 600 psf in the northeast corner and 1,900 psf along the remainder of the wall. The drained sliding resistance is 0.53 times the effective vertical stress for the entire wall. The proposed wall would meet the Standard Specifications for Highway Bridges (AASHTO) requirements for bearing pressure and sliding stability only along the shorter portions of the wingwalls. At the northeast corner the applied pressure would exceed the allowable bearing capacity by more than 3,000 psf.

Slope stability analyses of the wall's highest points along the abutment and along the wings were completed to determine the overall stability of the wall. Results of those analyses are included in the Appendix. The 1.08 and 0.82 factors of safety do not satisfy AASHTO requirements.

Although the upper native soils are relatively weak, they are overconsolidated and exhibit fairly low compressibility. The estimated total settlement under the weight of the proposed wall ranges up to 2.0 inches. Approximately one-half of this settlement is due to recompression of the glacial till stratum, which could take up to 200 months to be 90 percent complete. This magnitude and duration of settlement would not preclude construction of an MSE wall.

Some differential settlement is anticipated near the proposed stage lines. Theoretically, the subgrade soils within approximately 5 feet of the edge of a stage will consolidate 25% to 33% less than the central portion. When the adjacent stage is placed, the edge of the previous stage will settle to a level approximately equal to the central portion. This would affect pavement constructed on top of the first stage and may be visible in the panel joints on the face of the wall. Due to the relatively small settlement magnitude, this is not expected to be a serious concern for this structure.

The native cohesive soils found at this site are relatively weak and will not support the weight of a conventional MSE wall. Typically, the alternative solutions are to either reduce the wall's bearing pressure or to increase the foundation soils' strength. Several potential treatment options were considered. Widening the reinforced soil mass, the use of lightweight aggregate, and raising the wall in stages are not feasible for this wall. Removal and replacement of the foundation soils and ground improvement with aggregate columns are possible solutions.

The removal and replacement of the relatively shallow, softer soils would normally be an ideal solution. At this wall, any excavation below the base of the reinforced soil mass would require additional excavation to lay back slopes through the existing embankment and additional shoring to support the interstate along the stage lines. The cost of the temporary work renders the removal and replacement alternative uneconomical when compared to the other possible solutions.

Vibrator compacted aggregate columns tipped in the very stiff, gray glacial till could increase the allowable bearing capacities above the applied bearing pressures. Our preliminary analyses indicate that relatively short columns with an area replacement ratio of 7 to 65 percent would be sufficient. Although ground improvement with tamper compacted aggregate columns was not expressly investigated, it is expected that the wall also could be successfully constructed using that technology. The cost of aggregate column ground improvement is expected to be lower than the other feasible solutions.

9. Design Recommendations

When designing for the external stability of the MSE wall, it should be assumed that the reinforced soil mass will be composed of a granular select backfill and the fill behind the reinforced soil mass will be embankment material as defined by the IDOT Standard Specifications for Road and Bridge Construction (IDOT Standard Specifications). Both materials should be assumed to have a total unit weight of 125 pcf. The active earth pressure coefficient of the embankment fill could vary greatly depending on the actual material used, but should be assumed to be 0.36 for design. Near the wall corners, where the backfill will be the select material placed behind the other face, an active earth pressure coefficient of 0.28 may be used.

Aggregate column ground improvement is the recommended treatment option. The results are highly dependent upon the equipment and techniques used to install the aggregate columns. The contractors that perform this type of work routinely design the improvement to specific geotechnical performance requirements. A conservative estimate of the lump sum treatment cost is $207,000. Treatment of the soft to medium stiff soils in the southeast corner of the wall accounts for a large portion of the cost.

We recommend that the approximate horizontal limits of the aggregate column ground improvement be defined as an area bounded by a line 4 ft. beyond the perimeter of the reinforced soil mass. The limits along the wall should include the entire length of the wall, including the wingwalls. Within these limits, the contractor should be required to satisfy the following performance requirements:

1. Minimum factor of safety of 1.5 against global slope stability failure of permanent condition.
2. Minimum factor of safety of 1.5 against global slope stability failure of temporary condition at end of Stage 1.
3. Minimum factor of safety of 2.0 against equivalent uniform service bearing pressure failure if a load test is performed.
4. Minimum factor of safety of 2.5 against equivalent uniform service bearing pressure failure if a load test is not performed.
5. Total settlement measured at the base of the wall not to exceed 4.0 inches.
6. Total settlement measured on the pavement not to exceed 1.0 inch.
7. Differential settlement measured along the base of the wall not to exceed 1/100.

8. Primary consolidation of the soil within the depth of the ACGI to be at least 90 percent complete when the bridge piles are to be driven. Any required waiting periods shall be coordinated with the bridge construction schedule.

It should be noted that some of these performance requirements can be satisfied without any improvement to the native subgrade. The bearing pressure and global stability requirements will control the design of the aggregate column ground improvement. The provision allowing for a lower factor of safety if a load test is performed has been included for consistency with other walls on the I-74 project.

With the ground improvement, a conventional precast panel MSE wall is feasible. The theoretical top of leveling pad or base of reinforced soil mass may be located at the minimum embedment required by IDOT (3'-6" below finished grade). Any removals or other excavation below the reinforced soil mass should be backfilled with either the select backfill used in the reinforced soil mass or the granular material used as a drainage layer or working platform for the aggregate column ground improvement design. Other material outside the limits of the reinforced soil mass may be embankment fill in accordance with the IDOT Standard Specifications.

The external stability design should be completed using the parameters defined above. In areas with ground improvement, the applied bearing pressures should not be compared to allowable bearing capacities of the native soils. Instead, the estimated applied bearing pressures will be given as a performance requirement for the aggregate column ground improvement. The minimum length to height ratio specified by AASHTO (0.70) will be acceptable for the entire wall.

In areas where the footprint of the proposed MSE wall overlaps the existing semi-gravity wall, the existing structure must be removed. It is recommended that the tops of the existing piles be cut off at least one foot below the base of the wall or the base of the contractor's working platform in areas with ground improvement. Pile holes should be backfilled with compacted native material.

10. Construction Considerations

The construction of MSE walls and aggregate column ground improvement are not covered by the IDOT Standard Specifications. Guide Bridge Special Provisions No. 38, Mechanically Stabilized Earth Retaining Walls (Revised: January 18, 2011), and No. 71, Aggregate Column Ground Improvement (Revised: October 4, 2010), should be included in the construction documents. These special provisions require that the contractor take responsibility for the final design of much of the structure.

The general contractor will hire a specialty contractor to design and install the aggregate column ground improvement. He will also hire an MSE wall supplier to complete the MSE wall design and furnish the materials. The interdependence of the ground improvement and MSE wall designs must be considered when developing the plans. The MSE wall supplier will typically design a wall with a horizontal base with vertical steps at convenient locations. This results in a wall that is slightly taller and wider than the theoretical size shown on the construction plans. The wall supplier may also use different assumptions for unit weight and lateral earth pressure on the reinforced soil mass. Because of these factors, the target bearing pressure for the ground improvement contractor should be 5% to 10% higher than the theoretical value calculated during preliminary design.

The ground improvement contractor will need to assign strength and consolidation properties to the native soils in order to design the aggregate columns. All of the soils laboratory data in the Appendix to this report should be included in the contract documents. Usually, this is accomplished by adding a "Geotechnical Investigation Laboratory Data" section to the special provisions.

Obstructions, such as old footings, pavements, utilities, etc., that are within the area to be treated with aggregate column ground improvement generally should be removed. Although it is possible to predrill the columns through large obstructions or space the columns around smaller obstructions, this increases the cost and reduces the effectiveness of the ground improvement.

The piles supporting the existing bridges are a special case that should be investigated thoroughly. The existing piles could potentially interfere with the aggregate columns and the new bridge piles. It is not unusual for aggregate columns to be installed around piles; however, the number of piles at this site is much larger than typical. There must be enough clear space within the horizontal limits of improvement to allow 2′-6″ to 3′-0″ diameter aggregate columns to be installed at 4′-0″ to 9′-0″ intervals. If the relationship between the existing structure and new structure results in a site that is too congested, then some of the existing piles must be removed completely.

The first stage of construction will require top-down shoring for near-vertical cuts along the inside shoulders of EB and WB I-74. The height of this shoring exceeds the maximum values in the Bridge Manual's Design Guide 3.13.1 – Temporary Sheet Piling Design. The existing abutment's large pile cap will have a significant impact on the design of the shoring. A contractor-designed temporary wall is recommended. Guide Bridge Special Provision No. 44, Temporary Soil Retention System (Revised: May 11, 2009), should be included in the construction documents.

The first stage will also require temporary vertical faces along the sides of the reinforced soil mass, perpendicular to the front face of the permanent wall. These vertical faces should not be formed by placing the select backfill against the temporary soil retention system. This would inhibit compaction of the select backfill and obstruct removal of the temporary soil retention system. Temporary, wire-faced MSE walls are recommended along the stage lines. Guide Bridge Special Provision No. 57, Temporary Mechanically Stabilized Earth Retaining Walls (Revised: October 4, 2010), should be included in the construction documents.

The piles for the I-74 over 12th Avenue Bridges (S.N. 081-0182 and 081-0183), which are located within the reinforced soil mass for this wall, will interfere with the placement and compaction of the select backfill. The piles must either be driven prior to placing the select backfill or driven through sleeves after placing the select backfill. Refer to the structure geotechnical report for those structures for specific recommendations.

References

American Association of State Highway and Transportation Officials (2002). *Standard Specifications for Highway Bridges, 17th Edition.*

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CH2M HILL (2009, September). Structure Geotechnical Report 12th Avenue Bridge Structure Nos. 081-0182 (WB) and 081-0183 (EB).

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Hanson Professional Services Inc. (2011, May). Structure Geotechnical Report, I-74 Over 12th Avenue Bridges, Structure Nos. 081-0182 (WB) and 081-0183 (EB).

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Illinois Department of Transportation (2007). *Standard Specifications for Road and Bridge Construction*.

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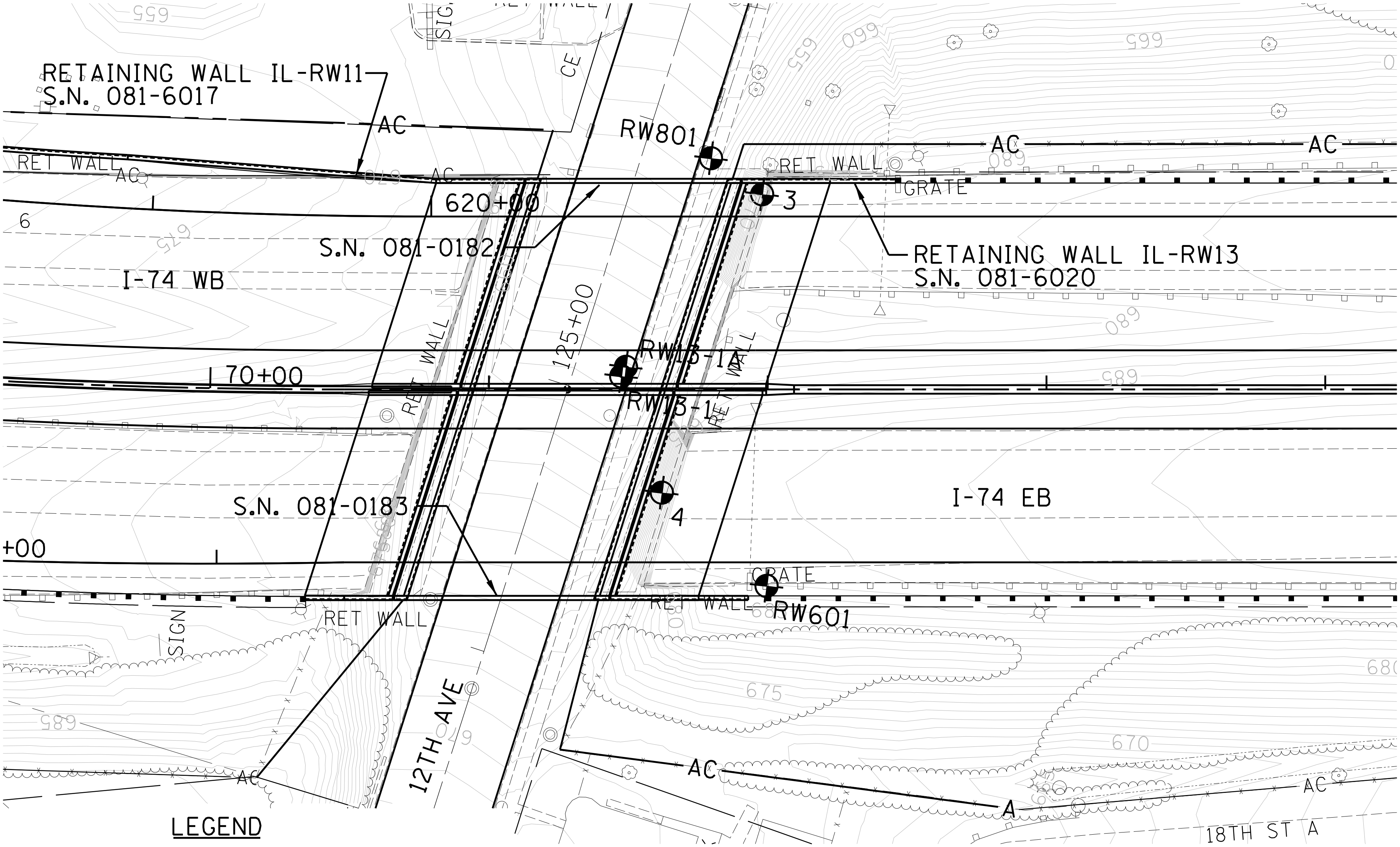
U.S. Department of Transportation, Federal Highway Administration (1997, August). *Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines* (Publication No. FHWA-SA-96-071).

Appendix

Boring Location Plan
Subsurface Data Profile
Boring Logs
Soils Laboratory Test Results
Summary of Slope Stability Analysis
Existing Structure Plans



LEGEND

RW600 BORING LOCATION

0 50 100
SCALE IN FEET

N

HANSON

BORING LOCATION PLAN

12TH AVENUE RETAINING WALL IL-RW13
S.N. 081-6020
ROCK ISLAND COUNTY, ILLINOIS

08H0120E 3/28/11

3
Sta. 71+98, 70' LT

Elev.	N	Qu	w%	Description
658.30				
	3	0.58B	22	Medium Brown SILT
655.80				
	4	1.09B	22	Stiff to Very Stiff Brown SILTY CLAY LOAM
	7	2.13B	14	
	7	1.16B	23	
648.30				
	6	0.89B	21	Medium to Soft Brown and Grey SILT (Wet)
	3	0.66B	25	
	3	0.54B	25	
	4	0.43E	32	
	7	0.35B	21	
635.8				
	16	1.75B	14	Stiff to Hard Brown to Grey CLAY LOAM with Gravel (TILL)
	22	5.15B	13	
	27	4.46B	15	
	25	4.27B	14	
	28	3.10B	15	
	32	2.35B	15	
	32	3.00B	15	
	32	4.07B	16	
	29	3.30B	16	
	29	3.05B	15	
	29	2.33B	16	
	30	3.10B	16	
	31	3.40B	14	
	30	3.10B	14	
	32	2.70B	15	
	33	2.96B	13	
	37	3.30B	15	
593.80				Bottom of hole = 64.5 feet

RW801
Sta. 71+80, 83' LT

Elev.	N	Qu	w%	Description
651.98				
651.48				Concrete - P.C. Cement concrete sidewalk underlain by 3" of crushed gravel
	4	1.3P		Silty Clay (CL) - Light to dark brown, moist, stiff, sand with iron oxide staining, fill
	5	0.3P		Brown moist/dry, soft with crushed limestone gravel, fill
	4	2.5P		
644.98				
		2.0P	21.0	Brown, moist/wet, stiff, medium plasticity with scattered black, oily asphalt and burnt wood particles, fill
640.98	6	3.5P		Sandy Lean Clay, Trace Gravel (CL) - Brown, moist, stiff, low-medium plasticity, trace rounded-subrounded gravel and silty clay mixed, gumbotil
	10	4.5P		
	15	4.3P		Sandy Lean Clay, Trace Gravel (CL) - Brown, moist, hard, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, possibly weathered till
	16	4.0P		
				Turning gray at bottom 2"
	21	4.3P	13.0	Gray, unweathered glacial clay Start mud rotary at 30' after sampling
	17		14.0	
	21	3.5P		
	18	3.0P		
	22	2.5P		
	21	2.3P		
	16	2.5P		
	19	2.5P		
589.00				
589.00				
	21	2.5P		
	22	2.5P		
	56	4.5P		With sand and medium to coarse with rounded-subrounded gravel seems throughout
561.98	50/2"			Shale - Possibly gray shale (no recovery, description based on field observation only). No recovery, possibly pounded on gravel or hard shale, possible shale at 90'
	50/3"			
554.98				Bottom of hole = 97.0 feet

RW13-1
Sta. 71+47, 5' LT

Elev.	N	Qu	w%	Description
658.50				
658.30				ASPHALT
657.60				CONCRETE
	6	0.50P	22	
		1.80P	19	Dark brown, moist, medium stiff, silty CLAY with trace gravel
655.00		1.30P	19	
			14	
		2.00P	15	Brown, moist, sandy CLAY
652.50		2.00P		Brown, moist, silty CLAY
651.50				Hole terminated due to equipment problems. Deformed auger tooth caused sample disturbance. Bottom of hole = 7.0 feet

LEGEND

N	Standard Penetration Test N (blows/ft)
Qu	Unconfined Strength (tsf)
w%	Natural Moisture Content (%)
Q	Unconsolidated Undrained Triaxial Test
R	Consolidated Undrained Triaxial Test
C	Consolidation Test
DD	Water Surface Elevation Encountered in Boring
558.10 ▽	DD = during drilling 24h = 24 hours after completion

SUBSURFACE DATA PROFILE
STRUCTURE NO. 081-6020

PROFESSIONAL DESIGN FIRM LICENSE #184-001084

HANSON
Hanson Professional Services Inc.

JOB NO.	SHEET NO. 1	F.A.I RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
08H0120E	2 SHEETS	74	81-1	ROCK ISLAND	_	
DATE 3/14/11				CONTRACT NO. 64C08		
		FED. ROAD DIST. NO. _	ILLINOIS	FED. AID PROJECT		

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

RW13-1A
Sta. 71+49, 8' LT

Elevation	N	Qu	w%	Description
658.10				
657.90				ASPHALT
657.20				CONCRETE
	8	0.56B	11	Brown and gray, moist, medium stiff, silty CLAY with trace sand
		1.75B	15	
		2.17S	13	
652.10		3.10B	15	Brown, moist, very stiff, clayey SILT with trace sand and gravel
		4.60S	15	
	50/5"		20	
648.10				Gray, moist, hard, silty CLAY with trace sand and gravel
647.10 (Oh)	25	4.50P	11	
	30	3.55B	11	
643.10				Bottom of hole = 15.0 feet

4
Sta. 71+62, 37' RT

Elevation	N	Qu	w%	Description
666.80				Medium Brown SILT
	3	0.58B	20	
	3	0.66E	21	
	4	0.54B	15	
658.80	14	2.10B	24	Stiff to Very Stiff SILTY CLAY
	12	1.40B	23	
652.60	24	1.90E	19	Very Stiff Brown CLAY LOAM
		3.60E		
	25	2.91B	15	
648.80	52	5.02B	10	Hard to Very Stiff Brown to Grey CLAY LOAM with Gravel (TILL)
	32	5.82B	11	
	27	5.14B	13	
	24	3.10B	13	
	22	2.72B	13	
	21	3.55B	13	
	22	2.42B	14	
	22	2.50E		
	18	2.05B	15	
	28	2.52B	14	
	23	2.33B	15	
	28	3.30B	14	
	38	3.75E		
	31	3.69B	13	
	31	3.49B	13	
611.80				Bottom of hole = 55.0 feet

RW601
Sta. 72+00, 70' RT

Elevation	N	Qu	w%	Description
687.16				Asphalt Cement Concrete - 1' asphalt cement concrete. Hole offset to shoulder of I-74 Eastbound gps point #49
686.16	10	4.5P		Silty Clay (CL) - Greenish gray, moist, stiff, low plasticity, with fine rounded to subrounded gravel, fill. Power auger for 1ft, HSA to 40ft
	9	0.8P		Possibly pounded on gravel, no recovery
	4			
	3			Brown, moist, soft, medium plasticity, fine rounded-subrounded gravel, fill Soil frozen until 5'
	5		18.0 [R] [C]	Brown, dark gray, trace organics, faint organic odor, no gravel, fill Dark gray, soft, moist, with brick pieces, fill (LL=28, PI=14)
	10			Grayish brown, moist, stiff, low plasticity, fine to coarse, subrounded-subangular gravel, fill
	12			Brown, moist, stiff, low plasticity, fine to coarse, subrounded-subangular gravel, fill
	3			Brick pieces, dry
DD 655.16	8			Brown silty clay, moist, wet at 32', sandy at 31.5', trace organics, medium plasticity, fill
				Sandy Lean Clay Trace Gravel (CL) - Reddish brown, stiff, dry, low plasticity, fine to coarse, subangular-angular gravel, fill-rubble fill Possible water at 32' while drilling
	19			
	20			Brown, moist, very stiff, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, weathered till Start mud rotary at 40' after sampling
	18			
	22			
	20			Grayish brown, unweathered glacial clay Switch to 10' sampling frequency at 55'
	19			
612.00				
612.00	21			
	18			
	17			
590.16				Bottom of hole = 97.0 feet

LEGEND

- N — Standard Penetration Test N (blows/ft)
- Qu — Unconfined Strength (tsf)
- w% — Natural Moisture Content (%)
- [Q] — Unconsolidated Undrained Triaxial Test
- [R] — Consolidated Undrained Triaxial Test
- [C] — Consolidation Test
- DD — Water Surface Elevation Encountered in Boring
- 558.10 ▽ — DD = during drilling; 24h = 24 hours after completion; Oh = upon completion

SUBSURFACE DATA PROFILE
STRUCTURE NO. 081-6020

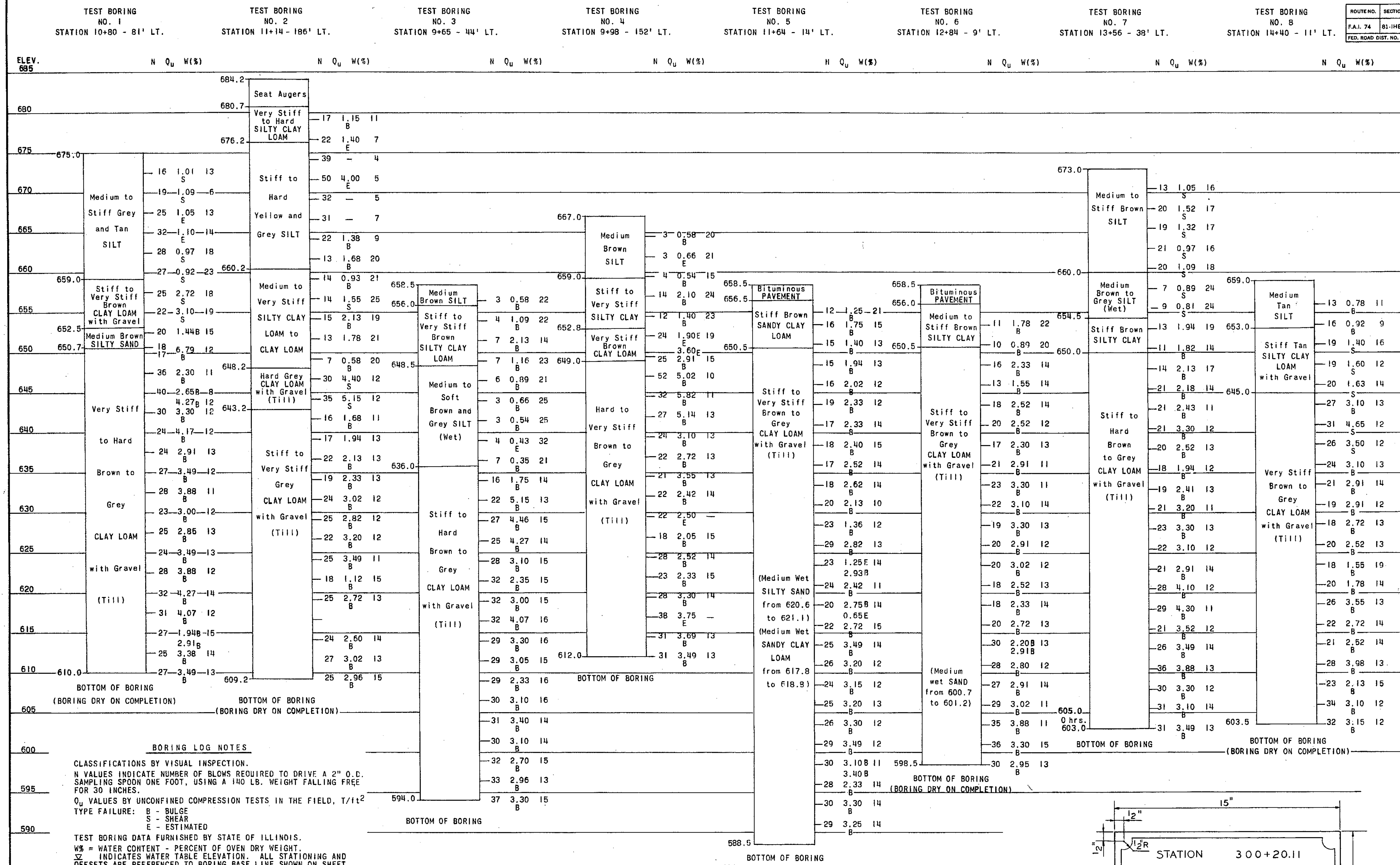
PROFESSIONAL DESIGN FIRM LICENSE #184-001084

HANSON
Hanson Professional Services Inc.

JOB NO.	SHEET NO.	F.A.I RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
08H0120E	SHEET NO. 2	74	81-1	ROCK ISLAND	_	
DATE 3/14/11	2 SHEETS	CONTRACT NO. 64C08				
		FED. ROAD DIST. NO. _	ILLINOIS	FED. AID PROJECT		

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
F.A.I. 74	81-1HB-1	ROCK ISLAND	389	255
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT I-74-1(51)0		

DWG. NO. S-2



BORING LOG NOTES

CLASSIFICATIONS BY VISUAL INSPECTION.

N VALUES INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. SAMPLING SPOON ONE FOOT, USING A 140 LB. WEIGHT FALLING FREE FOR 30 INCHES.

Q_u VALUES BY UNCONFINED COMPRESSION TESTS IN THE FIELD, T/ft^2

TYPE FAILURE: B - BULGE
S - SHEAR
E - ESTIMATED

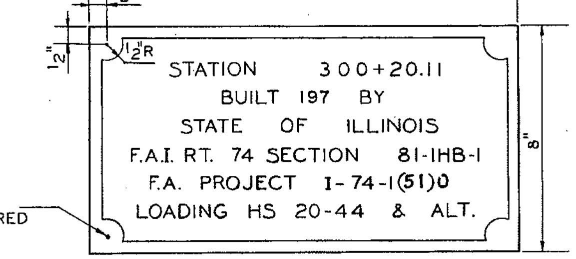
TEST BORING DATA FURNISHED BY STATE OF ILLINOIS.

W% = WATER CONTENT - PERCENT OF OVEN DRY WEIGHT.

▽ INDICATES WATER TABLE ELEVATION. ALL STATIONING AND OFFSETS ARE REFERENCED TO BORING BASE LINE SHOWN ON SHEET

SPECIAL NOTE

"S" DRAWING NUMBERS ON THE STRUCTURAL DRAWINGS FOR SECTION 81-1HB-1 MAY BE REPEATED ON DRAWINGS FOR OTHER SECTIONS IN THE SAME CONSTRUCTION CONTRACT. DRAWINGS ARE INDEPENDENTLY NUMBERED FOR SECTION 81-1HB-1 AND NO CROSS-REFERENCES ARE MADE OR INTENDED TO DRAWINGS FOR A DIFFERENT SECTION. ALL PROFILE GRADE ELEVATIONS AND VERTICAL CURVE DATA GIVEN THROUGHOUT THE STRUCTURAL PLANS REFER TO TOP OF CONCRETE AND DO NOT INCLUDE THE 1-1/2" BITUMINOUS CONCRETE SURFACE COURSE.



LETTERING FOR NAME PLATES
FOR DETAILS SEE STANDARD NO. 2113

DE LEUW, CATHER & COMPANY ENGINEERS
DESIGNED BY —
DRAWN BY H. DE PERCZEL
CHECKED G. C. WAY
IN CHARGE E. S. MARTINS
APPROVED W.G. HORN

TEST BORINGS AND NAME PLATES

F.A.I. 74 - SECTION 81-1HB-1
F.A.I. 74 OVER 12TH AVE.

ROCK ISLAND COUNTY
STATION 300 + 20.11

SCALE: AS NOTED DATE:

Illinois Department of Transportation
Division of Highways
CH2M HILL

SOIL BORING LOG

Date 12/15/05

ROUTE I-74 **DESCRIPTION** New I-74 Bridge Over Mississippi River - Illinois Approach **LOGGED BY** B. Karnik

SECTION I-74 Bridge over Mississippi River **LOCATION** (N=560656.718, E=2459835.618), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM**

COUNTY Rock Island **DRILLING METHOD** HSA, CME 55 **HAMMER TYPE** CME AUTOMATIC

STRUCT. NO.
Station

BORING NO. RW601
Station
Offset
Ground Surface Elev. 687.16 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 655.2 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Asphalt Cement Concrete 1' asphalt cement concrete Hole offset to shoulder of I-74 Eastbound gps point #49 (686.16)		4		
Silty Clay (CL) Greenish gray, moist, stiff, low plasticity, with fine rounded to subrounded gravel, fill Power auger for 1ft, HSA to 40ft Possibly pounded on gravel, no recovery		5 5 4	4.5 P	
	-5	6 5 4 3	0.8 P	
Brown, moist, soft, medium plasticity, fine rounded-subrounded gravel, fill Soil frozen until 5'		2 2 2 3		
Brown, dark gray, trace organics, faint organic odor, no gravel, fill		WOH WOH 3 4		
Dark gray, soft, moist, with brick pieces, fill	-10	WOH 2 3 4		
				18.0
Grayish brown, moist, stiff, low plasticity, fine to coarse, subrounded-subangular gravel, fill	-15	2 4 6 8		
	-20			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silty Clay (CL) Greenish gray, moist, stiff, low plasticity, with fine rounded to subrounded gravel, fill Power auger for 1ft, HSA to 40ft *(continued)*		4 5 7 8		
Brown, moist, stiff, low plasticity, fine to coarse, subrounded-subangular gravel, fill				
Brick pieces, dry	-25	1 2 1 2		
Brown silty clay, moist, wet at 32', sandy at 31.5', trace organics, medium plasticity, fill (655.16 ▼)	-30	3 3 5 5		
Sandy Lean Clay Trace Gravel (CL) Reddish brown, stiff, dry, low plasticity, fine to coarse, subangular-angular gravel, fill-rubble till Possible water at 32' while drilling	-35	7 9 10 11		
	-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
CH2M HILL

SOIL BORING LOG

Date 12/15/05

ROUTE I-74 **DESCRIPTION** New I-74 Bridge Over Mississippi River - Illinois Approach **LOGGED BY** B. Karnik

SECTION I-74 Bridge over Mississippi River **LOCATION** (N=560656.718, E=2459835.618), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM**

COUNTY Rock Island **DRILLING METHOD** HSA, CME 55 **HAMMER TYPE** CME AUTOMATIC

STRUCT. NO. ____
Station ____

BORING NO. RW601
Station ____
Offset ____
Ground Surface Elev. 687.16 ft

Surface Water Elev. ____ ft
Stream Bed Elev. ____ ft

Groundwater Elev.:
First Encounter 655.2 ft ▼
Upon Completion ____ ft
After ____ **Hrs.** ____ ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay Trace Gravel (CL) Reddish brown, stiff, dry, low plasticity, fine to coarse, subangular-angular gravel, fill-rubble till Possible water at 32' while drilling *(continued)* Brown, moist, very stiff, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, weathered till		5 8 12 13		
Start mud rotary at 40' after sampling	-45	5 7 11 12		
	-50	7 9 13 15		
Grayish brown, unweathered glacial clay Switch to 10' sampling frequency at 55'	-55	5 8 12 14		
	-60			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay Trace Gravel (CL) Reddish brown, stiff, dry, low plasticity, fine to coarse, subangular-angular gravel, fill-rubble till Possible water at 32' while drilling *(continued)*				
	-65	6 7 12 14		
	-70			
	-75	6 9 12 16		
	-80			

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

Illinois Department of Transportation
Division of Highways
CH2M HILL

SOIL BORING LOG

Date 12/15/05

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COUNTY Rock Island **DRILLING METHOD** HSA, CME 55 **HAMMER TYPE** CME AUTOMATIC

STRUCT. NO.
Station

BORING NO. RW601
Station
Offset
Ground Surface Elev. 687.16 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 655.2 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay Trace Gravel (CL) Reddish brown, stiff, dry, low plasticity, fine to coarse, subangular-angular gravel, fill-rubble till Possible water at 32' while drilling *(continued)*				
	-85	6		
		8		
		10		
		13		
	-90			
	-95	5		
		7		
		10		
590.16		12		
End of Boring	-100			

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

Illinois Department of Transportation

Division of Highways
CH2M HILL

SOIL BORING LOG

Date 12/8/05

ROUTE I-74 **DESCRIPTION** New I-74 Bridge Over Mississippi River - Illinois Approach **LOGGED BY** B. Karnik

SECTION I-74 Bridge over Mississippi River **LOCATION** (N=560683.901, E=2459983.026), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM**

COUNTY Rock Island **DRILLING METHOD** HSA, CME 55 **HAMMER TYPE** CME AUTOMATIC

STRUCT. NO. ______
Station ______

BORING NO. RW801
Station ______
Offset ______
Ground Surface Elev. 651.98 ft

Surface Water Elev. ______ ft
Stream Bed Elev. ______ ft

Groundwater Elev.:
First Encounter ______ ft
Upon Completion ______ ft
After ___ **Hrs.** ______ ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Concrete P.C. Cement concrete sidewalk underlain by 3" of crushed gravel	651.48				
Silty Clay (CL) Light to dark brown, moist, stiff, sand with iron oxide staining, fill			4 2 2 1	1.3 P	
Brown, moist/dry, soft, with crushed limestone gravel, fill		-5	4 3 2 3	0.3 P	
Brown, moist/wet, stiff, medium plasticity with scattered black, oily asphalt and burnt wood particles, fill	644.98		2 2 2 3	2.5 P	
Sandy Lean Clay, Trace Gravel (CL) Brown, moist, stiff, low-medium plasticity, trace rounded-subrounded gravel and silty clay mixed, gumbotil				2.0 P	21.0
	640.98	-10	3 3 3 4	3.5 P	
Sandy Lean Clay, Trace Gravel (CL) Brown, moist, hard, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, possibly weathered till			4 4 6 9	4.5 P	
		-15	5 6 9 9	4.3 P	
		-20			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay, Trace Gravel (CL) Brown, moist, hard, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, possibly weathered till *(continued)*		5 7 9 11	4.0 P	
	-25			
Turning gray at bottom 2"		7 9 12 13	4.3 P	13.0
	-30			
Gray, unweathered glacial clay Start mud rotary at 30' after sampling		6 7 10 10		14.0
	-35	6 9 12 14	3.5 P	
	-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
CH2M HILL

SOIL BORING LOG

Date 12/8/05

ROUTE I-74 **DESCRIPTION** New I-74 Bridge Over Mississippi River - Illinois Approach **LOGGED BY** B. Karnik

SECTION I-74 Bridge over Mississippi River **LOCATION** (N=560683.901, E=2459983.026), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM**

COUNTY Rock Island **DRILLING METHOD** HSA, CME 55 **HAMMER TYPE** CME AUTOMATIC

STRUCT. NO. ______
Station ______

BORING NO. RW801
Station ______
Offset ______
Ground Surface Elev. 651.98 ft

Surface Water Elev. ______ ft
Stream Bed Elev. ______ ft

Groundwater Elev.:
First Encounter ______ ft
Upon Completion ______ ft
After ___ **Hrs.** ______ ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay, Trace Gravel (CL) Brown, moist, hard, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, possibly weathered till *(continued)*		5 / 7 / 11 / 13	3.0 P	
	-45	5 / 9 / 13 / 15	2.5 P	
	-50	5 / 9 / 12 / 14	2.3 P	
	-55	5 / 7 / 9 / 12	2.5 P	
	-60			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay, Trace Gravel (CL) Brown, moist, hard, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, possibly weathered till *(continued)*		5 / 7 / 12 / 14	2.5 P	
	-65	5 / 9 / 12 / 15	2.5 P	
	-70	6 / 9 / 13 / 14	2.5 P	
	-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)

Illinois Department of Transportation
Division of Highways
CH2M HILL

SOIL BORING LOG

Date 12/8/05

ROUTE I-74 DESCRIPTION New I-74 Bridge Over Mississippi River - Illinois Approach LOGGED BY B. Karnik

SECTION I-74 Bridge over Mississippi River LOCATION (N=560683.901, E=2459983.026), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM**

COUNTY Rock Island DRILLING METHOD HSA, CME 55 HAMMER TYPE CME AUTOMATIC

STRUCT. NO. ____
Station ____

BORING NO. RW801
Station ____
Offset ____
Ground Surface Elev. 651.98 ft

Surface Water Elev. ____ ft
Stream Bed Elev. ____ ft

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

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Lean Clay, Trace Gravel (CL) Brown, moist, hard, low plasticity, fine to coarse, rounded-subrounded gravel embedded throughout, possibly weathered till *(continued)* With sand and medium to coarse with rounded-subrounded gravel seams throughout			18		
			29	4.5	
			27	P	
			36		
		-85			
	561.98	-90			
Shale Possibly gray shale (no recovery description based on field observation only) No recovery, possibly pounded on gravel or hard shale, possible shale at 90'			50/2		
		-95	50/3		
	554.98				
End of Boring		-100			

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

SOIL BORING LOG

Date 6/24/10

ROUTE F.A.I. 74 DESCRIPTION I-74 Over Mississippi River LOGGED BY JMB

SECTION 81-1-2 LOCATION NW¼ of SEC. 4, TWP. 17N, RNG. 1W, 4th P.M.

COUNTY Rock Island DRILLING METHOD Hollow Stem Auger HAMMER TYPE Auto

STRUCT. NO. 081-6020
Station
BORING NO. RW 13-1
Station 71+47
Offset 5' Lt.
Ground Surface Elev. 658.5 ft

Surface Water Elev.
Stream Bed Elev.

Groundwater Elev.:
First Encounter NE ft
Upon Completion ft
After Hrs. ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT	658.30				
CONCRETE	657.60				
Dark brown, moist, medium stiff, silty CLAY with trace gravel			2	0.50P	22
			3		
		2	3		
	655.00			1.80P	19
Brown, moist, sandy CLAY		4		1.30P	19
				2.00P	14
				2.00P	15
	652.50	6			
Brown, moist, silty CLAY	651.50				
Hole terminated due to equipment problems. Deformed auger tooth caused sample disturbance. End of Boring					

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

SOIL BORING LOG

Date 6/24/10

ROUTE F.A.I. 74 **DESCRIPTION** I-74 Over Mississippi River **LOGGED BY** JMB

SECTION 81-1-2 **LOCATION** NW¼ of SEC. 4, TWP. 17N, RNG. 1W, 4th P.M.

COUNTY Rock Island **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Auto

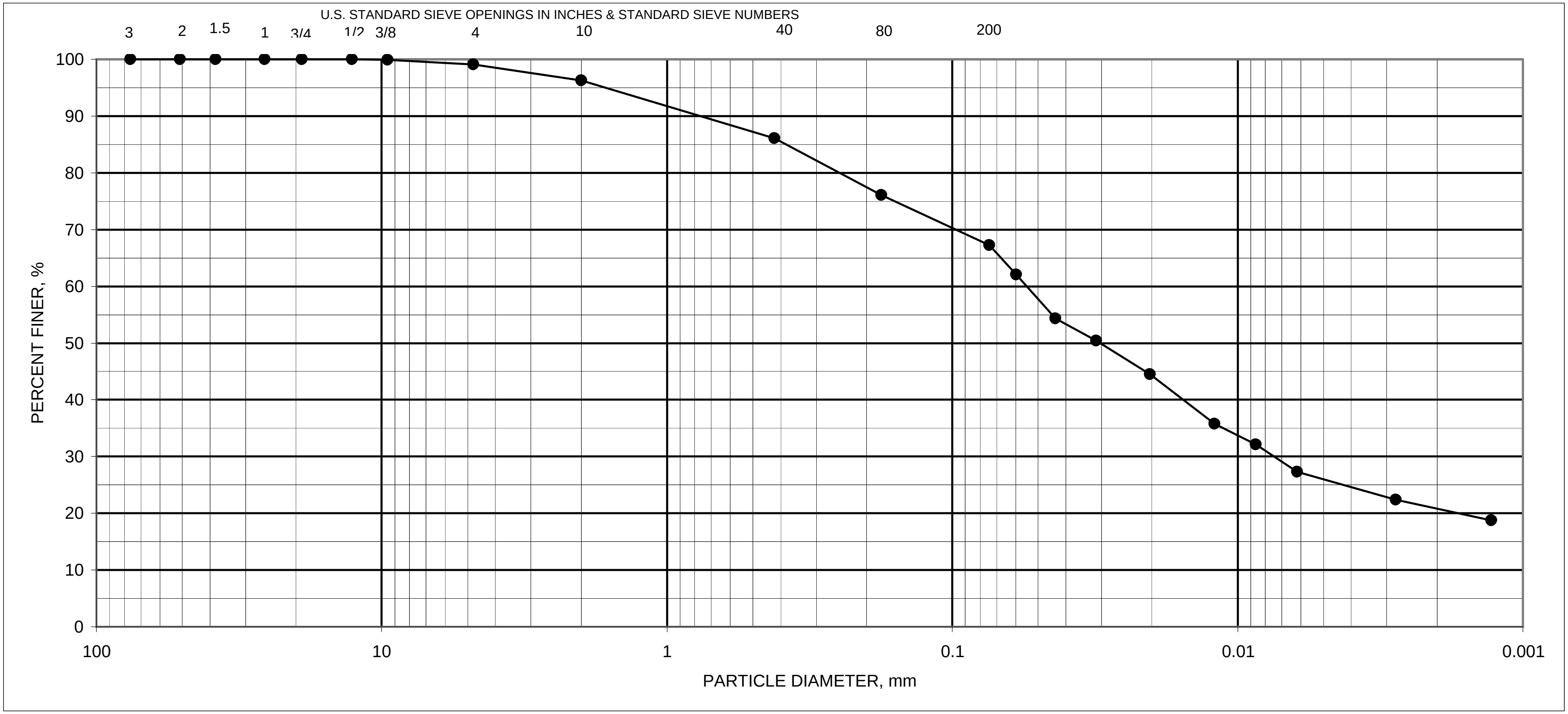
STRUCT. NO. 081-6020
Station
BORING NO. RW 13-1A
Station 71+49
Offset 8' Lt.
Ground Surface Elev. 658.1 ft

Surface Water Elev.
Stream Bed Elev.

Groundwater Elev.:
First Encounter ft
Upon Completion 647.1 ft ▽
After Hrs. ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT	657.90				
CONCRETE	657.20				
Brown and gray, moist, medium stiff, silty CLAY with trace sand			3	0.56B	11
			4		
		2	4		
				1.75B	15
				2.17S	13
		4			
	652.10				
Brown, moist, very stiff, clayey SILT with trace sand and gravel		6		3.10B	15
				4.60S	15
		8			
			50/5"		20
	648.10	10			
Gray, moist,hard, silty CLAY with trace sand and gravel		▽			
			8	4.50P	11
			12		
		12	13		
			7	3.55B	11
		14	12		
	643.10		18		
End of Boring					

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



GRAVEL		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

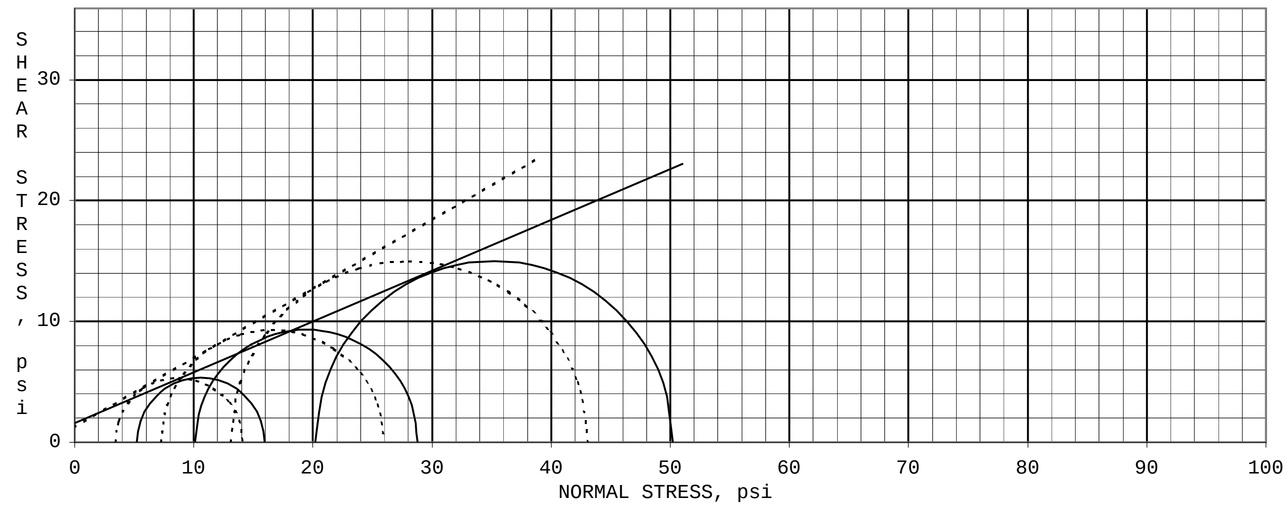
BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
RW601	T-1	11.0 TO 13.0	SANDY LEAN CLAY, OLIVE GRAY	CL	17.1	28	14	14

PROJECT I-74 CENTER SECTION

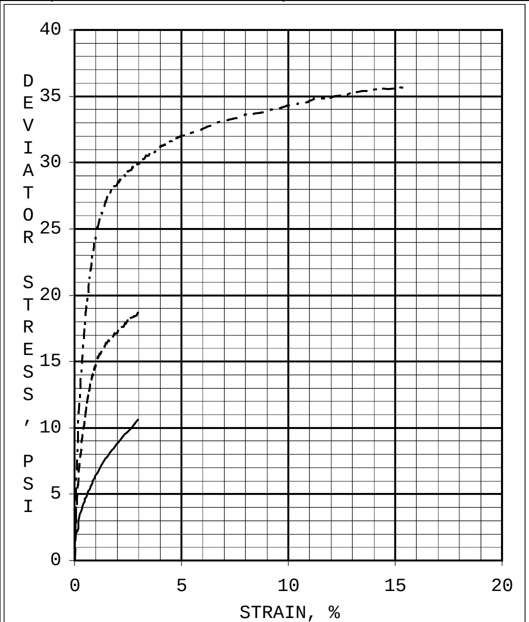
QUAD CITIES IA/IL JOB NO. 07045052 DATE 3/23/2006

Terracon

\\Orion\Guest\FAROUZ\RW19\[07045052 Hydrometer RW601-T1-11'.xls]REPORT



EFFECTIVE STRESS	ANGLE OF INTERNAL FRICTION, deg	**29.9**	COHESION, psi	**1.2**
TOTAL STRESS	ANGLE OF INTERNAL FRICTION, deg	**22.8**	COHESION, psi	**1.6**



SPECIMEN #:		A	B	C
INITIAL	WATER CONTENT, %	16.2	15.7	15.0
INITIAL	DRY DENSITY, pcf	117.7	118.5	119.9
INITIAL	SATURATION, %	101	100	100
INITIAL	VOID RATIO	0.43	0.42	0.41
BEFORE SHEAR	WATER CONTENT, %	15.7	15.0	14.3
BEFORE SHEAR	DRY DENSITY, pcf	118.4	119.8	121.5
BEFORE SHEAR	SATURATION (B PARAMETER)	1.00	1.00	1.00
BEFORE SHEAR	VOID RATIO	0.42	0.41	0.39
BEFORE SHEAR	FINAL BACK PRESSURE, psi	100.3	100.1	100.3
MINOR PRINCIPAL STRESS, psi		105.5	110.2	120.5
DEVIATOR STRESS @ 3% STRAIN, psi		10.7	18.7	30.0
TIME TO 3% STRAIN, min.		231	233	236
ULTIMATE DEVIATOR STRESS, psi		NA	NA	35.6
INITIAL DIAMETER, inch		2.882	2.915	2.930
INITIAL HEIGHT, inch		5.886	5.717	5.592
AREA AFTER CONSOLIDATION, inch2*		6.509	6.590	6.645

CONTROLLED - STRAIN TEST

t_{50} 21.0 min | Strain Rate, %/hr 0.78

DESCRIPTION OF SPECIMENS: SANDY LEAN CLAY, OLIVE GRAY

LL	PL	PI	Gs	SAMPLE TYPE:	TEST TYPE:
28	14	14	2.7 EST.	3" SHELBY TUBE	$\overline{CU}$

REMARKS:

MOHR'S CIRCLES DRAWN AT 3% STRAIN

SAMPLE WAS STAGE LOADED

* SECTION 10.2.2.1 METHOD A

PROJECT: I-74 CENTER SECTION
QUAD CITIES, IA/IL 07045052

BORING #: RW601

SAMPLE #: T-1

DEPTH OR ELEV.: 11.0 TO 13.0 feet

LABORATORY: TERRACON - LENEXA | DATE: 4/3/2006

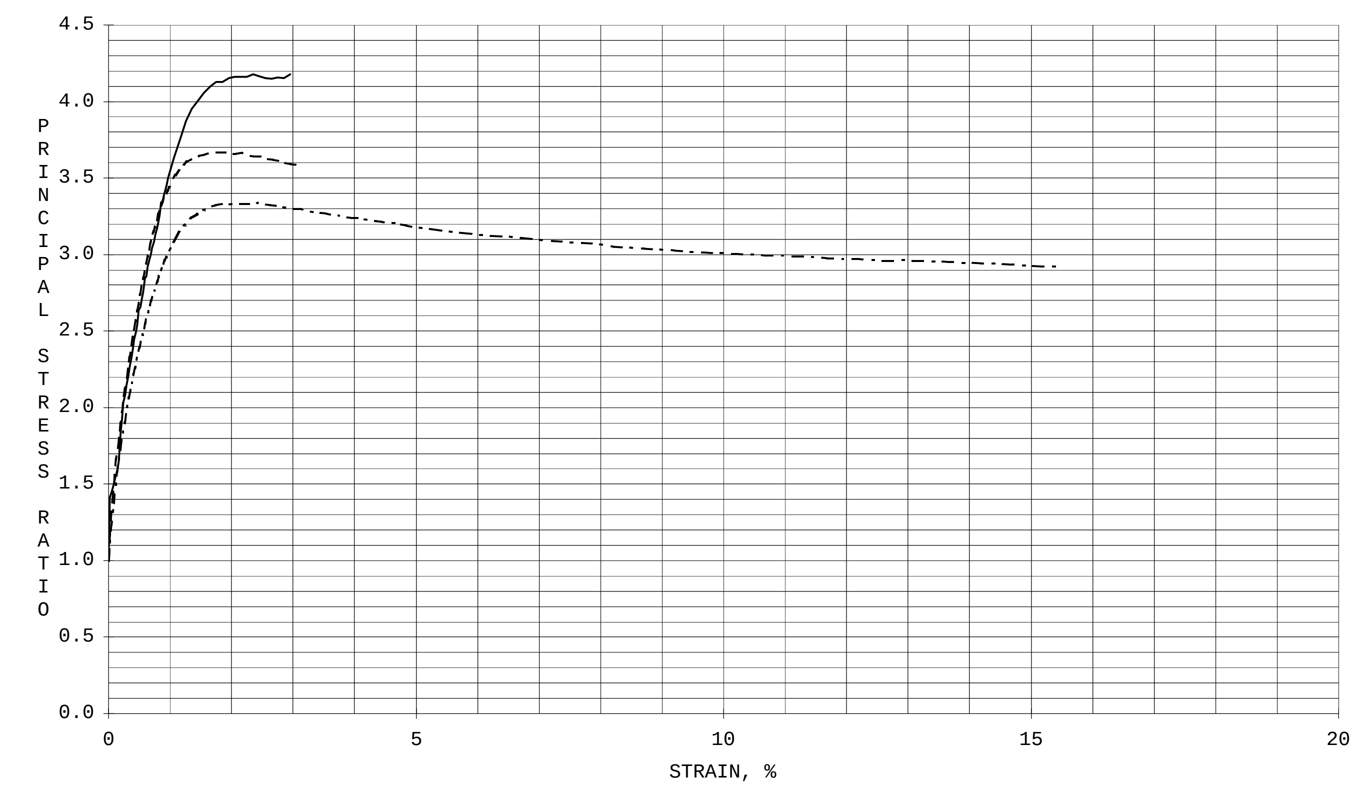
TRIAXIAL COMPRESSION TEST REPORT

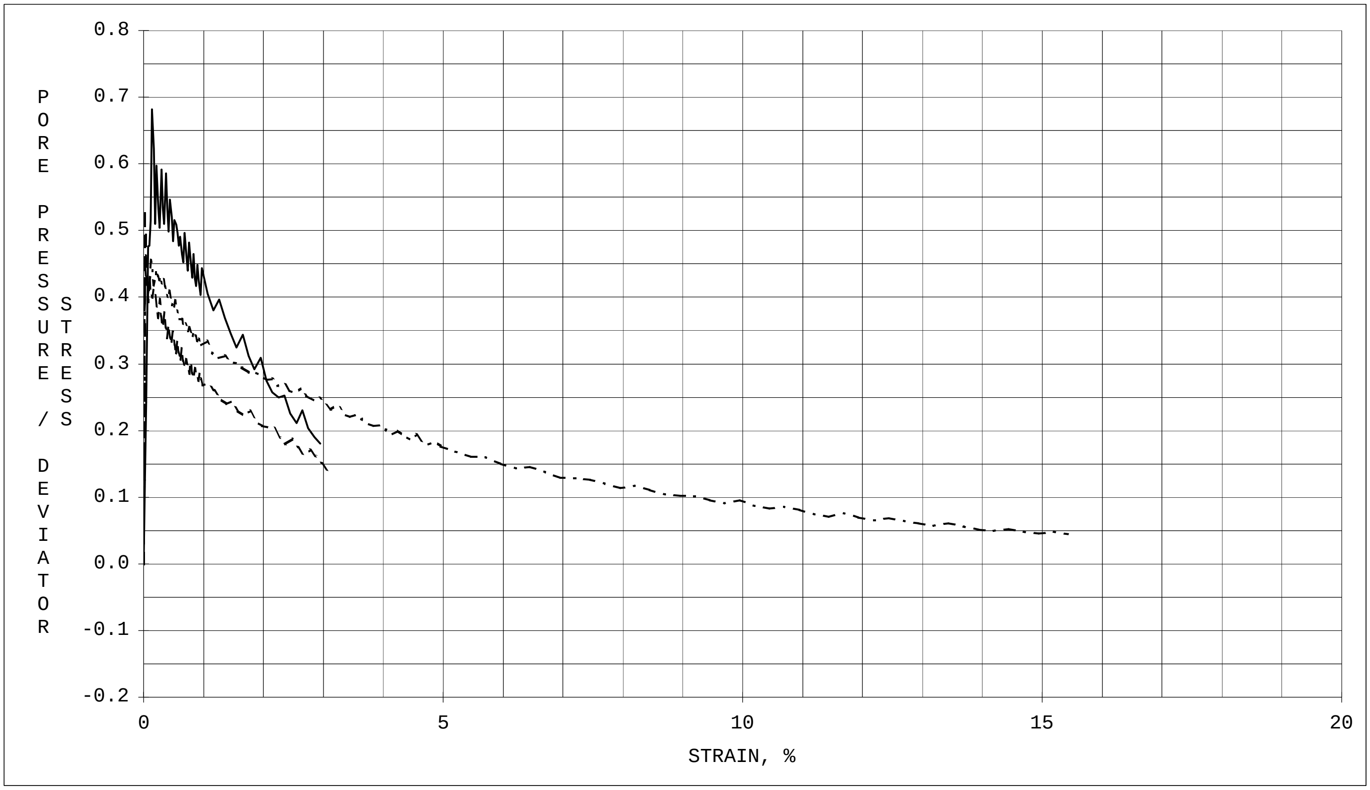
PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS (TERRACON MODIFIED FOR STAGE LOADING)

Terracon

I-74 CENTER SECTION

07045052 RW601 11.0 TO 13.0 feet

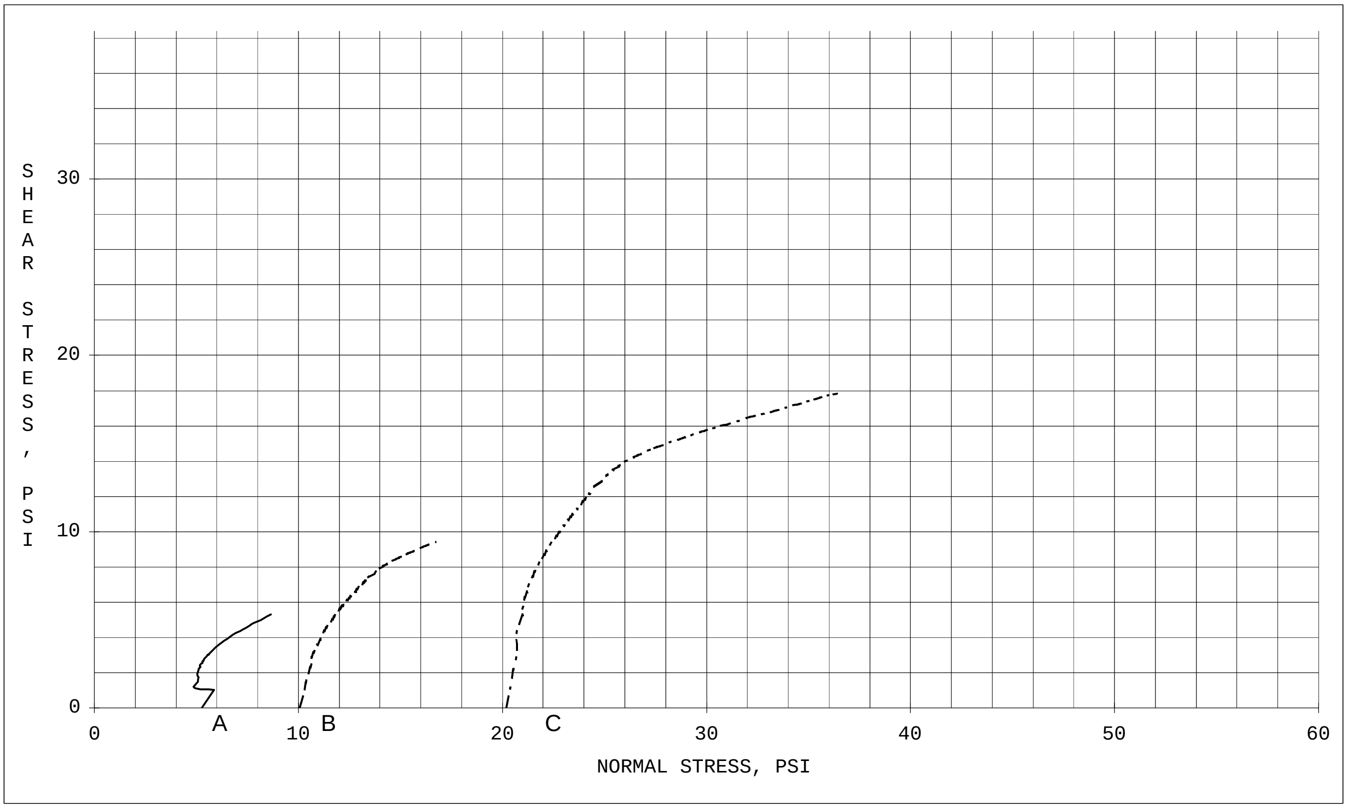


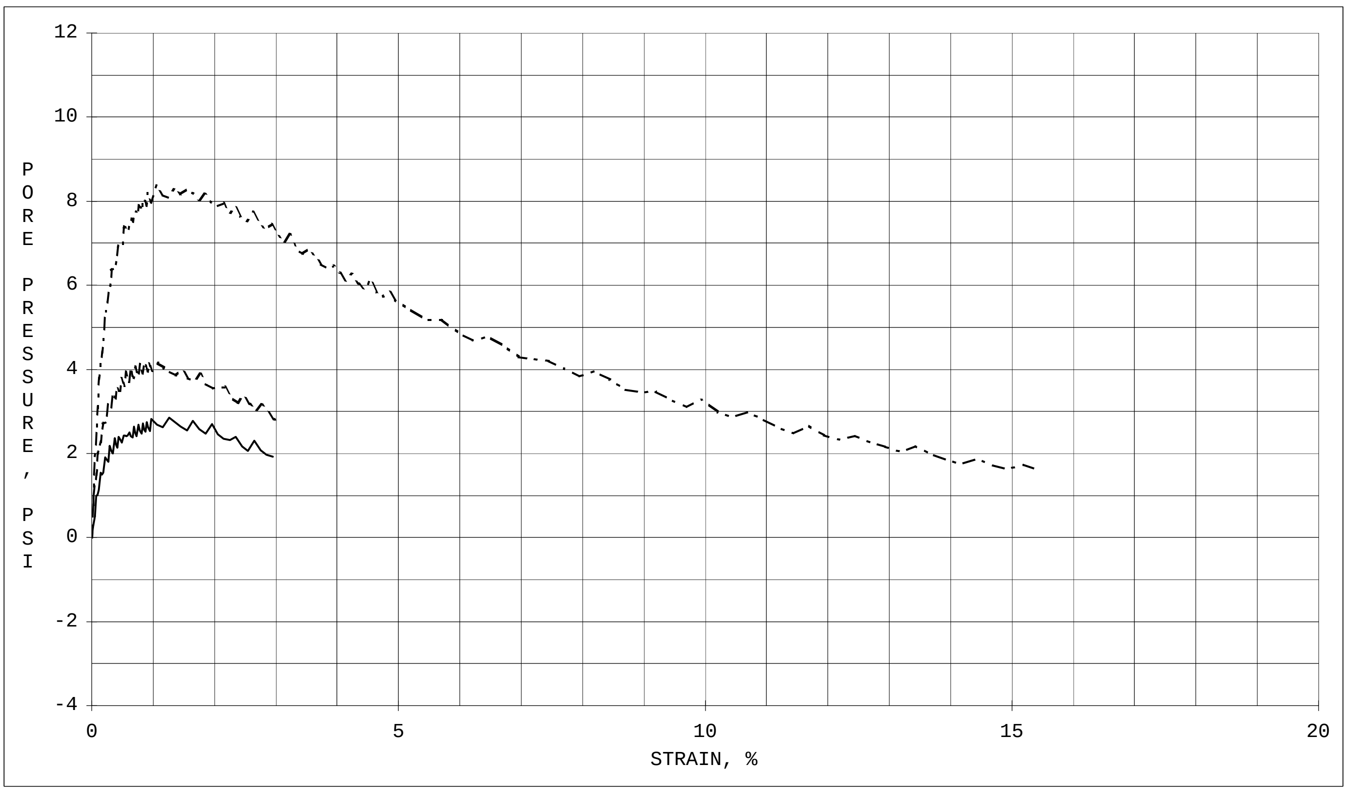


Terracon

I-74 CENTER SECTION

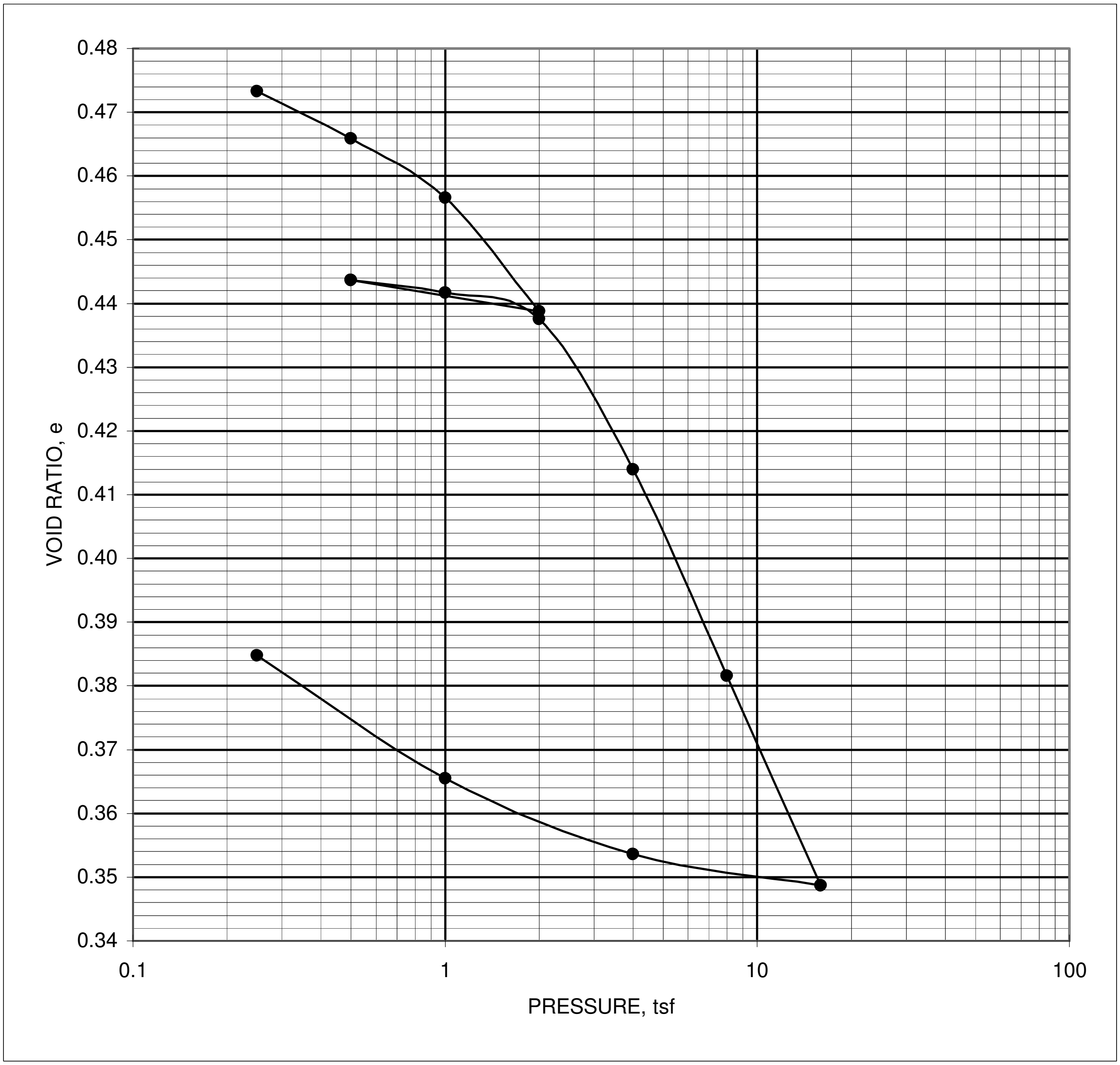
07045052 RW601 11.0 TO 13.0 feet





Terracon

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS
ASTM D2435



DIAMETER, mm	63.53	HEIGHT, mm	18.87	PROPERTY	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, tsf		0.83		MOISTURE, %	18.0	13.6
PRECONSOL. PRESSURE, tsf		1.72		DRY DENSITY, pcf	114.3	126.5
OVER CONSOLIDATION RATIO		2.1		SATURATION, %	103	100
COMPRESSION INDEX		0.11		VOID RATIO	0.474	0.384
REBOUND INDEX		0.009		SAMPLE TYPE	3" SHELBY TUBE	

LIQUID LIMIT	28	PLASTIC LIMIT	14	PLASTICITY INDEX	14	SPECIFIC GRAVITY	2.70 ASSUMED
SAMPLE DESCRIPTION	SANDY LEAN CLAY, OLIVE GRAY						
BORING NO.	RW601	SAMPLE NO.	T-1	DEPTH, feet	11.0 TO 13.0		

I-74 CENTER SECTION
QUAD CITIES, IA/IL
07045052
3/23/2006

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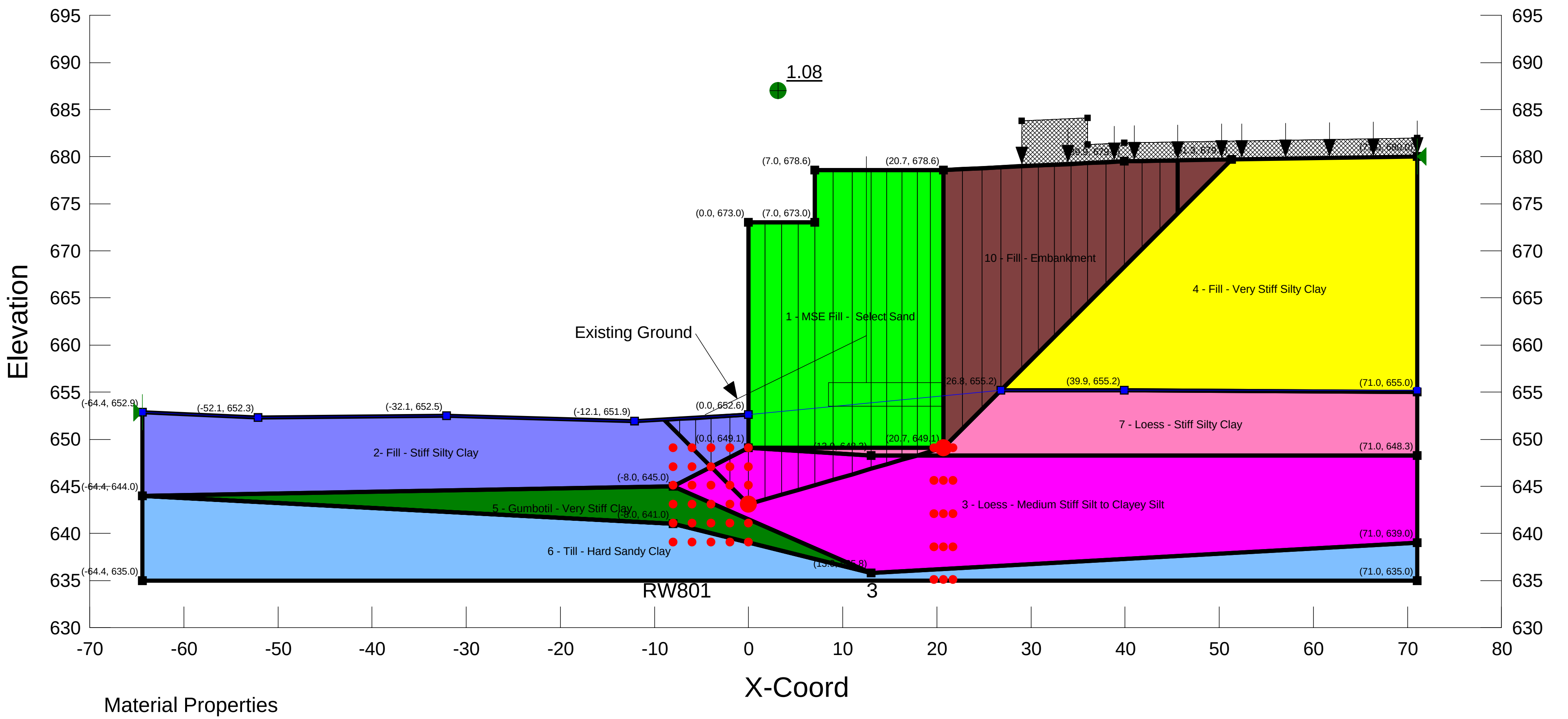
Terracon

I-74 CENTER SECTION
QUAD CITIES, IA/IL
07045052
3/23/2006

ADDITIONAL CONSOLIDATION DATA

RW601
T-1
11.0 TO 13.0

PRESSURE, tsf	Cv50, cm2/sec	Cv90, cm2/sec	Av, cm2/g	Mv, cm2/g	k, cm/sec
0					
0.25			3.24E-06	2.20E-06	
0.5	8.75E-04	8.81E-04	3.00E-05	2.04E-05	1.78E-08
1	5.38E-04	5.43E-04	1.91E-05	1.30E-05	7.00E-09
2	5.82E-04	5.87E-04	1.82E-05	1.25E-05	7.29E-09
0.5			3.38E-06	2.35E-06	
1	1.37E-03	1.38E-03	4.05E-06	2.81E-06	3.85E-09
2	1.17E-03	1.18E-03	4.26E-06	2.95E-06	3.47E-09
4	4.78E-04	4.82E-04	1.21E-05	8.39E-06	4.01E-09
8	4.88E-04	4.92E-04	8.26E-06	5.84E-06	2.85E-09
16	5.99E-04	6.04E-04	4.21E-06	3.04E-06	1.82E-09
AVERAGE	6.76E-04	6.81E-04	1.15E-05	7.92E-06	4.47E-09

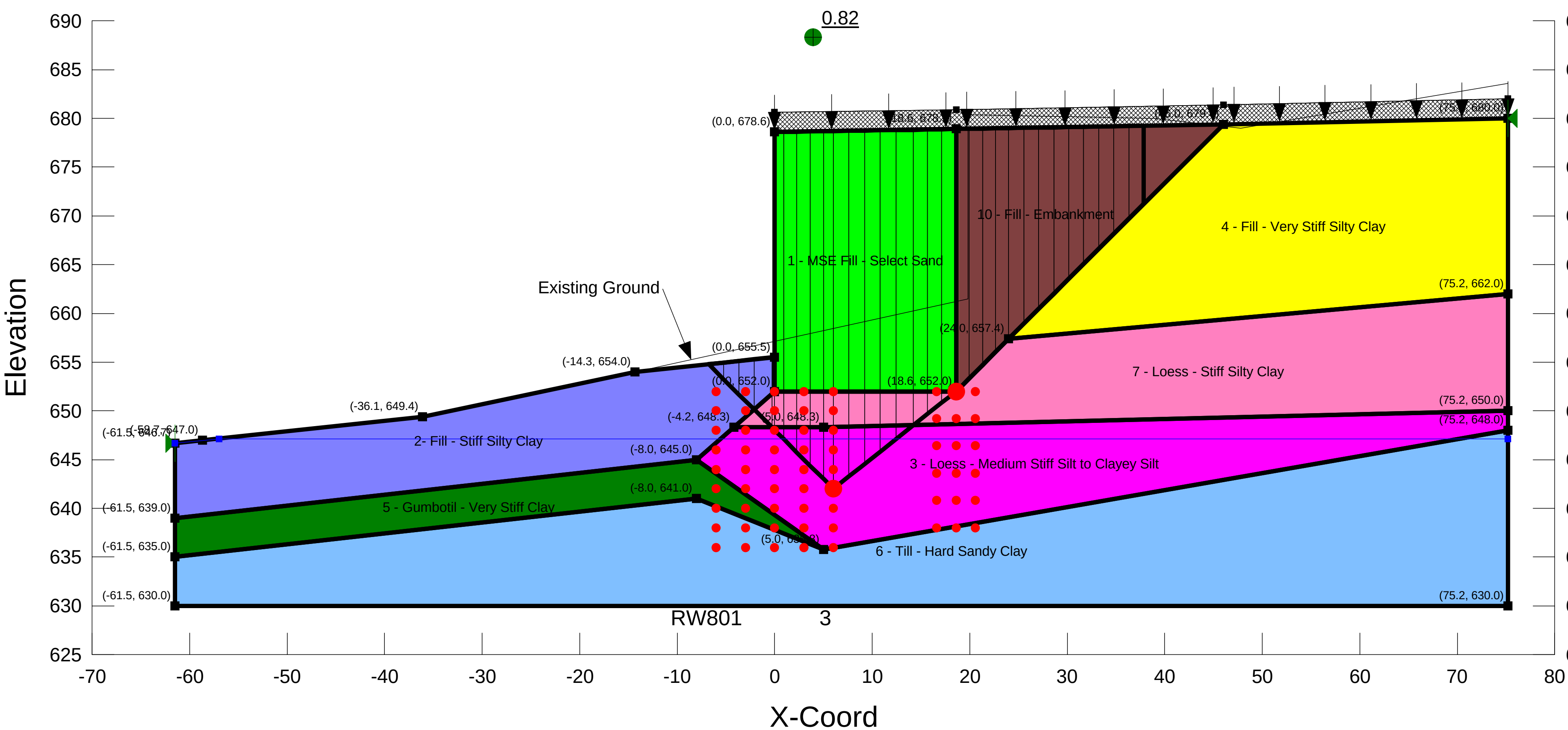


Material Properties
Name: 1 - MSE Fill - Select Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: 2- Fill - Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1000 psf Phi: 0 °
Name: 3 - Loess - Medium Stiff Silt to Clayey Silt Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 600 psf Phi: 0 °
Name: 4 - Fill - Very Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 2500 psf Phi: 0 °
Name: 5 - Gumbotil - Very Stiff Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 2500 psf Phi: 0 °
Name: 6 - Till - Hard Sandy Clay Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 4200 psf Phi: 0 °
Name: 7 - Loess - Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1500 psf Phi: 0 °
Name: 10 - Fill - Embankment Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 1000 psf Phi: 0 °

SN 081-0182 (S. Abut) SN 081-6020 IL-RW13 (C - C')
Case 2 - Through Abutment - Wedge
File Name: I-74 S Abut 081-0182 6020 - Through Abutment.gsz
Last Edited By: Robert Chantome
Date: 5/17/2011 10:13:10 AM

I-74 OVER THE MISSISSIPPI RIVER
CENTRAL SECTION FINAL DESIGN
ILLINOIS DEPARTMENT OF TRANSPORTATION
ROCK ISLAND COUNTY, ILLINOIS

HANSON
Engineering | Architecture | Planning | Allied Services



Material Properties
Name: 1 - MSE Fill - Select Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 34 °
Name: 2- Fill - Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1000 psf Phi: 0 °
Name: 3 - Loess - Medium Stiff Silt to Clayey Silt Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 600 psf Phi: 0 °
Name: 4 - Fill - Very Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 2500 psf Phi: 0 °
Name: 5 - Gumbotil - Very Stiff Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 2500 psf Phi: 0 °
Name: 6 - Till - Hard Sandy Clay Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 4200 psf Phi: 0 °
Name: 7 - Loess - Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1500 psf Phi: 0 °
Name: 10 - Fill - Embankment Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 1000 psf Phi: 0 °

SN 081-0182 (S Abut) SN 081-6020 for IL-RW13
Case 2 - Through Side - Wedge
File Name: I-74 S Abut 081-0182 6020 - Through Side.gsz
Last Edited By: Robert Chantome
Date: 5/17/2011 9:48:46 AM

I-74 OVER THE MISSISSIPPI RIVER
CENTRAL SECTION FINAL DESIGN
ILLINOIS DEPARTMENT OF TRANSPORTATION
ROCK ISLAND COUNTY, ILLINOIS

HANSON
Engineering | Architecture | Planning | Allied Services

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
F.A.I. 74	81-1HB-1	ROCK ISLAND	389	256
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT I-74-1( ) 1.4		

DWG. NO. S-3

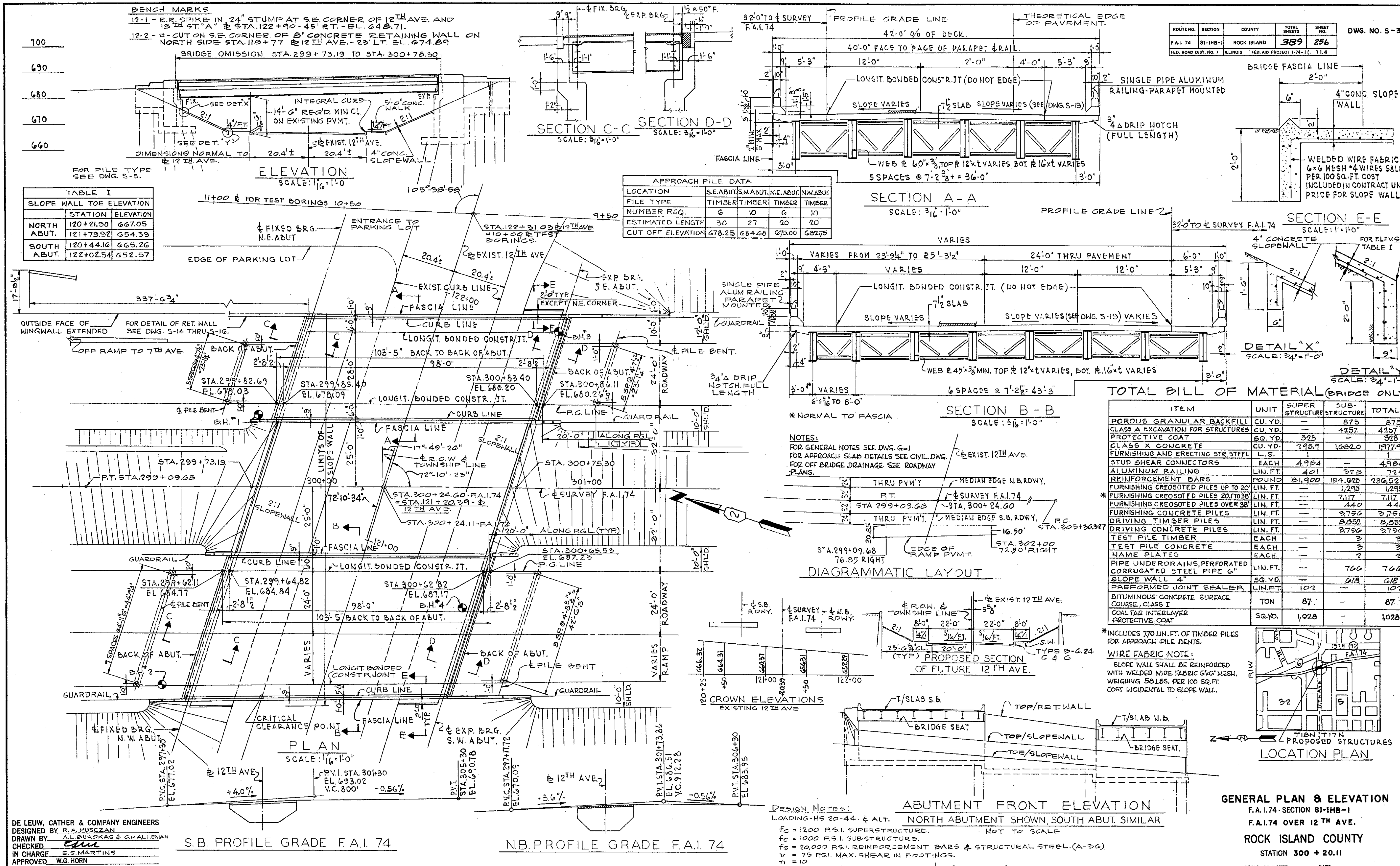


TABLE I		
SLOPE WALL TOE ELEVATION		
	STATION	ELEVATION
NORTH ABUT.	120+21.90	667.05
	121+79.92	654.39
SOUTH ABUT.	120+44.16	665.26
	122+02.54	652.57

APPROACH PILE DATA				
LOCATION	S.E. ABUT.	S.W. ABUT.	N.E. ABUT.	N.W. ABUT.
PILE TYPE	TIMBER	TIMBER	TIMBER	TIMBER
NUMBER REQ.	6	10	6	10
ESTIMATED LENGTH	30	27	20	20
CUT OFF ELEVATION	678.25	684.68	675.00	682.75

TOTAL BILL OF MATERIAL (BRIDGE ONLY)

ITEM	UNIT	SUPER STRUCTURE	SUB-STRUCTURE	TOTAL
POROUS GRANULAR BACKFILL	CU. YD.	—	875	875
CLASS A EXCAVATION FOR STRUCTURES	CU. YD.	—	4257	4257
PROTECTIVE COAT	SQ. YD.	323	—	323
CLASS X CONCRETE	CU. YD.	295.9	1,682.0	1977.9
FURNISHING AND ERECTING STR. STEEL	L.S.	1		1
STUD SHEAR CONNECTORS	EACH	4,984	—	4,984
ALUMINUM RAILING	LIN. FT.	401	328	729
REINFORCEMENT BARS	POUND	81,900	154,623	236,523
FURNISHING CREOSOTED PILES UP TO 20'	LIN. FT.	—	1,295	1,295
* FURNISHING CREOSOTED PILES 20.1' TO 38'	LIN. FT.	—	7,117	7,117
FURNISHING CREOSOTED PILES OVER 38'	LIN. FT.	—	440	440
FURNISHING CONCRETE PILES	LIN. FT.	—	3,756	3,756
DRIVING TIMBER PILES	LIN. FT.	—	8,852	8,852
DRIVING CONCRETE PILES	LIN. FT.	—	3,756	3,756
TEST PILE TIMBER	EACH	—	3	3
TEST PILE CONCRETE	EACH	—	3	3
NAME PLATES	EACH	—	2	2
PIPE UNDERDRAINS, PERFORATED CORRUGATED STEEL PIPE 6"	LIN. FT.	—	766	766
SLOPE WALL 4"	SQ. YD.	—	618	618
PREFORMED JOINT SEALER	LIN. FT.	102	—	102
BITUMINOUS CONCRETE SURFACE COURSE, CLASS I	TON	87	—	87
COAL TAR INTERLAYER PROTECTIVE COAT	SQ. YD.	1,028	—	1,028

*INCLUDES 770 LIN. FT. OF TIMBER PILES FOR APPROACH PILE BENTS.

WIRE FABRIC NOTE:

SLOPE WALL SHALL BE REINFORCED WITH WELDED WIRE FABRIC 6×6 MESH, WEIGHING 58 LBS. PER 100 SQ. FT. COST INCIDENTAL TO SLOPE WALL.

DESIGN NOTES:

LOADING - HS 20-44 & ALT.

f_c = 1200 P.S.I. SUPERSTRUCTURE.
f_c = 1000 P.S.I. SUBSTRUCTURE.
f_s = 20,000 P.S.I. REINFORCEMENT BARS & STRUCTURAL STEEL. (A-36).
v = 75 P.S.I. MAX. SHEAR IN FOOTINGS.
n = 10
ALLOWABLE L.L. DEFLECTION - $\frac{L}{1200}$ (COMPOSITE)

DE LEUW, CATHER & COMPANY ENGINEERS
DESIGNED BY R. F. PUSCZAN
DRAWN BY A. L. BUROKAS & G. P. ALLEMAN
CHECKED [signature]
IN CHARGE E. S. MARTINS
APPROVED W. G. HORN

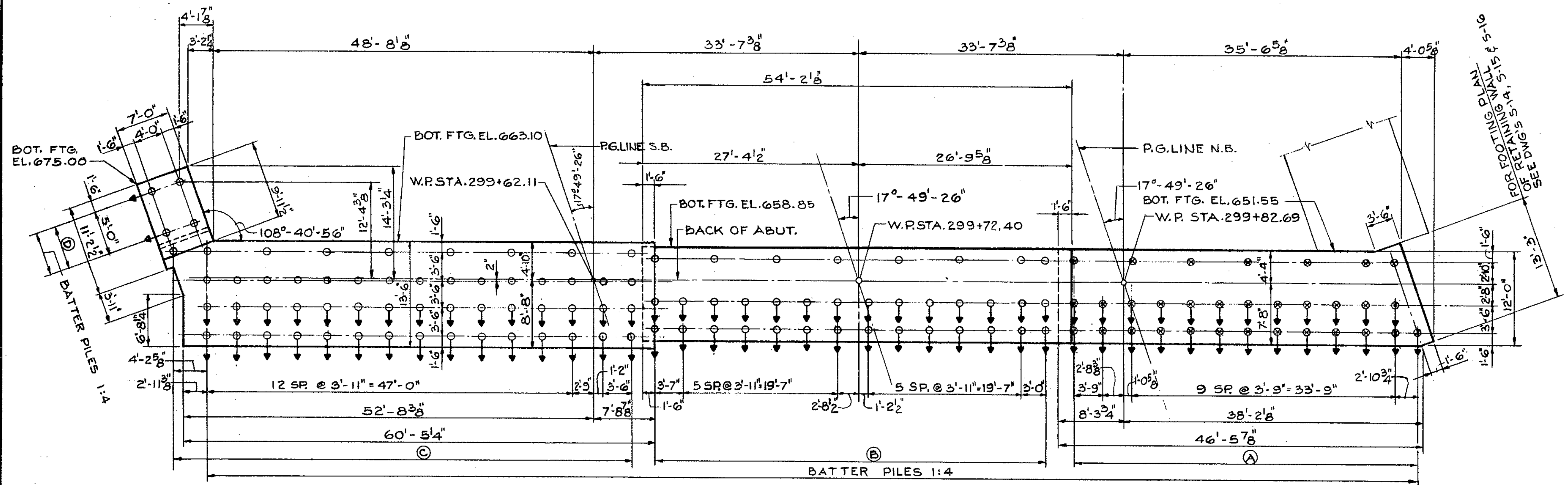
GENERAL PLAN & ELEVATION

F.A.I. 74 - SECTION 81-1HB-1
F.A.I. 74 OVER 12TH AVE.
ROCK ISLAND COUNTY
STATION 300 + 20.11

SCALE: AS NOTED DATE:

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
F.A.I. 74	81-IHB-1	ROCK ISLAND	389	258
FED. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT I-74-1( ) 1.4		

DWG. NO. S-5



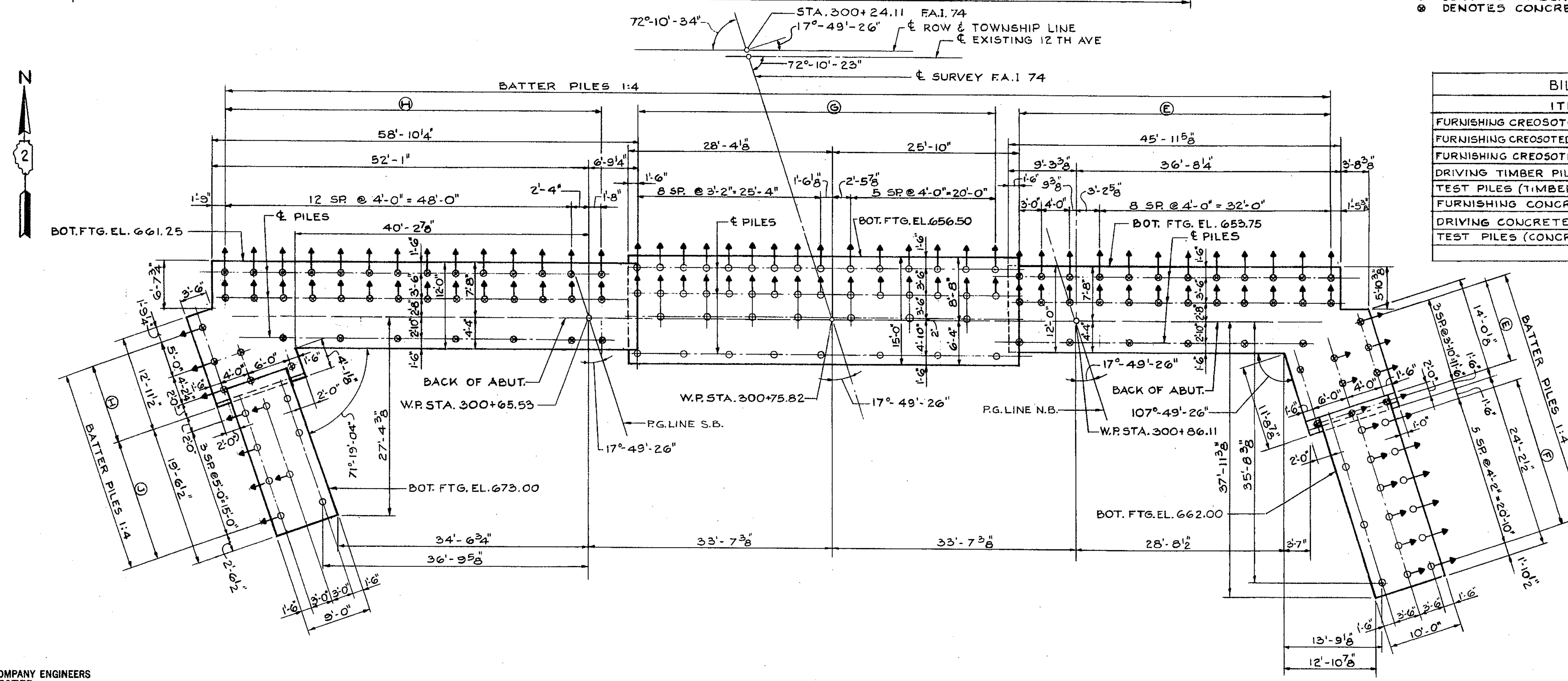
PILE DATA

PLAN LOCATION	STRUCTURE	PILE TYPE	MINIMUM CAPACITY TONS	NUMBER REQUIRED	ESTIMATED LENGTH FT.	CUT OFF ELEVATION
(A)	N.E. ABUT.	CONCRETE	45	32	24	652.55
(B)	N. MIDWALL	TIMBER	24	36	20	659.85
(C)	N.W. ABUT.	TIMBER	24	54	26	664.10
(D)	N.W. ABUT. WINGWALL	TIMBER	24	4	38'	676.00
(E)	S.E. ABUT. E. END	CONCRETE	45	39	44	654.75
	S.E. ABUT. W. END				34	
(F)	S.E. ABUT. WINGWALL	TIMBER	24	10	44	663.00
(G)	S. MIDWALL E. END	TIMBER	24	45	28	657.50
	S. MIDWALL W. END				14	
(H)	S.W. ABUT.	CONCRETE	45	41	27	662.25
(J)	S.W. ABUT. WINGWALL	TIMBER	24	9	30	674.00

DENOTES BATTER PILES

O DENOTES TIMBER PILES

⊗ DENOTES CONCRETE PILES



BILL OF MATERIAL

ITEM	UNIT	QUANTITY
FURNISHING CREOSOTED PILES UP TO 20'	LIN. FT.	975
FURNISHING CREOSOTED PILES FROM 20.1' TO 38'	LIN. FT.	2496
FURNISHING CREOSOTED PILES OVER 38'	LIN. FT.	440
DRIVING TIMBER PILES	LIN. FT.	3911
TEST PILES (TIMBER)	EACH	2
FURNISHING CONCRETE PILES	LIN. FT.	3306
DRIVING CONCRETE PILES	LIN. FT.	3306
TEST PILES (CONCRETE)	EACH	3

DE LEUW, CATHER & COMPANY ENGINEERS
DESIGNED BY R. S. KOESTER
DRAWN BY O. MARTINSONS
CHECKED W. Matzella
IN CHARGE E. S. MARTINS
APPROVED W.G. HORN

PILE PLAN

F.A.I. 74 - SECTION 81-IHB-1
F.A.I. 74 OVER 12TH AVE.

ROCK ISLAND COUNTY

STATION 300 + 20.11

SCALE: 1/8" = 1'-0" DATE: