

# STRUCTURE GEOTECHNICAL REPORT

**068-0513**

Existing SN 068-0027

FAP 777 (IL 185) over Bayou Creek  
1.3 miles East of Coffeen  
Section 10 B-2  
Montgomery County

D-96-109-09

Contract 72D08

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IDOT Region 4 District 6  
Geotechnical Unit  
217-782-6703

**Checked By:** Brian Laningham

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**Date:** June 30, 2014

**Date:** July 31, 2014

**Prepared For:** Cory Chamberlain  
WHKS & Co.  
Engineering  
217-483-9457

**Attachments:** Preliminary TSL  
Subsurface Profile  
Boring Logs  
Special Provisions

This Report has been prepared based on a preliminary TSL dated November 2011. Contact the author if there are any questions regarding this Report or if there are modifications to structure location, size, geometry, or vertical alignment.

Electronic copies of boring logs are available upon request for inclusion in the plans.

This Report has been prepared according to the 2008 IDOT Bureau of Bridges and Structures Bridge Manual and AASHTO LRFD Bridge Design Specifications 5<sup>th</sup> Edition – 2010 with 2008, 2009 Interims.

### **Project Description and Proposed Structure Information**

The project includes replacing an existing 43± ft long single span PCC deck beam bridge on closed abutments carrying IL 185 over Bayou Creek with a new 83± ft long and 35± ft wide, single span structure. The proposed structure includes integral abutments. Work will be completed under staged construction.

### **Site Investigation**

The existing structure is located in gently rolling terrain on 10± ft of fill. Primary land use is agriculture. Near the structure embankment slopes are 2H: 1V or flatter. No slope stability problems were observed along the embankment. The side slopes of the channel banks are 1H: 1V or steeper and show signs of sloughing. No signs of pavement settlement are visible.

The existing structure was reconstructed in 1980. The existing abutments are founded on timber piles. No pile driving data is available.

Borings were advanced by the District 6 drill crew using hollow stem auger methods according to AASHTO T 206 and the IDOT Geotechnical Manual. Borings were obtained at the proposed abutment locations on the existing IL 185 lanes. An additional Shelby tube sample was obtained for settlement and liquefaction data. The boring data indicates 15-20 ft of Silty Clay, Silty Clay Loam and Loam over 15-20ft of Sand over Shale.

Borings were filled with cuttings immediately after drilling to allow traffic on the roadway. Ground water was encountered during drilling at the east abutment at an elevation of 543± ft, and an elevation of 538±ft at the west abutment.

### **Geotechnical Evaluation**

**Settlement.** Settlement is not anticipated to be a problem since no change in grade is proposed.

**Slope Stability.** The slope stability analysis models a 2H:1V end slope at the east abutment between elevation 541 ft and 561 ft corresponding to the bottom of rock elevation the pavement elevation. The analysis is based on the more critical Boring 2 E. Abut data. The resulting factor of safety is 1.5. No slope stability problems are anticipated.

**Seismic Considerations.** The following table shows recommended seismic design data based on a 1000 year return period event.

Seismic Performance Zone (SPZ)	2
Spectral Acceleration at 1 second ( $S_{D1}$ )	0.232g
Design Spectral Acceleration at 0.2 Seconds ( $S_{DS}$ )	0.482g
Soil Site Class	D

Seismic Performance Zone 2 requires liquefaction and seismic slope stability analysis to be performed.

*Liquefaction.* In general the liquefiable layers begin at elevation 540±ft and terminate at 530±ft at the east abutment. At the west abutment liquefiable layers begin at 538±ft and terminate at 530±ft. The individual layers are approximately 2.5 ft thick.

*Seismic Settlement.* The potential liquefaction induced settlement at the east abutment is 16 inches and 6 inches at the west abutment based on Geotechnical Engineering Circular No. 3 Figure 62. The liquefiable layers are at depths of 19ft to 29ft below the bottom of abutment. The resulting downdrag is factored into the design of the piling. The magnitude of settlement would permit the structure to remain in service with some restrictions. As such, no remedial action is warranted.

*Seismic Slope Stability.* The stability of a 2:1 end slope using a peak horizontal ground acceleration of 0.12g with a return period of 5% in 50 years has been analyzed using soil data from boring at the east and west abutments. The analysis is based on the more critical Boring 2 E. Abut and Shelby tube 2-ST E. Abut data. The factor-of-safety is 1.3 at the east abutment. Slope stability problems are not anticipated following a seismic event.

*Scour.* The design scour elevation at each abutment is equal to the bottom of the abutment elevation shown on the TSL; adjustments may be made during final design.

*Mining Activity.* ISGS records indicate no mines located near the proposed project location.

### **Foundation Evaluation**

#### *Axial Loading*

Preliminary maximum factored loads, provided by the structure designer, are approximately 1023 kips vertical at the abutments. Spread footings will not be evaluated because of inadequate bearing capacity. Because Shale bedrock was encountered at approximate elevation +/-522.00', drilled shafts will not be evaluated because the required depths of (+/-33' + rock socket) would make them uneconomical. In addition, integral abutments are proposed which precludes the use of drill shafts. A driven pile foundation is recommended at each substructure.

Metal Shell and H-Piles were analyzed. H-Piles are recommended due to the presence of shale at elevation +/- 522.00' at both abutments. Metal Shell piles do not achieve sufficient bearing before encountering shale and may become damaged during pile driving.

Piles lengths should be determined by using the Factored Resistance Available (FRA), and/or Seismic Resistance Available (SRA) for each pile type at each location. The pile design tables assume a single row of piles at the abutments.

### West Abutment Pile Design Table

Est Pile Length (ft)	HP 10x42 Max NRB 335 kips			HP 12x53 Max NRB 418 kips			HP 12x63 Max NRB 497 kips		
	NRB	FRA	SRA	NRB	FRA	SRA	NRB	FRA	SRA
36.4	178	98	125	213	117	150	219	120	155
37.4	239	131	186	286	157	222	292	161	228
38.4	281	154	228	358	197	294	362	199	298
39.4	322	177	269	407	224	344	412	227	348
40.4							462	254	398

### East Abutment Pile Design Table

Est Pile Length (ft)	HP 10x42 Max NRB 335 kips			HP 12x53 Max NRB 418 kips			HP 12x63 Max NRB 497 kips		
	NRB	FRA	SRA	NRB	FRA	SRA	NRB	FRA	SRA
36.6	167	92	134	199	110	160	205	113	165
37.6	227	125	194	272	149	232	278	153	238
38.6	273	150	240	344	189	304	351	193	311
39.6	314	173	281	398	219	358	402	221	362
40.6							452	249	412

### Pile Cutoff Table

Location	SN 068-0513	
	Ground Surface Elev. During Driving	Cutoff Elev.
West Abutment	554.23	556.23
East Abutment	554.38	556.38

#### *Lateral Loading*

The pile response due to lateral loads from thermal expansion and contraction of the structure has already been accounted for in the Integral Abutment Pile Selection Chart provided in ABD Memo 12.3. In addition, LRFD 4.7.4.2 indicates that a seismic analysis is not required for single span bridges, regardless of seismic zone. All other lateral pile loads are anticipated to be minimal and a lateral pile analysis is not anticipated for final design. As such, no lateral load pile analysis data is provided in the SGR.

If the structural designer determines during final design that a lateral load pile analysis is required, the SGR author should be contacted and the necessary information will be provide via a Geotechnical Design Memorandum.

## **Approach Pavement**

Foundation conditions beneath proposed approach pavement footings have been reviewed, based on available boring data, the available bearing capacity is greater than required. For structure replacement projects experience indicates approach pavement footings do not experience excessive settlement when there is no new fill beneath the footing and it is constructed on undisturbed soil. No remedial action is required. *Do not show the maximum applied service bearing pressure ( $Q_{max}$ ) on the structure plans.*

## **Construction Considerations**

*Stage Construction:* Temporary soil retention will be needed to facilitate excavating at abutments during stage I construction. The maximum retained height is approximately 15 ft. At the abutments the piling will encounter low strength silty clay and sand before reaching Shale and will be unable to achieve the required embedment. Therefore, a temporary cantilevered sheet pile wall is not feasible. The special provision (GBSP 44) for Temporary Soil Retention System should be used.

*Ground Improvement:* No ground improvement is required.

*Earthwork:* No unusual construction conditions are expected.

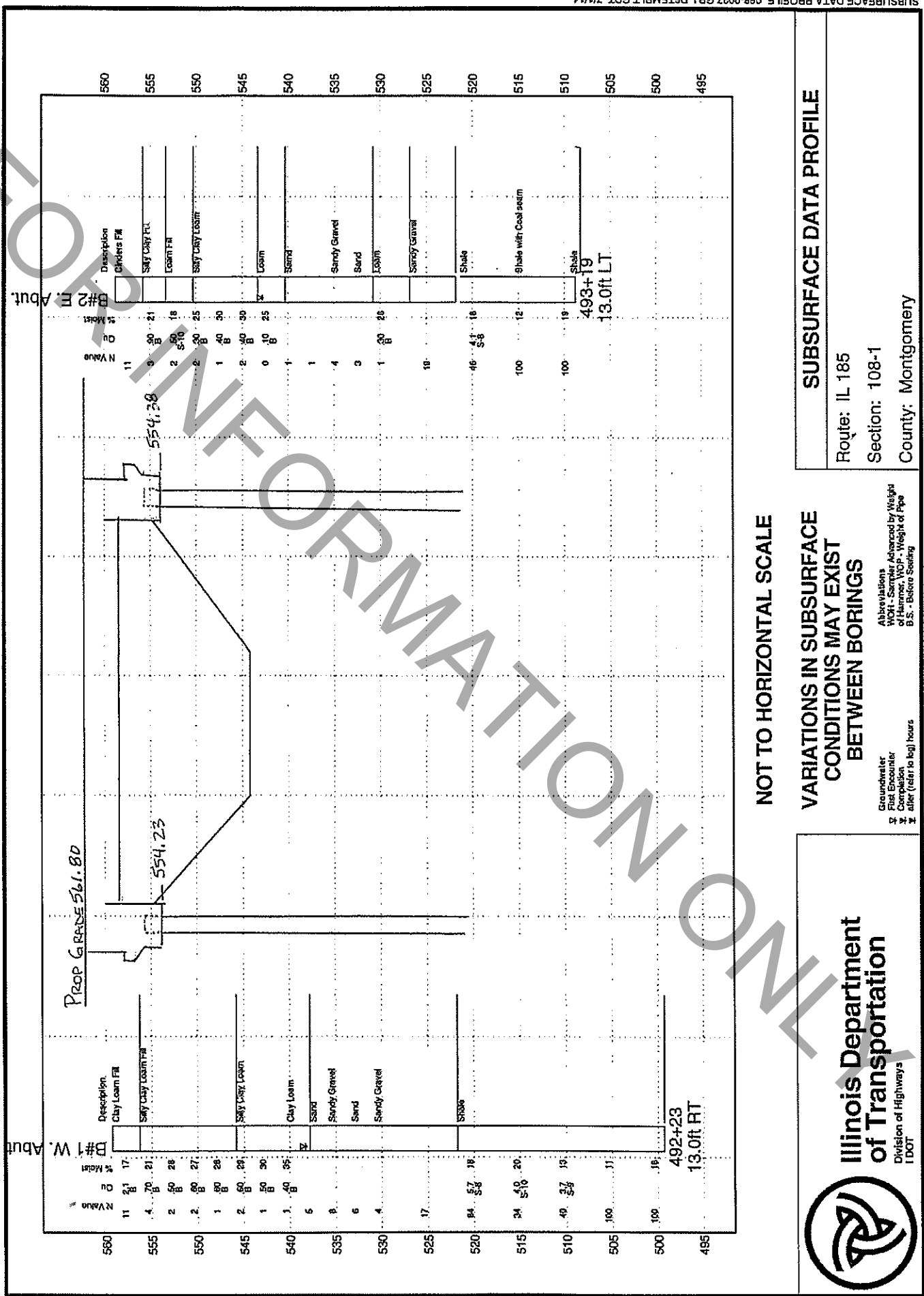
*Foundation Construction:* No unusual construction conditions are anticipated. It does not appear there are any conflicts with the existing foundation. Test piles are recommended at each substructure farthest from the boring locations. Metal shoes are required with the use of H-piles.

The following is a list of spreadsheets and software programs that were used in the geotechnical analysis:

- *Slide5.0* by Rocscience
- Seismic Site Class Determination Spreadsheet by BBS (Modified 12/10/10)
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2007
- IDOT Static Method of Estimating Pile Length by BBS (Modified 10/18/11)



Structure Number 068-0027 over Bayou Creek  
 Located in the SE 1/4 of Section 1, Township 7N, Range 3W of the 3 P.M.



SUBSURFACE DATA PROFILE 068-0027.GPJ D6TEMP.LT.GDT 7/1/14

SUBSURFACE DATA PROFILE 068-0027.GPJ D6TEMP.LT.GDT 7/1/14

**SUBSURFACE DATA PROFILE**  
 Route: IL 185  
 Section: 108-1  
 County: Montgomery

**NOT TO HORIZONTAL SCALE**  
**VARIATIONS IN SUBSURFACE**  
**CONDITIONS MAY EXIST**  
**BETWEEN BORINGS**

**Illinois Department**  
**of Transportation**  
 Division of Highways  
 IDOT



Groundwater  
 First Encounter  
 Completion  
 after (refer to log) hours  
 after (refer to log) hours  
 Abbreviations  
 WCH - Sampler Advanced by Weight  
 of Hammer; WDP - Weight of Pipe  
 B.S. - Before Soiling









# SOIL BORING LOG

ROUTE IL 185 DESCRIPTION over Bayou Creek LOGGED BY M. Tappan

SECTION 108-1 LOCATION SE 1/4, SEC. 1, TWP. 7N, RNG. 3W, 3 PM

COUNTY Montgomery DRILLING METHOD HSA HAMMER TYPE 140 # AUTO

STRUCT. NO.	Station	DEPTH	BLOW	UCS	MOIST	Surface Water Elev.	Stream Bed Elev.	Groundwater Elev.:	DEPTH	BLOW	UCS	MOIST
		(ft)	/6"	(tsf)	(%)			▽ First Encounter	(ft)	/6"	(tsf)	(%)
068-0513	492+71					543	542.5	542.8				
2 E. Abut.	493+19							Washed				
	13.0ft LT							After Plugged Hrs.				
	558.8											
CA-6 and CINDERS (Fill)		10						Gray Fine SAND (continued)		0		
		6								0		
		5								1		
	555.80											
Brown and Gray Moist SILTY CLAY (Fill)		1						Gray Medium SANDY GRAVEL		2		
		1	.90	21				Washed		2		
		2	B							2		
	553.30											
Grayish Brown Very Moist LOAM (Fill)		1						Gray Dirty Fine SAND		1		
		1	.50	18				Washed		1		
		1	S-10							2		
	550.30											
Gray Very Moist SILTY CLAY LOAM		0						Gray Wet LOAM		0		
		1	.30	25				Washed		0	.30	26
		1	B							1	B	
	550.30											
Dark Gray Very Moist SILTY CLAY LOAM		0						Gray Dirty Medium SANDY GRAVEL		2		
		0	.40	30				Washed		6		
		2	B							13		
	543.30											
Gray Wet LOAM		0										
		0	.10	25								
		0	B									
	540.30											
Gray Fine SAND		0						Light Olive Brown and Gray Moist Poorly Indurated Clayey SHALE		8		
		0						Washed		18	4.1	18
		1								28	S-8	

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



# SOIL BORING LOG

ROUTE IL 185 DESCRIPTION over Bayou Creek LOGGED BY M. Tappan

SECTION 108-1 LOCATION SE 1/4, SEC. 1, TWP. 7N, RNG. 3W, 3 PM

COUNTY Montgomery DRILLING METHOD HSA HAMMER TYPE 140 # AUTO

STRUCT. NO.	Station	BORING NO.	Station	Offset	Ground Surface Elev.	DEPTH	BLWS	UCS	MOIST	Surface Water Elev.	Stream Bed Elev.	Groundwater Elev.:	First Encounter	Upon Completion	After Plugged Hrs.
					ft	(ft)	/6"	(tsf)	(%)				ft	ft	ft
068-0513	492+71	2 E. Abut.	493+19	13.0ft LT	558.8					543	542.5		542.8	Washed	
Light Olive Brown and Gray Moist Poorly Indurated Clayey SHALE (continued)															
Dark Gray Dry Fissile Clayey SHALE with 3" Black Lignite COAL Seam															
Gray Dry Fissile Clayey SHALE															
Boring Completed															
Ref. Sta. to Centerline of Ex. Structure = 492+71 Sta. Increase to East															
Ref. Elev. to Chsld Square on NE Approach Slab = 558.7															

File Name: S:\SOIL SIGINT FILES\068 MONTGOMERY\068-0513.GPJ Data Template DBTEMP.LT.GDT Date Printed 7/31/14  
Latitude 39.04455N Longitude 89.21764W Datum NAD83 Job Number D-96-108-09

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





**Illinois Department of Transportation**

**Shelby Tube Test Results**

Boring No.: 2-ST E. Abut.      Route: FAP-777 (IL-185)      Tube Length/Diameter: 30-in / 3-in.      Page: 1 of 2  
 Station: 493+25      Section: 10B-2, 405B-1      Ground Surface Elev.: 558.8      Date: 05/06/2014  
 Offset: 13 ft. Lt.      County: Montgomery      Begin Sampling Depth: 555.3      Job No.: D-96-109-09  
 Latitude: 39° 04.455' N      Structure No.: 068-0513 prop.      Ground Water Elev.: 540.8      Soils Lab Project No.: 14002  
 Longitude: 89° 21.764' W      Contract No.: 72D08      Drilled by: Mike Tappan      Prepared by: Kurt Schmuck

Sample No.	Depth (ft)	Elev. (ft)	Qu (tsf)	Moist. (%)	Unit Wt. (pcf)	c (psf)	φ (deg)	c' (psf)	φ' (deg)	Soil Type, Description and Observations
	0.0	558.8								Ground Surface -- elev. 558.8 ft.
	↓	↓								Augered 3.5 ft. through asphalt & crushed stone to elev. 555.3 ft. -- Not sampled
	↓	↓								
	3.5	555.3								
1-1	4.1	554.7	0.84	18.4	126.2					Alternating layers of Brown Silty Clay, Silty Clay-Loam and Sand
1-2	4.8	554.0	UUTx	16.9	128.4	1102	16.2	955	24.3	Brown Silty Clay w/ Sand lenses and pockets and small seams
1-3	5.4	553.4	---	---	---					No Recovery
1-4	6.0	552.8*	---	---	---					No Recovery
2-1	6.6	552.2	0.83	25.7	122.0					Dark Gray Silty Clay-Loam w/ Silt lenses
2-2	7.3	551.5	UUTx	20.9	126.2	1361	2.7	1112	12.7	Dark Gray Silty Clay-Loam w/ Silt lenses, to Gray clayey SiL w/ SaL pockets
2-3	7.9	550.9	---	---	---					No Recovery
2-4	8.5	550.3	---	---	---					No Recovery
3-1	9.1	549.7	0.42	28.3	116.7					Dark Gray Silty Clay-Loam
3-2	9.8	549.0	0.50	28.7	116.0					Dark Gray clayey Silty Loam w/ Silt lenses
3-3	10.4	548.4	UUTx	28.4	117.6	523	0.0	367	10.0	Dark Gray clayey Silty Loam w/ Silt lenses -- isolated organic pockets
3-4	11.0	547.8	---	---	---					No Recovery
4-1	11.2	547.6	---	25.6	119.4					Gray clayey Silty Loam w/ Silt lenses
4-2	11.9	546.9	0.68	29.1	116.4					Gray clayey Silty Loam w/ Silt lenses and organic specks
4-3	12.5	546.3	UUTx	30.2	116.0	674	2.4	330	28.3	Gray Clayey Silty Loam w/ Silt lenses and Silty Clay pockets
4-4	13.5	545.3	---	---	---					No Recovery
5-1	13.7	545.1	---	33.3	112.6					Dark Gray Silty Clay-Loam w/ isolated organic seam
5-2	14.4	544.4	0.35	33.8	114.2					Dark Gray Silty Clay-Loam w/ organic seams
5-3	15.0	543.8	UUTx	29.1	119.9	776	0.4	697	5.7	Gray Silty Clay-Loam w/ Silt lenses and Silty Loam pockets

The Unit Wt. column represents the Moist Unit Weight.  
 The Qu column represents the Unconfined Compressive Strength using AASHTO T 208.  
 The c and φ column represents cohesion and friction angle for total stress using AASHTO T 296 (unconsolidated-undrained triaxial testing).  
 The c' and φ' column represents cohesion and friction angle for effective stress using either AASHTO T 297 (consolidated-undrained triaxial testing), or AASHTO T 296 with pore pressure measurement.





Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.	1-1		
Orig. Starting Wt.	54.800		
Hygro. Moist. %	0.843		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	54.342
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% In. Suspen.	Max. Dia. mm.
1							
5							
15							
30	68.0	17.5	18.5	6.30	12.20	22.30	0.0090
60	68.0	16.0	17.0	6.30	10.70	19.56	0.0064
90	68.0	15.5	16.5	6.30	10.20	18.64	0.0053
120	68.0	15.0	16.0	6.30	9.70	17.73	0.0046
250	68.0	14.5	15.5	6.30	9.20	16.81	0.0032
						15.34	0.0020
1440	68.0	13.0	14.0	6.30	7.70	14.07	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	1.059	1.95	98.05	98.05
#100	16.437	30.25	69.75	69.75
#200	25.265	46.49	53.51	53.51

%Clay	15.34	%Silt	38.17	%Sand	46.49
				%Gravel	0.00
				%Combined	46.49

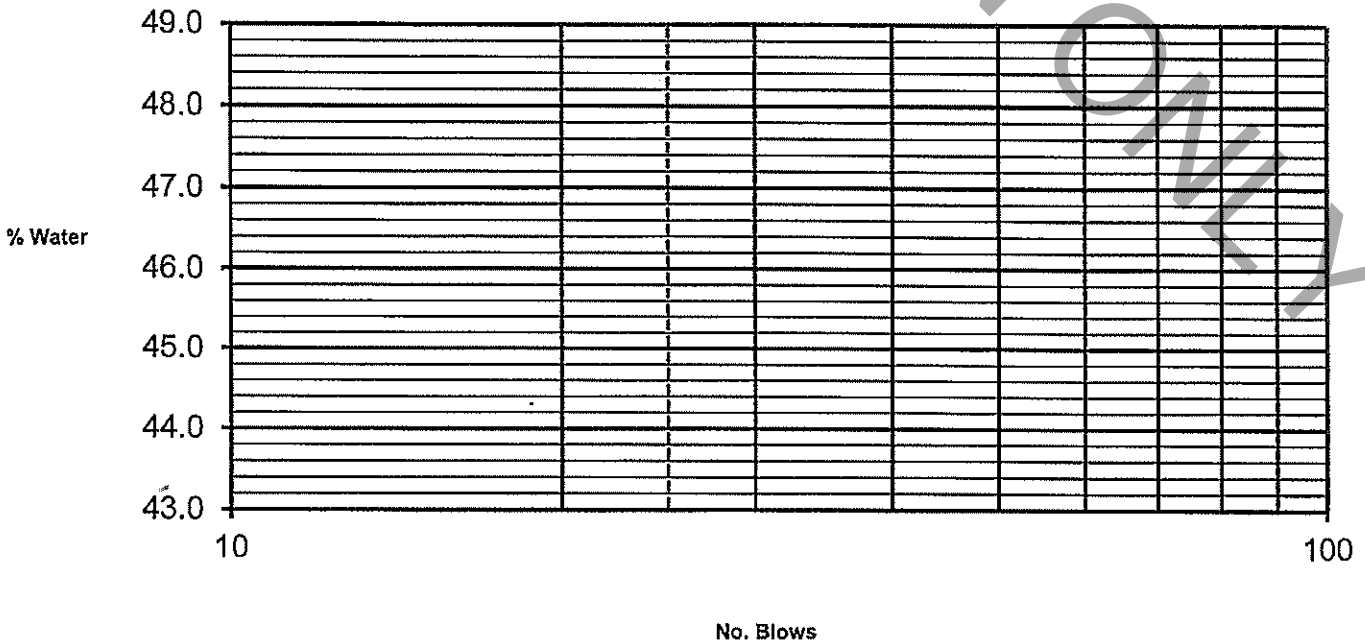
DOT Class.	Loam	#DIV/0!	#DIV/0!
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.				
Dry Wt.				
Moisture	0.000	0.000	0.000	0.000
Pan Wt.				
Wt. Dry Mat'l.	0.000	0.000	0.000	0.000
% Moisture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	Liquid Limit		
	5	6	7
		24.792	
		22.453	
	0.000	2.339	0.000
		8.881	
	0.000	13.572	0.000
	#DIV/0!	17.23	#DIV/0!
No. Blows		24	

\*  
17.23(24/25).121  
17.23(0.96).121  
17.23(0.995)=  
17.14%

LL	#DIV/0!
PL	#DIV/0!
PI	#DIV/0!



No. Blows



Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.	2-2		
Orig. Starting Wt.	54.500		
Hygro. Moist. %	0.476		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	54.242
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% In Suspen.	Max. Dia. mm
1							
5							
15							
30	68.0	25.0	26.0	6.30	19.70	36.07	0.0086
60	68.0	22.5	23.5	6.30	17.20	31.49	0.0062
90	68.0	21.0	22.0	6.30	15.70	28.75	0.0051
120	68.0	20.5	21.5	6.30	15.20	27.83	0.0044
250	68.0	19.5	20.5	6.30	14.20	26.00	0.0031
						23.71	0.0020
1440	68.0	17.0	18.0	6.30	11.70	21.42	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	0.678	1.25	98.75	98.75
#100	5.134	9.47	90.53	90.53
#200	8.914	16.43	83.57	83.57

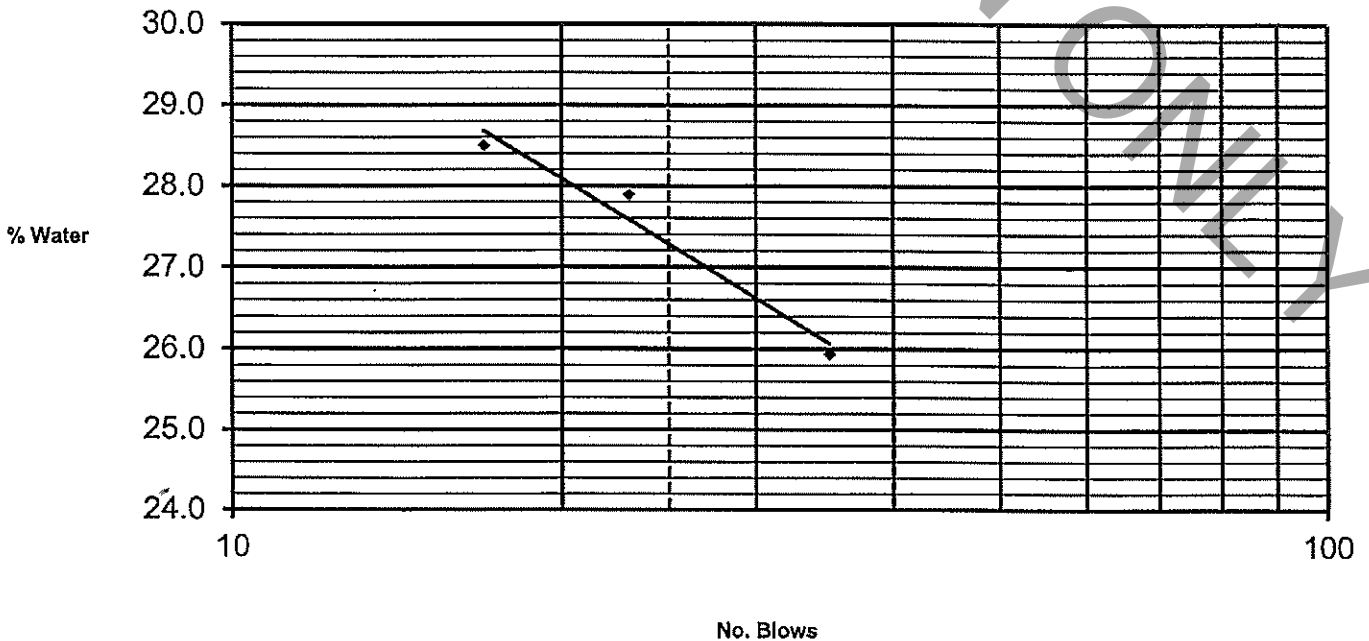
%Clay	23.71	%Silt	59.86	%Sand	16.43
				%Gravel	0.00
				%Combined	16.43

IDOT Class.	SiCL	A-4	6
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.	10.603	10.601	10.065	10.619
Dry Wt.	10.333	10.339	9.792	10.369
Moisture	0.270	0.262	0.273	0.250
Pan Wt.	8.735	8.816	8.198	8.842
Wt. Dry Mat'l.	1.598	1.523	1.594	1.527
% Moisture	16.9	17.2	17.1	16.4

	Liquid Limit		
	5	6	7
	19.721	18.717	18.817
	17.304	16.578	16.704
	2.417	2.139	2.113
	8.823	8.909	8.557
	8.481	7.669	8.147
	28.5	27.9	25.9
No. Blows	17	23	35

LL	27
PL	17
PI	10







Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.	3-3		
Orig. Starting Wt.	55.400		
Hygro. Moist. %	0.888		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	54.912
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% in. Suspen.	Max. Dia. mm.
1							
5							
15							
30	68.0	25.0	26.0	6.30	19.70	35.63	0.0086
60	68.0	21.5	22.5	6.30	16.20	29.30	0.0062
90	68.0	20.0	21.0	6.30	14.70	26.59	0.0051
120	68.0	19.5	20.5	6.30	14.20	25.68	0.0045
250	68.0	18.0	19.0	6.30	12.70	22.97	0.0031
						21.12	0.0020
1440	68.0	16.0	17.0	6.30	10.70	19.35	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	0.025	0.05	99.95	99.95
#100	0.249	0.45	99.55	99.55
#200	1.905	3.47	96.53	96.53

%Clay	21.12	%Silt	75.41	%Sand	3.47
				%Gravel	0.00
				%Combined	3.47

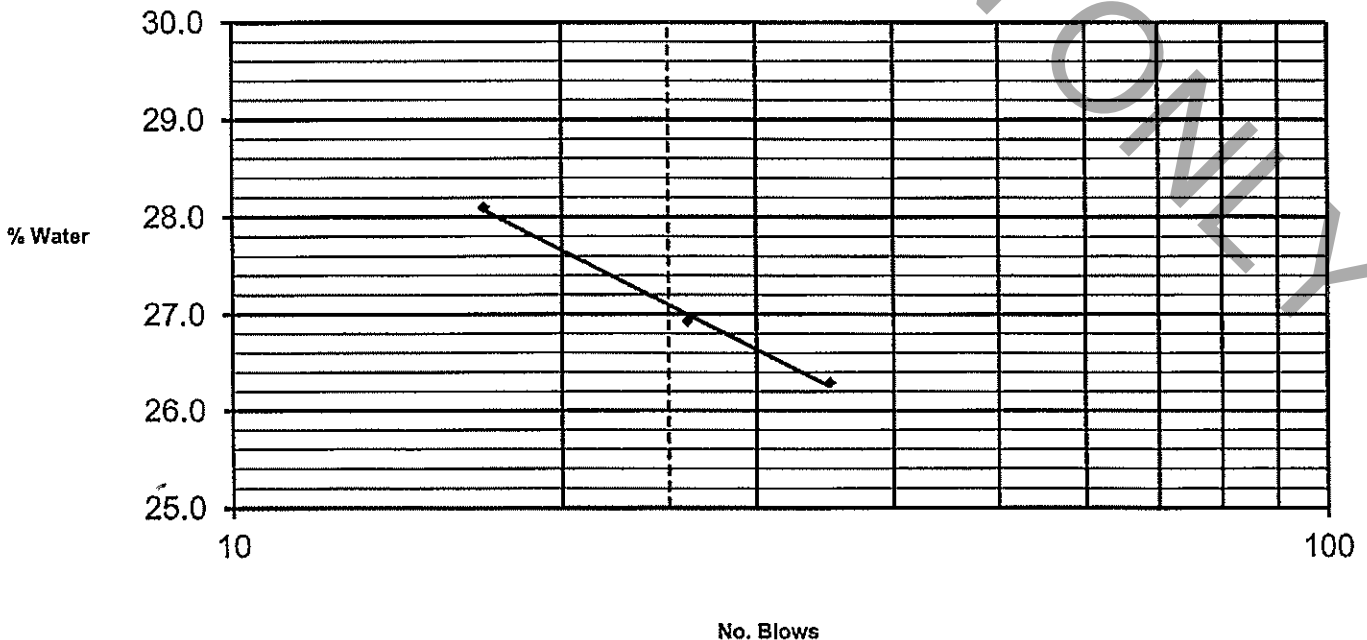
IDOT Class	SiCL	A-4	5
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.	9.994	10.217	10.506	10.751
Dry Wt.	9.698	9.925	10.216	10.435
Moisture	0.296	0.292	0.290	0.316
Pan Wt.	8.275	8.506	8.803	8.902
Wt. Dry Mat'l.	1.423	1.419	1.413	1.533
% Moisture	20.8	20.6	20.5	20.6

No. Blows	Liquid Limit		
	5	6	7
	18.676	18.330	22.656
	16.515	16.331	19.723
	2.161	1.999	2.933
	8.824	8.908	8.567
	7.691	7.423	11.156
	28.1	26.9	26.3

LL	27
PL	21
PI	6

No. Blows





Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.		4-3	
Orig. Starting Wt.	54.600		
Hygro. Moist. %	0.775		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	54.180
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% in Suspen.	Max. Dia. mm.
1							
5							
15							
30	68.0	27.0	28.0	6.30	21.70	39.78	0.0085
60	68.0	24.0	25.0	6.30	18.70	34.28	0.0061
90	68.0	22.5	23.5	6.30	17.20	31.53	0.0050
120	68.0	21.5	22.5	6.30	16.20	29.70	0.0044
250	68.0	20.0	21.0	6.30	14.70	26.95	0.0031
						24.66	0.0020
1440	68.0	17.5	18.5	6.30	12.20	22.36	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	0.023	0.04	99.96	99.96
#100	0.175	0.32	99.68	99.68
#200	0.919	1.70	98.30	98.30

%Clay 24.66

%Silt 73.64

%Sand 1.70

DOT Class: SiCL A-6 12

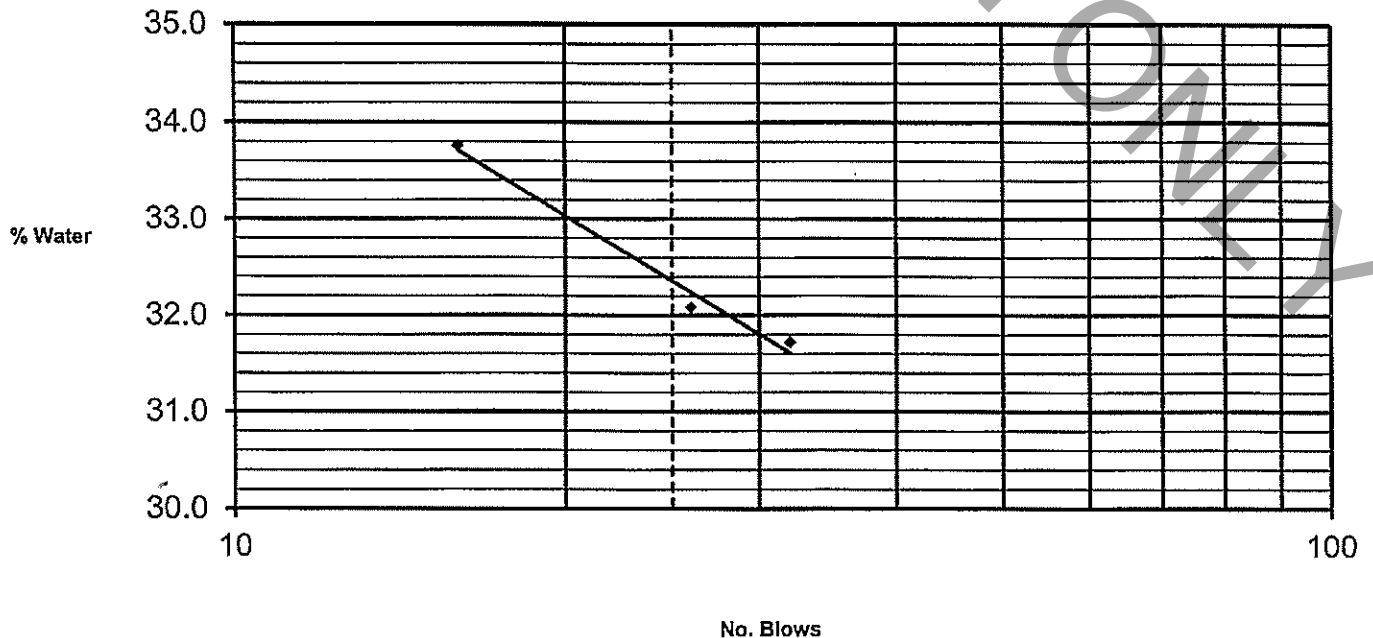
%Gravel 0.00

%Combined 1.70

Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.	10.546	10.314	10.574	10.688
Dry Wt.	10.265	9.995	10.287	10.374
Moisture	0.281	0.319	0.287	0.314
Pan Wt.	8.885	8.433	8.853	8.804
Wt. Dry Mat'l.	1.380	1.562	1.434	1.570
% Moisture	20.4	20.4	20.0	20.0

No. Blows	Liquid Limit		
	5	6	7
	18.419	18.980	19.341
	15.983	16.508	16.829
	2.436	2.472	2.512
	8.767	8.803	8.910
	7.216	7.705	7.919
	33.8	32.1	31.7
No. Blows	16	26	32

LL	32
PL	20
PI	12





Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.	5-3		
Orig. Starting Wt.	56.900		
Hygro. Moist. %	1.031		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	56.319
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% in Suspen.	Max. Dia. mm.
1							
5							
15							
30	68.0	31.0	32.0	6.30	25.70	45.32	0.0082
60	68.0	28.0	29.0	6.30	22.70	40.03	0.0059
90	68.0	26.0	27.0	6.30	20.70	36.50	0.0049
120	68.0	25.0	26.0	6.30	19.70	34.74	0.0043
250	68.0	23.5	24.5	6.30	18.20	32.10	0.0030
						30.02	0.0020
1440	68.0	21.0	22.0	6.30	15.70	27.69	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	0.107	0.19	99.81	99.81
#100	0.326	0.58	99.42	99.42
#200	0.975	1.73	98.27	98.27

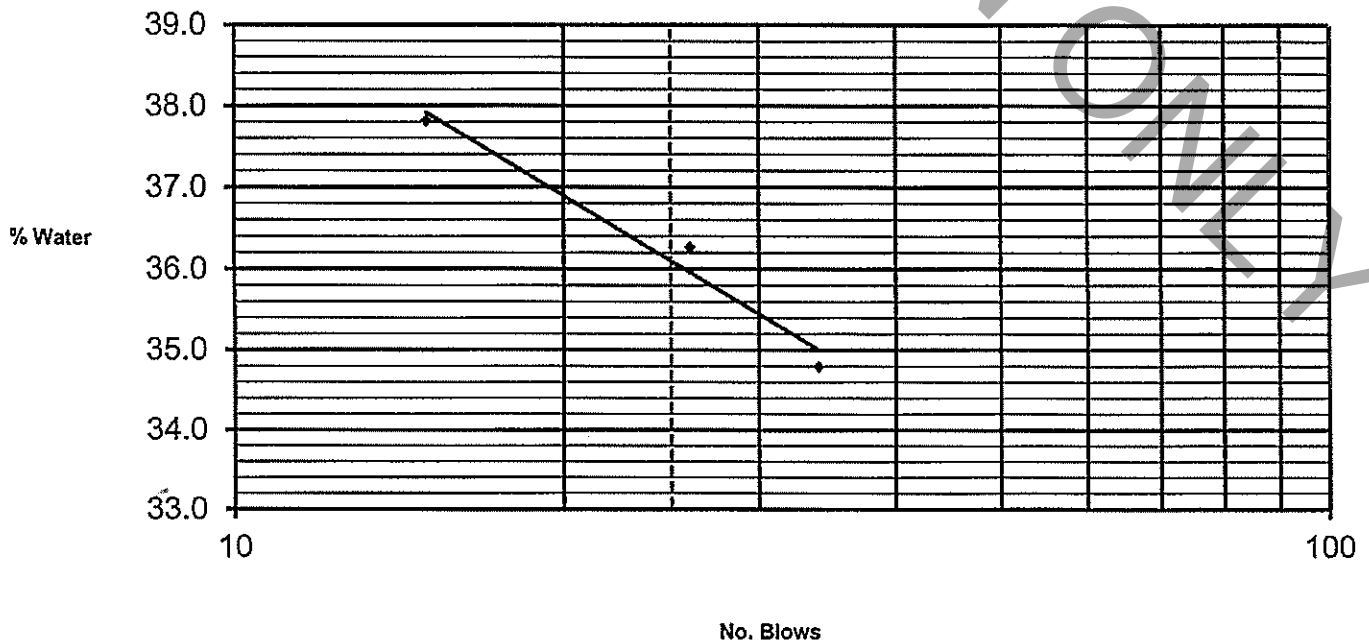
%Clay	30.02	%Silt	68.25	%Sand	1.73
				%Gravel	0.00
				%Combined	1.73

DOT Class	SiC	A-6	18
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.	10.281	10.470	10.010	10.591
Dry Wt.	10.043	10.213	9.727	10.317
Moisture	0.238	0.257	0.283	0.274
Pan Wt.	8.734	8.815	8.197	8.842
Wt. Dry Mat'l.	1.309	1.398	1.530	1.475
% Moisture	18.2	18.4	18.5	18.6

	Liquid Limit		
	5	6	7
	18.110	20.022	19.267
	15.464	17.053	16.607
	2.646	2.969	2.660
	8.467	8.867	8.962
	6.997	8.186	7.645
	37.8	36.3	34.8
No. Blows	15	26	34

LL	36
PL	18
PI	18





Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.	6-2		
Orig. Starting Wt.	54.600		
Hygro. Moist. %	0.600		
Corr. % Pass #10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	54.274
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Cor.	Corr. Bulb Rd.	% In Suspen.	Max. Dia. mm
1							
5							
15							
30	68.0	16.5	17.5	6.30	11.20	20.50	0.0091
60	68.0	15.0	16.0	6.30	9.70	17.75	0.0065
90	68.0	14.5	15.5	6.30	9.20	16.84	0.0053
120	68.0	14.0	15.0	6.30	8.70	15.92	0.0046
250	68.0	13.5	14.5	6.30	8.20	15.01	0.0032
						14.02	0.0020
1440	68.0	12.5	13.5	6.30	7.20	13.18	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	0.046	0.08	99.92	99.92
#100	8.807	16.23	83.77	83.77
#200	20.814	38.35	61.65	61.65

%Clay	14.02	%Silt	47.63	%Sand	38.35
				%Gravel	0.00
				%Combined	38.35

IDOT Class	Loam	#DIV/0!	#DIV/0!
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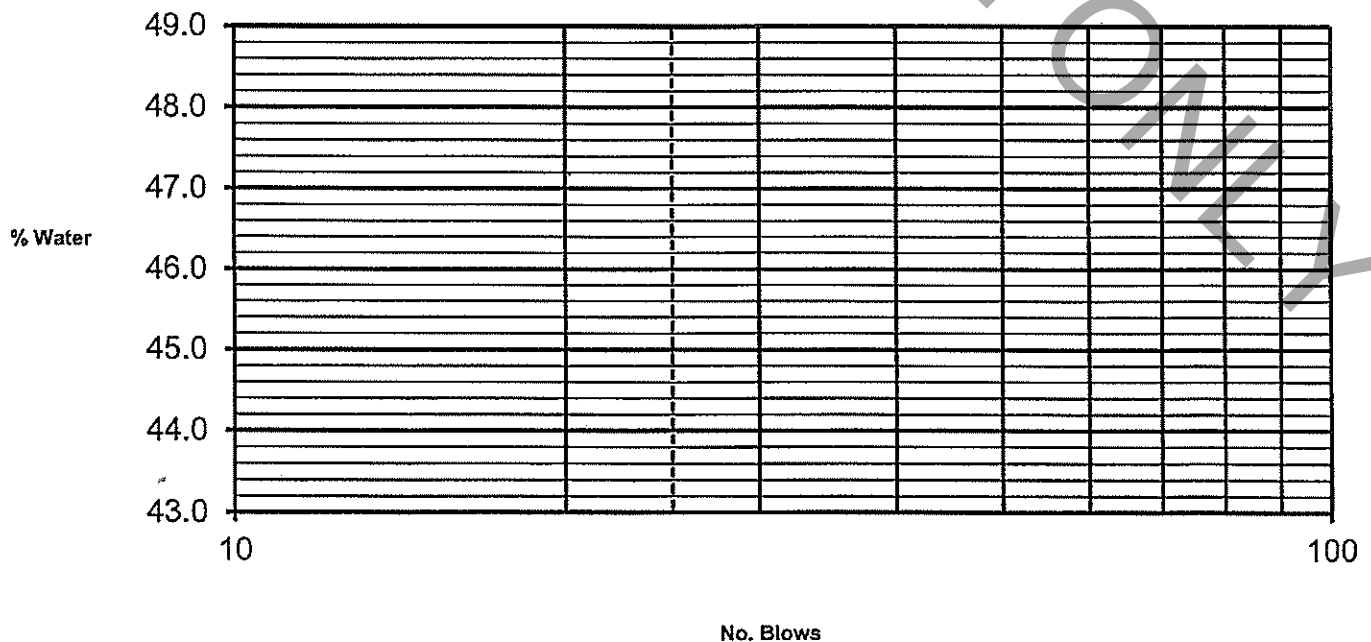
Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.				
Dry Wt.				
Moisture	0.000	0.000	0.000	0.000
Pan Wt.				
Wt. Dry Mat'l.	0.000	0.000	0.000	0.000
% Moisture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	Liquid Limit		
	5	6	7
		22.170	
		20.018	
	0.000	2.152	0.000
		8.910	
	0.000	11.108	0.000
	#DIV/0!	19.37	#DIV/0!

\*  
19.37(22/25).121  
19.37(.88).121  
19.37(0.985)  
19.1%

LL	#DIV/0!
PL	#DIV/0!
PI	#DIV/0!

No. Blows 22



No. Blows



Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	
County:	MONTGOMERY	Depth	
Lab / Sample No.	6-3		
Orig. Starting Wt.	56.700		
Hygro. Moist. %	0.253		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	56.557
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min.	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% In Susp.	Max. Dia. mm.
1							
5							
15							
30	68.0	14.0	15.0	6.30	8.70	15.28	0.0092
60	68.0	13.0	14.0	6.30	7.70	13.52	0.0065
90	68.0	12.5	13.5	6.30	7.20	12.64	0.0054
120	68.0	12.0	13.0	6.30	6.70	11.77	0.0047
250	68.0	12.0	13.0	6.30	6.70	11.77	0.0032
						10.80	0.0020
1440	68.0	11.0	12.0	6.30	5.70	10.01	0.0014

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	0.045	0.08	99.92	99.92
#100	15.640	27.65	72.35	72.35
#200	30.156	51.32	48.68	48.68

%Clay	10.80	%Silt	35.88	%Sand	53.32
				%Gravel	0.00
				%Combined	53.32

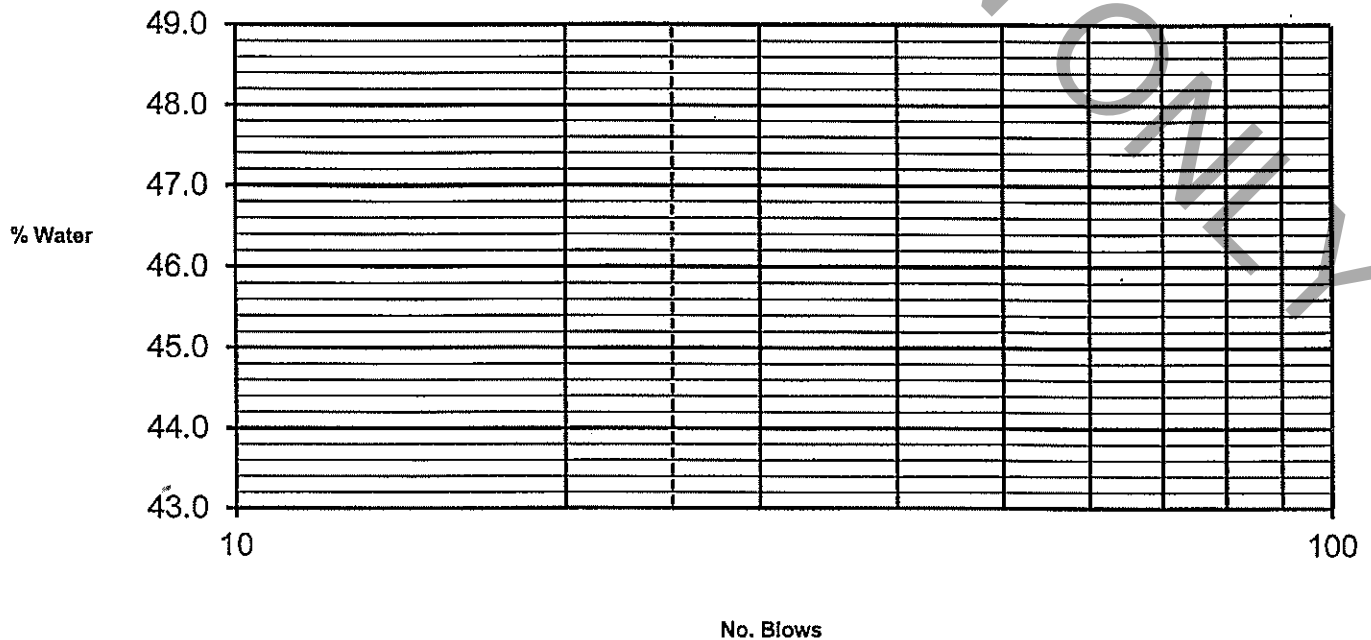
DOT Class	SaL	#DIV/0!	#DIV/0!
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.				
Dry Wt.				
Moisture	0.000	0.000	0.000	0.000
Pan Wt.				
Wt. Dry Mat'l.	0.000	0.000	0.000	0.000
% Moisture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	Liquid Limit		
	5	6	7
	0.000	0.000	0.000
	0.000	0.000	0.000
	#DIV/0!	#DIV/0!	#DIV/0!

LL	#DIV/0!
PL	#DIV/0!
PI	#DIV/0!

No. Blows



No. Blows



Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	BOR 2-ST, E ABUT
County:	MONTGOMERY	Depth	
Lab / Sample No.	6-4 BOT 2/3		
Orig. Starting Wt.	98.000		
Hygro. Moist. %	0.274		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	97.732
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time Min	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Cor.	Corr. Bulb Rd.	% In Susp.	Max. Dia. mm
1							
5							
15							
30	68.0	9.0	10.0	6.30	3.70	3.76	0.0095
60	68.0	9.0	10.0	6.30	3.70	3.76	0.0067
90	68.0	8.5	9.5	6.30	3.20	3.25	0.0055
120	68.0	8.5	9.5	6.30	3.20	3.25	0.0048
250	68.0	8.0	9.0	6.30	2.70	2.74	0.0033
						2.74	0.0020
1440	68.0	8.0	9.0	6.30	2.70	2.74	0.0014

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	15.471	15.83	84.17	84.17
#100	89.332	91.40	8.60	8.60
#200	93.665	95.84	4.16	4.16

%Clay	2.74	%Silt	1.42	%Sand	95.84
				%Gravel	0.00
				%Combined	95.84

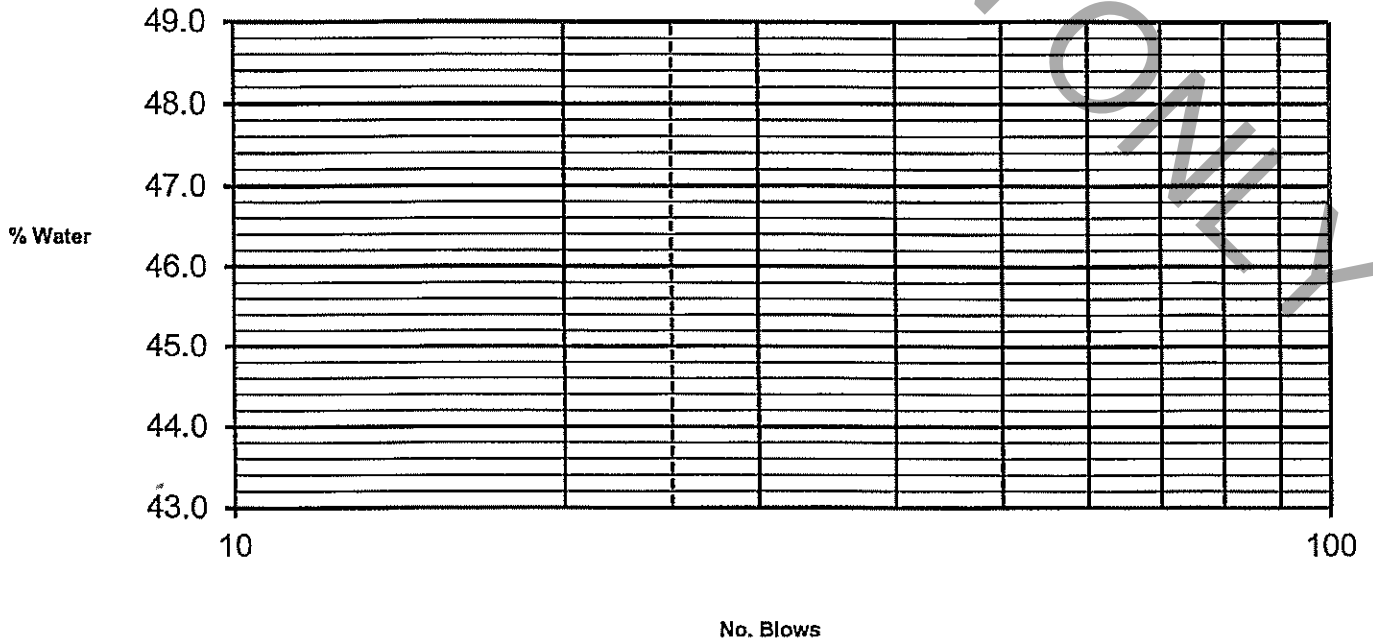
IDOT Class	Sand	#DIV/0!	#DIV/0!
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.				
Dry Wt.				
Moisture	0.000	0.000	0.000	0.000
Pan Wt.				
Wt. Dry Mat'l.	0.000	0.000	0.000	0.000
% Moisture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	Liquid Limit		
	5	6	7
	0.000	0.000	0.000
	0.000	0.000	0.000
	#DIV/0!	#DIV/0!	#DIV/0!

LL	#DIV/0!
PL	#DIV/0!
PI	#DIV/0!

No. Blows





Hydrometer Analysis of Soils  
Limit Test Data and P.I.  
(AASHTO T-88)

Route:	IL 185	Sta.	493+25
Section:		Ref to CL	BOR 2-ST, E ABUT
County:	MONTGOMERY	Depth	
Lab / Sample No.	6-4 TOP 1/3		
Orig. Starting Wt.	79.200		
Hygro. Moist. %	0.170		
Corr. % Pass.#10	100.00		
Specific Gravity	2.680		

Meniscus Correction	1.0
Corrected Dry Wt.	79.066
Decimal %Pass.#10	1.000

Date: 5/14/2014

Valid Temperature Ranges: 66.2 °F to 75.2 °F

Time-Mix	Temp F°	Observed Bulb Rd.	Actual Bulb Rd.	Comp. Corr.	Corr. Bulb Rd.	% in Suspen.	Max. Dia. mm
1							
5							
15							
30	68.0	15.0	16.0	6.30	9.70	12.18	0.0092
60	68.0	14.0	15.0	6.30	8.70	10.93	0.0065
90	68.0	13.0	14.0	6.30	7.70	9.67	0.0053
120	68.0	12.5	13.5	6.30	7.20	9.04	0.0046
250	68.0	12.0	13.0	6.30	6.70	8.42	0.0032
						8.07	0.0020
1440	68.0	11.5	12.5	6.30	6.20	7.79	0.0013

Sieve	Cumul. Wt. Ret.	% Ret.	% Pass	Corr. % Pass
3/4				
1/2				
3/8				
#4				
#8				
#10		0.00		100.00
#20				
#40	1.707	2.16	97.84	97.84
#100	43.869	55.48	44.52	44.52
#200	58.191	73.60	26.40	26.40

%Clay	8.07	%Silt	18.33	%Sand	73.60
				%Gravel	0.00
				%Combined	73.60

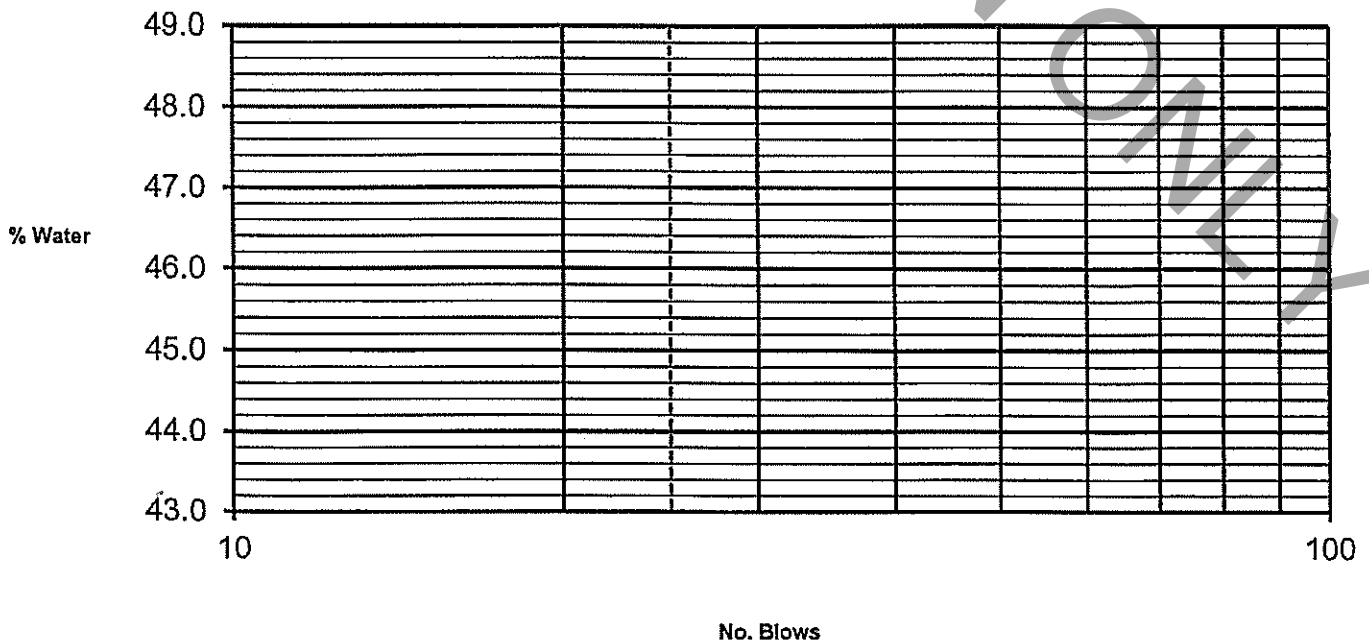
DOT Class	SaL	#DIV/0!	#DIV/0!
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Pan No.	Plastic Limit			
	1	2	3	4
Wet Wt.				
Dry Wt.				
Moisture	0.000	0.000	0.000	0.000
Pan Wt.				
Wt. Dry Mat'l.	0.000	0.000	0.000	0.000
% Moisture	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	Liquid Limit		
	5	6	7
	0.000	0.000	0.000
	0.000	0.000	0.000
	#DIV/0!	#DIV/0!	#DIV/0!

LL	#DIV/0!
PL	#DIV/0!
PI	#DIV/0!

No. Blows



No. Blows

## **TEMPORARY SOIL RETENTION SYSTEM**

Effective: December 30, 2002

Revised : May 11, 2009

Description. This work shall consist of designing, furnishing, installing, adjusting for stage construction when required and subsequent removal of the temporary soil retention system according to the dimensions and details shown on the plans and in the approved design submittal.

General. The temporary soil retention system shall be designed by the Contractor as a minimum, to retain the exposed surface area specified in the plans or as directed by the Engineer.

The design calculations and details for the temporary soil retention system proposed by the Contractor shall be submitted to the Engineer for approval. The calculations shall be prepared and sealed by an Illinois Licensed Structural Engineer. This approval will not relieve the Contractor of responsibility for the safety of the excavation. Approval shall be contingent upon acceptance by all involved utilities and/or railroads.

Construction. The Contractor shall verify locations of all underground utilities before installing any of the soil retention system components or commencing any excavation. Any disturbance or damage to existing structures, utilities or other property, caused by the Contractor's operation, shall be repaired by the Contractor in a manner satisfactory to the Engineer at no additional cost to the Department. The soil retention system shall be installed according to the Contractor's approved design, or as directed by the Engineer, prior to commencing any related excavation. If unable to install the temporary soil retention system as specified in the approved design, the Contractor shall have the adequacy of the design re-evaluated. Any reevaluation shall be submitted to the Engineer for approval prior to commencing the excavation adjacent to the area in question. The Contractor shall not excavate below the maximum excavation line shown in the approved design without the prior permission of the Engineer. The temporary soil retention system shall remain in place until the Engineer determines it is no longer required.

The temporary soil retention system shall be removed and disposed of by the Contractor when directed by the Engineer. When allowed, the Contractor may elect to cut off a portion of the temporary soil retention system leaving the remainder in place. The remaining temporary soil retention system shall be removed to a depth which will not interfere with the new construction, and as a minimum, to a depth of 12 in. (300 mm) below the finished grade, or as directed by the Engineer. Removed system components shall become the property of the Contractor.

When an obstruction is encountered, the Contractor shall notify the Engineer and upon concurrence of the Engineer, the Contractor shall begin working to break up, push aside, or remove the obstruction. An obstruction shall be defined as any object (such as but not limited to, boulders, logs, old foundations etc.) where its presence was not obvious or specifically noted on the plans prior to bidding, that cannot be driven or installed through or around, with normal driving or installation procedures, but requires additional excavation or other procedures to remove or miss the obstruction.



Method of Measurement. The temporary soil retention system furnished and installed according to the Contractor's approved design or as directed by the Engineer will be measured for payment in place, in square feet (square meters). The area measured shall be the vertical exposed surface area envelope of the excavation supported by temporary soil retention system. Portions of the temporary soil retention system left in place for reuse in later stages of construction shall only be measured for payment once.

Any temporary soil retention system installed beyond those dimensions shown on the contract plans or the approved contractor's design without the written permission of the Engineer, shall not be measured for payment but shall be done at the contractor's own expense.

Basis of Payment. This work will be paid for at the contract unit price per square foot (square meter) for TEMPORARY SOIL RETENTION SYSTEM.

Payment for any excavation, related solely to the installation and removal of the temporary soil retention system and/or its components, shall not be paid for separately but shall be included in the unit bid price for TEMPORARY SOIL RETENTION SYSTEM. Other excavation, performed in conjunction with this work, will not be included in this item but shall be paid for as specified elsewhere in this contract.

Obstruction mitigation shall be paid for according to Article 109.04 of the Standard Specifications.