STRUCTURE GEOTECHNICAL REPORT

Pinecrest Drive over Interstate 74

Existing S.N. 090-0091
Proposed S.N. 090-0181

FAI 74
SECTION (90-14HB-1)BR-1
TAZEWELL COUNTY, ILLINOIS
JOB NO. P-94-010-09 & D-94-060-09
PTB 177/09
KEG NO. 15-1062.00

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August 9, 2018
REVISED February 7, 2019
REVISED February 25, 2019

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EXECUTIVE SUMMARY

Pinecrest Drive over Interstate 74
FAU 6720
Section (90-14HB-1)BR-1
Tazewell County, Illinois
Job No. P-94-010-09 & D-94-060-09
PTB 177/09
Existing Structure No. 090-0091
Proposed Structure No. 090-0181

The original structure (SN 090-0091) will be replaced by a two-span structure located at Pinecrest Drive over I-74 in Tazewell County, Illinois. This report summarizes the analysis of the proposed structure replacement.

The proposed structure will result in reconstruction of endslopes at the abutments. Additionally, slope stability was analyzed for the side slope impacted by a proposed shared-use path. The results of the analysis, as provided in Table 4.2, indicates an acceptable FOS will exist under undrained and drained conditions for the endslopes and side slopes at the 1 vertical to 2 horizontal (1V:2H) condition proposed.

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1.0 Project Description and Proposed Structure Information

1.1 Introduction

The geotechnical study summarized in this report was performed for the proposed bridge at Pinecrest Drive over I-74 located in East Peoria, in Tazewell County, Illinois. The purpose of the report is to present design and construction recommendations for the proposed structure.

1.2 Project Description

The project consists of replacment of the existing bridge (SN 090-0091) located at Pinecrest Drive over I-74. The general location of the bridge is shown on a USGS Topographic Location Map, Exhibit A. The site lies within the limits of the Third Principal Meridian, (T. 25N, R. 4W, Section 3) within the Bloomington Ridged Plain of the Till Plains Section of the Central Lowland Province. The Ancient Illinois Floodplain is also located near the project.

1.3 Proposed Bridge Information

The proposed structure located at Pinecrest Drive over I-74 will consist of a two-span bridge with a 16 degree 36 minute 41 second skew from the centerline of I-74. The Type, Size, and Location Plan (TS&L), is included in Exhibit B. The proposed structure will measure 214’ from back-to-back of abutments, with an out-to-out width of 76 ft – 0 inches. The bridge spans from Station 59+03.09 to 61+15.01 along Pinecrest Drive. The bridge will carry two, 14-foot traffic lanes, 8-foot outside shoulders, a 12-foot left-turn lane and a 10’ wide multi-use path on the northbound side of the structure. The anticipated substructure units include integral abutments and a multi-column pier with crashwall.

Further substructure details will be based on the findings of this SGR. The project will utilize staged construction to maintain one lane of traffic during construction.

2.0 Existing Bridge Information

The original structure was built in 1959 and widened with a new deck in 1982. It consists of a four span structure with continuous wide-flange beams with pile bent pier abutments and reinforced concrete columns. The bridge is 200’-2” long from back-to-back of abutments, with an out-to-out width of 65’-2”. The structure was built on a 16º 36’ 40.5” skew. The existing vertical clearance on I-74 is only 14’-3”. The pile bent pier abutments are supported by concrete piles and the concrete columns are supported on creosote treated wood piles. Due to the existing structure having been supported on these driven with a batter, the proposed piles may be impacted. Efforts should be utilized to remove the existing driven piles within the footprint of the proposed replacement substructures, or drive the new piles to miss the existing piles.

3.0 Site Investigation, Subsurface Exploration, and Generalized Subsurface Conditions

The site investigation plan was developed by KEG and approved by IDOT District 4 Geotechnical personnel. A representative of KEG conducted a site visit, observed drilling operations, and logged subsurface conditions. Boring locations were staked by the District.

Five standard penetration test (SPT) borings, designated SB-1 through SB-5 were drilled in the embankments and near proposed pier locations between the dates of January 22 and 26, 2018. The boring locations are shown on the TS&L in Exhibit B. Detailed information regarding the nature and thickness of the soils encountered and the results of the field sampling and laboratory testing are shown on the Boring Logs, Exhibit C. The soil profile for the above mentioned borings can be found in Subsurface Profile, Exhibit D.

Table 3.0 – Boring Stations and Offsets

Designation	FAI 74 Stationing	Offset (ft.)	Pinecrest Dr. Stationing	Offset (ft.)	Surface Elevation (ft.)
SB-1	363+43.88	122.2 RT	58+91.05	32.0 LT	729.19
SB-2	364+55.81	80.0 RT	58+99.51	87.33 RT	711.52
SB-3	362+92.81	3.0 RT	60+19.90	46.85 LT	711.44
SB-4	364+20.81	67.0 LT	60+50.38	95.82 RT	710.31
SB-5	362+62.29	137.3 LT	61+63.05	36.0 LT	728.32

3.1 Subsurface Conditions

From the surface, Boring SB-1 (Surf. El. 729.19) had 12-inches of topsoil. A silty clay followed from El. 728.19 to 690.69, which had N-values ranging from 6 to 20 blows per foot (bpf), $Q_{u's}$ of 0.9 to 3.1 tons per square foot (tsf), and moisture contents of 15 to 27 percent. A stiff clay followed to termination of the boring at a depth of 100 feet. (El. 629.19), with N-values ranging from 16 to 44 bpf, Q_u values of 0.8 to 3.6 tsf, and moisture contents between 12 and 24 percent.

From the surface, Boring SB-2 (Surf. El. 711.52) consisted of silty clay to El. 695.52, with N-values of 5 to 21 bpf, Q_u values of 0.3 to 3.9 tsf, and moisture contents between 16 and 26 percent. An Atterberg limits test was perfomed on a sample from 13.5 to 15 ft and resulted in a liquid limit (LL) of 24, a Plastic Limit (PL) of 13 and a Plasticity Index (PI) of 11. A clay followed to El. 683.02, with N-values of 11 to14 bpf, Q_u values of 2.5 to 4.0 tsf, and moisture contents of 13 to 24 percent. A clayey silt followed to El. 678.02 with an N-value of 27 bpf, a Q_u value of 2.2 tsf, and a moisture content of 14 percent. A sand followed to El. 673.02, with an N-value of 25 bpf, and a moisture content of 11 percent. A clay followed to boring termination at a depth of 80 feet (El. 631.52). N-values ranged from 19 to 27 bpf, Qu values of 0.9 to 3.7 tsf, with moisture contents between 12 and 29 percent.

From the surface, Boring SB-3 (Surf. El. 711.44) consisted of clayey silt to El. 705.44, with N-values of 7 to 9 bpf, Qu values of 1.2 to 1.9 and moisture contents of 21 to 23 percent. A silty clay followed to El. 632.94. N-values ranged from 11 bpf to 50 blows per 6-inches, with Q_u values between 0.5 to 4.0 tsf, and moisture contents from 13 to 17 percent. A Shelby tube (ST) sample was taken from a depth of 21 to 23 ft., and had a Q_u value of 3.7 tsf, and a moisture content of 13 percent. An Atterberg limits test was also perfomed on the ST sample and resulted in a LL of 22, a PL of 12 and a PI of 10. Clay followed to termination of the boring at a depth of 120 ft. (El. 591.44), with N-values between 23 and 41 bpf, Q_u values between 1.6 and 4.4 tsf, and moisture contents from 13 to 27 percent.

From the surface, Boring SB-4 (Surf. El. 710.31) consisted of clayey silt to El. 706.81, with an N-value of 9 bpf, Q_u value of 1.1 and a moisture content of 23 percent. A sand followed to El. 704.31 with an N-value of 10 and a moisture content of 6 percent. A clayey silt followed to El. 699.31. N-values ranged from 6 to 7 bpf, with Q_u values of 0.7 tsf, and moisture contents from 16 to 19 percent. A silty clay followed to El. 681.81. N-values ranged from 11 to 15 bpf, with Q_u values of 0.4 to 2.6 tsf, and moisture contents from 14 to 18 percent. A ST sample was taken from a depth of 13 to 15 ft., and had a Q_u value of 1.4 tsf, and a moisture content of 14 percent. Sand followed to El. 676.81, with an N-value of 16 and a moisture content of 19 percent. Clay followed to El. 661.81, with N-values of 10 to12 bpf, Q_u values of 1.0 to 1.5 tsf and moisture contents of 14 percent. Sand followed to El. 651.81, with an N-value of 22 and a moisture content of 12 percent. Clay followed to termination of the boring at a depth of 80 ft. (El. 630.31), with N-values between 20 and 29 bpf, Q_u values between 0.8 and 3.1 tsf, and moisture contents from 14 to 27 percent.

From the surface, Boring SB-5 (Surf. El. 728.32) consisted of silty clay to El. 722.32, with N-values of 7 to 11 bpf, Q_u values of 1.9 to 2.0 tsf, and moisture contents between 25 and 27 percent. A clay followed to El. 715.32, with N-values of 6 t o16 bpf, Q_u values of 0.7 to 4.0 tsf, and moisture contents of 18 to 27 percent. A silty clay followed to El. 699.82 with N-values of 4 to 10 bpf, Q_u values of 0 to 1.9 tsf, and moisture contents of 15 to 27 percent. A ST sample was taken from a depth of 13 to 15 ft., and had a One-Dimensional Consolidation test performed on the sample. An Atterberg limits test was also perfomed on the ST sample and resulted in a LL of 30, a PL of 21 and a PI of 9. A ST sample was also taken from a depth of 26 to 28 ft., and had a Q_u value of 1.9 tsf, and a moisture content of 15 percent. A clay followed to El. 659.82, with N-values ranging from 13 to 20 bpf, Qu values of <0.25 to 2.2 tsf, and moisture contents between 14 and 23 percent. A sand followed to El. 649.82, with an N-value of 47 and a moisture content of 9 percent. A clay followed to boring termination at a depth of 100 feet (El. 628.32), with N-values of 36 to 40 bpf, Q_u values 0.5 to 3.3 tsf and moisture contents of 13 to 42 percent.

3.3 Groundwater

Groundwater was encountered in all of the borings. Table 3.3 shows the elevation that groundwater was encountered during drilling. It should be noted that the groundwater level is subject to seasonal and climatic variations. In addition, without extended periods of observation, measurement of true groundwater levels may not be possible.

Table 3.3 – Groundwater Elevations

Boring	FAI 74 Stationing	Offset (ft.)	Pinecrest Dr. Stationing	Offset (ft.)	Elevation (ft.)
SB-1	363+43.88	122.2 RT	58+91.05	32.0 LT	704.2
SB-2	364+55.81	80.0 RT	58+99.51	87.33 RT	702.5
SB-3	362+92.81	3.0 RT	60+19.90	46.85 LT	704.4
SB-4	364+20.81	67.0 LT	60+50.38	95.82 RT	703.3
SB-5	362+62.29	137.3 LT	61+63.05	36.0 LT	703.3

4.0 Geotechnical Evaluations

4.1 Settlement

The proposed structure will require placement of less than 2 feet of new structural fill on the approach embankments for the reconstruction efforts. Based on Consolidation testing performed on a ST sample from Boring SB-5, settlement due to the placement of less than 2 feet of new fill is estimated to be negligible at less than 1/10 of an inch.

4.2 Slope Stability

The proposed structure will result in endslopes and side slopes with inclinations of 1 Vertical to 2 Horizontal (1V:2H), with additional construction along the north side slope due to addition of a shared-use path.

Slope stability of the south endslope and of the north side slope were analyzed using SLOPE-W; the soil properties of SB-1, SB-4 and SB-5 and the endslope geometrics. Three conditions were modeled: end-of-construction, long-term, and a design seismic event. A critical factor of safety (FOS) was calculated for each condition. According to current standard of practice, the target FOS is 1.5 for end-of-construction and long-term slope stability and 1.0 for the design seismic event.

In order to model the end-of-construction condition, undrained soil parameters were used with a friction angle of 0 degrees assumed for cohesive soils. Drained soil parameters with assumed friction angles ranging from 26 to 38 degrees were used to model the long-term and seismic conditions to analyze the condition where excess pore water pressure from construction has dissipated. For cohesive materials, a nominal cohesion value between 100 and 250 psf was included in the drained strength parameters.

The Modified Bishop Method, which generates circular-arc failure surfaces, was used to calculate the critical failure surfaces and FOS for the analyzed conditions. The FOS obtained in the analysis is shown in Table 4.2. SLOPE-W program output from this analysis can be found in SLOPE/W Stability Analysis, Exhibit E.

Table 4.2 – Slope Stability Critical FOS

Location	Reference Boring	End-of-Construction	Long-Term	Seismic
South Abutment End Slope	SB-1	3.4	1.8	1.6
North Abutment Side Slope	SB-4/SB-5	2.2	1.5	1.4

The results of the analysis, as provided in Table 4.2, indicates an acceptable FOS will exist under undrained and drained conditions at all locations.

4.3 Seismic Considerations

The determination of Seismic Site Class was based on the method described by IDOT AGMU Memo 09.1 – Seismic Site Class Definition and the IDOT-provided spreadsheet titled: Seismic Site Class Determination. Using these resources, the controlling global site class for this project is Soil Site Class D.

Additional seismic parameters were calculated for use in design of the structure and evaluation of liquefaction potential. The USGS published information and mapping (http://earthquake.usgs.gov/), including software directly applicable to the AASHTO Guide Specifications for LRFD Seismic Bridge Design, was used to determine the parameters for the project site location. The values, based on a 1000-Year Return Period with a Probability of Exceedance (PE) of 7 percent in 75 years and the Soil Site Class D, are summarized below in Table 4.3.

Table 4.3 – Summary of Seismic Parameters

Parameter	Value
Soil Site Class	D
Spectral Response Acceleration, 0.2 Sec, S_{DS}	0.181 g
Spectral Response Acceleration, 1.0 Sec, S_{D1}	0.114 g
Seismic Performance Zone	1

As indicated in the table above, the Seismic Performance Zone (SPZ) is 1, based on S_{D1} and Table 3.15.2-1 in the IDOT Bridge Manual, the Soil Site Class D, and Figure 2.3.10-2 in the IDOT Bridge Manual. According to IDOT, seismic parameters and a detailed analyses are not necessary for structures in SPZ 1.

4.4 Scour

The proposed structure does not cross a river or other tributary; therefore, scour is not anticioated at this location.

4.5 Mining Activity

According to the Illinois State Geological Survey (ISGS) website, Tazewell County, Illinois Coal Mines and Industrial Mineral Mines map, dated August 25, 2017, obtained from the ISGS website (http://www.isgs.illinois.edu/research/coal/maps/county), mining has occurred at and around the project location. An interactive IL Mines map (http://isgs.illinois.edu/ilmines) by the ISGS shows an indefinite boundary of an underground mine and underground mine proximity region near the project area.

The listed disclaimer indicates locations of some features on the mine map may be offset by 500 feet or more due to errors in the original source maps, the compilation process, digitizing, or a combination of these factors.

No visual indication of surface or subsurface mining activities was evident at the project location. KEG's site observations did not detect any apparent depressions which could indicate a mine subsidence or shafts beneath the project location. Refer to Illinois State Geological Survey Mine Map for Tazewell County, Exhibit F, for additional information.

4.6 Liquefaction

A liquefaction analysis is not required to be performed for structures located in SPZ 1. Therefore, liquefaction was not considered as a reduction for the pile design capacity or other foundation considerations included herein.

4.7 Approach Slab

In accordance with the IDOT Bridge Manual, KEG has evaluated the foundation soils at the approach slabs for bearing capacity and excessive settlement. With proper compaction of the abutment wall backfill, the bearing capacity and settlement requirements of the IDOT Bridge Manual will be satisfied.

5.0 Foundation Evaluations and Design Recommendations

5.1 General Feasibility

ABD Memo 12.3 Integral Abutment Feasiblity Analysis was used to review what pile types may be applicable for support of this structure using integral abutments. Based on that review, the IDOT Static Method of Estimating Pile Length provided by IDOT BBS Foundations and Geotechnical Unit was used to determine the design length of a range of piles as summarized below. Based on the boring logs, and the results of the pile design analysis, Metal Shell Pile support of the structure foundations may be the optimal option with respect to the depths required in the underlying glacial tills.

5.2 Pile Supported Foundations

The foundations supporting the proposed bridge must provide sufficient support to resist dead and live loads. The IDOT Static Method uses the LRFD Pile Design Guide Procedure to estimate the pile lengths (IDOT Static Method of Estimating Pile Length, Exhibit G).

The factored reactions and the preliminary design loads, as provided by Maurer-Stutz are provided in Table 5.2. The Nominal Required Bearing (R_N) represents the resistance the pile will experience during driving, as well as assist the contractor in selecting a proper hammer size. The Factored Resistance Available (R_F) documents the net long term axial factored pile capacity available at the top of the pile to support factored substructure loadings.

Table 5.2 – Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
North Abutment	1,850
South Abutment	1,850
Pier	4,230

The estimated pile lengths for applicable Metal shell and H pile types are shown in Tables 5.2.1 – 5.2.7 below. The Nominal Required Bearing (R_N) represents the resistance the pile will experience during driving, and will assist the contractor in selecting a proper hammer size. The Factored Resistance Available (R_F) documents the net long-term axial factored pile capacity available at the top of the pile to support factored substructure loadings.

Table 5.2.1 – Estimated Pile Lengths for MS 14" w/ 0.312 wall Metal-Shell Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	204	112	39	727.7
	321	176	49	727.7
	497	273	59	727.7
	570	313	69	727.7
Pier SB-3	416	229	56	707.2
	484	266	66	707.2
	521	287	76	707.2
	570	313	86	707.2
South Abutment SB-1	245	135	38	727.4
	426	235	48	727.4
	482	265	58	727.4
	570	313	68	727.4

Table 5.2.2 – Estimated Pile Lengths for MS 16" w/0.312 wall Metal-Shell Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	237	131	39	727.7
	383	211	49	727.7
	607	334	59	727.7
	654	360	69	727.7
Pier SB-3	493	271	56	707.2
	575	316	66	707.2
	615	338	76	707.2
	654	360	86	707.2
South Abutment SB-1	284	156	38	727.4
	508	279	48	727.4
	572	315	58	727.4
	654	360	68	727.4

Table 5.2.3 – Estimated Pile Lengths for HP 12x53 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	302	166	99	727.7
	384	211	149	727.7
	401	220	159	727.7
	418	230	169	727.7
Pier SB-3	239	132	96	707.2
	390	214	166	707.2
	408	225	176	707.2
	418	230	186	707.2
South Abutment SB-1	364	200	98	727.4
	385	211	108	727.4
	405	223	118	727.4
	418	230	128	727.4

Table 5.2.4 – Estimated Pile Lengths for HP 12x63 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	305	168	99	727.7
	388	213	149	727.7
	471	259	199	727.7
	497	273	214	727.7
Pier SB-3	242	133	96	707.2
	356	196	146	707.2
	470	258	206	707.2
	497	273	221	707.2
South Abutment SB-1	367	202	98	727.4
	388	214	108	727.4
	472	260	148	727.4
	497	273	168	727.4

Table 5.2.5 – Estimated Pile Lengths for HP 14x73 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	373	205	99	727.7
	470	259	149	727.7
	568	312	199	727.7
	578	318	204	727.7
Pier SB-3	294	162	96	707.2
	433	238	146	707.2
	567	312	206	707.2
	578	318	211	707.2
South Abutment SB-1	448	247	98	727.4
	473	260	108	727.4
	572	315	148	727.4
	578	318	158	727.4

Table 5.2.6 – Estimated Pile Lengths for HP 14x89 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	378	208	99	727.7
	476	262	149	727.7
	575	316	199	727.7
	705	388	260	727.7
Pier SB-3	298	164	96	707.2
	439	242	146	707.2
	575	316	206	707.2
	705	388	261	707.2
South Abutment SB-1	455	250	98	727.4
	579	319	148	727.4
	629	346	168	727.4
	705	388	198	727.4

Table 5.2.7 – Estimated Pile Lengths for HP 14x117 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment SB-5	388	213	99	727.7
	528	291	169	727.7
	730	401	269	727.7
	929	511	369	727.7
Pier SB-3	306	168	96	707.2
	497	273	166	707.2
	727	400	266	707.2
	929	511	356	707.2
South Abutment SB-1	467	257	98	727.4
	492	271	108	727.4
	721	397	198	727.4
	929	511	280	727.4

As shown in the Tables above and in IDOT Static Method of Estimating Pile Length, Exhibit G, scour, downdrag and liquefaction have not been considered at the substructure locations.

KEG recommends one test pile be performed at an abutment location. A test pile is performed prior to production driving so that actual, on-site field data can be gathered to determine pile driving requirements for the project. This also is the manner in which the contractor's proposed equipment and methodologies identified in their Pile Installation Plan can be assessed.

5.3 Lateral Pile Response

Generally, the geotechnical engineer provides soil parameters to the structural engineer so that an L-Pile program or other approved software can be used for the lateral or displacement analysis of the foundations. Table 5.3 is included for the structural engineer's use in determining lateral pile response.

Table 5.3 – Soil Parameters for Lateral Pile Load Analysis

Boring	Elev. at Bottom of Layer	γ (pcf)	Short Term		Long Term		N	Assumed % fines < #200	K (pci)	ε50
			Φ (deg.)	c (psf)	Φ (deg.)	c (psf)				
SB-1	710.7	120	0	2000	26	100	8	60	500	0.007
	700.7	120	0	850	26	100	9	60	100	0.01
	690.7	120	0	2200	26	100	16	60	1000	0.005
	686.2	125	0	2500	28	100	17	80	1000	0.005
	654.2	125	0	3100	28	250	24	80	1000	0.005
	629.2	125	0	3600	28	250	39	80	1000	0.005
SB-2	695.5	120	0	1500	26	100	12	60	500	0.007
	683.0	125	0	3300	28	100	13	60	1000	0.005
	678.0	105	0	2200	28	100	27	60	1000	0.005
	673.0	125	38	--	38	--	25	25	60	n/a
	631.5	125	0	2500	28	250	23	80	1000	0.005
SB-3	705.4	120	0	1600	26	100	8	60	500	0.007
	632.9	125	0	2900	26	100	19	60	1000	0.005
	591.4	125	0	3500	28	250	30	80	1000	0.005
SB-4	706.8	105	0	1100	28	100	9	60	500	0.007
	704.3	125	38	--	38	--	10	25	60	n/a
	699.3	105	0	700	28	100	6	60	100	0.01
	681.8	120	0	1250	26	100	12	60	500	0.007
	676.8	125	38	--	38	--	16	25	60	n/a
	661.8	125	0	1250	28	100	12	60	500	0.007
	651.8	125	38	--	38	--	22	25	60	n/a
	630.3	125	0	2200	28	250	24	80	1000	0.005
SB-5	722.3	120	26	2000	26	100	9	60	500	0.007
	715.3	125	28	2500	28	100	11	80	1000	0.005
	699.8	120	26	600	26	50	7	60	100	0.01
	659.8	125	28	1500	28	250	17	80	500	0.007
	649.8	125	38	--	38	--	47	25	60	n/a
	628.3	125	28	2300	28	250	37	80	1000	0.005

6.0 Construction Considerations

6.1 Construction Activities

Construction activities should be performed in accordance with the current IDOT Standard Specifications for Road and Bridge Construction, all applicable Supplemental Specifications and Recurring Special Provisions, and any pertinent Special Provisions or Policies.

6.2 Temporary Sheeting and Soil Retention

Temporary sheeting may be required at various stages of this project, due to the proposed construction sequence. The IDOT Temporary Sheet Piling Design Guide and Charts and Spreadsheet were used to review a maximum retained height of 8.75 feet to indicate that Cantilevered Sheet Piling Systems are feasible. Table 6.2, below, summarizes the retained height versus required embedment depth and applicable section modulus. The design spreadsheets are included in Exhibit H, for additional information.

Table 6.2 – Temporary Sheet Pile Design Parameters

Location	Reference Boring	Retained Height (Feet)	Embedment Depth (Feet)	Section Modulus (IN.^{3}/Foot)
North Abutment - Stage II	SB-5	8.75	12.77	9.18
South Abutment – Stage II	SB-1	8.75	6.56	4.90

Temporary Soil Retention Systems may be required versus Cantilevered Sheet Piling, depending upon the surcharge loading conditions to be supported during construction. An Illinois-licensed Structural Engineer is required to seal the design of Temporary Soil Retention Systems, if deemed necessary.

6.3 Site and Soil Conditions

Should any bridge or embankment design considerations assumed by either IDOT or KEG change, KEG should be contacted to verify if the recommendations stated in this report still apply.

6.4 Foundation Construction

Conventional pile driving equipment and methodologies should be assumed. Protective tips should be provided for the piles.

As indicated above, due to the existing structure currently being supported on piles driven with a batter, the proposed piles may be impacted. Efforts should be utilized to remove the existing driven piles within the footprint of the proposed replacement substructures, or the new piles should be driven to miss the existing piles.

A JULIE locate shall be conducted to determine if any underground utilities are present in the area of the proposed structure prior to construction. Any utilities that may interfere with construction shall be moved by the owner. If utilities become a problem during construction, the appropriate owner shall be contacted immediately.

7.0 Computations

Computations and analyses for special circumstances, if any, are included as Exhibits. Please refer to each section of the report for reference to the Exhibit containing any such calculations or analysis used.

8.0 Geotechnical Data

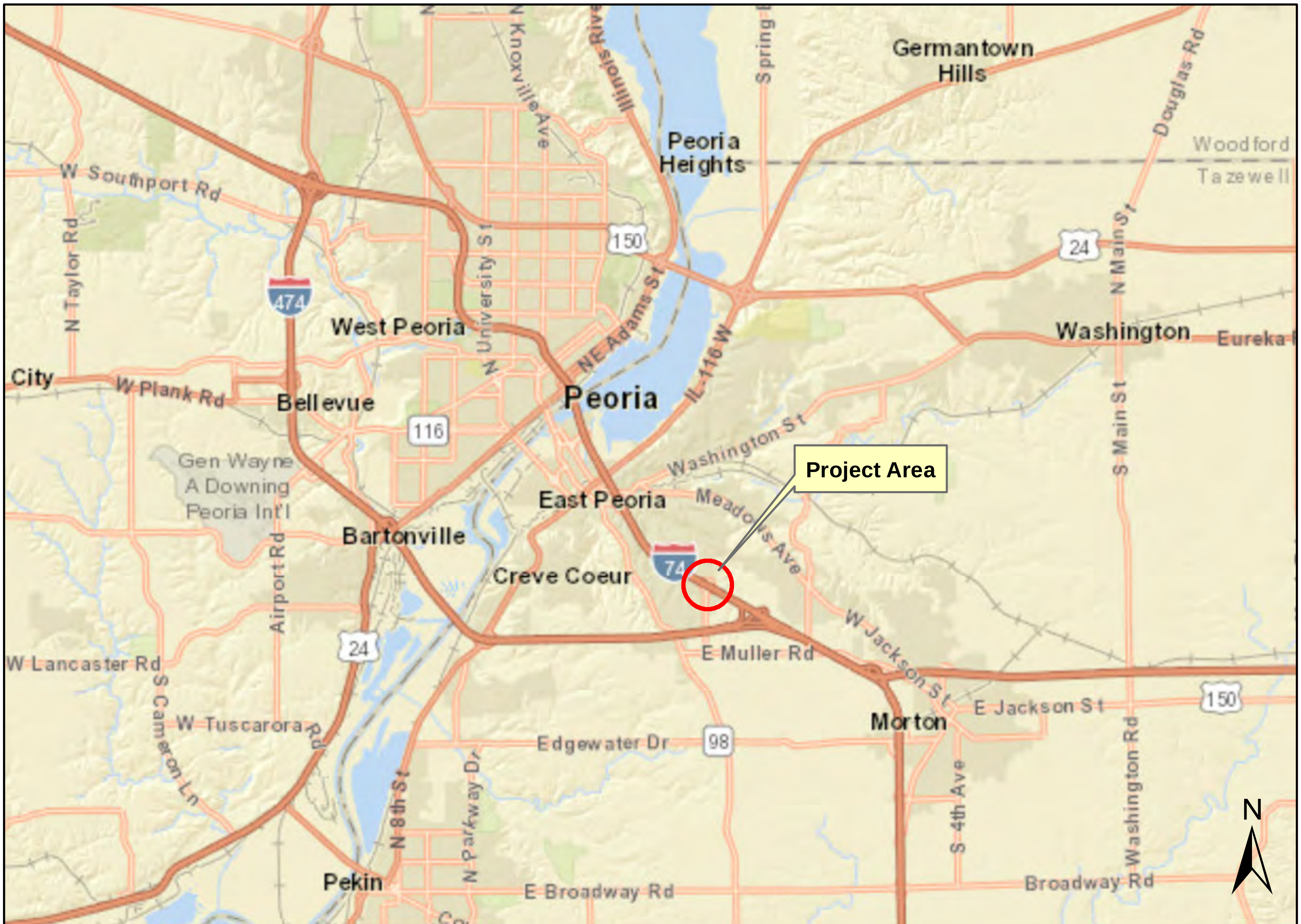
Soil boring logs can be found in Exhibit C. The Subsurface Profile can be found in Exhibit D.

9.0 Limitations

The recommendations provided herein are for the exclusive use of Maurer-Stutz and IDOT. They are specific only to the project described and are based on the subsurface information obtained at five boring locations by KEG within the proposed bridge area; KEG's understanding of the project as described herein, and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. KEG should be contacted if conditions encountered during construction are not consistent with those described.

EXHIBIT A

LOCATION MAP



Kaskaskia
Engineering Group, LLC
208 E. Main St., Suite 100
Belleville, Illinois 62220
618.233.5877 phone
618.233.5977 fax
www.kaskaskiaeng.com

PROFESSIONAL REGISTRATIONS	LICENSE NO.
Illinois Professional Design Firm	184.004773
Professional Engineering Group	20-5080586

LOCATION MAP

Pinecrest Drive over I-74 (F.A.I. 74)
Job No. P-94-010-09 & D-94-060-09
Existing S.N. 090-0091
Tazewell County, Illinois

Exhibit No.

A

KEG JOB #15-1062.00

EXHIBIT B

TYPE, SIZE, AND LOCATION PLAN (TS&L)

Benchmark – Chiseled square on north end of parapet wall at northeast corner of S.N. 090-0091. Elev. 733.04.
Existing Structure – S.N. 090-0091; Built in 1959 as F.A.I. Rt. 5, Section 90-14HB-1 at Sta. 363+40.81. Original structure was a 4-span continuous steel girder bridge, 33'-8" wide by 200'-2" long, with pile bent abutments and 3-column reinforced concrete piers. The structure was widened to 65'-2" in 1982 with a new concrete deck and additional steel girders, Section 90-14HB-1(BR). Several beams over the interstate below have been required to be replaced or straightened in 1993, 2008, 2010, 2012, and 2018 due to vehicular impact. The existing structure will be removed and replaced utilizing stage construction to maintain one lane of traffic in each direction on Pinecrest Drive.
Salvage – None.

HIGHWAY CLASSIFICATION

Pinecrest Drive – F.A.U. Rte. 6720	Interstate 74 – F.A.I. Rte. 74
Functional Class: Minor Arterial	Functional Class: Interstate
ADT: 4850 (2016); 6220 (2041)	ADT: 41300 (2017); 52440 (2041)
ADTT: 365 (2016); 468 (2041)	ADTT: 5500 (2017); 6984 (2041)
DHV: 622	DHV: 5244
Design Speed: 45 m.p.h.	Design Speed: 75 m.p.h.
Posted Speed: 40 m.p.h.	Posted Speed: 70 m.p.h.
Two-Way Traffic	Two-Way Traffic
Directional Distribution: 50:50	Directional Distribution: 50:50

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

LOADING HL-93

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

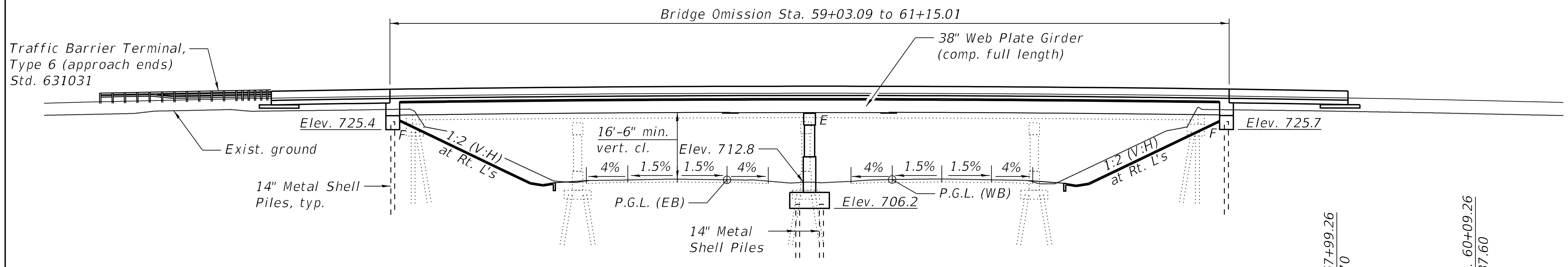
DESIGN STRESSES

FIELD UNITS

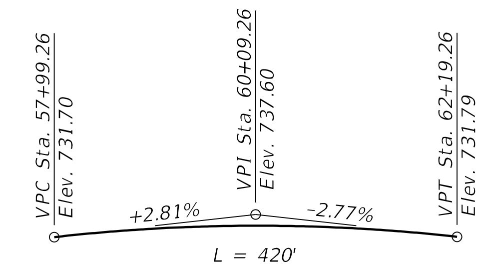
f'c = 3,500 psi
f'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50) (primary)
fy = 36,000 psi (M270 Grade 36)
All Structural Steel shall be Galvanized

SEISMIC DATA

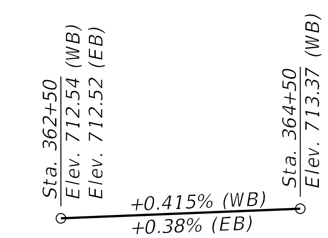
Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.114 g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.181 g
Soil Site Class = D



ELEVATION

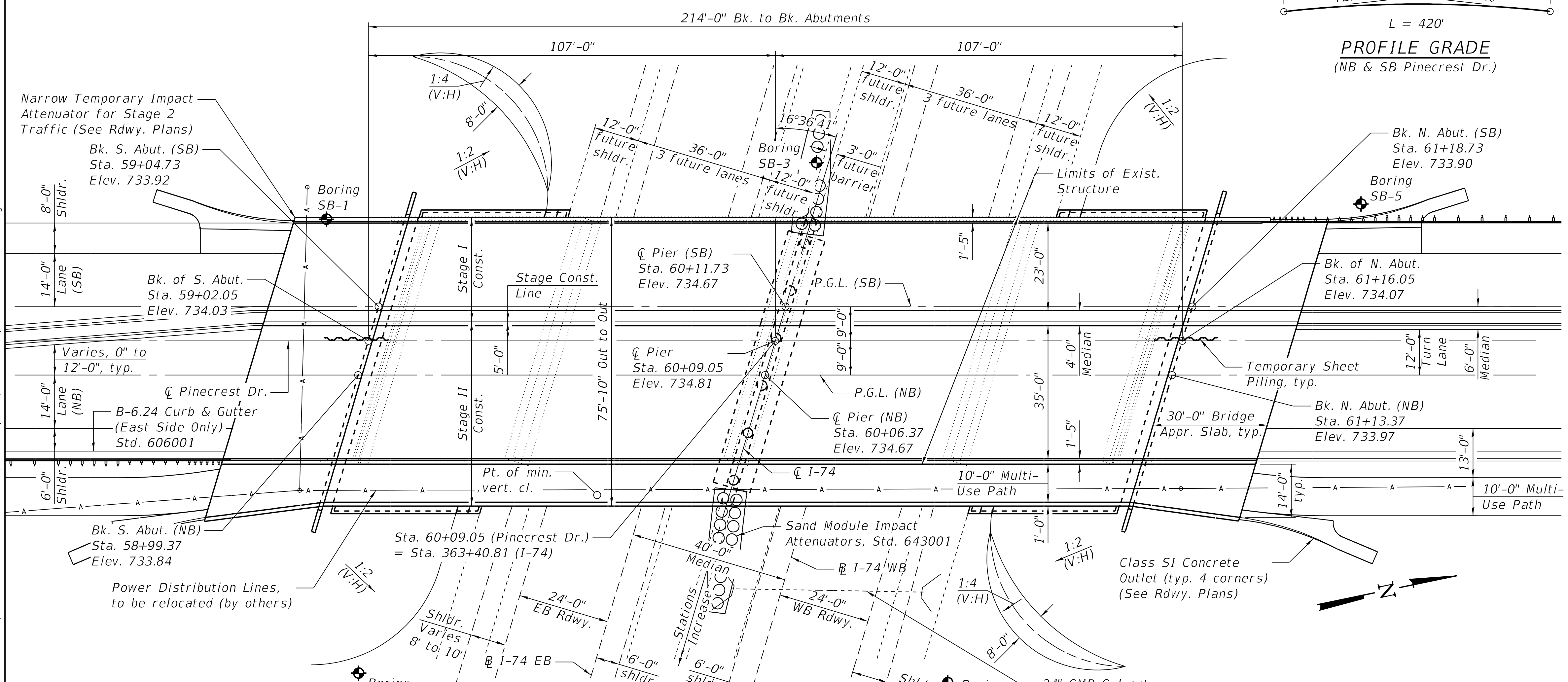


PROFILE GRADE
(NB & SB Pinecrest Dr.)

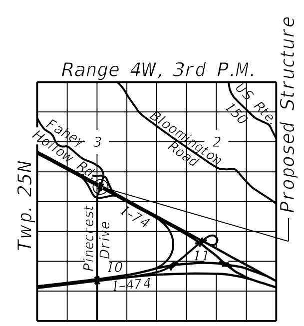


PROFILE GRADE
(℄ I-74 EB & WB)

Note: Slope wall elevations shall be set to accommodate future I-74 three-lane configuration with 16'-9" vertical clearance.



PLAN



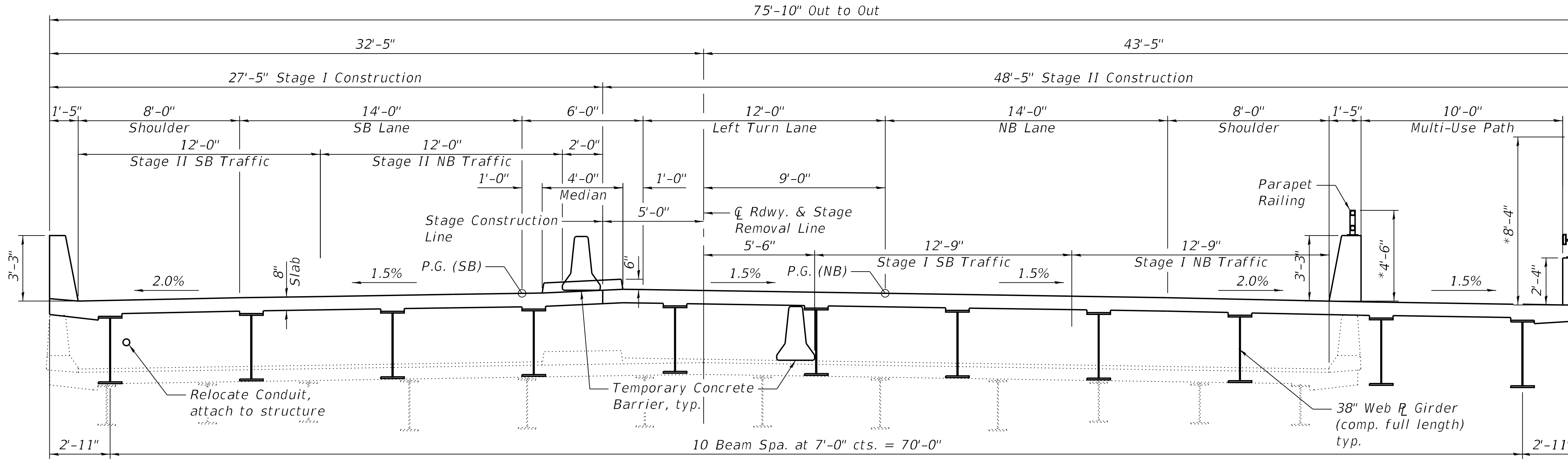
LOCATION SKETCH

GENERAL PLAN
PINECREST DRIVE OVER
INTERSTATE 74
F.A.I. 74 – SEC. (90-14HB-1)BR1
TAZEWELL COUNTY
STA. 363+40.81
STRUCTURE NO. 090-0181

MAURER-STUTZ ENGINEERS SURVEYORS	USER NAME = baswanson	DESIGNED - BAS	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	SHEET NO. 1 OF 2 SHEETS
		CHECKED - RJA	REVISED -		
	PLOT SCALE =	DRAWN - BAS	REVISED -		
	PLOT DATE = 2/1/2019	CHECKED -	REVISED -		

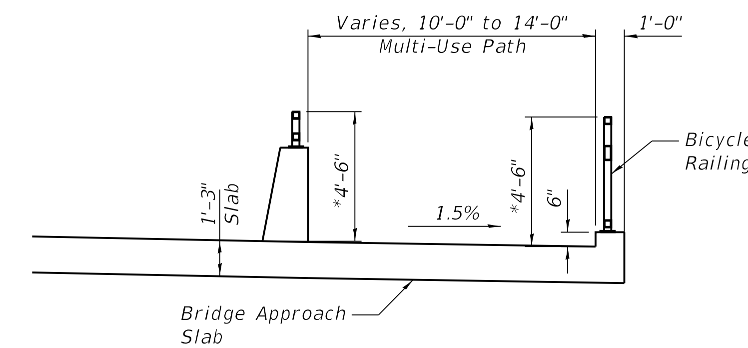
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(90-14HB-1)BR1	TAZEWELL		
		CONTRACT NO. 68894		
		ILLINOIS FED. AID PROJECT		

MODEL: Default
FILE NAME: S:\237\2016\23716001.00 (177-009 D4 Pinecrest Struct Replace Ph I)\CAD\CADD Sheets\0900181-68894-000-TSL.dgn
2/1/2019 3:57:58 PM

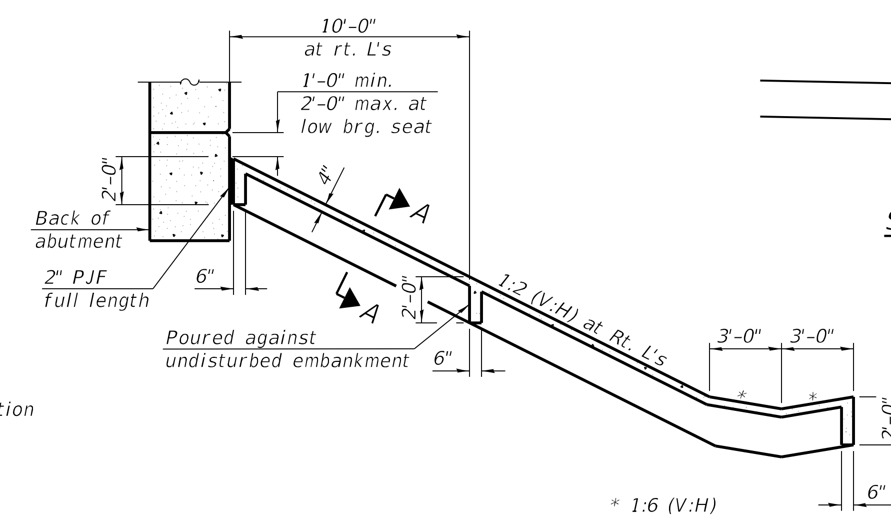


* Subject to change during final design

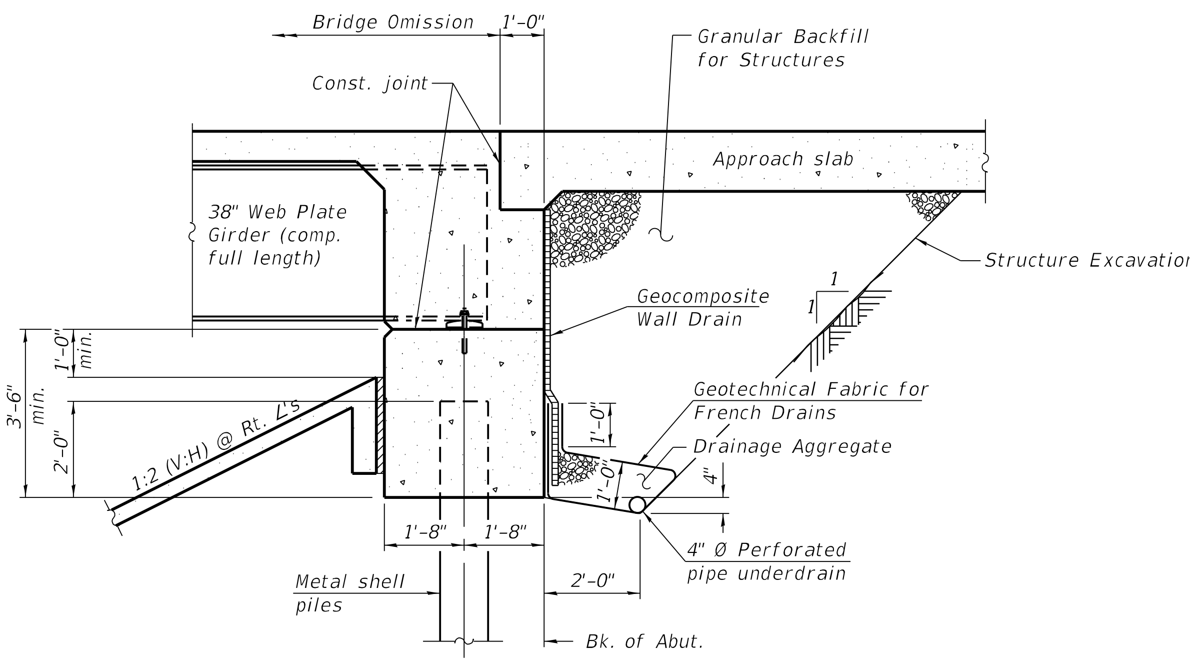
CROSS SECTION
(Looking North)



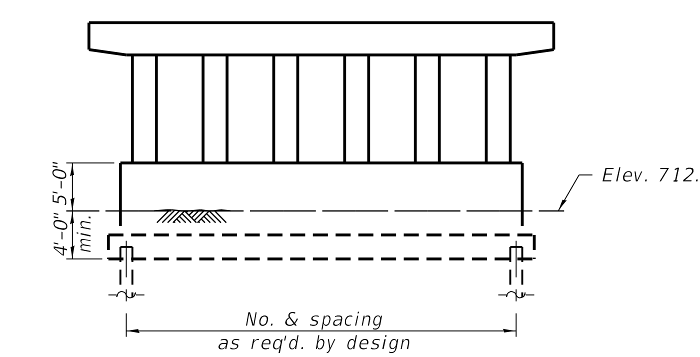
SECTION ON APPROACH SLAB
(Looking North)



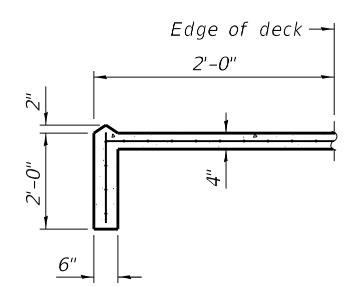
SECTION THRU CONCRETE SLOPEWALL



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



PIER SKETCH



SECTION A-A

GENERAL PLAN
PINECREST DRIVE OVER
INTERSTATE 74
F.A.I. 74 - SEC. (90-14HB-1)BR1
TAZEWELL COUNTY
STA. 363+40.81
STRUCTURE NO. 090-0181

MAURER-STUTZ ENGINEERS SURVEYORS

USER NAME = baswanson	DESIGNED - BAS	REVISED -
	CHECKED - RJA	REVISED -
PLOT SCALE =	DRAWN - BAS	REVISED -
PLOT DATE = 2/1/2019	CHECKED -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(90-14HB-1)BR1	TAZEWELL		

CONTRACT NO. 68894

ILLINOIS FED. AID PROJECT

MODEL: Default
FILE NAME: S:\237\2016\23716001.00 (177-009 D4 Pinecrest Struct Replace Ph I)\CADD\CADD Sheets\0900181-68894-000-TSL.dgn

2/1/2019 3:24:25 PM

EXHIBIT C

BORING LOGS

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/22/18

ROUTE FAI 74 (I-74) **DESCRIPTION** South Abutment for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-1
Station 363+43.88
Offset 122.2 ft RT
Ground Surface Elev. 729.19 ft

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

Groundwater Elev.:
First Encounter 704.2 ft ▼
Upon Completion ______ ft
After ____ **Hrs.** ______ ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
TOPSOIL				
728.19				
SILTY CLAY: Brown, medium		2 2 4	2.0 B	25
becomes stiff	-5	3 4 5	0.9 S	18
		3 4 5	2.6 B	26
becomes gray, medium	-10	3 4 4	3.1 B	26
		3 3 3	1.4 B	26
becomes stiff	-15	3 4 5	1.7 B	26
		3 5 6	2.3 S	27
710.69				
SILTY CLAY: Gray, medium LL 29 PL 19 PI 10	-20	2 3 4	0.5 B	24

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY: Gray, medium *(continued)*		4 5 6	0.5 B	18
becomes brown to gray	▼-25	3 4 5	1.7 B	18
becomes brown, trace sand and gravel		3 3 6	0.7 B	18
700.69				
SILTY CLAY: Brown, trace gravel	-30	5 6 7	1.8 B	15
becomes gray, trace gravel, very stiff	-35	5 8 12	2.6 B	15
690.69				
CLAY: Gray, trace gravel, very stiff	-40	5 7 11	3.0 B	16

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
Kaskaskia Engineering

SOIL BORING LOG

Date 1/22/18

ROUTE FAI 74 (I-74) **DESCRIPTION** South Abutment for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-1
Station 363+43.88
Offset 122.2 ft RT
Ground Surface Elev. 729.19 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 704.2 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, very stiff *(continued)*				
		5 6 10	1.9 B	17
	-45			
		5 8 13	3.1 B	13
	-50			
	-55			
<low recovery> contains gravel		7 12 13		22
	-60			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, very stiff *(continued)*				
	-65			
trace gravel		7 12 14	3.1 B	12
	-70			
	-75			
becomes hard		11 16 19	3.6 B	13
	-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
Kaskaskia Engineering

SOIL BORING LOG

Date 1/22/18

ROUTE FAI 74 (I-74) **DESCRIPTION** South Abutment for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-1
Station 363+43.88
Offset 122.2 ft RT
Ground Surface Elev. 729.19 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 704.2 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, very stiff *(continued)*				
	-85			
contains gravel		12		
		16		18
	-90	22		
	-95			
		12		
		20	0.8	24
629.19	-100	24	B	

End of Boring

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

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/24/18

ROUTE FAI 74 (I-74) **DESCRIPTION** South Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W, **Latitude** , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-2
Station 364+55.81
Offset 80.0 ft RT
Ground Surface Elev. 711.52 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 702.5 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY: Brown, stiff		4 / 5 / 5	0.7 B	19
becomes brown to red, medium	-5	2 / 2 / 3	0.3 B	26
becomes brown to gray		2 / 3 / 3	1.1 B	20
becomes stiff ▼	-10	2 / 5 / 7	0.5 B	23
becomes brown, trace gravel		5 / 6 / 9	3.9 B	16
698.02 — SILTY CLAY: Brown to gray, very stiff; LL 24 PL 13 PI 11	-15	7 / 10 / 11	2.9 B	17
695.52 — CLAY: Gray, stiff		5 / 6 / 8	3.1 B	13
	-20	5 / 6 / 8	4.0 B	13

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, stiff *(continued)*		5 / 5 / 8	2.5 B	14
becomes dark gray	-25	5 / 4 / 7	2.6 B	18
trace gravel			4.3 P	24
683.02 — CLAYEY SILT: Gray, very stiff	-30	6 / 11 / 16	2.2 B	14
678.02 — SAND: Gray, medium to coarse grained, medium dense	-35	14 / 15 / 10		11
673.02 — CLAY: Gray, trace gravel	-40	6 / 8 / 12	3.2 B	13

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

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/24/18

ROUTE FAI 74 (I-74) **DESCRIPTION** South Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-2
Station 364+55.81
Offset 80.0 ft RT
Ground Surface Elev. 711.52 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 702.5 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel *(continued)*				
with gravel <low recovery>		10		
		12	2.3	16
	-45	15	P	
trace gravel		5		
		8	2.6	14
	-50	11	B	
	-55			
		16		
		11	3.7	13
	-60	15	B	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel *(continued)*				
	-65			
		7		
		8	2.6	12
	-70	13	B	
	-75			
wood fragments				
trace organics		8		
		10	0.9	29
631.52	-80	14	B	

End of Boring

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

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/25/18

ROUTE FAI 74 (I-74) **DESCRIPTION** Center Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-3
Station 362+92.81
Offset 3.0 ft RT
Ground Surface Elev. 711.44 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 704.4 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAYEY SILT: Brown to gray, stiff				
		5 4 5	1.9 S	23
becomes medium	-5	3 3 4	1.2 B	21
705.44				
SILT CLAY: Brown, wet, stiff ▼		3 4 7	1.7 B	17
	-10	4 6 7	0.5 P	14
becomes very stiff		7 7 14	3.1 B	14
becomes gray	-15	5 6 10	4.0 B	14
		6 7 11	3.8 B	14
becomes stiff	-20	5 6 9	2.5 B	15

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILT CLAY: Brown, wet, stiff *(continued)*				
SHELBY TUBE RECOVERY: 24" LL 22 PL 12 PI 10			3.7 UNC	13
trace gravel, very stiff	-25	6 7 10	3.9 B	14
<cobbles while augering>		5 50	3.3 B	14
becomes stiff <slow augering - cobbles>	-30	5 6 9	3.2 B	14
becomes very stiff	-35	7 8 12	1.0 P	15
	-40	5 6 11	3.0 B	14

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
Kaskaskia Engineering

SOIL BORING LOG

Date 1/25/18

ROUTE FAI 74 (I-74) **DESCRIPTION** Center Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W, **Latitude** , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-3
Station 362+92.81
Offset 3.0 ft RT
Ground Surface Elev. 711.44 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 704.4 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILT CLAY: Brown, wet, stiff *(continued)*				
		5		
		7	2.7	15
	-45	10	B	
		7		
		6	2.1	14
	-50	11	B	
	-55			
		6		
		7	1.7	16
	-60	11	B	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILT CLAY: Brown, wet, stiff *(continued)*				
	-65			
		7		
		10	3.4	13
	-70	11	B	
	-75			
632.94				
CLAY: trace gravel		11		
		12	4.2	20
LL 33 PL 20 PI 13	-80	14	B	

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
Kaskaskia Engineering

SOIL BORING LOG

Date 1/25/18

ROUTE FAI 74 (I-74) **DESCRIPTION** Center Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-3
Station 362+92.81
Offset 3.0 ft RT
Ground Surface Elev. 711.44 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 704.4 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: trace gravel *(continued)*				
	-85			
becomes dark gray		9		
		11	1.6	27
	-90	12	B	
	-95			
becomes gray, hard		9		
		14	4.4	18
	-100	18	B	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: trace gravel *(continued)*				
	-105			
becomes very stiff, contains gravel		10		
		12	3.5	15
	-110	15	P	
	-115			
becomes hard, trace gravel		13		
		17	4.0	13
591.44	-120	24	B	
End of Boring				

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

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/24/18

ROUTE FAI 74 (I-74) **DESCRIPTION** North Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W, **Latitude** , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-4
Station 364+20.81
Offset 67.0 ft LT
Ground Surface Elev. 710.31 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 703.3 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAYEY SILT: Brown to gray, stiff		3		
		4	1.1	23
		5	B	
706.81				
SAND: Brown, loose		8		
		4		6
	-5	6		
704.31				
CLAYEY SILT: Brown to gray, medium ▼		3		
		3	0.7	16
		3	B	
		3		
		4	0.7	19
	-10	3	B	
699.31				
SILTY CLAY: Brown to gray, trace gravel, stiff		2		
		6	0.6	18
		5	B	
			1.4	14
Attempted Shelby Tube - Hit Gravel			B	
	-15			
becomes brown, trace gravel		3		
		4	1.5	17
		7	B	
			1.5	
SHELBY TUBE RECOVERY: 24"			P	
	-20			

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY: Brown to gray, trace gravel, stiff *(continued)*				
becomes gray, trace gravel		4		
		5	0.4	15
		7	B	
		4		
		5	0.8	15
	-25	6	B	
		4		
		5	2.6	15
		10	B	
681.81				
SAND: Gray, fine grained, medium dense		7		
		8		19
	-30	8		
676.81				
CLAY: Gray, trace gravel, stiff		10		
		6	1.0	14
	-35	4	B	
			--	--
Attempted Shelby Tube - NO RECOVERY	-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)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/24/18

ROUTE FAI 74 (I-74) **DESCRIPTION** North Pier for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W, **Latitude** , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-4
Station 364+20.81
Offset 67.0 ft LT
Ground Surface Elev. 710.31 ft

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

Groundwater Elev.:
First Encounter 703.3 ft ▼
Upon Completion ____ ft
After ____ **Hrs.** ____ ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, stiff *(continued)*				
		3		
		5	1.5	14
	-45	7	B	
661.81				
SAND: Gray, medium to coarse grained, medium dense		8		
		9		12
	-50	13		
	-55			
651.81				
CLAY: Gray, trace gravel, very stiff		7		
		10	3.1	15
	-60	14	B	

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, very stiff *(continued)*				
	-65			
		6		
		9	2.6	14
	-70	11	B	
	-75			
		10		
		13	0.8	27
630.31	-80	16	B	
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)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/23/18

ROUTE FAI 74 (I-74) **DESCRIPTION** North Abutment for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-5
Station 362+62.29
Offset 137.3 ft LT
Ground Surface Elev. 728.32 ft

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

Groundwater Elev.:
First Encounter 703.3 ft ▼
Upon Completion ______ ft
After ____ **Hrs.** ______ ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY: Brown, stiff		3 4 7	2.0 B	25
becomes medium	-5	3 3 4	1.9 S	27
722.32 CLAY: Gray, very stiff		5 7 9	4.0 P	18
becomes stiff	-10	5 5 7	0.7 B	27
becomes medium		3 3 3	2.6 B	25
715.32 SILTY CLAY: Gray to brown, soft SHELBY TUBE RECOVERY: 13" LL 30 PL 21 PI 9 One - Dimensional Consolidation Test Performed	-15		0.5 P	26
becomes stiff		3 4 6	0.9 B	27
	-20	2 1 3	0.2 B	28

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY: Gray to brown, soft *(continued)* becomes gray, medium		2 3 3	0.2 B	23
	▼ -25	4 4 5	0.0 B	22
SHELBY TUBE RECOVERY: 15" LL 26 PL 13 PI 13			1.9 UNC	15
699.82 CLAY: Gray, trace gravel, very stiff	-30	20 9 9	1.8 P	14
	-35	6 8 9	2.2 B	20
becomes stiff	-40	3 6 7	1.0 B	15

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

Illinois Department of Transportation
Division of Highways
Kaskaskia Engineering

SOIL BORING LOG

Date 1/23/18

ROUTE FAI 74 (I-74) **DESCRIPTION** North Abutment for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W, **Latitude** , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-5
Station 362+62.29
Offset 137.3 ft LT
Ground Surface Elev. 728.32 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 703.3 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, very stiff *(continued)*				
becomes very stiff		7		
		8	2.2	14
	-45	12	B	
contains gravel <low recovery>		5		
		7	<0.25	21
	-50	11	P	
	-55			
		6		
		9		23
	-60	11		

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, very stiff *(continued)*				
	-65			
659.82				
SAND: Gray, medium to coarse grained, dense		26		
		24		9
	-70	23		
	-75			
649.82				
CLAY: Gray, trace gravel, hard		12		
		16	3.3	13
	-80	24	B	

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
Kaskaskia Engineering

SOIL BORING LOG

Date 1/23/18

ROUTE FAI 74 (I-74) **DESCRIPTION** North Abutment for Pinecrest Drive over I-74 **LOGGED BY** TC

SECTION (90-14HB-1)BR-1 **LOCATION** , **SEC.** 3, **TWP.** 25N, **RNG.** 4W,
Latitude , **Longitude**

COUNTY Tazewell **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** AUTO

STRUCT. NO. 090-0091
Station 383+40.81

BORING NO. SB-5
Station 362+62.29
Offset 137.3 ft LT
Ground Surface Elev. 728.32 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 703.3 ft ▼
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY: Gray, trace gravel, hard *(continued)*				
	-85			
		11		
		14	3.0	14
	-90	22	B	
	-95			
		9		
		16	0.5	42
628.32	-100	21	B	

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)

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ONE-DIMENSIONAL CONSOLIDATION TEST

AASHTO T 216 / ASTM D 2435

Project: Pinecrest Drive over Interstate 74
Client: Kaskaskia Engineering
Soil Sample ID: Boring SB-5, ST#6, 13 to 15 feet
Sample Description: Gray SI CLAY LOAM to SI LOAM

Tested by: M. Snider
Prepared by: M. Snider
Test date: 2/8/2018
WEI: 1294-04-01

Initial sample height =	1.006	in
Initial sample mass =	153.59	g
Initial water content =	25.52%	
Initial dry unit weight =	94.19	pcf
Initial void ratio =	0.776	
Initial degree of saturation =	88.20%	
Final sample mass =	151.39	g
Final dry sample mass =	122.36	g
Final water content =	23.73%	
Final dry unit weight =	102.61	pcf
Final void ratio =	0.630	
Final degree of saturation =	100.00%	
Estimated specific gravity =	2.68	

Ring diameter =	2.503	in
Ring mass =	109.79	g
Initial sample and ring mass =	263.38	g
Tare mass =	67.54	g
Final ring and sample mass =	261.61	g
Mass of wet sample and tare =	218.93	g
Mass of dry sample and tare =	189.90	g
Initial dial reading =	0.01000	in
Final dial reading =	0.09258	in
LL =	30	%
PL =	21	%
% Sand =	NA	
% Silt =	NA	
% Clay =	NA	
In-Situ Vertical Effective Stress =	1600	psf

Compression and Swelling Indices

Compression index C_c =	0.128
Field corrected C_c =	0.135
Swelling index C_s =	0.018

Preconsolidation pressure, s_C

Casagrande Method =	2201	psf
Over-Consolidation Ratio (OCR) =	1.38	

Load number	Vertical stress	Dial reading	System deflection	Vertical strain	Void ratio	C_v	Cae	Elapsed time
	psf	in	in	%		ft^2/day	%	min
1	100.0	0.01106	0.00010	0.12	0.774	N/A	N/A	720
2	200.0	0.01298	0.00023	0.32	0.770	0.0599	0.18	720
3	500.0	0.01791	0.00058	0.84	0.761	0.2009	0.05	720
4	1000.0	0.02418	0.00090	1.50	0.749	0.1712	0.10	720
5	2000.0	0.03442	0.00135	2.56	0.730	0.1662	0.09	720
6	4000.0	0.04802	0.00193	3.97	0.705	0.1840	0.17	720
7	8000.0	0.06421	0.00253	5.64	0.675	0.1819	0.22	1440
8	16000.0	0.08314	0.00324	7.59	0.641	0.1709	0.25	720
9	32000.0	0.10406	0.00413	9.76	0.602	0.1710	0.20	720
10	8000.0	0.10432	0.00295	9.67	0.604	N/A	N/A	720
11	2000.0	0.09949	0.00198	9.09	0.614	N/A	N/A	720
12	500.0	0.09364	0.00123	8.44	0.626	N/A	N/A	720

Prepared by: ______________________ Date: ______________

Checked by: ______________________ Date: ______________

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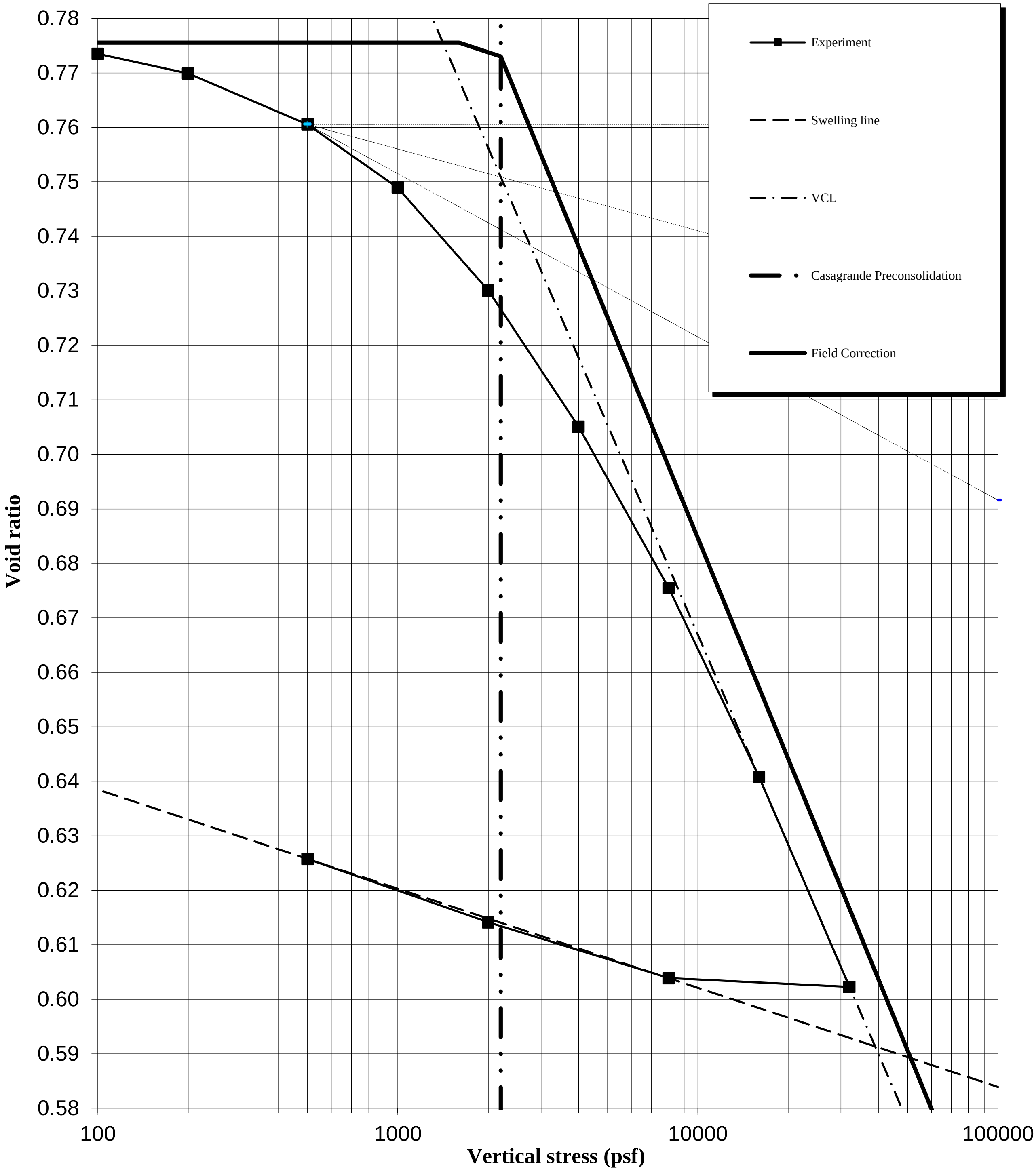
CONSOLIDATION CURVE

Sample SB-5, ST#6, 13 to 15 feet



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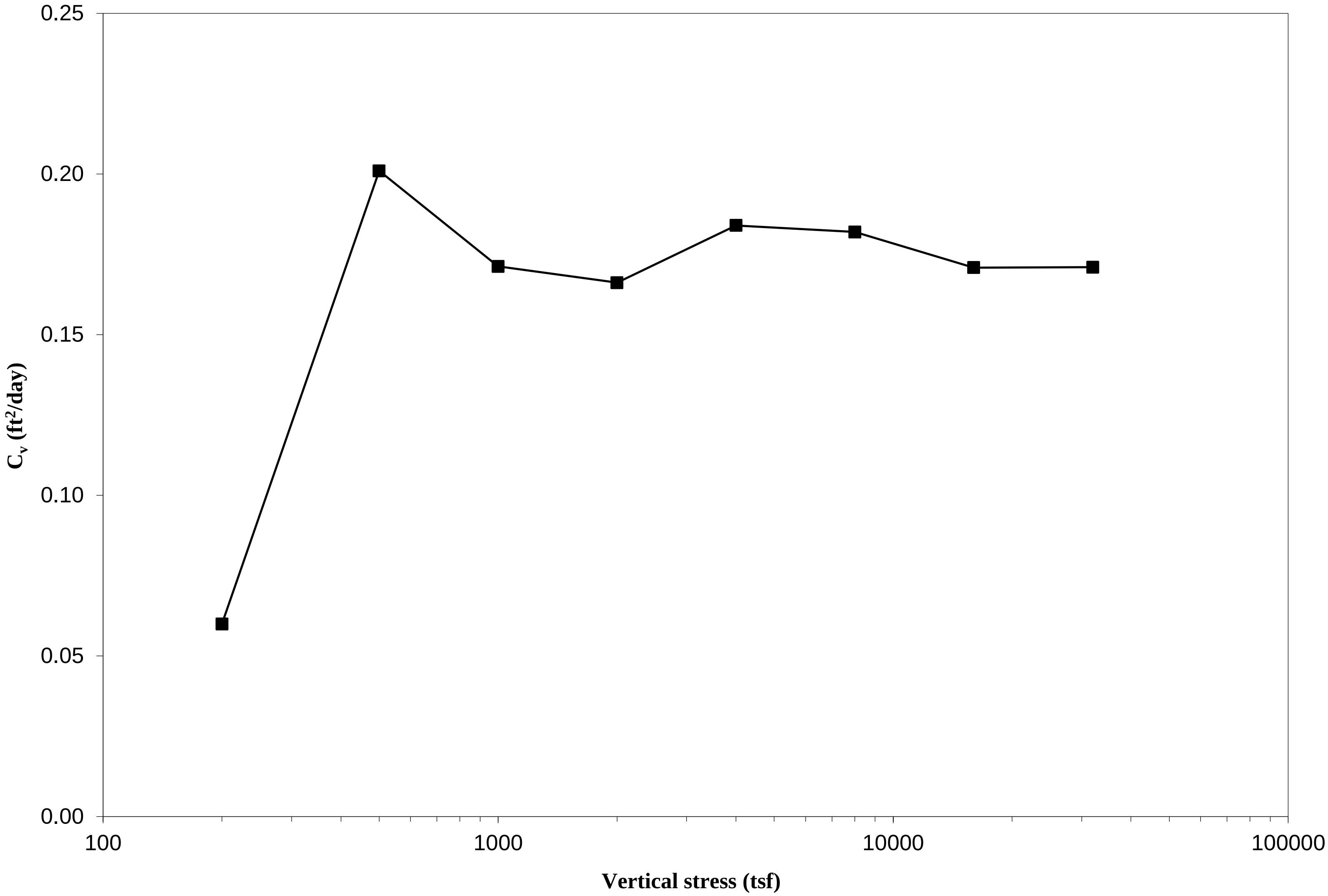
CONSOLIDATION COEFFICIENT (C_v) vs. VERTICAL STRESS

Sample SB-5, ST#6, 13 to 15 feet



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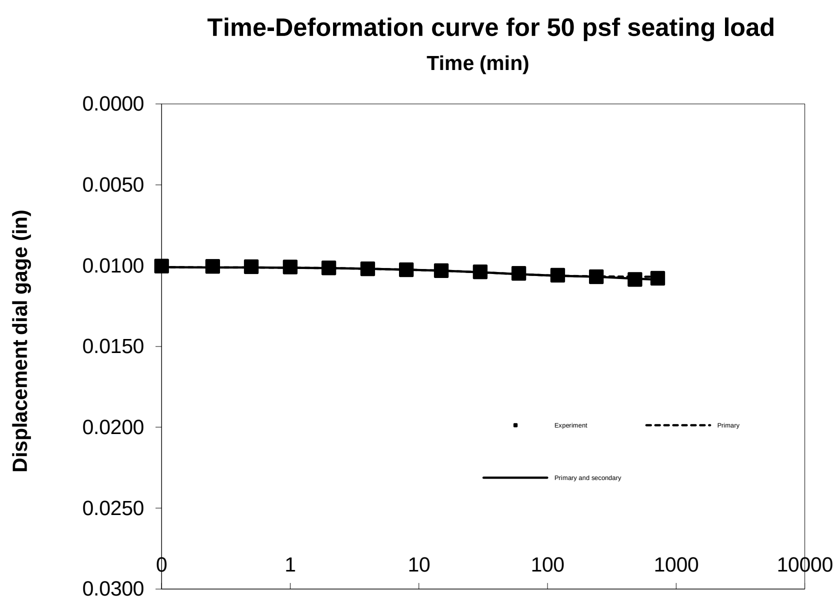
Applied stress	Elapsed time	Dial	Fitted Primary	Fitted Primary and Secondary
psf	min	in	in	in
50.0	*0.00*	0.01000	0.01007	0.01007
	0.10	0.01004	0.01009	0.01009
	0.25	0.01006	0.01010	0.01010
	0.50	0.01007	0.01012	0.01012
	1.00	0.01009	0.01013	0.01013
	2.00	0.01014	0.01016	0.01016
	4.00	0.01019	0.01020	0.01020
	8.00	0.01025	0.01025	0.01025
	15.00	0.01031	0.01031	0.01031
	30.00	0.01038	0.01041	0.01041
	60.00	0.01048	0.01053	0.01053
	120.00	0.01059	0.01063	0.01063
	240.00	0.01069	0.01067	0.01069
	480.00	0.01086	0.01068	0.01081
	720.00	0.01079	0.01068	0.01087

h_0 =	1.00600	in
U_s =	99%	
t_s =	216.50	min
d_s =	0.01067	in
d_0 =	0.01007	in
d_{100} =	0.01068	in
d =	0.50281	in
C_v =	0.0021	in^2/min
r_i =	9.3%	
r_p =	76.9%	
r_s =	13.8%	
Slope =	0.0004	
Intercept =	0.0098	
h_c =	1.0053	in
t_c =	211.41	min
C_{ae} =	0.036%	



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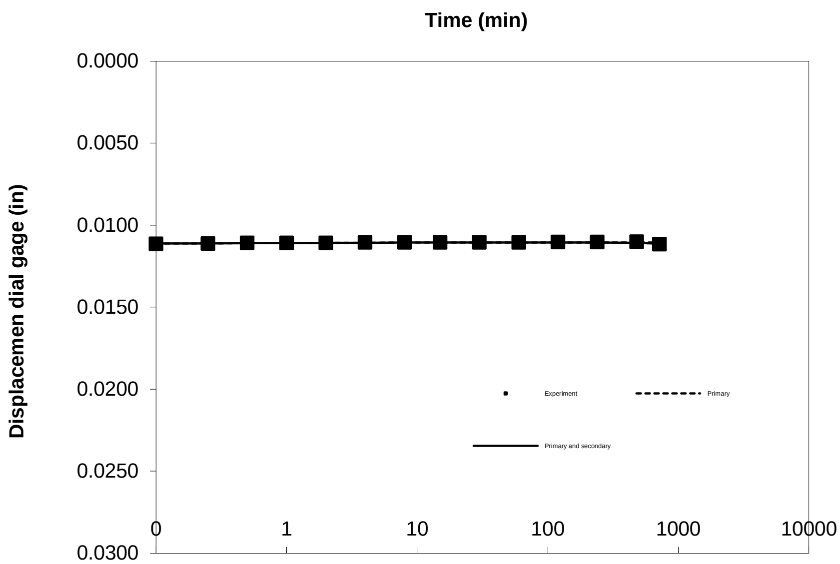
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
100.0	*0.00*	0.01078	0.01113	0.01113
	0.10	0.01115	0.01112	0.01112
	0.25	0.01114	0.01111	0.01111
	0.50	0.01109	0.01111	0.01111
	1.00	0.01110	0.01110	0.01110
	2.00	0.01109	0.01109	0.01109
	4.00	0.01106	0.01107	0.01107
	8.00	0.01106	0.01106	0.01106
	15.00	0.01106	0.01106	0.01106
	30.00	0.01105	0.01106	0.01106
	60.00	0.01105	0.01106	0.01106
	120.00	0.01105	0.01106	0.01106
	240.00	0.01103	0.01106	0.01106
	480.00	0.01102	0.01106	0.01109
	720.00	0.01117	0.01106	0.01113

h_0 =	1.00522	in
U_s =	99%	
t_s =	10.27	min
d_s =	0.01106	in
d_0 =	0.01113	in
d_{100} =	0.01106	in
d =	0.50245	in
C_v =	0.0438	in^2/min
r_i =	89.0%	
r_p =	-17.6%	
r_s =	28.6%	
Slope =	0.0003	
Intercept =	0.0104	
h_c =	1.0049	in
t_c =	388.34	min
C_{ae} =	0.026%	

Time-Deformation curve for 100 psf load



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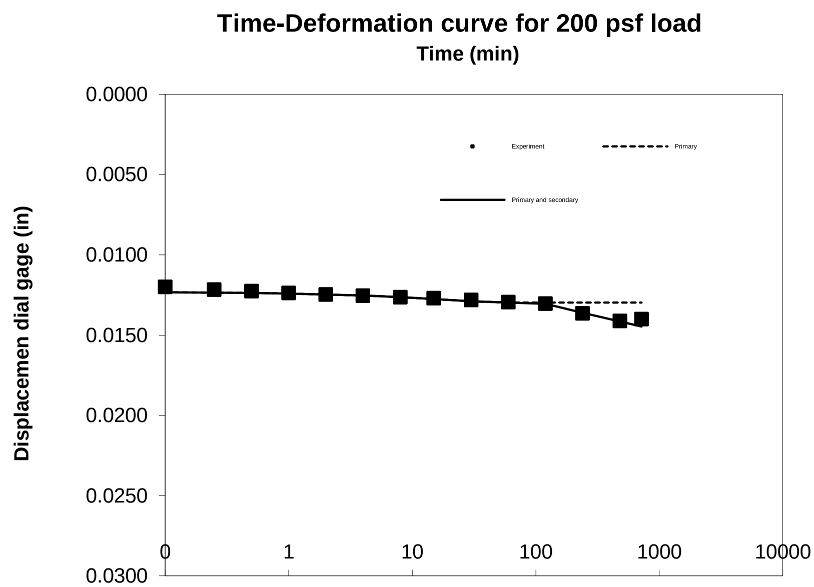
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
200.0	*0.00*	0.01118	0.01230	0.01230
	0.10	0.01199	0.01234	0.01234
	0.25	0.01216	0.01236	0.01236
	0.50	0.01226	0.01238	0.01238
	1.00	0.01237	0.01242	0.01242
	2.00	0.01246	0.01247	0.01247
	4.00	0.01254	0.01254	0.01254
	8.00	0.01263	0.01263	0.01263
	15.00	0.01270	0.01275	0.01275
	30.00	0.01281	0.01288	0.01288
	60.00	0.01295	0.01296	0.01296
	120.00	0.01303	0.01298	0.01305
	240.00	0.01364	0.01298	0.01360
	480.00	0.01413	0.01298	0.01415
	720.00	0.01400	0.01298	0.01447

h_0 =	1.00482	in
U_s =	99%	
t_s =	74.78	min
d_s =	0.01297	in
d_0 =	0.01230	in
d_{100} =	0.01298	in
d =	0.50168	in
C_v =	0.0060	in^2/min
r_i =	39.6%	
r_p =	24.2%	
r_s =	36.2%	
Slope =	0.0018	
Intercept =	0.0093	
h_c =	1.0030	in
t_c =	109.06	min
C_{ae} =	0.181%	



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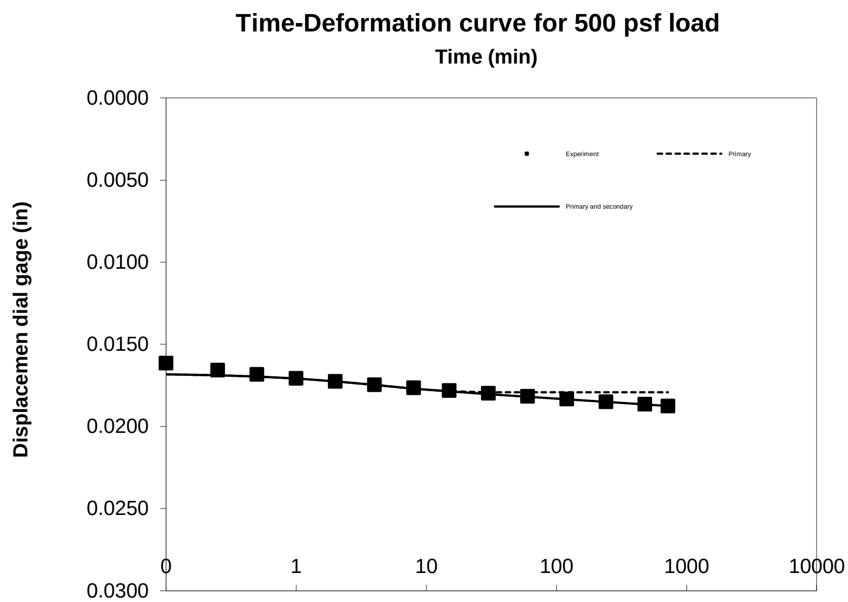
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
500.0	*0.00*	0.01398	0.01669	0.01669
	0.10	0.01615	0.01681	0.01681
	0.25	0.01658	0.01689	0.01689
	0.50	0.01683	0.01697	0.01697
	1.00	0.01707	0.01708	0.01708
	2.00	0.01726	0.01724	0.01724
	4.00	0.01746	0.01746	0.01746
	8.00	0.01765	0.01771	0.01771
	15.00	0.01781	0.01786	0.01786
	30.00	0.01798	0.01791	0.01803
	60.00	0.01817	0.01791	0.01819
	120.00	0.01834	0.01791	0.01834
	240.00	0.01851	0.01791	0.01850
	480.00	0.01865	0.01791	0.01865
	720.00	0.01877	0.01791	0.01874

h_0 =	1.00202	in
U_s =	99%	
t_s =	22.10	min
d_s =	0.01790	in
d_0 =	0.01669	in
d_{100} =	0.01791	in
d =	0.49935	in
C_v =	0.0201	in^2/min
r_i =	56.6%	
r_p =	25.5%	
r_s =	17.9%	
Slope =	0.0005	
Intercept =	0.0173	
h_c =	0.9981	in
t_c =	17.34	min
C_{ae} =	0.052%	



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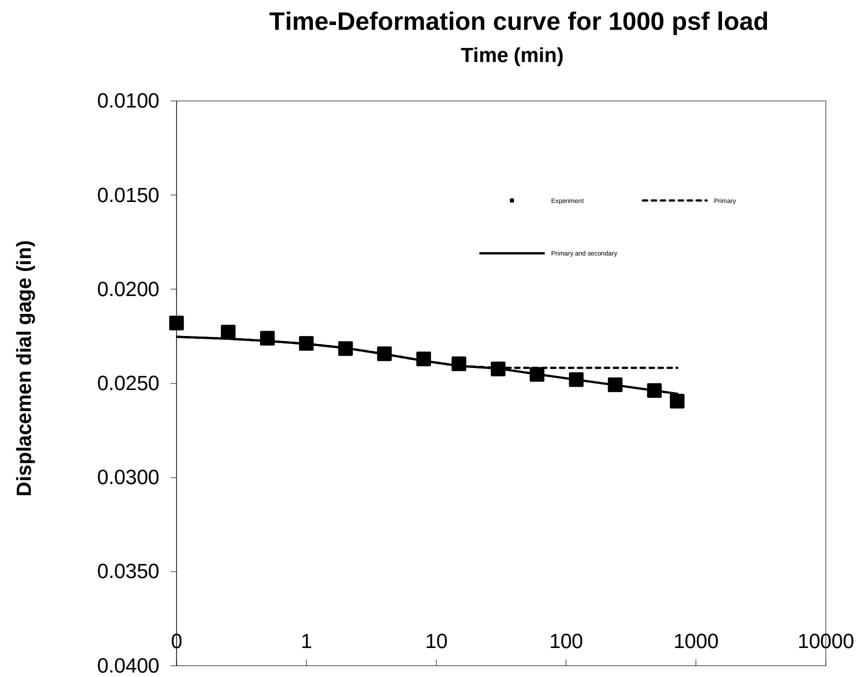
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
1000.0	*0.00*	0.01911	0.02236	0.02236
	0.10	0.02179	0.02253	0.02253
	0.25	0.02229	0.02263	0.02263
	0.50	0.02260	0.02274	0.02274
	1.00	0.02288	0.02290	0.02290
	2.00	0.02315	0.02313	0.02313
	4.00	0.02343	0.02344	0.02344
	8.00	0.02370	0.02380	0.02380
	15.00	0.02396	0.02407	0.02407
	30.00	0.02423	0.02417	0.02421
	60.00	0.02452	0.02418	0.02451
	120.00	0.02480	0.02418	0.02480
	240.00	0.02508	0.02418	0.02509
	480.00	0.02538	0.02418	0.02538
	720.00	0.02595	0.02418	0.02554

h_0 =	0.99689	in
U_s =	99%	
t_s =	25.63	min
d_s =	0.02416	in
d_0 =	0.02236	in
d_{100} =	0.02418	in
d =	0.49637	in
C_v =	0.0171	in^2/min
r_i =	47.5%	
r_p =	26.6%	
r_s =	25.9%	
Slope =	0.0010	
Intercept =	0.0228	
h_c =	0.9918	in
t_c =	27.00	min
C_{ae} =	0.097%	



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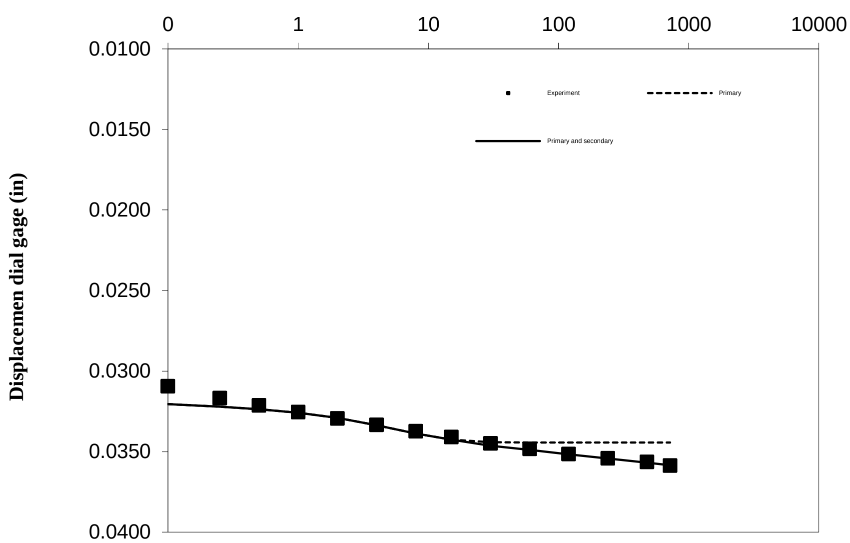
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
2000.0	*0.00*	0.02676	0.03181	0.03181
	0.10	0.03094	0.03206	0.03206
	0.25	0.03169	0.03220	0.03220
	0.50	0.03213	0.03236	0.03236
	1.00	0.03256	0.03259	0.03259
	2.00	0.03295	0.03291	0.03291
	4.00	0.03334	0.03336	0.03336
	8.00	0.03374	0.03388	0.03388
	15.00	0.03410	0.03426	0.03426
	30.00	0.03449	0.03441	0.03462
	60.00	0.03484	0.03442	0.03490
	120.00	0.03517	0.03442	0.03516
	240.00	0.03543	0.03442	0.03542
	480.00	0.03565	0.03442	0.03569
	720.00	0.03587	0.03442	0.03584

h_0 =	0.98924	in
U_s =	99%	
t_s =	25.89	min
d_s =	0.03440	in
d_0 =	0.03181	in
d_{100} =	0.03442	in
d =	0.49144	in
C_v =	0.0166	in^2/min
r_i =	55.5%	
r_p =	28.7%	
r_s =	15.8%	
Slope =	0.0009	
Intercept =	0.0333	
h_c =	0.9816	in
t_c =	17.21	min
C_{ae} =	0.089%	

Time-Deformation curve for 2000 psf load



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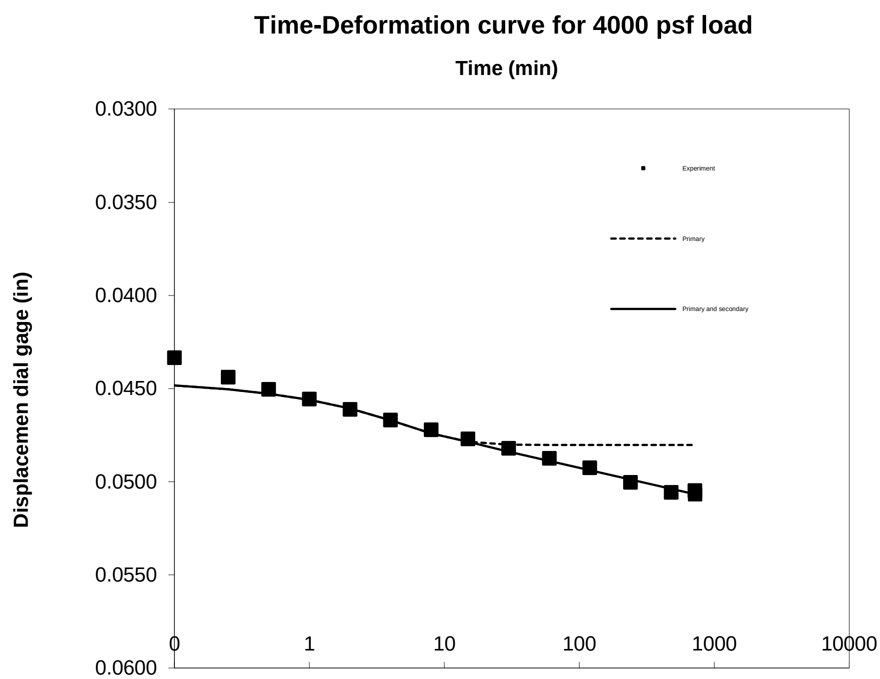
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
4000.0	0.00	0.03673	0.04448	0.04448
	0.10	0.04335	0.04484	0.04484
	0.25	0.04438	0.04504	0.04504
	0.50	0.04503	0.04527	0.04527
	1.00	0.04556	0.04560	0.04560
	2.00	0.04613	0.04606	0.04606
	4.00	0.04669	0.04670	0.04670
	8.00	0.04721	0.04741	0.04741
	15.00	0.04770	0.04786	0.04786
	30.00	0.04821	0.04801	0.04838
	60.00	0.04875	0.04802	0.04889
	120.00	0.04926	0.04802	0.04939
	240.00	0.05003	0.04802	0.04989
	480.00	0.05057	0.04802	0.05038
	720.00	0.05047	0.04802	0.05068

h_0 =	0.97927	in
U_s =	99%	
t_s =	22.76	min
d_s =	0.04798	in
d_0 =	0.04448	in
d_{100} =	0.04802	in
d =	0.48487	in
C_v =	0.0184	in^2/min
r_i =	56.4%	
r_p =	25.7%	
r_s =	17.9%	
Slope =	0.0017	
Intercept =	0.0459	
h_c =	0.9680	in
t_c =	17.91	min
C_{ae} =	0.171%	



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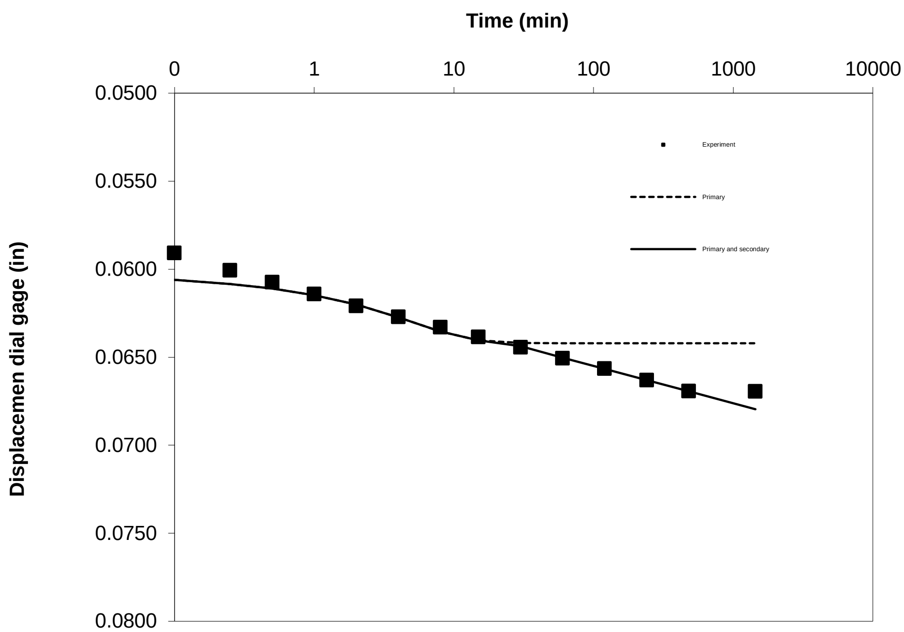
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
8000.0	0.00	0.05132	0.06019	0.06019
	0.10	0.05909	0.06060	0.06060
	0.25	0.06007	0.06083	0.06083
	0.50	0.06075	0.06110	0.06110
	1.00	0.06143	0.06147	0.06147
	2.00	0.06209	0.06201	0.06201
	4.00	0.06272	0.06273	0.06273
	8.00	0.06331	0.06354	0.06354
	15.00	0.06386	0.06404	0.06404
	30.00	0.06444	0.06420	0.06437
	60.00	0.06506	0.06421	0.06502
	120.00	0.06565	0.06421	0.06566
	240.00	0.06631	0.06421	0.06630
	480.00	0.06694	0.06421	0.06694
	1440.00	0.06695	0.06421	0.06796

h_0 =	0.96468	in
U_s =	99%	
t_s =	22.27	min
d_s =	0.06417	in
d_0 =	0.06019	in
d_{100} =	0.06421	in
d =	0.47690	in
C_v =	0.0182	in^2/min
r_i =	56.8%	
r_p =	25.7%	
r_s =	17.6%	
Slope =	0.0021	
Intercept =	0.0612	
h_c =	0.9518	in
t_c =	24.91	min
C_{ae} =	0.224%	

Time-Deformation curve for 8000 psf load



s:\netprojects\12940401\lab data\consolidation\ch13\lws_wang_mls_consol_20171017.xls

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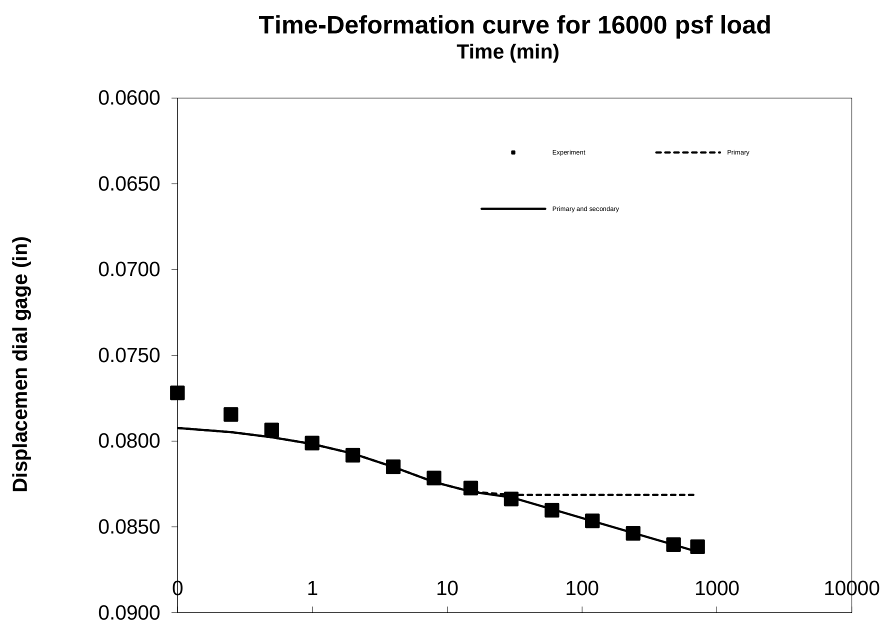
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
16000.0	*0.00*	0.06785	0.07880	0.07880
	0.10	0.07719	0.07923	0.07923
	0.25	0.07846	0.07948	0.07948
	0.50	0.07935	0.07977	0.07977
	1.00	0.08011	0.08017	0.08017
	2.00	0.08083	0.08073	0.08073
	4.00	0.08150	0.08151	0.08151
	8.00	0.08216	0.08239	0.08239
	15.00	0.08274	0.08294	0.08294
	30.00	0.08337	0.08313	0.08328
	60.00	0.08403	0.08314	0.08398
	120.00	0.08466	0.08314	0.08467
	240.00	0.08537	0.08314	0.08536
	480.00	0.08604	0.08314	0.08605
	720.00	0.08616	0.08314	0.08645

h_0 =	0.94815	in
U_s =	99%	
t_s =	22.78	min
d_s =	0.08309	in
d_0 =	0.07880	in
d_{100} =	0.08314	in
d =	0.46752	in
C_v =	0.0171	in^2/min
r_i =	59.8%	
r_p =	23.7%	
r_s =	16.5%	
Slope =	0.0023	
Intercept =	0.0799	
h_c =	0.9329	in
t_c =	25.86	min
C_{ae} =	0.246%	



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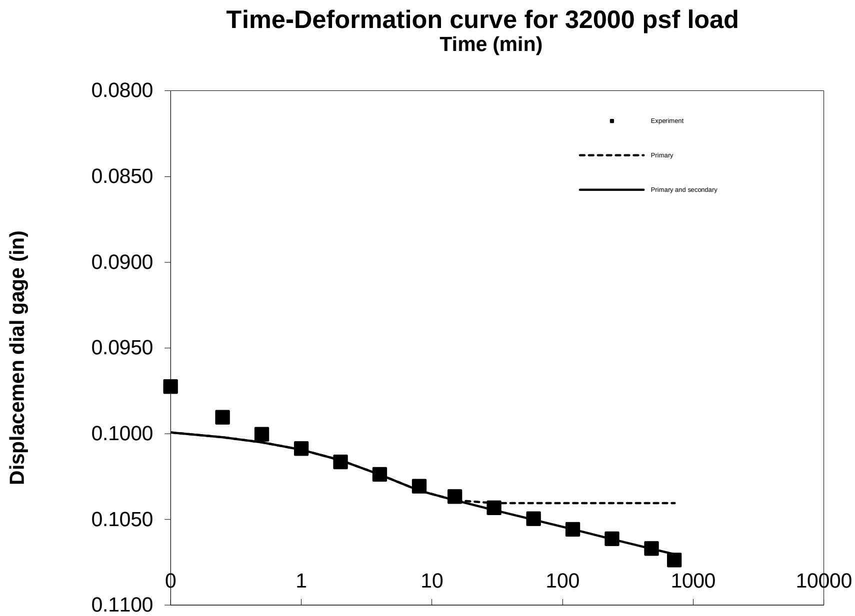
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
32000.0	*0.00*	0.08615	0.09946	0.09946
	0.10	0.09727	0.09993	0.09993
	0.25	0.09905	0.10020	0.10020
	0.50	0.10004	0.10051	0.10051
	1.00	0.10088	0.10094	0.10094
	2.00	0.10166	0.10156	0.10156
	4.00	0.10238	0.10239	0.10239
	8.00	0.10307	0.10332	0.10332
	15.00	0.10369	0.10388	0.10388
	30.00	0.10434	0.10405	0.10446
	60.00	0.10498	0.10406	0.10503
	120.00	0.10559	0.10406	0.10559
	240.00	0.10615	0.10406	0.10615
	480.00	0.10671	0.10406	0.10671
	720.00	0.10739	0.10406	0.10704

h_0 =	0.92985	in
U_s =	99%	
t_s =	21.77	min
d_s =	0.10401	in
d_0 =	0.09946	in
d_{100} =	0.10406	in
d =	0.45712	in
C_v =	0.0171	in^2/min
r_i =	62.6%	
r_p =	21.6%	
r_s =	15.7%	
Slope =	0.0019	
Intercept =	0.1017	
h_c =	0.9119	in
t_c =	18.13	min
C_{ae} =	0.205%	



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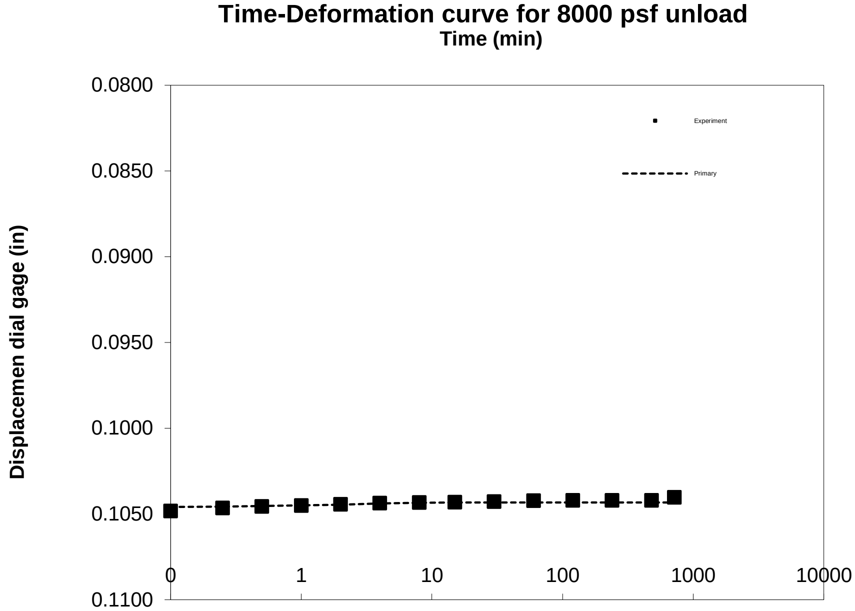
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
8000.0	*0.00*	0.10914	0.10463	0.10463
	0.10	0.10484	0.10459	0.10459
	0.25	0.10466	0.10457	0.10457
	0.50	0.10457	0.10454	0.10454
	1.00	0.10451	0.10451	0.10451
	2.00	0.10444	0.10445	0.10445
	4.00	0.10438	0.10439	0.10439
	8.00	0.10434	0.10434	0.10436
	15.00	0.10432	0.10432	0.10437
	30.00	0.10428	0.10432	0.10439
	60.00	0.10423	0.10432	0.10441
	120.00	0.10420	0.10432	0.10444
	240.00	0.10422	0.10432	0.10446
	480.00	0.10422	0.10432	0.10449
	720.00	0.10404	0.10432	0.10450

h_0 =	0.90686	in
U_s =	99%	
t_s =	13.42	min
d_s =	0.10432	in
d_0 =	0.10463	in
d_{100} =	0.10432	in
d =	0.45576	in
C_v =	0.0276	in^2/min
r_i =	91.6%	
r_p =	6.3%	
r_s =	2.1%	
Slope =	-0.0001	
Intercept =	0.1044	
h_c =	0.9117	in
t_c =	4.69	min
C_{ae} =	0.009%	

Time-Deformation curve for 8000 psf unload



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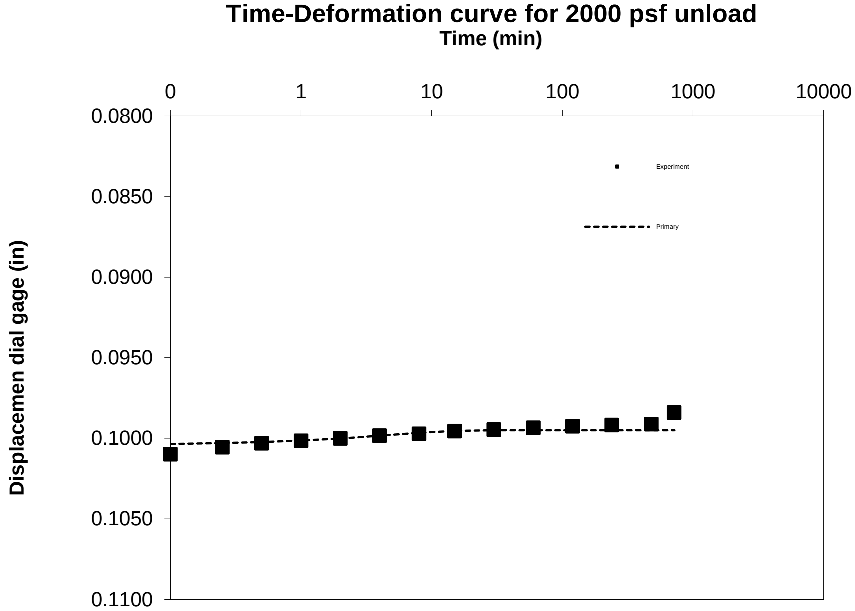
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
2000.0	*0.00*	0.10413	0.10045	0.10045
	0.10	0.10100	0.10035	0.10035
	0.25	0.10055	0.10029	0.10029
	0.50	0.10032	0.10023	0.10023
	1.00	0.10015	0.10014	0.10014
	2.00	0.10000	0.10002	0.10002
	4.00	0.09984	0.09985	0.09985
	8.00	0.09972	0.09965	0.09965
	15.00	0.09955	0.09953	0.09953
	30.00	0.09946	0.09949	0.09949
	60.00	0.09934	0.09949	0.09949
	120.00	0.09925	0.09949	0.09949
	240.00	0.09918	0.09949	0.09949
	480.00	0.09912	0.09949	0.09987
	720.00	0.09840	0.09949	0.10058

h_0 =	0.91187	in
U_s =	99%	
t_s =	22.39	min
d_s =	0.09950	in
d_0 =	0.10045	in
d_{100} =	0.09949	in
d =	0.45802	in
C_v =	0.0167	in^2/min
r_i =	64.3%	
r_p =	16.7%	
r_s =	19.0%	
Slope =	-0.0041	
Intercept =	0.1100	
h_c =	0.9165	in
t_c =	388.02	min
C_{ae} =	0.442%	

Time-Deformation curve for 2000 psf unload



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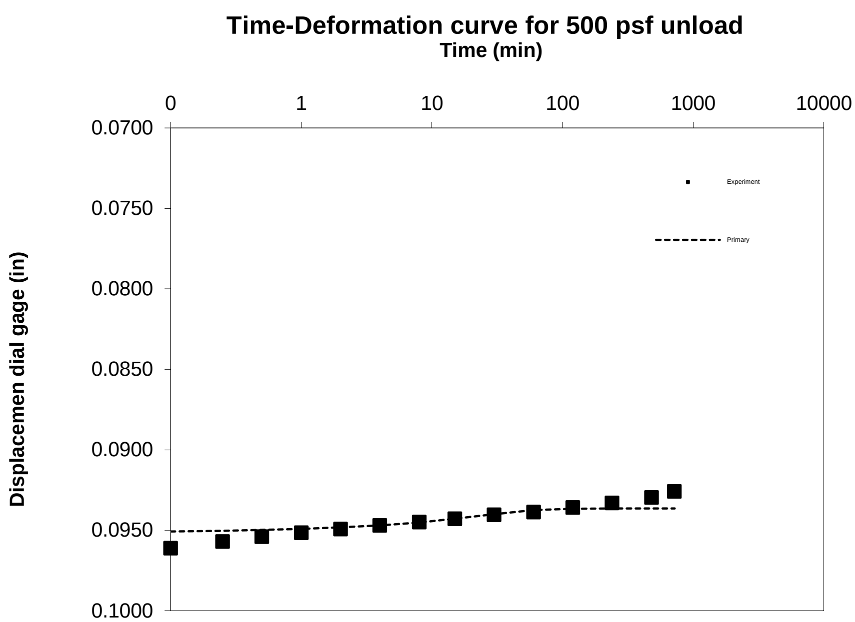
Applied stress psf	Elapsed time min	Dial in	Fitted Primary in	Fitted Primary and Secondary in
500.0	*0.00*	0.09835	0.09513	0.09513
	0.10	0.09611	0.09506	0.09506
	0.25	0.09571	0.09502	0.09502
	0.50	0.09540	0.09497	0.09497
	1.00	0.09515	0.09491	0.09491
	2.00	0.09492	0.09482	0.09482
	4.00	0.09470	0.09469	0.09469
	8.00	0.09449	0.09451	0.09451
	15.00	0.09429	0.09428	0.09428
	30.00	0.09405	0.09398	0.09398
	60.00	0.09387	0.09374	0.09374
	120.00	0.09360	0.09365	0.09370
	240.00	0.09330	0.09364	0.09398
	480.00	0.09298	0.09364	0.09427
	720.00	0.09258	0.09364	0.09444

h_0 =	0.91765	in
U_s =	99%	
t_s =	104.81	min
d_s =	0.09366	in
d_0 =	0.09513	in
d_{100} =	0.09364	in
d =	0.46081	in
C_v =	0.0036	in^2/min
r_i =	55.9%	
r_p =	25.7%	
r_s =	18.3%	
Slope =	-0.0010	
Intercept =	0.0956	
h_c =	0.9224	in
t_c =	107.22	min
C_{ae} =	0.105%	



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UNCONFINED COMPRESSIVE STRENGTH of COHESIVE SOIL

(AASHTO T 208 / ASTM D 2166)

Project: Pinecrest Dr. over I-74
Client: Kaaskaskia Engineering
WEI Job No.: 1294-04-01
Soil Sample ID: SB-3, ST#9 (21.0-23.0 ft.)
Type/Condition: ST/Undisturbed
Liquid Limit (%): 22
Plastic Limit (%): 12

Analyst name: A. Mohammed
Date received: 1/25/2018
Test date: 2/9/2018
Sample description: Brown&Gray LEAN CLAY (CL)

Sand(%): NA
Silt(%): NA
Clay(%): NA

Average initial height h_0 = 6.13 in
Average initial diameter d_0 = 2.87 in
Height to diameter ratio= 2.14
Mass of wet sample = 1484.77 g
Mass of dry sample and tare = 1328.80 g
Mass of tare = 13.46 g
Specific gravity = 2.70 (estimated)

Initial water content w = 12.88% (specimen)
Initial unit weight g = 142.50 pcf
Initial dry unit weight g_d = 126.24 pcf
Initial void ratio e_0 = 0.33
Initial degree of saturation S_r = 104%
Average Rate of Strain= 1%/min
Unconfined compressive strength q_u = 3.74 tsf
Shear Strength= 1.87 tsf

Displacement (in) Δh	Force (lbs) F	Strain (%) e	Stress (tsf) s
0.00	0.00	0.00	0.00
0.03	47.70	0.49	0.53
0.06	97.48	0.98	1.07
0.09	147.25	1.47	1.61
0.12	190.81	1.96	2.08
0.15	228.14	2.45	2.48
0.18	259.25	2.94	2.80
0.21	284.14	3.42	3.05
0.24	309.03	3.91	3.30
0.27	323.54	4.40	3.44
0.30	338.06	4.89	3.58
0.35	356.73	5.71	3.74
0.40	354.65	6.52	3.69
0.45	321.47	7.34	3.31
0.50	279.99	8.15	2.86
0.55	255.10	8.97	2.58
0.60	244.73	9.78	2.46
0.65	244.73	10.60	2.43
0.70	234.36	11.41	2.31
0.80	226.07	13.04	2.19
0.90	194.96	14.68	1.85
1.00	124.44	16.31	1.16

NOTES:

Prepared by: Jay Date: 2.15.18
Checked by: [signature] Date: 2/15/18

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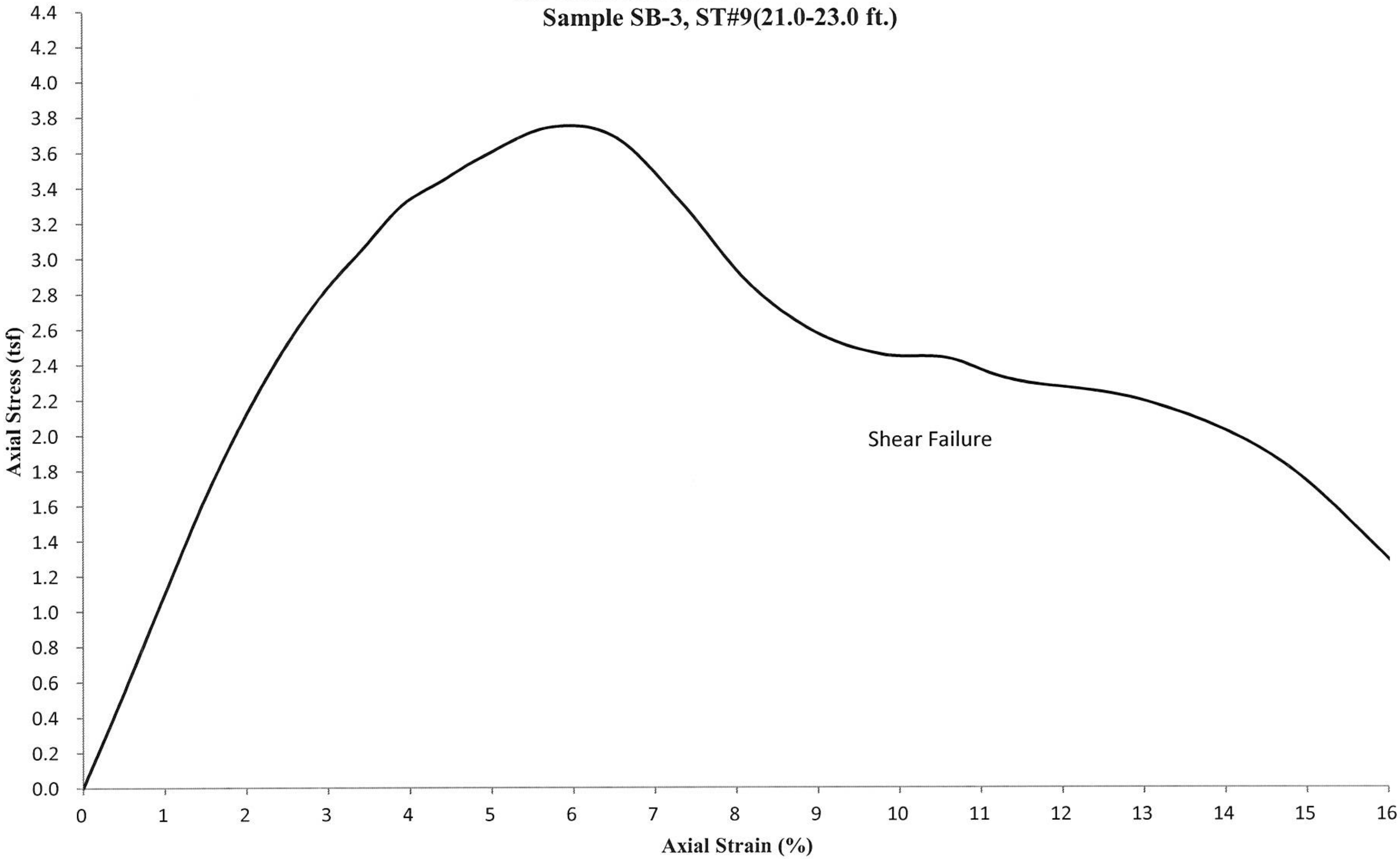
Unconfined Axial Stress v. Axial Strain
Sample SB-3, ST#9(21.0-23.0 ft.)



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UNCONFINED COMPRESSIVE STRENGTH of COHESIVE SOIL

(AASHTO T 208 / ASTM D 2166)

Project: Pinecrest Dr. over I-74
Client: Kaaskaskia Engineering
WEI Job No.: 1294-04-01
Soil Sample ID: SB-5, ST#11 (26.0-28.0 ft.)
Type/Condition: ST/Undisturbed
Liquid Limit (%): 26
Plastic Limit (%): 13

Analyst name: A. Mohammed
Date received: 1/25/2018
Test date: 2/9/2018
Sample description: Brown&Gray LEAN CLAY (CL)

Sand(%): NA
Silt(%): NA
Clay(%): NA

Average initial height h_0 = 6.10 in
Average initial diameter d_0 = 2.85 in
Height to diameter ratio= 2.14
Mass of wet sample = 1414.14 g
Mass of dry sample and tare = 1248.52 g
Mass of tare = 13.64 g
Specific gravity = 2.70 (estimated)

Initial water content w = 14.52% (specimen)
Initial unit weight g = 138.69 pcf
Initial dry unit weight g_d = 121.11 pcf
Initial void ratio e_0 = 0.39
Initial degree of saturation S_r = 100%
Average Rate of Strain= 1%/min
Unconfined compressive strength q_u = 1.93 tsf
Shear Strength= 0.97 tsf

Displacement (in) Δh	Force (lbs) F	Strain (%) e	Stress (tsf) s
0.00	0.00	0.00	0.00
0.03	14.52	0.49	0.16
0.06	31.11	0.98	0.35
0.09	51.85	1.48	0.58
0.12	70.52	1.97	0.78
0.15	91.26	2.46	1.01
0.18	112.00	2.95	1.23
0.21	130.66	3.44	1.43
0.24	145.18	3.94	1.58
0.27	153.48	4.43	1.66
0.30	163.85	4.92	1.76
0.35	174.22	5.74	1.86
0.40	180.44	6.56	1.91
0.45	184.59	7.38	1.93
0.50	182.51	8.20	1.89
0.55	172.14	9.02	1.77
0.60	157.62	9.84	1.61
0.65	157.62	10.66	1.59
0.70	143.11	11.48	1.43
0.80	128.59	13.12	1.26
0.90	97.48	14.76	0.94
1.00	70.52	16.40	0.67

NOTES:

Prepared by: [signature] Date: 2.15.18

Checked by: [signature] Date: 2/15/18

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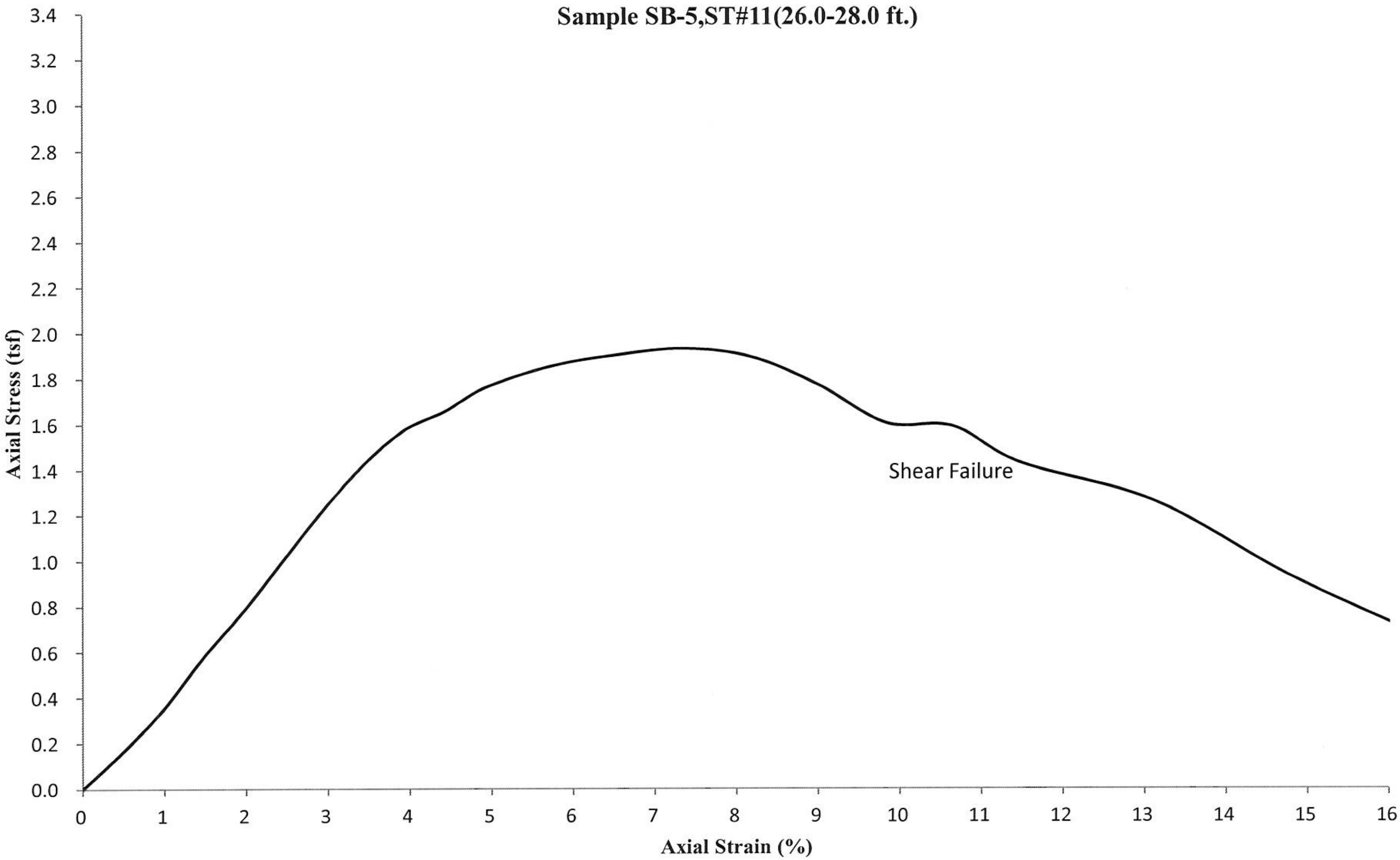
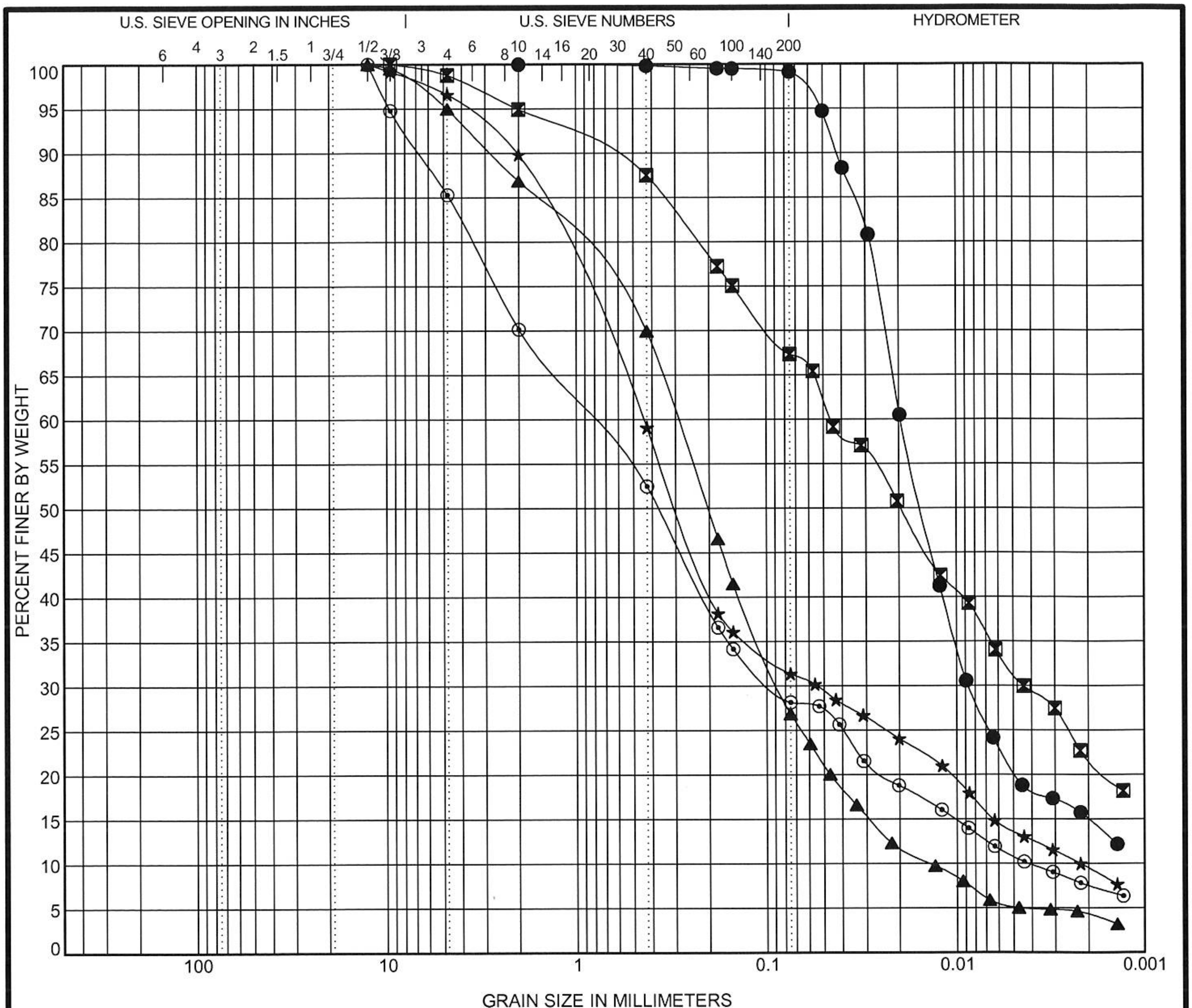
Unconfined Axial Stress v. Axial Strain
Sample SB-5,ST#11(26.0-28.0 ft.)



AASHTO R18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
● SB-1#	18.5 ft	**LEAN CLAY(CL)**	29	19	10		
⊠ SB-1#	38.5 ft						
▲ SB-2#	33.5 ft					1.88	21.54
★ SB-4#	48.5 ft					3.00	201.91
⊙ SB-5#	68.5 ft					2.54	198.55

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● SB-1#	18.5 ft	2	0.02	0.009		0.0	0.9	78.7	20.4
⊠ SB-1#	38.5 ft	9.5	0.046	0.004		1.2	31.5	35.8	31.5
▲ SB-2#	33.5 ft	12.5	0.295	0.087	0.014	5.0	68.1	21.7	5.2
★ SB-4#	48.5 ft	12.5	0.444	0.054	0.002	3.4	65.2	17.7	13.7
⊙ SB-5#	68.5 ft	12.5	0.821	0.093	0.004	14.7	57.2	17.3	10.8

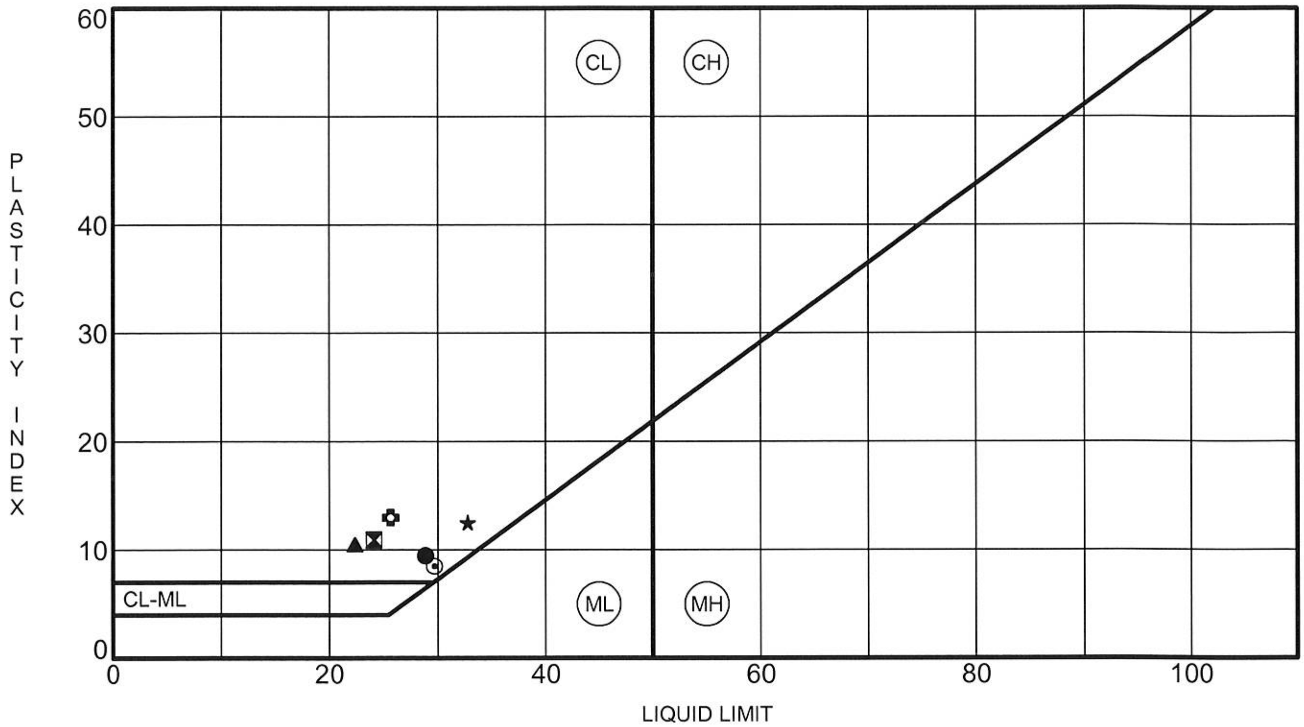
WEI SINCE 1982
Wang Engineering, Inc.
1145 North Main Street
Lombard, Illinois 60148
Telephone: 630-953-9928
Fax:

GRAIN SIZE DISTRIBUTION

Project: Pinecrest Drive over I-74

Location: East Peoria, IL

Number: 1294-04-01



	Specimen Identification		LL	PL	PI	Fines	USCS Classification
●	SB-1#	18.5 ft	29	19	10	99	LEAN CLAY(CL)
⊠	SB-2#	13.5 ft	24	13	11		
▲	SB-3#	21.0 ft	22	12	10		
★	SB-3#	78.5 ft	33	20	13		
⊙	SB-5#	13.0 ft	30	21	9		
✿	SB-5#	26.0 ft	26	13	13		

WEI SINCE 1982
Wang Engineering, Inc.
1145 North Main Street
Lombard, Illinois 60148
Telephone: 630-953-9928
Fax:

ATTERBERG LIMITS' RESULTS

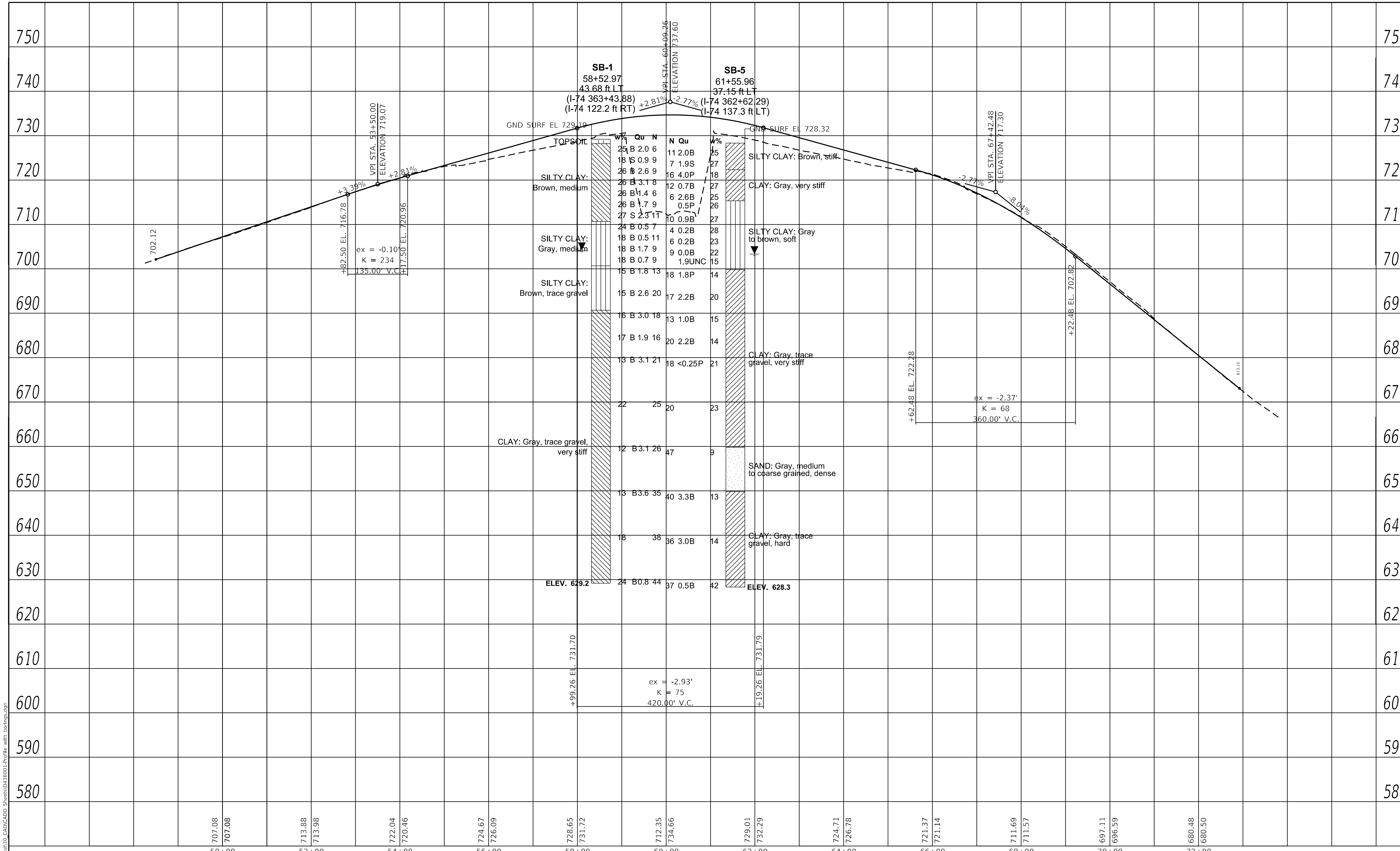
Project: Pinecrest Drive over I-74

Location: East Peoria, IL

Number: 1294-04-01

EXHIBIT D

SUBSURFACE PROFILE



PLAN — NOTE BOOK NO.___ — SURVEYED / PLOTTED / ALIGNMENT CHECKED / RT. OF WAY CHECKED / CADD FILE NAME — BY — DATE

PROFILE — NOTE BOOK NO.___ — SURVEYED / PLOTTED / GRADES CHECKED / B.M. NOTED / STRUCTURE NOTATIONS CHK'D — BY — DATE

MODEL: Default
FILE NAME: P:\15-1062 Pinecrest\10_CADD\CADD Sheets\D4160001-Profile with borings.dgn

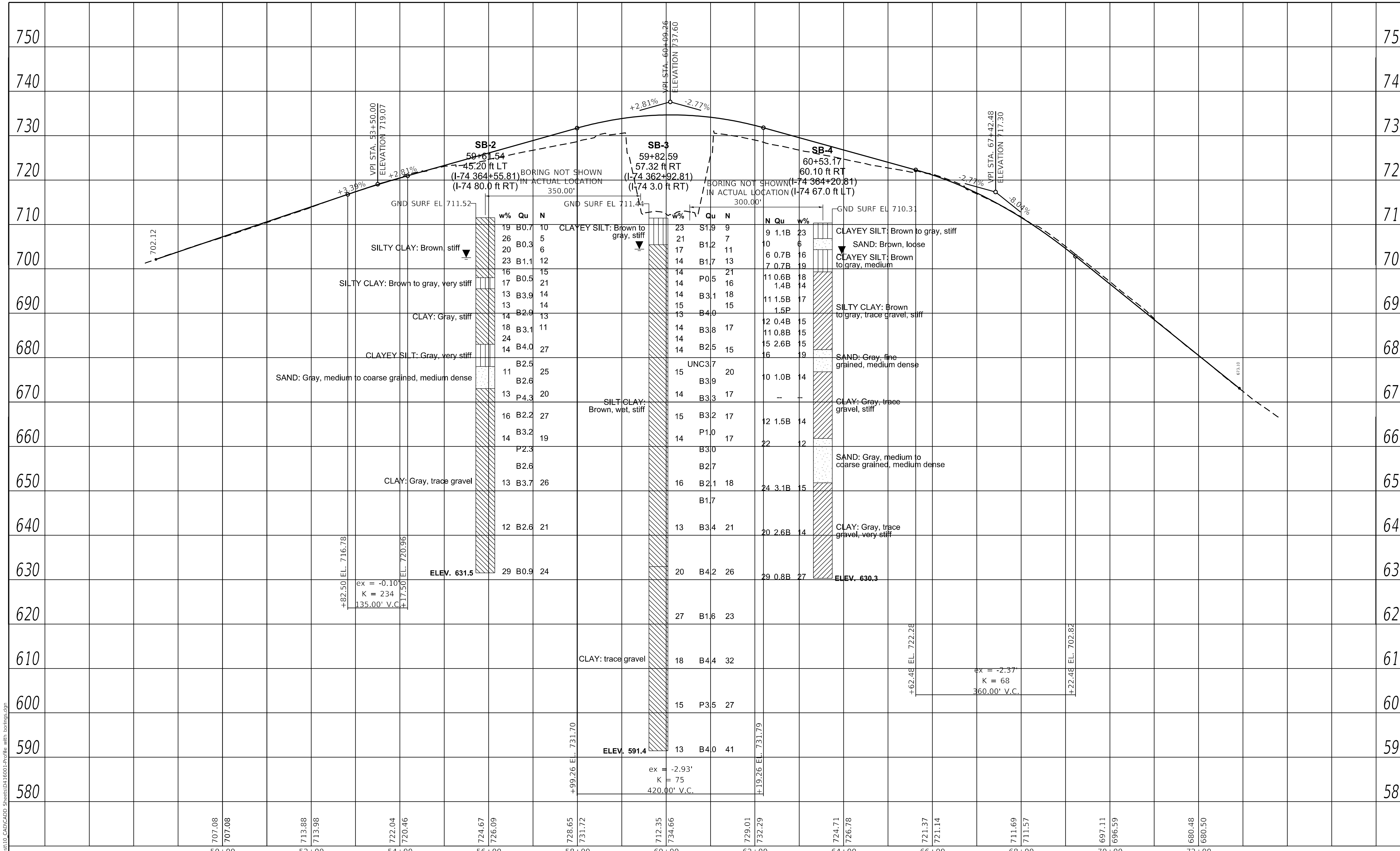
USER NAME = bbb	DESIGNED - ________	REVISED - ________
	DRAWN - ________	REVISED - ________
PLOT SCALE = 200.0000 ' / in.	CHECKED - ________	REVISED - ________
PLOT DATE = 8/6/2018	DATE - ________	REVISED - ________

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SOIL BRORING PROFILE
PINECREST DRIVE OVER I–74

SCALE: ______ SHEET __ OF __ SHEETS STA. _______ TO STA. _______

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(90-14HB-1)BR-1	PEORIA	___	___
		CONTRACT NO. ____		
		ILLINOIS	FED. AID PROJECT	



USER NAME = bbb	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
	DRAWN -	REVISED -	
PLOT SCALE = 200.0000 ' / in.	CHECKED -	REVISED -	
PLOT DATE = 8/6/2018	DATE -	REVISED -	

SOIL BORING PROFILE
PINECREST DRIVE OVER I-74

SCALE: ______ SHEET __ OF __ SHEETS STA. ______ TO STA. ______

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	(90-14HB-1)BR-1	PEORIA	___	___
		CONTRACT NO. ___		
		ILLINOIS FED. AID PROJECT		

PLAN — NOTE BOOK NO.____ — SURVEYED, PLOTTED, ALIGNMENT CHECKED, R.T. OF WAY CHECKED, CADD FILE NAME — BY — DATE

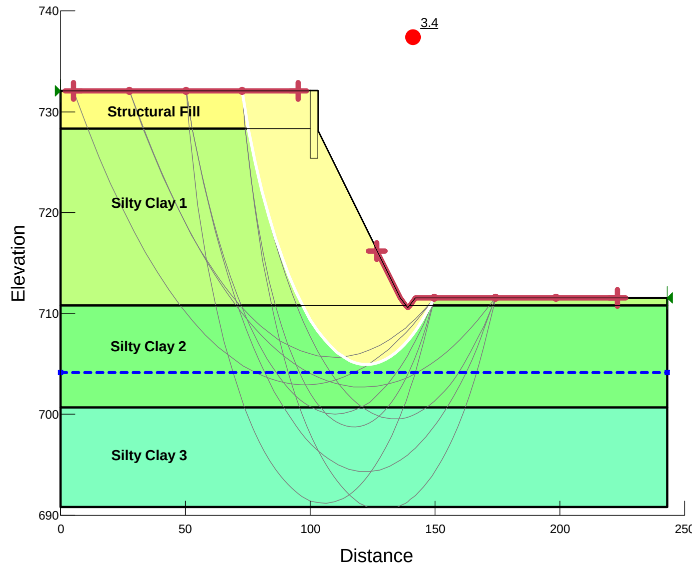
PROFILE — NOTE BOOK NO.____ — SURVEYED, PLOTTED, GRADES CHECKED, B.M. NOTED, STRUCTURE NOTATNS CHKD — BY — DATE

MODEL: Default
FILE NAME: Pr.J15-1062 Pinecrest\10_CAD\CADD Sheets\D416001-Profile with borings.dgn

EXHIBIT E

SLOPE/W SLOPE STABILITY ANALYSIS

Pinecrest Drive over I-74
South Abutment End Slope
End-of-Construction Analysis



Name: Structural Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 1,000 psf
Phi': 0 °

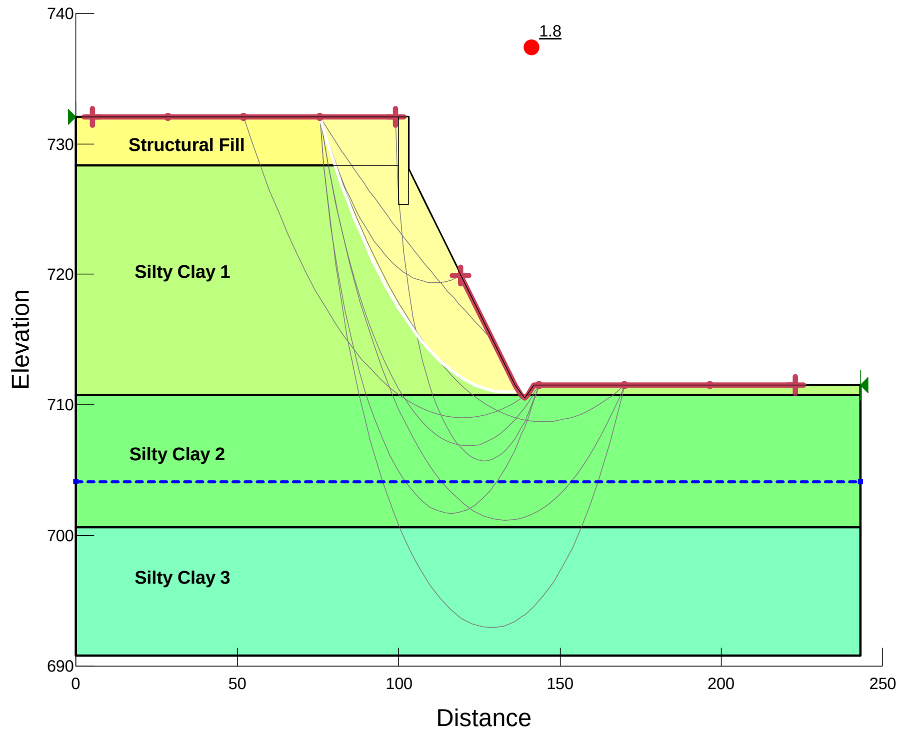
Name: Silty Clay 1
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,000 psf
Phi': 0 °

Name: Silty Clay 2
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 850 psf
Phi': 0 °

Name: Silty Clay 3
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,200 psf
Phi': 0 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 0 °

Pinecrest Drive over I-74
South Abutment
Long Term Analysis



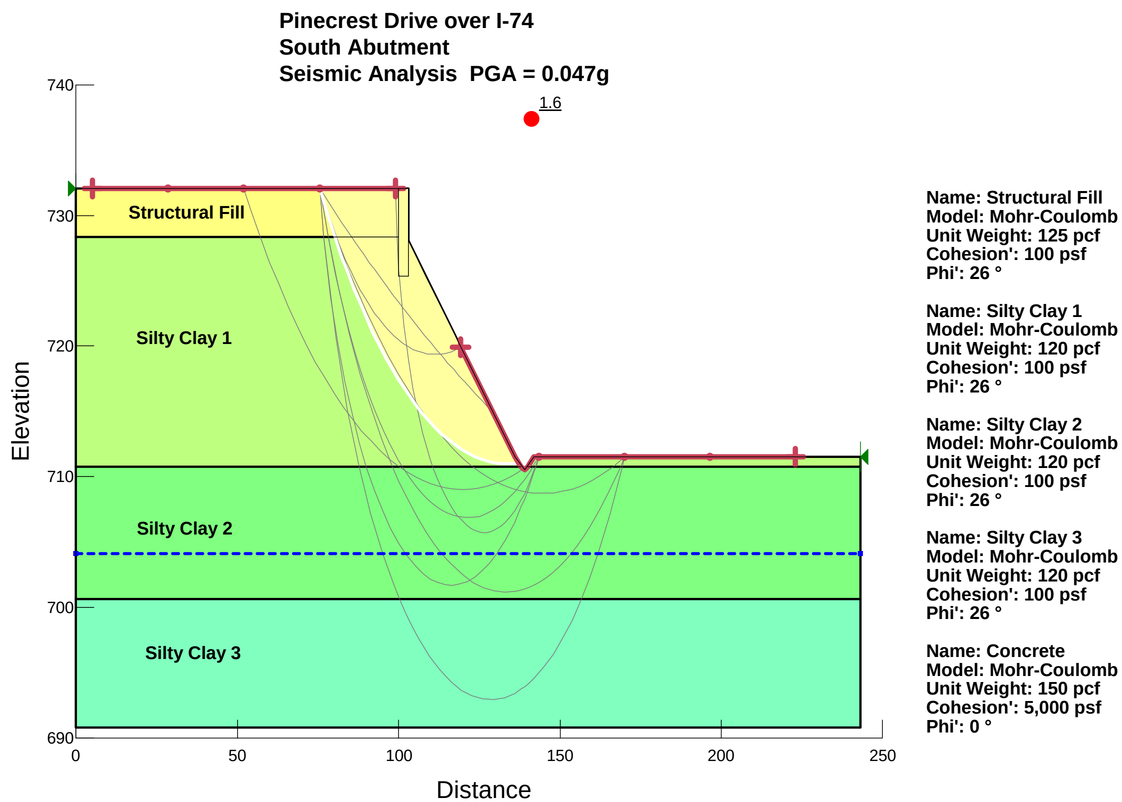
Name: Structural Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 250 psf
Phi': 26 °

Name: Silty Clay 1
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

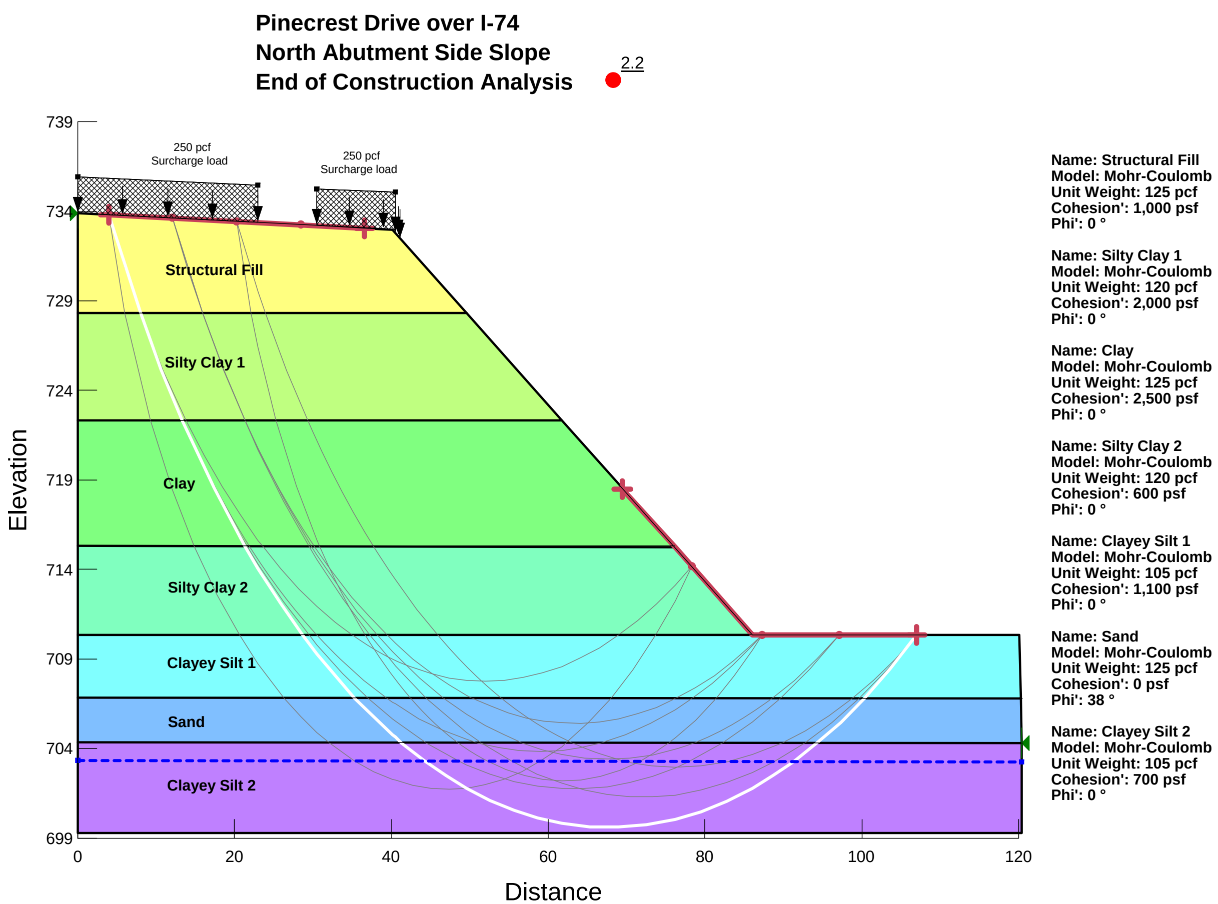
Name: Silty Clay 2
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Silty Clay 3
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

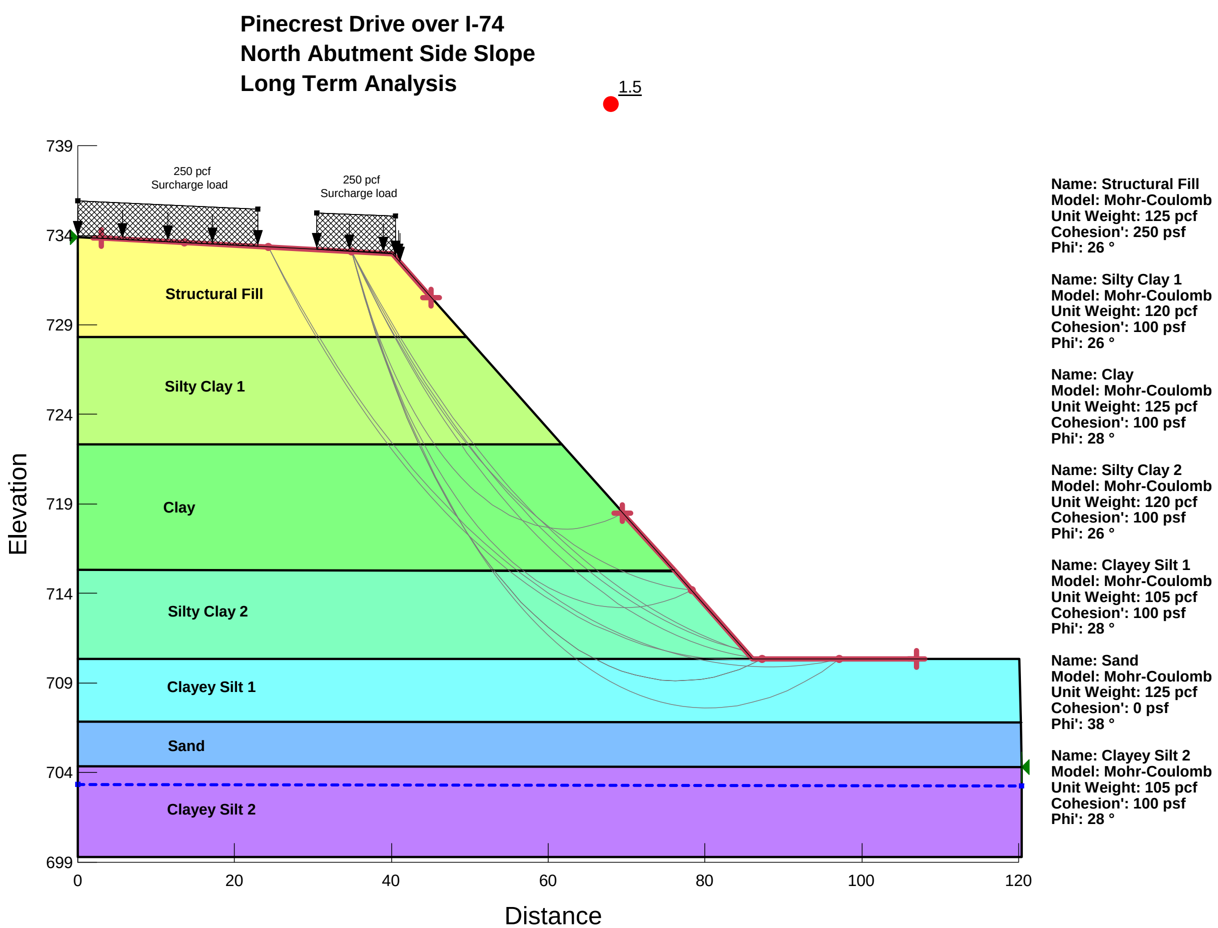
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 0 °



Pinecrest Drive over I-74
South Abutment
Seismic Analysis PGA = 0.047g
1.6
740
730
720
710
700
690
0
50
100
150
200
250
Elevation
Distance
Structural Fill
Silty Clay 1
Silty Clay 2
Silty Clay 3
Name: Structural Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Silty Clay 1
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Silty Clay 2
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Silty Clay 3
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 0 °



Pinecrest Drive over I-74
North Abutment Side Slope
End of Construction Analysis
2.2
250 pcf
Surcharge load
250 pcf
Surcharge load
Structural Fill
Silty Clay 1
Clay
Silty Clay 2
Clayey Silt 1
Sand
Clayey Silt 2
739
734
729
724
719
714
709
704
699
0
20
40
60
80
100
120
Elevation
Distance
Name: Structural Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 1,000 psf
Phi': 0 °
Name: Silty Clay 1
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,000 psf
Phi': 0 °
Name: Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 2,500 psf
Phi': 0 °
Name: Silty Clay 2
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 600 psf
Phi': 0 °
Name: Clayey Silt 1
Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion': 1,100 psf
Phi': 0 °
Name: Sand
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Name: Clayey Silt 2
Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion': 700 psf
Phi': 0 °



Pinecrest Drive over I-74
North Abutment Side Slope
Long Term Analysis
1.5
250 pcf
Surcharge load
250 pcf
Surcharge load
Structural Fill
Silty Clay 1
Clay
Silty Clay 2
Clayey Silt 1
Sand
Clayey Silt 2
739
734
729
724
719
714
709
704
699
Elevation
0
20
40
60
80
100
120
Distance
Name: Structural Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 250 psf
Phi': 26 °
Name: Silty Clay 1
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 28 °
Name: Silty Clay 2
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Clayey Silt 1
Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion': 100 psf
Phi': 28 °
Name: Sand
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Name: Clayey Silt 2
Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion': 100 psf
Phi': 28 °

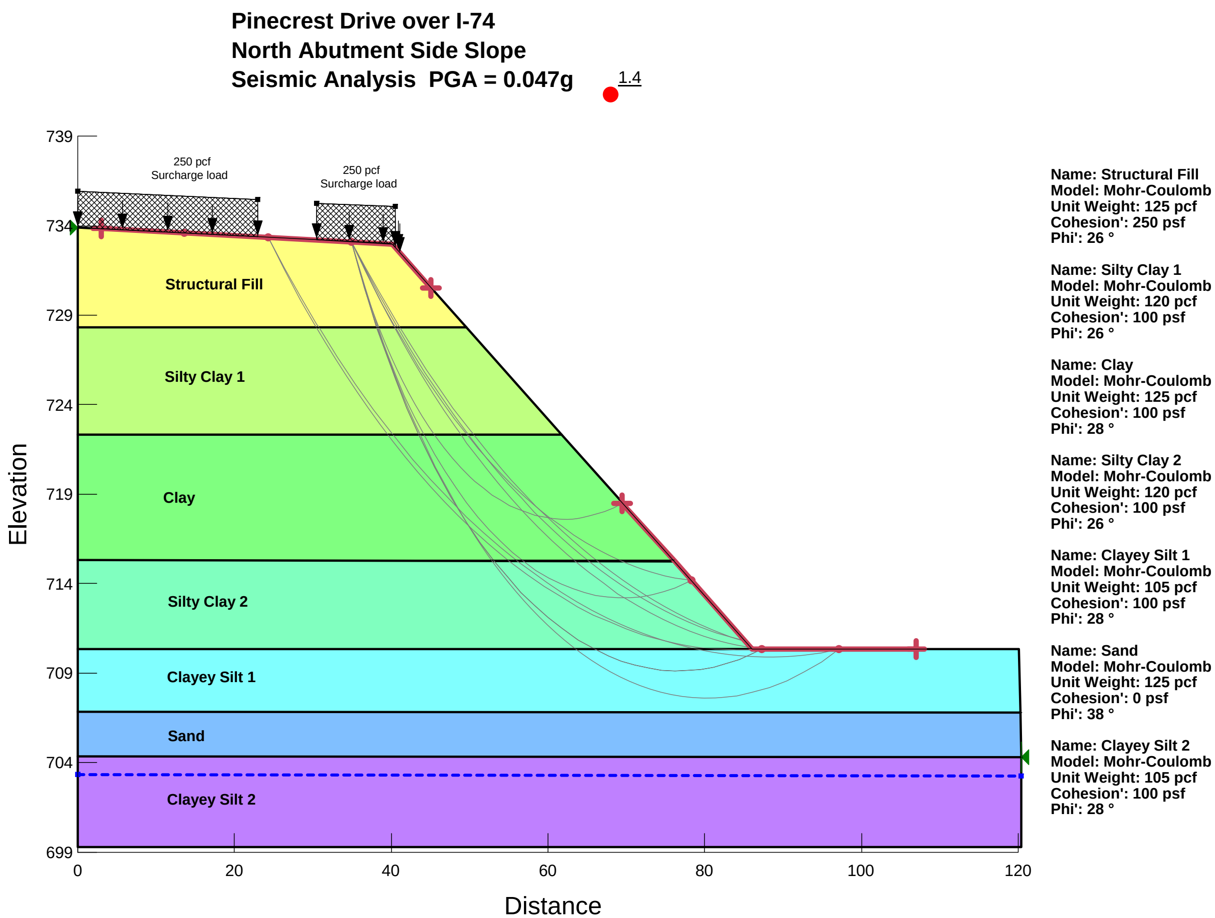

Pinecrest Drive over I-74
North Abutment Side Slope
Seismic Analysis PGA = 0.047g
1.4
250 pcf
Surcharge load
250 pcf
Surcharge load
739
734
729
724
719
714
709
704
699
Elevation
0
20
40
60
80
100
120
Distance
Structural Fill
Silty Clay 1
Clay
Silty Clay 2
Clayey Silt 1
Sand
Clayey Silt 2
Name: Structural Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 250 psf
Phi': 26 °
Name: Silty Clay 1
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Clay
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 28 °
Name: Silty Clay 2
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °
Name: Clayey Silt 1
Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion': 100 psf
Phi': 28 °
Name: Sand
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 38 °
Name: Clayey Silt 2
Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion': 100 psf
Phi': 28 °

EXHIBIT F

ILLINOIS STATE GEOLOGICAL SURVEY MINE MAP

ILLINOIS STATE GEOLOGICAL SURVEY
PRAIRIE RESEARCH INSTITUTE

ILLINOIS

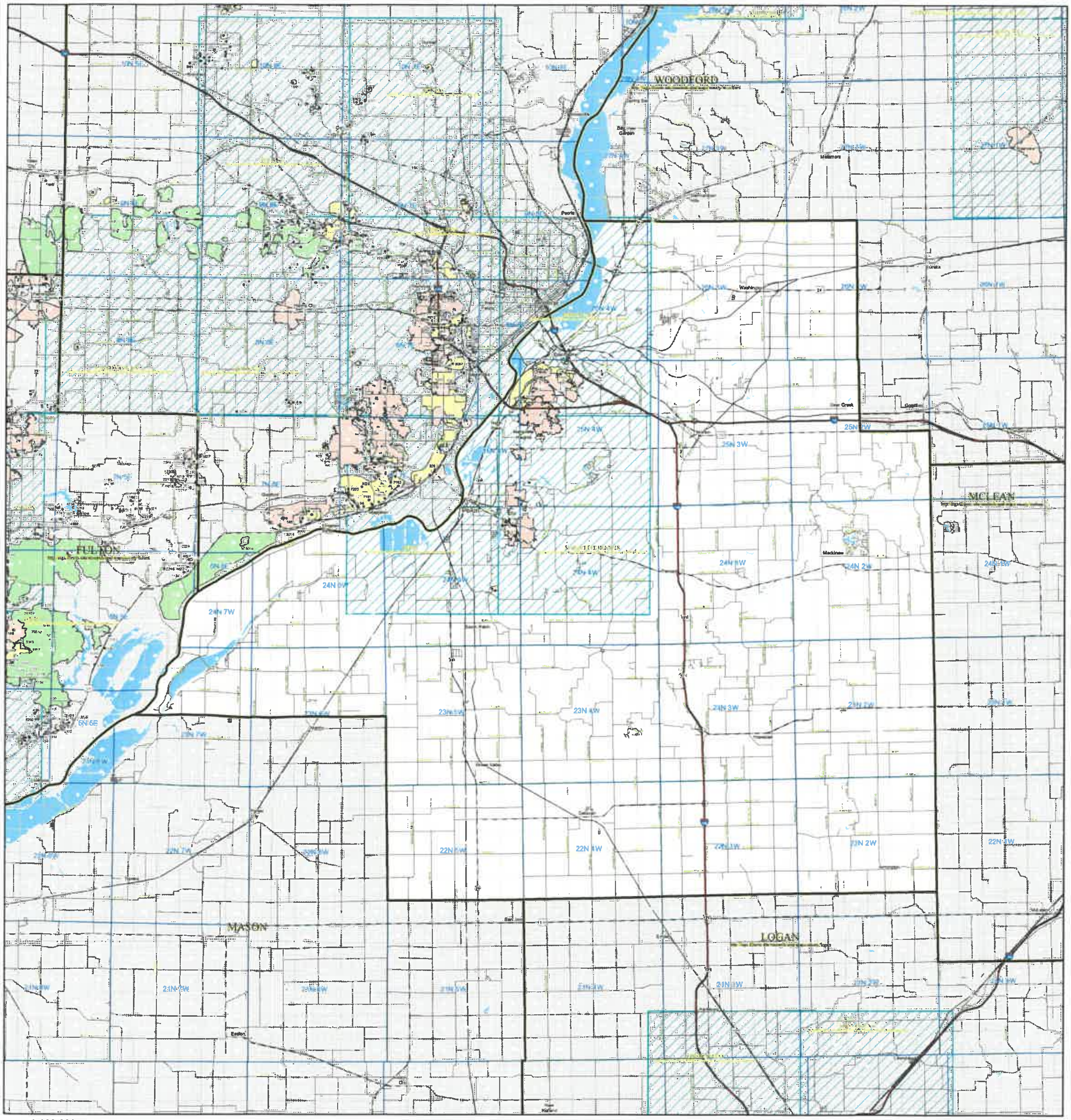
For further information contact:
Prairie Research Institute
Illinois State Geological Survey
University of Illinois at Urbana-Champaign
615 East Peabody Drive
Champaign, Illinois 61820-6964
(217) 333-4747
http://www.isgs.illinois.edu

Coal Mines and Industrial Mineral Mines
TAZEWELL
County

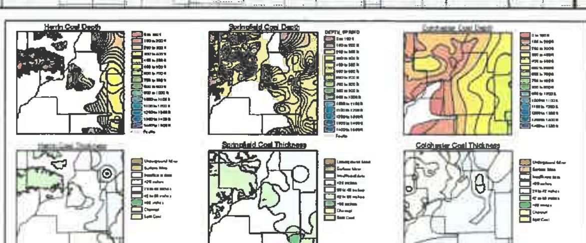
County Coal Map Series
ISGS Coal Section
Map construction: August 25, 2017

This product is under review and may not meet the standards of the Illinois State Geological Survey.

County coal maps and select quadrangle maps available as downloadable PDF files at: http://www.isgs.illinois.edu



1:100,000
Miles



County	Opening type unknown
Township	Uncertain location
Section	Active surface tipple
Quadrangle study (Available on Website)	Abandoned surface tipple
Lake or river	Active shaft
Coal mine - active	Abandoned shaft
Underground coal mine - abandoned	Active slope
Surface coal mine - abandoned	Abandoned slope
Indefinite underground coal mine boundary - abandoned	Active drift
Underground industrial mine and surrounding buffer region	Abandoned drift
951, 951 Coal mine index number (polygon label, point label)	Underground industrial mine entrance or general location

Map Explanation

This map accompanies the coal mines directory for this county. Please consult the directory for an explanation of the coal mine information shown on this map. Buffer regions for industrial mineral mines were incorporated into this map due to limited information regarding these mines. The size of the buffer region is dependent on the uncertainty or inaccuracy of the mine location. For more information regarding industrial mineral mines please contact the ISGS Industrial Minerals Section.

The maps and digital files used for this study were compiled from data obtained from a variety of public and private sources and have varying degrees of completeness and accuracy. They present reasonable interpretations of the geology of the area and are based on available data. These data were compiled and digitized at a scale of 1:62,500. Locations of some features may be offset by 500 feet or more due to errors in the original source maps, the compilation process, digitizing, or a combination of these factors.

These data are not intended for use in site-specific screening or decision-making. Data included in this map are suitable for use at a scale of 1:100,000.

Disclaimer

The Illinois State Geological Survey and the University of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this data set and accept no liability for the consequences of decisions made by others on the basis of the information presented here.

EXHIBIT G

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE==================================== North Abutment
REFERENCE BORING ================================ SB-5
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. =================================== 727.70 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 725.70 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 1850 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 76.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 194.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 73.03 KIPS

PILE TYPE AND SIZE ============= Metal Shell 14"Φ w/.312" walls
Pile Perimeter============================== 3.665 FT.
Pile End Bearing Area========================== 1.069 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
570 KIPS	**569** KIPS	**313** KIPS	**69** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)				NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
724.82	0.88	1.90			5.7		28.0				28	0	0	15	3
722.32	2.50	1.90			16.2	22.3	68.7				69	0	0	38	5
720.82	1.50	4.00	16		16.3	46.9	46.4				46	0	0	26	7
718.32	2.50	0.70	12		7.6	8.2	76.2				76	0	0	42	9
715.82	2.50	2.60			19.8	30.5	96.0				96	0	0	53	12
715.32	0.50	2.60			4.0	30.5	75.4				75	0	0	41	12
713.32	2.00	0.50			4.5	5.9	84.6				85	0	0	47	14
710.82	2.50	0.90	10		9.4	10.6	85.7				86	0	0	47	17
708.32	2.50	0.20			2.4	2.3	88.1				88	0	0	48	19
705.82	2.50	0.20			2.4	2.3	90.4				90	0	0	50	22
703.32	2.50	0.20	9		2.4	2.3	112.7				113	0	0	62	24
699.82	3.50	1.90			22.6	22.3	134.1				134	0	0	74	28
698.32	1.50	1.80	18		9.4	21.1	148.2				148	0	0	82	29
693.32	5.00	2.20	17		35.5	25.8	169.6				170	0	0	93	34
688.32	5.00	1.00	13		20.4	11.7	204.1				204	0	0	112	39
683.32	5.00	2.20	20		35.5	25.8	216.7				217	0	0	119	44
678.32	5.00	0.25	18		5.8	2.9	320.5				321	0	0	176	49
668.32	10.00		20	Hard Till	40.4	100.9	497.2				497	0	0	273	59
658.32	10.00		47	Hard Till	107.2	237.2	569.1				569	0	0	313	69
648.32	10.00		40	Hard Till	85.1	201.9	634.0				~~634~~	~~0~~	~~0~~	~~349~~	~~79~~
638.32	10.00		36	Hard Till	74.2	181.7	713.2				~~713~~	~~0~~	~~0~~	~~392~~	~~89~~
628.32	10.00		37	Hard Till	76.8	186.7	790.0				~~790~~	~~0~~	~~0~~	~~435~~	~~99~~
618.32	10.00		37	Hard Till	76.8	186.7	866.8				~~867~~	~~0~~	~~0~~	~~477~~	~~109~~
608.32	10.00		37	Hard Till	76.8	186.7	943.6				~~944~~	~~0~~	~~0~~	~~519~~	~~119~~
598.32	10.00		37	Hard Till	76.8	186.7	1020.5				~~1020~~	~~0~~	~~0~~	~~561~~	~~129~~
588.32	10.00		37	Hard Till	76.8	186.7	1097.3				~~1097~~	~~0~~	~~0~~	~~603~~	~~139~~
578.32	10.00		37	Hard Till	76.8	186.7	1174.1				~~1174~~	~~0~~	~~0~~	~~646~~	~~149~~
568.32	10.00		37	Hard Till	76.8	186.7	1250.9				~~1251~~	~~0~~	~~0~~	~~688~~	~~159~~
558.32	10.00		37	Hard Till	76.8	186.7	1327.7				~~1328~~	~~0~~	~~0~~	~~730~~	~~169~~
548.32	10.00		37	Hard Till	76.8	186.7	1404.5				~~1405~~	~~0~~	~~0~~	~~772~~	~~179~~
538.32	10.00		37	Hard Till	76.8	186.7	1481.3				~~1481~~	~~0~~	~~0~~	~~815~~	~~189~~
528.32	10.00		37	Hard Till	76.8	186.7	1558.1				~~1558~~	~~0~~	~~0~~	~~857~~	~~199~~
518.32	10.00		37	Hard Till	76.8	186.7	1634.9				~~1635~~	~~0~~	~~0~~	~~899~~	~~209~~
508.32	10.00		37	Hard Till	76.8	186.7	1711.8				~~1712~~	~~0~~	~~0~~	~~941~~	~~219~~
488.32	20.00		37	Hard Till	153.6	186.7	1865.4				~~1865~~	~~0~~	~~0~~	~~1026~~	~~239~~
468.32	20.00		37	Hard Till	153.6	186.7	2019.0				~~2019~~	~~0~~	~~0~~	~~1110~~	~~259~~
458.32	10.00		37	Hard Till	76.8	186.7	2095.8				~~2096~~	~~0~~	~~0~~	~~1153~~	~~269~~
448.32	10.00		37	Hard Till		186.7									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE==================================== North Abutment
REFERENCE BORING ================================ SB-5
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================== 727.70 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 725.70 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
654 KIPS	**607** KIPS	**334** KIPS	**59** FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 1850 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 76.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 194.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 73.03 KIPS

PILE TYPE AND SIZE ============= Metal Shell 16"Φ w/.312" walls
Pile Perimeter============================== 4.189 FT.
Pile End Bearing Area========================== 1.396 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
724.82	0.88	1.90			6.5		***35.6***	36	0	0	20	3
722.32	2.50	1.90			18.5	29.1	***86.2***	86	0	0	47	5
720.82	1.50	4.00	16		18.6	61.3	***54.3***	54	0	0	30	7
718.32	2.50	0.70	12		8.6	10.7	***92.1***	92	0	0	51	9
715.82	2.50	2.60			22.7	39.8	***114.7***	115	0	0	63	12
715.32	0.50	2.60			4.5	39.8	***87.1***	87	0	0	48	12
713.32	2.00	0.50			5.1	7.7	***98.4***	98	0	0	54	14
710.82	2.50	0.90	10		10.7	13.8	***98.3***	98	0	0	54	17
708.32	2.50	0.20			2.7	3.1	***101.0***	101	0	0	56	19
705.82	2.50	0.20			2.7	3.1	***103.7***	104	0	0	57	22
703.32	2.50	0.20	9		2.7	3.1	***132.4***	132	0	0	73	24
699.82	3.50	1.90			25.9	29.1	***156.8***	157	0	0	86	28
698.32	1.50	1.80	18		10.7	27.6	***173.6***	174	0	0	95	29
693.32	5.00	2.20	17		40.6	33.7	***195.8***	196	0	0	108	34
688.32	5.00	1.00	13		23.3	15.3	***237.4***	237	0	0	131	39
683.32	5.00	2.20	20		40.6	33.7	***248.1***	248	0	0	136	44
678.32	5.00	0.25	18		6.7	3.8	***382.8***	383	0	0	211	49
668.32	10.00		20	Hard Till	46.1	131.8	***606.9***	607	0	0	334	59
658.32	10.00		47	Hard Till	122.5	309.8	***683.3***	~~683~~	~~0~~	~~0~~	~~376~~	~~69~~
648.32	10.00		40	Hard Till	97.3	263.7	***754.2***	~~754~~	~~0~~	~~0~~	~~415~~	~~79~~
638.32	10.00		36	Hard Till	84.8	237.3	***845.6***	~~846~~	~~0~~	~~0~~	~~465~~	~~89~~
628.32	10.00		37	Hard Till	87.8	243.9	***933.4***	~~933~~	~~0~~	~~0~~	~~513~~	~~99~~
618.32	10.00		37	Hard Till	87.8	243.9	***1021.2***	~~1021~~	~~0~~	~~0~~	~~562~~	~~109~~
608.32	10.00		37	Hard Till	87.8	243.9	***1108.9***	~~1109~~	~~0~~	~~0~~	~~610~~	~~119~~
598.32	10.00		37	Hard Till	87.8	243.9	***1196.7***	~~1197~~	~~0~~	~~0~~	~~658~~	~~129~~
588.32	10.00		37	Hard Till	87.8	243.9	***1284.5***	~~1285~~	~~0~~	~~0~~	~~706~~	~~139~~
578.32	10.00		37	Hard Till	87.8	243.9	***1372.3***	~~1372~~	~~0~~	~~0~~	~~755~~	~~149~~
568.32	10.00		37	Hard Till	87.8	243.9	***1460.1***	~~1460~~	~~0~~	~~0~~	~~803~~	~~159~~
558.32	10.00		37	Hard Till	87.8	243.9	***1547.9***	~~1548~~	~~0~~	~~0~~	~~851~~	~~169~~
548.32	10.00		37	Hard Till	87.8	243.9	***1635.6***	~~1636~~	~~0~~	~~0~~	~~900~~	~~179~~
538.32	10.00		37	Hard Till	87.8	243.9	***1723.4***	~~1723~~	~~0~~	~~0~~	~~948~~	~~189~~
528.32	10.00		37	Hard Till	87.8	243.9	***1811.2***	~~1811~~	~~0~~	~~0~~	~~996~~	~~199~~
518.32	10.00		37	Hard Till	87.8	243.9	***1899.0***	~~1899~~	~~0~~	~~0~~	~~1044~~	~~209~~
508.32	10.00		37	Hard Till	87.8	243.9	***1986.8***	~~1987~~	~~0~~	~~0~~	~~1093~~	~~219~~
488.32	20.00		37	Hard Till	175.6	243.9	***2162.3***	~~2162~~	~~0~~	~~0~~	~~1189~~	~~239~~
468.32	20.00		37	Hard Till	175.6	243.9	***2337.9***	~~2338~~	~~0~~	~~0~~	~~1286~~	~~259~~
458.32	10.00		37	Hard Till	87.8	243.9	***2425.7***	~~2426~~	~~0~~	~~0~~	~~1334~~	~~269~~
448.32	10.00		37	Hard Till		243.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE===================================== Center Pier
REFERENCE BORING ================================ SB-3
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================== 707.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 706.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 4230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 76.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 222.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 83.49 KIPS

PILE TYPE AND SIZE ============= Metal Shell 14"Φ w/.312" walls
Pile Perimeter============================== 3.665 FT.
Pile End Bearing Area========================== 1.069 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
570 KIPS	**521** KIPS	**287** KIPS	**76** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
705.44	0.76	1.20			3.6		***23.5***	24	0	0	13	2
703.94	1.50	1.70			9.0	19.9	***18.4***	18	0	0	10	3
701.44	2.50	0.50	13		5.6	5.9	***54.5***	55	0	0	30	6
698.94	2.50	3.10	21		22.5	36.3	***87.5***	88	0	0	48	8
696.44	2.50	4.00	16		27.2	46.9	***112.4***	112	0	0	62	11
693.94	2.50	3.80	18		26.1	44.6	***123.3***	123	0	0	68	13
691.44	2.50	2.50	15		19.3	29.3	***156.7***	157	0	0	86	16
688.44	3.00	3.70	16		30.7	43.4	***189.8***	190	0	0	104	19
686.44	2.00	3.90	17		21.3	45.7	***417.7***	418	0	0	230	21
683.94	2.50		50	Hard Till	29.5	252.4	***270.5***	271	0	0	149	23
681.44	2.50		15	Hard Till	7.6	75.7	***303.3***	303	0	0	167	26
676.44	5.00		20	Hard Till	20.2	100.9	***308.4***	308	0	0	170	31
671.44	5.00		17	Hard Till	17.2	85.8	***325.6***	326	0	0	179	36
666.44	5.00		17	Hard Till	17.2	85.8	***342.7***	343	0	0	188	41
661.44	5.00		17	Hard Till	17.2	85.8	***364.9***	365	0	0	201	46
651.44	10.00		18	Hard Till	36.3	90.8	***416.4***	416	0	0	229	56
641.44	10.00		21	Hard Till	42.4	106.0	***484.0***	484	0	0	266	66
631.44	10.00		26	Hard Till	52.5	131.2	***521.4***	521	0	0	287	76
621.44	10.00		23	Hard Till	46.4	116.1	***613.2***	~~613~~	~~0~~	~~0~~	~~337~~	~~86~~
611.44	10.00		32	Hard Till	64.6	161.5	***652.6***	~~653~~	~~0~~	~~0~~	~~359~~	~~96~~
601.44	10.00		27	Hard Till	54.5	136.3	***777.7***	~~778~~	~~0~~	~~0~~	~~428~~	~~106~~
591.44	10.00		41	Hard Till	88.0	206.9	***865.7***	~~866~~	~~0~~	~~0~~	~~476~~	~~116~~
581.44	10.00		41	Hard Till	88.0	206.9	***953.8***	~~954~~	~~0~~	~~0~~	~~525~~	~~126~~
571.44	10.00		41	Hard Till	88.0	206.9	***1041.8***	~~1042~~	~~0~~	~~0~~	~~573~~	~~136~~
561.44	10.00		41	Hard Till	88.0	206.9	***1129.8***	~~1130~~	~~0~~	~~0~~	~~621~~	~~146~~
551.44	10.00		41	Hard Till	88.0	206.9	***1217.8***	~~1218~~	~~0~~	~~0~~	~~670~~	~~156~~
541.44	10.00		41	Hard Till	88.0	206.9	***1305.9***	~~1306~~	~~0~~	~~0~~	~~718~~	~~166~~
531.44	10.00		41	Hard Till	88.0	206.9	***1393.9***	~~1394~~	~~0~~	~~0~~	~~767~~	~~176~~
521.44	10.00		41	Hard Till	88.0	206.9	***1481.9***	~~1482~~	~~0~~	~~0~~	~~815~~	~~186~~
501.44	20.00		41	Hard Till	176.0	206.9	***1658.0***	~~1658~~	~~0~~	~~0~~	~~912~~	~~206~~
481.44	20.00		41	Hard Till	176.0	206.9	***1834.0***	~~1834~~	~~0~~	~~0~~	~~1009~~	~~226~~
461.44	20.00		41	Hard Till	176.0	206.9	***2010.1***	~~2010~~	~~0~~	~~0~~	~~1106~~	~~246~~
441.44	20.00		41	Hard Till	176.0	206.9	***2186.1***	~~2186~~	~~0~~	~~0~~	~~1202~~	~~266~~
421.44	20.00		41	Hard Till	176.0	206.9	***2362.1***	~~2362~~	~~0~~	~~0~~	~~1299~~	~~286~~
411.44	10.00		41	Hard Till	88.0	206.9	***2450.2***	~~2450~~	~~0~~	~~0~~	~~1348~~	~~296~~
408.94	2.50		41	Hard Till	22.0	206.9	***2472.2***	~~2472~~	~~0~~	~~0~~	~~1360~~	~~298~~
406.44	2.50		41	Hard Till	22.0	206.9	***2494.2***	~~2494~~	~~0~~	~~0~~	~~1372~~	~~301~~
403.94	2.50		41	Hard Till		206.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE===================================== Center Pier
REFERENCE BORING ================================ SB-3
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================== 707.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 706.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 4230 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 76.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 222.63 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 83.49 KIPS

PILE TYPE AND SIZE ============= Metal Shell 16"Φ w/.312" walls
Pile Perimeter============================== 4.189 FT.
Pile End Bearing Area========================== 1.396 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
654 KIPS	**615** KIPS	**338** KIPS	**76** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
705.44	0.76	1.20			4.1		***30.1***	30	0	0	17	2
703.94	1.50	1.70			10.3	26.0	***22.0***	22	0	0	12	3
701.44	2.50	0.50	13		6.4	7.7	***68.2***	68	0	0	38	6
698.94	2.50	3.10	21		25.7	47.5	***107.7***	108	0	0	59	8
696.44	2.50	4.00	16		31.1	61.3	***135.7***	136	0	0	75	11
693.94	2.50	3.80	18		29.9	58.2	***145.7***	146	0	0	80	13
691.44	2.50	2.50	15		22.1	38.3	***186.1***	186	0	0	102	16
688.44	3.00	3.70	16		35.1	56.7	***224.3***	224	0	0	123	19
686.44	2.00	3.90	17		24.4	59.7	***518.6***	519	0	0	285	21
683.94	2.50		50	Hard Till	33.7	329.6	***321.5***	322	0	0	177	23
681.44	2.50		15	Hard Till	8.7	98.9	***363.2***	363	0	0	200	26
676.44	5.00		20	Hard Till	23.1	131.8	***366.5***	366	0	0	202	31
671.44	5.00		17	Hard Till	19.6	112.1	***386.1***	386	0	0	212	36
666.44	5.00		17	Hard Till	19.6	112.1	***405.7***	406	0	0	223	41
661.44	5.00		17	Hard Till	19.6	112.1	***431.9***	432	0	0	238	46
651.44	10.00		18	Hard Till	41.5	118.7	***493.2***	493	0	0	271	56
641.44	10.00		21	Hard Till	48.5	138.4	***574.6***	575	0	0	316	66
631.44	10.00		26	Hard Till	60.0	171.4	***614.8***	615	0	0	338	76
621.44	10.00		23	Hard Till	53.1	151.6	***727.2***	~~727~~	~~0~~	~~0~~	~~400~~	~~86~~
611.44	10.00		32	Hard Till	73.8	210.9	***768.0***	~~768~~	~~0~~	~~0~~	~~422~~	~~96~~
601.44	10.00		27	Hard Till	62.3	178.0	***922.6***	~~923~~	~~0~~	~~0~~	~~507~~	~~106~~
591.44	10.00		41	Hard Till	100.6	270.3	***1023.2***	~~1023~~	~~0~~	~~0~~	~~563~~	~~116~~
581.44	10.00		41	Hard Till	100.6	270.3	***1123.8***	~~1124~~	~~0~~	~~0~~	~~618~~	~~126~~
571.44	10.00		41	Hard Till	100.6	270.3	***1224.4***	~~1224~~	~~0~~	~~0~~	~~673~~	~~136~~
561.44	10.00		41	Hard Till	100.6	270.3	***1325.0***	~~1325~~	~~0~~	~~0~~	~~729~~	~~146~~
551.44	10.00		41	Hard Till	100.6	270.3	***1425.6***	~~1426~~	~~0~~	~~0~~	~~784~~	~~156~~
541.44	10.00		41	Hard Till	100.6	270.3	***1526.2***	~~1526~~	~~0~~	~~0~~	~~839~~	~~166~~
531.44	10.00		41	Hard Till	100.6	270.3	***1626.8***	~~1627~~	~~0~~	~~0~~	~~895~~	~~176~~
521.44	10.00		41	Hard Till	100.6	270.3	***1727.4***	~~1727~~	~~0~~	~~0~~	~~950~~	~~186~~
501.44	20.00		41	Hard Till	201.2	270.3	***1928.6***	~~1929~~	~~0~~	~~0~~	~~1061~~	~~206~~
481.44	20.00		41	Hard Till	201.2	270.3	***2129.8***	~~2130~~	~~0~~	~~0~~	~~1171~~	~~226~~
461.44	20.00		41	Hard Till	201.2	270.3	***2331.0***	~~2331~~	~~0~~	~~0~~	~~1282~~	~~246~~
441.44	20.00		41	Hard Till	201.2	270.3	***2532.2***	~~2532~~	~~0~~	~~0~~	~~1393~~	~~266~~
421.44	20.00		41	Hard Till	201.2	270.3	***2733.4***	~~2733~~	~~0~~	~~0~~	~~1503~~	~~286~~
411.44	10.00		41	Hard Till	100.6	270.3	***2834.0***	~~2834~~	~~0~~	~~0~~	~~1559~~	~~296~~
408.94	2.50		41	Hard Till	25.1	270.3	***2859.1***	~~2859~~	~~0~~	~~0~~	~~1573~~	~~298~~
406.44	2.50		41	Hard Till	25.1	270.3	***2884.3***	~~2884~~	~~0~~	~~0~~	~~1586~~	~~301~~
403.94	2.50		41	Hard Till		270.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE===================================== South Abutment
REFERENCE BORING ================================ SB-1
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ==================================== 727.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 725.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 1850 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 76.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 194.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 73.03 KIPS

PILE TYPE AND SIZE ============= Metal Shell 14"Φ w/.312" walls
Pile Perimeter============================== 3.665 FT.
Pile End Bearing Area========================== 1.069 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
570 KIPS	**482** KIPS	**265** KIPS	**58** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
724.19	1.21	0.90	9		4.5		***35.0***	35	0	0	19	3
721.69	2.50	2.60	9		19.8	30.5	***60.7***	61	0	0	33	6
719.19	2.50	3.10	8		22.5	36.3	***63.3***	63	0	0	35	8
716.69	2.50	1.40	6		13.2	16.4	***79.9***	80	0	0	44	11
714.19	2.50	1.70	9		15.0	19.9	***102.0***	102	0	0	56	13
711.69	2.50	2.30	11		18.3	27.0	***99.1***	99	0	0	55	16
709.19	2.50	0.50	7		5.6	5.9	***104.7***	105	0	0	58	18
706.69	2.50	0.50	11		5.6	5.9	***124.4***	124	0	0	68	21
704.19	2.50	1.70	9		15.0	19.9	***127.7***	128	0	0	70	23
700.69	3.50	0.70	9		10.6	8.2	***151.2***	151	0	0	83	27
699.19	1.50	1.80	13		9.4	21.1	***169.9***	170	0	0	93	28
694.19	5.00	2.60	20		39.7	30.5	***214.3***	214	0	0	118	33
689.19	5.00	3.00	18		43.9	35.2	***245.3***	245	0	0	135	38
684.19	5.00	1.90	16		32.3	22.3	***291.7***	292	0	0	160	43
679.19	5.00	3.10	21		44.9	36.3	***426.4***	426	0	0	235	48
669.19	10.00		25	Hard Till	50.5	126.2	***481.9***	482	0	0	265	58
659.19	10.00		26	Hard Till	52.5	131.2	***579.9***	~~580~~	~~0~~	~~0~~	~~319~~	~~68~~
649.19	10.00		35	Hard Till	71.7	176.6	***666.7***	~~667~~	~~0~~	~~0~~	~~367~~	~~78~~
639.19	10.00		38	Hard Till	79.5	191.8	***776.4***	~~776~~	~~0~~	~~0~~	~~427~~	~~88~~
629.19	10.00		44	Hard Till	97.3	222.1	***873.7***	~~874~~	~~0~~	~~0~~	~~481~~	~~98~~
619.19	10.00		44	Hard Till	97.3	222.1	***971.0***	~~971~~	~~0~~	~~0~~	~~534~~	~~108~~
609.19	10.00		44	Hard Till	97.3	222.1	***1068.2***	~~1068~~	~~0~~	~~0~~	~~588~~	~~118~~
599.19	10.00		44	Hard Till	97.3	222.1	***1165.5***	~~1165~~	~~0~~	~~0~~	~~641~~	~~128~~
589.19	10.00		44	Hard Till	97.3	222.1	***1262.7***	~~1263~~	~~0~~	~~0~~	~~695~~	~~138~~
569.19	20.00		44	Hard Till	194.5	222.1	***1457.2***	~~1457~~	~~0~~	~~0~~	~~801~~	~~158~~
549.19	20.00		44	Hard Till	194.5	222.1	***1651.8***	~~1652~~	~~0~~	~~0~~	~~908~~	~~178~~
529.19	20.00		44	Hard Till	194.5	222.1	***1846.3***	~~1846~~	~~0~~	~~0~~	~~1015~~	~~198~~
509.19	20.00		44	Hard Till	194.5	222.1	***2040.8***	~~2041~~	~~0~~	~~0~~	~~1122~~	~~218~~
489.19	20.00		44	Hard Till	194.5	222.1	***2235.3***	~~2235~~	~~0~~	~~0~~	~~1229~~	~~238~~
469.19	20.00		44	Hard Till	194.5	222.1	***2429.8***	~~2430~~	~~0~~	~~0~~	~~1336~~	~~258~~
459.19	10.00		44	Hard Till	97.3	222.1	***2527.1***	~~2527~~	~~0~~	~~0~~	~~1390~~	~~268~~
454.19	5.00		44	Hard Till	48.6	222.1	***2575.7***	~~2576~~	~~0~~	~~0~~	~~1417~~	~~273~~
449.19	5.00		44	Hard Till	48.6	222.1	***2624.3***	~~2624~~	~~0~~	~~0~~	~~1443~~	~~278~~
446.69	2.50		44	Hard Till	24.3	222.1	***2648.6***	~~2649~~	~~0~~	~~0~~	~~1457~~	~~281~~
444.19	2.50		44	Hard Till	24.3	222.1	***2673.0***	~~2673~~	~~0~~	~~0~~	~~1470~~	~~283~~
441.69	2.50		44	Hard Till	24.3	222.1	***2697.3***	~~2697~~	~~0~~	~~0~~	~~1483~~	~~286~~
439.19	2.50		44	Hard Till	24.3	222.1	***2721.6***	~~2722~~	~~0~~	~~0~~	~~1497~~	~~288~~
436.69	2.50		44	Hard Till		222.1						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE==================================== South Abutment
REFERENCE BORING ================================ SB-1
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================== 727.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 725.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 1850 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 76.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 194.74 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 73.03 KIPS

PILE TYPE AND SIZE ============= Metal Shell 16"Φ w/.312" walls
Pile Perimeter============================= 4.189 FT.
Pile End Bearing Area========================== 1.396 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
654 KIPS	**572** KIPS	**315** KIPS	**58** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
724.19	1.21	0.90	9		5.2		***45.0***	45	0	0	25	3
721.69	2.50	2.60	9		22.7	39.8	***75.3***	75	0	0	41	6
719.19	2.50	3.10	8		25.7	47.5	***75.0***	75	0	0	41	8
716.69	2.50	1.40	6		15.0	21.4	***94.6***	95	0	0	52	11
714.19	2.50	1.70	9		17.2	26.0	***121.0***	121	0	0	67	13
711.69	2.50	2.30	11		20.9	35.2	***114.3***	114	0	0	63	16
709.19	2.50	0.50	7		6.4	7.7	***120.7***	121	0	0	66	18
706.69	2.50	0.50	11		6.4	7.7	***145.4***	145	0	0	80	21
704.19	2.50	1.70	9		17.2	26.0	***147.3***	147	0	0	81	23
700.69	3.50	0.70	9		12.1	10.7	***176.2***	176	0	0	97	27
699.19	1.50	1.80	13		10.7	27.6	***199.1***	199	0	0	110	28
694.19	5.00	2.60	20		45.4	39.8	***250.6***	251	0	0	138	33
689.19	5.00	3.00	18		50.2	45.9	***283.9***	284	0	0	156	38
684.19	5.00	1.90	16		36.9	29.1	***339.3***	339	0	0	187	43
679.19	5.00	3.10	21		51.4	47.5	***507.9***	508	0	0	279	48
669.19	10.00		25	Hard Till	57.7	164.8	***572.2***	572	0	0	315	58
659.19	10.00		26	Hard Till	60.0	171.4	***691.5***	~~692~~	~~0~~	~~0~~	~~380~~	~~68~~
649.19	10.00		35	Hard Till	81.9	230.7	***793.2***	~~793~~	~~0~~	~~0~~	~~436~~	~~78~~
639.19	10.00		38	Hard Till	90.9	250.5	***923.6***	~~924~~	~~0~~	~~0~~	~~508~~	~~88~~
629.19	10.00		44	Hard Till	111.2	290.1	***1034.8***	~~1035~~	~~0~~	~~0~~	~~569~~	~~98~~
619.19	10.00		44	Hard Till	111.2	290.1	***1145.9***	~~1146~~	~~0~~	~~0~~	~~630~~	~~108~~
609.19	10.00		44	Hard Till	111.2	290.1	***1257.1***	~~1257~~	~~0~~	~~0~~	~~691~~	~~118~~
599.19	10.00		44	Hard Till	111.2	290.1	***1368.2***	~~1368~~	~~0~~	~~0~~	~~753~~	~~128~~
589.19	10.00		44	Hard Till	111.2	290.1	***1479.4***	~~1479~~	~~0~~	~~0~~	~~814~~	~~138~~
569.19	20.00		44	Hard Till	222.3	290.1	***1701.7***	~~1702~~	~~0~~	~~0~~	~~936~~	~~158~~
549.19	20.00		44	Hard Till	222.3	290.1	***1924.0***	~~1924~~	~~0~~	~~0~~	~~1058~~	~~178~~
529.19	20.00		44	Hard Till	222.3	290.1	***2146.3***	~~2146~~	~~0~~	~~0~~	~~1180~~	~~198~~
509.19	20.00		44	Hard Till	222.3	290.1	***2368.6***	~~2369~~	~~0~~	~~0~~	~~1303~~	~~218~~
489.19	20.00		44	Hard Till	222.3	290.1	***2590.9***	~~2591~~	~~0~~	~~0~~	~~1425~~	~~238~~
469.19	20.00		44	Hard Till	222.3	290.1	***2813.2***	~~2813~~	~~0~~	~~0~~	~~1547~~	~~258~~
459.19	10.00		44	Hard Till	111.2	290.1	***2924.3***	~~2924~~	~~0~~	~~0~~	~~1608~~	~~268~~
454.19	5.00		44	Hard Till	55.6	290.1	***2979.9***	~~2980~~	~~0~~	~~0~~	~~1639~~	~~273~~
449.19	5.00		44	Hard Till	55.6	290.1	***3035.5***	~~3035~~	~~0~~	~~0~~	~~1670~~	~~278~~
446.69	2.50		44	Hard Till	27.8	290.1	***3063.3***	~~3063~~	~~0~~	~~0~~	~~1685~~	~~281~~
444.19	2.50		44	Hard Till	27.8	290.1	***3091.1***	~~3091~~	~~0~~	~~0~~	~~1700~~	~~283~~
441.69	2.50		44	Hard Till	27.8	290.1	***3118.9***	~~3119~~	~~0~~	~~0~~	~~1715~~	~~286~~
439.19	2.50		44	Hard Till	27.8	290.1	***3146.6***	~~3147~~	~~0~~	~~0~~	~~1731~~	~~288~~
436.69	2.50		44	Hard Till		290.1						

EXHIBIT H

TEMPORARY SHEET PILE DESIGN SPREADSHEETS

Illinois Department of Transportation

TEMPORARY SHEET PILE DESIGN CHARTS

SOIL PROPERTIES BELOW EXCAVATION LINE

RETAINED HEIGHT (FT)	LAYER THICKNESS (FT)	SPT N - VALUE (BPF)	UNCONFINED COMPR. STRENGTH Qu (TSF)
8.75	0.88		2
	2.5		1.9
	2.5	16	
	2.5		0.7
	1.5		2.6
	3.5		0.5
	2.5		0.9

STRUCTURE ========================== SN 090-0181
SUBSTRUCTURE & REFERENCE BORING ==== N. Abut Stage II Construction SB-5

GRANULAR CHARTS CONTROL USING AN EMBEDMENT DEPTH OF: 12.77 ***FT***

AND REQUIRES A SECTION MODULUS OF: 9.18 ***IN.^{3}/FT***

DEPTH BELOW EXCAV. (FT)	SPLIT LAYER THICK-NESS (FT)	SPLIT N AT DEPTH (BPF)	SPLIT Qu AT DEPTH (TSF)	AVG. N ABOVE DEPTH (BPF)	AVG. N IN UPPER 50% (BPF)	REQ'D CHART EMBED. DEPTH (FT)	AVG. N IN UPPER 33% (BPF)	REQ'D CHART SECT. MOD. W/ AMP. (IN.^{3}/FT)	RATIO LOWER/ UPPER 1/3 N	AVG. Qu ABOVE DEPTH (TSF)	AVG. Qu IN UPPER 50% (TSF)	REQ'D CHART EMBED. DEPTH (FT)	AVG. Qu IN UPPER 33% (TSF)	REQ'D CHART SECT.MOD. W/ AMP. (IN.^{3}/FT)	RATIO OF LOWER/ UPPER 1/3 Qu
0.22	0.22	20	2	20.00						2.00					
0.44	0.22	20	2	20.00						2.00					
0.66	0.22	20	2	20.00	20.00	~~11.38~~	20.00		1.00	2.00	2.00	~~6.56~~	2.00		1.00
0.88	0.22	20	2	20.00	20.00	~~11.38~~	20.00		1.00	2.00	2.00	~~6.56~~	2.00		1.00
1.19	0.3125	19	1.9	19.74	20.00	~~11.38~~	20.00		1.00	1.97	2.00	~~6.56~~	2.00		1.00
1.51	0.3125	19	1.9	19.58	20.00	~~11.43~~	20.00		1.00	1.96	2.00	~~6.56~~	2.00		1.00
1.82	0.3125	19	1.9	19.48	19.97	~~11.46~~	20.00		1.00	1.95	2.00	~~6.56~~	2.00		1.00
2.13	0.3125	19	1.9	19.41	19.83	~~11.48~~	20.00		1.00	1.94	1.98	~~6.56~~	2.00		1.00
2.44	0.3125	19	1.9	19.36	19.72	~~11.49~~	20.00		1.00	1.94	1.97	~~6.56~~	2.00		1.00
2.76	0.3125	19	1.9	19.32	19.64	~~11.50~~	19.96		1.00	1.93	1.96	~~6.56~~	2.00		1.00
3.07	0.3125	19	1.9	19.29	19.57	~~11.51~~	19.86		0.99	1.93	1.96	~~6.56~~	1.99		0.99
3.38	0.3125	19	1.9	19.26	19.52	~~11.52~~	19.78		0.98	1.93	1.95	~~6.56~~	1.98		0.98
3.69	0.3125	16	0	18.98	19.48	~~11.52~~	19.71		0.97	1.76	1.95		1.97		0.97
4.01	0.3125	16	0	18.75	19.44	~~11.57~~	19.66		0.97	1.63	1.94		1.97		0.97
4.32	0.3125	16	0	18.55	19.41	~~11.62~~	19.61		0.96	1.51	1.94		1.96		0.96
4.63	0.3125	16	0	18.38	19.38	~~11.66~~	19.57		0.96	1.41	1.94		1.96		0.96
4.94	0.3125	16	0	18.23	19.36	~~11.70~~	19.53		0.95	1.32	1.94		1.95		0.95
5.26	0.3125	16	0	18.10	19.33	~~11.73~~	19.50		0.95	1.24	1.93		1.95		0.95
5.57	0.3125	16	0	17.98	19.32	~~11.76~~	19.47		0.95	1.17	1.93		1.95		0.95
5.88	0.3125	16	0	17.87	19.30	~~11.78~~	19.45		0.95	1.11	1.93		1.94		0.95
6.19	0.3125	7	0.7	17.33	19.28	~~11.80~~	19.43		0.96	1.09	1.93		1.94		0.96
6.51	0.3125	7	0.7	16.83	19.27	~~11.92~~	19.41		0.96	1.07	1.93		1.94		0.96
6.82	0.3125	7	0.7	16.38	19.23	~~12.03~~	19.39		0.96	1.05	1.91		1.94		0.96
7.13	0.3125	7	0.7	15.97	19.09	~~12.14~~	19.37		0.96	1.04	1.83		1.94		0.96
7.44	0.3125	7	0.7	15.59	18.96	~~12.24~~	19.35		0.96	1.02	1.75		1.94		0.96
7.76	0.3125	7	0.7	15.25	18.84	~~12.33~~	19.34		0.97	1.01	1.68		1.93		0.97
8.07	0.3125	7	0.7	14.93	18.73	~~12.42~~	19.33		0.97	1.00	1.61		1.93		0.97
8.38	0.3125	7	0.7	14.63	18.63	~~12.50~~	19.32		0.97	0.99	1.55		1.93		0.97
8.57	0.1875	26	2.6	14.88	18.57	~~12.59~~	19.31		0.97	1.02	1.52		1.93		0.97
8.76	0.1875	26	2.6	15.12	18.52	~~12.52~~	19.30		0.97	1.05	1.49		1.93		0.97
8.94	0.1875	26	2.6	15.35	18.46	~~12.45~~	19.30		0.97	1.09	1.46		1.93		0.97
9.13	0.1875	26	2.6	15.56	18.41	~~12.39~~	19.29		0.97	1.12	1.43		1.93		0.97
9.32	0.1875	26	2.6	15.77	18.37	~~12.34~~	19.28		0.97	1.15	1.40		1.93		0.97
9.51	0.1875	26	2.6	15.98	18.32	~~12.29~~	19.28		0.97	1.18	1.37		1.93		0.97
9.69	0.1875	26	2.6	16.17	18.27	~~12.23~~	19.27		0.97	1.20	1.34		1.93		0.97
9.88	0.1875	26	2.6	16.36	18.23	~~12.19~~	19.27		0.97	1.23	1.32		1.93		0.97
10.32	0.4375	5	0.5	15.87	18.14	~~12.14~~	19.20		0.97	1.20	1.26		1.89		0.94
10.76	0.4375	5	0.5	15.43	18.05	~~12.26~~	19.07		0.96	1.17	1.21		1.82		0.86
11.19	0.4375	5	0.5	15.02	17.97	~~12.37~~	18.95		0.95	1.15	1.16		1.74		0.79
11.63	0.4375	5	0.5	14.65	17.90	~~12.48~~	18.84		0.94	1.12	1.12		1.68		0.73
12.07	0.4375	5	0.5	14.30	17.60	~~12.58~~	18.74		0.93	1.10	1.10		1.62		0.67
12.51	0.4375	5	0.5	13.97	17.23	~~12.68~~	18.64		0.92	1.08	1.08		1.56		0.61
12.94	0.4375	5	0.5	13.67	16.88	12.77	18.55	9.18	0.91	1.06	1.07		1.51		0.56

TEMPORARY SHEET PILE DESIGN CHARTS

Illinois Department of Transportation

STRUCTURE ========================== SN 090-0181
SUBSTRUCTURE & REFERENCE BORING ==== S. Abutment Stage II - Boring SB-1

SOIL PROPERTIES BELOW EXCAVATION LINE

RETAINED HEIGHT (FT)	LAYER THICKNESS (FT)	SPT N - VALUE (BPF)	UNCONFINED COMPR. STRENGTH Qu (TSF)
8.75	2.46		0.9
	2.5		2.6
	2.5		3.1
	2.5		1.4
	2.5		1.7

COHESIVE CHARTS CONTROL USING AN EMBEDMENT DEPTH OF: 6.56 ***FT***

AND REQUIRES A SECTION MODULUS OF: 4.90 ***IN.^{3}/FT***

DEPTH BELOW EXCAV. (FT)	SPLIT LAYER THICK-NESS (FT)	SPLIT N AT DEPTH (BPF)	SPLIT Qu AT DEPTH (TSF)	AVG. N ABOVE DEPTH (BPF)	AVG. N IN UPPER 50% (BPF)	REQ'D CHART EMBED. DEPTH (FT)	AVG. N IN UPPER 33% (BPF)	REQ'D CHART SECT. MOD. W/ AMP. (IN.^{3}/FT)	RATIO LOWER/ UPPER 1/3 N	AVG. Qu ABOVE DEPTH (TSF)	AVG. Qu IN UPPER 50% (TSF)	REQ'D CHART EMBED. DEPTH (FT)	AVG. Qu IN UPPER 33% (TSF)	REQ'D CHART SECT.MOD. W/ AMP. (IN.^{3}/FT)	RATIO OF LOWER/ UPPER 1/3 Qu
0.62	0.615	9	0.9	9.00						0.90					
1.23	0.615	9	0.9	9.00						0.90					
1.85	0.615	9	0.9	9.00	9.00	~~14.66~~	9.00		1.00	0.90	0.90	~~7.06~~	0.90		1.00
2.46	0.615	9	0.9	9.00	9.00	~~14.66~~	9.00		1.00	0.90	0.90	~~7.06~~	0.90		1.00
2.77	0.3125	26	2.6	10.92	9.00	~~14.66~~	9.00		1.00	1.09	0.90	~~7.06~~	0.90		1.00
3.09	0.3125	26	2.6	12.44	9.00	~~14.66~~	9.00		1.00	1.24	0.90	~~7.06~~	0.90		1.00
3.40	0.3125	26	2.6	13.69	9.00	~~14.66~~	9.00		1.00	1.37	0.90	~~7.06~~	0.90		1.00
3.71	0.3125	26	2.6	14.73	9.00	~~14.66~~	9.00		1.00	1.47	0.90	~~7.06~~	0.90		1.00
4.02	0.3125	26	2.6	15.60	9.00	~~14.66~~	9.00		1.00	1.56	0.90	~~7.06~~	0.90		1.00
4.34	0.3125	26	2.6	16.35	9.00	~~14.66~~	9.00		1.00	1.64	0.90	~~7.06~~	0.90		1.00
4.65	0.3125	26	2.6	17.00	9.00	~~14.66~~	9.00		1.00	1.70	0.90	~~7.06~~	0.90		1.00
4.96	0.3125	26	2.6	17.57	9.14	~~14.66~~	9.00		1.00	1.76	0.91	~~7.06~~	0.90		1.00
5.27	0.3125	31	3.1	18.36	10.14	~~14.59~~	9.00		1.00	1.84	1.01	~~6.99~~	0.90		1.00
5.59	0.3125	31	3.1	19.07	11.02	~~14.13~~	9.00		1.00	1.91	1.10	~~6.56~~	0.90		1.00
5.90	0.3125	31	3.1	19.70	11.82	~~13.76~~	9.00		1.00	1.97	1.18	~~6.56~~	0.90		1.00
6.21	0.3125	31	3.1	20.27	12.53	~~13.46~~	9.00		1.00	2.03	1.25	~~6.56~~	0.90		1.00
6.52	0.3125	31	3.1	20.79	13.18	~~13.22~~	9.00		1.00	2.08	1.32	~~6.56~~	0.90		1.00
6.84	0.3125	31	3.1	21.25	13.76	~~13.01~~	9.00		1.00	2.13	1.38	6.56	0.90	4.90	1.00
7.15	0.3125	31	3.1	21.68	14.30	~~12.83~~	9.00		1.00	2.17	1.43		0.90		1.00
7.46	0.3125	31	3.1	22.07	14.79	~~12.68~~	9.18		1.04	2.21	1.48		0.92		1.04
7.77	0.3125	14	1.4	21.75	15.24	~~12.54~~	9.86		1.19	2.17	1.52		0.99		1.19
8.09	0.3125	14	1.4	21.45	15.65	~~12.42~~	10.48		1.33	2.14	1.57		1.05		1.33
8.40	0.3125	14	1.4	21.17	16.04	~~12.32~~	11.06		1.46	2.12	1.60		1.11		1.46
8.71	0.3125	14	1.4	20.91	16.40	~~12.22~~	11.60		1.58	2.09	1.64		1.16		1.58
9.02	0.3125	14	1.4	20.67	16.73	~~12.14~~	12.09		1.69	2.07	1.67		1.21		1.69
9.34	0.3125	14	1.4	20.45	17.04	~~12.06~~	12.56		1.79	2.04	1.70		1.26		1.79
9.65	0.3125	14	1.4	20.24	17.33	~~11.98~~	13.00		1.89	2.02	1.73		1.30		1.89
9.96	0.3125	14	1.4	20.04	17.62	~~11.92~~	13.40		1.98	2.00	1.76		1.34		1.98
10.27	0.3125	17	1.7	19.95	18.03	~~11.86~~	13.79		2.06	2.00	1.80		1.38		2.06
10.59	0.3125	17	1.7	19.86	18.41	~~11.77~~	14.15		2.14	1.99	1.84		1.41		2.14
10.90	0.3125	17	1.7	19.78	18.77	~~11.69~~	14.49		2.22	1.98	1.88		1.45		2.22
11.21	0.3125	17	1.7	19.70	19.11	~~11.62~~	14.81		2.29	1.97	1.91		1.48		2.29
11.52	0.3125	17	1.7	19.63	19.44	~~11.55~~	15.11		2.36	1.96	1.94		1.51		2.36
11.84	0.3125	17	1.7	19.56	19.74	11.49	15.40	10.13	2.42	1.96	1.97		1.54		2.42