GSG CONSULTANTS, INC
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May 24, 2018

Mr. Olufemi Oladeinde, P.E. S.E.
SDIENGR Corp
309 West Washington Street, Ste 325
Chicago, Illinois 60606

Abbreviated Structural Geotechnical Report
Bridge Replacement Project
US 45 over Prairie Creek
IDOT PTB 156-26
Structure Number: 038-0225
County: Iroquois

Dear Mr. Oladeinde:

Attached is a copy of the Abbreviated Structural Geotechnical Report – Form BBS 132 for the above referenced project. The site investigation was completed by IDOT in 2016 and included advancing two soil borings for the design and construction of the proposed bridge. The borings were drilled to depths of 61.5 to 66.5 feet. The foundation recommendations include supporting the proposed abutments on driven piles.

Should you have any questions or require additional information, please call us at 312-733-6262.

Sincerely,

Dawn Edgell.

Dawn Edgell, P.E.
Sr. Project Engineer

Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 11/10/2017	**Proposed SN:** 038-0225	**Route:**	FAS 317
Revised Date: 05/24/2018	**Existing SN:** 038-0039	**Section:**	36BR-1
Geotechnical Engineer: Ms. Dawn Edgell, P.E.		**County:**	Iroquois County
Structural Engineer: Mr. Olufemi Oladeinde		**Contract:**	#66F70

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structure is a new bridge that will be supported on driven pile supported integral abutments. The proposed total bridge length would be 84 feet from back to back of the abutments. The out-to-out deck width of the new bridge would be 35 feet 2 inches. The new bridge will consist of two lanes with 4-foot shoulders in either direction.

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 site investigation was conducted by IDOT on September 7th, 2016 and the soil boring logs provided by IDOT in Appendix C. The soil boring logs provide specific conditions encountered at each boring location, including: soil descriptions, stratifications, penetration resistance, elevations, location of the samples, water levels (when encountered), and moisture test results.

Borings 01 and 02 were drilled in the existing pavement area in the vicinity of the existing bridge. Borings 01 and 02 noted augered shoulder stone mixed with black silty clay loam fill to depths of 2.5 feet below grade, underlain by stiff to hard brown, gray, and black silty clay loam fill to depths of 7 feet. The fill layer was underlain by stiff brown and gray and dark gray silty clay and silty clay loam till to depths of 12 feet below grade. Boring 02 also noted some organic materials within this layer. Below this depth, the borings noted hard gray silty clay till, very uniform and monolithic with silt and sand layers, to the termination depths of between 61.5 and 66.5 feet.

In general, the native upper cohesive materials encountered had unconfined compressive strengths ranging between 1.4 and 1.6 tsf. The lower till had unconfined compressive strengths ranging from 4.3 to 5.2 tsf.

No additional investigations are necessary for the proposed design.

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: The existing slopes of US 45 are about 1:2 (V:H) towards the north and south side of Prairie Creek and the proposed slopes grades for the new bridge will be similar to the existing slopes with similar elevations. The new approach slabs on either end of the bridge will be supported by the existing grade or new engineered fill replacing the removed abutment structures. It is anticipated that a maximum of 1 to 2 feet of additional fill will be placed at the embankment approaches. Therefore, the anticipated settlement due to the regrading activity is considered to be negligible. No additional ground improvement or treatment is necessary.

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 embankment slopes below the new bridge after removal of the existing closed abutments, will be about 1:2 (V:H) on the north and south sides of US 45. Based on the proposed geometry for the improvements, slope stability was required.

Slide 7.0 is a comprehensive slope stability analysis software used to evaluate the proposed slopes for the project based on the limit equilibrium method. The proposed side slopes were analyzed based on the preliminary grading and the soils encountered while drilling. Both circular and block failure analysis were evaluated using the simplified Bishop analysis methods for the proposed slope geometry. Based on the proposed geometry and the soil borings, global stability analyses were performed. A circular and block failure analysis were evaluated for both a short term (undrained) and long term (drained) condition.

The factors of safety for the short term analyses were between 9.2 and 10.2; the long term analyses results ranged between 1.6 to 1.8. The resultant analyses exceed the minimum factor of safety of 1.5, therefore no further testing or ground improvements is necessary.

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: For the bridge, the proposed 100-year and 200-year total scour depths are 639.6 and 640.0 feet respectively. The proposed ground surface is 643 feet. The recommended foundation design scour elevation is 639.6 feet.

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 soil site class was found to be Soil Site Class C "Very Dense Soil and Soft Rock". The Seismic Performance Zone (SPZ) was found to be Seismic Performance Zone 1. The short (SDS) period design spectral acceleration coefficient was determined to be 0.133g and the long (SD1) period design spectral acceleration coefficient was determined to be 0.078g.The IDOT Seismic Site Classification Determination is attached.

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 existing bridge structure is supported on a system of shallow foundations for the bridge abutments and driven piles for the pier. GSG evaluated foundation system for the proposed new bridge and determined driven piles as the most feasible option. The anticipated factored loads for the bridge structure are as follows:
Factored Live Load + Impact Load = 245 kips * 1.75 = 429 kips
Factored Dead Load = 530 kips * 1.25 = 663 kips
Factored Wearing Surface Dead Load = 69 kips * 1.5 = 104 kips

Piles considered for this site include metal shell piles, concrete piles, and H-piles. Concrete piles are not recommended for this site because the pile lengths cannot be readily adjusted to accommodate variability in soil conditions. Metal shell piles and H-piles are a feasible option for the site.

For metal shell piles, a wall thickness of 0.25” or greater is recommended to minimize potential damage during driving. The estimated pile lengths are based on the pile cut off elevations provided on the preliminary plans (639.41 feet for the South abutment and 639.39 feet for the North abutment). The IDOT design tables for various pile sections, capacities and depths are provided in Appendix E, based on the uncorrected SPT N values of the boring logs. A summary table of the maximum nominal bearing of each pile, the maximum factored resistance available and the maximum pile length for each pile size is included in Appendix E also. The actual pile length and capacity should be evaluated based on test piles installed in accordance with the specifications provided in Section 512.15 of IDOT Standard Specifications for Road and Bridge Construction. A minimum of 1 test pile per abutment should be completed at a location away from the soil borings at the northeast and southwest corners of the bridge. Per section 3.10.1.11 of the IDOT Bridge Manual (2012), the minimum pile spacing should be 3 pile diameters, and the maximum pile spacing should not be more than 3.5 times the effective footing thickness plus one foot, not to exceed a total of 8 feet.

Lateral loadings applied to pile foundations are typically resisted by battering selected piles, the soil/structure interaction, pile flexure, or a combination of these factors. Section 3.10.1.10 of the 2012 IDOT Bridge Manual requires performing detailed structure interaction analysis if the factored lateral loading per pile exceeds 3 kips. The analysis shall determine actual pile moment and deflection to determine the selected pile adequacy for the existing loadings.

Table D, Appendix D: Recommened Geotechnical Design Parameters provides recommended lateral soil modulus and soil strain parameters that can be used for laterally loaded pile analysis via the p-y curve method based on the encountered subsurface conditions. Table D also provides lateral earth pressure coefficients and soil parameters for the design of the abutment walls. The lateral earth pressures for the abutment should be designed using the at-rest condition.

Traffic and other surcharge loads should be included in the abutment design. The Integral Abutment Feasibility Analysis spreadsheet from IDOT is attached in Appendix D. A live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall in accordance with Article 3.11.6.4 of AASHTO LRFD Bridge Design Specifications.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: Based on the preliminary plan provided to GSG, the estimated water surface elevation is 626.63 feet. Cofferdams are not anticipated to be necessary for the construction of the integral abutments due to the pile driving elevation being at above the water surface elevation.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: The preliminary plans indicate that construction of the proposed bridge will require complete removal of the existing structure using staged construction, therefore portions of the bridge will remain in use during installation of the new structure. Temporary sheet piling will be necessary during construction for the staged construction, in addition to behind and in front of the proposed abutment construction and should extend from the back of each existing abutment to the far end of the new bridge Structure Excavation below each approach slab. The sheet pile retaining system should be designed in accordance with the IDOT Bridge Design Manual, Section 3.13.1, Temporary Sheet Piling Design, Temporary Soil Retention Systems and Braced Excavations and the IDOT Design Guide, Section 3.13.1, Temporary Sheet Piling Design. Temporary sheet piling design charts can be used to provide a design.

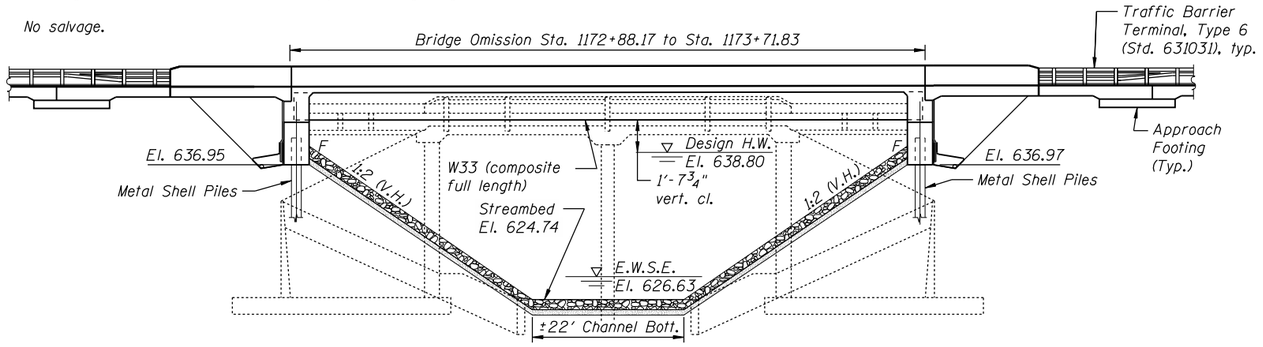
APPENDIX A

GENERAL PLAN & ELEVATION

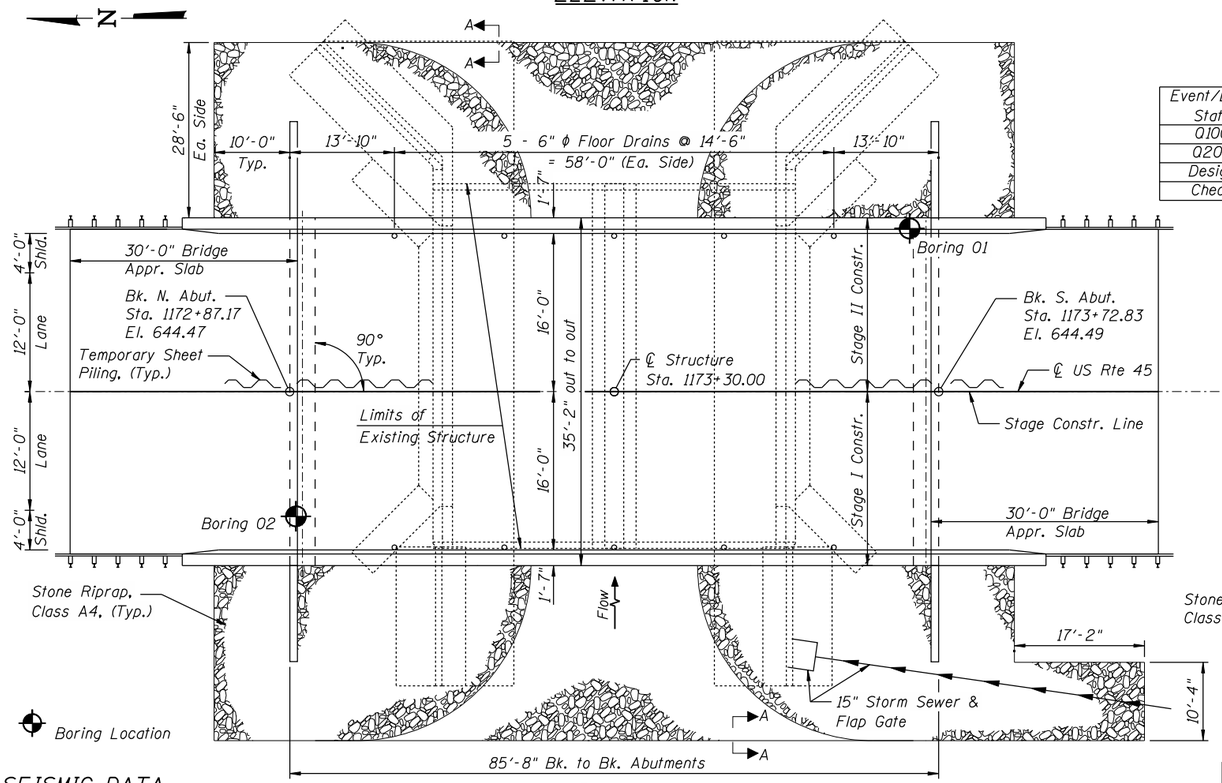
B.M. #1: Chiseled "□" in top of N.E. Wingwall, Sta. 1173+05.20, 22.95' Lt., Elev. 641.696

Existing Structure: S.N. 038-0039 (ex.), originally constructed in 1922 as a single span concrete slab bridge (Rt. SBI-25, Sec. 36). In 1952 the bridge was converted into a two span bridge by widening the original north and south Abutments and adding a center Pier that consists of 6 precast concrete piles directly supporting a new widened Superstructure slab (Rt. SBI-25, Sec. 36BY). The Superstructure slab was then replaced in 1984 (Rt. SBI-25, Sec. 36BR-1). Concrete Sealer was applied to the deck surface in 2012. Currently, the existing structure consists of 11" CIP concrete slab supported on closed abutments and a center concrete pile Pier. The existing bridge currently measures 47'-8" back to back of Abutment and 38'-0" out to out of bridge deck.
Existing structure to be removed and replaced using stage construction.

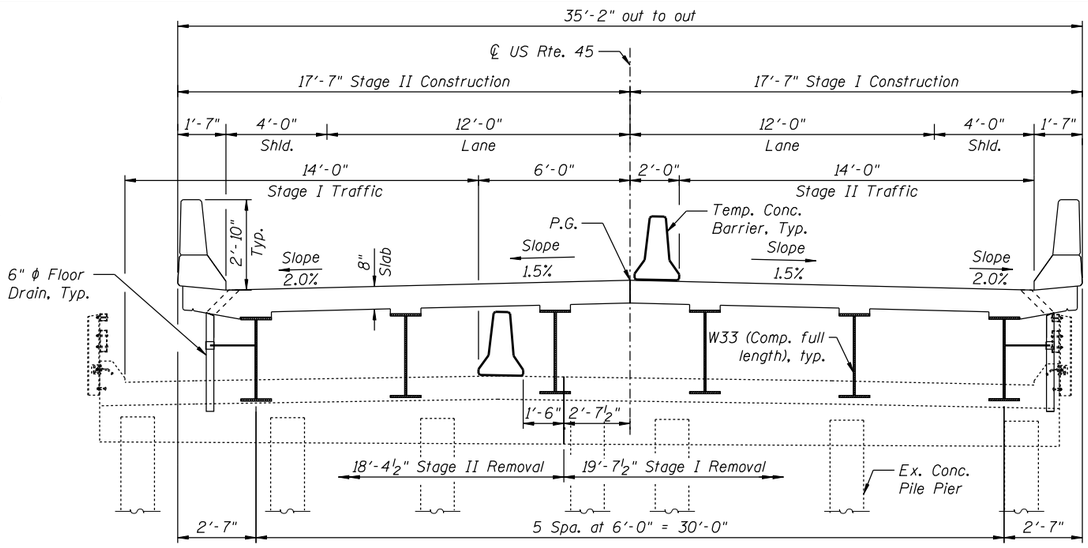
No salvage.



ELEVATION



PLAN

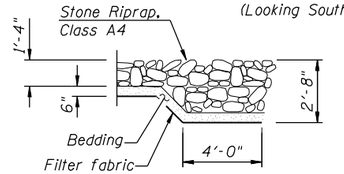


CROSS SECTION

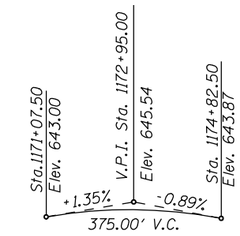
(Looking South)

DESIGN SCOUR ELEVATION TABLE

Event/Limit State	Design Scour Elevations (ft.) North Abut.	Design Scour Elevations (ft.) South Abut.	Item 113
Q100	636.95	636.97	8
Q200	636.95	636.97	
Design	636.95	636.97	
Check	636.95	636.97	

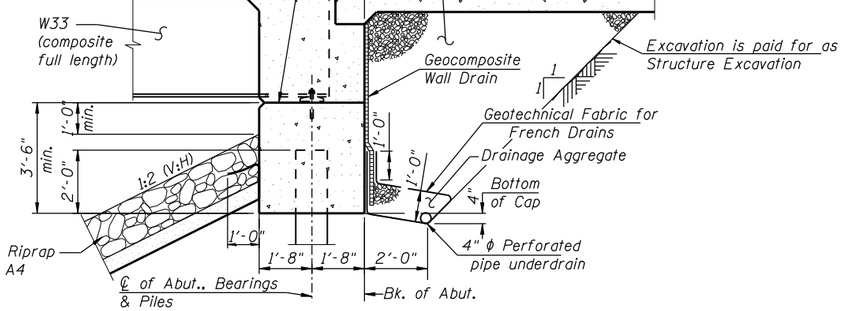


SECTION A-A

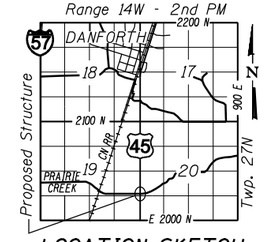


PROFILE GRADE

(F.A.S. Route 317)



SECTION THRU INTEGRAL ABUTMENT



LOCATION SKETCH

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (S_{D1}) = 0.078 g
Design Spectral Acceleration at 0.2 sec. (S_{DS}) = 0.133 g
Soil Site Class = C

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

LOADING HL-93

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

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 p.s.i.
f'c = 4,000 p.s.i. (Superstructure Concrete)
fy = 60,000 p.s.i. (Reinforcement)
fy = 50,000 p.s.i. (Structural Steel)
AASHTO M270 Grade 50W

HIGHWAY CLASSIFICATION

FAS 317 (US45)
Functional Class: Major Collector
ADT: 2520 (2020) / 3000 (2040)
ADTT: 330 (2020) / 393 (2040)
DHV: 285 (2040)
Design Speed: 55 mph
Posted Speed : 55 mph
Two-Way Traffic
Directional Distribution: 50/50

WATERWAY INFORMATION

Drainage Area = 40.5 sq. mi. | Exist. Low Grade El.= 640.61 @ Sta. 1165+00 | Prop. Low Grade El.= 640.61 @ Sta. 1165+00

FLOOD	FREQUENCY (Yr.)	Q (cfs)	OPENING Sq. ft Exist.	OPENING Sq. ft Prop.	NAT. H.W.E.	HEAD - ft. Exist.	HEAD - ft. Prop.	HEADWATER EL. Exist.	HEADWATER EL. Prop.
	10	1570	482	579	637.9	0.1	0.1	638.0	638.0
Hydraulic Design	50	2410	522	645	638.8	0.5	0.4	639.3	639.2
Base/Scour Des.	100	2760	535	667	639.1	0.7	0.5	639.8	639.6
Scour Check	200	3130	547	688	639.4	0.9	0.7	640.3	640.0
Max. Calc.	500	3610	561	713	639.7	1.5	0.8	641.2	640.5
Overtopping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

GENERAL PLAN & ELEVATION
US RT. 45 OVER PRAIRIE CREEK
F.A.S. ROUTE 317 (US 45)
SECTION (36BR-1)ES
IROQUOIS COUNTY
STATION 1173+30.00
STRUCTURE NO. 038-0225

SDI ENGINEERING CORP. www.sdiengr.com

USER NAME = $USER$	DESIGNED - BL/AA	REVISED -	
	DRAWN - AA	REVISED -	
PLOT SCALE = $SCALE$	CHECKED - OAO	REVISED -	
PLOT DATE = $DATE$	DATE - 05-14-2018	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN
S.N. 038-0225
SHEET NO. OF SHEETS

F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
317	(36BR-1)ES	IROQUOIS		
		CONTRACT NO. 66F70		
	ILLINOIS FED. AID PROJECT			

APPENDIX B

SOIL BORING PROFILE

LEGEND

FILL: CLAY, SILTY CLAY

NATIVE: CLAY, SILTY CLAY

EXISTING US45 ℄

APPROXIMATE BRIDGE DECK PROFILE

PRAIRIE CREEK

02
1172+88
14.00ft RT

EL	D	N	Qu	w%
641.37				
Augered Shoulder Stone, Black Silty Clay Loam Fill 638.87	0			
		8	2.5 P	19
Very Stiff Brown & Black Silty Clay Loam Fill 634.37	5	7	2.5 P	18
		4	1.5 P	27
Stiff Dark Gray Silty Clay with Organics 629.37	10	5	1.6 B	20
		13	5.2 S	16
	15	11	4.3 B	19
		11	4.3 B	21
	20	12	4.5 S	20
		11	4.3 B	21
	25	11	4.3 B	20
		9	4.3 B	21
	30	10	4.3 B	22
		11	4.5 B	21
	35	11	4.5 B	19
		11	4.5 B	19
	40	12	4.5 B	20
		11	4.3 B	19
	45	11	4.5 B	21
		10	4.3 B	19
	50	9	4.3 B	19
		12	4.5 B	20
	55	14	4.7 B	21
	60	17	4.7 S	20
574.87	65	16	4.7 S	21

Hard Gray Silty Clay Till - Very Uniform and Monolithic

End of Boring

01
1173+69
17.00ft LT

EL	D	N	Qu	w%
641.34				
Augered Shoulder Stone, Black & Gray Silty Clay Loam Fill 638.84	0			
Hard to Stiff Gray & Black Silty Clay Loam Fill 634.34		6	4 P	20
	5	5	1.5 P	22
Stiff Dark Gray Silty Clay 631.84		4	1.4 B	28
Stiff Brown & Gray Silty Clay Loam Till 629.34	10	3	1.5 P	24
			4.5 S	21
WH = Weight of Hammer	15		5.2 S	18
			4.5 S	21
	20		4.5 S	20
			4.6 S	22
	25		4.3 B	24
			4.5 B	23
	30		4.5 B	22
			4.5 B	22
	35		4.5 B	23
			4.4 B	21
	40		4.5 B	20
			4.3 B	25
	45		4.5 B	25
			4.5 B	21
	50		4.5 B	25
			4.5 B	26
	55		4.5 B	24
579.84	60		4.5 B	24

Hard Gray Silty Clay Till - Very Monolithic with Silt & Sand Layers @ 40 Ft

End of Boring

720 710 700 690 680 670 660 650 640 630 620 610 600 590 580 570 560 550

1172+50 1172+60 1172+70 1172+80 1172+90 1173+00 1173+10 1173+20 1173+30 1173+40 1173+50 1173+60 1173+70 1173+80 1173+90 1174+00

PLAN

	DATE
SURVEYED	
PLOTTED	
CHECKED	
ALIGNMENT CHECKED	
RT. OF WAY CHECKED	
CADD FILE NAME	
NOTE BOOK	
NO.	

PROFILE

	DATE
SURVEYED	
PLOTTED	
CHECKED	
BM. NOTED	
STRUCTURE NO	
TAINS CHKD	
NOTE BOOK	
NO.	

GSG CONSULTANTS, INC.
855 West Adams, Suite 200
Chicago, Illinois 60607
tel: 312.733.6262 • fax: 312.733.5612

USER NAME = eflores	DESIGNED - EF	REVISED -
	DRAWN -	REVISED -
PLOT SCALE = 1:100	CHECKED - DE	REVISED -
PLOT DATE = 12/1/2017	DATE - 11/28/17	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

US45 OVER PRAIRIE CREEK
SOIL BORING PROFILE

SCALE: 5 | SHEET 1 OF 1 SHEETS | STA. 1172+50 TO STA. 1174+00

F.A.S RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
317	(36BR-1)ES	IROQUOIS	1	1
		CONTRACT NO. 66F70		
	ILLINOIS FED. AID PROJECT			

APPENDIX C

SOIL BORING LOGS

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 9/7/16

ROUTE SBI 25 (US 45) **DESCRIPTION** US 45 over Prairie Creek, 2.35 miles North of US 24 **LOGGED BY** Larry Myers

SECTION 36-BY **LOCATION** SW 1/4, **SEC.** 20, **TWP.** 27N, **RNG.** 14W, 2nd **PM**,
Latitude 40.80041, **Longitude** -87.978798

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

STRUCT. NO. 038-0039
Station 1173+30

BORING NO. 01 (S.E. Quad.)
Station 1173+69
Offset 17.0 ft Lt.
Ground Surface Elev. 641.34 ft

Surface Water Elev. 626.69 ft
Stream Bed Elev. 625.22 ft

Groundwater Elev.:
First Encounter 621.3 ft ▼
Upon Completion 601.3 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Augered Shoulder Stone, Black & Gray Silty Clay Loam Fill
638.84				
	3			Hard to Stiff Gray & Black Silty Clay Loam Fill
	3 3	4.0 P	20	
-5				
	3			
	1 2	1.5 P	22	
634.34				
	2			Stiff Dark Gray Silty Clay
	2 2	1.4 B	28	
631.84				
-10				Stiff Brown & Gray Silty Clay Loam Till
	WH			WH = Weight of Hammer
	1 2	1.5 P	24	
629.34				
	4			Hard Gray Silty Clay Till - Very Monolithic with Silt & Sand Layers @ 40 Ft
	5 6	4.5 S	21	
-15				
	4			
	5 6	5.2 S	18	
	5			
	6 9	4.5 S	21	
▼ -20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			Hard Gray Silty Clay Till - Very Monolithic with Silt & Sand Layers @ 40 Ft *(continued)*
	5 7	4.5 S	20	
	4			
	5 6	4.6 S	22	
-25				
	3			
	4 5	4.3 B	24	
	4			
	5 6	4.5 B	23	
-30				
	3			
	4 6	4.5 B	22	
	3			
	4 5	4.5 B	23	
-35				
	3			
	4 6	4.5 B	23	
	4			
	4 5	4.4 B	21	
▽ -40				

SOIL BORING 038-0039.GPJ IL_DOT.GDT 10/18/16

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

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 9/7/16

ROUTE SBI 25 (US 45) **DESCRIPTION** US 45 over Prairie Creek, 2.35 miles North of US 24 **LOGGED BY** Larry Myers

SECTION 36-BY **LOCATION** SW 1/4, **SEC.** 20, **TWP.** 27N, **RNG.** 14W, 2nd **PM**,
Latitude 40.80041, **Longitude** -87.978798

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

STRUCT. NO. 038-0039
Station 1173+30

BORING NO. 01 (S.E. Quad.)
Station 1173+69
Offset 17.0 ft Lt.
Ground Surface Elev. 641.34 ft

Surface Water Elev. 626.69 ft
Stream Bed Elev. 625.22 ft

Groundwater Elev.:
First Encounter 621.3 ft ▼
Upon Completion 601.3 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	4		
	5 6	4.5 B	20
	3		
	4 5	4.3 B	25
-45	4		
	5 6	4.5 B	25
	4		
	6 6	4.5 B	21
-50	4		
	5 6	4.5 B	25
	4		
	6 7	4.5 B	26
-55	4		
	5 6	4.5 B	24
-60			

Hard Gray Silty Clay Till - Very Monolithic with Silt & Sand Layers @ 40 Ft *(continued)*

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	5		
	6 6	4.5 B	24
579.84			
-65			
-70			
-75			
-80			

Hard Gray Silty Clay Till - Very Monolithic with Silt & Sand Layers @ 40 Ft *(continued)*

End of Boring

SOIL BORING 038-0039.GPJ IL_DOT.GDT 10/18/16

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

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 9/13/16

ROUTE SBI 25 (US 45) **DESCRIPTION** US 45 over Prairie Creek, 2.35 miles North of US 24 **LOGGED BY** Larry Myers

SECTION 36-BY **LOCATION** SE 1/4, **SEC.** 19, **TWP.** 27N, **RNG.** 14W, 2nd **PM**,
Latitude 40.800633, **Longitude** -87.978904

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

STRUCT. NO. 038-0039
Station 1173+30

BORING NO. 02 (N.W. Quad.)
Station 1172+88
Offset 14.0 ft Rt.
Ground Surface Elev. 641.37 ft

Surface Water Elev. 626.69 ft
Stream Bed Elev. 625.05 ft

Groundwater Elev.:
First Encounter 594.4 ft ▼
Upon Completion 591.4 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Augered Shoulder Stone, Black Silty Clay Loam Fill
638.87				
	2			Very Stiff Brown & Black Silty Clay Loam Fill
	3 5	2.5 P	19	
-5				
	2			
	3 4	2.5 P	18	
634.37				
	2			Stiff Dark Gray Silty Clay with Organics
	2 2	1.5 P	27	
-10				
	1			
	2 3	1.6 B	20	
629.37				
	4			Hard Gray Silty Clay Till - Very Uniform and Monolithic
	6 7	5.2 S	16	
-15				
	4			
	5 6	4.3 B	19	
	4			
	5 6	4.3 B	21	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			Hard Gray Silty Clay Till - Very Uniform and Monolithic *(continued)*
	5 7	4.5 S	20	
	4			
	5 6	4.3 B	21	
-25				
	4			
	5 6	4.3 B	20	
	3			
	4 5	4.3 B	21	
-30				
	4			
	5 5	4.3 B	22	
	4			
	5 6	4.5 B	21	
-35				
	5			
	5 6	4.5 B	19	
	4			
	5 6	4.5 B	19	
-40				

SOIL BORING 038-0039.GPJ IL_DOT.GDT 10/18/16

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

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 9/13/16

ROUTE SBI 25 (US 45) **DESCRIPTION** US 45 over Prairie Creek, 2.35 miles North of US 24 **LOGGED BY** Larry Myers

SECTION 36-BY **LOCATION** SE 1/4, **SEC.** 19, **TWP.** 27N, **RNG.** 14W, 2nd **PM**,
Latitude 40.800633, **Longitude** -87.978904

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

STRUCT. NO. 038-0039
Station 1173+30

BORING NO. 02 (N.W. Quad.)
Station 1172+88
Offset 14.0 ft Rt.
Ground Surface Elev. 641.37 ft

Surface Water Elev. 626.69 ft
Stream Bed Elev. 625.05 ft

Groundwater Elev.:
First Encounter 594.4 ft ▼
Upon Completion 591.4 ft ▽
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	5			Hard Gray Silty Clay Till - Very Uniform and Monolithic *(continued)*
	6 6	4.5 B	20	
	4			
	5 6	4.3 B	19	
-45	4			
	5 6	4.5 B	21	
▼	4			
	5 5	4.3 B	19	
▽ -50	4			
	4 5	4.3 B	19	
	4			
	6 6	4.5 B	20	
-55	5			
	7 7	4.7 B	21	
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	5			Hard Gray Silty Clay Till - Very Uniform and Monolithic *(continued)*
	8 9	4.7 S	20	
-65	5			
	8 8	4.7 S	21	
574.87				End of Boring
-70				
-75				
-80				

SOIL BORING 038-0039.GPJ IL_DOT.GDT 10/18/16

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

APPENDIX D

RECOMMENDED GEOTECHNICAL DESIGN PARAMETERS

Table D: Summary of Soil Parameters

Elevation feet	Soil Description	In situ Unit Weight γ (pcf)	Undrained		Drained		Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	At Rest Earth Pressure Coefficient (K_o)	Lateral Modulus of Subgrade Reaction (pci)	Soil Strain (ε_{50})	OSHA Soil Type
			Cohesion c (psf)	Friction Angle ϕ (°)	Cohesion c (psf)	Friction Angle ϕ (°)						
	New Engineered Clay Fill	125	1,000	0	50	25	0.40	2.50	0.58	500	0.007	Type B
640-634	Fill Brown and Black Silty Clay	133	2,600	0	100	28	0.36	2.77	0.53	1,310	0.005	Type A
634-632	Dark Gray Stiff Silty Clay	134	1,400	0	50	25	0.41	2.46	0.58	720	0.007	Type B
632-629	Brown and Gray Stiff Silty Clay	135	1,500	0	75	25	0.41	2.46	0.58	750	0.007	Type B
629-574	Gray Hard Silty Clay	140	4,500	0	150	28	0.36	2.77	0.53	2,260	0.004	Type A

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====US 45 over Prairie Creek

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	641.34	ft.
Pile or Shaft Dia.		inches
Boring Number	1	
Top of Boring Elev.	641.34	ft.
Approximate Fixity Elev.	641.34	ft.

Individual Site Class Definition:

N (bar): 9 (Blows/ft.) Soil Site Class E
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): 3.94 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
2.5	638.8	2.50	6	4.00	
5.0	636.3	2.50	3	1.50	B
7.5	633.8	2.50	4	1.40	B
10.0	631.3	2.50	3	1.50	B
12.5	628.8	2.50	11	4.50	
15.0	626.3	2.50	11	5.20	
17.5	623.8	2.50	15	4.50	
20.0	621.3	2.50	12	4.50	
22.5	618.8	2.50	11	4.60	
25.0	616.3	2.50	9	4.30	
27.5	613.8	2.50	11	4.50	
30.0	611.3	2.50	10	4.50	
32.5	608.8	2.50	9	4.50	
35.0	606.3	2.50	10	4.50	
37.5	603.8	2.50	9	4.40	
40.0	601.3	2.50	11	4.50	
42.5	598.8	2.50	9	4.30	
45.0	596.3	2.50	11	4.50	
47.5	593.8	2.50	12	4.50	
50.0	591.3	2.50	11	4.50	
52.5	588.8	2.50	13	4.50	
55.0	586.3	2.50	11	4.50	
96.0	545.3	41.00	12	4.50	B

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	641.37	ft.
Pile or Shaft Dia.		inches
Boring Number	2	
Top of Boring Elev.	641.37	ft.
Approximate Fixity Elev.	641.37	ft.

Individual Site Class Definition:

N (bar): 11 (Blows/ft.) Soil Site Class E
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): 3.94 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
2.5	638.9	2.50	8	2.50	
5.0	636.4	2.50	7	2.50	B
7.5	633.9	2.50	4	1.50	
10.0	631.4	2.50	5	1.60	B
12.5	628.9	2.50	13	5.20	
15.0	626.4	2.50	11	4.30	
17.5	623.9	2.50	11	4.30	
20.0	621.4	2.50	12	4.50	
22.5	618.9	2.50	11	4.30	
25.0	616.4	2.50	11	4.30	
27.5	613.9	2.50	9	4.30	
30.0	611.4	2.50	10	4.30	
32.5	608.9	2.50	11	4.50	
35.0	606.4	2.50	11	4.50	
37.5	603.9	2.50	11	4.50	
40.0	601.4	2.50	12	4.50	
42.5	598.9	2.50	11	4.30	
45.0	596.4	2.50	11	4.50	
47.5	593.9	2.50	10	4.30	
50.0	591.4	2.50	9	4.30	
52.5	588.9	2.50	12	4.50	
55.0	586.4	2.50	14	4.70	
60.0	581.4	5.00	17	4.70	
100.0	541.4	40.00	16	4.70	B

Substructure 3

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

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 2

N (bar): 10 (Blows/ft.) Soil Site Class E
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): 3.94 (ksf) Soil Site Class C <----Controls

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 1/7/2014

STRUCTURE NUMBER==========	038-0039	
STRUCTURE TYPE ==========	SIMPLE-SPAN	
STRUCTURE SKEW==========	0	DEGREES
TOTAL STRUCTURE LENGTH==========	84.00	FT

ABUTMENT #1 DATA

ABUTMENT NAME ==========	North	
ABUTMENT REFERENCE BORING==========	B-2	
BOTTOM OF ABUTMENT ELEVATION==========	637.39	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	6	

ABUTMENT #2 DATA

ABUTMENT NAME ==========	South	
ABUTMENT REFERENCE BORING==========	B-1	
BOTTOM OF ABUTMENT ELEVATION==========	637.41	FT
ESTIMATED NUMBER OF PILES AT ABUT.=======	6	

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)
634.39	3.00	1.5		
631.89	2.50	1.4		
629.39	2.50	1.5		
627.39	2.00	4.5		

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)
634.41	3.00	2.5		
631.91	2.50	1.5		
629.41	2.50	1.6		
627.41	2.00	5.20		

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1======= 2.08 TSF

WEIGHTED AVERAGE Qu FOR ABUTMENT #2======= 2.57 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*2.08])========== 1.21

PILE STIFFNESS MODIFIER FOR ABUTMENT #2
= 1/(1.45-[0.3*2.57])========== 1.47

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.21*6*0+1.47*6*84]/[1.21*6+1.47*6]========== 46.09 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.47*6*0+1.21*6*84]/[1.47*6+1.21*6]========== 37.91 FT

EFFECTIVE EXPANSION LENGTH (EEL) CALCULATION

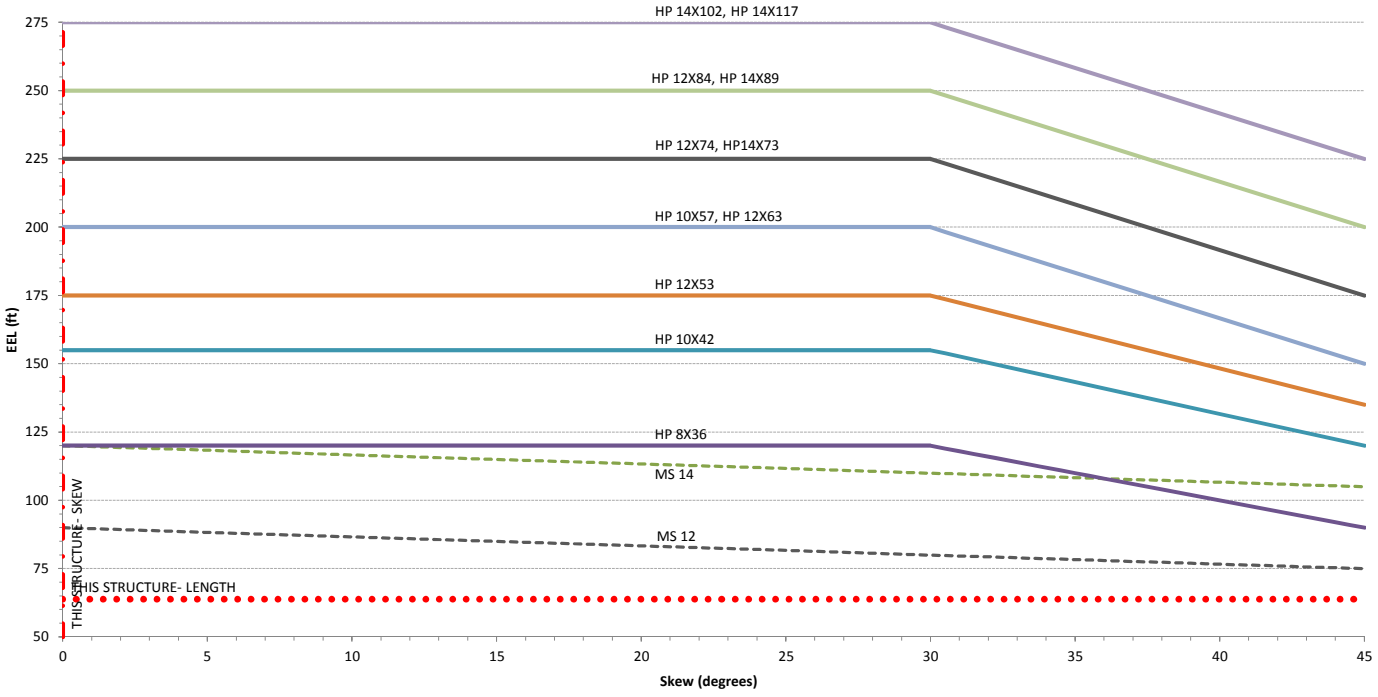
CONTROLLING ABUTMENT==========	ABUT. #1 North	
CONTROLLING EXPANSION LENGTH (DISTANCE TO CENTROID OF STIFFNESS FROM CONTROLLING ABUTMENT) ==========	46.09	FT
WEIGHTED AVE. Qu FOR CONTROLLING ABUTMENT ==========	2.08	TSF
Qu CORRECTION FACTOR ========== 2.08/1.5 ==========	1.38	
EFFECTIVE EXPANSION LENGTH (EEL) ========== EEL = 46.09*1.38 ==========	63.76	FT

FEASIBLE PILE TYPES PER CHART IN ABD MEMO 12.3 BASED ON SKEW AND EEL OR MODIFIED EEL:

ALL PILE SIZES MAY BE USED FOR THIS INTEGRAL ABUTMENT STRUCTURE

AVAILABLE PILE SIZES:

MS 12, MS 14, HP 8X36, HP 10X42, HP 12X53, HP 10X57, HP 12X63, HP 12X74, HP 14X73, HP 12X84, HP 14X89, HP 14X102, HP 14X117



APPENDIX E

IDOT PILE DESIGN TABLES

Bridge Replacement Project
Route: US 45 over Prairie Creek
Iroquois County, Illinois

Existing Structure Number: 038-0039
Proposed Structure Number: 038-0225

South Abutment – Boring #1

Pile Size	Maximum Nominal Bearing of Pile (kips)	Maximum Nominal Bearing of Boring (kips)	Maximum Factored Resistance of Boring (kips)	Maximum Pile Length in Boring (feet)
Metal Shell 12” w. 0.179” walls	254	254	140	27
Metal Shell 12” w. 0.25” walls	353	353	194	37
Metal Shell 14” w. 0.25” walls	413	413	227	35
Metal Shell 14” w. 0.312” walls	513	513	282	45
Steel HP 8x36	286	286	157	55
Steel HP 10x42	335	335	184	47
Steel HP 10x57	454	391	215	55*
Steel HP 12x53	418	418	230	50
Steel HP 12x63	497	475	261	55*
Steel HP 12x74	589	482	286	55*
Steel HP 12x84	664	489	269	55*
Steel HP 14x73	578	571	314	55*
Steel HP 14x89	705	578	318	55*
Steel HP 14x102	810	585	322	55*
Steel HP 14x117	929	592	326	55*

*Maximum pile length calculated based on available soil boring information

Bridge Replacement Project
Route: US 45 over Prairie Creek
Iroquois County, Illinois

Existing Structure Number: 038-0039
Proposed Structure Number: 038-0225

North Abutment – Boring #2

Pile Size	Maximum Nominal Bearing of Pile (kips)	Maximum Nominal Bearing of Boring (kips)	Maximum Factored Resistance of Boring (kips)	Maximum Pile Length in Boring (feet)
Metal Shell 12” w. 0.179” walls	254	254	140	27
Metal Shell 12” w. 0.25” walls	353	353	194	37
Metal Shell 14” w. 0.25” walls	413	413	227	37
Metal Shell 14” w. 0.312” walls	513	513	282	45
Steel HP 8x36	286	286	157	52
Steel HP 10x42	335	335	184	50
Steel HP 10x57	454	419	230	60*
Steel HP 12x53	418	418	230	50
Steel HP 12x63	497	497	273	60
Steel HP 12x74	589	515	284	60*
Steel HP 12x84	664	523	287	60*
Steel HP 14x73	578	578	318	60
Steel HP 14x89	705	618	340	60*
Steel HP 14x102	810	626	344	60*
Steel HP 14x117	929	633	348	60*

*Maximum pile length calculated based on available soil boring information

Bridge Replacement Project
Route: US 45 over Prairie Creek
Iroquois County, Illinois

Existing Structure Number: 038-0039
Proposed Structure Number: 038-0225

Pile Design Table for South Abutment utilizing Boring #1

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.179" walls			**Steel HP 10 X 57**			**Steel HP 14 X 73**		
25	13	5	14	8	5	20	11	5
62	34	7	31	17	7	43	23	7
94	52	10	57	31	10	80	44	10
113	62	12	81	45	12	115	63	12
139	76	15	107	59	15	151	83	15
165	91	17	132	72	17	188	103	17
188	104	20	146	80	20	223	123	20
215	118	22	165	91	22	255	140	22
240	132	25	182	100	25	279	154	25
Metal Shell 12"Φ w/.25" walls			200	110	27	304	167	27
25	13	5	217	120	30	328	181	30
62	34	7	234	129	32	351	193	32
94	52	10	252	139	35	377	207	35
113	62	12	268	147	37	397	219	37
139	76	15	286	158	40	425	234	40
165	91	17	304	167	42	449	247	42
188	104	20	321	177	45	474	260	45
215	118	22	339	186	47	498	274	47
240	132	25	356	196	50	522	287	50
266	146	27	391	215	55	571	314	55
291	160	30	**Steel HP 12 X 53**			**Steel HP 14 X 89**		
316	174	32	16	9	5	20	11	5
342	188	35	34	19	7	45	25	7
Metal Shell 14"Φ w/.25" walls			66	36	10	83	46	10
31	17	5	95	52	12	118	65	12
80	44	7	125	69	15	155	85	15
118	65	10	155	85	17	191	105	17
140	77	12	181	100	20	227	125	20
170	93	15	204	112	22	259	142	22
201	110	17	224	123	25	283	156	25
227	125	20	245	135	27	308	169	27
258	142	22	266	146	30	333	183	30
288	158	25	285	157	32	355	196	32
318	175	27	307	169	35	382	210	35
347	191	30	324	178	37	402	221	37
376	207	32	347	191	40	430	237	40
406	224	35	368	202	42	455	250	42
Metal Shell 14"Φ w/.312" walls			388	214	45	480	264	45
31	17	5	409	225	47	504	277	47
80	44	7	**Steel HP 12 X 63**			529	291	50
118	65	10	17	9	5	578	318	55
140	77	12	36	20	7	**Steel HP 14 X 102**		
170	93	15	68	37	10	21	12	5
201	110	17	97	53	12	47	26	7
227	125	20	128	70	15	85	47	10
258	142	22	159	87	17	120	66	12
288	158	25	183	101	20	157	86	15
318	175	27	206	113	22	194	107	17
347	191	30	227	125	25	230	126	20
376	207	32	248	136	27	262	144	22
406	224	35	268	148	30	287	158	25
434	239	37	288	158	32	312	172	27
465	256	40	310	170	35	337	185	30
495	272	42	328	180	37	360	198	32

Bridge Replacement Project
Route: US 45 over Prairie Creek
Iroquois County, Illinois

Existing Structure Number: 038-0039
Proposed Structure Number: 038-0225

Pile Design Table for South Abutment utilizing Boring #1

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
11	6	5
23	13	7
44	24	10
64	35	12
83	46	15
98	54	17
110	61	20
125	69	22
139	76	25
153	84	27
167	92	30
180	99	32
195	107	35
208	114	37
222	122	40
236	130	42
250	138	45
264	145	47
278	153	50
Steel HP 10 X 42		
13	7	5
29	16	7
55	30	10
79	43	12
104	57	15
128	70	17
142	78	20
161	89	22
178	98	25
195	107	27
212	117	30
229	126	32
246	135	35
262	144	37
280	154	40
297	163	42
314	173	45
332	182	47

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
351	193	40
371	204	42
392	216	45
413	227	47
434	239	50
475	261	55
Steel HP 12 X 74		
17	9	5
38	21	7
70	38	10
99	55	12
130	71	15
161	88	17
186	102	20
209	115	22
231	127	25
252	138	27
273	150	30
292	161	32
314	173	35
333	183	37
356	196	40
377	207	42
398	219	45
419	230	47
440	242	50
482	265	55
Steel HP 12 X 84		
18	10	5
39	21	7
72	39	10
101	55	12
132	72	15
163	90	17
189	104	20
213	117	22
234	129	25
255	141	27
277	152	30
297	163	32
319	175	35
337	186	37
361	198	40
382	210	42
404	222	45
425	234	47
446	245	50
489	269	55

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
387	213	35
408	224	37
436	240	40
461	253	42
486	267	45
511	281	47
535	295	50
585	322	55
Steel HP 14 X 117		
22	12	5
49	27	7
88	49	10
123	68	12
160	88	15
197	108	17
233	128	20
266	146	22
291	160	25
317	174	27
342	188	30
365	201	32
392	215	35
413	227	37
441	243	40
466	257	42
492	270	45
517	284	47
542	298	50
592	326	55
Precast 14"x 14"		
40	22	5
102	56	7
150	83	10
178	98	12
216	119	15
255	140	17
Timber Pile		
16	9	5
37	20	7
64	35	10
88	48	12
113	62	15
139	77	17

Pile Design Table for North Abutment utilizing Boring #2

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.179" walls		
30	16	5
42	23	7
86	47	10
103	57	12
128	70	15
155	85	17
178	98	20
203	112	22
228	125	25
252	139	27
Metal Shell 12"Φ w/.25" walls		
30	16	5
42	23	7
86	47	10
103	57	12
128	70	15
155	85	17
178	98	20
203	112	22
228	125	25
252	139	27
279	153	30
304	167	32
330	181	35
Metal Shell 14"Φ w/.25" walls		
37	20	5
52	29	7
109	60	10
128	70	12
157	86	15
188	103	17
215	118	20
244	134	22
273	150	25
302	166	27
333	183	30
363	199	32
392	216	35
Metal Shell 14"Φ w/.312" walls		
37	20	5
52	29	7
109	60	10
128	70	12
157	86	15
188	103	17
215	118	20
244	134	22
273	150	25
302	166	27
333	183	30
363	199	32
392	216	35
422	232	37
450	247	40
481	264	42
508	280	45

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
19	10	5
31	17	7
49	27	10
73	40	12
97	54	15
122	67	17
139	77	20
156	86	22
173	95	25
190	104	27
209	115	30
226	124	32
244	134	35
261	144	37
277	152	40
296	163	42
311	171	45
328	180	47
347	191	50
366	201	52
384	211	55
419	230	60
Steel HP 12 X 53		
22	12	5
36	20	7
56	31	10
85	47	12
114	63	15
143	79	17
173	95	20
193	106	22
213	117	25
233	128	27
256	141	30
276	152	32
297	163	35
317	175	37
335	184	40
358	197	42
376	207	45
396	218	47
418	230	50
Steel HP 12 X 63		
23	12	5
37	20	7
58	32	10
87	48	12
117	64	15
147	81	17
175	96	20
195	107	22
215	118	25
235	129	27
258	142	30
279	153	32
300	165	35

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
27	15	5
44	24	7
69	38	10
103	57	12
138	76	15
174	95	17
209	115	20
242	133	22
265	146	25
289	159	27
316	174	30
341	187	32
365	201	35
390	214	37
410	226	40
438	241	42
458	252	45
482	265	47
509	280	50
537	296	52
562	309	55
Steel HP 14 X 89		
28	15	5
45	25	7
72	39	10
106	58	12
141	78	15
177	97	17
213	117	20
245	135	22
269	148	25
293	161	27
321	176	30
345	190	32
370	203	35
395	217	37
415	228	40
443	244	42
464	255	45
488	268	47
515	284	50
544	299	52
569	313	55
618	340	60
Steel HP 14 X 102		
28	16	5
46	25	7
74	41	10
108	59	12
143	79	15
179	99	17
215	118	20
249	137	22
273	150	25
297	163	27
325	179	30

Bridge Replacement Project
Route: US 45 over Prairie Creek
Iroquois County, Illinois

Existing Structure Number: 038-0039
Proposed Structure Number: 038-0225

Pile Design Table for North Abutment utilizing Boring #2

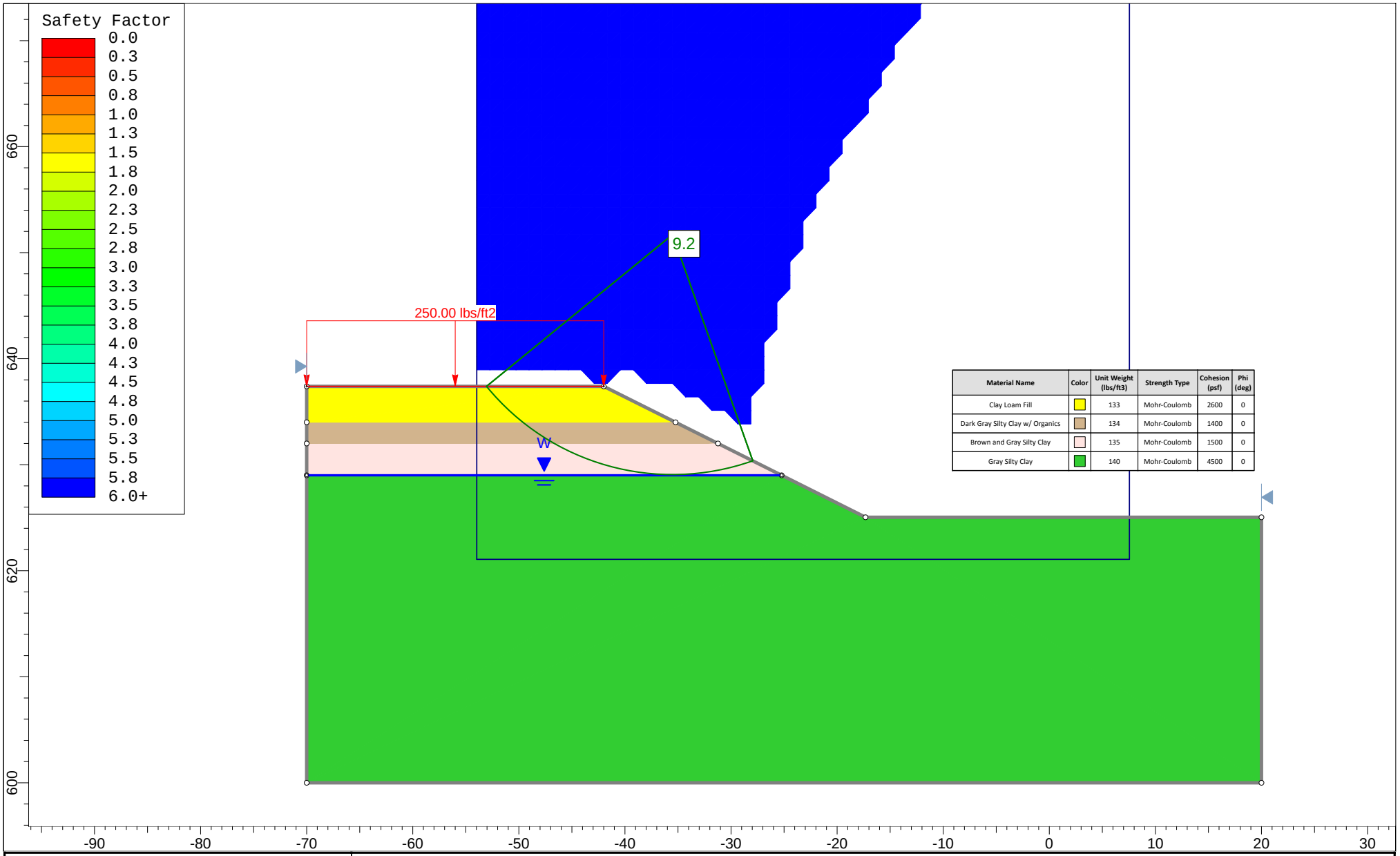
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36		
15	8	5
24	13	7
38	21	10
57	31	12
77	42	15
92	51	17
105	58	20
118	65	22
132	72	25
145	80	27
160	88	30
174	96	32
188	103	35
202	111	37
215	118	40
230	126	42
242	133	45
256	141	47
271	149	50
286	157	52
Steel HP 10 X 42		
18	10	5
30	17	7
47	26	10
71	39	12
95	52	15
120	66	17
136	75	20
152	84	22
169	93	25
185	102	27
204	112	30
221	122	32
238	131	35
255	140	37
271	149	40
289	159	42
304	167	45
321	176	47

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
321	176	37
339	186	40
361	199	42
379	209	45
399	220	47
422	232	50
446	245	52
467	257	55
Steel HP 12 X 74		
23	13	5
38	21	7
60	33	10
89	49	12
119	65	15
149	82	17
178	98	20
198	109	22
219	120	25
239	131	27
262	144	30
283	156	32
304	167	35
325	179	37
344	189	40
367	202	42
385	212	45
405	223	47
428	236	50
452	249	52
473	260	55
515	284	60
Steel HP 12 X 84		
24	13	5
38	21	7
62	34	10
91	50	12
120	66	15
151	83	17
181	100	20
202	111	22
222	122	25
243	134	27
266	146	30
288	158	32
309	170	35
330	182	37
349	192	40
372	205	42
390	215	45
411	226	47
435	239	50
459	252	52
480	264	55
523	287	60

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
350	192	32
375	206	35
400	220	37
421	231	40
449	247	42
470	258	45
494	272	47
522	287	50
551	303	52
576	317	55
626	344	60
Steel HP 14 X 117		
29	16	5
47	26	7
77	42	10
111	61	12
146	80	15
183	100	17
219	120	20
252	139	22
277	152	25
301	165	27
329	181	30
354	195	32
380	209	35
405	223	37
426	234	40
454	250	42
476	262	45
500	275	47
528	291	50
558	307	52
583	321	55
633	348	60
Precast 14"x 14"		
47	26	5
66	36	7
138	76	10
163	90	12
200	110	15
239	132	17
Timber Pile		
21	12	5
33	18	7
56	31	10
79	43	12
104	57	15
129	71	17

APPENDIX F

SLOPE STABILITY ANALYSES EXHIBITS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Clay Loam Fill		133	Mohr-Coulomb	2600	0
Dark Gray Silty Clay w/ Organics		134	Mohr-Coulomb	1400	0
Brown and Gray Silty Clay		135	Mohr-Coulomb	1500	0
Gray Silty Clay		140	Mohr-Coulomb	4500	0

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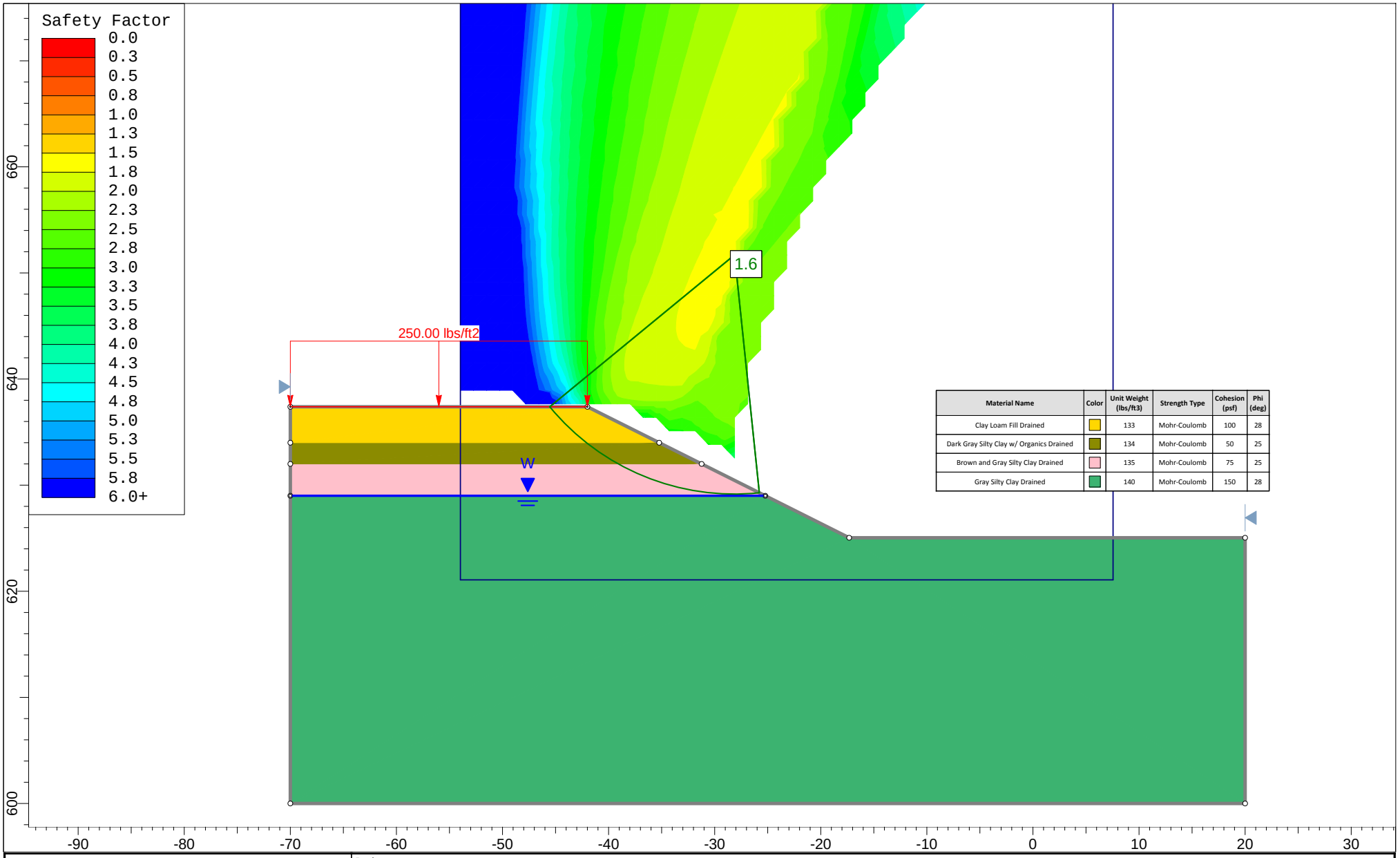
SLIDEINTERPRET 7.026

Project	IDOT US 45 over Prairie Creek		
Analysis Description	Exhibit 1 - Circular Short Term		
Drawn By	JR	*Scale* 1:150	*Company* GSG Consultants, Inc
Date	11/29/2017, 11:15:24 AM		*File Name* US 45 North Slope.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Clay Loam Fill Drained		133	Mohr-Coulomb	100	28
Dark Gray Silty Clay w/ Organics Drained		134	Mohr-Coulomb	50	25
Brown and Gray Silty Clay Drained		135	Mohr-Coulomb	75	25
Gray Silty Clay Drained		140	Mohr-Coulomb	150	28

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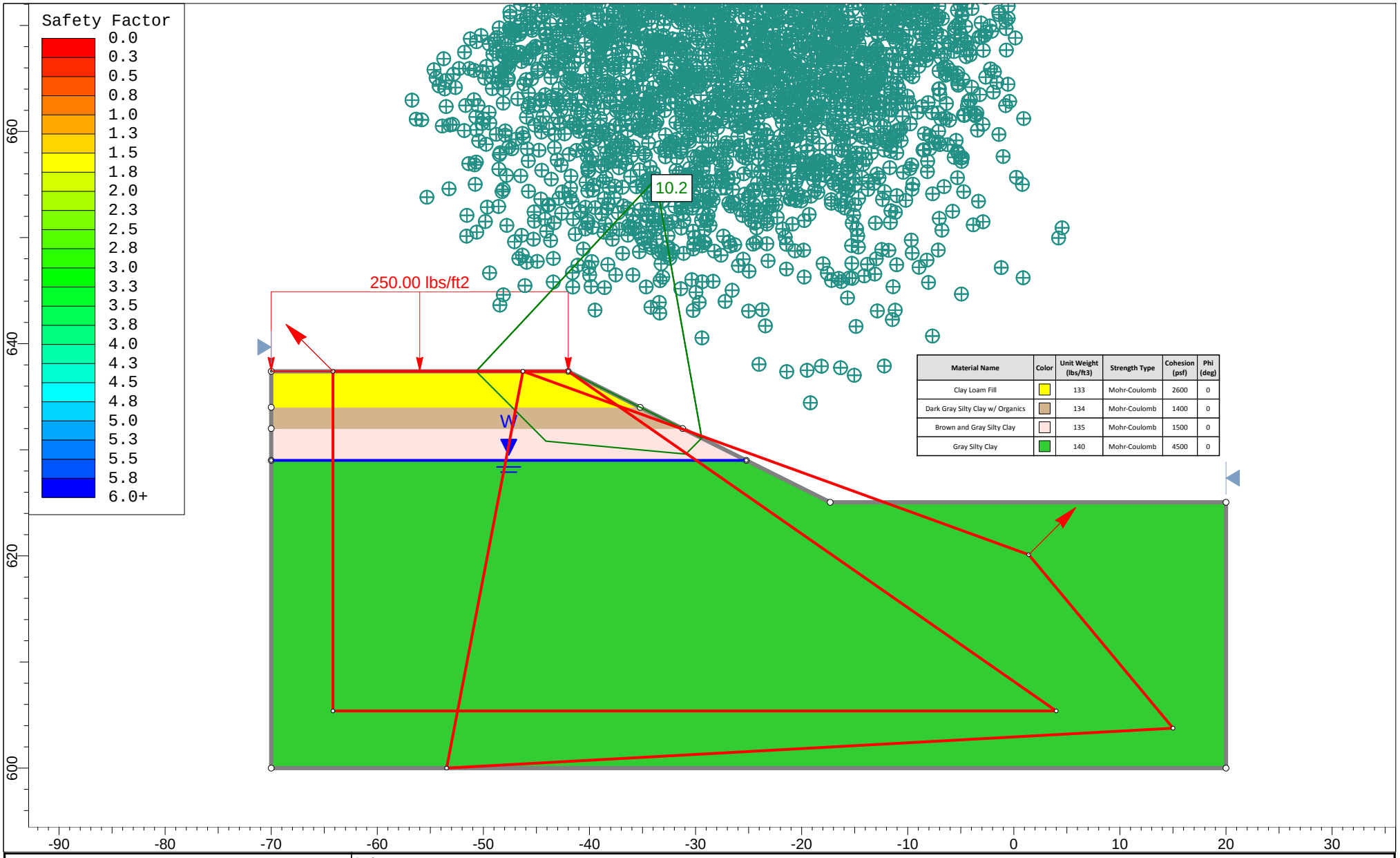
SLIDEINTERPRET 7.026

Project	IDOT US 45 over Prairie Creek				
Analysis Description	Exhibit 2 - Circular Long Term				
Drawn By	JR	Scale	1:150	Company	GSG Consultants, Inc
Date	11/29/2017, 11:15:24 AM			File Name	US 45 North Slope.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Clay Loam Fill		133	Mohr-Coulomb	2600	0
Dark Gray Silty Clay w/ Organics		134	Mohr-Coulomb	1400	0
Brown and Gray Silty Clay		135	Mohr-Coulomb	1500	0
Gray Silty Clay		140	Mohr-Coulomb	4500	0

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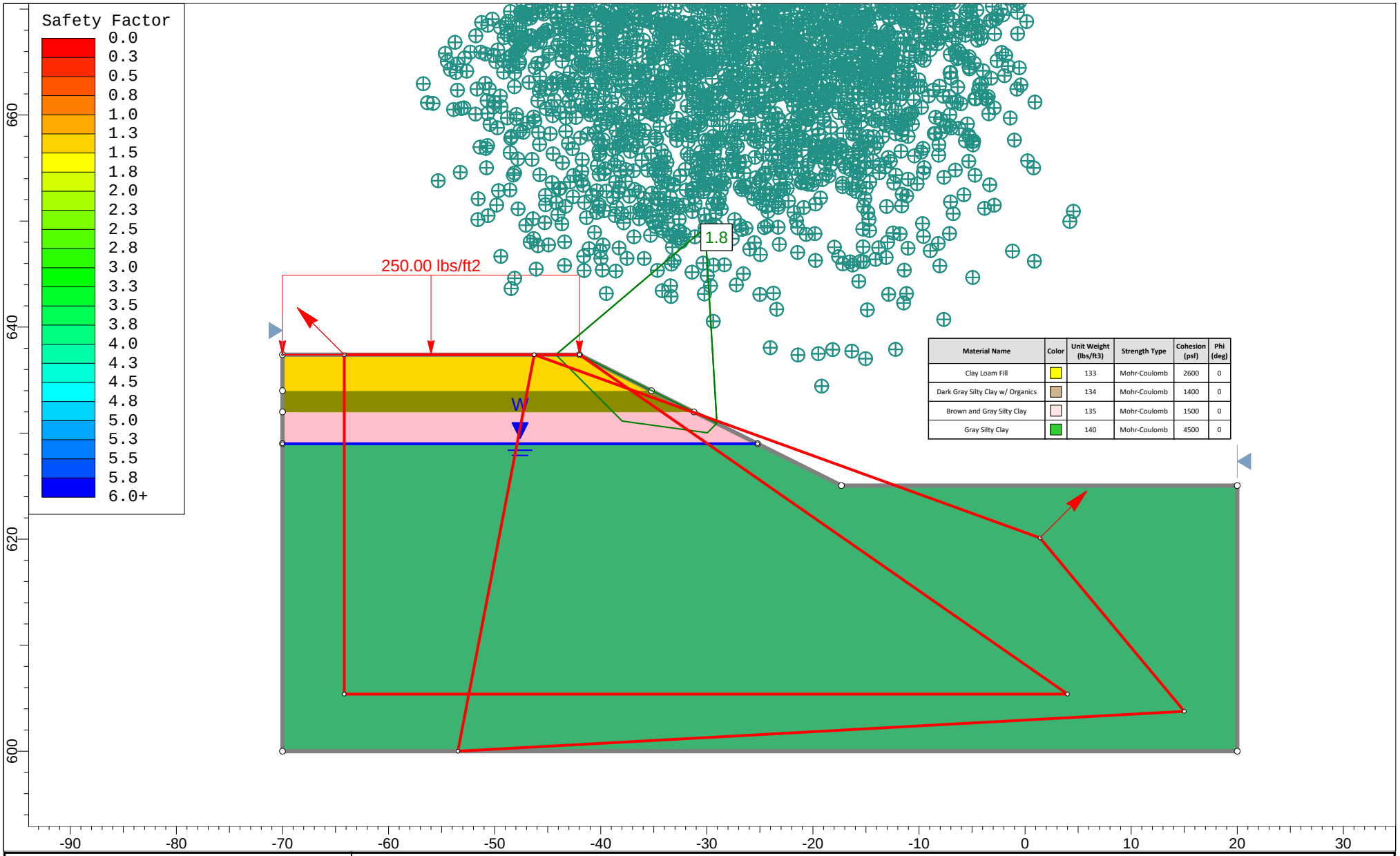
SLIDEINTERPRET 7.026

Project	IDOT US 45 over Prairie Creek				
Analysis Description	Exhibit 3 - Block Short Term				
Drawn By	JR	Scale	1:150	Company	GSG Consultants, Inc
Date	11/29/2017, 11:15:24 AM			File Name	US 45 North Slope.slim



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SLIDEINTERPRET 7.026

Project	IDOT US 45 over Prairie Creek				
Analysis Description	Exhibit 4 - Block Long Term				
Drawn By	JR	Scale	1:150	Company	GSG Consultants, Inc
Date	11/29/2017, 11:15:24 AM			File Name	US 45 North Slope.slim