



November 30, 2009

WD Transportation
7007 Discovery Blvd.
Dublin, Ohio 43017

Attention: Mr. Kevin Carpenter, P.E., P.S.
Roadway Division Manager

Reference: Permeability Testing Results
MAD-70-10.27
PID No. 83245
Madison County, Ohio
CTL Project No. 09050096COL

Dear Mr. Carpenter:

CTL Engineering, Inc. has completed the permeability (hydraulic conductivity) testing for the above referenced project. Results of the testing are provided in the attached summary table. The samples were obtained at the approximate locations indicated on the attached plan sheet.

We appreciate the opportunity to be of service to you on this project. If you have any questions or need further information, please do not hesitate to contact us.

Respectfully submitted,

CTL Engineering, Inc.

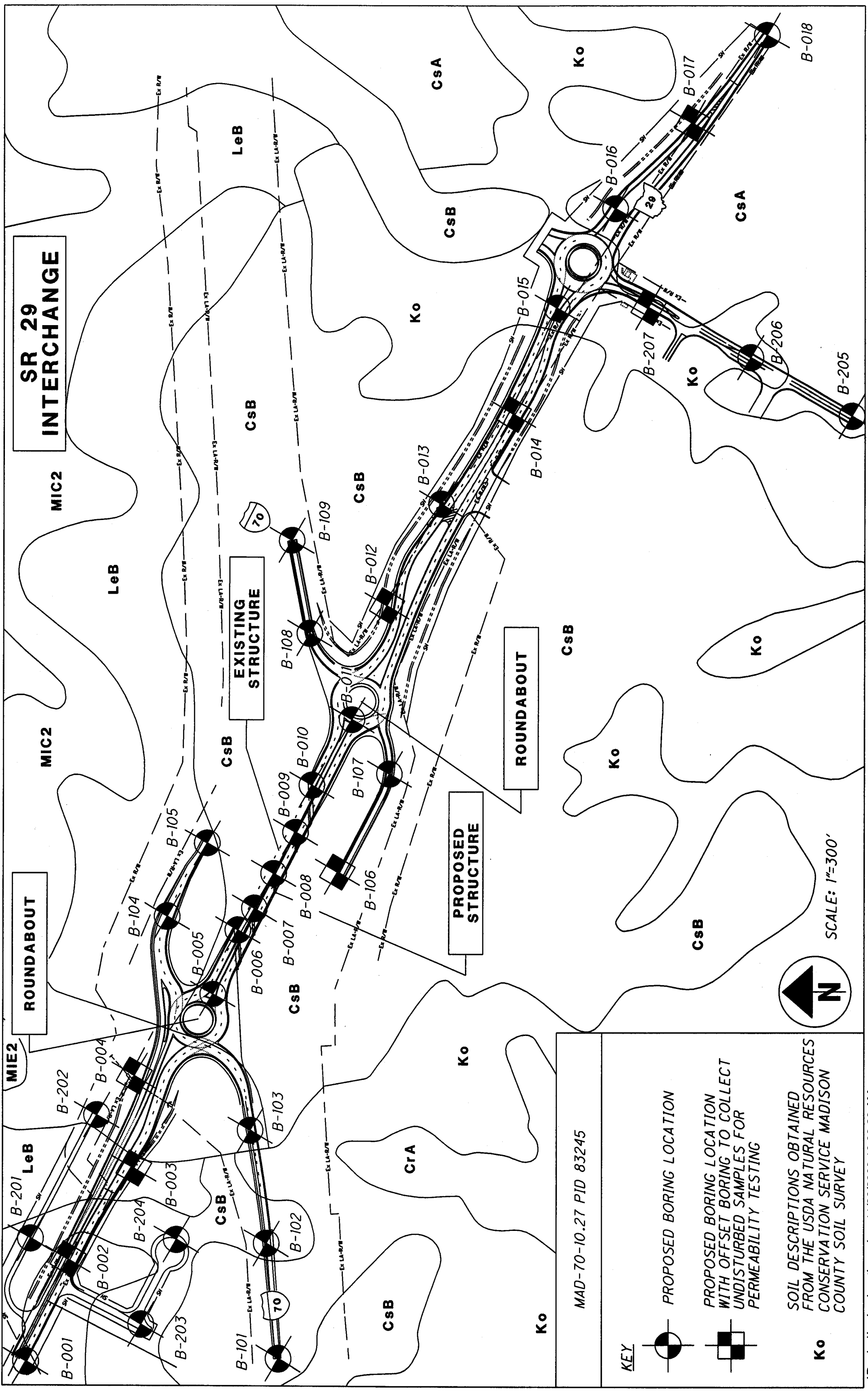
A handwritten signature in black ink, appearing to read 'Joe Grani', written over a horizontal line.

Joe Grani, P.E.
Project Engineer

A handwritten signature in black ink, appearing to read 'Roger Evans', written over a horizontal line.

Roger Evans, P.E.
Project Engineer

cc: Mr. Ferzan Ahmed, P.E., ODOT District 6 (via email)



SR 29 INTERCHANGE

EXISTING STRUCTURE

PROPOSED STRUCTURE


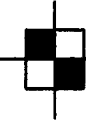
ROUNDABOUT



SCALE: 1"=300'

MAD-70-10.27 PID 83245

KEY

-  PROPOSED BORING LOCATION
-  PROPOSED BORING LOCATION WITH OFFSET BORING TO COLLECT UNDISTURBED SAMPLES FOR PERMEABILITY TESTING

Soil Descriptions: SOIL DESCRIPTIONS OBTAINED FROM THE USDA NATURAL RESOURCES CONSERVATION SERVICE MADISON COUNTY SOIL SURVEY

Soil Type Legend: Ko

Summary of Laboratory Testing on Shelby Tube Samples

Boring No.	NRCS Soil Type	Sample No.	Depth (feet)	ODOT Class	Gradation (%)					Atterberg			Moisture Content (%)	Hydraulic Conductivity (cm/sec)
					Agg	CS	FS	Silt	Clay	LL	PL	PI		
B-002	Ko	ST-4	4'-6'	A-4a	10	10	14	40	26	26	16	10	13	1.9×10^{-6}
		ST-6	8'-10'	A-4a	15	10	13	38	24	25	16	9	13	2.6×10^{-8}
B-003	LeB	ST-2	1'-3'	A-4a	11	11	14	39	25	24	15	9	10	--
		ST-2A	1'-3'	A-4a	9	11	15	39	26	23	15	8	--	4.5×10^{-8}
		ST-2B	3'-5'	A-4a	11	10	15	38	26	23	15	8	--	6.1×10^{-8}
		ST-10	16'-18'	A-4a	28	9	13	35	15	23	15	8	12	--
B-004	MIC2	ST-3	2'-4'	A-4a	8	10	31	38	13	NP	NP	NP	12	--
		ST-5	4'-6'	A-4b	6	8	16	54	16	22	17	5	14	2.9×10^{-7}
B-012	CsB	ST-2A	1'-3'	A-7-6	1	2	10	31	56	62	29	33	--	4.2×10^{-5} *
		ST-3	3'-5'	A-6a	14	11	14	42	19	28	17	11	13	--
		ST-7	8'-10'	A-4a	9	9	13	44	25	25	16	9	14	--
B-014	CsB	ST-2	2.5'-4.5'	A-6b	0	1	6	49	44	39	21	18	24	5.1×10^{-8}
		ST-5	5'-7'	A-7-6	9	8	6	43	34	42	23	19	26	--
B-017	CsA	ST-2	2'-4'	A-4a	10	10	16	49	15	24	15	9	12	--
B-106	CsB	ST-5	5'-7'	A-7-6	0	2	4	50	44	51	24	27	25	2.2×10^{-8}
		ST-6	8'-10'	A-6b	4	6	13	51	26	34	18	16	24	--
		ST-9	12'-14'	A-6a	10	8	13	45	24	28	17	11	13	2.5×10^{-8}
B-207	Ko	ST-2	1'-3'	A-4a	42	11	10	26	11	26	16	10	13	--
		ST-5	3'-5'	A-6a	23	9	11	34	23	30	18	12	15	3.5×10^{-7}

* Gravel seam noted in sample

PROJECT: MAD-70-10.27		DRILLING FIRM / OPERATOR: CTL / MK		STATION / OFFSET: 546+82.54, 5.11 LT		EXPLOSION ID: B-002										
TYPE: ROADWAY		SAMPLING FIRM / LOGGER: CTL / MK		ALIGNMENT: SR 29		PAGE: 1 OF 1										
PID: 83245 BR ID: N/A		DRILLING METHOD: 3.25" HSA		ELEVATION: 978.1 (MSL) EOB: 20.0 ft.												
START: 8/10/09 END: 8/10/09		SAMPLING METHOD: SPT		COORD: 715347.376 N, 1730313.226 E												
MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTHS	SPT/RQD	REC SAMPLE (%)	HP (tsf)	GRADATION (%)				ODOT CLASS (GI)	INST.				
							GR	CS	FS	SI	CL	LL	PL	PI	WC	
Asphalt concrete (12")		978.1	1													
Portland cement concrete (9")		977.1	2													
Base course (7")		976.7	3													
STIFF, BROWN, SILT AND CLAY, SOME GRAVEL, LITTLE SAND, FILL, MOIST		975.8	4	2	56	3.50	28	4	15	34	19	28	16	12	22	A-6a (4)
STIFF, BROWN, CLAY, AND SILT, TRACE SAND, DAMP		974.6	5	2	44	3.50	0	0	7	43	50	55	25	30	25	A-7-6 (19)
STIFF, BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL, MOIST		973.1	6	3	94	4.00	6	13	16	39	26	30	18	12	23	A-6a (7)
@6.5' STIFF, BROWN, SANDY SILT, SOME CLAY, TRACE GRAVEL, TILL, DAMP		972.6	7	4	-	-	10	10	14	40	26	26	16	10	13	A-4a (6)
			8	4	83	4.00	10	11	15	38	26	24	16	8	14	A-4a (6)
			9	5	-	-	15	10	13	38	24	25	16	9	13	A-4a (5)
			10	3	89	4.00	-	-	-	-	-	-	-	-	15	A-4a (V)
			11	4												
			12													
VERY STIFF, GRAY, SANDY SILT, LITTLE CLAY, TRACE GRAVEL WITH COBBLES, TILL, DAMP		965.6	13	7	94	4.50	-	-	-	-	-	-	-	-	11	A-4a (V)
@15.0'; HARD			14	12												
			15	9	89	4.50	6	10	29	39	16	17	12	5	8	A-4a (4)
GRAVEL AND/OR STONE FRAGMENTS WITH SAND		961.1	16	16												
			17													
HARD, BROWN, SANDY SILT, SOME CLAY, TILL, DAMP		959.6	18													
			19	11	94	4.50	0	11	28	39	22	19	12	7	8	A-4a (5)
			20	15												
		958.1	EOB													

NOTES: ST-6 OBTAINED IN OFFSET HOLE FROM 8' TO 10'; ST-4 OBTAINED IN OFFSET HOLE FROM 5' TO 7'

NOTES: GROUNDWATER ENCOUNTERED @ 17.0' DURING DRILLING. 14.0' AT COMPLETION

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: MAD-70-10.27
 TYPE: ROADWAY
 PID: 83245 BR ID: N/A
 START: 7/20/09 END: 7/20/09

DRILLING FIRM / OPERATOR: CTL / MF
 SAMPLING FIRM / LOGGER: CTL / MF
 DRILLING METHOD: 3.25" HSA
 SAMPLING METHOD: SPT

DRILL RIG: CME 75 T-349
 HAMMER: CME AUTOMATIC
 CALIBRATION DATE: 6/27/07
 ENERGY RATIO (%): 85

STATION / OFFSET: 553+58.03, 85.0 LT
 ALIGNMENT: SR 29
 ELEVATION: 962.4 (MSL) EOB: 29.0 ft.
 COORD: 715158.206 N, 1730968.539 E

EXPLOSION ID: B-004
 PAGE: 1 OF 1

DEPTH (ft)	SPT / RQD	N ₆₀	REC SAMPLE (%)	HP (tsf)	GRADATION (%)					ATTERBERG					WC	ODOT CLASS (GI)	INST.
					GR	CS	FS	SI	CL	LL	PL	PI					
1	8	17	67	4.00	8	12	21	39	20	23	15	8	9	A-4a (5)			
2	7	5															
3	5	16	67		45	17	16	14	8	19	13	6	8	A-1-b (0)			
4	4	21	72	4.50	8	10	31	38	13	NP	NP	NP	12	A-4a (3)			
5	5	10			2	5	29	51	13	NP	NP	NP	11	A-4b (6)			
6	9	21	61	4.00	6	8	16	54	16	22	17	5	14	A-4b (7)			
7	14	40	39	4.50													
8	14																
9	11	44	78	4.50										A-4a (V)			
10	14	17															
11	10	45	72	4.50	10	10	20	42	18	23	14	9	9	A-4a (5)			
12	13	19															
13																	
14	11	55	72	4.50										A-4a (V)			
15	18	21															
16	11	62	72	4.50										A-4a (V)			
17	18	26															
18																	
19	18	92	67	4.50	6	10	18	40	26	25	14	11	8	A-6a (7)			
20	25	40															
21	47																
22	50/4"		40											A-6a (V)			
23																	
24	37		40											A-6a (V)			
25	50/4"																
EOB																	
ELEV. 962.4																	
ELEV. 960.4																	
ELEV. 959.4																	
ELEV. 958.9																	
ELEV. 957.4																	
ELEV. 943.9																	

MATERIAL DESCRIPTION AND NOTES

1-3": Topsoil (3")

3-5": VERY STIFF, BROWN, SANDY SILT, LITTLE CLAY, TRACE GRAVEL WITH ORGANICS, DAMP

5-6": MEDIUM DENSE, BROWN, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, DAMP

6-9": BROWN, SANDY SILT, LITTLE CLAY, TRACE GRAVEL

9-14": MEDIUM DENSE, GRAY, SILT, SOME SAND, LITTLE CLAY, TRACE GRAVEL, DAMP

14-15": VERY STIFF TO HARD, GRAY, SANDY SILT, LITTLE CLAY, LITTLE GRAVEL, TILL, DAMP @6.5'; HARD, WITH COBBLES

15-17": @8.5'; WITH COBBLES

17-19": HARD, GRAY, SILT AND CLAY, SOME SAND, TRACE GRAVEL, DAMP

21-22": Hatched pattern

22-24": Hatched pattern

24-25": Hatched pattern

NOTES: ST-3 OBTAINED FROM OFFSET HOLE 2' TO 4'; ST-5 OBTAINED IN OFFSET HOLE FROM 4' TO 6'

NOTES: NO GROUNDWATER ENCOUNTERED DURING DRILLING. DRY AT COMPLETION. ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: MAD-70-10.27		DRILLING FIRM / OPERATOR: CTL / MK		STATION / OFFSET: 580+09.16, 0.7 RT		EXPLORATION ID										
TYPE: ROADWAY		SAMPLING FIRM / LOGGER: CTL / MK		ALIGNMENT: SR 29		B-014										
PID: 83245 BR ID: N/A		DRILLING METHOD: 3.25" HSA		ELEVATION: 970.9 (MSL) EOB: 20.0 ft.		PAGE										
START: 8/11/09 END: 8/11/09		SAMPLING METHOD: SPT		COORD: 714014.321 N, 1733359.879 E		1 OF 1										
MATERIAL DESCRIPTION AND NOTES		ELEV.	DEPTH	SPT/RQD	REC SAMPLE (%)	HP (tsf)	GR	GRADATION (%)				WC	ODOT CLASS (GI)	INST.		
								CS	FS	SI	CL	LL	PL	PI		
Asphalt concrete (8") over Brick (3")		970.2	1													
Portland cement concrete (8")		969.3	2													
Base course (7")		968.7	3													
STIFF BROWN, SANDY SILT, LITTLE CLAY, SOME GRAVEL, FILL, DAMP		967.9	4	3	78	-	5	22	22	37	14	22	14	8	14	A-4a (3)
BROWN, SILTY CLAY, TRACE SAND		967.4	5	4	-	-	0	1	6	49	44	39	21	18	24	A-6b (11)
MEDIUM STIFF, GRAY, CLAY, AND SILT, LITTLE SAND, TRACE GRAVEL, FILL, MOIST		965.9	6	3	67	3.50	2	10	39	47	52	26	26	26	28	A-7-6 (17)
MEDIUM STIFF TO STIFF, BROWN, CLAY, AND SILT, TRACE SAND, TRACE GRAVEL, DAMP			7	2	83	4.00	1	9	40	49	50	25	25	25	26	A-7-6 (16)
			8	3	-	-	9	8	6	43	34	42	23	19	26	A-7-6 (12)
		960.9	9	3	89	3.50	-	-	-	-	-	-	-	-	-	A-7-6 (V)
			10	4												
MEDIUM DENSE, BROWN, COARSE AND FINE SAND, AND GRAVEL, SOME SILT, TRACE CLAY WITH COBBLES, DAMP			11	3	44	-	42	14	9	25	10	-	-	-	14	A-3a (V)
			12	4												
MEDIUM DENSE, GRAY, GRAVEL AND/OR STONE FRAGMENTS, SOME SAND, TRACE SILT, TRACE CLAY, WET		958.4	13	5	72	-	-	-	-	-	-	-	-	-	19	A-1-a (V)
			14	5												
			15	4	67	-	59	28	7	6	-	-	-	-	17	A-1-a (V)
			16	5												
			17	4												
		952.4	18	5												
			19	4	39	-	22	11	17	36	14	19	13	6	12	A-4a (3)
STIFF GRAY, SANDY SILT, SOME CLAY, SOME GRAVEL, TILL, DAMP		950.9	20	5												

NOTES: ST-2 OBTAINED IN OFFSET HOLE FROM 2.5' TO 4.5'; ST-5 OBTAINED IN OFFSET HOLE FROM 5' TO 7'

NOTES: GROUNDWATER ENC @ 12.5 DURING DRILLING, 10.2' AT COMPLETION.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: MAD-70-10-27		DRILLING FIRM / OPERATOR: CTL / CG		STATION / OFFSET: 563+13.66, 231.0 RT		EXPLORATION ID: B-106							
TYPE: ROADWAY		SAMPLING FIRM / LOGGER: CTL / CG		ALIGNMENT: SR 29		PAGE: 1 OF 1							
PID: 83245 BR ID: N/A		DRILLING METHOD: 3.25" HSA		ELEVATION: 977.7 (MSL) EOB: 20.0 ft.									
START: 7/14/09 END: 7/14/09		SAMPLING METHOD: SPT		COORD: 714498.784 N, 1731720.188 E									
DRILL RIG: CME 75 T-296		HAMMER: CME AUTOMATIC		GRADATION (%)		ODOT CLASS (GI)							
CALIBRATION DATE: 6/27/07		ENERGY RATIO (%): 89		GR	CS	FS	SI	CL	LL	PL	PI	WC	
SPT/RQD	N ₆₀	REC SAMPLE (%)	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	INST.
6	37	89	4.00	16	10	12	34	28	35	19	16	9	A-6b(8)
11	14												
10													
11	31	94	4.50	5	4	7	36	48	45	23	22	16	A-7-6(14)
10													
6	11	78	4.50	8	9	14	39	30	29	17	12	7	A-6a(8)
12													
7	5	94	4.50	-	-	-	-	-	-	-	-	23	A-7-6(V)
8	8	-	-	-1	2	4	51	44	51	24	27	25	A-7-6(17)
7													
8													
6	10	100	2.50	5	5	14	48	28	28	17	11	16	A-6a(8)
3	4												
4													
7	25	100	4.00	10	8	14	38	30	27	16	11	12	A-6a(7)
8	9												
9													
8	27	94	4.00	8	10	16	39	27	25	16	9	11	A-4a(6)
10													
15													
4	15	67	-	-	-	-	-	-	-	-	-	17	A-1-b(V)
5	5												
5	15	44	-	48	23	9	15	5	NP	NP	NP	18	A-1-b(0)
5	5												

DEPTHS: 1-20 EOB

ELEV.: 977.7, 975.7, 974.2, 972.7, 970.7, 969.2, 964.2, 961.7, 957.7

MATERIAL DESCRIPTION AND NOTES:

HARD, BROWN, SILTY CLAY, SOME SAND, LITTLE GRAVEL, FILL, DAMP

HARD, BROWN, CLAY, AND SILT, LITTLE SAND, TRACE GRAVEL, FILL, DAMP

HARD, BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL WITH ROCK FRAGMENTS, FILL, DAMP

VERY STIFF, BROWN, CLAY, AND SILT, TRACE SAND, DAMP

BROWN, SILTY CLAY, LITTLE SAND, TRACE GRAVEL, MOIST

STIFF, BROWN, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, DAMP

@11.0'; VERY STIFF, SOME SAND

VERY STIFF, BROWN, SANDY SILT, SOME CLAY, TRACE GRAVEL, DAMP

MEDIUM DENSE, GRAY, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY, WET

NOTES: ST-5 OBTAINED IN OFFSET HOLE FROM 5' TO 7'; ST-6 IN OFFSET HOLE FROM 8' TO 10'; ST-9 IN OFFSET HOLE FROM 12' TO 14'

NOTES: GROUNDWATER ENC. @ 15.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

PROJECT: MAD-70-10.27 ROADWAY
 TYPE: ROADWAY
 PID: 83245 BR ID: N/A
 START: 6/29/09 END: 6/29/09

DRILLING FIRM / OPERATOR: CTL / JD
 SAMPLING FIRM / LOGGER: CTL / JD
 DRILLING METHOD: 3.25" HSA
 SAMPLING METHOD: SPT

DRILL RIG: CME 75 R-25
 HAMMER: CME AUTOMATIC
 CALIBRATION DATE: 6/27/07
 ENERGY RATIO (%): 84

STATION / OFFSET: 585+95.66, 205.75 R
 ALIGNMENT: SR 29
 ELEVATION: 969.6 (MSL) EOB: 20.0 ft.
 COORD: 713570.580 N, 1733765.546 E

EXPLORATION ID: B-207
 PAGE: 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC SAMPLE (%)	HP (tsf)	GRADATION (%)						WC	ODOT CLASS (G)	INST.	
							GR	CS	FS	SI	CL	LL				PL
Topsoil (8")	969.6	1	5	20	67	-	25	10	20	30	15	24	16	8	9	A-4a (2)
VERY STIFF, BROWN, SANDY SILT, SOME GRAVEL, LITTLE CLAY, DAMP	968.9	2	7	7	-	-	42	11	10	26	11	26	16	10	13	A-4a (0)
VERY STIFF, BROWN, CLAY, AND SILT, LITTLE SAND, TRACE GRAVEL, DAMP	967.6	3	5	22	72	-	5	4	15	39	37	43	22	21	21	A-7-6 (13)
VERY STIFF, BROWN, SILT AND CLAY, SOME GRAVEL, LITTLE SAND WITH COBBLES, DAMP	966.1	4	5	29	67	-	-	-	-	-	-	-	-	-	10	A-6a (V)
HARD, BROWN, SANDY SILT, SOME CLAY, TRACE GRAVEL, DAMP	964.6	5	13	41	72	4.50	23	9	11	34	23	30	18	12	15	A-6a (5)
MEDIUM DENSE, BROWN, COARSE AND FINE SAND, SOME SILT, TRACE CLAY, DAMP	961.6	6	11	17	41	-	1	12	16	45	26	26	16	10	13	A-4a (7)
		7														
		8														
		9	13	28	67	-	14	32	21	28	5	NP	NP	NP	12	A-3a (0)
		10	11	9												
@11.0'; LITTLE SILT, WET		11	7	25	67	-	15	25	39	18	3	NP	NP	NP	15	A-3a (0)
		12	9	9												
NO RECOVERY		13														
		14	7	25	0	-	-	-	-	-	-	-	-	-	-	-
@16.0'; DENSE, WET		15	10													
		16	14	34	67	-	-	-	-	-	-	-	-	-	10	A-3a (V)
DENSE, GRAY, GRAVEL AND/OR STONE FRAGMENTS WITH SAND, LITTLE SILT, TRACE CLAY WITH COBBLES, WET	952.1	17	12													
		18														
		19	10	41	72	-	50	18	15	14	3	NP	NP	NP	9	A-1-b (0)
		20	12	17												

NOTES: ST-2 OBTAINED IN OFFSET HOLE FROM 1' TO 3'; ST-5 OBTAINED IN OFFSET HOLE FROM 3' TO 5'.
 NOTES: GROUNDWATER ENC. @ 11.0' DURING DRILLING, 13.0 AT COMPLETION. ST-2 OBTAINED IN OFFSET HOLE FROM 1' TO 3'.
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED.



Hydraulic Conductivity - Method C - ASTM D 5084

Client: WD Transportation	Date Tested: 9/14-9/15/2009
Project: MAD-70-10.27	Project #: 09050096COL
Sample: B-002 ST-4, 4'-6'	Technician(s): AC/SM
	Reviewed by: JG

Confining Pressure, Cp =	60 psi	or	4220 cm water
Head Pressure (air), Hp =	58 psi	or	4080 cm water
Back Pressure (air), Bp =	56 psi	or	3939 cm water
Pipette Area, a =	0.869 cm ²	(0.869(pipette), 3.476(annulus) or 4.345(both))	
Pipette Length, Lp =	28.77 cm		
Pipette Volume, Vp =	25 cm ³		Vo = Pipette reading out
Sample Length, L =	7.491 cm		Vi = Pipette reading in
Sample Area, A =	40.434 cm ²		t = Time in seconds
Temperature, T =	23.7 deg.C		

$$K = (aL/2At) * \frac{\ln[(Hp - Bp + ((Vo - Vi) * Lp / Vp))]}{(Hp - Bp + ((Vo - Vi) * Lp / Vp))} \quad \begin{matrix} (t = 1) \\ (t = 2) \end{matrix}$$

Permeation									
Date	Time	t (sec)	Vi*	dVi	Vo*	dVo	dVo/dVi	K	Notes
09/14/09	11:46	0	6.7	---	23.4	---	---	---	INITIAL
	11:51	300	7.3	0.6	22.9	0.5	0.83	2.1E-06	
	11:59	480	8.2	0.9	22.1	0.8	0.89	2.1E-06	
	12:09	540	9.2	1.0	21.2	0.9	0.90	2.1E-06	
	12:18	540	10.1	0.9	20.3	0.9	1.00	2.0E-06	FINAL

* Inner Pipette

Specimen Information:

Type of Permeant: Distilled Water

Average of four consecutive readings: 2.1E-06 cm/sec

Corrected permeability (K₂₀): 1.9E-06 cm/sec

Weight (lbs): 1.473	Initial Moisture Content (%): 12.3
Height (in): 2.949	Initial Dry Unit Weight (pcf): 122.6
Diameter (in): 2.825	Initial Volume (ft ³): 0.0107
Height-to-Diameter Ratio: 1.044	Initial Saturation (%): 88.6
Specific Gravity (assumed): 2.7	Final Moisture Content (%): 14.8
β: 1	Final Dry Unit Weight (pcf): 120.4
	Final Volume(ft ³): 0.0107
	Final Saturation (%): 100.2



Hydraulic Conductivity - Method C - ASTM D 5084

Client: WD Transportation	Date Tested: 9/14-9/15/2009
Project: MAD-70-10.27	Project #: 09050096COL
Sample: B-207 3'-5'	Technician(s): AC/SM
	Reviewed by: JG

Confining Pressure, Cp =	60 psi or	4220 cm water
Head Pressure (air), Hp =	58.5 psi or	4115 cm water
Back Pressure (air), Bp =	57 psi or	4009 cm water
Pipette Area, a =	0.869 cm ²	(0.869(pipette), 3.476(annulus) or 4.345(both))
Pipette Length, Lp =	28.77 cm	
Pipette Volume, Vp =	25 cm ³	Vo = Pipette reading out
Sample Length, L =	7.181 cm	Vi = Pipette reading in
Sample Area, A =	39.963 cm ²	t = Time in seconds
Temperature, T =	23.7 deg.C	

$$K = (aL/2At) * \frac{\ln[(Hp - Bp + ((Vo - Vi) * Lp / Vp))]}{(Hp - Bp + ((Vo - Vi) * Lp / Vp))} \quad (t = 1)$$

$$(t = 2)$$

Permeation									
Date	Time	t (sec)	Vi*	dVi	Vo*	dVo	dVo/dVi	K	Notes
09/14/09	11:48	0	3.1	---	21.7	---	---	---	INITIAL
	12:29	2460	3.9	0.8	21.1	0.6	0.75	4.1E-07	
	13:07	2280	4.5	0.6	20.5	0.6	1.00	3.8E-07	
	14:27	4800	5.7	1.2	19.3	1.2	1.00	3.7E-07	
	15:22	3300	6.6	0.9	18.5	0.8	0.89	3.9E-07	FINAL

* Inner Pipette

Specimen Information:

Type of Permeant: Distilled Water

Average of four consecutive readings: 3.8E-07 cm/sec

Corrected permeability (K₂₀): 3.5E-07 cm/sec

Weight (lbs): 1.301	Initial Moisture Content (%): 18.0
Height (in): 2.827	Initial Dry Unit Weight (pcf): 108.8
Diameter (in): 2.808	Initial Volume (ft ³): 0.0101
Height-to-Diameter Ratio: 1.007	Initial Saturation (%): 88.5
Specific Gravity (assumed): 2.7	Final Moisture Content (%): 16.5
β: 1	Final Dry Unit Weight (pcf): 110.8
	Final Volume(ft ³): 0.0101
	Final Saturation (%): 85.3