Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date:	12/23/2022	**Proposed SN:**	050-0262	**Route:**	FAP Route 587
Revised Date:	01/24/2023	**Existing SN:**	050-0040	**Section:**	(18B)ES
Geotechnical Engineer:	Rubino Engineering, Inc. (Report G22.170)			**County:**	LaSalle
Structural Engineer:	Quigg Engineering, Inc.			**Contract:**	66K85

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed bridge configuration of US 34 over Indian Creek consists of a two-span steel 48-inch web plate girder bridge structure that spans 239'-9" to the back of the abutments, has an out-to-out deck width of 35'-5", and an 11-degree skew. The preliminary TS&L drawing indicates that the proposed bridge will contain integral abutments supported by H-Piles and a pier supported by H-Piles set in rock. The preliminary TSL drawing by Quigg Engineering, Inc. dated 01/05/2023 is attached herein. Load information provided by Quigg Engineering, Inc. dated 09/27/2022 is attached herein and indicates anticipated axial total factored loads of 1,582 kips, 3,902.4 kips, and 1,319.8 kips for the west abutment, pier, and east abutment respectively.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): The plans indicate that the existing structure is a four-span structure and is composed of two abutments and three piers. Per Quigg Engineering, Inc, the existing east abutment is supported on four rows of piles, the existing west abutment is supported by a spread footing, the existing pier 1 and pier 3 are supported on three rows of piles, and the existing pier 2 is supported on four rows of piles.

Two soil borings were conducted in October of 2018 by IDOT. One boring at the west abutment (Boring 01) and one boring at the east abutment (Boring 02). A soil boring was not conducted at the proposed pier. Rock cores were not performed for this project. Please see the supplied TS&L attached herein to reference the soil boring locations.

Beneath the bituminous and concrete pavement, silty clay loam fill, and silty clay loam till fill, soil conditions within Boring 01 and Boring 02 generally consisted of stiff to hard silty clay loam till with various sand, gravel, and silt layers, hard silty clay till, very stiff silty clay loam / silty loam till, medium fine to coarse sand, medium loamy gravel with some sand and silt layers, and sandy loam till with sand layers. Dense limestone and angular gravel in limestone silt matrix was encountered near the termination of Boring 01 at the west abutment where assumed rock surface was encountered at EL 650.87 feet. This boring did not extend into the assumed rock surface. In Boring 02, dense fine silica sand, reworked St. Peter Sandstone with thin layers of reworked limestone were encountered starting at EL 652.94 feet at Boring 02 at the east abutment. Dense shale was encountered at EL 638.44 feet at Boring 02. The N-Values of the reworked St. Peter Sandstone indicate to Rubino that the rock is weathered. Copies of these boring logs and a soil profile are attached.

Rubino does not recommend additional geotechnical exploration be conducted at this time for the proposed abutments. At the proposed pier based on the supplied TS&L, the designer has indicated that H-Piles set in rock is the desired foundation choice. A soil boring with a rock core is recommended at the proposed pier to provide a more accurate rock surface elevation at the substructure, for Rubino to provide H-Pile Set in Rock recommendations, for Rubino to evaluate if a scour reduction can be applied at the pier, and to better evaluate the need for a seal coat at the pier. The rock information within Boring 02 and the bedrock geology evaluated by Rubino indicate that the bedrock may be weak and weathered; thus, a rock core is highly recommended for this site based on the desired foundation types.

The bedrock geology was evaluated by Rubino due to rock core information not being provided, Boring 01 terminating at the assumed rock surface, due to a soil boring not being conducted at the proposed pier, and the rock information within Boring 02 indicating that the rock is weathered and may be weak. Please reference the "Geologic Setting" section attached herein for more information.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: Based on the TS&L dated 01/05/2023, cuts and fills are proposed to be minimal for the approach pavement areas. Rubino does not anticipate that settlement of the approach pavement areas is of concern due to the minimal fills proposed.

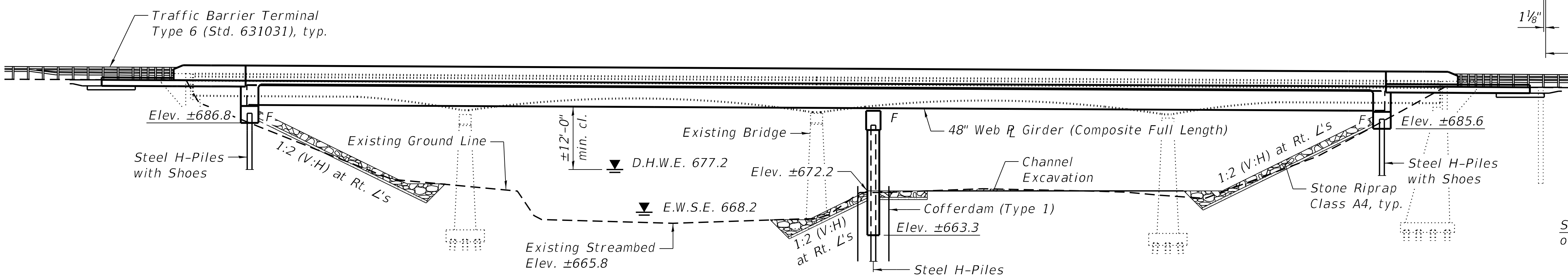
Based on the supplied TS&L, minimal cuts and fills are proposed for the proposed slopewalls. Rubino does not anticipate that settlement of the proposed slopewalls is of concern due to the minimal fills proposed.
Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The proposed abutments will be installed closer together than the existing abutments and will require a minimal fill at a slope of 1:1 behind the abutments. Granular backfill for structures is proposed for these areas per the supplied TS&L. The proposed stone riprap slopewall below the east and west abutments and on the east side of the center pier is 1:2 (V:H). Slope stability analyses were conducted at the east abutment. In slope stability analyses, the drained (long-term) conditions control over the undrained (short-term) conditions. Rubino used the slope stability program Stedwin Version 2.90 to run the Modified Bishop Method. A factor of safety of 1.51 was achieved in the drained condition and a factor of safety of 4.53 was achieved in the undrained condition. These results meet the 2022 IDOT Geotechnical Manual requirement of a factor of safety greater than or equal to 1.5 when using field rimac test data. No additional analysis or treatment is recommended.
Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: At the west abutment, the 100-yr and 200-yr scour depths are anticipated to be 2.43 feet and 2.81 feet, respectively, per the supplied scour results from IDOT District 3. The proposed 100-yr and 200-yr scour depths for the pier are anticipated to be 4.99 feet and 5.56 feet, respectively, per the supplied scour results from IDOT District 3. No scour depths were indicated for the east abutment. No non-granular scour depth reduction factor is recommended for the scour depth at the pier due to the nearest boring being over 100 feet away. As indicated on the supplied TS&L, the abutment end slopes are to be riprapped, which corresponds to no scour loss at the abutments based on the end slopes being riprapped per the 2012 IDOT Bridge Manual. The supplied TS&L indicates that the streambed is at elevation 665.8 feet. Recommended design scour elevations for the pier are Q100 = 660.8 feet and Q200 = 660.2 feet based on the streambed elevation from the TS&L and scour depths provided by IDOT.
Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: The seismic data is as follows: Seismic Site Class = C; Seismic Performance Zone = SPZ 1; Design Spectral Acceleration at 0.2 sec. (SDS) = 0.122; Design Spectral Acceleration at 1.0 sec. (SD1) = 0.066. Liquefaction is not applicable because the SPZ = 1. Please see the Seismic Site Class Determination results attached herein.
Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: The depth to assumed rock surface, as stated on the boring log, in Boring 01 is approximately 36 feet from the bottom of the west abutment at an elevation of approximately 650.9 feet. Based on the geologic setting researched by Rubino, Rubino anticipates that the weathered rock profile encountered in Boring 02 of weathered limestone over weathered sandstone over shale may be encountered at Boring 01. Rubino recommends a test pile at the west abutment (Boring 01) to confirm the rock elevation/driving length of the pile. The depth to the estimated rock surface in Boring 02 is approximately 47 feet from the bottom of the east abutment at an elevation of approximately 638.44 feet. A boring was not conducted at the proposed pier to provide substructure specific information. Rubino utilized Boring 02 to provide design parameters at the proposed pier. Rubino estimates the rock surface elevation at the proposed pier to be 638.5 feet based on the available subsurface information. Rubino recommends a soil boring and rock core be obtained at the proposed pier to provide a more accurate top of rock elevation. The supplied TS&L shows that driven steel H-piles are proposed at each abutment. Due to the depth of rock and that metal shell piles do not reach the anticipated axial factored load per pile for each abutment prior to the rock surface, Rubino recommends driven H-piles for the abutments and does not recommend driven metal shell piles for the substructures. Per the draft abbreviated SGR dated 12/23/2022 by Rubino, Rubino stated that driven H-piles were a possible foundation option for the proposed pier; however, given the scour elevation and the estimated rock surface elevation, Rubino recommended that the designer evaluate if driven H-piles provide sufficient lateral support. The evaluation should not consider soils above the scour elevation in the analysis. Rubino stated that if the designer determines that driven piles do not provide sufficient lateral support at the pier, H-piles Set in Rock were recommended; however, it

was recommended that the designer evaluate if H-piles Set in Rock provide sufficient lateral support and the evaluation should not consider soils above the scour elevation in the analysis. Per the supplied TS&L, the designer states that H-piles Set in Rock is the desired foundation type at the proposed pier. Due to a soil boring not being conducted at the proposed pier, a rock core not obtained during the field exploration previously conducted for this project, and the rock data within Boring 02 indicating to Rubino that the rock is weathered and may be weak combined with the geologic setting researched by Rubino, Rubino recommends a soil boring and rock core be obtained at the proposed pier in order for Rubino to provide H-Pile Set in Rock foundation recommendations. Pile shoes are recommended for driven H-piles due to the potential to drive through layers of dense weathered/reworked limestone and sandstone. Please see the attached pile tables herein for a list of Nominal Required Bearings, Factored Resistances Available, and the corresponding Estimated Pile Lengths for each substructure, as well as preliminary set in rock recommendations for the pier. Rubino utilized rock data from Boring 02 starting at elevation The pile lengths in the attached tables herein are based on the assumed pile cutoff elevations of approximately 688.80 feet, 687.60 feet, and 664.3 feet for the west abutment, east abutment, and pier (assuming 1-foot embedment into the pier cap per the 2012 IDOT Bridge Manual Section 3.10.1.12), respectively. The proposed pile locations need to be checked for conflict with the existing piling. Existing piles should be cut off to an appropriate elevation to not interfere with the new abutment, pier, and pile system. Due to Boring 01 at the proposed west abutment not extending through the assumed rock surface, combined with the encountered reworked sandstone and limestone in Boring 02 at the east abutment having variable N-Values (inconsistencies between the assumed/estimated rock surfaces and conditions with the rock surface not defined in Boring 02), Rubino recommends that a test pile be conducted at each abutment to better determine the Pile Length required to achieve the desired Factored Resistance at each substructure. Test pile recommendations have been made in reference to the 2012 IDOT Bridge Manual Section 3.10.1.7. If a rock core is obtained at the proposed pier, the test pile recommendation at the abutments may be altered by Rubino. For integral abutment recommendations, please see the attached Integral Abutment Feasibility document.
Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: Due to a soil boring not being conducted at the proposed pier, Rubino evaluated the soils located at the elevation of the bottom of the proposed pier at Boring 01 and Boring 02 (at the abutments) to determine the need for a seal coat. Silty clay loam till with various sand and gravel and silt layers was encountered at the bottom of the proposed pier elevation in Boring 01. Loamy gravel with sand and silt layers and low moisture contents was encountered at the bottom of the proposed pier elevation in Boring 02. Groundwater was encountered in Boring 02 at elevation 663.9 feet (approximaetly 0.6 feet above the bottom of the proposed pier). Groundwater was encountered in Boring 01 at elevation 670.87 feet (approximately 7.57 feet above the bottom of the proposed pier). Based on the available subsurface information at the abutment borings, a seal coat may be necessary due to the possibility of a presence of granular (permeable) soils and shallow groundwater at the bottom of the proposed pier. The estimated water surface elevation (EWSE) is stated to be 668.2 feet per the supplied TS&L and the bottom of the proposed pier is stated to be at elevation 663.3 feet. The bottom of the pier will be approximately 4.9 feet below the EWSE. The depth below the EWSE elevation meets the 2012 IDOT Bridge Manual Section 3.13.3 requirements for a Type 1 cofferdam (substructure is less than 6 feet below the EWSE); however, a seal coat may be necessary for construction as stated above. If a seal coat is necessary, a Type 2 cofferdam is required based on Section 3.13.3 in the 2012 IDOT Bridge Manual. A soil boring is recommended at the proposed pier to provide substructure specific soil information at the base of the proposed pier. If a soil boring is performed at the proposed pier, Rubino will reassess the need for a seal coat and thus the need for a Type 2 cofferdam.
Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Due to the structure being replaced under a road closure, Rubino does not anticipate the need for temporary sheeting, soil retention, or construction slopes.

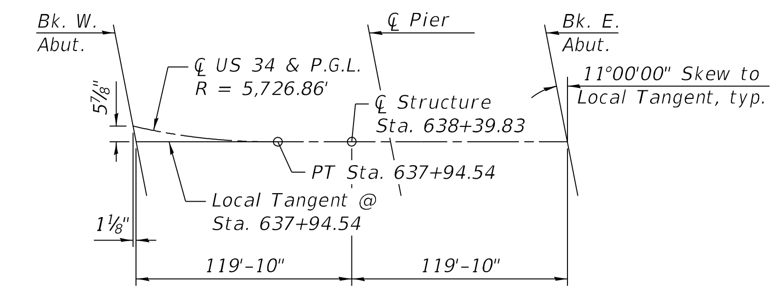
Benchmark: BM 17 - Cut '□' on SW Wing of SN 050-0040. Sta. 637+13.39, Offset 18.61' Rt., Elev. 696.47.

Existing Structure: Structure No. 050-0040, built in 1952 under FA-19, Section 18-B at Station 638+40. The existing structure consists of a 4-span continuous cast in place reinforced concrete tee beam bridge. The structure is 263'-0" back to back of abutments and has an out to out deck width of 35'-8" with a skew of 11 degrees. The structure will be replaced using road closure and a detour to maintain traffic.

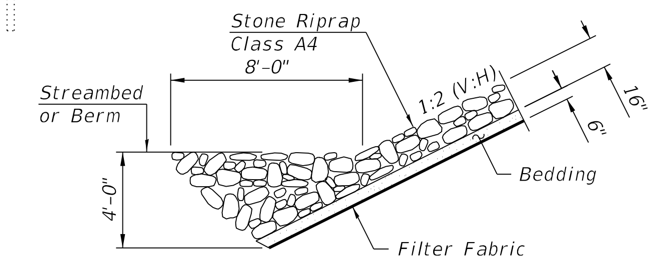
No Salvage.



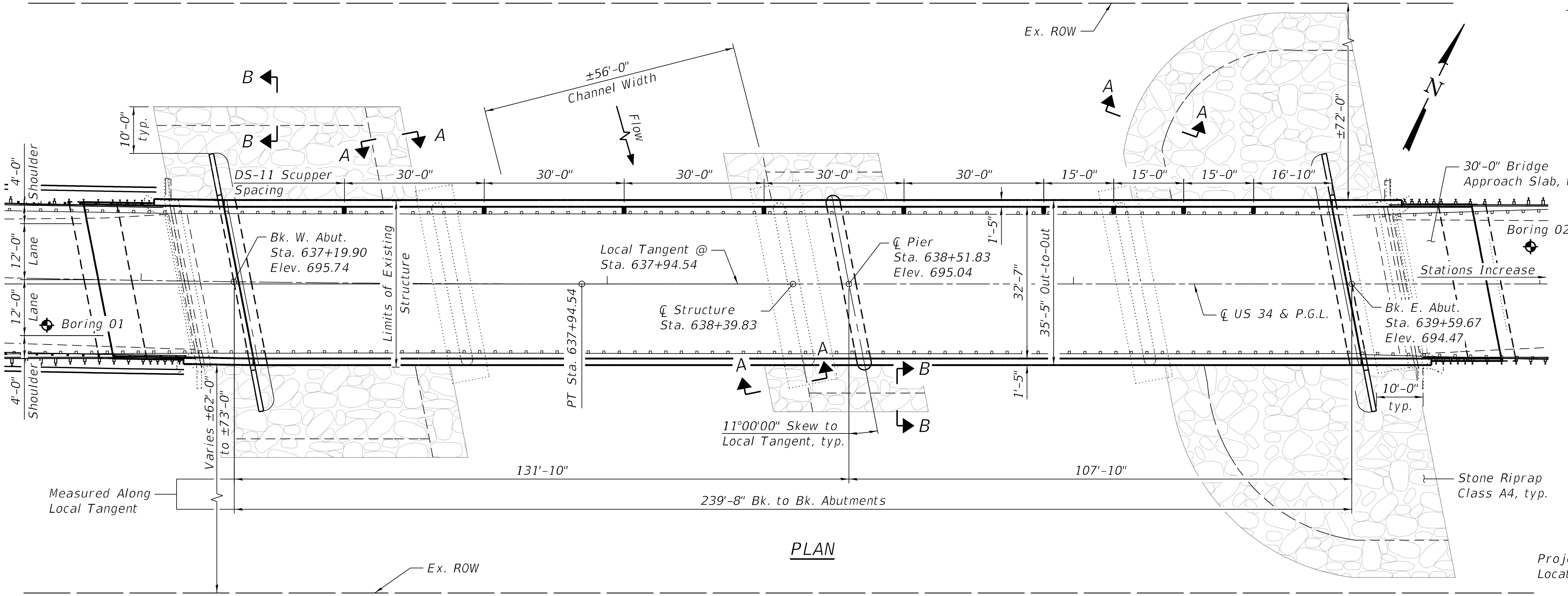
ELEVATION



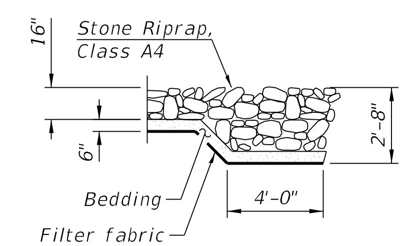
OFFSET SKETCH



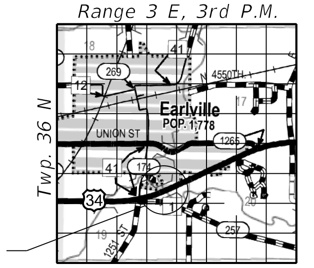
SECTION A-A



PLAN



SECTION B-B



LOCATION SKETCH

GENERAL PLAN & ELEVATION
US 34 OVER INDIAN CREEK
FAP ROUTE 587 - SECTION (18B)ES
LASALLE COUNTY
STATION 638+39.83
STRUCTURE NO. 050-0262

LOADING HL-93
Allow 50#/sq. ft. for future wearing surface.

DESIGN SPECIFICATIONS
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

HIGHWAY CLASSIFICATION
FAP Route 587 - US 34
Functional Class: Minor Arterial
ADT: 2,200 (2021); 2,222 (2046)
ADTT: 198 (2021); 200 (2046)
DHV: 200 (Two-way)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

DESIGN STRESSES
FIELD UNITS
f'c = 3,500 psi
f'c = 4,000 psi (Superstructure Concrete)
fy = 60,000 psi (Reinforcement)
fy = 36,000 psi (M270 Grade 36)
fy = 50,000 psi (M270 Grade 50)

SEISMIC DATA
Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.066g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.122g
Soil Site Class = C

MODEL: Default
FILE NAME: S:\2021\21IL083 - PTB 201-28 D3 - Oates - Var Ph I-II\WO-5 TSL US-34 over Indian Ck 050-0040\CADD\CADD Sheets\0500262-66K85-TSL-001.dgn

QUIGG ENGINEERING INC

USER NAME = rwhiteside	DESIGNED - ZLD	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	GENERAL PLAN & ELEVATION STRUCTURE NO. 050-0262	
0500262-66K85-TSL-001.dgn	CHECKED - RPW	REVISED -			
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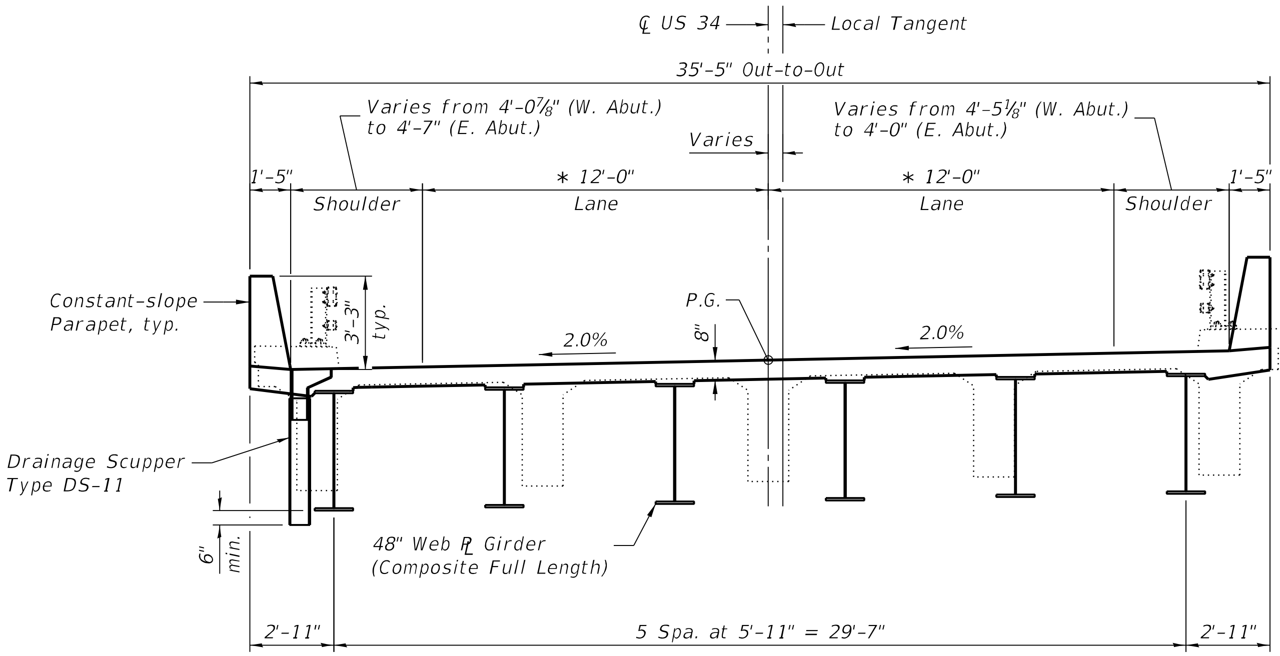
PLOT DATE =	CHECKED - MDC	REVISED -		SHEET 1 OF 2 SHEETS	

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
587	(18B)ES	LASALLE		
		CONTRACT NO. 66K85		
	ILLINOIS	FED. AID PROJECT		

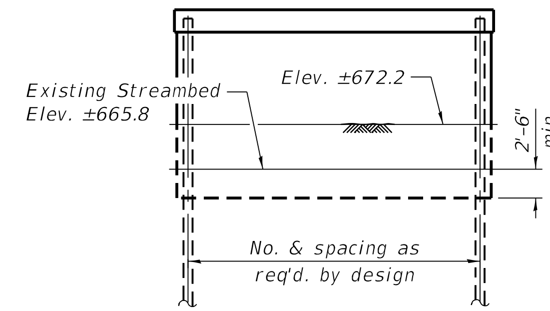
1/5/2023 11:33:12 AM



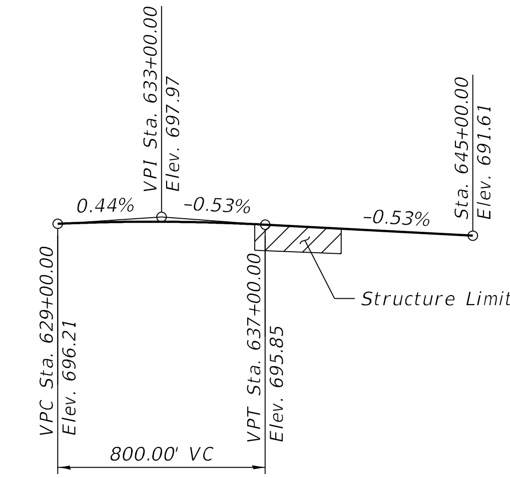
CROSS SECTION

(Looking East)
(Dimensions are perpendicular to the Local Tangent, U.N.O.)
(Shoulder widths are measured at back of abutments)

∗ Measured Radially



PIER SKETCH



PROFILE

(Along ℄ US 34)

CURVE DATA

EX CURVE EXCL
P.I. Sta. = 625+52.90
Δ = 25° 15' 43" (LT)
D = 1° 00' 02"
R = 5,726.86'
T = 1,283.36'
L = 2,525.00'
E = 142.04'
e = 2.0% (Exist./Prop.)
T.R. = 90.00' (Prop.)
S.E. Run = 110.00' (Prop.)
P.C. Sta. = 612+69.54
P.T. Sta. = 637+94.54

DESIGN SCOUR ELEVATION TABLE

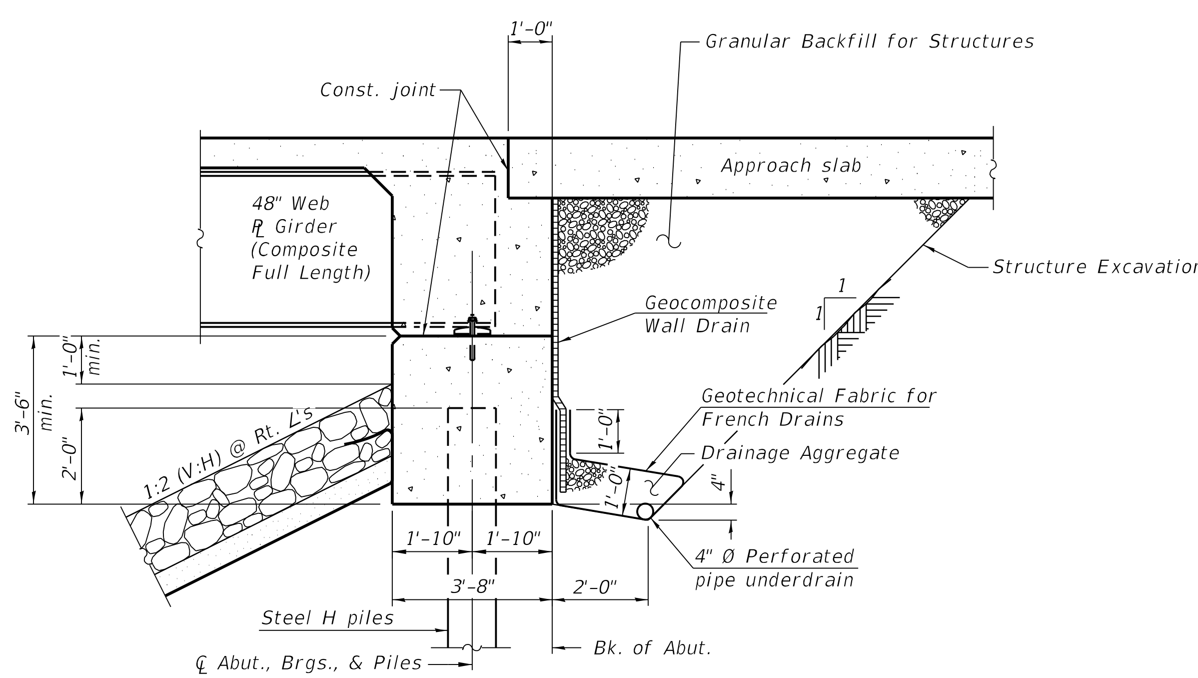
Event / Limit State	Design Scour Elevations (ft.) W. Abut.	Pier	E. Abut.	Item 113
Q100	±686.8	±660.8	±685.6	5
Q200	±686.8	±660.2	±685.6	
Design	±686.8	±660.8	±685.6	
Check	±686.8	±660.2	±685.6	

WATERWAY INFORMATION

Drainage Area = 116.4 sq. mi.
Existing Overtopping Elev. 693.8 @ Sta. 640+61
Proposed Overtopping Elev. 693.8 @ Sta. 640+61

Flood Event	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	3,680	1,013	1,029	675.9	0.9	0.7	676.8	676.5
Design	50	5,410	1,259	1,285	677.2	1.2	0.8	678.4	678.0
Base	100	6,140	1,355	1,385	677.7	1.3	0.9	679.0	678.6
Scour Check	200	7,161	1,478	1,513	678.4	1.4	1.0	679.8	679.4
Max. Calc.	500	7,870	1,562	1,601	678.8	1.5	1.1	680.3	679.8

10-Year Velocity through Existing Structure = 3.6 fps
10-Year Velocity through Proposed Structure = 3.6 fps



SECTION THRU INTEGRAL ABUTMENT

(Horiz. dim. @ Rt. ∠'s)

DETAILS
US 34 OVER INDIAN CREEK
FAP ROUTE 587 - SECTION (18B)ES
LASALLE COUNTY
STATION 638+39.83
STRUCTURE NO. 050-0262

QUIGG ENGINEERING INC

USER NAME = rwhiteside	DESIGNED - ZLD	REVISED -	
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PLOT DATE =	CHECKED - MDC	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

DETAILS
STRUCTURE NO. 050-0262

SHEET 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
587	(18B)ES	LASALLE		

CONTRACT NO. 66K85

ILLINOIS | FED. AID PROJECT

Job No.:	21IL083
SN:	050-0040(E)
Designed:	ZLD
Date:	9/26/2022
Checked:	RPW
Date:	9/27/2022
Page:	1 of 1

Note: The Longitudinal and Transverse Loads shown below do not act concurrently.

INITIAL ESTIMATED PILE LOADS: (AASHTO LRFD)

Total Load per W. Abutment: Impact = 1.00

	SERVICE LOADS:		STRENGTH-I LOADS:		EXT. EVENT-I LOADS:	
Abutment DL =	157.3	k	196.6	k	157.3	k
Approach Slab DL =	117.2	k	146.5	k	117.2	k
DC =	319.9	k	399.8	k	319.9	k
DW =	81.3	k	122.0	k	81.3	k
LL Lane =	0.0	k	0.0	k	0.0	k
LL Vehicle =	409.7	k	717.0	k	204.9	k
Long. Lat. Load =		k		k		k
Trans. Lat. Load =		k		k		k
Total Axial Load =	1085.4	k	1582.0	k	880.6	k
Est. # Piles/Abut. =	6	piles				
Axial Load/Pile =	**181**	**k/pile**	**264**	**k/pile**	**147**	**k/pile**

Total Load per Pier: Impact = 1.00

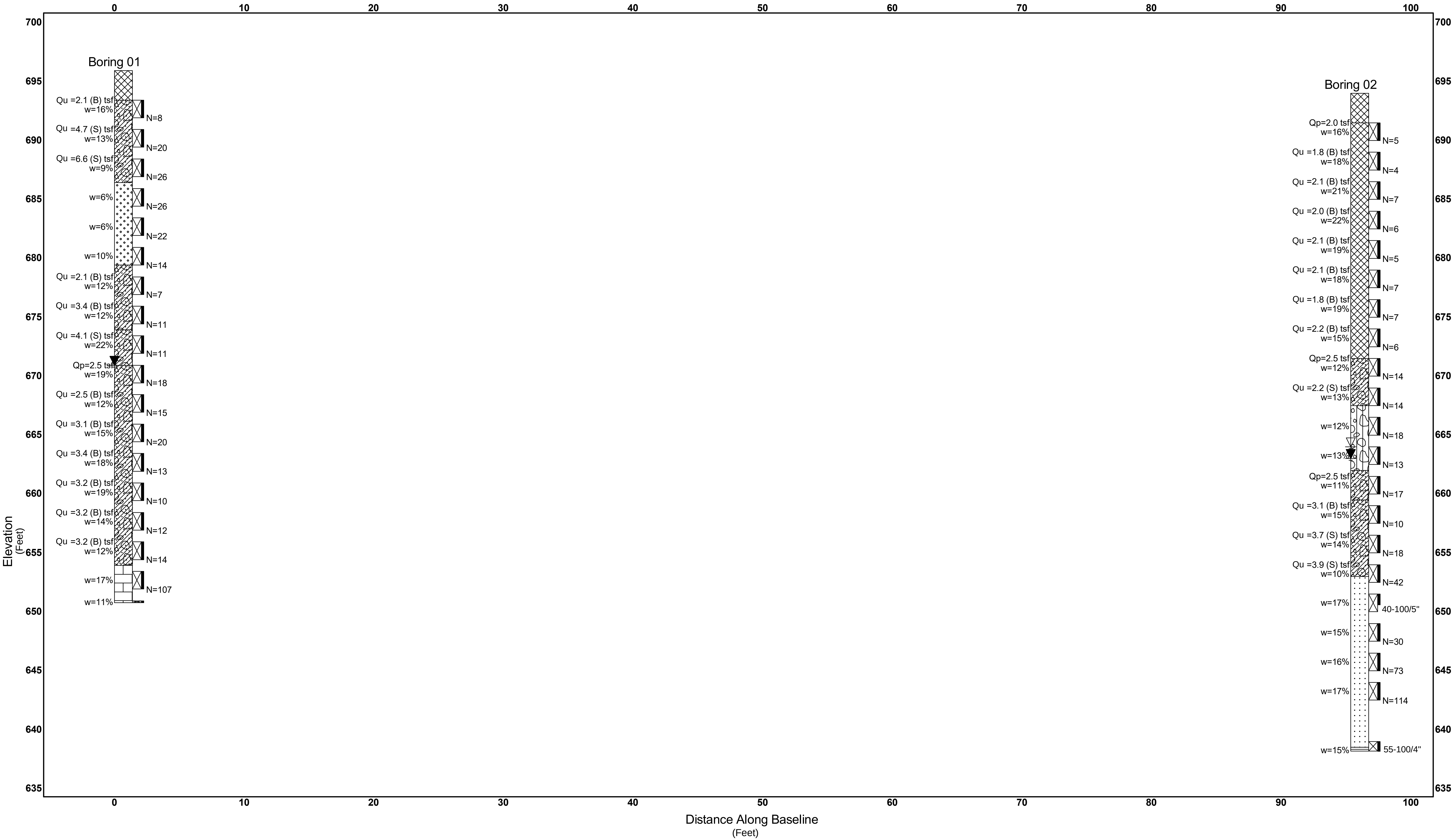
	SERVICE LOADS:		STRENGTH-I LOADS:		EXT. EVENT-I LOADS:	
Pier DL =	634.1	k	792.6	k	634.1	k
DC =	1030.7	k	1288.4	k	1030.7	k
DW =	252.6	k	378.9	k	252.6	k
LL Lane =	0.0	k	0.0	k	0.0	k
LL Vehicle =	824.3	k	1442.6	k	412.2	k
Long. Lat. Load =		k		k		k
Trans. Lat. Load =		k		k		k
Total Axial Load =	2741.7	k	3902.4	k	2329.5	k
Est. # Piles/Pier =	14	piles				
Axial Load/Pile =	**196**	**k/pile**	**279**	**k/pile**	**166**	**k/pile**

Total Load per E. Abutment: Impact = 1.00

	SERVICE LOADS:		STRENGTH-I LOADS:		EXT. EVENT-I LOADS:	
Abutment DL =	157.3	k	196.6	k	157.3	k
Approach Slab DL =	117.2	k	146.5	k	117.2	k
DC =	192.4	k	240.5	k	192.4	k
DW =	52.6	k	78.8	k	52.6	k
LL Lane =	0.0	k	0.0	k	0.0	k
LL Vehicle =	375.6	k	657.3	k	187.8	k
Long. Lat. Load =		k		k		k
Trans. Lat. Load =		k		k		k
Total Axial Load =	895.1	k	1319.8	k	707.3	k
Est. # Piles/Abut. =	6	piles				
Axial Load/Pile =	**149**	**k/pile**	**220**	**k/pile**	**118**	**k/pile**

In the SGR provide at each substructure location the Pile Type & Lengths for the following loads:

+/- 120% of Strength-I & Extreme Event-I Loads shown above



Rubino Engineering, Inc.
425 Shepard Drive
Elgin, IL 60123
Telephone: 847-931-1555
Fax: 847-931-1560

Soil Profile

Rubino Job No.: G22.170
Project: IDOT PTB 197-022 WO16 US34 over Indian Creek
Location: LaSalle County
City, State: Earlville, Illinois
Client: IDOT District 3

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 10/30/18

ROUTE FAP 587 (US 34) **DESCRIPTION** US 34 over Indian Creek, 12.88 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 18-B **LOCATION** NE 1/4, **SEC.** 19, **TWP.** 36N, **RNG.** 3E, 3rd **PM**, **Latitude** 41.579309, **Longitude** -88.918108

COUNTY LaSalle **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 050-0040 (Exist.)
Station 638+40

BORING NO. 01 (W. Abut.)
Station 636+80
Offset 10.0 ft Rt.
Ground Surface Elev. 695.87 ft

Surface Water Elev. 667.07 ft
Stream Bed Elev. 666.17 ft

Groundwater Elev.:
First Encounter 670.9 ft ▼
Upon Completion 670.9 ft ▽
After ___ **Hrs.** ___ ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Cored Bituminous & Concrete Pavement, CA6 & Brown Silty Clay Loam Fill	693.37				
Very Stiff to Hard Brown Silty Clay Loam Till			4 4 4	2.1 B	16
		-5	5 7 13	4.7 S	13
	686.37		13 11 15	6.6 S	9
Medium Brown Fine Sand to Coarse Sand with some Fine to Coarse Gravel - Loamy		-10	13 15 11		6
			10 11 11		6
	679.37	-15	7 7 7		10
Very Stiff Gray Silty Clay Loam Till			3 3 4	2.1 B	12
		-20			

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Gray Silty Clay Loam Till *(continued)*	673.87		3 6 5	3.4 B	12
Hard Gray Silty Clay Till	670.87 ▼▽	-25	3 5 6	4.1 S	22
Very Stiff Brownish Gray Silty Clay Loam Till with Various Sand, Gravel & Silt Layers			4 6 12	2.5 P	19
			3 5 7	2.7 B	12
		-30	6 9 11	3.1 B	15
			5 6 7	3.4 B	18
		-35	4 4 6	3.2 B	19
			4 5 7	3.2 B	14
		-40			

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 10/30/18

ROUTE FAP 587 (US 34) **DESCRIPTION** US 34 over Indian Creek, 12.88 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 18-B **LOCATION** NE 1/4, **SEC.** 19, **TWP.** 36N, **RNG.** 3E, 3rd **PM**, **Latitude** 41.579309, **Longitude** -88.918108

COUNTY LaSalle **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 050-0040 (Exist.)
Station 638+40

BORING NO. 01 (W. Abut.)
Station 636+80
Offset 10.0 ft Rt.
Ground Surface Elev. 695.87 ft

Surface Water Elev. 667.07 ft
Stream Bed Elev. 666.17 ft

Groundwater Elev.:
First Encounter 670.9 ft ▼
Upon Completion 670.9 ft ▽
After ____ **Hrs.** ____ ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff Brownish Gray Silty Clay Loam Till with Various Sand, Gravel & Silt Layers *(continued)*			4 5 9	3.2 B	12
	653.87				
Dense Buff & Tan Limestone, Angular Gravel in Limestone Silt Matrix - Weathered & Reworked Surface			95 37 70		17
	650.87	-45			
Assumed Rock Surface End of Boring			100/2"		11
		-50			
		-55			
		-60			

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 10/31/18

ROUTE FAP 587 (US 34) **DESCRIPTION** US 34 over Indian Creek, 12.88 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 18-B **LOCATION** NE 1/4, **SEC.** 19, **TWP.** 36N, **RNG.** 3E, 3rd **PM**, **Latitude** 41.579731, **Longitude** -88.917112

COUNTY LaSalle **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO.	050-0040 (Exist.)	**Surface Water Elev.**	667.07 ft
Station	638+40	**Stream Bed Elev.**	666.07 ft
BORING NO.	02 (E. Abut.)	**Groundwater Elev.:**	
Station	639+98	**First Encounter**	663.9 ft ▼
Offset	8.0 ft Lt.	**Upon Completion**	662.9 ft ▽
Ground Surface Elev.	693.94 ft	**After ___ Hrs.**	ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Cored Asphalt & Concrete Pavement, Augered Brown Silty Clay Loam Fill					
	691.44				
Stiff to Very Stiff Brown, Gray Silty Clay Loam Till Fill			2		
			2	2.0	16
			3	P	
		-5			
			2		
			2	1.8	18
			2	B	
			4		
			4	2.1	21
			3	B	
		-10			
			1		
			3	2.0	22
			3	B	
			2		
			3	2.1	19
			2	B	
		-15			
			1		
			3	2.1	18
			4	B	
			2		
			3	1.8	19
			4	B	
		-20			

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff to Very Stiff Brown, Gray Silty Clay Loam Till Fill *(continued)*			2		
			2	2.2	15
			4	B	
	671.44				
Very Stiff Brown Silty Clay Loam / Silty Loam Till			5		
			6	2.5	12
			8	P	
		-25			
			3		
			4	2.2	13
	667.44		10	S	
Medium Black, Gray & Brown Loamy Gravel with some Sand & Silt Layers			4		
			6		12
			12		
	▼	-30			
			13		
	▽		6		13
			7		
	661.94				
Very Stiff Brownish Gray Sandy Loam Till with Sand Layers			6		
			7	2.5	11
			10	P	
	659.44				
Very Stiff Brownish Gray Silty Clay Loam Till with Sand & Silt Layers		-35			
			3		
			4	3.1	15
			5	B	
			7		
			9	3.7	14
			9	S	
		-40			

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

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 10/31/18

ROUTE FAP 587 (US 34) **DESCRIPTION** US 34 over Indian Creek, 12.88 miles East of IL 251 **LOGGED BY** Larry Myers

SECTION 18-B **LOCATION** NE 1/4, **SEC.** 19, **TWP.** 36N, **RNG.** 3E, 3rd **PM**, **Latitude** 41.579731, **Longitude** -88.917112

COUNTY LaSalle **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 050-0040 (Exist.)
Station 638+40

BORING NO. 02 (E. Abut.)
Station 639+98
Offset 8.0 ft Lt.
Ground Surface Elev. 693.94 ft

Surface Water Elev. 667.07 ft
Stream Bed Elev. 666.07 ft

Groundwater Elev.:
First Encounter 663.9 ft ▼
Upon Completion 662.9 ft ▽
After ____ **Hrs.** ____ ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	652.94		7 12 30	3.9 S	10
Dense White / Green Fine Silica Sand - Reworked St. Peter Sandstone with Thin Layers of Reworked Limestone			40 100/5"		17
		-45	21 17 13		15
			55 46 27		16
		-50	46 51 63		17
	638.44	-55	55 100/4"		15
Dense Gray Green & Gray Shale End of Boring					
		-60			

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

Geologic Setting

A review of the Facies Analysis of the Ordovician Maquoketa Group and Adjacent Strata in Kane County (Graese, 1991), the Bedrock Geology of Illinois (Kolata et al., 2005), and the Geology of Illinois (Kolata & Nimz, 2010) reveal that the subsurface geology of the site is dominated by Ordovician sandstones, limestones, dolomites, and shales.

The Bedrock Geology of Illinois (Kolata et al., 2005) shows that the town of Earlville sits on top of the older Prairie du Chien Group (Opdc) to the East and the younger Ancell Group (Oa) to the West (*Figure 1*). The Prairie du Chien Group includes the Gunter Sandstone, Oneota Dolomite, New Richmond Sandstone, and Shakopee Dolomite. Except for the regressive episodes of the Gunter and New Richmond Sandstones, Early Ordovician sedimentation was dominated by carbonate deposition. The Middle and Late Ordovician sequences were deposited during a major transgressive cycle starting with the Everton Formation followed by the succession of mixed carbonates and siliciclastics of the Ancell Group (*Figure 2*). The Ancell Group consists of the St. Peter Sandstone, Dutchtown Limestone, Joachim Dolomite, and the Glenwood Formation.

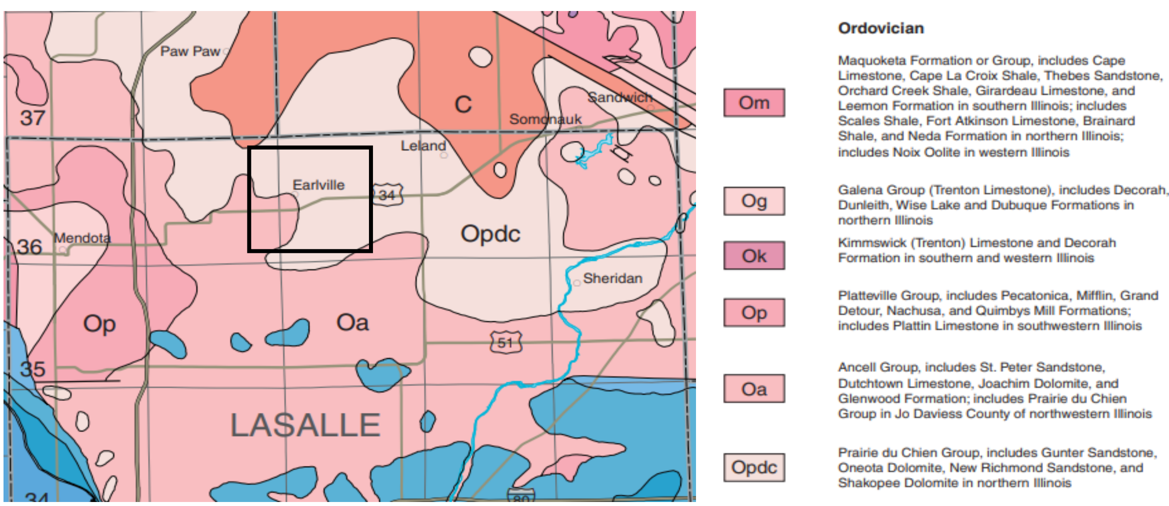


Figure 1. Bedrock Geology of Illinois (Kolata et al., 2005) including the site area outlined in black and associated unit descriptions.

The St. Peter Sandstone was deposited in an advancing shoreline dominated by eolian dune and beach processes. The lower Tonti Sandstone Member consists of fine-grained pure quartz sandstone that irregularly onlaps the Shakopee Dolomite in the northern portion of the Illinois Basin. The upper Starved Rock Sandstone Member consists of medium-grained ferruginous to pure quartz sandstone and is thought to have formed as a barrier island complex (Kolata & Nimz, 2010).

A north-south cross section from Kolata & Nimz (2010) suggests that the site area might encounter the Glenwood Formation on top of the St. Peter Sandstone (*Figure 2*). The Glenwood

Formation consists of poorly sorted sandstone, silty or argillaceous dolomite, and green shale (Graese, 1991, Kolata & Nimz, 2010; *Figure 3*). The Glenwood Formation lies on top of the Tonti Sandstone Member and is suggested to have been deposited north of the linear belt of the Starved Rock Sandstone Member of the St. Peter Sandstone located in LaSalle County (*Figure 2*).

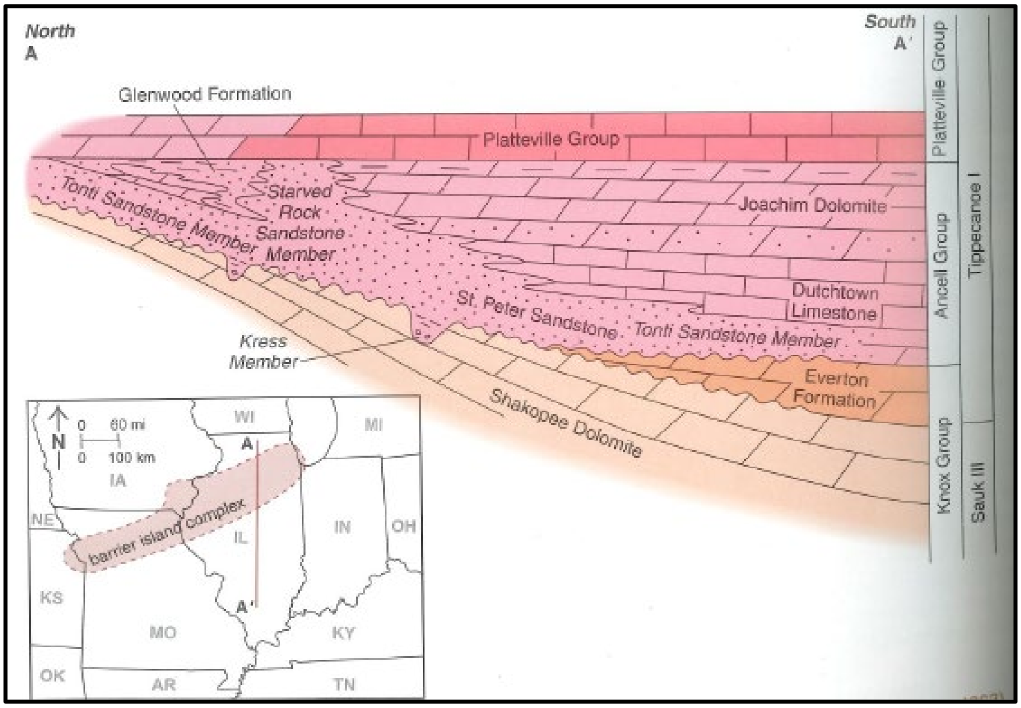


Figure 2. Diagrammatic north-south cross section showing facies of the Ancell Group (Kolata & Nimz, 2010; pg. 148).

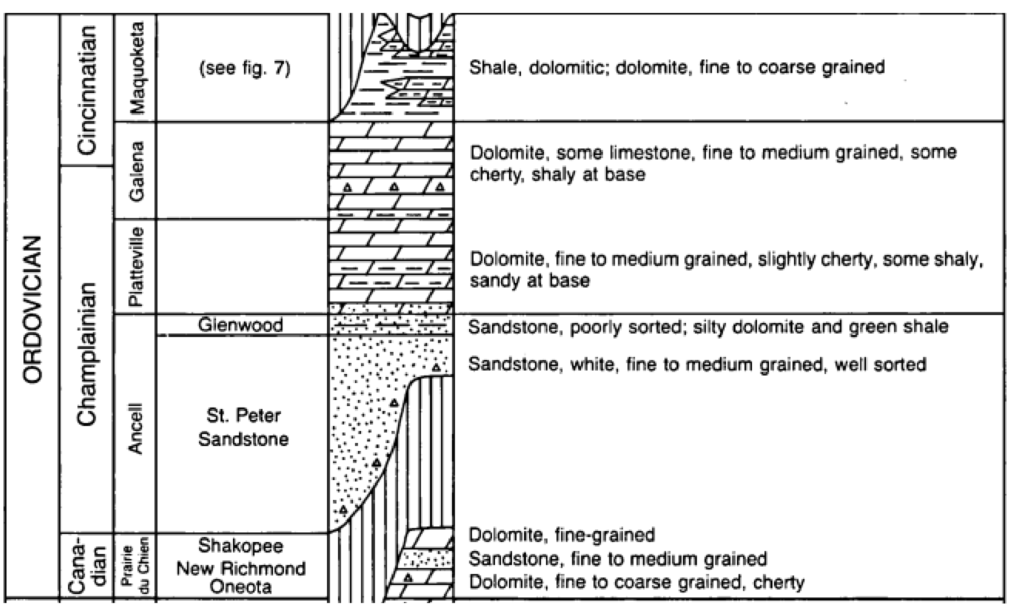


Figure 3. Generalized stratigraphic column of Paleozoic units near the Sandwich Fault Zone in Northeastern Illinois (Graese, 1991).

G22.170 Work Order 16 US 34 over Indian Creek (DRAINED)

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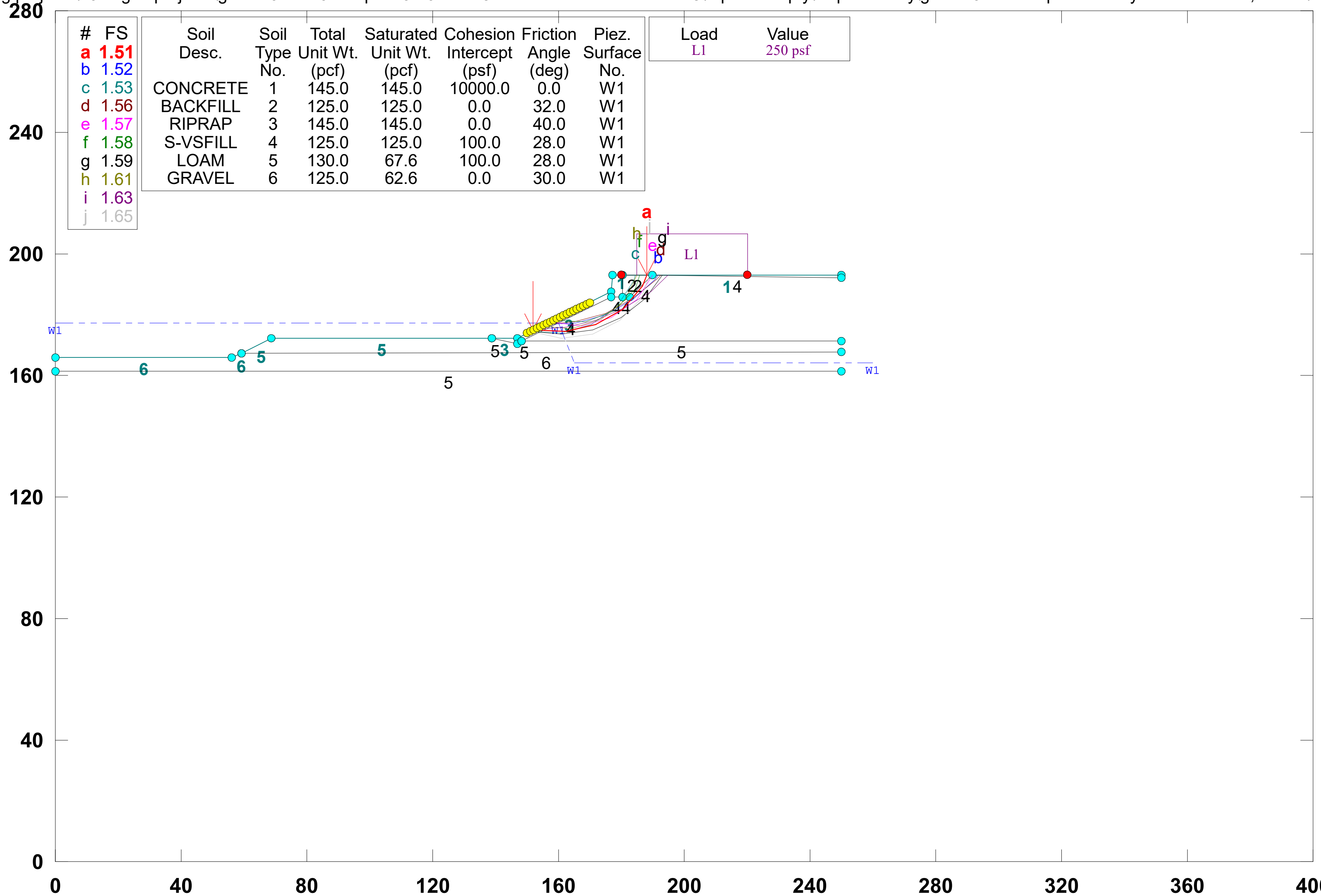

PCSTABL5M/si FSmin=1.51

Safety Factors Are Calculated By The Modified Bishop Method

G22.170 Work Order 16 US 34 over Indian Creek (UNDRAINED)

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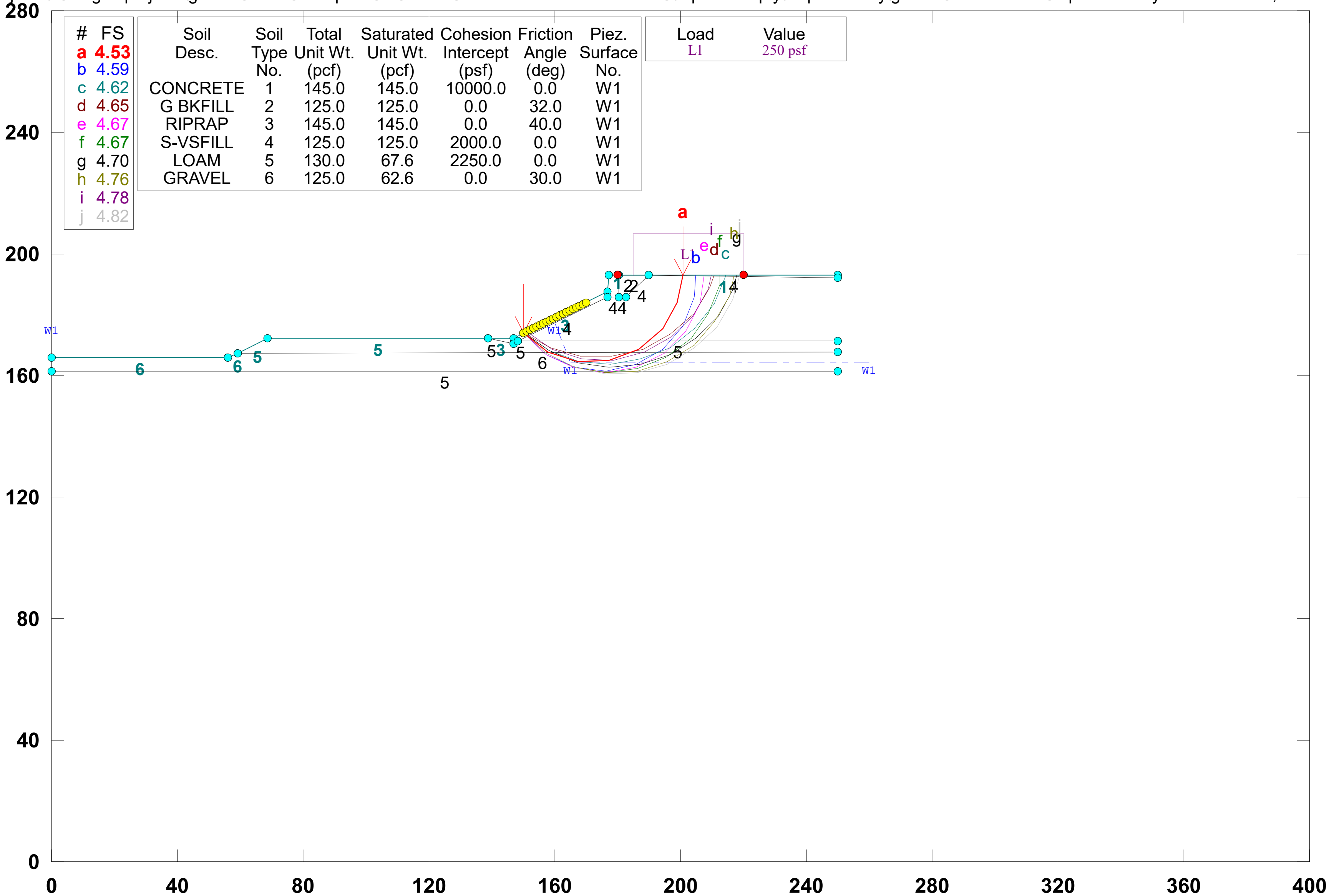


#	FS
a	4.53
b	4.59
c	4.62
d	4.65
e	4.67
f	4.67
g	4.70
h	4.76
i	4.78
j	4.82

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CONCRETE	1	145.0	145.0	10000.0	0.0	W1
G BKFILL	2	125.0	125.0	0.0	32.0	W1
RIPRAP	3	145.0	145.0	0.0	40.0	W1
S-VSFILL	4	125.0	125.0	2000.0	0.0	W1
LOAM	5	130.0	67.6	2250.0	0.0	W1
GRAVEL	6	125.0	62.6	0.0	30.0	W1

Load	Value
L1	250 psf

PCSTABL5M/si FSmin=4.53

Safety Factors Are Calculated By The Modified Bishop Method

Final Scour Results - SN 050-0040

	Existing											
	50 yr			100 yr			200 yr			500 yr		
	LT	Channel	RT	LT	Channel	RT	LT	Channel	RT	LT	Channel	RT
Abutment	0		0	0		0	0		0	0		0
Pier		4.58			4.7			4.85			4.95	
Contraction	1.7	0.36	0	1.94	0.88	0	2.33	1.66	0	2.56	2.34	0
Pressure		0			0			0.00			0.00	
TOTAL Pier + Contraction*		**4.94**			**5.58**			**6.51**			**7.29**	
TOTAL Abut. + Contraction	**1.7**		**0**	**1.94**		**0**	**2.33**		**0**	**2.56**		**0**
D50 Used	**0.2 mm Sand**											

	Proposed											
	50 yr			100 yr			200 yr			500 yr		
	LT	Channel	RT	LT	Channel	RT	LT	Channel	RT	LT	Channel	RT
Abutment	0		0	0		0	0		0	0		0
Pier		4.86			4.99			5.16			5.27	
Contraction	0.74	0	0	2.43	0	0	2.81	0.4	0	3.06	0.92	0
Pressure		0			0			0			0	
TOTAL Pier + Contraction*		**4.86**			**4.99**			**5.56**			**6.19**	
TOTAL Abut. + Contraction	**0.74**		**0**	**2.43**		**0**	**2.81**		**0**	**3.06**		**0**
D50 Used	**0.2 mm Sand**											

*Pier scour used is greater of pier or pressure scour

Characteristic Soil D50 Sizes		
Sand	**0.074 - 2.0**	**mm**
Silt	**0.002 - 0.074**	**mm**
Clay	**< 0.002**	**mm**

1. Largest stone in mix no greater than 1.5 x D50
2. Thickness of layer 2.25 x D50

Common D50 sizes			
RipRap	**lbs**	**cube**	**mm**
RR 1		1.5"	38
RR 2		2"	50
RR 3	10-12	4-5"	127
RR 4	40-50	7-8"	200
RR 5	90-170	10-12"	300
RR 6	300	15"	381
RR 7	400-1000	16-22"	457

Illinois Department of Transportation

SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE===== US 34 over Indian Creek, LaSalle County SN 050-0262 (SN 050-0040 Replacement)

Substructure 1 - West Abutment

Base of Substruct. Elev. (or ground surf for bents)	686.8	ft.
Pile or Shaft Dia.	14	inches
Boring Number	Boring 01&Boring 02*	
Top of Boring Elev.	695.87	ft.
Approximate Fixity Elev.	679.8	ft.

Individual Site Class Definition:

N (bar):	35	(Blows/ft.)	Soil Site Class D
N_{ch} (bar):	91	(Blows/ft.)	Soil Site Class C
s_u (bar):	4.23	(ksf)	Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	693.4	2.50	8	2.10	
	690.9	2.50	8	2.10	
	688.4	2.50	20	4.70	
	686.4	2.00	26	6.60	B
	683.9	2.50	26		
	681.4	2.50	22		
0.4	679.4	2.00	14		B
2.9	676.9	2.50	7	2.10	
4.4	675.4	1.50	11	3.40	
5.9	673.9	1.50	11	3.40	B
7.4	672.4	1.50	11	4.10	
8.9	670.9	1.50	11	4.10	B
11.4	668.4	2.50	18	2.50	
13.9	665.9	2.50	12	2.70	
16.4	663.4	2.50	20	3.10	
18.9	660.9	2.50	13	3.40	
21.4	658.4	2.50	10	3.20	
23.9	655.9	2.50	12	3.20	
25.9	653.9	2.00	14	3.20	B
27.4	652.4	1.50	107		
28.9	650.9	1.50	107		B
30.9	648.9	2.00	30		
32.9	646.9	2.00	30		
35.4	644.4	2.50	73		
37.9	641.9	2.50	114		
40.4	639.4	2.50	114		
41.4	638.4	1.00	114		B
100.0	579.8	58.60	100	10.00	R

*Data from Boring 02 used starting at elevation 650.9

Substructure 2 - Pier

Base of Substruct. Elev. (or ground surf for bents)	661.8	ft.
Pile or Shaft Dia.	14	inches
Boring Number	Boring 02	
Top of Boring Elev.	693.94	ft.
Approximate Fixity Elev.	654.8	ft.

Individual Site Class Definition:

N (bar):	88	(Blows/ft.)	Soil Site Class C
N_{ch} (bar):	96	(Blows/ft.)	Soil Site Class C <----Controls
s_u (bar):	4.97	(ksf)	Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	691.4	2.50	5	2.00	
	688.9	2.50	5	2.00	
	686.4	2.50	4	1.80	
	683.9	2.50	7	2.10	
	681.4	2.50	6	2.00	
	678.9	2.50	5	2.10	
	676.4	2.50	7	2.10	
	673.9	2.50	7	1.80	
	671.4	2.50	6	2.20	B
	669.4	2.00	14	2.50	
	667.4	2.00	14	2.20	B
	664.9	2.50	18		
	663.4	1.50	13		
	661.9	1.50	13		B
	659.4	2.50	17	2.50	B
	656.9	2.50	9	3.10	
0.4	654.4	2.50	18	3.70	
1.9	652.9	1.50	18	3.90	B
4.4	650.4	2.50	100		
6.4	648.4	2.00	30		
8.4	646.4	2.00	30		
10.9	643.9	2.50	73		
13.4	641.4	2.50	114		
15.9	638.9	2.50	114		
16.4	638.4	0.50	114		B
100.0	554.8	83.60	100	10.00	R

Substructure 3 - East Abutment

Base of Substruct. Elev. (or ground surf for bents)	685.6	ft.
Pile or Shaft Dia.	14	inches
Boring Number	Boring 02	
Top of Boring Elev.	693.94	ft.
Approximate Fixity Elev.	678.6	ft.

Individual Site Class Definition:

N (bar):	33	(Blows/ft.)	Soil Site Class D
N_{ch} (bar):	69	(Blows/ft.)	Soil Site Class C <----Controls
s_u (bar):	4	(ksf)	Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	691.4	2.50	5	2.00	
	688.9	2.50	5	2.00	
	686.4	2.50	4	1.80	
	683.9	2.50	7	2.10	
	681.4	2.50	6	2.00	
	678.9	2.50	5	2.10	
2.2	676.4	2.50	7	2.10	
4.7	673.9	2.50	7	1.80	
7.2	671.4	2.50	6	2.20	B
9.2	669.4	2.00	14	2.50	
11.2	667.4	2.00	14	2.20	B
13.7	664.9	2.50	18		
15.2	663.4	1.50	13		
16.7	661.9	1.50	13		B
19.2	659.4	2.50	17	2.50	B
21.7	656.9	2.50	9	3.10	
24.2	654.4	2.50	18	3.70	
25.7	652.9	1.50	18	3.90	B
28.2	650.4	2.50	100		
30.2	648.4	2.00	30		
32.2	646.4	2.00	30		
34.7	643.9	2.50	73		
37.2	641.4	2.50	114		
39.7	638.9	2.50	114		
40.2	638.4	0.50	114		B
100.0	578.6	59.80	100	10.00	R

Substructure 4

Base of Substruct. Elev. (or ground surf for bents)		ft.
Pile or Shaft Dia.		inches
Boring Number		
Top of Boring Elev.		ft.
Approximate Fixity Elev.		ft.

Individual Site Class Definition:

N (bar):		(Blows/ft.)	NA
N_{ch} (bar):		(Blows/ft.)	NA
s_u (bar):		(ksf)	NA

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary

Global Site Class Definition: Substructures 1 through 3

N (bar):	52	(Blows/ft.)	Soil Site Class C
N_{ch} (bar):	86	(Blows/ft.)	Soil Site Class C <----Controls
s_u (bar):	4.41	(ksf)	Soil Site Class C

West Abutment Pile Design Table - Boring 01 and Using Boring 02 Rock Data starting at Elevation 650.87 feet

West Abutment Design Loads per Pile (k/pile)

120% Extreme Event	176
120% Strength	317

		Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Estimated Pile Length (feet)
Steel HP 12x74	120% Extreme Event	366	201	38
	---	504	277	40
	120% Strength	589	324	42
	Max. Nominal Req'd Bearing	589	324	42
Steel HP 12x84	120% Extreme Event	370	204	38
	---	511	281	40
	120% Strength	615	338	42
	Max. Nominal Req'd Bearing	664	365	43
Steel HP 14x73	120% Extreme Event	333	183	35
	120% Strength	578	318	39
	Max. Nominal Req'd Bearing	578	318	39
Steel HP 14x89	120% Extreme Event	345	190	35
	---	436	240	38
	120% Strength	606	333	40
	Max. Nominal Req'd Bearing	705	388	42
Steel HP 14x102	120% Extreme Event	353	194	35
	---	444	244	38
	120% Strength	614	338	40
	Max. Nominal Req'd Bearing	810	445	42
Steel HP 14x117	120% Extreme Event	363	200	35
	---	523	287	38
	120% Strength	667	367	40
	Max. Nominal Req'd Bearing	929	511	43

East Abutment Pile Design Table - Boring 02

East Abutment Design Loads per Pile (k/pile)

120% Extreme Event	142
120% Strength	264

		Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Estimated Pile Length (feet)
Steel HP 12x74	120% Extreme Event	274	151	37
	---	468	258	43
	120% Strength	532	293	46
	Max. Nominal Req'd Bearing	589	324	51
Steel HP 12x84	120% Extreme Event	280	154	37
	---	476	262	43
	120% Strength	585	297	46
	Max. Nominal Req'd Bearing	664	365	52
Steel HP 14x73	120% Extreme Event	283	156	35
	---	316	174	37
	120% Strength	491	270	41
	Max. Nominal Req'd Bearing	578	318	45
Steel HP 14x89	120% Extreme Event	289	159	35
	120% Strength	501	275	41
	---	558	307	43
	---	640	352	49
	Max. Nominal Req'd Bearing	705	388	51
Steel HP 14x102	120% Extreme Event	292	161	35
	120% Strength	507	278	41
	---	567	312	43
	---	649	357	49
	Max. Nominal Req'd Bearing	810	445	52
Steel HP 14x117	120% Extreme Event	296	163	35
	---	425	234	38
	120% Strength	517	284	41
	---	580	319	43
	---	657	361	49
	Max. Nominal Req'd Bearing	929	511	54

Pier Pile Design Table (Piles Set in Rock) - Using Boring 02

Pier Design Loads per Pile (k/pile)		***Factored Resistance Available** (kips)	****Side Resistance Available** (ksf)
120% Extreme Event	199		
120% Strength	335		
Steel HP 10x42		434	10.3
Steel HP 10x57		588	10.3
Steel HP 12x53		543	10.3
Steel HP 12x63		644	10.3
Steel HP 12x74		763	10.3
Steel HP 12x84		861	10.3
Steel HP 14x73		749	10.3
Steel HP 14x89		914	10.3
Steel HP 14x102		1050	10.3
Steel HP 14x117		1204	10.3

*Resistance factor for piles set in rock = 0.7

**Calculated per AASHTO eq. 10.8.3.5.4b-1

Integral Abutment Feasibility

Integral abutments are the preferred end bent type due to elimination of the joints in the bridge decks, decreasing maintenance costs, and increasing service life. The proposed structure length typically fits in the range of applicability for integral abutments. The bottom abutment elevation is +/-686.8 feet at the west abutment and +/-685.6 feet at the east abutment. Critical depth for intergral abutment analysis is 10 feet below the bottom of the abutment elevation.

Abutment	Soil Strengths at Critical Depth	Recommendation
West Abutment	Qu between 2.1 – 3.4 tsf Average Qu ≈ 2.74 tsf	No Pre-Coring
East Abutment	Qu between 1.8 – 2.1 tsf Average Qu ≈ 2.05 tsf	No Pre-Coring

According to the IDOT ABD Memo 19.8, the integral abutment study only pertains to soils with an average Qu of less than 3.0 tsf. See the attached IDOT BBS 145 spreadsheet for in-situ Integral Abutment Feasibility Analysis.

Utilizing the available Qu data for both embankment conditions, the results show integral abutments are applicable for the pile types recommended in the Pile Design Tables attached to this report. Please reference the Integral Abutment Feasibility spreadsheet included in this report.

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER=====================	SN 050-0262		TOTAL STRUCTURE LENGTH===============	239.75	FT
STRUCTURE TYPE =======================	MULTI-SPAN		NUMBER OF SPANS ======================	2	
STRUCTURE SKEW=======================	11	DEGREES	END SPAN LENGTH ==================	131.88	FT
SUPER. DATA IN REFERENCE TO SUB. DATA ====	ABUT 1		ADJACENT INTERIOR SPAN LENGTH ===========	0.01	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE ===========================	PLATE GIRDER	
TOP FLANGE WIDTH ====================	14.00	IN
TOP FLANGE THICKNESS ==================	1.00	IN
WEB DEPTH ========================	48.00	IN
WEB THICKNESS =======================	0.50	IN
BOTTOM FLANGE WIDTH ==================	14.00	IN
BOTTOM FLANGE THICKNESS ================	1.00	IN
BEAM SPACING PERP. TO CL ================	5.92	FT
SLAB THICKNESS =======================	8.00	IN
SLAB F'C =========================	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH ====================	14.00	IN
TOP FLANGE THICKNESS ==================	1.00	IN
WEB DEPTH ========================	48.00	IN
WEB THICKNESS =======================	0.50	IN
BOTTOM FLANGE WIDTH ==================	14.00	IN
BOTTOM FLANGE THICKNESS ================	1.00	IN
BEAM SPACING PERP. TO CL ================	5.92	FT
SLAB THICKNESS =======================	8.00	IN
SLAB F'C =========================	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME ======================	West	
ABUTMENT REFERENCE BORING ============	01	
BOTTOM OF ABUTMENT ELEVATION =========	686.8	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	6	
PILE SPACING PERP. TO CL ================	6	FT

ABUTMENT #2 DATA

ABUTMENT NAME ======================	East	
ABUTMENT REFERENCE BORING============	02	
BOTTOM OF ABUTMENT ELEVATION=========	685.6	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	6	
PILE SPACING PERP. TO CL ================	6	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
686.37	0.43		26	3.1
684.37	2.00		26	3.1
681.87	2.50		22	3.0
679.37	2.50		14	2.7
676.87	2.50	2.1		
676.80	0.07	3.40		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
683.94	1.66	2.1		
681.44	2.50	2.0		
678.94	2.50	2.1		
676.44	2.50	2.10		
675.60	0.84	1.80		

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1======= 2.74 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*2.74])=================== 1.59

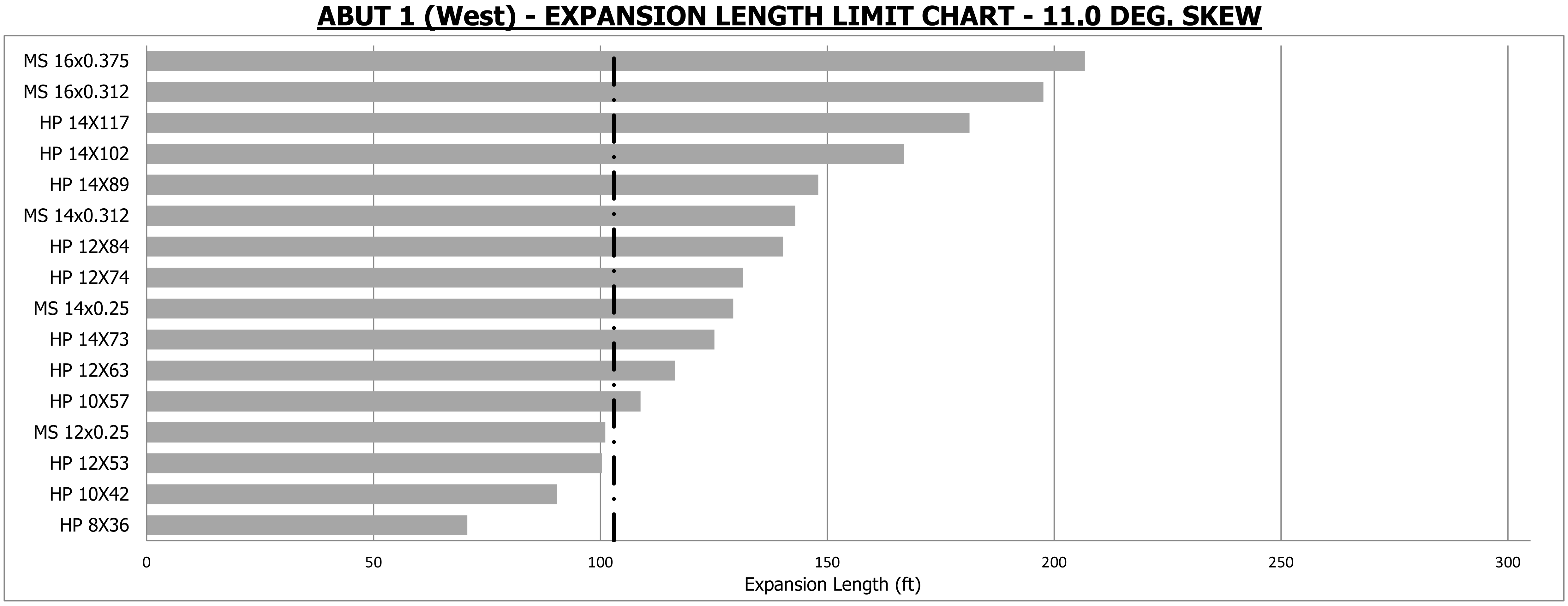
WEIGHTED AVERAGE Qu FOR ABUTMENT #2======= 2.05 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #2
= 1/(1.45-[0.3*2.05])=================== 1.20

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.59*6*0+1.2*6*239.75]/[1.59*6+1.2*6]=============== 102.99 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.2*6*0+1.59*6*239.75]/[1.2*6+1.59*6]=============== 136.76 FT

ABUT 1 (West) - EXPANSION LENGTH LIMIT CHART - 11.0 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER=====================	SN 050-0262		TOTAL STRUCTURE LENGTH===============	239.75	FT
STRUCTURE TYPE =======================	MULTI-SPAN		NUMBER OF SPANS =====================	2	
STRUCTURE SKEW=======================	11	DEGREES	END SPAN LENGTH ==================	131.88	FT
SUPER. DATA IN REFERENCE TO SUB. DATA ====	ABUT 2		ADJACENT INTERIOR SPAN LENGTH ===========	0.01	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE ===========================	PLATE GIRDER	
TOP FLANGE WIDTH ====================	14.00	IN
TOP FLANGE THICKNESS ==================	1.00	IN
WEB DEPTH =========================	48.00	IN
WEB THICKNESS =======================	0.50	IN
BOTTOM FLANGE WIDTH ==================	14.00	IN
BOTTOM FLANGE THICKNESS ================	1.00	IN
BEAM SPACING PERP. TO CL ================	5.92	FT
SLAB THICKNESS =======================	8.00	IN
SLAB F'C =========================	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH ====================	14.00	IN
TOP FLANGE THICKNESS ==================	1.00	IN
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BOTTOM FLANGE THICKNESS ================	1.00	IN
BEAM SPACING PERP. TO CL ================	5.92	FT
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SLAB F'C =========================	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME ======================	West	
ABUTMENT REFERENCE BORING ============	01	
BOTTOM OF ABUTMENT ELEVATION =========	686.8	FT
ESTIMATED NUMBER OF PILES AT ABUT. =======	6	
PILE SPACING PERP. TO CL ================	6	FT

ABUTMENT #2 DATA

ABUTMENT NAME ======================	East	
ABUTMENT REFERENCE BORING============	02	
BOTTOM OF ABUTMENT ELEVATION=========	685.6	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	6	
PILE SPACING PERP. TO CL ================	6	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
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684.37	2.00		26	3.1
681.87	2.50		22	3.0
679.37	2.50		14	2.7
676.87	2.50	2.1		
676.80	0.07	3.40		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
683.94	1.66	2.1		
681.44	2.50	2.0		
678.94	2.50	2.1		
676.44	2.50	2.10		
675.60	0.84	1.80		

10.00 FT = TOTAL DEPTH ENTERED

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PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*2.74])=================== 1.59

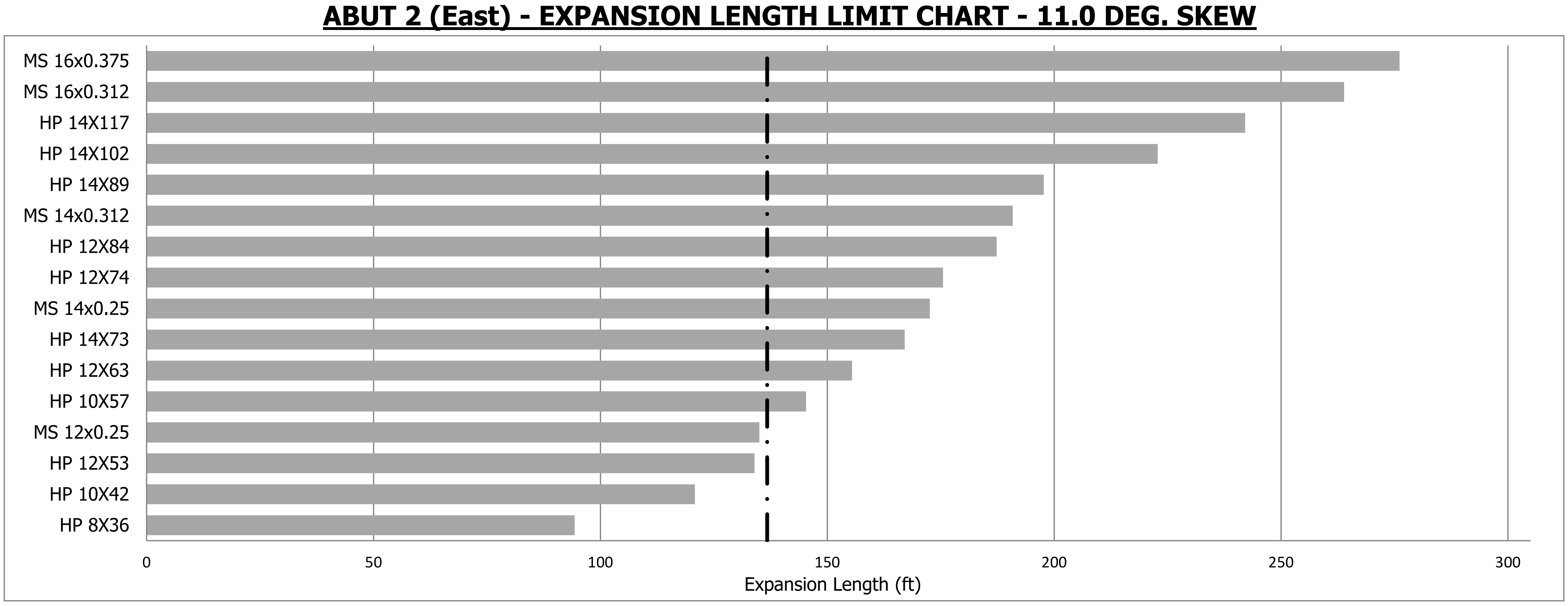
WEIGHTED AVERAGE Qu FOR ABUTMENT #2======= 2.05 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #2
= 1/(1.45-[0.3*2.05])=================== 1.20

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.59*6*0+1.2*6*239.75]/[1.59*6+1.2*6]=============== 102.99 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.2*6*0+1.59*6*239.75]/[1.2*6+1.59*6]=============== 136.76 FT

ABUT 2 (East) - EXPANSION LENGTH LIMIT CHART - 11.0 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)