STRUCTURE GEOTECHNICAL REPORT

IL 3 OVER DRAINAGE DITCH

Existing S.N. 002-0012
Proposed S.N. 002-0038

F.A.P RTE 14 (IL 3)
Section 136-1B
ALEXANDER COUNTY, ILLINOIS
JOB NO. D-99-059-19
PTB 193-032
KEG NO. 19-1143.05

LICENSED PROFESSIONAL ENGINEER
CHRISTOPH S. OPPERMAN
062-074390
OF ILLINOIS

4/10/2025
Exp. 11/30/2025

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January 17, 2024
Revised Date: April 10, 2025

Kaskaskia
Engineering Group, LLC

TABLE OF CONTENTS

EXHIBITS

1.0 PROJECT DESCRIPTION AND SCOPE

1.1 Introduction

The geotechnical study summarized in this report was performed by Kaskaskia Engineering Group, LLC (KEG) for a proposed bridge replacement carrying IL 3 over a Drainage Ditch. The project is located in Alexander County, Illinois. The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to present design and construction recommendations for the proposed structure.

1.2 Project Description

The project consists of the removal and replacement of a three-span bridge (Ex. SN 002-0012) carrying IL 3 over a Drainage Ditch. The existing structure was built in 1948. It has a total length of 122’-0.5” from back-to-back of abutments and a width of 26’. The general location of the proposed structure is shown on a Location Map, Exhibit A. The project is located around 1.3 miles south of Unity, IL.

1.3 Proposed Structure Information

The proposed structure will consist of a three-span bridge. It will provide two 12 ft. wide driving lanes and two 4 ft. wide shoulders. The bridge will measure 132’-6” back-to-back of abutments and 34’-10” out to out deck. A Type Size and Location Plan is included in Exhibit C.

Further substructure details will be based on the findings of this SGR.

2.0 FIELD EXPLORATION

2.1 Subsurface Exploration and Testing

Two standard penetration test (SPT) borings designated 1-S and 2-S were drilled on May 9 and October 14, 2019. The boring locations are shown on the Boring Plan, 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 D. A Soil Profile is included as Subsurface Profile, Exhibit E.

2.2 Subsurface Conditions

The profiles at the two (2) boring locations exhibited layers of asphalt, concrete, clay, silty clay, clay loam, sandy loam, gravelly sand, and limestone. Boring 1-S was advanced to 85’ in depth, while 2-S was advanced to 73.7’ in depth. The bedrock cored in 1-S was limestone. Table 2.2.1 shows a summary of the pavement structure(s), depth of drilling, the top of rock, and ground surface elevation (GSE) of the borings. A summary of the general condition of the subsurface is described in Table 2.2.2 and Table 2.2.3.

Table 2.2.1 - Boring Information Summary

Designation	Asphalt	Concrete	Depth (ft)	Top of Rock (ft.)	GSE (ft.)
1-S	5”	10”	85	259.9	316.5
2-S	2”	11”	73.7	-	300.5

Table 2.2.2 – Subsurface Profile Summary

Soil Type	N-Values (bpf)	Q_u (tsf)	WC (%)	Boring
Clay	3-100/4”	0.9 – 3.4	23 – 39	1-S, 2-S
Silty Clay	3-14	0.7 – 1.9	20 – 37	1-S, 2-S
Silty Clay Loam	8-14	0.8 – 3.1	15 – 25	1-S, 2-S
Loam	0-4	0.2	28 – 31	1-S
Silty Loam	5-100/3”	0.7– 2.5	22 – 27	1-S, 2-S
Sandy Loam	0-5	0.7	27	1-S, 2-S
Sand	1 - 14	-	19	1-S
Sandy Gravel	9-28	-	10 – 16	1-S, 2-S

Table 2.2.3 – Rock Summary

Rock Type	RQD (%)	UCS (tsf)	Boring
Limestone	0-8	696	1-S

2.3 Groundwater

Boring 1-S first encountered groundwater at an elevation of 316.5 ft. Upon completion of drilling, the groundwater was measured at an elevation of 315.0 ft. Boring 2-S first encountered groundwater at an elevation of 300.5 ft. 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.

3.0 GEOTECHNICAL EVALUATIONS

3.1 Settlement

Since no significant grading or changes to the existing embankments are expected at the proposed structure, it is estimated that the existing embankments will experience no settlement. Therefore, no settlement calculations were performed for the proposed structure.

3.2 Slope Stability

Stability analysis using SLOPE/W was performed using the proposed structure geometry on the GP&E. Three conditions were modeled for each scenario: end-of-construction, long-term, and seismic stability. A critical factor of safety (FOS) was calculated for each condition. According to the current standard of practice, the target FOS is 1.5 for end-of-construction and long-term slope stability.

To model the end-of-construction condition, undrained soil parameters were used. Full cohesion and a friction angle of 0 degrees were assumed for cohesive soils. Drained soil parameters with nominal cohesion and full friction angle values were used to model the long-term condition and analyze the theoretical condition where pore water pressure dissipated. The drained strength parameters for cohesive materials included a nominal cohesion value between 50 and 100 psf, with friction angles between 26 and 30 degrees.

The Bishop Circular Method, which generates circular-shaped failure surfaces, was used to calculate the critical failure surfaces and FOS for the proposed conditions. The FOS obtained in the analysis is shown in Table 3.2.1. SLOPE/W program output from this analysis can be found in SLOPE/W Slope Stability Analysis, Exhibit F. As provided in Table 3.2.1, the analysis results indicate that an acceptable FOS will exist under the analyzed conditions.

Table 3.2.1 – Slope Stability Critical FOS

Location (1V:2H Slope)	Critical FOS		
	End-of Construction	Long Term	Seismic
East Abutment (1-S)	3.1	1.6	1.0
West Abutment (2-S)	3.2	1.6	1.1

3.3 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 E.

Additional seismic parameters were calculated for use in the design of the structure. Published information and mapping from the USGS, including software directly applicable to the AASHTO Guide Specifications for LRFD Seismic Bridge Design, was used to develop the parameters for the bridge location. The values, based on Soil Site Class E, are summarized below.

Table 3.3.1 - Summary of Seismic Parameters

Parameter	Value
Soil Site Class	E
Spectral Response Acceleration, 0.2 Sec, S_{DS}	1.663 g (Site Class E)
Spectral Response Acceleration, 1.0 Sec, S_{D1}	1.217 g (Site Class E)
Seismic Performance Zone	4

As indicated in the table above, the Seismic Performance Zone is 4, based on S_{D1} and Table 3.15.2-1 in the IDOT Bridge Manual, the Soil Site Class E, and Figure 2.3.10-4 in the IDOT Bridge Manual.

3.4 Liquefaction

A liquefaction analysis was performed using the liquefaction analysis worksheet provided by IDOT BBS Central Geotechnical Unit and procedures outlined in AGMU 10.1 - Liquefaction Analysis. The PGA and Mw to be used were obtained from the deaggregation data of the seismic hazard for the site, by accessing the USGS website: https://earthquake.usgs.gov/hazards/interactive/ for both NMSZ (far source-site) and CEUS (near source-site) models. The deaggregation data indicated five source-sites from the New Madrid Fault contributing at least 5% to the hazard for this site; hence, a PGA maximum from the NMSZ Model was necessary. All five sites had source-to-site distances of 10 km, with varying Mw values, so the maximum Mw value (7.7) was the only one tested. The Maximum Horizontal Ground Surface Acceleration value was set to the NMSZ PGA (1.699g) which was calculated in the IDOT Liquefaction Analysis Spreadsheet.

Both borings (1-S and 2-S) were analyzed for liquefaction. The results from the analysis showed potential for liquefaction in boring 2-S, as summarized in Table 3.4.1 below. The layers that were classified as liquefiable were mostly cohesionless materials located below the groundwater table noted during drilling, which was found to be about 35 feet below the ground surface at the time of drilling. The liquefiable zones were located within the top 75 ft. Therefore, reduction for liquefaction was considered for the pile design capacity and other foundation considerations. A summary of the liquefaction analysis including each specific run is included in Exhibit G, Liquefaction Analysis.

Table 3.4.1 – Potential Liquefaction Zones

Boring	Substructure	Depth (ft)	Elevation	Soil Type	Factor of Safety CRR/CSR	Source
2-S	West Abut Pier 2	33.5-36	301.5-299	Silty/Sandy Loam	0.153 (C)	NMSZ
		36-38.5	299-296.5	Sand	0.140 (C)	NMSZ
		38.5-43.5	296.5-291.5	Sand	0.408 (D)	NMSZ
		43.5-48.5	291.5-286.5	Sand	0.311 (C)	NMSZ
		58.5-63.5	276.5-271.5	Sand	0.560 (D)	NMSZ
		63.5-68.5	271.5-266.5	Sand	0.336 (C)	NMSZ
		68.5-73.5	266.5-261.5	Sand	0.522 (D)	NMSZ

4.0 FOUNDATION EVALUATIONS AND DESIGN RECOMMENDATIONS

4.1 Driven Piles

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 (Pile Length/Pile Type, Exhibit H). The factored reactions and the preliminary design loads, as provided by Crawford, Murphy & Tilly (CM&T) are provided in Table 4.1.1.

Table 4.1.1 - Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
East Abutment	974
Pier 1	1357
Pier 2	1357
West Abutment	974

The estimated pile lengths for applicable Metal Shell types are shown in Tables 4.1.2 through 4.1.5 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 4.1.2 - Estimated Pile Lengths for HP 10x42 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Seismic Resistance Available – Liquefaction (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (1-S)	335	184	--	72	330.5
Pier 1 (1-S)	335	184	--	69	327.5
Pier 2 (2-S)	335	184	329	67	327.5
West Abutment (2-S)	335	184	329	70	330.5

Table 4.1.3 - Estimated Pile Lengths for HP 12x53 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Seismic Resistance Available – Liquefaction (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (1-S)	418	230	--	72	330.5
Pier 1 (1-S)	418	230	--	69	327.5
Pier 2 (2-S)	418	230	410	68	327.5
West Abutment (2-S)	418	230	410	71	330.5

Table 4.1.4 - Estimated Pile Lengths for HP 12x63 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Seismic Resistance Available – Liquefaction (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (1-S)	497	273	--	73	330.5
Pier 1 (1-S)	497	273	--	69	327.5
Pier 2 (2-S)	497	273	489	68	327.5
West Abutment (2-S)	497	273	489	71	330.5

Table 4.1.5 - Estimated Pile Lengths for HP 14x73 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Seismic Resistance Available – Liquefaction (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (1-S)	578	318	--	73	330.5
Pier 1 (1-S)	578	318	--	70	327.5
Pier 2 (2-S)	578	318	569	68	327.5
West Abutment (2-S)	578	318	569	71	330.5

Table 4.1.6 - Estimated Pile Lengths for HP 14x89 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Seismic Resistance Available – Liquefaction (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (1-S)	705	388	--	73	330.5
Pier 1 (1-S)	705	388	--	71	327.5
Pier 2 (2-S)	705	388	696	69	327.5
West Abutment (2-S)	705	388	696	72	330.5

Table 4.1.7 - Estimated Pile Lengths for HP 14x117 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Seismic Resistance Available – Liquefaction (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment (1-S)	929	511	--	74	330.5
Pier 1 (1-S)	929	511	--	72	327.5
Pier 2 (2-S)	929	511	919	70	327.5
West Abutment (2-S)	929	511	919	73	330.5

KEG recommends one test pile be performed, at a minimum. 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 is also the way the contractor's proposed equipment and methodologies identified in their Pile Installation Plan can be assessed.

4.2 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 4.2.1 and Table 4.2.2 are included for the structural engineer's use in determining lateral pile response.

Table 4.2.1 - Soil Parameters for Lateral Pile Load Analysis

Boring	Soil Type	Depth at Bot. of Layer (Ft.)	γ (pcf)	Undrained		N Value (Average)	Assumed % Fines < #200	K (pci)	ε50
				c (psf)	Φ (deg)				
1-S	Clay	28.5	120	2000	0	6	85	500	0.007
	Clay Loam	31	120	1300	0	5	65	500	0.007
	Clay	54	120	1850	0	5	85	500	0.007
	Sandy Loam	59	120	600	0	4	0	-	-
	Clay Loam	64	120	2300	0	5	65	1000	0.005
	Clay	69	120	1300	0	9	85	500	0.007

Boring	Soil Type	Depth at Bot. of Layer (Ft.)	γ (pcf)	Undrained		N Value (Average)	Assumed % Fines < #200	K (pci)	ε50
				c (psf)	Φ (deg)				
	Clay Loam	119	120	1300	0	8	65	500	0.007
	Sandy Gravel	120.5	120	0	38	20	3	-	-
2-S	Silty Clay	3.5	120	800	0	3	65	100	0.01
	Clay	18.5	120	1450	0	5	85	500	0.007
	Silty Clay	28.5	120	1250	0	5	65	500	0.007
	Clay	38.5	120	1250	0	7	85	500	0.007
	Silty Clay	44	120	1400	0	5	65	500	0.007
	Clay	49	120	2900	0	10	85	1000	0.005
	Silty Clay	59+	120	600	0	2.5	65	100	0.01
	Clay	74	120	1333	0	6	85	500	0.007
	Clay Loam	119	120	900	0	10	65	100	0.01
	Sandy Gravel	130.9	120	0	38	4	3	-	-

Table 4.2.2 - Rock Parameters for Lateral Pile Load Analysis

Rock Type	Strong Rock	
	y (psf)	Qu (tsf)
Limestone	149	200.0

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Construction Activities

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

Should any design considerations assumed by KEG change, KEG should be contacted to determine if the recommendations stated in this report still apply.

5.2 Temporary Sheeting and Soil Retention

Temporary shoring may be required at various stages of this project due to the proposed staged-construction layout shown in the TS&L.

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

5.3 Site and Soil Conditions

Provisions of the Standard Specifications should adequately address site and soil conditions.

6.0 COMPUTATIONS

Computations and analyses for specific 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.

7.0 GEOTECHNICAL DATA

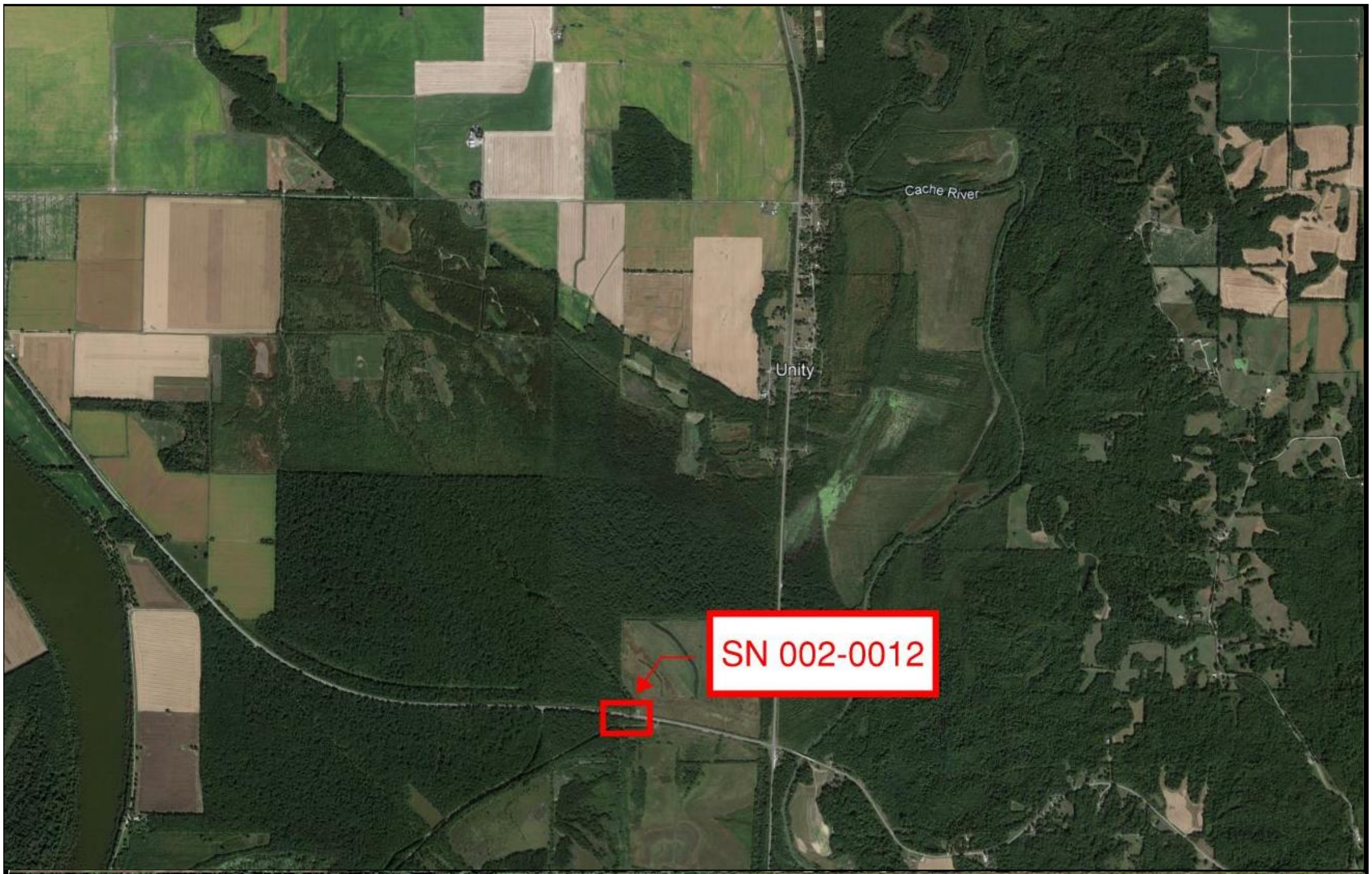
Soil boring logs and subsurface profiles can be found in Exhibit E. Pile Design Tables can be found in Exhibit H.

8.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of CM&T and the Illinois Department of Transportation (IDOT) District 9. They are specific only to the project described and are based on the subsurface information obtained by IDOT at two boring locations within the structure 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

LOCATION MAP

IL-3 Bridge Replacement Alexander County, Illinois

Exhibit No.

A

KEG JOB #19-1143.03

EXHIBIT B

BORING PLAN

Kaskaskia Engineering Group, LLC

BORING LOCATION MAP

IL-3 Bridge
Replacement
Alexander County,
Illinois

Exhibit No.

B

KEG JOB #19-1143.03

EXHBIT C

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

Benchmark: Chiseled "□" on top of wingwall of NW corner of Structure 002-0012, ½ mile west of the IL Rt. 127 interchange, Elevation = 335.631.

Existing Structure: SN 002-0012 was originally built in 1948 under Section 136-1B on F.A. Route 100. The structure is a three-span bridge with concrete stub abutments on precast concrete piles with an overall length of 122'-0½" from back to back of abutments. The superstructure is made of a reinforced concrete deck on steel beams. The width of the structure is 26'-0" between the railings and 32'-4" out-to-out of the deck. The structure is to be removed and replaced utilizing staged construction.

No Salvage.

HIGHWAY CLASSIFICATION

F.A.P. 14 - IL Rt. 3
Functional Class: Minor Arterial
ADT: 2,500 (2023); 3,110 (2045)
ADTT: 360 (2023); 445 (2045)
DHV: 280 (2045)
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50-50

LOADING HL-93

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

DESIGN SPECIFICATIONS

2024 AASHTO LRFD Bridge Design Specifications, 10th Edition
2023 AASHTO Guide Specifications for LRFD Seismic Bridge Design

DESIGN STRESSES

FIELD UNITS

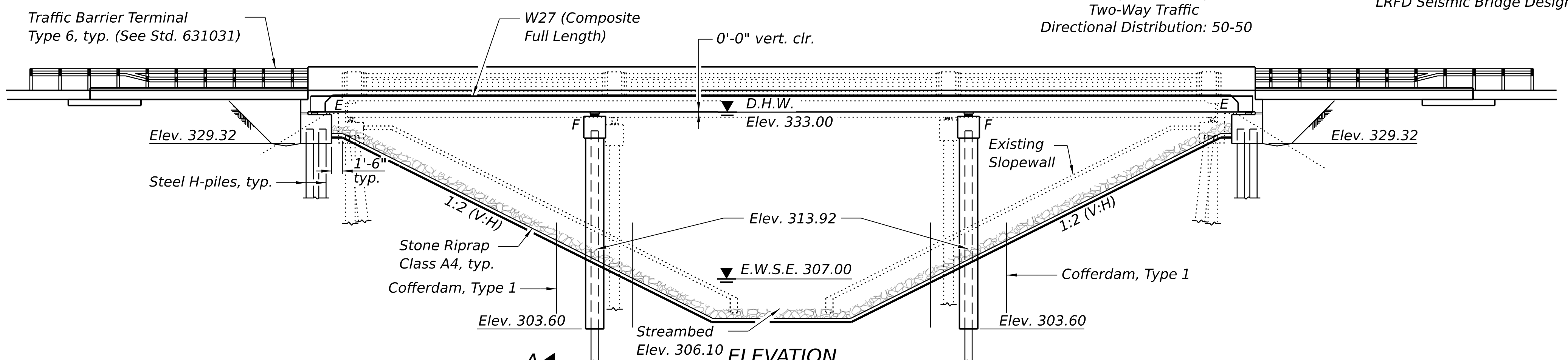
f'c = 4,000 psi (superstructure)
f'c = 3,500 psi (substructure)
fy = 60,000 psi (reinforcement)
fy = 50,000 psi (M270 Grade 50) *
* Galvanized

CURVE DATA

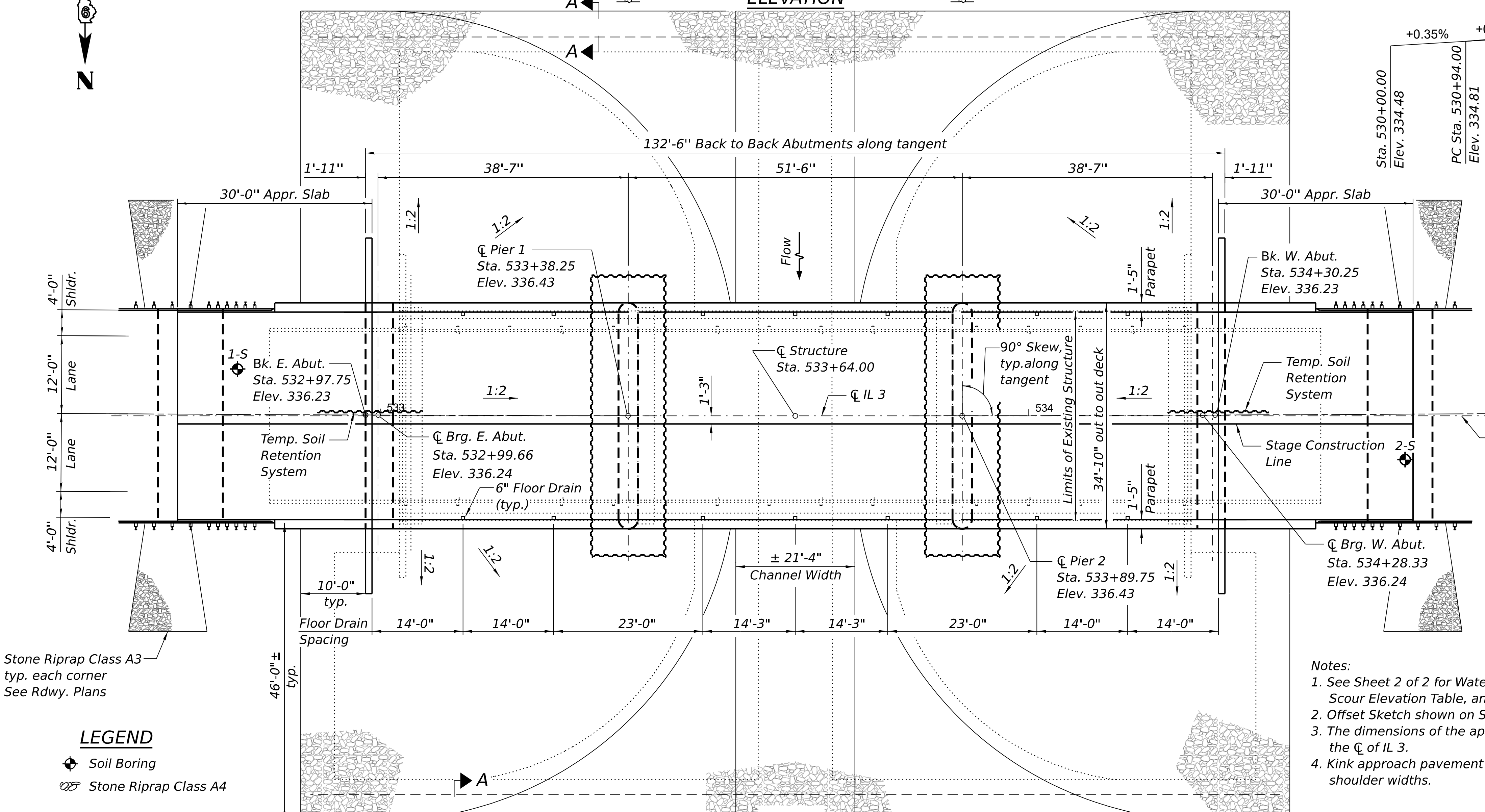
P.I. Sta. = 535+79.54
Δ = 12°12'00" (LT)
D = 00°20'00"
R = 17,188.80'
T = 1,836.95'
L = 3660.00'
E = 97.88'
P.C. Sta. = 517+42.60
P.T. Sta. = 554+02.60

SEISMIC DATA

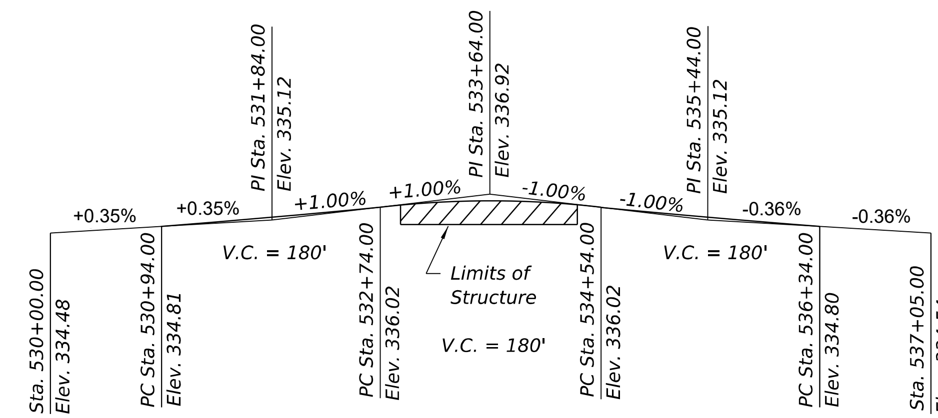
2023 AASHTO Seismic Hazard
Seismic Design Category (SDC) = D
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.753g
Soil Site Class = DE
Performance Level = Operational
Latitude = 37.13° N Longitude = 89.28° W



ELEVATION

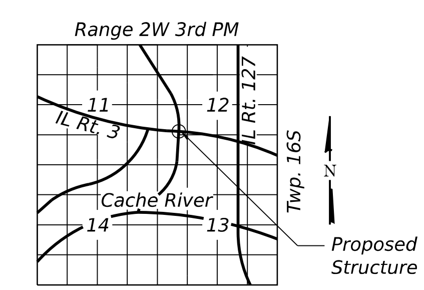


PLAN



PROFILE GRADE

Along ℄ IL 3



LOCATION SKETCH

Notes:
1. See Sheet 2 of 2 for Waterway Information Table, Design Scour Elevation Table, and Section A-A.
2. Offset Sketch shown on Sheet 2 of 2.
3. The dimensions of the approach roadway are radial to the ℄ of IL 3.
4. Kink approach pavement in order to maintain lane and shoulder widths.

LEGEND

Soil Boring
Stone Riprap Class A4

GENERAL PLAN AND ELEVATION
IL 3 OVER DRAINAGE DITCH
F.A.P. RTE. 14 - SEC. 136-1B
ALEXANDER COUNTY
STATION 533+64.00
STRUCTURE NO. 002-0038

USER NAME = dcochran	DESIGNED - DAC	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
	DRAWN - DAC	REVISED -	
PLOT SCALE = NA	CHECKED - DH	REVISED -	
PLOT DATE = 4/9/2025	DATE - 04/11/2025	REVISED -	

CMT
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SCALE: SHEET 1 OF 2 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
14	136-1B	ALEXANDER		

CONTRACT NO. 78791
ILLINOIS FED. AID PROJECT

MODEL: Untitled [Sheet]
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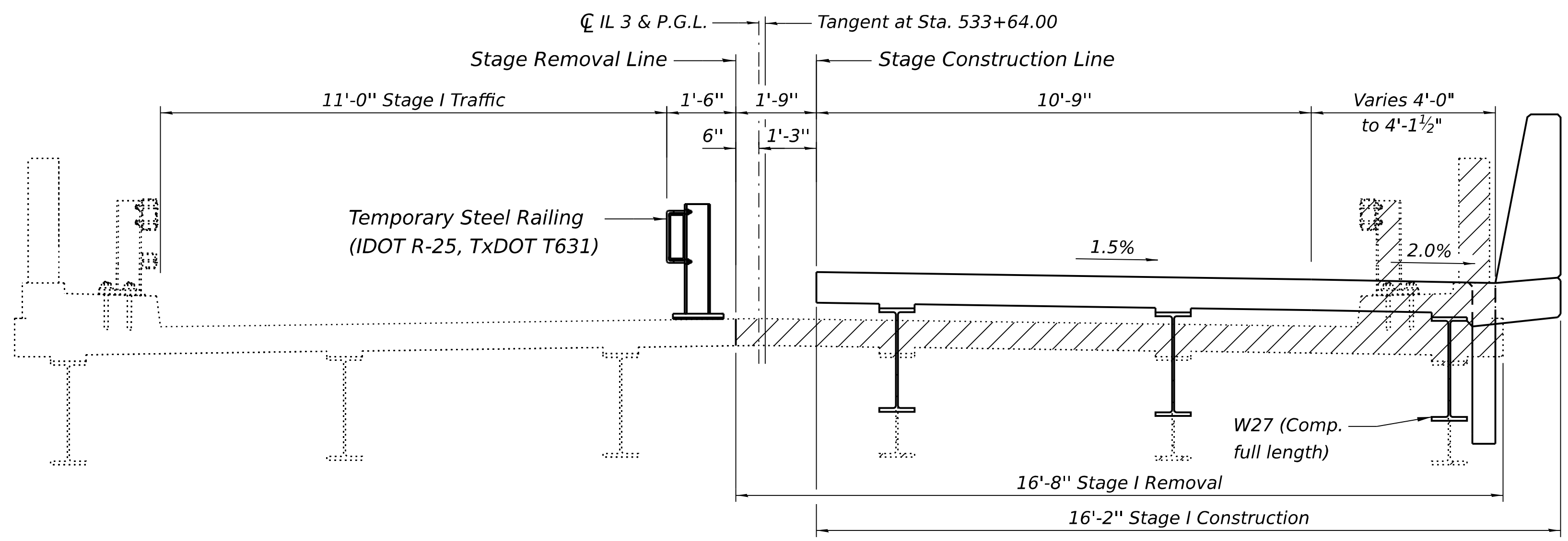
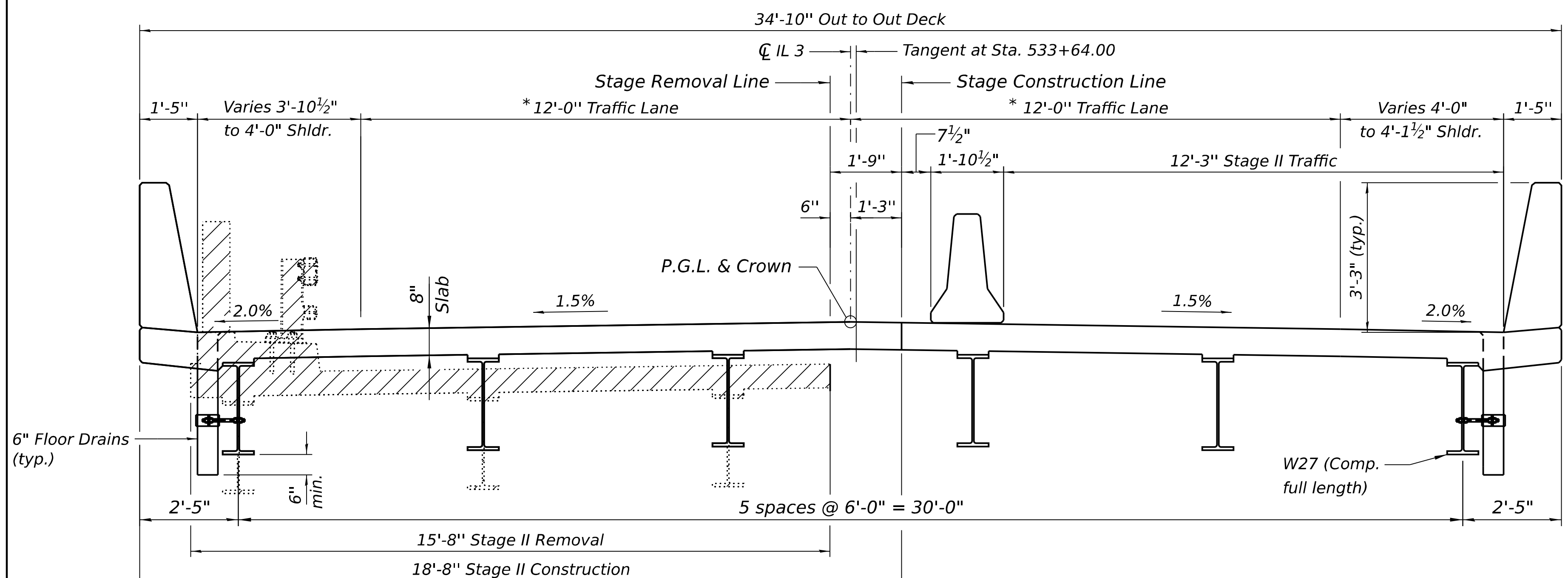


STAGE I CROSS SECTION

(Looking West)

* Radial to ℄ of roadway



STAGE II CROSS SECTION

(Looking West)

WATERWAY INFORMATION

Drainage Area = 12 Sq. Mi.	Exist. Overtopping Elev. = 334.0 at Sta. 522+50
	Prop. Overtopping Elev. = 334.0 at Sta. 522+50

Flood	Freq. Yr.	Q C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
Ten-Year	10	2,120	1,482	1,664	333.0	0.0	0.0	333.0	333.0
Design	50	3,090	1,482	1,664	333.0	0.0	0.0	333.0	333.0
Base	100	3,500	1,482	1,664	333.0	0.1	0.1	333.1	333.1
Scour Check	200	3,953	1,482	1,664	333.0	0.1	0.1	333.1	333.1
Max. Calc.	500	4,540	1,482	1,664	333.0	0.1	0.1	333.1	333.1

Existing 10 Year Average Velocity (Q/A) = 1.6 ft/s

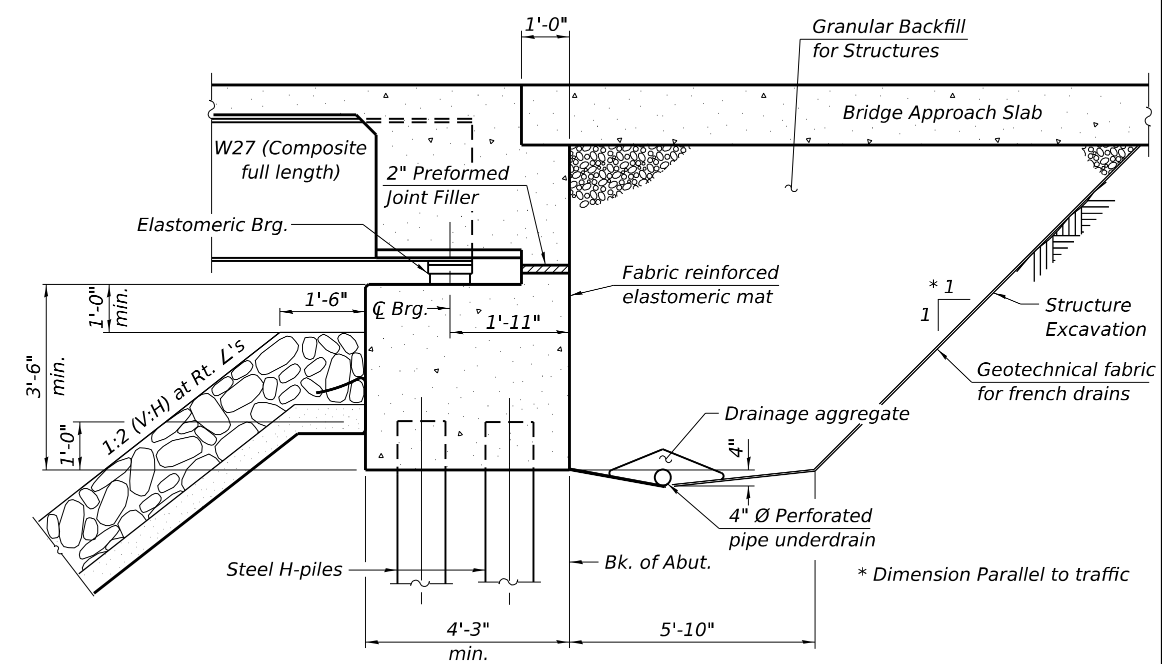
Proposed 10 Year Average Velocity (Q/A) = 1.3 ft/s

DESIGN SCOUR ELEVATION TABLE

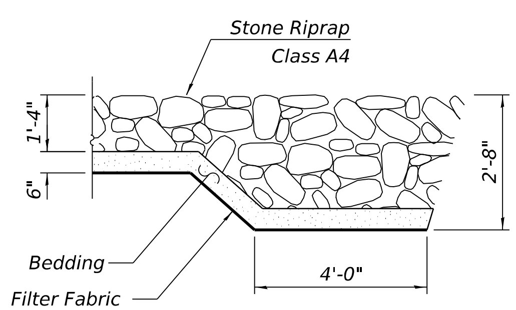
Event / Limit State	Design Scour Elevations (ft.) E. Abut.	Pier 1	Pier 2	W. Abut.	Item 113
Q100	--	298.9	298.9	--	5
Q200	--	298.1	298.1	--	
Design	329.32	298.9	298.9	329.32	
Check	329.32	298.1	298.1	329.32	

BYPASS FLOWRATE FROM BRIDGE LIMITS (END OF APPROACH SLAB) TO ROADWAY

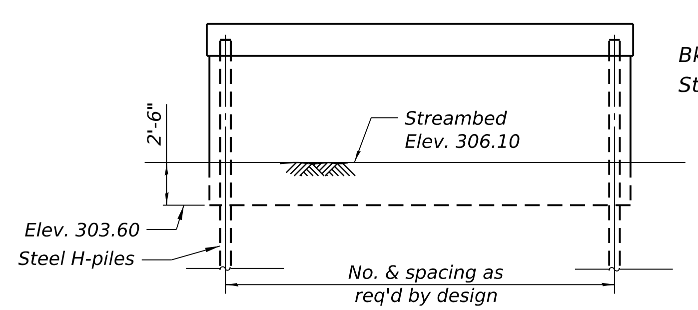
	NW Curbline	SW Curbline	NE Curbline	SE Curbline
Q (C.F.S.)	0.46	0.46	0.46	0.46



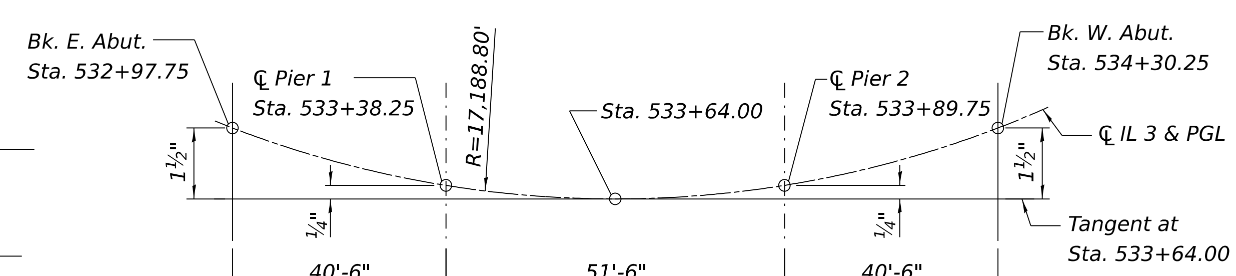
SECTION THRU SEMI-INTEGRAL ABUTMENT



SECTION A-A



PIER SKETCH



OFFSET SKETCH

DETAILS
IL 3 OVER DRAINAGE DITCH
F.A.P. RTE. 14 - SEC. 136-1B
ALEXANDER COUNTY
STATION 533+64.00
STRUCTURE NO. 002-0038

FILE NAME: L:\IDOT\19066\10\WO_5\Draw\Structures\002 - TSL IL 3 Over Drainage Ditch ORD.dgn

CMT

License No. 184-000613 Copyright CMT, Inc.

USER NAME = dcochran	DESIGNED - DAC	REVISED -
	DRAWN - DAC	REVISED -
PLOT SCALE = N/A	CHECKED - DH	REVISED -
PLOT DATE = 4/9/2025	DATE - 04/11/2025	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SCALE: SHEET 2 OF 2 SHEETS STA. TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
14	136-1B	ALEXANDER		

CONTRACT NO. 78791

ILLINOIS FED. AID PROJECT

EXHIBIT D

BORING LOGS

Illinois Department of Transportation

Memorandum

To:	Carrie Nelsen	Attn: Dave Piche
From:	Keith Roberts	By: Aaron Hayes
Subject:	Boring Logs	
Date:	January 3, 2020	

IL 3 over drainage ditch
Structure 002-0012 (Existing)
Alexander County

Foundation boring logs have been obtained for the design of the replacement of the above listed structure and are attached.

Boring 1-S, near the east abutment, shows a layer of potentially liquefiable soil at a depth of 31.0 to 38.5 feet. Boring 2-S, near the west abutment, shows a layer of potentially liquefiable soil at a depth of 33.5 to 48.5 feet. A liquefaction analysis should be completed with the Structural Geotechnical Report once the proposed structure's dimensions are determined.

A General Plan and Elevation sheet from 1947 has been attached for additional information. Please contact the Geotechnical Unit if additional subsurface information is necessary for the design of this structure.

Attachments
AWH:ah

cc: Soils File\Alexander\Structures

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 5/9/19

ROUTE IL 3 **DESCRIPTION** Structure over drainage ditch **LOGGED BY** L. Estel

SECTION **LOCATION** Near E. Abut 1/2 mi. W of IL 127, **SEC.** 12, **TWP.** 16S, **RNG.** 2W, **PM**

COUNTY Alexander **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lbs

STRUCT. NO. 002-0012
Station 533+64

BORING NO. 1-S
Station 532+78
Offset 7.0ft LT
Ground Surface Elev. 335.0 ft

Surface Water Elev. 327.7 ft
Stream Bed Elev. 306.6 ft

Groundwater Elev.:
▽ **First Encounter** 316.5 ft
▼ **Upon Completion** 315.0 ft
▼ **After** ___ **Hrs.** ___ ft

Description	Bottom Elev. (ft)	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
Cored Pavement, 5" HMA over 10" CONCRETE	333.75				
Brown, Moist CLAY with f. rounded GRAVEL	331.50				
Stiff Grey and Brown, Moist SILTY CLAY with f. rounded GRAVEL	329.00	-5	1 4 4	1.9 B	20
Stiff Grey and Brown, Moist SILTY LOAM	326.50		1 3 4	1.5 B	22
M. Stiff Grey, Moist SILTY CLAY	324.00	-10	1 1 2	0.7 B	23
V. Stiff Brown, Moist SILTY CLAY LOAM with f. Brown Rounded GRAVEL	321.50		1 6 8	2.2 B	21
Stiff Brown, Moist SILTY CLAY LOAM with f. Brown Rounded GRAVEL	319.00	-15	1 6 6	1.3 B	25
Stiff Grey, Moist CLAY	▽ 316.50		1 3 5	1.6 B	28
Stiff Grey, V. Moist CLAY with ORGANICS (Note 1) ▼		-20	1 2 3	1.1 S	39
	314.00				
Stiff Grey, V. Moist CLAY with ORGANICS (Note 1)	311.50		1 3 5	1.9 S	39
M. Stiff Brownish Grey, Moist CLAY (Note 1)	309.00	-25	1 2 3	1.9 B	37
M. Stiff Brownish Grey with specks of Brown, Moist CLAY (Note 1)	306.50		WOH 1 2	0.9 B	31
V. Soft Grey, Moist LOAM 45% f. to m. Sand, 37% Silt, 18% Clay, LL = 36, PI = 16 (Lab 32)	304.00	-30	WOH WOH WOH	0.2 B	28
V. Loose Grey, V. Moist LOAM 47% f. to m. Sand, 40% Silt, 13% Clay, V. Low Plasticity (Lab 33)	301.50		WOH 1 3		31
V. Loose Grey, V. Moist SANDY LOAM 1% c. Sand, 76% f. to m. Sand, 17% Silt, 6% Clay, Non-plastic (Lab 34)	299.00	-35	WOH WOH WOH		27
M. Dense Grey, Moist SAND 15% c. Sand, 81% f. to m. Sand, 3% Silt, 2% Clay, Non-plastic (Lab 35)	296.50		2 7 8		19
		-40	7 7 12		16

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

Illinois Department of Transportation

Division of Highways
District 9

SOIL BORING LOG

Date 5/9/19

ROUTE IL 3 **DESCRIPTION** Structure over drainage ditch **LOGGED BY** L. Estel

SECTION **LOCATION** Near E. Abut 1/2 mi. W of IL 127, **SEC.** 12, **TWP.** 16S, **RNG.** 2W, **PM**

COUNTY Alexander **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lbs

STRUCT. NO. 002-0012
Station 533+64

BORING NO. 1-S
Station 532+78
Offset 7.0ft LT
Ground Surface Elev. 335.0 ft

Surface Water Elev. 327.7 ft
Stream Bed Elev. 306.6 ft

Groundwater Elev.:
First Encounter 316.5 ft
Upon Completion 315.0 ft
After ____ **Hrs.** ____ ft

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
M. Dense Grey, Moist SAND with f. GRAVEL 31% c. Sand and f. Gravel, 51% f. to m. Sand, 12% Silt, 6% Clay, Non-plastic (Lab 36) (Note 2) *(continued)*				
291.00				
M. Dense Grey, Moist m. to c. SAND with f. GRAVEL (Note 2)		5		
	-45	10		15
		11		
		6		
	-50	8		10
		10		
		5		
	-55	6		
		12		
		5		
	-60	7		

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
M. Dense Grey, Moist m. to c. SAND with f. GRAVEL (Note 2) *(continued)*		12		
		6		
	-65	10		
		15		
266.00				
V. Stiff Brownish Grey, Dry to Moist SILTY LOAM		100/9"		
	-70		2.5 E	27
261.00				
V. Stiff Grey, Moist CLAY with CHERT		8		
259.90	-75	100/4"	3.4 S	23
Borehole continued with rock coring				
	-80			

Note 1: Not Liquefiable, PI >= 12 based on visual ID and historical data
Note 2: Not Liquefiable, N60 > 25

Bottom of hole @ 85.1 ft
Elevation referenced to BM 002-0012, Chiseled Square on NW Wingwall of SN 002-0012; EL. 335.63

To convert "N" values to "N60", multiply by 1.5

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
District 9

ROCK CORE LOG

Date 5/9/19

ROUTE IL 3 **DESCRIPTION** Structure over drainage ditch **LOGGED BY** L. Estel

Near E. Abut.

SECTION ______ **LOCATION** 1/2 mi. W of IL 127, **SEC.** 12, **TWP.** 16S, **RNG.** 2W, **PM**

COUNTY Alexander **CORING METHOD** Conventional rotary with water

STRUCT. NO. 002-0012
Station 533+64

BORING NO. 1-S
Station 532+78
Offset 7.0ft LT
Ground Surface Elev. 335.0 ft

CORING BARREL TYPE & SIZE NV3 5FT NWJ

Core Diameter 2 in
Top of Rock Elev. 259.90 ft
Begin Core Elev. 259.90 ft

Description	Elev.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Grey CLAY SHALE, Dry, V. Fine Grained, Hard Field Hardness	259.90		1	94	8	4	696
White with Light Brown LIMESTONE, Dry, V. Fine Grained, Low Hardness Field Hardness	259.30	-80	2	46	0	5	
	252.50						
White with streaks of Light Brown CHERT, Dry, V. Fined Grained, Hard Field Hardness	249.90	-85					
		-90					
		-95					

Color pictures of the cores Yes, attached
Cores will be stored for examination until Const. complete
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run

Illinois Department of Transportation
District Nine Materials
Unconfined Compressive Strength

Route IL 3
Structure 002-0012 (Boring 1-S)
Alexander County

75.1' →

← 85.1'

Boring #	Specimen#	Depth	Unconfined Compression
1-S	1	75.3'	9670 psi

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 10/14/19

ROUTE IL 3 **DESCRIPTION** Structure over drainage ditch **LOGGED BY** L. Estel

SECTION **LOCATION** Near W. Abut. 1/2 mi. W of IL 127, **SEC.** 12, **TWP.** 16S, **RNG.** 2W, **PM**

COUNTY Alexander **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lbs

STRUCT. NO. 002-0012
Station 533+64

BORING NO. 2-S
Station 534+58
Offset 7.0ft RT
Ground Surface Elev. 335.0 ft

Surface Water Elev. 310.4 ft
Stream Bed Elev. 306.6 ft

Groundwater Elev.:
▽ **First Encounter** 300.5 ft
▼ **Upon Completion** ft
▼ **After** Hrs. ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
Cored Pavement, 2" HMA over 11" CONCRETE	333.92				
Stiff Brown, Moist SILTY CLAY LOAM with GRAVEL			5		
			5	1.4	15
	331.50		5	S	
Stiff Greyish Brown, Moist SILTY CLAY			1		
			4	1.6	23
		-5	4	B	
			1		
			3	1.1	21
	326.50		3	B	
M. Stiff Brown with specks of Grey, Moist SILTY CLAY LOAM			1		
			3	0.8	24
	324.00	-10	5	B	
Hard Brown, Moist SILTY CLAY LOAM			1		
			4	3.1	17
	321.50		6	B	
Stiff Brown and mottled Grey, Moist SILTY CLAY			1		
			5	1.7	37
	319.00	-15	5	B	
Stiff Grey, Moist CLAY			1		
			3	1.5	29
	316.50		4	B	
V. Stiff Brown and mottled Grey, Moist CLAY (Note 1)			1		
			3	2.2	32
		-20	4	B	

Description	Elev. (ft)	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
V. Stiff Brown and mottled Grey, Moist CLAY (Note 1) *(continued)*			1		
			3	2.2	31
	311.50		5	B	
M. Stiff Brownish Grey, Moist SILTY CLAY (Note 1)			1		
			2	0.8	33
	309.00	-25	3	B	
Stiff Brownish Grey and mottled Black, Moist SILTY CLAY (Note 1)			1		
			1	1.2	29
	306.50		2	B	
Stiff Bluish Grey, Moist CLAY (Note 1)			1		
			1	1.1	38
		-30	2	B	
			1		
			2	1.0	29
	301.50		3	B	
M. Stiff Grey, Moist SILTY LOAM			1		
	▽ 300.50		3	0.7	23
V. Loose Grey, Wet SANDY LOAM 71% f. SAND, 21% SILT, 8% CLAY (Lab 55)	299.00	-35	2	B	
V. Loose Grey, Moist f. SAND with m. SAND 2% c. SAND, 15% m. SAND, 78% f. SAND, 4% SILT, 1% CLAY (Lab 56)			WOH		
			WOH		
	296.50		1		
M. Dense Grey, Moist f. SAND with rounded GRAVEL 10% c. SAND to f. GRAVEL, 12%			3		
			5		
		-40	7		

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
District 9

SOIL BORING LOG

Date 10/14/19

ROUTE IL 3 **DESCRIPTION** Structure over drainage ditch **LOGGED BY** L. Estel

SECTION **LOCATION** Near W. Abut. 1/2 mi. W of IL 127, **SEC.** 12, **TWP.** 16S, **RNG.** 2W, **PM**

COUNTY Alexander **DRILLING METHOD** Hollow stem auger (8" O.D., 3.25" I.D.) **HAMMER TYPE** Auto SPT 140 lbs

STRUCT. NO. 002-0012
Station 533+64

BORING NO. 2-S
Station 534+58
Offset 7.0ft RT
Ground Surface Elev. 335.0 ft

Surface Water Elev. 310.4 ft
Stream Bed Elev. 306.6 ft

Groundwater Elev.:
First Encounter 300.5 ft
Upon Completion ft
After Hrs. ft

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
m. SAND, 73% f. SAND, 4% SILT, 1% CLAY (Lab 57)				
Loose		3		
		3		
	-45	6		
M. Dense		7		
		13		
	-50	15		
281.50				
M. Dense Grey, Moist m. to f. SAND with f. GRAVEL 13% c. SAND to f. GRAVEL, 59% m. SAND, 26% f. SAND, 2% SILT (Lab 58)		6		
		12		
	-55	12		
(with a 2" COAL layer)		5		
		9		
	-60	12		

Description	DEPTH (ft)	BLOWS	UCS Qu (tsf)	MOIST (%)
M. Dense Grey, Moist m. to f. SAND with f. GRAVEL 13% c. SAND to f. GRAVEL, 59% m. SAND, 26% f. SAND, 2% SILT (Lab 58) *(continued)*				
		4		
		6		
	-65	7		
		8		
		10		
	-70	12		
261.50				
V. Hard White to Tan, Dry LIMESTONE 261.30		100/2"		
	-75			
	-80			

Note 1: Not Liquefiable, PI >= 12 based on visual ID and historical data

Bottom of hole @ 73.7 ft

Elevation referenced to BM 002-0012, Chiseled Square on NW Wingwall of SN 002-0012; EL. 335.63

To convert "N" values to "N60", multiply by 1.5

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)

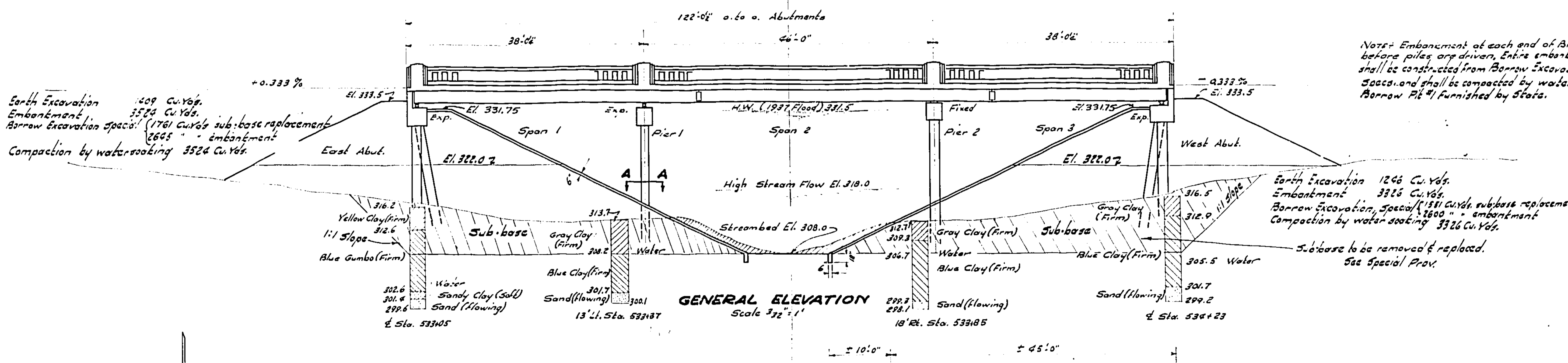
B.M. Spike & 2 washers in root of 15" Elm
100' Lt. Sta. 532+35 El. 315.53
Location - No existing structure

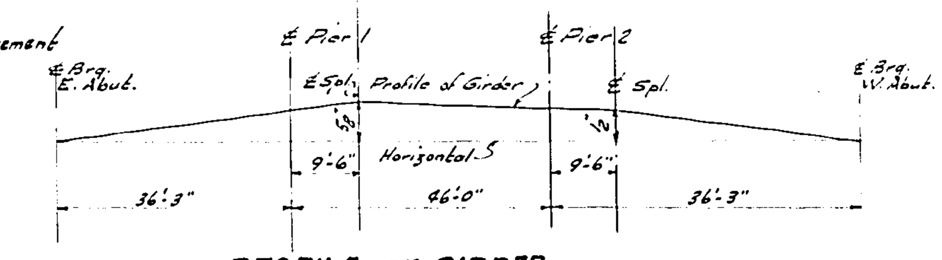
STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

~~BOND ISSUE~~ ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
FA100	136-1B	Alexander	9	4
FED. ROAD DIST. NO. 7		ILLINOIS	FED AID PROJECT -	

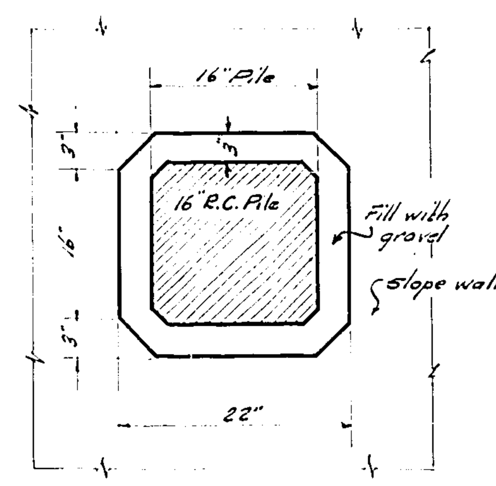
SHEET NO. 1
4 SHEETS

Note: Embankment at each end of Bridge to be constructed to El. 328.0 before piles are driven. Entire embankment at each abutment, including sub-base replacement, shall be constructed from Borrow Excavation, Special, in accordance with Sec. 16 of the Standard Specs. and shall be compacted by watersoaking in addition to mechanical compaction. Borrow Pit #1 Furnished by State.



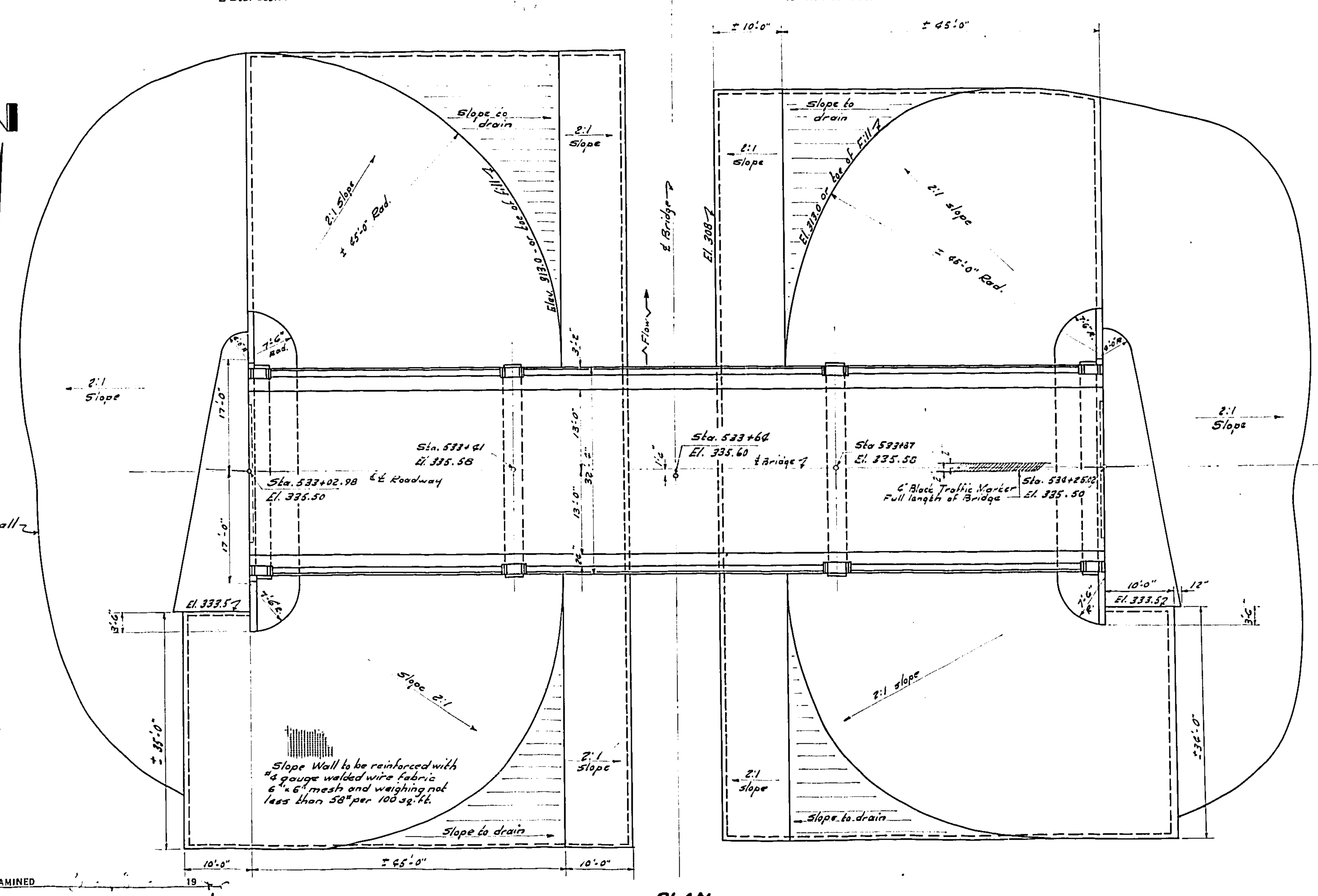


PROFILE OF GIRDER



SEC. A-A

Cost of furnishing & placing gravel to be included in contract unit price for slopewall.



PLAN

TOTAL BILL OF MATERIAL

Item		Super structure	Sub structure	Total
Class X Concrete	Cu. Yds.	106.8	52.6	159.4
Handrail Concrete	Cu. Yds.	13.4	—	13.4
Structural Steel	Lbs.	87360	—	87360
Reinforcement Bars	Lbs.	19760	3750	23510
16" Precast Concrete Piles (40'lg.)	Lin. Ft.		1040	1040
Precast Test Piles	Each		2	2
Borrow Excavation, Special	Cu. Yds.		8557	8557
Slope Wall	Sq. Yds.		1625	1625
Name Plate	Each	1		1
Compaction by Watersoaking	Cu. Yds.		6850	6850
Earth Excavation	Cu. Yds.		2655	2655
Tree Removal	Acres			0.11

GENERAL NOTES

Class X Concrete shall be used thru-out, except as noted.

Concrete floor slab shall be finished in accordance with Art. 61.3 (e) of the Standard Specifications and shall be poured in one continuous operation.

All connections shall be riveted, except as noted. Rivets shall be ¾"φ and holes 13/16"φ, except as noted.

All holes for splices shall be punched 11/16"φ and reamed to proper size (13/16"φ in web and 15/16"φ in flange) with all stringers assembled in shop in proper position with or without diaphragms in place. Leave assembled in shop for inspection.

All rollers, bearing plates, lead plates, and anchor bolts shall be furnished painted and set in accordance with Art. 54.3 (d) of the Std. Specs. and are included for payment as Structural Steel Est. Weight 6952#

Structural steel shall receive one shop coat of red lead paint after inspection and two field coats of aluminum paint. All paint to be furnished by the contractor.

Contractor shall drive two test piles as directed by the Engineer before casting the remainder of the piles. One test pile shall be driven after embankment has been placed to El. 322.0.

Layout of slope walls may be varied as necessary to conform to ground surface after embankment has been constructed if so directed by the Engineer.

Embankments at Abutments shall be compacted by watersoaking in addition to mechanical compaction.

Anchor bolts shall be set before riveting diaphragms over abuts. & piers.

Boring data are shown only as a guide to bidders in estimating soil conditions which may be encountered in the work.

STANDARD	COMPUTED	George T. Fletcher
	CHECKED	R.L. Smith
	DRAWN	Fletcher Sutzer
	CHECKED	R.L.S.
SPECIAL	ASSEMBLED	
	CHECKED	

EXAMINED ____ 19 __
BRIDGE ENGINEER
PASSED
ENGINEER OF DESIGN
APPROVED
CHIEF HIGHWAY ENGINEER

Revised from 24' to 26' Roadway. - 10-7-46 W.F. Baumann Chk. 10-14-46 R.L.S.
Revised 1/24/47 - Sub-base removal & replacement added

WATERWAY INFORMATION
Drainage Area 6250 Acres
Character Level, Hilly
314 ☐' opening corresponds to, C (Talbot) = 0.447
Opening Provided 314☐' below H.W.
1335☐' below 1937 Flood

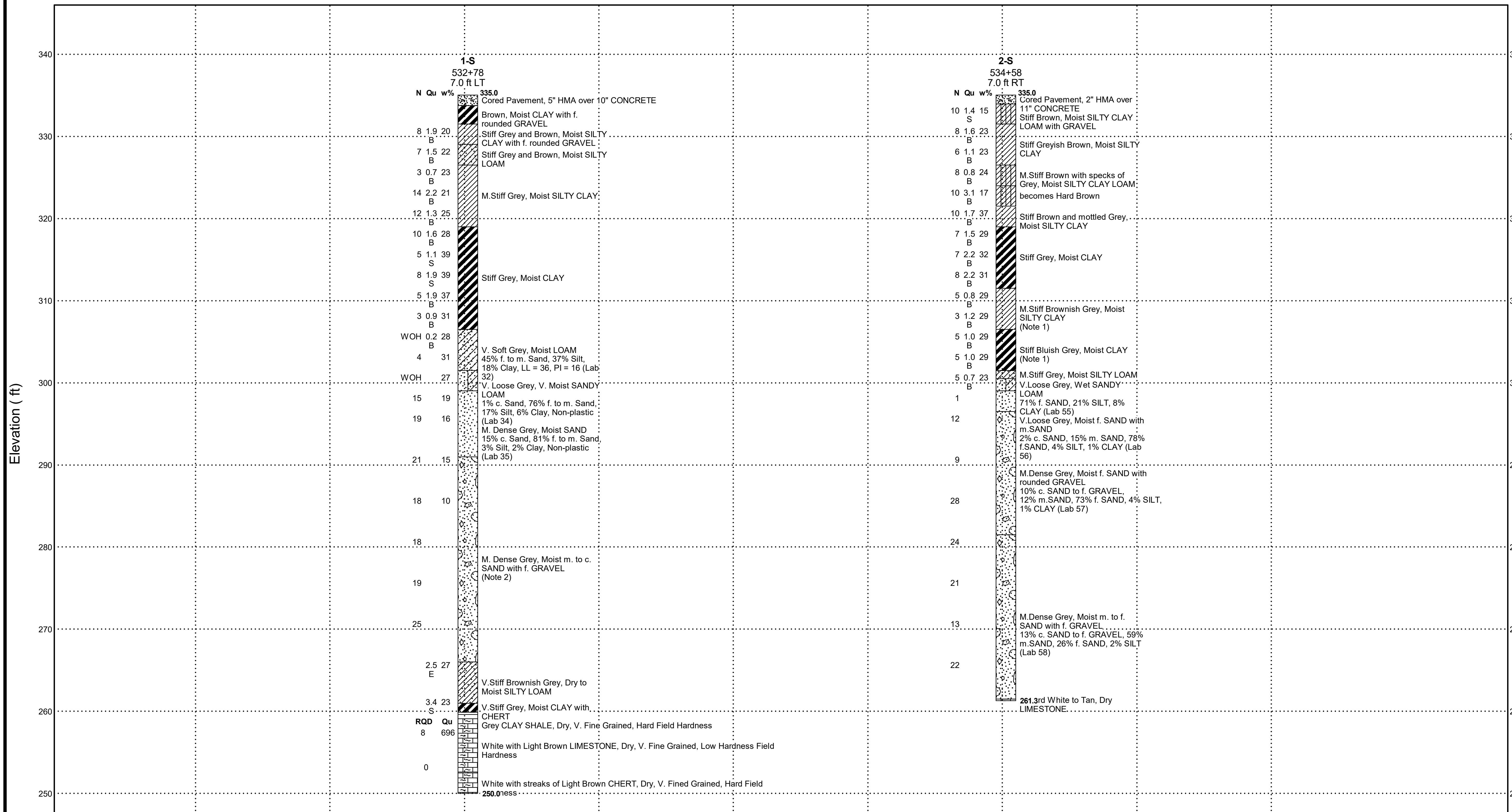
Design Stresses
fs 20,000 Reinforcement
fs 18,000 Structural
fc 1200
n 10

H-20-S-16-44 Loading

PROJ. F-201 (9)
F.A. RTE. 100 (~~SBI RTE 150~~) SEC. 136-1-B
ALEXANDER CO.
STA. 533+64

EXHIBIT E

SUBSURFACE PROFILE



NOT TO HORIZONTAL SCALE

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

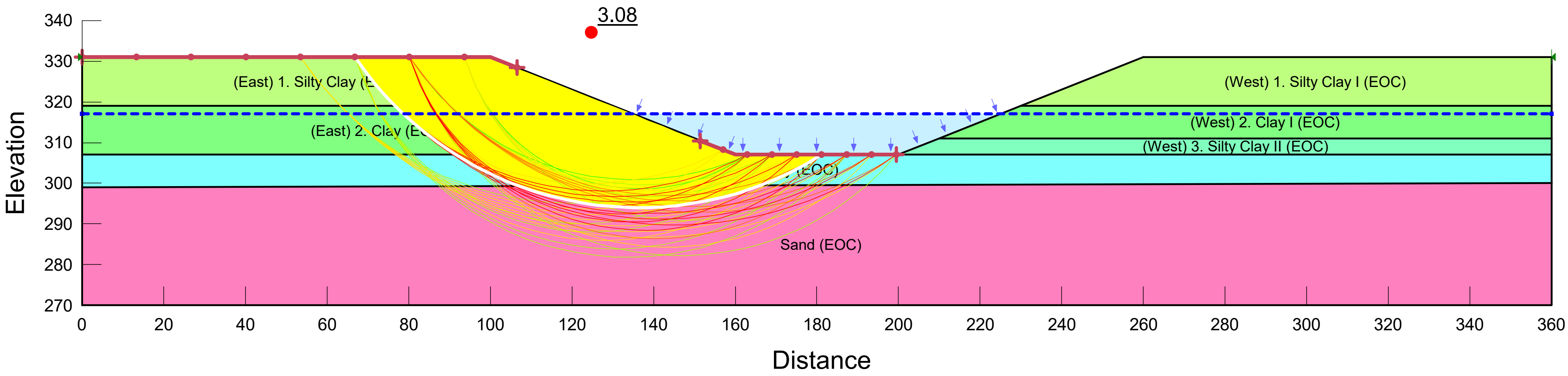
SUBSURFACE PROFILE

Route: FAP 14 (IL 3)
Section: 136-1B
County: Alexander

EXHIBIT F

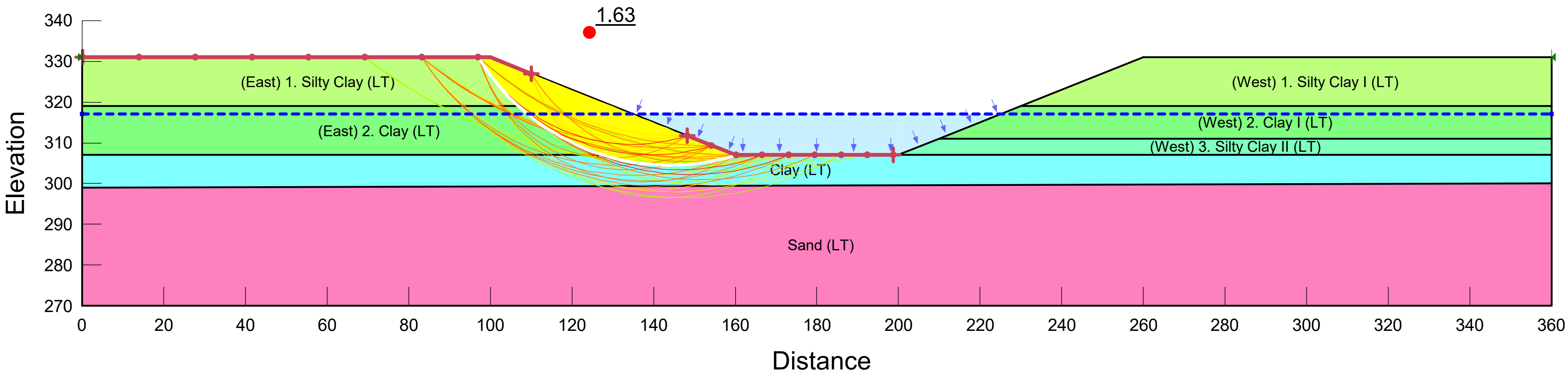
SLOPE/W SLOPE STABILITY ANALYSIS

IL-3 over Unnamed Ditch, Alexander Co. Bridge Replacement - East Abutment
Boring 1-S
End-of-Construction (Undrained Analysis)



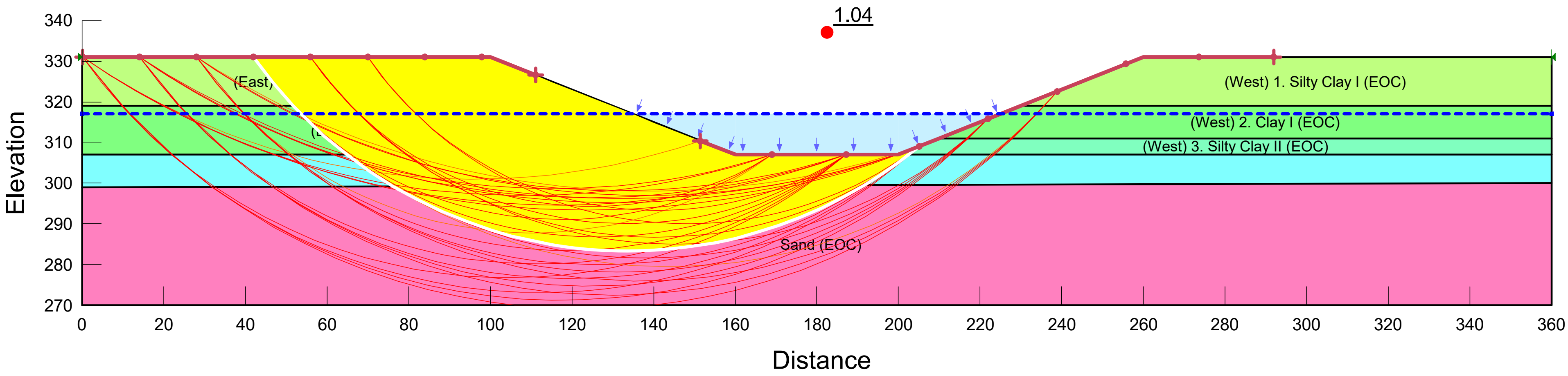
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	(East) 1. Silty Clay (EOC)	Mohr-Coulomb	120	1,500	0	0	1
	(East) 2. Clay (EOC)	Mohr-Coulomb	120	1,600	0	0	1
	(West) 1. Silty Clay I (EOC)	Mohr-Coulomb	120	1,660	0	0	1
	(West) 2. Clay I (EOC)	Mohr-Coulomb	120	2,000	0	0	1
	(West) 3. Silty Clay II (EOC)	Mohr-Coulomb	120	1,000	0	0	1
	Clay (EOC)	Mohr-Coulomb	120	900	0	0	1
	Sand (EOC)	Mohr-Coulomb	120	0	34	0	1

IL-3 over Unnamed Ditch, Alexander Co. Bridge Replacement - East Abutment
Boring 1-S
Long Term (Drained Analysis)



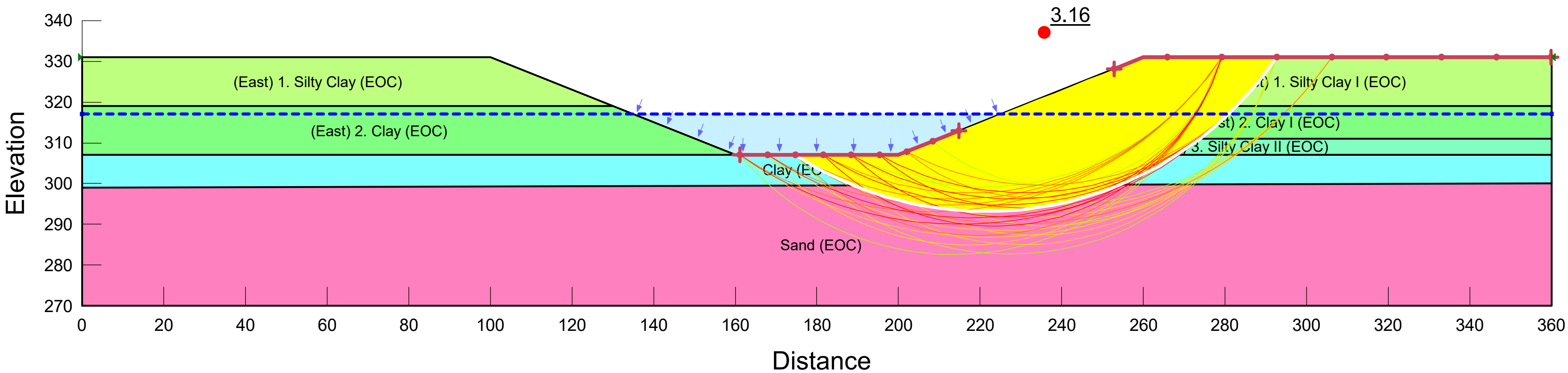
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	(East) 1. Silty Clay (LT)	Mohr-Coulomb	120	100	26	0	1
	(East) 2. Clay (LT)	Mohr-Coulomb	120	100	26	0	1
	(West) 1. Silty Clay I (LT)	Mohr-Coulomb	120	100	26	0	1
	(West) 2. Clay I (LT)	Mohr-Coulomb	120	100	26	0	1
	(West) 3. Silty Clay II (LT)	Mohr-Coulomb	120	100	26	0	1
	Clay (LT)	Mohr-Coulomb	120	100	26	0	1
	Sand (LT)	Mohr-Coulomb	120	0	34	0	1

IL-3 over Unnamed Ditch, Alexander Co. Bridge Replacement - East Abutment
Boring 1-S
Seismic Analysis, Ks = 0.4126



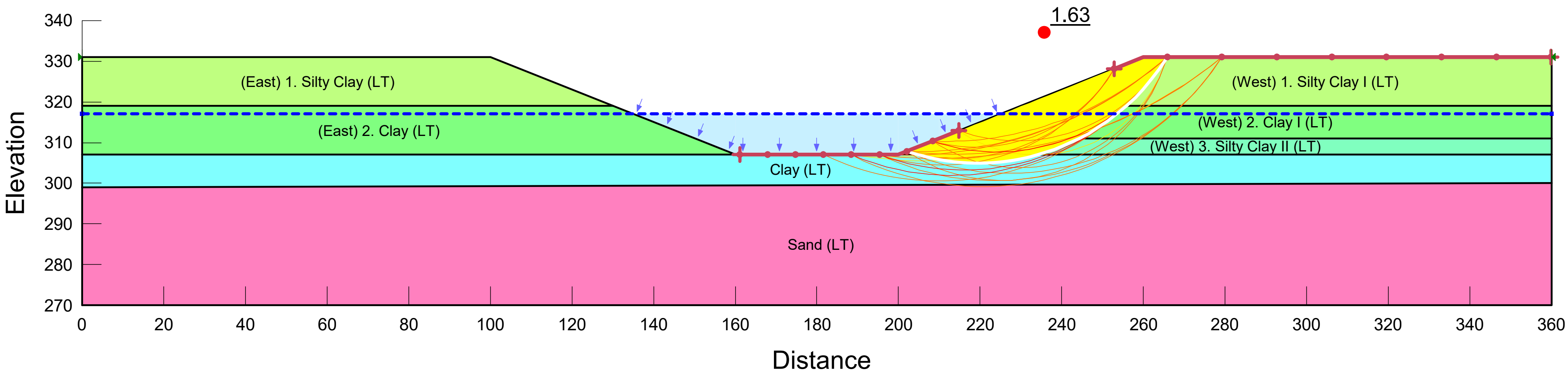
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	(East) 1. Silty Clay (EOC)	Mohr-Coulomb	120	1,500	0	0	1
	(East) 2. Clay (EOC)	Mohr-Coulomb	120	1,600	0	0	1
	(West) 1. Silty Clay I (EOC)	Mohr-Coulomb	120	1,660	0	0	1
	(West) 2. Clay I (EOC)	Mohr-Coulomb	120	2,000	0	0	1
	(West) 3. Silty Clay II (EOC)	Mohr-Coulomb	120	1,000	0	0	1
	Clay (EOC)	Mohr-Coulomb	120	900	0	0	1
	Sand (EOC)	Mohr-Coulomb	120	0	34	0	1

IL-3 over Unnamed Ditch, Alexander Co. Bridge Replacement - West Abutment
Boring 2-S
End-of-Construction (Undrained Analysis)



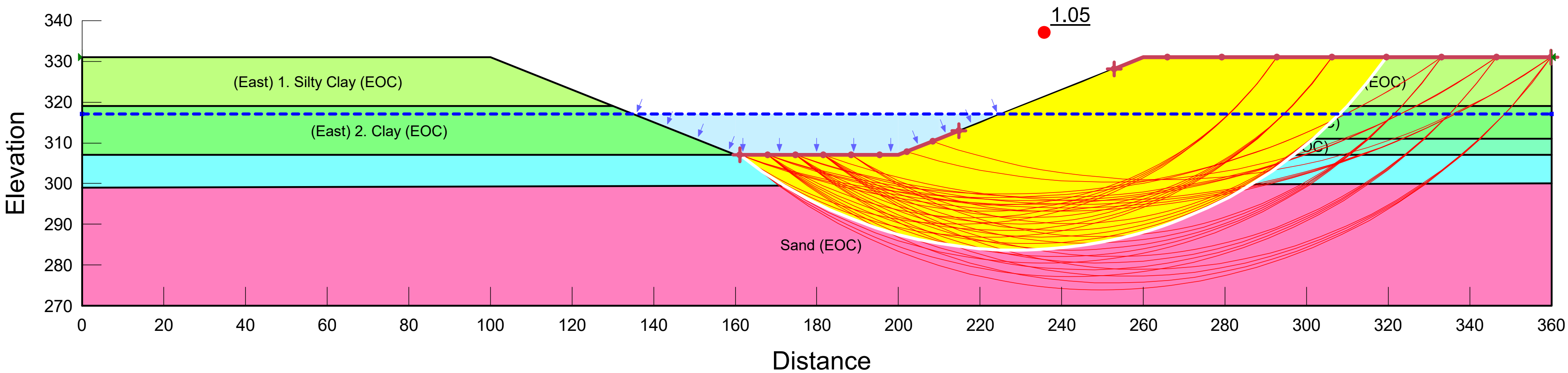
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	(East) 1. Silty Clay (EOC)	Mohr-Coulomb	120	1,500	0	0	1
	(East) 2. Clay (EOC)	Mohr-Coulomb	120	1,600	0	0	1
	(West) 1. Silty Clay I (EOC)	Mohr-Coulomb	120	1,660	0	0	1
	(West) 2. Clay I (EOC)	Mohr-Coulomb	120	2,000	0	0	1
	(West) 3. Silty Clay II (EOC)	Mohr-Coulomb	120	1,000	0	0	1
	Clay (EOC)	Mohr-Coulomb	120	900	0	0	1
	Sand (EOC)	Mohr-Coulomb	120	0	34	0	1

IL-3 over Unnamed Ditch, Alexander Co. Bridge Replacement - West Abutment
Boring 2-S
Long Term (Drained Analysis)



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	(East) 1. Silty Clay (LT)	Mohr-Coulomb	120	100	26	0	1
	(East) 2. Clay (LT)	Mohr-Coulomb	120	100	26	0	1
	(West) 1. Silty Clay I (LT)	Mohr-Coulomb	120	100	26	0	1
	(West) 2. Clay I (LT)	Mohr-Coulomb	120	100	26	0	1
	(West) 3. Silty Clay II (LT)	Mohr-Coulomb	120	100	26	0	1
	Clay (LT)	Mohr-Coulomb	120	100	26	0	1
	Sand (LT)	Mohr-Coulomb	120	0	34	0	1

IL-3 over Unnamed Ditch, Alexander Co. Bridge Replacement - West Abutment
Boring 2-S
Seismic Analysis, Ks = 0.4126



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Line
	(East) 1. Silty Clay (EOC)	Mohr-Coulomb	120	1,500	0	0	1
	(East) 2. Clay (EOC)	Mohr-Coulomb	120	1,600	0	0	1
	(West) 1. Silty Clay I (EOC)	Mohr-Coulomb	120	1,660	0	0	1
	(West) 2. Clay I (EOC)	Mohr-Coulomb	120	2,000	0	0	1
	(West) 3. Silty Clay II (EOC)	Mohr-Coulomb	120	1,000	0	0	1
	Clay (EOC)	Mohr-Coulomb	120	900	0	0	1
	Sand (EOC)	Mohr-Coulomb	120	0	34	0	1

EXHIBIT G

LIQUEFACTION ANALYSIS

LIQUEFACTION ANALYSIS

Illinois Department of Transportation

REFERENCE BORING NUMBER ==================================== 1-S
ELEVATION OF BORING GROUND SURFACE ========================= 335.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 18.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ================== 18.50 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.938
EARTHQUAKE MOMENT MAGNITUDE =============================== 7.7
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ===================== FT.
HAMMER EFFICIENCY=== 73 %
BOREHOLE DIAMETER== 8 IN.
SAMPLING METHOD== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **0.948**

AVG. SHEAR WAVE VELOCITY (top 40')
$V^{*}_{s,40'}$ = **#DIV/0!** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.7
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = NMSZ
PGA = **1.699**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE						
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
332.5	2.5	5					20	0.111	0.278	9.541	9.541	0.109	0.111	0.278	0.278	1.500	**0.155**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
330	5	8	1.9				20	0.129	0.600	13.932	13.932	0.149	0.129	0.600	0.600	1.382	**0.196**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
327.5	7.5	7	1.5				22	0.126	0.915	10.966	10.966	0.122	0.126	0.915	0.915	1.221	**0.141**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
325	10	3	0.7				23	0.117	1.208	4.678	4.678	0.070	0.117	1.208	1.208	1.119	**0.074**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
322.5	12.5	14	2.2				21	0.131	1.535	22.344	22.344	0.247	0.131	1.535	1.535	1.105	**0.259**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
320	15	12	1.3				25	0.125	1.848	17.955	17.955	0.191	0.125	1.848	1.848	1.039	**0.189**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
317.5	17.5	8	1.6				28	0.127	2.165	11.186	11.186	0.124	0.127	2.165	2.165	0.995	**0.117**	#DIV/0!	**#DIV/0!**	**N.L. (1)**
315	20	5	1.1		40	60	39	0.060	2.315	6.903	6.903	0.087	0.060	2.315	2.409	0.982	**0.081**	#DIV/0!	**#DIV/0!**	**N.L. (2)**
312.5	22.5	8	1.9		40	60	39	0.067	2.483	10.820	10.820	0.120	0.067	2.483	2.732	0.963	**0.110**	#DIV/0!	**#DIV/0!**	**N.L. (2)**
310	25	5	1.9		40	60	37	0.067	2.650	6.606	6.606	0.084	0.067	2.650	3.056	0.954	**0.076**	#DIV/0!	**#DIV/0!**	**N.L. (2)**
307.5	27.5	3	0.9		40	60	31	0.058	2.795	3.882	3.882	0.064	0.058	2.795	3.357	0.946	**0.057**	#DIV/0!	**#DIV/0!**	**N.L. (2)**
305	30	0	0.2	18	16	36	28	0.042	2.900	0.000	3.234	0.060	0.042	2.900	3.618	0.939	**0.053**	#DIV/0!	**#DIV/0!**	**N.L. (2)**
302.5	32.5	4					31	0.053	3.033	5.002	5.002	0.072	0.053	3.033	3.906	0.931	**0.064**	#DIV/0!	**#DIV/0!**	**#DIV/0! (C)**
300	35	0					27	-0.062	2.878	0.000	0.000	0.049	-0.062	2.878	3.907	0.941	**0.044**	#DIV/0!	**#DIV/0!**	**#DIV/0! (C)**
297.5	37.5	15					19	0.065	3.040	19.296	19.296	0.207	0.065	3.040	4.226	0.901	**0.177**	#DIV/0!	**#DIV/0!**	**#DIV/0! (D)**
295	40	19					16	0.067	3.208	24.411	24.411	0.281	0.067	3.208	4.549	0.875	**0.233**	#DIV/0!	**#DIV/0!**	**#DIV/0! (D)**
290	45	21					15	0.068	3.548	25.767	25.767	0.308	0.068	3.548	5.201	0.844	**0.246**	#DIV/0!	**#DIV/0!**	**N.L. (3)**
285	50	18					10	0.066	3.878	20.505	20.505	0.222	0.066	3.878	5.843	0.836	**0.176**	#DIV/0!	**#DIV/0!**	**#DIV/0! (D)**
280	55	18					10	0.066	4.208	19.460	19.460	0.209	0.066	4.208	6.485	0.819	**0.162**	#DIV/0!	**#DIV/0!**	**#DIV/0! (D)**
275	60	19					10	0.067	4.543	19.620	19.620	0.211	0.067	4.543	7.132	0.801	**0.160**	#DIV/0!	**#DIV/0!**	**#DIV/0! (D)**
270	65	25					10	0.069	4.888	25.331	25.331	0.299	0.069	4.888	7.789	0.761	**0.215**	#DIV/0!	**#DIV/0!**	**N.L. (3)**
265	70	100	2.5				27	0.070	5.238	######	108.748	0.787	0.070	5.238	8.451	0.696	**0.520**	#DIV/0!	**#DIV/0!**	**N.L. (3)**
260	75	100	3.4				23	0.074	5.608	######	103.871	0.750	0.074	5.608	9.133	0.678	**0.482**	#DIV/0!	**#DIV/0!**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI $\geq$ 12 OR w_c/LL $\leq$ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

LIQUEFACTION ANALYSIS

Illinois Department of Transportation

REFERENCE BORING NUMBER ====================================== 2-S
ELEVATION OF BORING GROUND SURFACE ========================== 335.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 18.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ================== 18.50 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.938
EARTHQUAKE MOMENT MAGNITUDE ================================ 7.7
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ===================== FT.
HAMMER EFFICIENCY== 73 %
BOREHOLE DIAMETER== 8 IN.
SAMPLING METHOD== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **0.948**

AVG. SHEAR WAVE VELOCITY (top 40')
$V^{*}_{s,40'}$ = **383** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.7
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = NMSZ
PGA = **1.699**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
332.5	2.5	10	1.4				15	0.125	0.313	19.931	19.931	0.215	0.125	0.313	0.313	1.500	**0.305**	0.960	**0.585**	**N.L. (1)**
330	5	8	1.6				23	0.127	0.630	13.786	13.786	0.148	0.127	0.630	0.630	1.363	**0.191**	0.914	**0.557**	**N.L. (1)**
327.5	7.5	6	1.1				21	0.123	0.938	9.339	9.339	0.107	0.123	0.938	0.938	1.204	**0.123**	0.863	**0.526**	**N.L. (1)**
325	10	8	0.8				24	0.119	1.235	12.385	12.385	0.135	0.119	1.235	1.235	1.142	**0.146**	0.809	**0.494**	**N.L. (1)**
322.5	12.5	10	3.1				17	0.135	1.573	15.177	15.177	0.162	0.135	1.573	1.573	1.082	**0.166**	0.753	**0.459**	**N.L. (1)**
320	15	10	1.7				37	0.128	1.893	14.518	14.518	0.155	0.128	1.893	1.893	1.030	**0.152**	0.697	**0.425**	**N.L. (1)**
317.5	17.5	7	1.5				29	0.126	2.208	9.700	9.700	0.110	0.126	2.208	2.208	0.991	**0.104**	0.642	**0.392**	**N.L. (1)**
315	20	7	2.2		35	60	32	0.069	2.380	9.537	9.537	0.109	0.069	2.380	2.474	0.974	**0.101**	0.591	**0.375**	**N.L. (2)**
312.5	22.5	8	2.2		35	60	31	0.069	2.553	10.671	10.671	0.119	0.069	2.553	2.802	0.957	**0.108**	0.544	**0.364**	**N.L. (2)**
310	25	5	0.8		15	30	33	0.057	2.695	6.549	6.549	0.084	0.057	2.695	3.101	0.951	**0.076**	0.503	**0.353**	**N.L. (2)**
307.5	27.5	3	1.2		15	30	29	0.061	2.848	3.845	3.845	0.064	0.061	2.848	3.409	0.943	**0.057**	0.467	**0.341**	**N.L. (2)**
305	30	3	1.1		35	60	38	0.060	2.998	3.760	3.760	0.063	0.060	2.998	3.715	0.933	**0.056**	0.437	**0.330**	**N.L. (2)**
302.5	32.5	5	1		35	60	29	0.059	3.145	6.129	6.129	0.081	0.059	3.145	4.019	0.921	**0.071**	0.412	**0.321**	**N.L. (2)**
300	35	2	0.7		5	20	23	0.055	3.283	2.402	2.402	0.055	0.055	3.283	4.312	0.916	**0.048**	0.391	**0.313**	**0.153 (C)**
297.5	37.5	1		5				0.043	3.390	1.183	1.183	0.050	0.043	3.390	4.576	0.910	**0.043**	0.375	**0.308**	**0.140 (C)**
295	40	12		5				0.063	3.548	13.875	13.875	0.149	0.063	3.548	4.889	0.877	**0.124**	0.361	**0.304**	**0.408 (D)**
290	45	9						0.060	3.848	9.973	9.973	0.113	0.060	3.848	5.501	0.871	**0.093**	0.342	**0.299**	**0.311 (C)**
285	50	28						0.070	4.198	32.076	32.076	0.753	0.070	4.198	6.163	0.777	**0.554**	0.331	**0.296**	**N.L. (3)**
280	55	24						0.069	4.543	25.459	25.459	0.301	0.069	4.543	6.820	0.779	**0.222**	0.324	**0.296**	**N.L. (3)**
275	60	21						0.068	4.883	20.818	20.818	0.226	0.068	4.883	7.472	0.779	**0.167**	0.319	**0.298**	**0.560 (D)**
270	65	13						0.063	5.198	12.023	12.023	0.131	0.063	5.198	8.099	0.803	**0.100**	0.313	**0.298**	**0.336 (C)**
265	70	22						0.068	5.538	19.970	19.970	0.215	0.068	5.538	8.751	0.754	**0.154**	0.306	**0.295**	**0.522 (D)**
260	75	100						0.083	5.953	99.653	99.653	0.718	0.083	5.953	9.478	0.662	**0.451**	0.299	**0.290**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI $\geq$ 12 OR w_c/LL $\leq$ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

*** Deaggregation of Seismic Hazard at One Period of Spectral Acceleration ***
*** Data from Dynamic: Conterminous U.S. 2014 (update) (4.2.0) ****
PSHA Deaggregation. %contributions.
site: Test
longitude: 89.284°W
latitude: 37.132°E
imt: Peak Ground Acceleration
vs30 = 760 m/s (B/C boundary)
return period: 2475 yrs.
#This deaggregation corresponds to: Total
Summary statistics for PSHA PGA deaggregation, r=distance, ε=epsilon:
Deaggregation targets:
  Return period: 2475 yrs
  Exceedance rate: 0.0004040404 yr^{-1}
  PGA ground motion: 1.3487461 g
Recovered targets:
  Return period: 2471.6135 yrs
  Exceedance rate: 0.000404594 yr^{-1}
Totals:
  Binned: 100 %
  Residual: 0 %
  Trace: 0.2 %
Mean (over all sources):
  m: 7.29
  r: 17.21 km
  ε_0: 0.43 σ
Mode (largest m-r bin):
  m: 7.52
  r: 16 km
  ε_0: 0.23 σ
  Contribution: 46.84 %
Mode (largest m-r-ε_0 bin):
  m: 7.52
  r: 16.44 km
  ε_0: 0.2 σ
  Contribution: 19.53 %
Discretization:
  r: min = 0.0, max = 1000.0, Δ = 20.0 km
  m: min = 4.4, max = 9.4, Δ = 0.2
  ε: min = -3.0, max = 3.0, Δ = 0.5 σ
Epsilon keys:
  ε0: [-∞ .. -2.5)
  ε1: [-2.5 .. -2.0)
  ε2: [-2.0 .. -1.5)
  ε3: [-1.5 .. -1.0)
  ε4: [-1.0 .. -0.5)
  ε5: [-0.5 .. 0.0)
  ε6: [0.0 .. 0.5)
  ε7: [0.5 .. 1.0)
  ε8: [1.0 .. 1.5)
  ε9: [1.5 .. 2.0)
  ε10: [2.0 .. 2.5)
  ε11: [2.5 .. +∞]

Closest Distance, rF	Magnitude (Mw)	ALL_ε	ε=(-∞,-2.5)	ε=[-2.5,-2)	ε=[-2,-1.5)	ε=[-1.5,-1)	ε=[-1,-0.5)	ε=[-0.5,0)	ε=[0,0.5)	ε=[0.5,1)	ε=[1,1.5)	ε=[1.5,2)	ε=[2,2.5)	ε=[2.5,∞)
10	7.5	46.844	0	0	0	0	0	15.546	19.53	8.93	1.823	0.49	0.484	0.042
10	7.3	13.971	0	0	0	0	0	5.232	6.648	1.09	0.695	0.05	0.23	0.027
10	6.9	11.438	0	0	0	0	0	1.71	2.515	5.017	1.625	0.456	0.111	0.003
10	7.7	5.859	0	0	0	0	0	3.412	2.05	0.013	0.264	0.104	0.016	0
10	7.1	5.029	0	0	0	0	0	0.958	2.085	1.414	0.44	0.081	0.048	0.003
10	6.7	3.387	0	0	0	0	0	0.188	0.866	1.403	0.674	0.191	0.05	0.015
10	6.5	1.764	0	0	0	0	0	0.199	0.263	0.713	0.452	0.087	0.047	0.002
70	7.7	1.31	0	0	0	0	0	0	0	0	0	0.695	0.615	0
10	7.9	1.183	0	0	0	0	0	1.09	0.017	0.041	0.012	0.019	0.004	0
10	4.9	0.64	0	0	0	0	0	0	0	0.199	0.063	0.276	0.058	0.044
10	5.1	0.64	0	0	0	0	0	0	0	0.224	0.077	0.234	0.084	0.02
10	5.3	0.617	0	0	0	0	0	0	0.046	0.138	0.228	0.11	0.08	0.016
30	7.5	0.605	0	0	0	0	0	0	0.007	0.279	0.241	0.07	0.005	0.001
10	6.1	0.605	0	0	0	0	0	0.11	0.119	0.121	0.145	0.092	0.014	0.003
10	5.5	0.574	0	0	0	0	0	0	0.144	0.075	0.159	0.108	0.069	0.019
10	6.3	0.543	0	0	0	0	0	0.104	0.106	0.146	0.112	0.062	0.012	0
30	7.3	0.536	0	0	0	0	0	0	0	0.099	0.293	0.133	0.01	0.001
10	5.7	0.517	0	0	0	0	0	0.028	0.081	0.146	0.124	0.088	0.044	0.007
10	5.9	0.45	0	0	0	0	0	0.043	0.093	0.084	0.113	0.085	0.03	0.003
50	7.5	0.446	0	0	0	0	0	0	0	0	0.001	0.161	0.285	0
30	7.7	0.397	0	0	0	0	0	0	0.06	0.231	0.094	0.011	0.002	0
50	7.9	0.337	0	0	0	0	0	0	0	0	0.205	0.131	0	0
10	4.7	0.311	0	0	0	0	0	0	0	0	0.143	0.111	0.043	0.014
50	7.7	0.309	0	0	0	0	0	0	0	0	0.001	0.214	0.093	0

EXHIBIT H

PILE LENGTH/PILE TYPE

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE=================================== East Abutment
REFERENCE BORING ================================ 1-S
LRFD or ASD or SEISMIC ============================= LRFD
PILE CUTOFF ELEV. ================================ 330.50 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 328.50 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 ============== 974 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts =========== 243.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts =========== 91.31 KIPS

PILE TYPE AND SIZE ============= Steel HP 10 X 42
Plugged Pile Perimeter========================= 3.300 FT. Unplugged Pile Perimeter============== 4.858 FT.
Plugged Pile End Bearing Area=================== 0.680 SQFT. Unplugged Pile End Bearing Area======= 0.086 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
335 KIPS	**335** KIPS	**184** KIPS	**72** 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 PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D 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.)
326.50	2.00	1.50			6.3		13.0	9.3		***10.2***	10	0	0	6	4
324.00	2.50	0.70			4.3	6.7	31.7	6.4	0.8	***18.4***	18	0	0	10	7
321.50	2.50	2.20			10.2	21.0	33.3	15.0	2.7	***32.3***	32	0	0	18	9
319.00	2.50	1.30			7.2	12.4	***42.4***	10.6	1.6	43.1	42	0	0	23	12
316.50	2.50	1.50			7.9	14.3	***46.5***	11.7	1.8	54.3	46	0	0	26	14
314.00	2.50	1.10			6.3	10.5	***60.4***	9.3	1.3	64.6	60	0	0	33	17
311.50	2.50	1.90			9.3	18.1	***69.7***	13.7	2.3	78.3	70	0	0	38	19
309.00	2.50	1.90			9.3	18.1	***69.5***	13.7	2.3	90.8	70	0	0	38	22
306.50	2.50	0.90			5.4	8.6	***68.2***	7.9	1.1	97.8	68	0	0	38	24
304.00	2.50	0.20			1.4	1.9	***74.4***	2.0	0.2	100.5	74	0	0	41	27
301.50	2.50		4	Medium Sand	0.6	6.8	***68.3***	0.9	0.9	100.5	68	0	0	38	29
299.00	2.50		0	Medium Sand	0.0	0.0	***93.7***	0.0	0.0	103.7	94	0	0	52	32
296.50	2.50		15	Medium Sand	2.3	25.4	***102.7***	3.3	3.2	107.9	103	0	0	56	34
291.00	5.50		19	Medium Sand	6.3	32.2	***112.4***	9.2	4.1	117.6	112	0	0	62	40
286.00	5.00		21	Medium Sand	6.3	35.6	***113.6***	9.3	4.5	126.2	114	0	0	62	45
281.00	5.00		18	Medium Sand	5.4	30.5	***119.0***	8.0	3.9	134.2	119	0	0	65	50
276.00	5.00		18	Medium Sand	5.4	30.5	***126.1***	8.0	3.9	142.4	126	0	0	69	55
271.00	5.00		19	Medium Sand	5.7	32.2	***142.0***	8.4	4.1	152.1	142	0	0	78	60
266.00	5.00		25	Medium Sand	7.5	42.4	***131.0***	11.1	5.4	160.8	131	0	0	72	65
261.00	5.00	2.50			22.2	23.8	256.5	32.7	3.0	***206.6***	207	0	0	114	70
259.90	1.10		100	Hard Till	7.8	127.1	222.0	11.5	16.1	***212.7***	213	0	0	117	71
259.30	0.60			Shale	24.7	84.8	331.4	36.3	10.7	***259.8***	260	0	0	143	71.2
258.30	1.00			Limestone	82.2	169.5	413.6	121.0	21.5	***380.8***	~~381~~	~~0~~	~~0~~	~~209~~	~~72.2~~
257.30	1.00			Limestone	82.2	169.5	***495.8***	121.0	21.5	501.8	~~496~~	~~0~~	~~0~~	~~273~~	~~73.2~~
256.30	1.00			Limestone	82.2	169.5	***578.0***	121.0	21.5	622.9	~~578~~	~~0~~	~~0~~	~~318~~	~~74.2~~
255.30	1.00			Limestone	82.2	169.5	***660.2***	121.0	21.5	743.9	~~660~~	~~0~~	~~0~~	~~363~~	~~75.2~~
254.30	1.00			Limestone	82.2	169.5	***742.5***	121.0	21.5	865.0	~~742~~	~~0~~	~~0~~	~~408~~	~~76.2~~
253.30	1.00			Limestone	82.2	169.5	***824.7***	121.0	21.5	986.0	~~825~~	~~0~~	~~0~~	~~454~~	~~77.2~~
252.50	0.80			Limestone	65.8	169.5	***890.4***	96.8	21.5	1082.8	~~890~~	~~0~~	~~0~~	~~490~~	~~78~~
251.50	1.00			Limestone	82.2	169.5	***972.7***	121.0	21.5	1203.9	~~973~~	~~0~~	~~0~~	~~535~~	~~79~~
250.50	1.00			Limestone	82.2	169.5	***1054.9***	121.0	21.5	1324.9	~~1055~~	~~0~~	~~0~~	~~580~~	~~80~~
249.50	1.00			Limestone	82.2	169.5	***1137.1***	121.0	21.5	1446.0	~~1137~~	~~0~~	~~0~~	~~625~~	~~81~~
248.50	1.00			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE=================================== Pier 1
REFERENCE BORING =============================== 1-S
LRFD or ASD or SEISMIC ============================ LRFD
PILE CUTOFF ELEV. ================================ 327.50 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 304.50 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 ============== 1357 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts =========== 339.25 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts =========== 127.22 KIPS

PILE TYPE AND SIZE ============= Steel HP 10 X 42
Plugged Pile Perimeter========================= 3.300 FT. Unplugged Pile Perimeter============== 4.858 FT.
Plugged Pile End Bearing Area=================== 0.680 SQFT. Unplugged Pile End Bearing Area======= 0.086 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
335 KIPS	281 KIPS	155 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 PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D 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.)
301.50	3.00		4	Medium Sand	0.7		0.7	1.1		1.1	1	0	0	0	26
299.00	2.50		0	Medium Sand	0.0	0.0	25.1	0.0	0.0	4.2	4	0	0	2	29
296.50	2.50		15	Medium Sand	2.3	24.4	35.2	3.3	3.1	8.5	8	0	0	5	31
291.00	5.50		19	Medium Sand	6.3	32.2	44.9	9.2	4.1	18.1	18	0	0	10	37
286.00	5.00		21	Medium Sand	6.3	35.6	46.1	9.3	4.5	26.8	27	0	0	15	42
281.00	5.00		18	Medium Sand	5.4	30.5	51.5	8.0	3.9	34.8	35	0	0	19	47
276.00	5.00		18	Medium Sand	5.4	30.5	58.6	8.0	3.9	42.9	43	0	0	24	52
271.00	5.00		19	Medium Sand	5.7	32.2	74.5	8.4	4.1	52.6	53	0	0	29	57
266.00	5.00		25	Medium Sand	7.5	42.4	63.5	11.1	5.4	61.3	61	0	0	34	62
261.00	5.00	2.50			22.2	23.8	189.0	32.7	3.0	107.1	107	0	0	59	67
259.90	1.10		100	Hard Till	7.8	127.1	154.4	11.5	16.1	113.3	113	0	0	62	68
259.30	0.60			Shale	24.7	84.8	263.8	36.3	10.7	160.3	160	0	0	88	68.2
258.30	1.00			Limestone	82.2	169.5	346.1	121.0	21.5	281.4	281	0	0	155	69.2
257.30	1.00			Limestone	82.2	169.5	428.3	121.0	21.5	402.4	~~402~~	~~0~~	~~0~~	~~221~~	~~70.2~~
256.30	1.00			Limestone	82.2	169.5	510.5	121.0	21.5	523.5	~~510~~	~~0~~	~~0~~	~~281~~	~~71.2~~
255.30	1.00			Limestone	82.2	169.5	592.7	121.0	21.5	644.5	~~593~~	~~0~~	~~0~~	~~326~~	~~72.2~~
254.30	1.00			Limestone	82.2	169.5	674.9	121.0	21.5	765.5	~~675~~	~~0~~	~~0~~	~~371~~	~~73.2~~
253.30	1.00			Limestone	82.2	169.5	757.1	121.0	21.5	886.6	~~757~~	~~0~~	~~0~~	~~416~~	~~74.2~~
252.50	0.80			Limestone	65.8	169.5	822.9	96.8	21.5	983.4	~~823~~	~~0~~	~~0~~	~~453~~	~~75~~
251.50	1.00			Limestone	82.2	169.5	905.1	121.0	21.5	1104.5	~~905~~	~~0~~	~~0~~	~~498~~	~~76~~
250.50	1.00			Limestone	82.2	169.5	987.3	121.0	21.5	1225.5	~~987~~	~~0~~	~~0~~	~~543~~	~~77~~
249.50	1.00			Limestone	82.2	169.5	1069.6	121.0	21.5	1346.5	~~1070~~	~~0~~	~~0~~	~~588~~	~~78~~
248.50	1.00			Limestone	82.2	169.5	1151.8	121.0	21.5	1467.6	~~1152~~	~~0~~	~~0~~	~~633~~	~~79~~
247.50	1.00			Limestone	82.2	169.5	1234.0	121.0	21.5	1588.6	~~1234~~	~~0~~	~~0~~	~~679~~	~~80~~
246.50	1.00			Limestone	82.2	169.5	1316.2	121.0	21.5	1709.7	~~1316~~	~~0~~	~~0~~	~~724~~	~~81~~
245.50	1.00			Limestone	82.2	169.5	1398.4	121.0	21.5	1830.7	~~1398~~	~~0~~	~~0~~	~~769~~	~~82~~
244.70	0.80			Limestone	65.8	169.5	1464.2	96.8	21.5	1927.5	~~1464~~	~~0~~	~~0~~	~~805~~	~~82.8~~
243.70	1.00			Limestone	82.2	169.5	1546.4	121.0	21.5	2048.6	~~1546~~	~~0~~	~~0~~	~~851~~	~~83.8~~
242.70	1.00			Limestone	82.2	169.5	1628.6	121.0	21.5	2169.6	~~1629~~	~~0~~	~~0~~	~~896~~	~~84.8~~
241.70	1.00			Limestone	82.2	169.5	1710.9	121.0	21.5	2290.7	~~1711~~	~~0~~	~~0~~	~~941~~	~~85.8~~
240.70	1.00			Limestone	82.2	169.5	1793.1	121.0	21.5	2411.7	~~1793~~	~~0~~	~~0~~	~~986~~	~~86.8~~
239.70	1.00			Limestone	82.2	169.5	1875.3	121.0	21.5	2532.8	~~1875~~	~~0~~	~~0~~	~~1031~~	~~87.8~~
238.70	1.00			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE=================================== Pier 2
REFERENCE BORING ================================ 2-S
LRFD or ASD or SEISMIC ============================= SEISMIC
PILE CUTOFF ELEV. ================================= 327.50 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 308.30 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Liquef.
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ============== 286.50 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========= 301.50 ft

TOTAL SEISMIC SUBSTRUCTURE LOAD ================ 1357 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Seismic Loading Applied per pile spaced at 8 ft. Cts ====== 339.25 KIPS
Approx. Seismic Loading Applied per pile spaced at 3 ft. Cts ====== 127.22 KIPS

PILE TYPE AND SIZE ============= Steel HP 10 X 42
Plugged Pile Perimeter========================= 3.300 FT. Unplugged Pile Perimeter============== 4.858 FT.
Plugged Pile End Bearing Area=================== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 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 Seismic Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	224 KIPS	218 KIPS	67 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	ULTIMATE PLUGGED SIDE RESIST. (KIPS)	ULTIMATE PLUGGED END BRG. RESIST. (KIPS)	ULTIMATE PLUGGED TOTAL RESIST. (KIPS)	ULTIMATE UNPLUGGED SIDE RESIST. (KIPS)	ULTIMATE UNPLUGGED END BRG. RESIST. (KIPS)	ULTIMATE UNPLUGGED TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	NOMINAL GEOTECH. LOSS FROM LIQUEF. & DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	SEISMIC RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
299.00	1.50		5	Fine Sand	0.4		2.1	0.6		0.8	1	0	0	0	29
296.50	2.50		1	Fine Sand	0.1	1.7	20.9	0.2	0.2	3.4	3	1	0	3	31
291.50	5.00		12	Fine Sand	3.4	20.3	19.2	5.0	2.6	7.8	8	4	0	4	36
286.50	5.00		9	Fine Sand	2.5	15.3	54.0	3.7	1.9	15.6	16	7	0	9	41
281.50	5.00		28	Medium Sand	8.6	47.5	55.8	12.7	6.0	27.4	27	7	0	21	46
276.50	5.00		24	Medium Sand	7.2	40.7	57.9	10.6	5.1	37.4	37	7	0	31	51
271.50	5.00		21	Medium Sand	6.3	35.6	50.7	9.3	4.5	44.9	45	7	0	38	56
266.50	5.00		13	Medium Sand	3.9	22.0	69.8	5.8	2.8	52.6	53	7	0	46	61
261.50	5.00		22	Medium Sand	6.6	37.3	208.6	9.7	4.7	79.1	79	7	0	73	66
261.30	0.20			Limestone	16.4	169.5	225.1	24.2	21.5	103.3	103	7	0	97	66.2
260.30	1.00			Limestone	82.2	169.5	307.3	121.0	21.5	224.3	224	7	0	218	67.2
259.30	1.00			Limestone	82.2	169.5	389.5	121.0	21.5	345.4	~~345~~	~~7~~	~~0~~	~~339~~	~~68.2~~
258.30	1.00			Limestone	82.2	169.5	471.7	121.0	21.5	466.4	~~466~~	~~7~~	~~0~~	~~460~~	~~69.2~~
257.30	1.00			Limestone	82.2	169.5	554.0	121.0	21.5	587.5	~~554~~	~~7~~	~~0~~	~~547~~	~~70.2~~
256.30	1.00			Limestone	82.2	169.5	636.2	121.0	21.5	708.5	~~636~~	~~7~~	~~0~~	~~630~~	~~71.2~~
255.30	1.00			Limestone	82.2	169.5	718.4	121.0	21.5	829.5	~~718~~	~~7~~	~~0~~	~~712~~	~~72.2~~
254.30	1.00			Limestone	82.2	169.5	800.6	121.0	21.5	950.6	~~801~~	~~7~~	~~0~~	~~794~~	~~73.2~~
253.30	1.00			Limestone	82.2	169.5	882.8	121.0	21.5	1071.6	~~883~~	~~7~~	~~0~~	~~876~~	~~74.2~~
252.30	1.00			Limestone	82.2	169.5	965.0	121.0	21.5	1192.7	~~965~~	~~7~~	~~0~~	~~959~~	~~75.2~~
251.30	1.00			Limestone	82.2	169.5	1047.3	121.0	21.5	1313.7	~~1047~~	~~7~~	~~0~~	~~1041~~	~~76.2~~
250.30	1.00			Limestone	82.2	169.5	1129.5	121.0	21.5	1434.8	~~1129~~	~~7~~	~~0~~	~~1123~~	~~77.2~~
249.30	1.00			Limestone	82.2	169.5	1211.7	121.0	21.5	1555.8	~~1212~~	~~7~~	~~0~~	~~1205~~	~~78.2~~
248.30	1.00			Limestone	82.2	169.5	1293.9	121.0	21.5	1676.8	~~1294~~	~~7~~	~~0~~	~~1287~~	~~79.2~~
247.30	1.00			Limestone	82.2	169.5	1376.1	121.0	21.5	1797.9	~~1376~~	~~7~~	~~0~~	~~1370~~	~~80.2~~
246.30	1.00			Limestone	82.2	169.5	1458.3	121.0	21.5	1918.9	~~1458~~	~~7~~	~~0~~	~~1452~~	~~81.2~~
245.30	1.00			Limestone	82.2	169.5	1540.6	121.0	21.5	2040.0	~~1541~~	~~7~~	~~0~~	~~1534~~	~~82.2~~
244.30	1.00			Limestone	82.2	169.5	1622.8	121.0	21.5	2161.0	~~1623~~	~~7~~	~~0~~	~~1616~~	~~83.2~~
243.30	1.00			Limestone	82.2	169.5	1705.0	121.0	21.5	2282.0	~~1705~~	~~7~~	~~0~~	~~1699~~	~~84.2~~
242.30	1.00			Limestone	82.2	169.5	1787.2	121.0	21.5	2403.1	~~1787~~	~~7~~	~~0~~	~~1781~~	~~85.2~~
241.30	1.00			Limestone	82.2	169.5	1869.4	121.0	21.5	2524.1	~~1869~~	~~7~~	~~0~~	~~1863~~	~~86.2~~
240.30	1.00			Limestone	82.2	169.5	1951.7	121.0	21.5	2645.2	~~1952~~	~~7~~	~~0~~	~~1945~~	~~87.2~~
239.30	1.00			Limestone	82.2	169.5	2033.9	121.0	21.5	2766.2	~~2034~~	~~7~~	~~0~~	~~2027~~	~~88.2~~
238.30	1.00			Limestone	82.2	169.5	2116.1	121.0	21.5	2887.3	~~2116~~	~~7~~	~~0~~	~~2110~~	~~89.2~~
237.30	1.00			Limestone	82.2	169.5	2198.3	121.0	21.5	3008.3	~~2198~~	~~7~~	~~0~~	~~2192~~	~~90.2~~
236.30	1.00			Limestone	82.2	169.5	2280.5	121.0	21.5	3129.3	~~2281~~	~~7~~	~~0~~	~~2274~~	~~91.2~~
235.30	1.00			Limestone	82.2	169.5	2362.7	121.0	21.5	3250.4	~~2363~~	~~7~~	~~0~~	~~2356~~	~~92.2~~
234.30	1.00			Limestone	82.2	169.5	2445.0	121.0	21.5	3371.4	~~2445~~	~~7~~	~~0~~	~~2438~~	~~93.2~~
233.30	1.00			Limestone		169.5			21.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE=================================== West Abutment
REFERENCE BORING ================================ 2-S
LRFD or ASD or SEISMIC ============================ SEISMIC
PILE CUTOFF ELEV. ================================ 330.50 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 328.50 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Liquef.
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ============== 286.50 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========= 301.50 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 Seismic Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**224** KIPS	**218** KIPS	**70** FT.

TOTAL SEISMIC SUBSTRUCTURE LOAD ================ 974 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Seismic Loading Applied per pile spaced at 8 ft. Cts ====== 243.50 KIPS
Approx. Seismic Loading Applied per pile spaced at 3 ft. Cts ====== 91.31 KIPS

PILE TYPE AND SIZE ============= Steel HP 10 X 42
Plugged Pile Perimeter========================== 3.300 FT. Unplugged Pile Perimeter============== 4.858 FT.
Plugged Pile End Bearing Area==================== 0.680 SQFT. Unplugged Pile End Bearing Area======== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	ULTIMATE PLUGGED SIDE RESIST. (KIPS)	ULTIMATE PLUGGED END BRG. RESIST. (KIPS)	ULTIMATE PLUGGED TOTAL RESIST. (KIPS)	ULTIMATE UNPLUGGED SIDE RESIST. (KIPS)	ULTIMATE UNPLUGGED END BRG. RESIST. (KIPS)	ULTIMATE UNPLUGGED TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	NOMINAL GEOTECH. LOSS FROM LIQUEF. & DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	SEISMIC RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
299.00	1.50		5	Fine Sand	0.4		2.1	0.6		***0.8***	1	0	0	0	32
296.50	2.50		1	Fine Sand	0.1	1.7	20.9	0.2	0.2	***3.4***	3	1	0	3	34
291.50	5.00		12	Fine Sand	3.4	20.3	19.2	5.0	2.6	***7.8***	8	4	0	4	39
286.50	5.00		9	Fine Sand	2.5	15.3	54.0	3.7	1.9	***15.6***	16	7	0	9	44
281.50	5.00		28	Medium Sand	8.6	47.5	55.8	12.7	6.0	***27.4***	27	7	0	21	49
276.50	5.00		24	Medium Sand	7.2	40.7	57.9	10.6	5.1	***37.4***	37	7	0	31	54
271.50	5.00		21	Medium Sand	6.3	35.6	50.7	9.3	4.5	***44.9***	45	7	0	38	59
266.50	5.00		13	Medium Sand	3.9	22.0	69.8	5.8	2.8	***52.6***	53	7	0	46	64
261.50	5.00		22	Medium Sand	6.6	37.3	208.6	9.7	4.7	***79.1***	79	7	0	73	69
261.30	0.20			Limestone	16.4	169.5	225.1	24.2	21.5	***103.3***	103	7	0	97	69.2
260.30	1.00			Limestone	82.2	169.5	307.3	121.0	21.5	***224.3***	224	7	0	218	70.2
259.30	1.00			Limestone	82.2	169.5	389.5	121.0	21.5	***345.4***	~~345~~	~~7~~	~~0~~	~~339~~	~~71.2~~
258.30	1.00			Limestone	82.2	169.5	471.7	121.0	21.5	***466.4***	~~466~~	~~7~~	~~0~~	~~460~~	~~72.2~~
257.30	1.00			Limestone	82.2	169.5	***554.0***	121.0	21.5	587.5	~~554~~	~~7~~	~~0~~	~~547~~	~~73.2~~
256.30	1.00			Limestone	82.2	169.5	***636.2***	121.0	21.5	708.5	~~636~~	~~7~~	~~0~~	~~630~~	~~74.2~~
255.30	1.00			Limestone	82.2	169.5	***718.4***	121.0	21.5	829.5	~~718~~	~~7~~	~~0~~	~~712~~	~~75.2~~
254.30	1.00			Limestone	82.2	169.5	***800.6***	121.0	21.5	950.6	~~801~~	~~7~~	~~0~~	~~794~~	~~76.2~~
253.30	1.00			Limestone	82.2	169.5	***882.8***	121.0	21.5	1071.6	~~883~~	~~7~~	~~0~~	~~876~~	~~77.2~~
252.30	1.00			Limestone	82.2	169.5	***965.0***	121.0	21.5	1192.7	~~965~~	~~7~~	~~0~~	~~959~~	~~78.2~~
251.30	1.00			Limestone	82.2	169.5	***1047.3***	121.0	21.5	1313.7	~~1047~~	~~7~~	~~0~~	~~1041~~	~~79.2~~
250.30	1.00			Limestone	82.2	169.5	***1129.5***	121.0	21.5	1434.8	~~1129~~	~~7~~	~~0~~	~~1123~~	~~80.2~~
249.30	1.00			Limestone	82.2	169.5	***1211.7***	121.0	21.5	1555.8	~~1212~~	~~7~~	~~0~~	~~1205~~	~~81.2~~
248.30	1.00			Limestone	82.2	169.5	***1293.9***	121.0	21.5	1676.8	~~1294~~	~~7~~	~~0~~	~~1287~~	~~82.2~~
247.30	1.00			Limestone	82.2	169.5	***1376.1***	121.0	21.5	1797.9	~~1376~~	~~7~~	~~0~~	~~1370~~	~~83.2~~
246.30	1.00			Limestone	82.2	169.5	***1458.3***	121.0	21.5	1918.9	~~1458~~	~~7~~	~~0~~	~~1452~~	~~84.2~~
245.30	1.00			Limestone	82.2	169.5	***1540.6***	121.0	21.5	2040.0	~~1541~~	~~7~~	~~0~~	~~1534~~	~~85.2~~
244.30	1.00			Limestone	82.2	169.5	***1622.8***	121.0	21.5	2161.0	~~1623~~	~~7~~	~~0~~	~~1616~~	~~86.2~~
243.30	1.00			Limestone	82.2	169.5	***1705.0***	121.0	21.5	2282.0	~~1705~~	~~7~~	~~0~~	~~1699~~	~~87.2~~
242.30	1.00			Limestone	82.2	169.5	***1787.2***	121.0	21.5	2403.1	~~1787~~	~~7~~	~~0~~	~~1781~~	~~88.2~~
241.30	1.00			Limestone	82.2	169.5	***1869.4***	121.0	21.5	2524.1	~~1869~~	~~7~~	~~0~~	~~1863~~	~~89.2~~
240.30	1.00			Limestone	82.2	169.5	***1951.7***	121.0	21.5	2645.2	~~1952~~	~~7~~	~~0~~	~~1945~~	~~90.2~~
239.30	1.00			Limestone	82.2	169.5	***2033.9***	121.0	21.5	2766.2	~~2034~~	~~7~~	~~0~~	~~2027~~	~~91.2~~
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237.30	1.00			Limestone	82.2	169.5	***2198.3***	121.0	21.5	3008.3	~~2198~~	~~7~~	~~0~~	~~2192~~	~~93.2~~
236.30	1.00			Limestone	82.2	169.5	***2280.5***	121.0	21.5	3129.3	~~2281~~	~~7~~	~~0~~	~~2274~~	~~94.2~~
235.30	1.00			Limestone	82.2	169.5	***2362.7***	121.0	21.5	3250.4	~~2363~~	~~7~~	~~0~~	~~2356~~	~~95.2~~
234.30	1.00			Limestone	82.2	169.5	***2445.0***	121.0	21.5	3371.4	~~2445~~	~~7~~	~~0~~	~~2438~~	~~96.2~~
233.30	1.00			Limestone		169.5			21.5						