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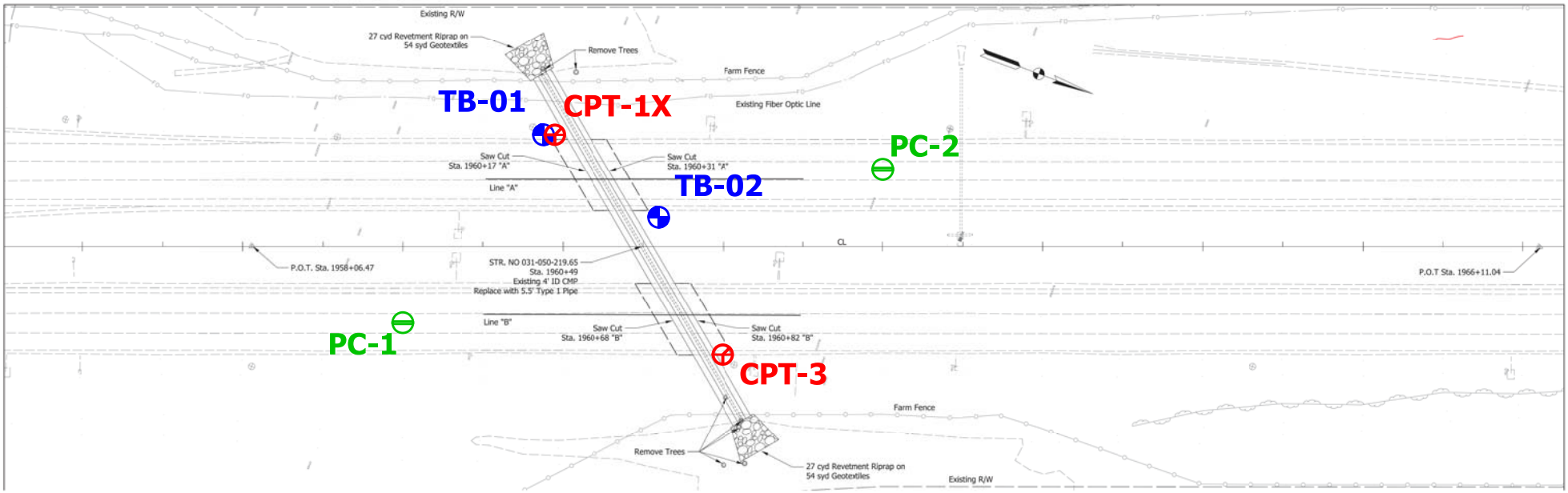
APPENDICES

APPENDIX 1
BORING LOCATION PLAN EXAMPLE

Boring Location Plan



Des# 1298559
Contract# R-33953
Location: US 31 1.95 mi N of SR-10
County: Marshall

Scale: Not to Scale

APPENDIX 2
INDOT FIELD BORING LOG

Office of Geotechnical Services Field Boring Log

DES. NO. ROAD NO. COUNTY: BORING NO:
STA: OFFSET: LINE: ELEV:. STRU. #:
LOC: LAT: LONG:
BORING TYPE: RIG TYPE(S): HOLE DIA : DRLR: INSP:
START: COMP:
WEATHER: TEMP:: WATER ADDED DURING DRILLING Y or N DEPTH ADDED:

FIELD ID	SAMPLE	INTVL	BLOW COUNT	% REC & RQD	FIELD	OFFICE

GROUND WATER :DURING DRILLING :________ AT COMPLETION:______ 24HOURS:_______ CAVED:_______

BACKFILL MATERIALS: (circle) SOIL BENTONITE ASPHALT CONCRETE

BORING LOG CONTINUED

BORING NO.

FIELD ID	SAMPLE	INTVL	BLOW COUNT	% REC & RQD	FIELD	OFFICE

APPENDIX 3
INDOT BORING LOG EXAMPLE

INDOT BORING LOG

BORING NO.: **TB-01**
SHEET 1 OF 1
LATITUDE :
LONGITUDE :
DATUM :
DATE STARTED : 03-15-18
DATE COMPLETED : 03-15-18

ROUTE #: US-31 COUNTY : Marshall
PROJECT TYPE: Small Structure Replacement
LOCATION : Us 31, 1.95 Mi N Of Sr-10
DES NO. : 1298559 PROJECT NO.:

ELEVATION	: 817.0	BORING METHOD	: HSA	HAMMER	: Auto
STATION	: 1959+88	RIG TYPE	: Truck	DRILLER/INSP	: DT/LB
OFFSET	: 70.0 ft Left	CASING DIA.	: 8 in	TEMPERATURE	: 39 °F
LINE	: 'CL'	CORE SIZE	:	WEATHER	: Clear
DEPTH	: 25.0 ft				

GROUNDWATER: ▽ Encountered at 19.0 ft ▼ At completion DRY ▼ NA After NA hours ▩ Caved in at 12.0 ft

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	SAMPLE NUMBER	SPT per 6"	% RECOVERY	MOISTURE CONTENT	UNCONF. COMP., ksf	ATTERBERG LIMITS LL	PL	PI	REMARKS
816.0		**Soil**. 1.0	SS 1	8 10 13	100	7.7					
	2.5										
	5.0		SS 2	8 8 11	100						
	7.5	**Sandy Loam**, **A-4**, Brown, Moist, Medium Dense To Dense, (Test TB-2 SS-4).	SS 3	3 8 15	100						
	10.0		SS 4	5 14 15	100						
	12.5		SS 5	6 14 19	0						
804.0		13.0									
	15.0										
	17.5										
	20.0	**Sandy Loam**, **A-2-4 (0)**, Brown, Wet, Very Loose, (Test TB-1 SS-6).	SS 6	2 2 2	100			NP	NP	NP	
	22.5										
792.0	25.0	25.0	SS 7	2 1 2	100						
		Bottom of Boring at 25.0 ft									
	27.5										
	30.0										

APPENDIX 4
INDOT CONE PENTRATION TEST EXAMPLE

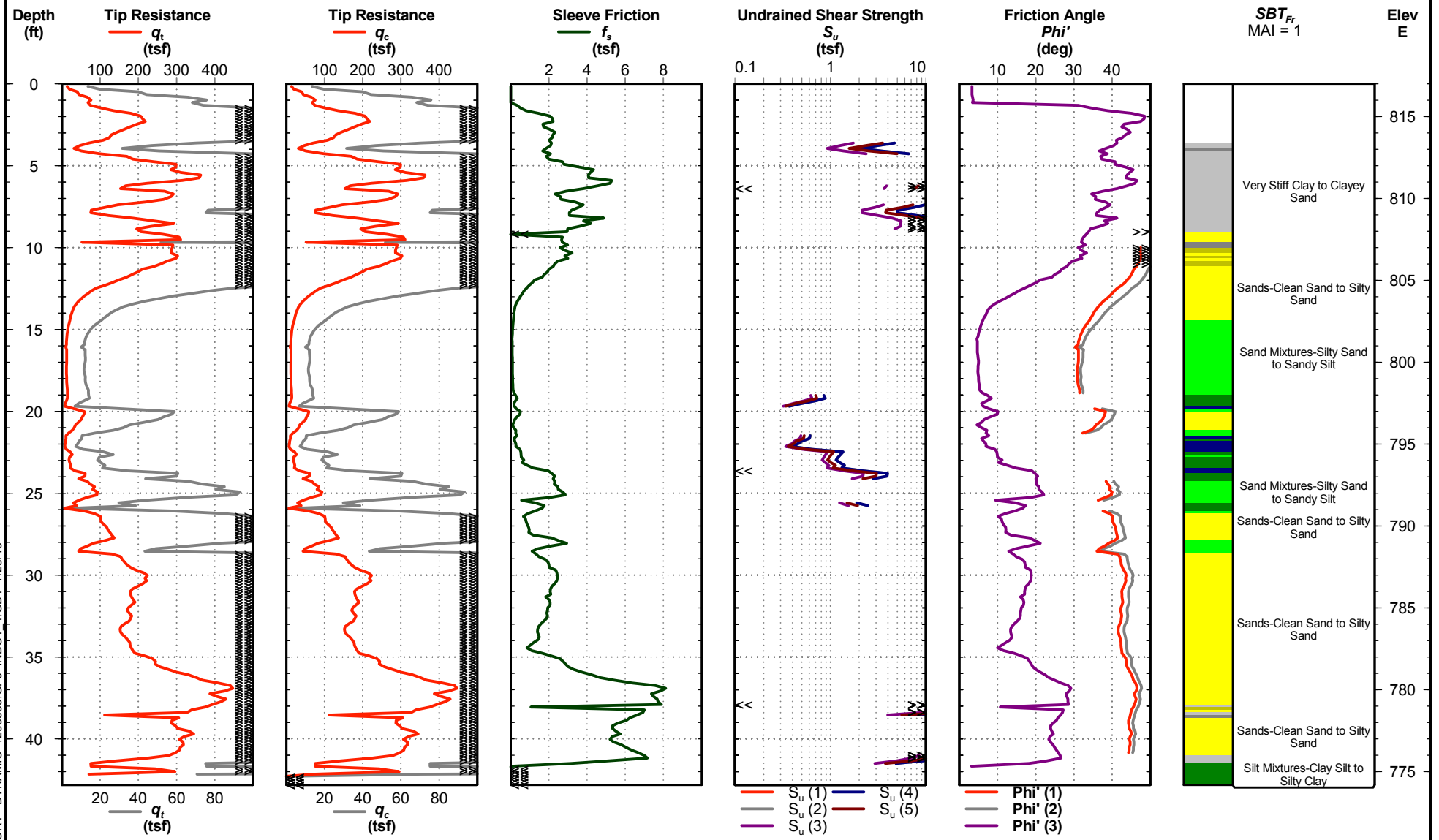
INDOT Cone Penetration Test

Date : 3/15/2018
Route : US-31
County : Marshall
Project Type : Small Structure Replacement
Location : Us 31, 1.95 Mi N Of Sr-10

Des Number : 1298559
Project Number :
Operator : DT

Station : 1959+95
Line : CL
Offset : 70.0 ft Left

CPT Number : *CPT-1X*
Page : 1 of 1
Elevation : 817.0
Depth : 42.8 ft
Water : 0.0 ft



Electronic Filename: us31 1298559 cpt -1.cpt

CPT REPORT - DYNAMIC 1298559.GPJ INDOT_4.GDT 7/25/18

APPENDIX 5
INDOT PAVEMENT CORE REPORT EXAMPLE

Example Pavement Core Report

PAVEMENT CORE REPORT

Des No.:

Location:

Road	Core No.	Date Cored	Core Dia.	Station	Offset	Line

Photo of Core next to measurement tape

Photo of Core Location looking down the roadway

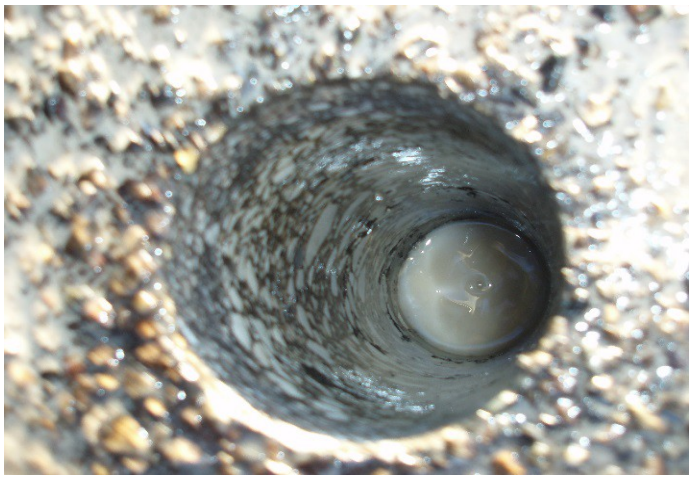
Photo inside the hole where core was extracted

Photo of the base stones at the base of the pavement core

Depth (inches)	Pavement Type	Notes

Recovered Core Length (inches)	In-hole Depth (inches)	Recovery (%)

Location	Core No.	Date Cored	Core Dia.	Station	Offset	Line
SR 29	PC-2	10/17/2018	4	34+75	6 ft Lt	CL

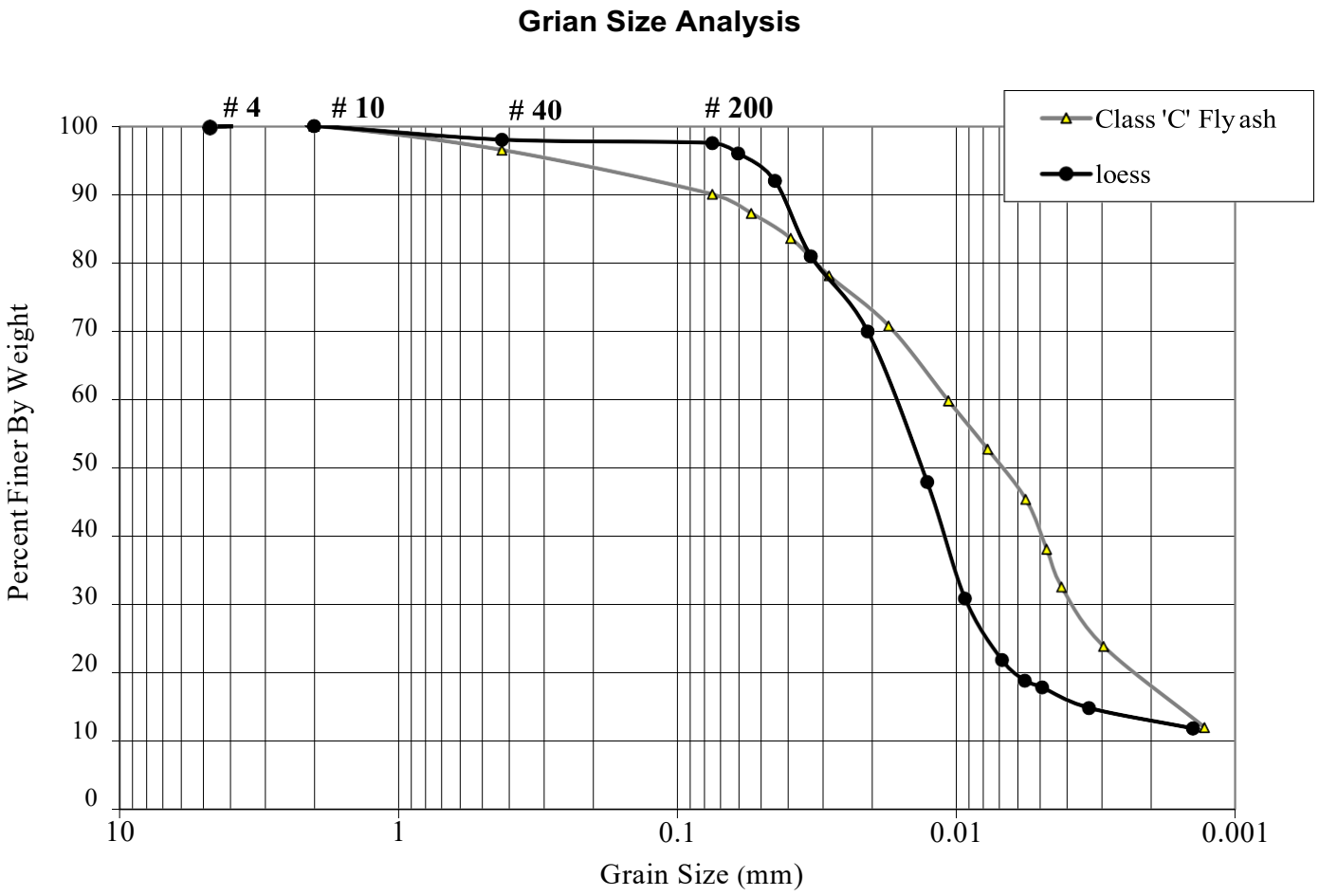


Depth (inches)	Pavement Type	Notes
13	Asphalt	

Recovered Core Length (inches)	In-hole Depth (inches)	Recovery (%)
13		100

APPENDIX 6
GRAIN SIZE EXAMPLE

Grain Size Example



Boulders	Gravel	Sand		Silt	Clay
		Coarse	Fine		

Sample Identification.		Station / Offset / Line			Dept, meters			Elev. USCGS			
RB-5	SS-3	2+300	3.0m Lt.	"A"	1.2 - 1.7			258.8 + 258.1			
Lab #	Class	Spec. Gravity	pH	% Gravel	% Sand	% Silt	% Clay	MC %	LL	PL	PI
N/A	Loam A-4(1)										

APPENDIX 7
CONSOLIDATION TEST (SPECIMEN DATA)

Consolidation Test (Specimen

Data)

Date:_____

Project: _____

Boring No: _____

Classification: _____

Tare No.			Before Test			After Test	
			Specimen		Trimmings	Specimen	
			Ring and Plates				
Weight in grams	Tare plus wet soil						
	Tare plus dry soil						
	Water	W_W	W_W			W_{WF}	
	Tare						
	Dry Soil	W_S					
Water Content		w	$^{W}_{O}$	%	%	$^{W}_{F}$	
Consolidometer No.					Area of specimen A, sq. in.		
Weight of ring, g					Height of specimen, H, in.		
Weight of plates, g					Specific gravity of solids, G_S		

$$H_S = \frac{W_S}{AG\ \gamma_W}$$

$$\text{Degree of saturation after test, } Sr = \frac{H_{WF}}{H_f - H_s} = \_\_\_\_\_ \%.$$

Net change of height of specimen at end of test, ΔH=_____in.

Height of specimen at end of test, Hr = H - ΔH=_____in.

Remarks: _____

_____

$$\text{Void ratio after tests} = \frac{H_f - H_s}{H_s} = \_\_\_\_\_ =$$

$$\text{Degree of saturation before test, } So = \frac{H_w}{H - H_s} = \text{—} = \text{—} \%$$

$$\text{Dry Density} = \frac{Ws}{H_s \text{ x } A} = \_\_\_\_\_ \text{ lb/cu ft.}$$

Technician:_____Computed by:_____Checked by:_____

APPENDIX 8
CONSOLIDATION TEST (TIME-CONSOLIDATION DATA)

**Consolidation Test (Time-
Consolidation Data)**

Date:_________________________

Subject: ____

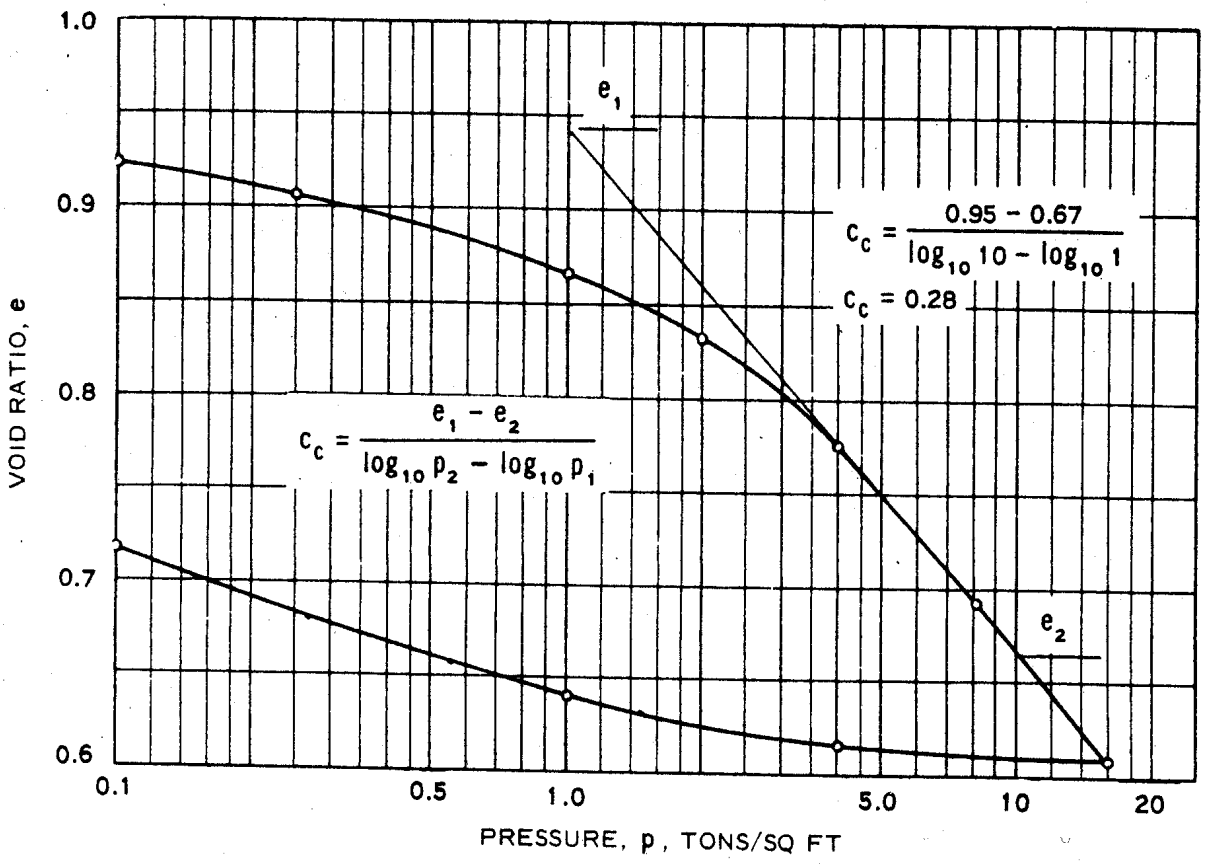
Boring No:_________________ Sample No:________________ Consolidation No: ___________

Date & Pressure	Time	Elapsed time, min.	Dial Rdg. 10^{-4} in.	Temp. ºC	Date & Pressure	Time	Elapsed time, min.	Dial Rdg. 10^{-4} in.	Temp. ºC
						Technician:			

APPENDIX 9
E-LOG P CURVE CONSOILDATION TEST

E-Log P Curve Consolidation

Test



Boring No:_____Sample No:_____Depth: _____

Soil Description: _____

Liquid Limit:_____Plastic Limit:_____% Fines:_____

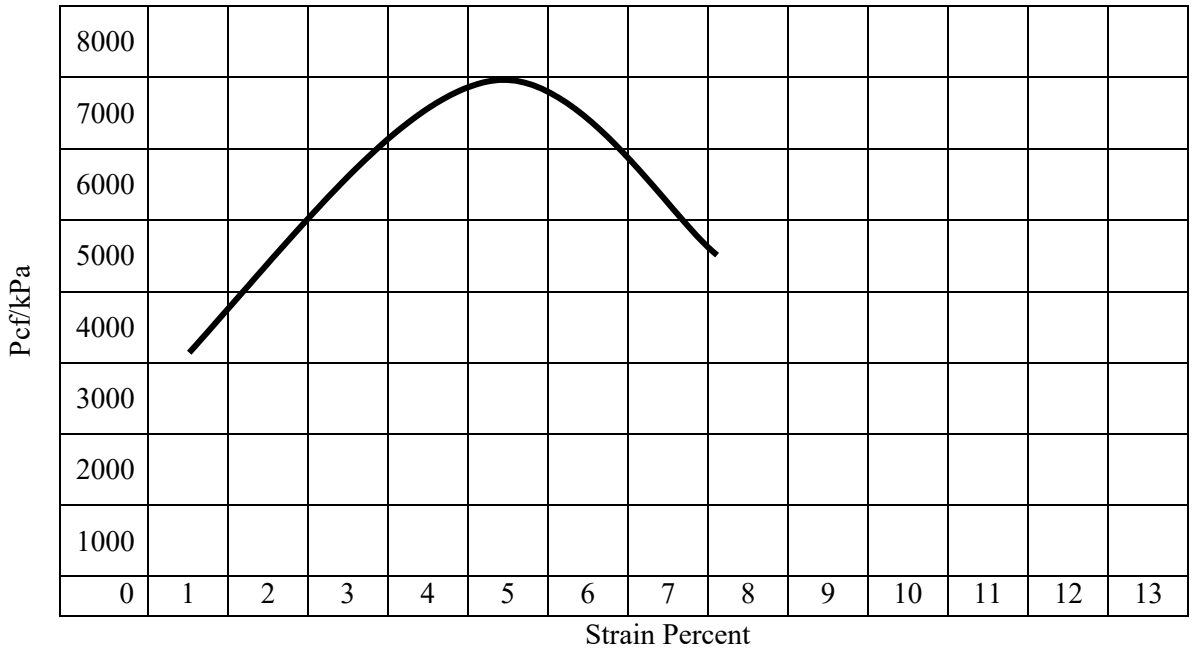
Wet Density, t:_____Water Content, W%:_____Initial Void Ratio, ℓo: _____

Cc:_____Cr:_____Pc:_____Cv: _____

APPENDIX 10
STRAIN PERCENTAGE WORKSHEET UNCONFINED COMPESSIVE STRENGTH TEST

Strain Percentage Worksheet Unconfined

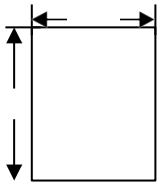
Compressive Strength Test



Sample Location: _____

Depth: _____ Moisture Content _____

Strain Rate: _____ Dry Unit Weight _____



Soil Description: _____

Soil Description: _____

Soil Description: _____

Project #: _____ Des. #: _____

Road: _____ County: _____

Location: _____

APPENDIX 11
TRIAXIAL COMPRESSION TEST (SPECIMEN DATA)

Triaxial Compression Test (Specimen Data)

						Date:		
Project:								
Boring No:				Sample No:				
Type of Test:				Confining Pressure		tons/sq ft		
Test No.				Classification:				
Before test								
			Specimen		Trimmings		Specimen	
Tare No:								
Weight,q	Tare plus wet soil							
	Tare plus dry soil							
	Water	W_W		W_{WO}		W_{wf}		
	Tare							
	Wet Soil	W_S						
	Dry Soil	W						
Water Content	w		%	w_O	%	w_f	%	
Initial Condition of Specimen								
Diameter, inch (cm)	D_o	Top		Center	Bottom		Average	
Height, cm	H_o			Volume of solids, in.^{3}			V_s	
Area sq inch = 7.854 D^2	A_o			Void ratio = $(V_o - V_s) \div V_s$			e_o	
Volume = in.^{2}	V_o			Saturation, %			S	
Specific gravity of solids	G			Dry Density, lb/cu ft			$_d$	
Condition of Specimen After Consolidation (R and S Tests)								
Change in height during consolidation, in.	δH_o			Volume, in. =	$A_c H_c$		V_c	
Height, = H_o -δH_oin.	H_c			Void Ratio = $(V_c - V_s) \div V_s$			e_c	
Area, sq. in.	A_c			Saturation, %			S_c	
Condition of Specimen After Test (R and S Tests)								
Diameter, cm	D_r	Top		Center	Bottom		Average	
Change in height during Shear Tests, in.	ΔH			Volume, in.^{3} = $A_f H_f$			V_f	
Height, in. = H_c - Δ H	H_r			Void Ratio = $(V_r - V_s) \div V_s$			e_r	
Area, sq inch	A_f			Saturation, %			S_r	

$$Ws = \frac{W}{w}, v_s = \frac{W_s}{Y_w G_s}; S_o = \frac{\frac{w_o}{100} x \frac{w_s}{yw}}{V_o - V_s} x100, s_c = \frac{\frac{w_c}{100} x \frac{w_s}{yw}}{V_c - V_s} x100,$$

$$S_r = \frac{\frac{wf}{100} x \frac{w_s}{yw}}{Vf - Vs} x\ 100, = \frac{w_s}{Vo} x\ 62.4,\ Ac = A_o \frac{H_o - \Delta H}{H_o}$$

w = water content

Remarks:

Technician:		Computed by:		Checked by:	

APPENDIX 12
TRIAXIAL COMPRESSION (Q) AND TEST AXIAL LOADING DATA

Triaxial Compression (Q) and Test Axial Loading Data

Date: _____

Project: _____

Boring No: _____ Sample No: _____ Test No: _____

Type Test: _____ Confining Pressure: _____ lb/sq ft: _____

Time	Elapsed Time min.	Dial Reading 10^{-2}	Cumulative Change (Δ H) 10^{-2} in	P Axial Load lb	P Axial Strain * $\frac{\Delta H}{H}$	ε	^corr = $\frac{A^{**}}{1 - \varepsilon}$ sq in.	Deviator Stress = $\frac{P}{}$ x 0.465 Corr tons/sq ft

* Use H_o for Q tests and H_c for R tests H_o_____inch (cm)_____in A_o sq in

**Use H_o for Q tests and H_c for R tests H_o_____inch (cm)_____in A_o sq in

Test time to failure_____min. Type Failure:

Technician:

APPENDIX 13
TRIAXIAL COMPRESSION TEST (SPECIMEN DATA)

Triaxial Compression Test (Specimen Data)

						Date:		
Project:								
Boring No:				Sample No:				
Type of Test:				Confining Pressure		tons/sq ft		
Test No.				Classification:				
Before test								
			Specimen		Trimmings		Specimen	
Tare No:								
Weight,q	Tare plus wet soil							
	Tare plus dry soil							
	Water	W_W		W_{WO}		W_{wf}		
	Tare							
	Wet Soil	W_S						
	Dry Soil	W						
Water Content	w		%	w_O	%	w_f	%	
Initial Condition of Specimen								
Diameter, inch (cm)	D_o	Top		Center	Bottom		Average	
Height, cm	H_o			Volume of solids, in.^{3}			V_s	
Area sq inch = 7.854 D^2	A_o			Void ratio = $(V_o - V_s) \div V_s$			e_o	
Volume = in.^{2}	V_o			Saturation, %			S	
Specific gravity of solids	G			Dry Density, lb/cu ft			$_d$	
Condition of Specimen After Consolidation (R and S Tests)								
Change in height during consolidation, in.	δH_o			Volume, in. =	$A_c H_c$		V_c	
Height, = H_o -δH_oin.	H_c			Void Ratio = $(V_c - V_s) \div V_s$			e_c	
Area, sq. in.	A_c			Saturation, %			S_c	
Condition of Specimen After Test (R and S Tests)								
Diameter, cm	D_r	Top		Center	Bottom		Average	
Change in height during Shear Tests, in.	ΔH			Volume, in.^{3} = $A_f H_f$			V_f	
Height, in. = H_c - Δ H	H_r			Void Ratio = $(V_r - V_s) \div V_s$			e_r	
Area, sq inch	A_f			Saturation, %			S_r	

$$Ws = \frac{W}{w}, v_s = \frac{W_s}{Y_w G_s}; S_o = \frac{\frac{w_o}{100} x \frac{w_s}{yw}}{V_o - V_s} x100, s_c = \frac{\frac{w_c}{100} x \frac{w_s}{yw}}{V_c - V_s} x100,$$

$$S_r = \frac{\frac{wf}{100} x \frac{w_s}{yw}}{Vf - Vs} x\ 100, = \frac{w_s}{Vo} x\ 62.4,\ Ac = A_o \frac{H_o - \Delta H}{H_o}$$

w = water content

Remarks:

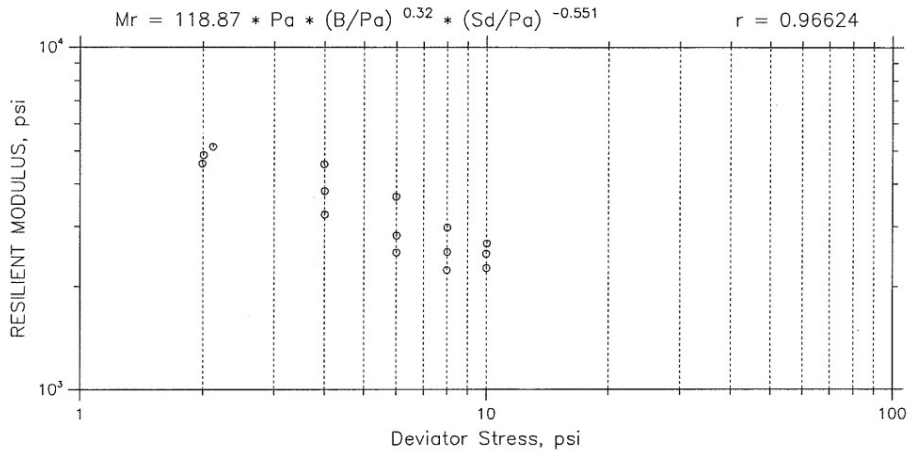
Technician:		Computed by:		Checked by:	

APPENDIX 14
RESILIENT MODULUS TEST DATA SHEET OMC

Resilient Modulus Test Data Sheet OMC

RESILIENT MODULUS TEST DATA

SUMMARY REPORT



Confining Stress S3 (psi)	Nom. Max. Deviator Stress (psi)	Mean Deviator Stress (psi)	Std. Dev. Deviator Stress (psi)	Mean Bulk Stress (psi)	Mean Resilient Strain (%)	Std. Dev. Resilient Strain (%)	Mean Resilient Modulus (psi)	Std. Dev. Resilient Modulus (psi)
5.944	2	2.009	0.0220	19.84	0.04	0.00	4860.1	41.039
5.957	4	3.991	0.0303	21.86	0.09	0.00	4568.2	9.5005
5.87	6	5.994	0.0070	23.6	0.16	0.00	3667.4	7.162
5.911	8	8.012	0.0232	25.74	0.25	0.00	2976	1.644
5.882	10	10.02	0.0083	27.67	0.35	0.00	2671.8	6.3841
3.888	2	2.118	0.3716	13.78	0.04	0.01	5141.3	143.77
3.925	4	4.003	0.0362	15.78	0.10	0.00	3810	7.4317
3.905	6	6.011	0.0211	17.72	0.20	0.00	2820.6	7.0813
3.965	8	8.007	0.0225	19.9	0.30	0.00	2523.2	1.1863
3.926	10	9.988	0.0524	21.77	0.37	0.00	2492.2	3.1053
1.987	2	1.994	0.0078	7.956	0.04	0.00	4586.8	26.805
1.956	4	4.005	0.0237	9.873	0.12	0.00	3253.1	8.3585
1.969	6	6.003	0.0194	11.91	0.22	0.00	2515	2.5653
1.974	8	7.992	0.0287	13.92	0.33	0.00	2232.9	1.6959
1.977	10	10	0.0026	15.93	0.41	0.00	2262.5	0.55944

Project: Covington	Location: Allen Co.	Project No.: DES 0710928
Boring No.: RB - 2A	Tested By: LS	Checked By:
Sample No.: 10-RM001~2	Test Date: 01/15/2010	Depth: 1' - 3'
Test No.: #2	Sample Type: remolded	Elevation: n/a
Description: CLAY A- 6 (9) .....Maximum Dry Density 110.7 pcf and 17.1% Optimum Moisture		
Remarks: Tested at 2% above Optimum Moisture Content. (Permanent Strain = 0.34328% after Conditioning Sequence)		
File: C:\Documents and Settings\MRSPITSY\Desktop\RM file\2010\RM001\10-RM001~2.dat		

Tue, 19-JAN-2010 09:42:00

APPENDIX 15
SUBGRADE EVALUATION
EXAMPLE

Subgrade Evaluation (example)

Boring No.	Sta	Offset	Line	Sample No	Depth (ft.)	Soil Type	AASHTO Class.	SPT (N)	In-situ Dry Density (pcf)	Max. Dry Density (pcf)	In-situ % Comp action	Nat. Moisture (%)	Opt iMoisture (%)	% Moi Diff
RB-06	276+00	20’ Lt	“A”	SS-1	2.0-3.5	Loam	A-6	5	110.9	110.0	100.8	14.5	17.8	-3.3
RB-09	290+00	20’ Rt	“A”	SS-2	3.5-5.0	Silty Clay Loam	A-6	13	111.5	110.0	101.4	17.6	17.8	-0.2
RB-11	303+00	30’ Rt	“A”	SS-1	1.5-3.0	Silty Clay Loam	A-6	7	109.1	110.0	99.2	17.8	17.8	0.0
RB-16	322+50	35’ Lt	“A”	SS-1	2.0-3.5	Silty Clay Loam	A-6	9	108.3	110.0	98.4	16.0	17.8	-1.8
RB-22	343+00	20’ Lt	“A”	SS-1	2.0-3.0	Loam	A-6	9	119.5			110.6		
RB-27	385+00	35’ Lt	“A”	SS-1	2.0-3.0	Silty Clay Loam	A-6	10	109.8	110.0	99.8	12.7	17.8	-5.1
RB-36	440+00	15’ Lt	“PR-A”	SS-2	1.5-3.5	Silty Clay Loam	A-6	12	108.2	110.0	98.3	18.7	17.8	0.9

APPENDIX 16
PEAT UNIT WEIGHT EXAMPLE

Peat Unit Weight (example)

Boring No.	Station	Offset	Line	Sample No.	Depth (feet)	Soil Type	AASHTO Class.	SPT (N)	Natural Moisture (%)	Max. Dry Density (pcf)
RB-17B	326+00	98'Rt	"A"	ST-2	16.0-18.0	Silty Clay w/Little Organic Matter	A-7-5	0	82.6	91.8
RB-17B	326+50	98'Rt	"A"	SWT-9	33.5-35.0	Silty Clay w/Little Organic Matter	A-7-5	0	103.6	90.2
RB-17B	326+50	98'Rt	"A"	ST-3	36.0-38.0	Silty Clay w/Little Organic Matter	A-7-5	0	71.5	81.0
RB-18	326+50	54'Lt	"A"	SS-1	0.5-2.0	Silty Clay w/Traces of Organic Matter	A-6	2	55.4	92.3
RB-18	326+50	54'Lt	"A"	SS-4	8.5-10.0	Silty Clay w/Little Organic Matter	A-7-5	0	65.0	93.2
RB-18	326+50	54'Lt	"A"	SS-9	21.0-22.5	Silty Clay w/Little Organic Matter	A-7-5	0	119.1	88.8
RB-18B	328+00	51'Lt	"A"	SS-2	3.0-4.5	Silty Clay w/Little Organic Matter	A-7-5	1	89.1	105.2*
RB-19	332+15	35'Rt	"A"	SS-1	1.0-2.0	Silty Clay w/Traces of Organic Matter	Visual	25	35.4	110.3*
Average of Peat Unit Weight										89.5*
RB-18D	326+50	30'Lt	"A"	SS-4	8.5-10.0	Loam	A-7-6	16.3	16.3	120.9*
RB-18E	326+45	54'Lt	"A"	ST-1	5.0-7.0	Clay w/Little Organic Matter	Visual	75.6	75.6	119.8

***** *Not included in average*

APPENDIX 17
TOPSOIL TEST RESULTS TABLE

INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF GEOTECHNICAL SERVICES
Summary of Existing Topsoil Test Results for use with Plant Growth Layer

Rev 11/17

Date: 3/14/2018
Des. No.: 1298559
Project: US 31 Small Structure Pipe Lining
Location: US 31

					ANALYSIS							
REF.	LOCATION				AASHTO T 289	AASHTO T 88 and T 89	AASHTO T 88 and T 89	AASHTO T 88 and T 89	AASHTO T 88 and T 89	AASHTO T 267 and T 21**	Bray P-1 Equivalent	NCRRP 221, Chapt 7***
Boring Log	Station (Road Post)	Offset (feet)	Lt/Rt	Tested Depth (inch)	pH	Gravel*	Sand	Silt	Clay	Organic Content (% by Wt)	Phosphorus (ppm)	Potassium (ppm)
						(% by Weight)						
TB-1	9+38	18	Rt	6" - 12"	8.8	22.4	58.8	10.3	3.8	2.1	7	39
TB-2	10+10	18	Lt	6" - 12"	8.9	28.5	55.2	9.7	4.7	2.3	8	57
TB-3	10+50	68	Rt	6" - 12"	8.6	26.3	56.4	11.1	5.1	1.9	4	37
	Acceptable Ranges per 914.01 =				6.0 - 7.3	N/A	5 - 50%	30 - 80%	5 - 30%	3 - 10%**	20 - 80	105 - 250

***** For informational purposes only

** In Davies, Gibson, Knox, Pike Posey, and Vanderburgh Counties, AASHTO T 21 shall also be performed. Acceptable range is 4 - 10%

*** North Central Regional Research Publication 221, Chapter 7

Note: All existing topsoil test results presented herein are for information only.

APPENDIX 18
MSE WALL DESIGN AND GEOTECHNICAL CHECK TABLE

MSE Wall Design Parameter and Geotechnical Check Table

MSE Wall Design Parameter and Geotechnical Check Table

Design Parameter	Value (area 1)*
Maximum Calculated Settlement	"x" inches
Maximum Differential Settlement	"y" inches
Time for settlement completion	"z" days
Maximum wall height	XX ft
Design Recommendations	
Minimum Reinforcement Length/Height Ratio	0.75H (example)
Undercut required	**yes**/no
Undercut depth	X feet
Undercut area	from Sta. XX to XX line "XX"
Undercut Backfill Material	XXXXXXX
Seismic recommendation	
Site Class	
Seismic Zone	
Peak Ground Acceleration As	
Geotechnical Analysis Checks	**CDR**
Sliding	>=1.0
Eccentricity	>=1.0
Global Stability	Factor of safety/ resistance factor
Factored Bearing Resistance	5400 psf (example value)
Foundation Soils Strength Parameters**	
Cohesion	
internal friction angle	

Notes:
*more sheets can be added to include recommendations for each area of concern.
**if varying soil conditions encountered underneath the MSE wall, the table can be expanded to include all soil profile information

APPENDIX 19
INDOT CHECKLIST FOR RETAINING STRUCTURES

INDOT Check List for Retaining Structures

Masonry Retaining Wall

*Indicates higher likelihood

Wall Facing & Vertical Support Columns are susceptible to show…

-Delamination/Spall/ Patched Area

-Exposed Rebar/Welded Wire Fabric/Strands

-Efflorescence/Rust Staining

-Mortar Breakdown (Cracking)*

-Split/Spall

-Patched Area

-Masonry Displacement*

-Distortion

-Bulging*

-Vertical Rotation

-Horizontal Rotation

-Separation*

-Graffiti

-Vegetation Growth

-Freeze-thaw Damage

-Leakage

-Erosion

-Damage (from impact)

Horizontal Coping, Vertical coping, and Masonry Architectural Facing is susceptible to show…

-Everything listed in first column **EXCEPT** for erosion.

Wall Railing (masonry) is susceptible to show…

-Everything in first column **EXCEPT** for leakage and erosion.

R.C. Cantilever & R.C. Counterfort Retaining Wall

(Reinforced Concrete)

*Indicates higher likelihood

Wall Facing & Vertical Support Columns are susceptible to show…

-Delamination/Spall/ Patched Area

-Exposed Rebar/Welded Wire Fabric/Strands

-Efflorescence/Rust Staining

-Cracking*

-Abrasion/Wear

-Distortion

-Bulging*

-Vertical Rotation

-Horizontal Rotation

-Separation

-Graffiti

-Vegetation Growth

-Freeze-thaw Damage

-Leakage

-Erosion

-Damage (from impact)

Spread Footing & Pile/ Caissons are susceptible to show…

-Scour

-Everything listed in first column **EXCEPT** for bulging, vertical rotation, horizontal rotation, separation, and leakage.

Horizontal Coping, Vertical Coping, and Concrete Architectural Facing is susceptible to show…

-Everything listed in first column **EXCEPT** for erosion.

Wall Railing (concrete) is susceptible to show…

-Everything listed in first column **EXCEPT** for abrasion/wear.

Prestressed Concrete

R.C. Cantilever & R.C. Counterfort retaining walls made from pre-stressed concrete have all of the same susceptibilities as reinforced concrete with one exception, all elements are also susceptible to show exposed prestressing.

Cantilever Sheet Pile Retaining Wall

*Indicates higher likelihood

Wall Facing & Vertical Support Columns are susceptible to show…

-Corrosion*

-Cracking

-Connection Distress

-Distortion

-Bulging

-Vertical Rotation

-Horizontal Rotation

-Separation

-Graffiti

-Vegetation Growth

-Leakage

-Erosion

-Damage (from impact)

Horizontal Coping, Vertical coping, and Steel Architectural Facing is susceptible to show…

-Everything listed in first column **EXCEPT** for erosion.

Pile/Caissons are susceptible to show…

-Scour

-Settlement

-Everything listed in first column **EXCEPT** for bulging, vertical rotation, horizontal rotation, leakage, and separation.

Wall Railing (steel) is susceptible to show…

-Everything in first column **EXCEPT** for settlement and erosion.

Anchored Bulkhead Retaining Wall

Anchored Bulkhead Retention Walls have all of the same susceptibilities as Cantilever Sheet Pile retention Walls. However, they also include an anchorage, which introduce defects specific to the anchor. These include…

-Corrosion -Deterioration -Effectiveness of Anchor (slippage)

-Connection Distress -Distortion -Damage (from impact)

Diaphragm, Bored Pile, & Soldier Pile Retaining Wall

*Indicates higher likelihood

Wall Facing & Vertical Support Columns are susceptible to show…

-Delamination/Spall/ Patched Area

-Exposed Rebar/Welded Wire Fabric/Strands

-Efflorescence/Rust Staining

-Cracking*

-Abrasion/Wear

-Distortion

-Bulging*

-Vertical Rotation

-Horizontal Rotation

-Separation

-Graffiti

-Vegetation Growth

-Freeze-thaw Damage

-Leakage

-Erosion

-Damage (from impact)

Horizontal Coping, Vertical Coping, and Concrete Architectural Facing is susceptible to show…

-Everything listed in first column **EXCEPT** for erosion.

Wall Railing (concrete) is susceptible to show…

-Everything listed in first column **EXCEPT** for abrasion/wear.

Pile/Caissons are susceptible to show…

-Scour

-Everything listed in first column **EXCEPT** for bulging, vertical rotation, horizontal rotation, separation, and leakage.

Anchorage is susceptible to show…

-Corrosion -Deterioration -Effectiveness of Anchor (slippage)

-Connection Distress -Distortion -Damage (from impact)

Reinforced Earth & Mechanically Stabilized Earth (MSE) Retaining Wall

*Indicates higher likelihood

Wall Facing & Vertical Support Columns are susceptible to show…

-Delamination/Spall/ Patched Area

-Exposed Rebar/Welded Wire Fabric/Strands

-Efflorescence/Rust Staining

-Cracking*

-Abrasion/Wear

-Distortion

-Bulging

-Vertical Rotation

-Horizontal Rotation

-Separation

-Graffiti

-Vegetation Growth

-Freeze-thaw Damage

-Leakage

-Erosion

-Damage (from impact)

Horizontal Coping, Vertical Coping, and Concrete Architectural Facing is susceptible to show…

-Everything listed in first column **EXCEPT** for erosion.

Pile/Caissons are susceptible to show…

-Scour

-Everything listed in first column **EXCEPT** for bulging, vertical rotation, horizontal rotation, separation, and leakage.

Anchorage is susceptible to show…

-Corrosion

-Deterioration

-Effectiveness of Anchor (slippage)

-Connection Distress

-Distortion

-Damage (from impact)

Timber/Bin/Wire Retaining Walls

*Indicates higher likelihood

Wall Facing & Vertical Support Columns are susceptible to show…

-Connection Distress

-Decay/Section Loss*

-Check/Shake

-Crack (Timber)

-Split/Delamination*

-Abrasion/Wear

-Distortion

-Bulging*

-Vertical Rotation

-Horizontal Rotation

-Separation

-Graffiti

-Vegetation Growth

-Leakage

-Settlement

-Erosion

-Corrosion*

-Damage (from impact)

Pile/Caissons are susceptible to show…

-Scour

-Settlement

-Everything listed in first column **EXCEPT** for bulging, vertical rotation, horizontal rotation, leakage, and separation.

Horizontal Coping, Vertical Coping, and Timber Architectural Facing is susceptible to show…

-Everything listed in first column **EXCEPT** for erosion.

Wall Railing (timber) is susceptible to show…

-Everything listed in first column **EXCEPT** for leakage and erosion.

APPENDIX 20
PERFORMANCE CRITERIA REPORT

Performance Criteria Report

Geotechnical Engineering

Report Completion

Schedule

Schedule

Did the consultant meet the delivery schedule?

Exceeds - An acceptable final product was delivered more than 30 calendar days ahead of schedule.

Above Average - An acceptable final product was delivered more than 14 but less than 30 calendar days ahead of schedule.

Satisfactory - An acceptable final work product was delivered within the scheduled time.

Improvement Required - An acceptable final work product was delivered up to two months behind schedule.

Unsatisfactory - An acceptable final work product was delivered more than two months behind schedule.

Not Applicable - Not Applicable

Budget

Budget

Did the consultant deliver the services cost effectively?

Exceeds - The consultant improved the operations budget more than 10%.

Above Average - The consultant improved the operations budget more than 5%.

Satisfactory - The consultant maintained the operations budget within 5%.

Improvement Required - The consultant had budget slippage of 5% to 10%.

Unsatisfactory - The consultant exceeded the budget by more than 10%.

Not Applicable - Not Applicable

Drilling Procedure

Quality

Were samples collected in accordance with INDOT standards?

Satisfactory - All samples were collected in accordance with INDOT standards.

Improvement Required - Some samples were not collected in compliance with INDOT standards.

Unsatisfactory - Most samples were not in compliance with INDOT standards. As a result the consultant was instructed to remobilize and collect the required samples.

24 Hour Water Levels

Quality

Were 24 hour water levels recorded for boreholes at the appropriate time?

Satisfactory - 24hr water level readings were recorded.

Improvement Required - 24hr water level readings were not recorded in boreholes.

Unsatisfactory - No 24hr water level readings were recorded.

Not Applicable - Not Applicable

Geotechnical Engineering

Backfilling Boreholes

Quality

Were boreholes appropriately backfilled?

Satisfactory - All boreholes were backfilled.

Improvement Required - Some boreholes backfilled correctly, consultant requested to go back and fill unfilled holes.

Unsatisfactory - None of the boreholes were backfilled. Consultant was required to go back and fill the holes.

Traffic Control

Quality

Were appropriate traffic control measures followed?

Satisfactory - Met all requirements.

Improvement Required - Was incomplete and required major revisions.

Unsatisfactory - Consultant did not have traffic control when it was required.

Laboratory Procedures

Quality

Were laboratory tests performed in accordance with requirements?

Above Average - All tests were performed in accordance with standards and requirements, with additional graphs and plots of test data.

Satisfactory - All tests were performed in accordance with standards and requirements.

Improvement Required - Some tests were not performed in accordance with standards and requirements.

Unsatisfactory - None of the tests were performed in accordance with the standards and requirements.

Engineering Recommendations

Quality

Were engineering recommendations technically correct and economically effective?

Exceeds - Engineering recommendations were both technically correct and presented the most economical engineering solutions. No revisions were required to the original submittal.

Above Average - Engineering recommendations were technically correct and presented the most economical engineering solutions. Minor revisions were required to the original submittal.

Satisfactory - Engineering recommendations were adequate. Revisions were required to the original submittal.

Improvement Required - Initial engineering recommendations were inadequate. Revisions were required to the original submittal.

Unsatisfactory - Initial engineering recommendations were inadequate and inappropriate. Multiple revisions were required and multiple submittals were required to achieve an acceptable report.

Operations Responsiveness

Responsiveness

Willingness to answer questions and make appropriate changes to plans/documents.

Exceeds - Willingness to answer questions and make requested changes exceeded expectations and was proactive in addressing project issues.

Geotechnical Engineering

Above Average - The consultant revised plans/documents in accordance with comments and made additional improvements that had not been suggested but resulted in an improved product. Readily explained revisions and answered all questions.

Satisfactory - The consultant did revise the plans/documents in accordance with the comments and/or explained why revisions were not made and showed a willingness to answer questions.

Improvement Required - The Consultant did not revise some of the plans/documents in accordance with the comments and did not explain why some of the revisions were not made. Consultant showed some cooperation in answering questions but required several requests.

Unsatisfactory - The consultant did not comply with any of the above.

APPENDIX 21
SOIL PARAMETERS FOR PAVEMENT DESIGN

Soil Parameters for Pavement Design

Work Type **Soil Parameters Required**	New Roadway Alignment	Pavement Replacement or Reconstruction	Pavement Improvement Projects	Surface Treatment Projects	Rubblization or Full Depth Reclamation, FDR
Resilient Modulus (MR)* of predominant soils of prepared subgrade, psi	X	X			X
In situ MR for cut and at grade, psi	X				X
In situ MR of foundation soils, taken at 1-5 ft			X		
MR Historical Data				X	
Predominant Soil Type	X	X	X	X	X
% Passing #200	X	X	X	X	X
% Silt	X	X	X		X
% Clay	X	X	X		X
LL and PI, %	X	X	X	X	X
Altered Soils AASHTO classification after Subgrade Stabilization / Modification	X	X			X
Subgrade Treatment Type	X	X			X
Depth to Water Table Range	X	X	X	X	X
Subgrade Moisture Range, %	X	X	X		X
Optimum Moisture Content, %	X	X	X		X
Organic Content Range, % (if encountered)	X	X	X	X	X
Marl Content Range, % (if encountered)	X	X	X	X	X
Estimated Hydraulic Conductivity of subgrade, ft. /day	X	X			X
Subgrade Sulfate Content Range, ppm	X	X	X		X
Rock Elevation, ft.(if encountered)	X	X	X		X
Geotextile Type for Underdrains, if needed	X	X	X		X
Foundation Treatment	X	X			X
Other important information			X		

X represents the parameters that are require for each project type.

* At 95% optimum moisture content