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PLANNERS • SURVEYORS

November 16, 2007

Michael D. Weeks, P.E., P.S.
TranSystems Corporation
5747 Perimeter Drive, Suite 240
Dublin, OH 43017

Re: **Pavement Design Information**
Phase 2 - Mainline and Side Road CBR Values
SCI-823-10.13 Portsmouth Bypass
Phase 2 – Stage I
DLZ Job No.: 0121-3070.03
PID No. 79977

Dear Mr. Weeks:

This document presents the findings of subsurface explorations performed for proposed side roads, ramps and the mainline alignment for Phase 2 of the SCI-823 Portsmouth Bypass project. The Phase 2 area is defined as being from station 537+50 to station 904+79.54.

The side roads in the Phase 2 area have been independently evaluated for subgrade improvements and pavement design information. Please refer to these documents for more information.

Appendix A: Pavement Design Information
CR 184 / Flatwood Fallen Timbers Road

Appendix B: Pavement Design Information
US 23 Interchange

Appendix C: Pavement Design Information
Phase 2 Mainline

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We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning our reports.

Respectfully submitted,

DLZ OHIO, INC.

Steven J. Riedy
Geotechnical Engineer

Andrew M. Jalbrzikowski
Engineering Geologist

Pete Nix, P.E.
Geotechnical Division Manager

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APPENDIX A

DLZ

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November 16, 2007

Michael D. Weeks, P.E., P.S.
TranSystems Corporation
5747 Perimeter Drive, Suite 240
Dublin, OH 43017

Re: **Pavement Design Information**
CR 184 / Flatwoods Fallen Timber Road
SCI-823-10.13 Portsmouth Bypass
DLZ Job No.: 0121-3070.03
Document # 0101

Dear Mr. Weeks:

This letter includes the findings of a subsurface exploration performed for the subgrade of CR 184. The findings in this letter pertain to the realignment and resurfacing of CR 184 to accommodate the proposed bridge structure over SCI-823. Note that the stationing used in the report is referenced to the centerline of CR 184 unless noted otherwise. Subsurface explorations were performed for the other features of the project but the results are presented in separate reports.

According to the information provided, approximately 1900 feet of CR 184 will be realigned. See the attached boring plan and profile for more information. The recommendations presented in this report have been made on the basis of the foregoing information. If the proposed improvements or concept is changed or differs from that assumed, DLZ Ohio, Inc. (DLZ) should be informed of the changes so that recommendations and conclusions presented in this letter may be revised as necessary.

The results of these evaluations are based upon the findings of four borings drilled between May 30, 2007 and June 5, 2007, using an ATV mounted, rotary-type drill rig. Borings were planned and staked in the field by representatives of DLZ. The surveyed locations and ground surface elevations of the borings were determined by representatives from Lockwood, Lanier, Mathias & Noland, Inc. (2LMN). Borings were advanced to depths between 6.4 and 25.0 feet. The borings were continuously sampled to approximately 6.0 feet below the proposed CR 184 subgrade elevation to evaluate the subgrade soil properties. See the attached boring logs for more information

The stations and offsets for all the borings are listed on the attached GB-1 spreadsheet and boring logs. All of the borings were drilled on the asphalt pavement of CR 184. The borings encountered 6 inches of asphalt concrete pavement over 0 to 5 inches of aggregate base.

Below the pavement layers, B-1707 encountered stiff orange brown silt and clay (A-6a) and hard silty clay (A-6b). The remaining borings generally encountered orange and brown silt (A-4b) and sandy silt (A-4a).

Pavement Design Information

The table below lists the subgrade soils encountered by the borings and the group indices, CBR values, and number of samples tested for each soil type.

ODOT Classification	Group Index	CBR	No. Samples Tested
Gravel (A-1-a)	0	12	1
Sandy Silt (A-4a)	8	7	1
Silt (A-4b)	8	7	7
Silt and Clay (A-6a)	8	7	1

Based upon the average results of the laboratory testing, a CBR value of 7 is recommended for pavement design.

Subgrade Condition and Preparation

The existing subgrade soils along the project were evaluated for suitability according to the ODOT Geotechnical Bulletin GB-1 "Plan Subgrade." The optimum moisture content (MC) for each soil tested was estimated using the following criteria:

Optimum MC	=	plastic limit minus 3 (A-7-6 soils)
	=	plastic limit minus 5 (A-4 and A-6 soils)
	=	6 to 10 (granular soils)
	=	11 (non-plastic silts)

The results of this evaluation are presented in the attached spreadsheet. Note only samples within six feet of the proposed grade were evaluated. According to the referenced guidelines, any soils with moisture contents that exceed the optimum moisture content by three or more percentage points will likely require some form of subgrade treatment. In addition, any soils with standard penetration values (N-Values) of 10 or less will also likely require some form of subgrade treatment.

To determine the appropriate option, the average standard penetration value (N-value) and the plasticity index (PI) of the subgrade soils were considered. The average N-value, PI, moisture content, and CBR are presented in the table below.

Percent of Samples Over Optimum MC + 3 Percent	Average N_L*	Average PI	Average MC	CBR Average
100	12.3	7.1	14.2	7

* - N_L indicates lowest standard penetration value (N) in subgrade soil.

According to the GB-1, any soil with moisture content exceeding the optimum moisture content of the soil by three or more percentage points, or has low N-values (generally N<10), is considered problematic soil and will likely require some form of subgrade treatment. The stabilization options available include undercutting, cement stabilization, and lime stabilization. However, the cement or lime stabilization may not be effective in very weak soils (N-values less than 5 blows per foot).

Based on GB-1 guidelines, cement treatment is the preferred stabilization option for soils with average N-values less than 10 and an average PI less than 20. However, cement stabilization is generally not effective in stabilizing subgrade soils with N-values less than 5 because the soils do not gain sufficient strength. Two of the four borings were determined to be suitable for cement treatment. Generally, chemical stabilization is more economical when the area to be stabilized is greater than a mile. Given the fact that less than one-half mile of the subgrade would require treatment, undercutting of the subgrade appears to be a more cost-effective soil stabilization method.

All the borings encountered silt (A-4b) within the top three feet of the proposed subgrade. Silt is listed as an unsuitable material in GB-1 and must be completely removed. Based on the GB-1 guidelines, all of the subgrade soils along the proposed CR 184 realignment should be undercut to a minimum depth of three feet.

The undercut areas should be replaced with compacted Type B or Type C granular material (ODOT Item 703.16.C) and should extend 18 inches beyond the edge of the pavement, paved shoulders, or paved medians. In addition to undercutting, it is recommended that the entire subgrade be proof-rolled to identify any soft or weak areas that require subgrade stabilization. If any soft or weak areas are encountered, it is recommended that the area be overexcavated and replaced with compacted Type B or C granular material (ODOT Item 703.16.C).

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Seepage and groundwater were not encountered in any of the borings. Although no groundwater was encountered within the proposed subgrade elevations, the contractor should be prepared to maintain reasonably dry excavations if water from seepage or precipitation enters any excavations.

We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning our findings.

Respectfully submitted,

DLZ OHIO, INC.

Andrew M. Jalbrzikowski
Engineering Geologist

Pete Nix, P.E.
Geotechnical Division Manager

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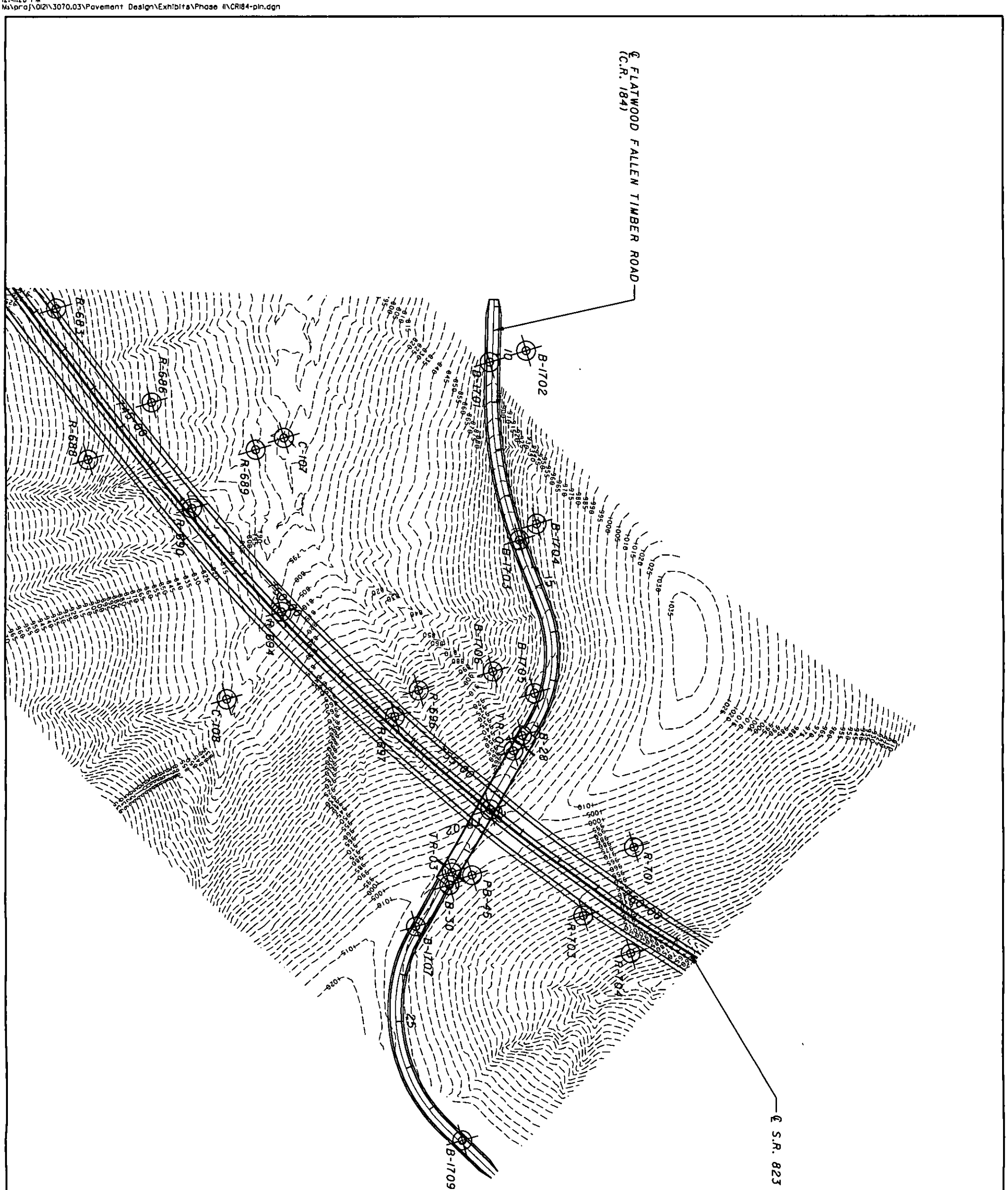

1/2	SCI-823-10.13	BORING PLAN C.R. 184 STA. 8+85.44 TO STA. 28+94.283	CADD/DRAWN BY: RLS CHECKED: AEN	0 100 50 200 HORIZONTAL SCALE IN FEET

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	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000	1010	1020	
9	863.75																		863.81
10	868.62																		868.90
	873.62																		873.98
11	879.15																		879.31
	885.49																		885.10
12	892.48																		891.38
	899.91																		898.12
13	907.46																		905.10
	915.01																		912.08
14	922.07																		919.07
	928.59																		926.05
15	934.22																		933.03
	939.56																		940.01
16	944.11																		946.79
	947.41																		953.15
17	949.93																		959.09
	952.67																		964.62
18	955.70																		969.73
	960.75																		974.43
19	966.63																		978.72
	972.64																		982.58
20	978.56																		986.04
	984.50																		989.08
21	990.65																		991.70
	996.67																		993.91
22	1,001.07																		995.91
	1,003.47																		997.91
23	1,004.08																		999.91
	1,003.85																		1,001.91
24	1,004.59																		1,003.91
	1,005.90																		1,005.91
25	1,007.48																		1,007.52
	1,009.10																		1,008.37
26	1,009.25																		1,008.44
	1,008.28																		1,007.75
27	1,006.62																		1,006.91
	1,006.06																		1,006.54
28	1,006.39																		1,006.64
	1,007.14																		1,007.21
	1,007.93																		1,008.02
	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000	1010	1020	

PROPOSED

EXISTING

2/2	SCI-823-10.13	**PROFILE** **CR 184 STA. 8+85.44 TO STA. 28+94.283**	DRAWN RLS CHECKED AEN

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1701 | Location: Sta. 10+16.8, 5.9 ft. RT of CR 184 CL | Date Drilled: 05/30/07

WATER OBSERVATIONS: Water seepage at: Not Reported
Water level at completion: 3.9' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	874.7													
0.7	874.0						Asphalt Concrete - 6" Aggregate Base - 2"							
		5 5 6 6	16	1			FILL: Medium dense brown GRAVEL (A-1-a), little sand, trace silty clay; damp.	73	7	--	5	15		Non-Plastic
3.0	871.7	2 1 2 4	24	2		--	Medium dense orangish brown SILT (A-4b), little to some gravel; damp to moist.	2	10	--	6	62	21	
5		4 5 8 11	23	3		--		1	9	--	12	58	20	
8.5	866.2	8 34 50/3	17	4			Very dense gray SANDY SILT (A-4a), some sand, trace clay; damp.							50+
10														
11.0	863.7	43 44 50/3	15	5			Very dense orangish brown FINE SAND (A-3), little to some gravel, trace silty clay; decomposed limestone; damp.							50+
		28 45 50/6	13	6										50+
15.0	859.7	Core 60"	Rec 58"	RQD 0%	R-1		Soft to medium hard brown and gray SANDSTONE and SILTSTONE; very fine to fine grained, highly weathered to decomposed, laminated to thickly bedded, highly fractured to broken.							
20		Core 60"	Rec 60"	RQD 55%	R-3									
25.0	849.7						Bottom of Boring - 25.0'							
30														

Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

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DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1703 | Location: Sta. 13+96.6, 3.5 ft. LT of CR 184 CL | Date Drilled: 05/30/07

WATER OBSERVATIONS: Water seepage at: Not Reported
Water level at completion: 6.7' (includes drilling water0

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	928.2												
0.9	927.3						Asphalt Concrete - 6" Aggregate Base - 5"						
		13 15 18	24	1			FILL: Dense to very dense orangeish brown SANDY SILT (A-4a), some gravel, trace clay; contains decomposed rock; damp.						
3.0	925.2	50/4											
		39 27 27 33	24	2			Medium dense to very dense orangeish brown SILT (A-4b), little to some gravel, trace to little clay; contains decomposed rock; damp.	1	20	--	10	53	17
5		4 6 21 38	18	3				0	4	--	7	66	23
				3A									
		50/5	5	4									
10		29 35 29	18	5									
		11 19 20	18	6									
15		17 21 25	18	7									
		14 22 50	18	8									
20													
21.0	907.2	50/3	3	9									
21.5	906.7						Severely weathered gray SANDSTONE.						
		Core 60"	Rec 60"	RQD 85%	R-1		Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, laminated to massive, moderately fractured. @ 22.1', 22.8'-23.2', 23.3', 23.6', 24.8', clay-filled fractures. @ 25.4'-25.7', high angle fracture.						
25													
26.5	901.7						Bottom of Boring - 26.5'						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

54
50+
64
72
50+

FILE: 0121-3070-03 [11/15/2007 5:37 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1707 | Location: Sta. 22+92.1, 7.1 ft. RT of CR 184 CL | Date Drilled: 06/05/07

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: 6.5' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	1005.1												
0.5	1004.6						Asphalt Concrete - 6"						
2.0	1003.1	6 4 3	16	1A 1B		2.25 4.5+	FILL: Very stiff orangeish brown SILT AND CLAY (A-6a), little gravel; damp.						
2.5	1002.6	2 2 2	18	2		2.5	FILL: Hard gray SILTY CLAY (A-6b), some sand, some gravel; damp.	1	4	--	4	65	28
4.0	1001.1	1 1 1	16	3		2.0	Very stiff to hard orangeish brown SILT AND CLAY (A-6a), some fine to coarse sand, little gravel; damp.	1	8	--	6	59	26
5.5	999.6	1 2 4	12	4		4.5	Very loose to dense orange brown SILT (A-4b), some clay, trace gravel; damp.	1	18	--	10	47	24
		3 6 9	16	5		4.5	Very loose to dense orange brown SANDY SILT (A-4a), some clay, trace gravel; damp.						
10		10 17 23	18	6		4.5+							
		8 13 18	18	7		4.5+							
11.5	993.6	10 22 27	18	8			Dense gray with brown mottling SANDY SILT (A-4a), little fine to coarse sand, trace clay; damp.						
13.5	991.6	7 40 50/3	15	9			Severely weathered brown SILTSTONE.						
15		50/5	5	10									
18.0	987.1	Core 60"	Rec 60"	RQD 70%	R-1		Medium hard gray and brown SILTSTONE interbedded with SANDSTONE; highly weathered to decomposed, arenaceous, thinly bedded to laminated, highly fractured to broken.						
20													
23.0	982.1						Bottom of Boring - 23.0'						
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
50+
50+

FILE: 0121-3070-03 [11/15/2007 5:37 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1709 | Location: Sta. 27+94.8, 5.4 ft. LT of CR 184 CL | Date Drilled: 06/05/07

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	1006.9												
0.5	1006.4						Asphalt Concrete Pavement - 6"						
1.0	1005.9	11 7 4	17	1			FILL: Medium dense gray SANDY SILT (A-4a), little gravel; damp.						
		2 6 10	18	2			FILL: Loose orangeish brown to gray SANDY SILT (A-4a), little fine to coarse sand, trace gravel, trace clay; damp.	0	1	--	10	68	22
3.5	1003.4	15 13 13	18	3			Severely weathered brown SILTSTONE and SANDSTONE.	0	4	--	7	68	20
5		15 35 50/5	17	4									
6.4	1000.5						Bottom of Boring - 6.4'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
50+

10 15 20 25 30

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Subgrade Analysis

V. 9.09 08/10/07

Design	7
CBR	
Item 320	No
Global CS	Option
Global LS	No

4 Total Borings

Classification Counts by Sample

R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	1	0	0	0	0	0	0	0	1	7	0	1	0	0	0	0	0
	10%								10%	70%		10%					
0.0%	10.0%								90.0%								

Class @ Surface

2-5	0	
4b	1	25%
5	0	
7-5	0	
7-6	0	
8a	0	
8b	0	
R	0	

	N_{60}	N_L	PI	Clay	M	M_{OPT}	GI
Average	20.1	12.3	7.1	22.2	14.2	13.7	7.00
Maximum	60	30	30	21	11	68	27.5	92.2	25.8	16	8
Minimum	2	2	21	17	4	15	17.2	15	8.9	6	0

% Borings	
N_L <= 5	25%
N_L <=10	50%
N_L >=20	25%
M+	50%
R	0%

% Surface			
75%			
25%	50%		
% Borings			
100%			
0%	50%	100%	50%

SCI-823-10.13 CR 184

#	B #	Boring Location	Depth	To	Cut Fill	Standard Penetration n_2	n_3	N_m	Rig	N_{60}	N_L	Physical Characteristics LL	PL	PI	% Silt	% Clay	P 200	Moisture M	M_{OPT}	Classification Class	GI	Comments	Problem w/ Class	w/ MN	Treatments LS	CS	UC Class	UC MN
1	1701	Sta. 10+16.8	1.0	3.0	0.0	6	6	12	A	12		np	np	NP	15		15	9	6	1a	0			MN		12		1
		5.9 ft. RT	3.0	5.0		2	4	6		6		21	17	4	62	21	83	17	12	4b	8		4b	MN		16	3	3
			5.0	7.0		8	11	19		19		27	20	7	58	20	78	17	15	4b	8		4b				3	
											6																	
2	1703	Sta. 13+96.6	3.0	5.0	-3.0	27	33	60	A	60		27	21	6	53	17	70	9	16	4b	7		4b				3	
		3.5 ft. LT	5.0	7.0		21	38	59		59		27	21	6	66	23	88	10	16	4b	8		4b				3	
											30																	
3	1707	Sta. 22+92.1	2.5	4.0	-2.0	2	2	4	A	4		30	19	11	65	28	92	26	14	6a	8			MN		--		5
		7.1 ft. RT	4.0	5.5		1	1	2		2		28	21	7	59	26	85	19	16	4b	8		4b	N		--	3	5
			5.5	7.0		2	4	6		6		30	20	10	47	24	71	14	15	4a				N		16		3
											2																	
4	1709	Sta. 27+94.8	0.5	2.0	-2.0	7	4	11	A	11																		
		5.4 ft. LT	2.0	3.5		6	10	16		16		26	18	8	68	22	90	10	13	4b	8		4b				3	
			3.5	5.0		13	13	26		26		24	19	5	68	20	88	11	14	4b	8		4b				3	
											11																	

III.C. Subgrade Checklist

C-R-S: SC-823-10.10 CR 184	PID: 79977	Reviewer: AMJ	Date: 11-16-2007

If you do not have any subgrade work on the project, you do not have to fill out this checklist.

Y N X 1	Has the subsurface investigation adequately characterized the soil or rock according to Geotechnical Bulletin 1: Plan Subgrades (GB1)?	
Y N X 2	If soils classified as A-2-5, A-4b, A-5, or A-7-5 are present at the proposed subgrade (soil profile), do the plans specify that these materials need to be removed and replaced?	
Y N X	a If these materials are to be removed and replaced, have the station limits, depth, and lateral limits for the planned removal been provided?	
Y **N** X 3	If there is any rock, shale, or coal present at the proposed subgrade (CMS 204.05), do the plans specify the removal of the material?	
Y N **X**	a If removal of any rock, shale, or coal is required, have the station limits, depth, and lateral limits for the planned removal of the material at proposed subgrade been provided?	
Y N X 4	In accordance with GB1, do the SPT values and existing moisture contents for the proposed subgrade soils indicate the need for subgrade stabilization?	
Y **N** X	a If removal and replacement is applicable, has the detail of subgrade removal been shown on the plans, including depth of removal, station limits, lateral extent, replacement material, and plan notes (Item 204 – Subgrade Compaction and Proof Rolling)?	Refer to roadway cross-sections.
Y N **X**	b If chemical stabilization is applicable, has the detail of this treatment been shown on the plans, including depth, percentage of chemical, station limits, lateral extent, and plan notes?	
	Indicate type of subgrade treatment specified: 9 **cement treatment** 9 lime treatment 9 other List Other items:	GB-1 recommends cement treatment or undercutting. Undercutting was recommended for subgrade treatment.
Y N X 5	If drainage or groundwater is an issue with the proposed subgrade, has an appropriate drainage system (e.g., pipe, underdrains) been provided?	Refer to roadway cross-sections.
Y N **X** 6	Has an appropriate quantity of Proof Rolling been included in the plans (CMS 204.06)?	Refer to roadway cross-sections.
Y N X 7	Has a design CBR value been provided?	

APPENDIX B

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November 16, 2007

Michael D. Weeks, P.E., P.S.
TranSystems Corporation
5747 Perimeter Drive, Suite 240
Dublin, OH 43017

Re: **Pavement Design Information**
US 23 Interchange
SCI-823-10.13 Portsmouth Bypass
DLZ Job No.: 0121-3070.03
Document # 0102

Dear Mr. Weeks:

This letter includes the findings of a subsurface exploration performed for the subgrade of US 23 at the proposed SCI-823 interchange. The findings in this letter pertain to the reconstruction and widening of US 23 to accommodate the four proposed ramps at the proposed SCI-823 interchange. Note that the stationing used in the report is referenced to the centerline of US 23 unless noted otherwise. Subsurface explorations were performed for the other features of the project but the results are presented in separate reports.

According to the information provided, southbound US 23 will intersect with the proposed ramp A from approximately station 630+50 to station 640+00. Embankment fills or sidehill fills, approximately between 1 to 4.5 feet thick, will be required for the construction of the proposed ramp A up to Station 1926+00 (referenced to ramp A baseline). Southbound US 23 will intersect with the proposed ramp D from approximately station 607+00 to station 619+00. Fills required for the construction of the proposed ramp D from station 4904+10.82 to station 4922+00 (referenced to ramp D baseline) will be up to 30 feet. Northbound US 23 will intersect the proposed ramp B from approximately station 587+75 to station 603+75. Fills required for the construction of the proposed ramp B up to Station 2604+00 (referenced to ramp B baseline) are up to 33 feet thick. Ramp C will intersect northbound US 23 from station 617+00 to station 645+00. Embankment fills or sidehill fills, up to 32 feet thick, will be required for the construction of the proposed ramp C from station 3900+00 to station 3928+38.75 (referenced to ramp C baseline). Along US 23 at ramps B and C, US 23 will also require reconstruction and fill placement from the existing grade to the proposed MSE walls. See the attached boring plan for further details.

The recommendations presented in this report have been made on the basis of the foregoing information. If the proposed improvements or concept is changed or differs from that assumed, DLZ Ohio, Inc. (DLZ) should be informed of the changes so that recommendations and conclusions presented in this letter may be revised as necessary.

The results of these evaluations are based upon the findings of 24 borings. The borings were drilled between July 11 and July30, 2005. All borings were drilled using a truck mounted rotary-type drill rig. Boring locations were determined and staked in the field by representatives of DLZ. The surveyed locations and ground surface elevations of the borings were determined by representatives from Lockwood, Lanier, Mathias & Noland, Inc. (2LMN). Borings were advanced to depths between 10.0 and 35.0 feet. In addition to subgrade information, the deeper borings also provided subsurface data for other features of the Portsmouth bypass project. Additional (non-subgrade) borings drilled within the proposed pavement area were also considered in developing the subgrade recommendations. Subgrade borings were continuously sampled below the pavement layers to approximately 6.0 feet below the ground surface to evaluate the subgrade soil properties. See the attached boring logs for more information.

The stations and offsets for all the borings are listed on the attached GB-1 spreadsheet. Sixteen of the borings were drilled on the asphalt pavement of US 23, while eight of the borings were drilled on the shoulder of the roadway. Borings drilled in the road surface encountered 4 to 8 inches of asphalt concrete pavement over 4 to 8 inches of aggregate base. Borings drilled off the road surface encountered 4 to 5 inches of topsoil.

Ramp A and US 23
Below the pavement layers, boring B-1131 encountered loose coarse and fine sand (A-3a) over loose brown gravel with sand and silt (A-2-4). Borings B-1132 and B-1133 encountered medium dense sandy silt (A-4a) over medium stiff to stiff silt and clay (A-6a).

Ramp B and US 23
Borings B-1101 and B-1107 encountered medium dense brown gravel with sand and silt (A-2-4) and medium dense brown silt (A-4b) below the pavement and aggregate base. Below the pavement layers, boring B-1108 encountered brown medium dense sandy silt (A-4a) over hard dark brown silt and clay (A-6a). Borings B-1102 through B-1106 and B-1109 encountered medium stiff silt and clay (A-6a) and silty clay (A-6b) beneath the pavement and topsoil layers.

Ramp C and US 23
Below the pavement layers, borings B-1121 through B-1123 and borings B-1125 through B-1129, encountered medium stiff to stiff silt and clay (A-6a), silty clay (A-6b), and medium dense sandy silt (A-4a). Boring B-1130 encountered very dense brown gravel with sand (A-1b) and medium dense sandy silt (A-4a).

Ramp D and US 23
Below the pavement layers, boring B-1149 encountered hard brown silt and clay (A-6a), over very stiff brown sandy silt (A-4a). Boring B-1150 encountered hard dark gray sandy silt (A-4b) over hard brown and gray silt and clay (A-6a). Boring B-1151 encountered medium dense coarse and fine sand (A-3a) over very stiff brown and gray (A-6b).

Pavement Design Information

It is anticipated that the majority of the project will be at grade with the widening portion requiring small fill sections at the ramp intersections within five feet of existing grade along the existing embankment. The table below lists the subgrade soils encountered by the borings and the group indices, CBR values, and number of samples tested for each soil type.

ODOT Classification	Group Index	CBR	No. Samples Tested
Gravel with Sand (A-1-b)	0	12	2
Coarse and Fine Sand (A-3a)	0	12	4
Gravel with Sand and Silt (A-2-4)	0	12	5
Sandy Silt (A-4a)	4	9	18
Silt (A-4b)	8	7	3
Silt and Clay (A-6a)	8	7	19
Silty Clay (A-6b)	10	6	9

Based upon the average results of the laboratory testing, a CBR value of 8 is recommended for pavement design.

Subgrade Condition and Preparation

The existing subgrade soils along the project were evaluated for suitability according to the ODOT Geotechnical Bulletin GB-1 "Plan Subgrade." The optimum moisture content (MC) for each soil tested was estimated using the following criteria:

Optimum MC	=	plastic limit minus 3 (A-7-6 soils)
	=	plastic limit minus 5 (A-4 and A-6 soils)
	=	6 to 10 (granular soils)
	=	11 (non-plastic silts)

The results of this evaluation are presented in the attached spreadsheet. Note only samples within six feet of the proposed grade were evaluated. According to the referenced guidelines, any soils with moisture contents that exceed the optimum moisture content by three or more percentage points will likely require some form of subgrade treatment. In addition, any soils with standard penetration values (N-Values) of 10 or less will also likely require some form of subgrade treatment.

To determine the appropriate option, the average standard penetration value (N-value) and the plasticity index (PI) of the subgrade soils were considered. The average N-value, PI, moisture content, and CBR are presented in the table below.

Percent of Samples Over Optimum MC + 3 Percent	Average N_L*	Average PI	Average MC	CBR Average
54	10.9	11	14.6	8

* - N_L indicates lowest standard penetration value (N) in subgrade soil.

According to the GB-1, any soil with moisture content exceeding the optimum moisture content of the soil by three or more percentage points, or has low N-values (generally N<10), is considered problematic soil and will likely require some form of subgrade treatment. The stabilization options available include undercutting, cement stabilization, and lime stabilization. However, the cement or lime stabilization may not be effective in very weak soils (N-values less than 5 blows per foot).

Based on GB-1 guidelines, cement treatment is the preferred stabilization option for soils with average N-values less than 10 and an average PI less than 20. However, cement stabilization is generally not effective in stabilizing subgrade soils with N-values less than 5 because the soils do not gain sufficient strength. Fifteen of the twenty-four borings were determined to be suitable for cement treatment. Generally, chemical stabilization is more economical when the area to be stabilized is greater than a mile. Given the fact that less than one-half mile of the subgrade would require treatment, undercutting of the subgrade appears to be a more cost-effective soil stabilization method.

Based on the GB-1 Soil Investigation Summary Sheet, the subgrade soils along US 23 and the ramp alignments and should be undercut in the areas and to the depths indicated in the table below.

Associated ramp / US 23	Begin Station*	End Station*	Depth of Undercut, ft
Ramp B - US 23 Northbound	589+50	597+00	2
Ramp B - US 23 Northbound	598+50	601+50	2
Ramp C - US 23 Northbound	617+00	622+50	1
Ramp C - US 23 Northbound	632+00	634+00	2
Ramp A - US 23 Southbound	638+50	640+00	2
Ramp D - US 23 Southbound	606+50	611+00	1

*Stations are referenced to the centerline of US 23.

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PLANNERS • SURVEYORS

The undercut areas should be replaced with compacted Type B or Type C granular material (ODOT Item 703.16.C) and should extend 18 inches beyond the edge of the pavement, paved shoulders, or paved medians. However, it should be noted, that the existing pavement is performing well. No excessive cracking, settlements, or rutting were observed in the project area. In addition to undercutting, it is recommended that the entire project be proof-rolled to identify any soft or weak areas that require subgrade stabilization. If soft or weak areas are encountered, it is recommended that the area be overexcavated and replaced with compacted Type B or C granular material (ODOT Item 703.16.C).

Seepage was first encountered in the borings from 11 to 22.0 feet. In boring B-1126, at a depth of 11 feet, groundwater was noted prior to coring rock and adding drilling water. Although no groundwater was encountered within the proposed subgrade elevations, the contractor should be prepared to maintain reasonably dry excavations if water from seepage or precipitation enters any excavations.

We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning our findings.

Respectfully submitted,

DLZ OHIO, INC.

Andrew Jalbrzikowski
Engineering Geologist

Pete Nix, P.E.
Geotechnical Division Manager

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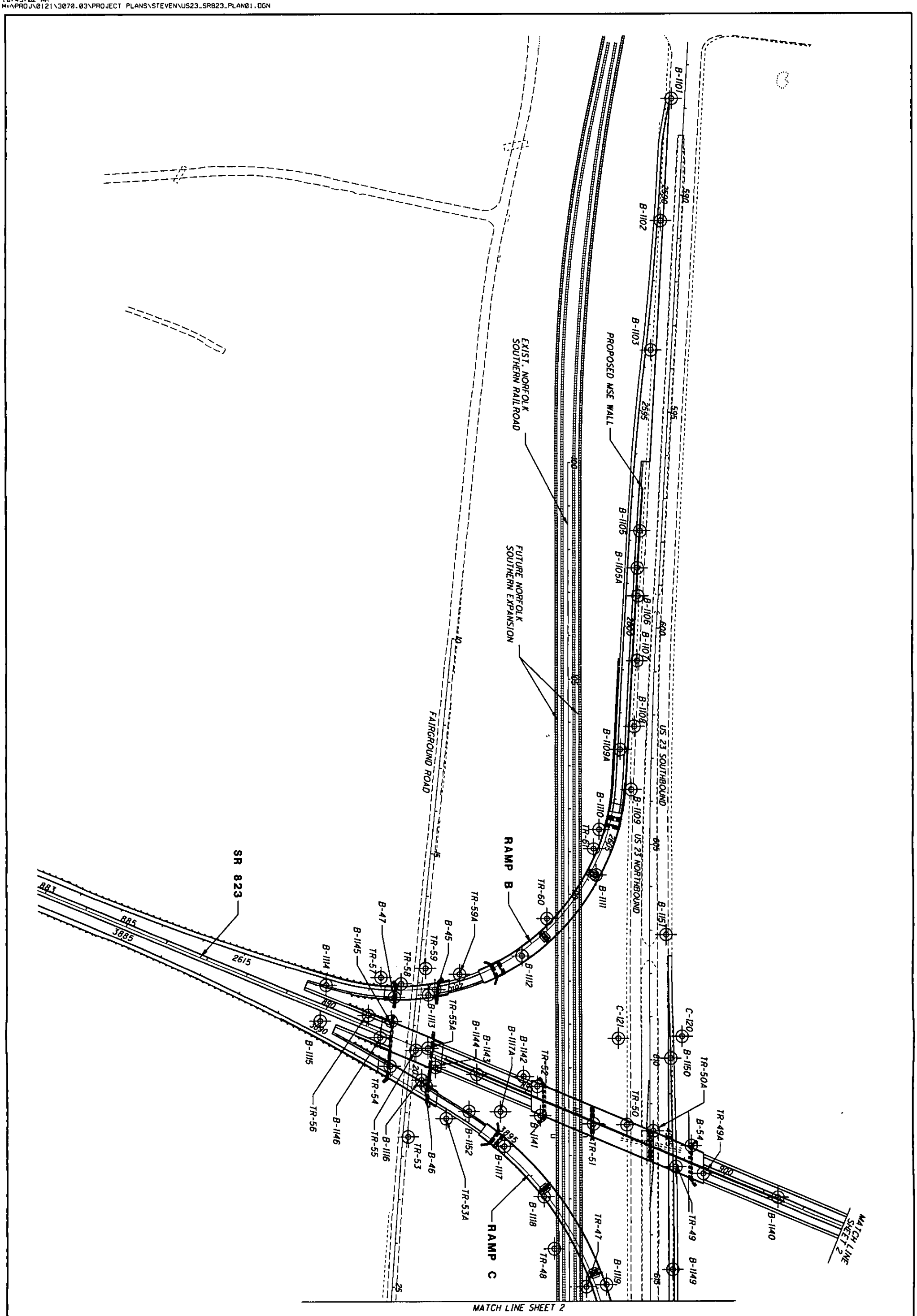

1/2	SCI-823-10.13	PID NO. 79977	BORING LOCATION PLAN US 23/SR 823 INTERCHANGE

0 50 100 200
HORIZONTAL SCALE IN FEET

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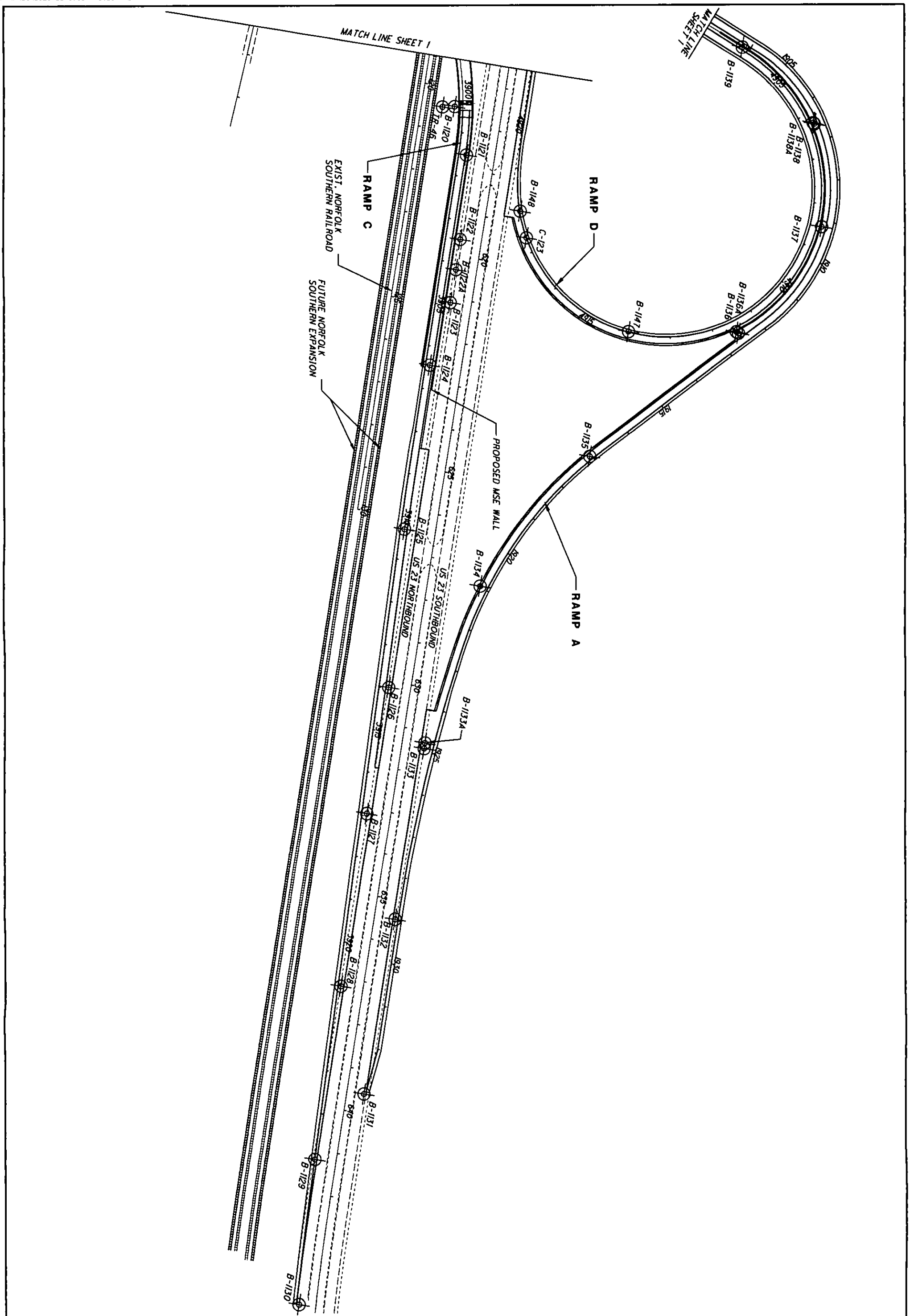

2/2	SCI-823-10.13	PID NO. 79977	**BORING LOCATION PLAN** **US 23/SR 823 INTERCHANGE**

0 100 50 200
HORIZONTAL SCALE IN FEET

N

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1101 | Location: Sta. 2587+78.9, 15.8 ft. LT of US 23 Ramp B BL | Date Drilled: 07/27/05

WATER OBSERVATIONS: Water seepage at: Not Reported; Water level at completion: Not Reported

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.6												
1.0	540.6	24 20 10 7	13	1			Asphalt - 5" Aggregate Base - 7" Medium dense to dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; damp to moist.	32	26	--	12	20	10
		7 8 8 23	10	2				32	35	--	13	12	9
5		28 12 7 7	16	3									
7.5	534.1	5 6 6 5	16	4		1.75	Stiff brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; moist.						
10.0	531.6						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1102 | Location: Sta. 2590+60.9, 7.0 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.8												
0.8	540.0						Asphalt - 5" Aggregate Base - 4"						
		7 10 7 10	21	1		4.5+	Hard brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; slightly organic; damp.	2	2	--	10	49	37
3.0	537.8	3 3 4 4	24	2		2.5	Very stiff gray SILT (A-4b), some clay, trace fine sand; slightly organic; moist.	0	0	--	3	65	32
5.0	535.8	3 3 3 5	20	3		2.0	Stiff to very stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand; damp to moist.	0	1	--	2	64	33
		2 2 3	16	4		1.0							
		3 4 3	18	5		3.5							
10.0	530.8						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢—⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

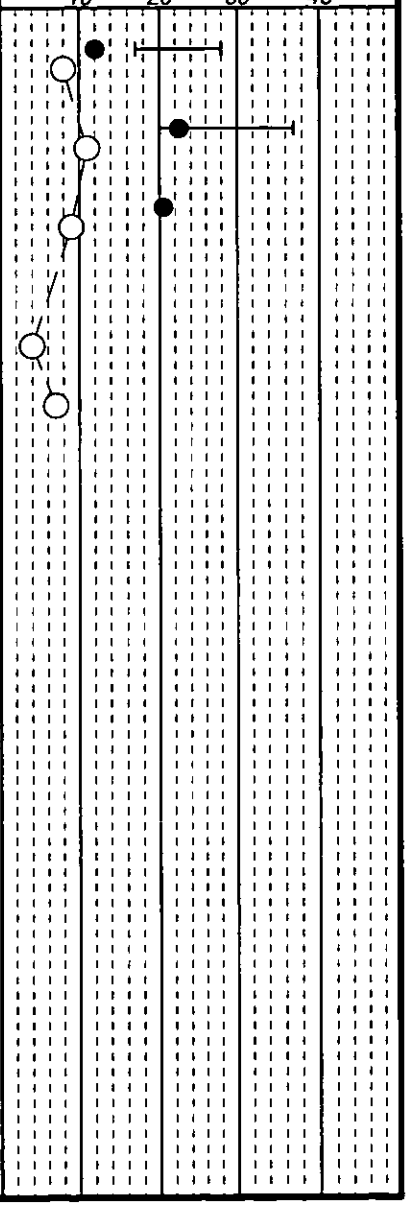
LOG OF: Boring B-1103 | Location: Sta. 2593+58.6, 11.4 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	539.5												
0.4	539.1	2 3 5 5	24	1		4.5+	Topsoil - 5" Hard brown SILT AND CLAY (A-6a), some fine to coarse sand, little gravel; slightly organic; damp.	18	17	--	15	31	19
2.0	537.5	6 7 4 5	22	2		3.0	Very stiff to hard gray SILTY CLAY (A-6b), trace fine to coarse sand; moist. @ 2.0', 4.0', slightly organic.	0	2	--	4	50	44
5		4 5 4 4	20	3		4.5+	@ 4.0'-6.0', damp.						
		2 2 2	18	4		1.5	@ 7.0', stiff.						
		4 4 3	18	5		1.0							
10.0	529.5						Bottom of Boring - 10.0'						
15													
20													
25													
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1104 | Location: Sta. 2596+29.8, 8.3 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 21.0'-35.0'
Water level at completion: 21.7' (prior to coring)
2.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	538.8												
0.8	538.0						Asphalt - 6" Aggregate Base - 4"						
		7 6 8 7	24	1		4.5+	Very stiff to hard brown SILT AND CLAY (A-6a), trace to little fine to coarse sand, trace gravel; damp.	4	4	--	8	51	33
		3 5 5 7	24	2		4.0		0	2	--	17	45	36
5		4 5 4 6	22	3		3.5		0	2	--	4	62	32
		3 5 3	18	4		1.0	@ 7.0', stiff, grayish brown, moist.						
		1 2 1	15	5		1.5							
10													
10.5	528.3												
		1 1 4	17	6		3.5	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		3 3 4	18	7		2.0							
15													
15.5	523.3												
		2 4 6	18	8		4.5+	Hard brown CLAY (A-7-6), trace fine to coarse sand, trace gravel; damp.						
		2 5 6	16	9		4.25							
20													
20.5	518.3												
		1 2 3	18	10			Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay, trace silt; wet.						
		3 4 9	17	11									
25													
		10 18 17	15	12									
		5 12 17	16	13									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1104 | Location: Sta. 2596+29.8, 8.3 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 21.0'-35.0'
Water level at completion: 21.7' (prior to coring)
2.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
30	508.8													
31.5	507.3	4 50/4	10	14			Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay, trace silt; wet.							50+
		50/4	3	15			Severely weathered gray SANDSTONE, argillaceous, micaceous.							50+
35														
36.5	502.3	50/2	2	16										50+
		Core 60"	Rec 57"	RQD 57%	R1		Very hard gray SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, massive, slightly fractured. @ 36.5'-37.3', decomposed. @ 37.3'-38.2', broken, highly weathered to decomposed.							
40														
41.5	497.3						Bottom of Boring - 41.5'							
45														
50														
55														
60														

STANDARD PENETRATION (N): Natural Moisture Content, % - ● PL ⊢——⊣ LL; Blows per foot - ○ (10, 20, 30, 40)

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1105 | Location: Sta. 2597+77.5, 24.0 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.0'-30.0'
Water level at completion: 22.0' (prior to coring)
6.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	539.0												
0.4	538.6	8 8 5	18	1		4.5+	Topsoil - 5" Hard brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp.	3	3	--	8	56	30
3.0	536.0	2 5 7	13	2		4.0	Stiff to very stiff brown and gray SILT AND CLAY (A-6a), trace to little fine to coarse sand, trace gravel; damp to moist.	1	3	--	12	46	38
5		2 2 3	18	3		1.5	@ 6.0', stiff; moist.	0	2	--	6	61	31
		1 1 1	13	4		1.75							
10		1 1 1	15	5		1.0							
		1 1 3	16	6		1.25							
15													
15.5	523.5	4 5 7	18	7		4.25	Very stiff to hard brown and gray CLAY (A-7-6), trace gravel, trace fine to coarse sand; damp.						
		2 3 5	17	8		3.5							
20													
20.5	518.5	2 3 4	18	9			Very loose to loose brown GRAVEL WITH SAND (A-1-b), little clay; wet.						
		W O H	4	10									
25		5 6 15	18	11			@ 26.0'-30.0', medium dense to dense.						
		6 21 28	16	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1105 | Location: Sta. 2597+77.5, 24.0 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.0'-30.0'
Water level at completion: 22.0' (prior to coring)
6.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
30.0	509.0													
	509.0	50/4	4	13			Severely weathered gray SANDSTONE, argillaceous, micaceous.							50+
32.0	507.0	Core 60"	Rec 60"	RQD 70%	R1		Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, massively bedded, moderately fractured, iron-staining on high angle fractures. @ 32.3'-32.6', high angle fracture. @ 34.2'-34.5', decomposed, clay filled fractures.							
37.0	502.0						Bottom of Boring - 37.0'							

Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1106 | Location: Sta. 2599+28.3, 27.8 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.5'-31.0'
Water level at completion: 23.0' (prior to coring)
8.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.2												
0.3	539.9						Topsoil - 4"						
		6 7 6	14	1		4.5+	Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp to moist.	0	0	--	2	61	37
		4 6 5	18	2		4.5+		1	2	--	6	60	31
5													
5.5	534.7												
		2 5 4	16	3		3.75	Stiff to very stiff gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.	0	1	--	4	59	36
		4 4 5	17	4		3.5							
10													
		2 2 2	13	5		2.0	@ 11.0', little gravel.						
		1 2 3	16	6		1.0							
15													
15.5	524.7												
		3 4 5	18	7		4.5+	Very stiff to hard brown CLAY (A-7-6), some silt, trace fine to coarse sand; damp.	0	1	--	2	34	63
		4 6 6	18	8		3.5							
20													
		2 3 5	17	9		2.5							
23.0	517.2												
		1 1 1	13	10			Loose brown GRAVEL WITH SAND (A-1-b), trace clay; wet.	13	57	--	23	7	Non-Plastic
25													
		4 3 3	16	11			@ 26.0'-27.5', little clay.						
		2 2 8	18	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1106 | Location: Sta. 2599+28.3, 27.8 ft. LT of US 23 Ramp B BL | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.5'-31.0'
Water level at completion: 23.0' (prior to coring)
8.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
30.0	510.2	50/4	4	13			Severely weathered gray SANDSTONE, argillaceous, micaceous.							50+
32.5	507.7	Core 60"	Rec 58"	RQD 65%	R1		Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, thickly bedded, moderately fractured. @ 32.5'-33.2', broken zone. @ 33.6', 34.5', 34.7', 35.6', 35.9', shale laminations with fractures.							
37.5	502.7						Bottom of Boring - 37.5'							

Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

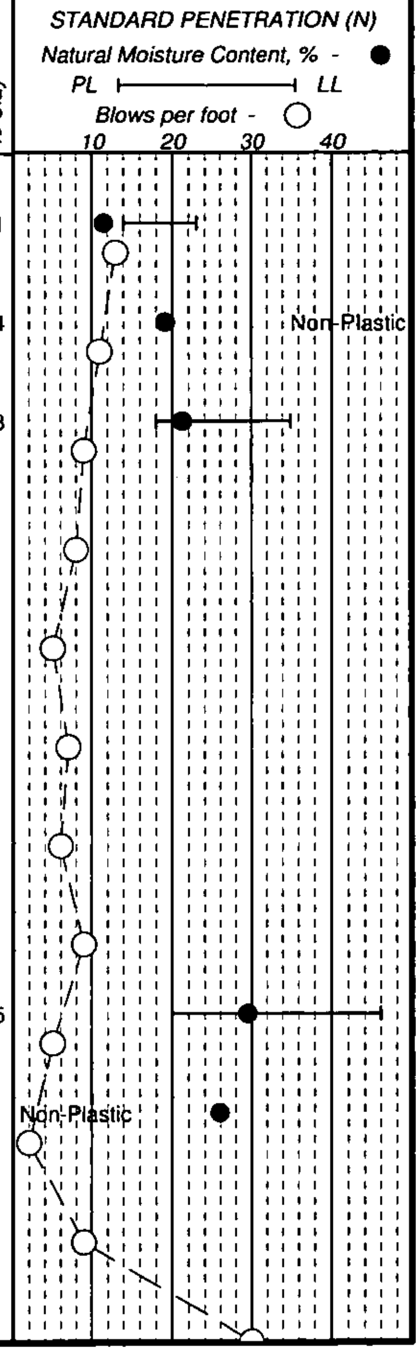
DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1107 | Location: Sta. 2600+77.4, 34.2 ft. LT of US 23 Ramp B BL | Date Drilled: 07/20/05

WATER OBSERVATIONS: Water seepage at: 25.0'-29.0'
Water level at completion: 25.0' (prior to coring)
6.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.5						Asphalt - 4" Aggregate Base - 8"						
1.0	539.5	5 7 6	10	1		3.5	Medium dense dark brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	27	24	--	20	18	11
3.0	537.5	4 5 6	11	2			Medium dense brown SILT (A-4b), some clay, trace fine to coarse sand, trace gravel; damp to moist.	3	1	--	5	57	34
5.5	535.0	4 5 4	14	3		3.0	Very stiff gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp to moist.	8	5	--	12	42	33
		3 4 4	12	4		2.5							
10.5	530.0	2 2 3	14	5		1.5	Stiff to very stiff brown and gray CLAY (A-7-6), "and" silt, trace fine to coarse sand; moist.						
		1 3 4	14	6		3.0							
		1 3 3	16	7		2.5							
		3 4 5	13	8		2.5							
		2 2 3	17	9		1.25		0	2	--	5	38	55
23.0	517.5	WOH 1 1	15	10			Loose brown GRAVEL WITH SAND (A-1-b), trace clay; wet.	9	70	--	14	7	
		2 4 5	10	11									
28.0	512.5	10 11 19	18	12			Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; moist.						



FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1107 | Location: Sta. 2600+77.4, 34.2 ft. LT of US 23 Ramp B BL | Date Drilled: 07/20/05

WATER OBSERVATIONS: Water seepage at: 25.0'-29.0'
Water level at completion: 25.0' (prior to coring)
6.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
	510.5													
30.0	510.5	Core 60"	Rec 50"	RQD 20%	R1		Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, massive, slightly fractured. @ 30.0'-30.7', lost recovery. @ 30.7'-31.6', calcareous, sulfur odor. @ 30.7'-31.6', 32.7'-32.9', 33.8'-33.9', high angle fractures.							
35.0	505.5						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1108 | Location: Sta. 2602+29.5, 35.3 ft. LT of US 23 Ramp B BL | Date Drilled: 07/21/05

WATER OBSERVATIONS: Water seepage at: 25.0'
Water level at completion: 25.0' (prior to coring)
8.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7						Asphalt - 4" Aggregate Base - 8"						
1.0	539.7	3 5 4	12	1		1.5	FILL: Stiff dark brown SANDY SILT (A-4a), little clay, little gravel; damp to moist.	10	18	--	28	31	13
3.0	537.7	3 4 6	10	2		3.0	FILL: Very stiff dark brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp to moist.	6	4	--	8	43	39
5.5	535.2	2 3 5	16	3		--	FILL: Stiff to very stiff gray SILT AND CLAY (A-6a), little fine to coarse sand, little gravel; slightly organic; moist.	10	4	--	8	51	27
8.0	532.7	3 5 7	13	4		4.5+	Hard brown and gray SILTY CLAY (A-6b), trace to little fine to coarse sand, trace gravel; moist.	7	6	--	10	44	33
10.0	530.7				P1	3.75	Very stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand; damp.	0	1	--	3	58	38
12.0	528.7	2 2 2	14	5		1.0		3	0	--	1	59	37
		2 2 3	16	6	P2	1.5	Stiff brown SILTY CLAY (A-6b), trace to little fine to coarse sand, trace gravel; moist.	2	4	--	9	48	37
15		1 3 3	15	7		1.75							
		2 2 4	15	8	P3	1.0		1	4	--	5	51	39
20													
21.5	519.2	1 2 3	18	9		1.5	Stiff brown CLAY (A-7-6), trace gravel, trace fine sand; moist.	2	0	--	1	25	72
23.0	517.7	WOH 1 1	15	10			Very loose to loose gray COARSE AND FINE SAND (A-3a), little gravel, trace clay; wet.						
25													
26.5	514.2	6 50/4	9	11			Severely weathered black SILTSTONE, carbonaceous.						
28.9	511.8						Hard gray SANDSTONE interbedded with SILTSTONE.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

59
50+

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1108 | Location: Sta. 2602+29.5, 35.3 ft. LT of US 23 Ramp B BL | Date Drilled: 07/21/05

WATER OBSERVATIONS: Water seepage at: 25.0'
Water level at completion: 25.0' (prior to coring)
8.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30	510.7	Core 60"	Rec 53"	RQD 78%	R1		Hard gray SANDSTONE interbedded with SILTSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, medium bedded, slightly fractured. @ 28.9'-29.1', 31.4'-31.7', 32.2'-33.2', high angle fractures.						
33.5	507.2						Bottom of Boring - 33.5'						
35													
40													
45													
50													
55													
60													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1109 | Location: Sta. 2603+75.4, 36.5 ft. LT of US 23 Ramp B BL | Date Drilled: 07/22/05

WATER OBSERVATIONS: Water seepage at: 19.0'-22.0'
Water level at completion: 19.0' (prior to coring)
8.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.6						Asphalt - 4" Aggregate Base - 8"						
1.0	539.6	3 2 2	12	1		1.5	FILL: Stiff dark brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; moist.	7	10	--	11	48	24
3.0	537.6	2 4 5	14	2		2.0	FILL: Stiff to very stiff dark brown SANDY SILT (A-4a), some gravel, little clay; contains wood fragments; damp.	22	15	--	12	32	19
5.5	535.1	3 4 5	15	3		3.5	POSSIBLE FILL: Very stiff to hard grayish brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; slightly organic; moist.	1	3	--	7	51	38
10		2 3 3	13	4		4.25		1	4	--	11	47	37
10.5	530.1	1 4 4	10	5			Medium stiff brown SANDY SILT (A-4a), some gravel, little clay; moist.	33	17	--	14	24	12
13.0	527.6	1 1 2	15	6		1.5	Stiff gray CLAY (A-7-6), some silt, trace fine to coarse sand, trace gravel; moist to wet.	1	3	--	7	35	54
15		1 1 3	12	7		2.0							
18.0	522.6	1 1 2	18	8		--	Soft brown SANDY SILT (A-4a), little clay, trace gravel; wet.	3	12	--	32	39	14
20		WOH 1 1	16	9		--		0	1	--	52	47	
23.5	517.1	10 50/5	9	10			Severely weathered black SHALE, carbonaceous.						
25.0	515.6	Core 60"	Rec 60"	RQD 77%	R1		Soft to medium hard black SHALE; very fine grained, moderately weathered to decomposed, carbonaceous, thinly laminated, highly fractured. @ 28.0'-28.1', 28.3'-28.6', high angle fracture.						
28.3	512.3						Medium hard to hard gray SANDSTONE; fine grained, highly weathered, micaceous, argillaceous, massive, slightly						
30.0	510.6												

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
50+

FILE: 0121-3070-03 | 11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1109 | Location: Sta. 2603+75.4, 36.5 ft. LT of US 23 Ramp B BL | Date Drilled: 07/22/05

WATER OBSERVATIONS: Water seepage at: 19.0'-22.0'
Water level at completion: 19.0' (prior to coring)
8.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	510.6						fractured. Bottom of Boring - 30.0'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1121 | Location: Sta. 3901+49.8, 18.1 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-21.0'
Water level at completion: 16.0' (prior to coring)
9.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
^	539.0												
0.3	538.7						Topsoil - 4"						
		3 4 5	13	1		4.5+	FILL: Hard dark brown SILT AND CLAY (A-6a), little fine to coarse sand, little gravel; damp.	16	9	--	7	38	30
3.5	535.5												
		3 4 5	8	2		--	FILL: Medium stiff brown SANDY SILT (A-4a), some clay, trace gravel; wet.	7	16	--	24	31	22
5													
5.5	533.5												
		3 4 3	13	3		1.0	Stiff gray SILT AND CLAY (A-6a), trace to little fine to coarse sand, trace gravel; moist.	2	4	--	6	57	31
		2 2 2	16	4		1.25							
10													
		W O H	17	5		1.0	@ 11.0', some fine to coarse sand.						
13.0	526.0												
		2 1 1	10	6			Very loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); moist to wet.						
15													
		4 9 9	9	7			@ 16.0'-17.5', medium dense.						
18.0	521.0												
		9 9 13	12	8			Medium dense brown COARSE AND FINE SAND (A-3a), some clay, trace gravel; wet.						
20													
21.5	517.5	12 11 11	13	9			Severely weathered gray SANDSTONE.						
		33 50/4	8	10									
25.0	514.0												
		Core 60"	Rec 57"	RQD 65%	R1		Very hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, medium bedded, moderately fractured. @ 25.3'-25.4', 26.3'-26.4', 29.1'-29.5', filled fractures. @ 29.7'-30.0', calcareous.						
30.0	509.0						Bottom of Boring - 30.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

50+

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1121 | Location: Sta. 3901+49.8, 18.1 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-21.0'
Water level at completion: 16.0' (prior to coring)
9.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	509.0													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 | 11/14/2007 10:43 PM |

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1122 | Location: Sta. 3903+45.0, 34.5 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-22.0'
Water level at completion: 16.0' (prior to coring)
10.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7						Asphalt - 8" Aggregate Base - 4"						
1.0	539.7	5 5 6	9	1		2.0	FILL: Stiff to very stiff brown SANDY SILT (A-4a), little clay, little gravel; damp to moist.	16	19	--	22	28	15
3.0	537.7	5 5 9	14	2		4.5+	Hard brown and gray SILTY CLAY (A-6b), trace fine to coarse sand; moist.	0	1	--	4	56	39
6.0	534.7	5 5 7	12	3		4.0	Very stiff to hard brown SILT AND CLAY (A-6a), little fine to coarse sand, little gravel; contains sand seams; moist.	13	11	--	8	44	24
8.0	532.7	10 5 4	9	4			Loose brown COARSE AND FINE SAND (A-3a), little gravel, trace clay; damp to moist.						
10.5	530.2	3 5 4	2	5		3.0	Stiff to very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
15		2 2 3	12	6		1.0							
		1 1 1	8	7		--	@ 16.0'-20.0', soft to medium stiff; wet.						
20		WOH 3 3	6	8		0.5							
20.5	520.2	13 16 15	12	9			Dense to very dense brown and gray GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); contains sandstone fragments; moist.						
25		18 24 18	10	10									
		22 50/3	4	11									
27.5	513.2						Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to massive, slightly fractured.						
30		Core 60"	Rec 54"	RQD 65%	R1								

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
50+

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1122 | Location: Sta. 3903+45.0, 34.5 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-22.0'
Water level at completion: 16.0' (prior to coring)
10.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	510.7						Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to massive, slightly fractured, iron-staining.							
32.5	508.2						@ 28.2' to 28.3', broken.							
35							@ 28.5' to 28.9', broken and decomposed.							
40							@ 30.4' to 30.7', broken with decomposed zones.							
45							Bottom of Boring - 32.5'							
50														
55														
60														

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1123 | Location: Sta. 3904+93.1, 34.5 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 19.0'-20.0'
Water level at completion: 19.0' (prior to coring)
12.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.9						Asphalt - 6" Aggregate Base - 6"						
1.0	539.9	4 5 6	9	1		2.5	FILL: Very stiff gray SANDY SILT (A-4a), some gravel, little clay; damp.	25	12	--	13	34	16
3.0	537.9	2 5 4	10	2		4.5+	FILL: Very stiff to hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.	7	6	--	4	45	38
5		5 6 5	15	3		3.0	@ 6.0', gray, organic staining and odor, contains sand seams.	4	8	--	8	47	33
		3 4 3	9	4		3.5							
10		3 3 4	13	5		2.5							
13.0	527.9												
		2 4 4	9	6		2.0	Stiff brown and gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist to wet.						
15		1 2 2	14	7		1.0							
		2 2 2	10	8		1.0							
20													
20.5	520.4	5 14 14	6	9		4.5+	Hard brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); damp.						
		10 25 18	13	10		4.5+							
25		8 46 50/3	8	11		4.5+							
27.5	513.4	Core 60"	Rec 50"	RQD 42%	R1		Hard gray SANDSTONE; fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, highly fractured to broken, iron-staining.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
50+

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1123 | Location: Sta. 3904+93.1, 34.5 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 19.0'-20.0'
Water level at completion: 19.0' (prior to coring)
12.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	510.9						Hard gray SANDSTONE; fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, highly fractured to broken, iron-staining.							
32.5	508.4						Bottom of Boring - 32.5'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

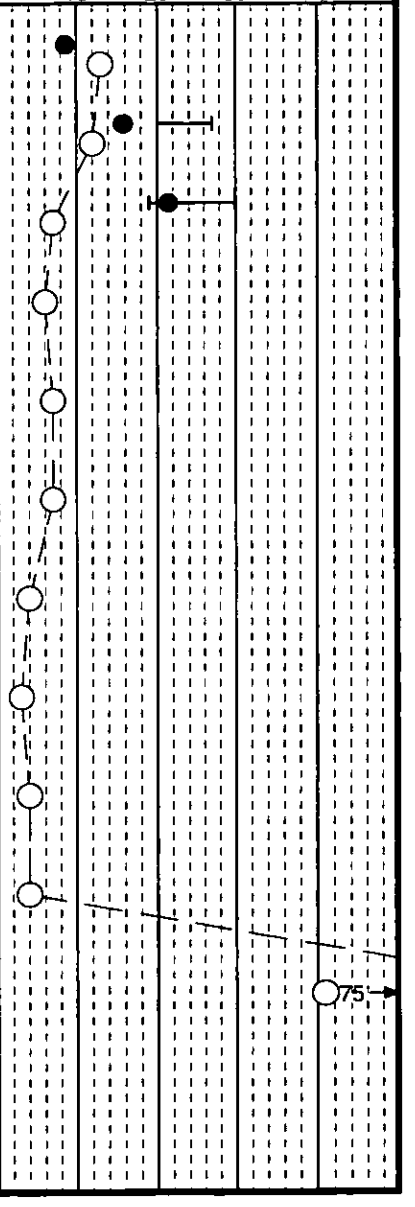
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1125 | Location: Sta. 3910+29.2, 9.3 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05 to 07/20/05

WATER OBSERVATIONS: Water seepage at: 14.0'-19.0'
Water level at completion: 14.0' (prior to coring)
11.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	538.9												
0.3	538.6	2 5 8 6	18	1		4.5+	Topsoil - 4" FILL: Hard brown SANDY SILT (A-4a), trace gravel, little clay; damp.						
		5 7 5 5	17	2		4.5+		8	14	--	11	49	18
4.0	534.9	4 3 4 4	19	3		2.0	Stiff brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; moist.	1	8	--	9	53	29
5		2 3 3	16	4		1.5							
8.0	530.9												
		2 3 4	18	5		2.5	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
10		3 3 4	16	6		2.25							
		2 2 2	16	7		--	@ 13.5', "and" sand, wet.						
15													
15.5	523.4	1 1 2	12	8			Very loose brown GRAVEL WITH SAND (A-1-b), some silt, little clay; wet.						
		WOH 2 2	10	9									
20		WOH 2 2	3	10									
23.0	515.9												
		8 25 50	18	11			Very dense brown SANDY SILT (A-4a), trace gravel, trace clay; moist.						
25.0	513.9	Core 60"	Rec 52"	RQD 48%	R1		Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, moderately fractured, iron-staining. @ 25.2'-25.7', 26.2'-26.6', 27.5'-27.8', broken. @ 26.6'-26.7', 28.5'-28.6', high angle fractures.						
30.0	508.9						Bottom of Boring - 30.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1125 | Location: Sta. 3910+29.2, 9.3 ft. LT of US 23 Ramp C BL | Date Drilled: 7/19/05 to 07/20/05

WATER OBSERVATIONS: Water seepage at: 14.0'-19.0'
Water level at completion: 14.0' (prior to coring)
11.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	508.9													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1126 | Location: Sta. 3913+97.9, 22.7 ft. LT of US 23 Ramp C BL | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-14.0', 21.0'-25.0'
Water level at completion: 11.0' (prior to coring)
7.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7						Asphalt - 3" Aggregate Base - 8"						
0.9	539.8	5 6 7 7	16	1		4.5+	Hard brown SILTY CLAY (A-6b), trace fine to coarse sand; damp.	0	1	--	2	62	35
3.0	537.7	1 6 5 5	17	2		4.5+	Very stiff to hard brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; damp to moist.	8	13	--	10	37	32
5		7 8 9 5	14	3		3.0	@ 5.0'-7.0', contains sand seams. @ 5.0', gray and brown.						
		3 4 5	15	4		2.5							
		2 2 3	13	5		3.5	@ 8.5', little fine to coarse sand.	0	1	--	11	42	46
10													
10.5	530.2	2 2 2	15	6		0.25	Soft brown SILT (A-4b), some clay, little fine to coarse sand; wet.	0	1	--	15	58	26
		1 1 2	13	7		0.5							
15													
15.5	525.2	WOH 2 2	18	8		0.75	Medium stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist to wet.	1	2	--	4	64	29
		1 2 2	16	9		1.0							
20													
20.5	520.2	WOH WOH 2	17	10			Very loose brown SANDY SILT (A-4a), little clay; wet.	0	12	--	48	29	11
23.0	517.7	8 14 21	18	11			Dense to very dense brown and gray GRAVEL WITH SAND (A-1-b), trace clay; wet.	5	69	--	20	6	
25													
		10 50/5	11	12									
27.5	513.2	Core 60"	Rec 53"	RQD 33%	R1		Hard to very hard gray SANDSTONE; very fine to fine grained, highly weathered to decomposed, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured to broken.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

Non-Plastic

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 012[illegible]3070.03

LOG OF: Boring B-1126 | Location: Sta. 3913+97.9, 22.7 ft. LT of US 23 Ramp C BL | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-14.0', 21.0'-25.0'
Water level at completion: 11.0' (prior to coring)
7.5' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢⊣ LL Blows per foot - ○ 10 20 30 40
30	510.7						Hard to very hard gray SANDSTONE; very fine to fine grained, highly weathered to decomposed, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured to broken, iron-staining.							
32.5	508.2						@ 28.6'-30.5', decomposed.							
							Bottom of Boring - 32.5'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

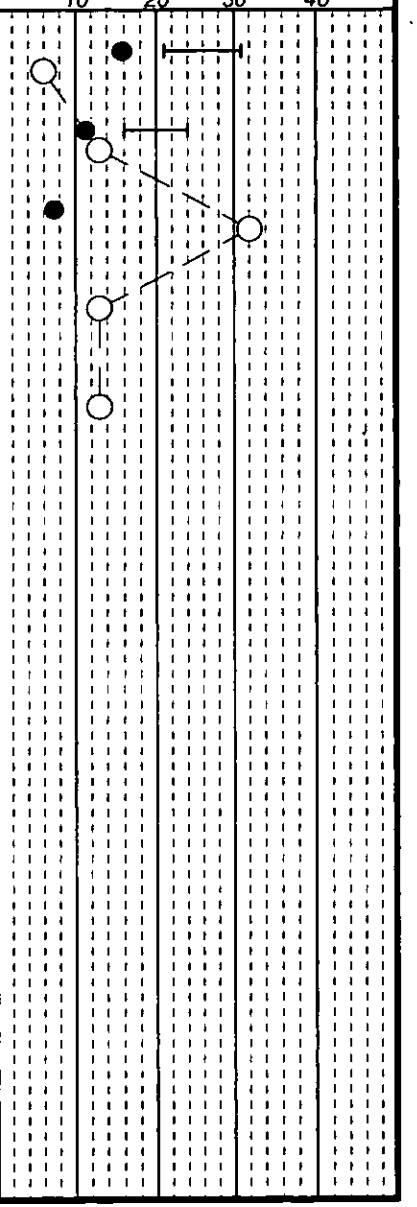
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1127 | Location: Sta. 3916+94.6, 11.7 ft. LT of US 23 Ramp C BL | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: Not Reported; Water level at completion: Not Reported

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.0												
0.3	539.7	2 3 3 7	20	1		3.75	Topsoil - 4" Very stiff to hard brown SANDY SILT (A-4a), some clay, trace gravel; damp.	8	9	--	9	45	29
		6 5 8 7	22	2		4.5+		6	19	--	20	33	22
5		5 16 16 16	21	3		4.5+							
6.0	534.0	2 5 8	17	4		4.5+	Hard dark brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.						
8.0	532.0	5 6 7	18	5		3.0	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand; moist.						
10.0	530.0						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1128 | Location: Sta. 3921+02.4, 6.9 ft. LT of US 23 Ramp C BL | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.6						Asphalt - 8" Aggregate Base - 4"						
1.0	539.6	8 11 7 6	19	1		4.5+	Hard brown SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	8	2	--	2	55	33
3.0	537.6	3 9 17 10	22	2			Medium dense brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; damp.	41	23	--	14	17	5
5.0	535.6	8 5 13 10	20	3		4.5+	Hard brown SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	2	5	--	10	48	35
7.0	533.6	2 4 4	16	4		4.5+	Hard gray SILTY CLAY (A-6b), trace fine to coarse sand; damp.						
		4 4 4	18	5		4.25	@ 8.5', brown.						
10.0	530.6						Bottom of Boring - 10.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
Non-Plastic

15 20 25 30

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1129 | Location: Sta. 3925+05.5, 0.2 ft. LT of US 23 Ramp C BL | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.9												
0.8	540.1	6 6 20 21	22	1		4.5+	Asphalt - 6" Aggregate Base - 4" Hard black SILT (A-4b), some clay, trace gravel, trace fine to coarse sand, organic; damp.	6	2	--	5	55	32
3.0	537.9	7 10 12 11	21	2			Medium dense to dense brown COARSE AND FINE SAND (A-3a), little gravel, little silt, trace clay; damp.	17	32	--	26	17	8
5		15 15 14 14	20	3									
		16 18 15	18	4									
		13 21 17	18	5			@ 8.5', contains sandstone fragments.						
10.0	530.9						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1130 | Location: Sta. 3928+41.7, 5.9 ft. LT of US 23 Ramp C BL | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: Not Reported; Water level at completion: Not Reported

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.4												
0.8	540.6	20 30 15	14	1			Asphalt - 4" Aggregate Base - 6" Dense brown GRAVEL WITH SAND (A-1-b), little clay; damp.	53	19	--	10	18	
3.0	538.4	5 5 5 5	16	2		2.5	Very stiff brown SANDY SILT (A-4a), some gravel, little clay; damp.	21	18	--	22	22	17
5		6 3 2 1	15	3		3.25							
7.5	533.9	10 7 5 3	16	4			Medium dense brown GRAVEL WITH SAND (A-1-b); damp.						
10.0	531.4						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1131 | Location: Sta. 1933+06.8, 15.9 ft. RT of US 23 Ramp A BL | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.0												
0.8	540.2						Asphalt - 5" Aggregate Base - 5"						
		3 4 4 5	6	1			Loose gray COARSE AND FINE SAND (A-3a), little gravel, little silt, little clay; damp.	16	25	--	29	18	12
3.0	538.0	3 4 3 5	16	2			Loose gray GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	34	19	--	12	20	15
5.0	536.0	2 4 3 3	15	3		4.5+	Very stiff to hard brown and gray SILT AND CLAY (A-6a), trace fine to coarse sand; damp.	0	2	--	11	57	30
		3 3 3 4	16	4		3.5							
10.0	531.0						Bottom of Boring - 10.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

15 20 25 30

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1132 | Location: Sta. 1928+97.1, 7.4 ft. RT of US 23 Ramp A BL | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7												
0.8	539.9						Asphalt - 6" Aggregate Base - 4"						
		3 4 5 5	20	1		3.5	Very stiff brown SANDY SILT (A-4a), some clay, little gravel; damp.	16	19	--	18	27	20
3.0	537.7	4 6 6 6	22	2		3.5	Very stiff brown SILT AND CLAY (A-6a), "and" fine to coarse sand, little gravel; damp.	15	24	--	18	23	20
5.0	535.7	7 16 14 8	21	3			Medium dense to dense brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	19	31	--	20	19	11
7.0	533.7	3 4 7	11	4		3.5	Very stiff brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; moist.						
		5 5 5	17	5		3.0							
10.0	530.7						Bottom of Boring - 10.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

15 20 25 30

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1133 | Location: Sta. 1924+94.0, 20.4 ft. RT of US 23 Ramp A BL | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0', 27.0'-28.0'
Water level at completion: 11.0' (prior to coring)
7.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.2												
0.4	539.8	2 6 7 10	16	1		2.75	Topsoil - 5" Very stiff brown SANDY SILT (A-4a), little clay, little gravel; moist.	12	22	--	20	32	14
2.0	538.2	6 7 7 9	14	2		4.5+	Hard brown SILT AND CLAY (A-6a), some fine to coarse sand, some gravel; damp.	27	20	--	11	23	19
4.0	536.2	5 6 12 16	16	3		4.0	Very stiff to hard brown SANDY SILT (A-4a), little clay, little gravel; damp.	13	31	--	18	27	11
5		4 5 5	15	4		3.5	@ 6.0'-7.5', very stiff, gray, organic staining.						
		3 5 4	14	5		4.0							
10													
10.5	529.7	1 1 1	13	6			Very loose brown SANDY SILT (A-4a), some clay, little gravel; wet.						
		WOH 1 1	17	7			@ 13.5'-15.0', "and" gravel.						
15		W O H	17	8									
18.0	522.2												
		W O H	17	9		0.25	Soft gray SILTY CLAY (A-6b), trace fine to coarse sand; wet.						
20		W O H	18	10		0.5							
		W O H	18	11		0.25							
25													
25.5	514.7	1 4 9	15	12			Medium dense gray COARSE AND FINE SAND (A-3a), little gravel; wet.						
28.0	512.2												
30		7 11 50/4	16	13			Very dense brown and gray GRAVEL WITH SAND AND SILT (A-2-4), little clay; contains sandstone fragments; wet.						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1133 | Location: Sta. 1924+94.0, 20.4 ft. RT of US 23 Ramp A BL | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0', 27.0'-28.0'
Water level at completion: 11.0' (prior to coring)
7.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	510.2												
30.0	510.2	Core 60"	Rec 52"	RQD 33%	R1		Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to medium bedded, moderately to highly fractured. @ 30.4'-30.7', 32.5'-32.9', broken and decomposed. @ 33.0'-33.2', 34.7'-35.0', high angle fractures.						
35.0	505.2						Bottom of Boring - 35.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

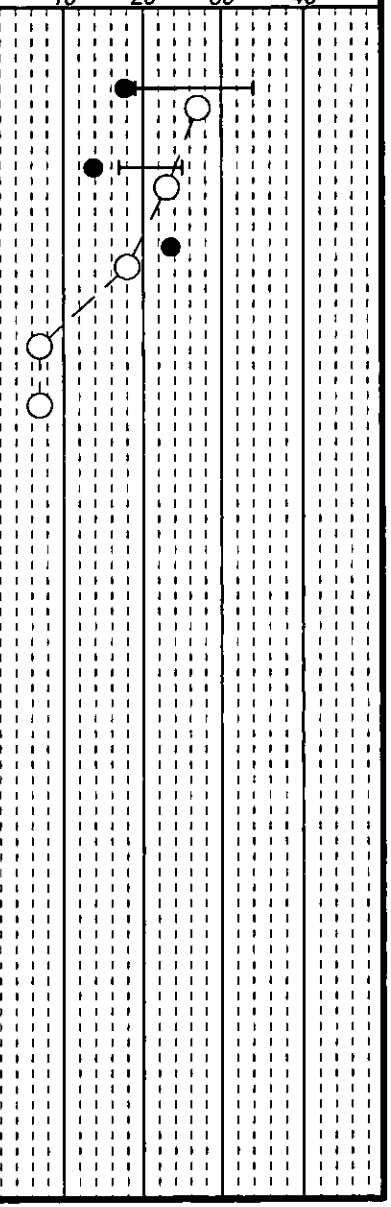
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1149 | Location: Sta. 4921+98.8, 3.0 ft. LT of US 23 Ramp D BL | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.4												
0.9	539.5	10 17 10 13	21	1		4.5+	Asphalt - 7" Aggregate Base - 4" Hard brown SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	1	4	--	5	50	40
3.0	537.4	6 10 13 12	20	2		2.5	Very stiff brown SANDY SILT (A-4a), some clay, little gravel; damp.	20	12	--	11	34	23
5		17 10 8 10	23	3		2.25							
7.0	533.4	3 3 4	15	4		4.0	Very stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand; moist.						
		3 4 3	17	5		2.5							
10.0	530.4						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1150 | Location: Sta. 4926+81.3, 0.6 ft. RT of US 23 Ramp D BL | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.8												
0.9	539.9						Asphalt - 6" Aggregate Base - 5"						
		6 5 6 6	22	1		4.0	Very stiff to hard dark gray SANDY SILT (A-4a), some clay, trace gravel; organic; damp.	7	6	--	8	48	31
3.0	537.8	3 6 9 9	22	2		4.5+	Very stiff to hard brown and gray SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp. @ 3.0'-5.0', slightly organic.	0	2	--	5	57	36
5		8 7 7 8	24	3		2.5							
		3 4 5	18	4		4.0							
		4 5 5	17	5		3.5							
10.0	530.8						Bottom of Boring - 10.0'						
15													
20													
25													
30													

GRADATION

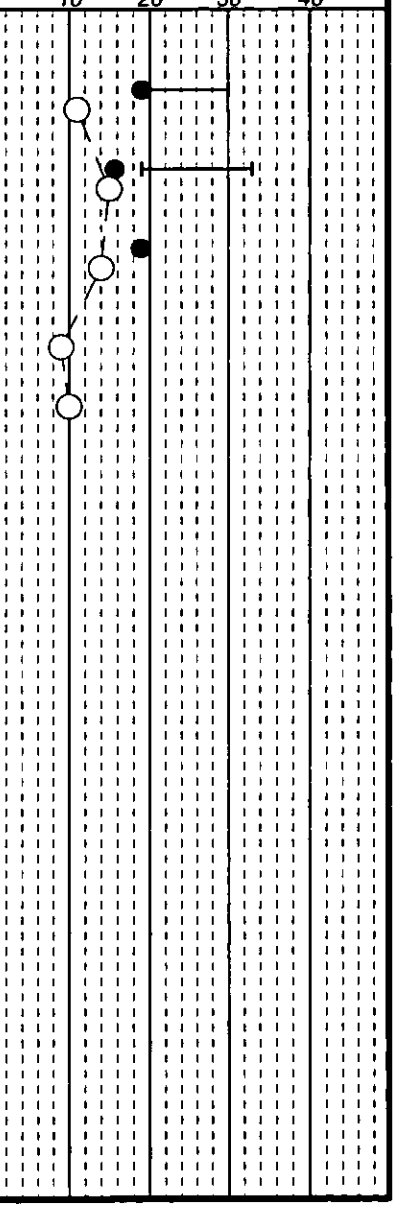
STANDARD PENETRATION (N)

Natural Moisture Content, % - ●

PL ⊢——⊣ LL

Blows per foot - ○

10 20 30 40



FILE: 0121-3070-03 [11/14/2007 10:43 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1151 | Location: Sta. 4929+67.2, 3.5 ft. LT of US 23 Ramp D BL | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: Not Reported; Water level at completion: Not Reported

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf) / * Point-Load Strength (psi)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.1						Asphalt - 4" Aggregate Base - 8"						
1.0	540.1	18 11 4 5	13	1			Medium dense gray COARSE AND FINE SAND (A-3a), little clay, little gravel; damp.	18	23	--	32	16	11
3.0	538.1	3 5 8 5	15	2		3.0	Very stiff to hard brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp.	4	5	--	7	42	42
5		7 6 6 7	12	3		4.5+							
		5 9 8 8	16	4		--							
10.0	531.1						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [11/14/2007 10:43 PM]

Subgrade Analysis

V. 9.09 08/10/07

Design	8
CBR	
Item 320	No
Global CS	Option
Global LS	No

24 Total Borings

Classification Counts by Sample

R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	2	0	4	5	0	0	0	18	3	0	19	9	0	0	0	0
		3%		7%	8%				30%	5%		32%	15%				
0.0%		18.3%							81.7%								

Class @ Surface

2-5	0	
4b	1	4%
5	0	
7-5	0	
7-6	0	
8a	0	
8b	0	
R	0	

% Borings	
N_L <= 5	8%
N_L <=10	50%
N_L >=20	4%
M+	54%
R	0%

% Surface			
42%			
4%	38%		
% Borings			
67%			
0%	58%	13%	63%

	N_{60}	N_L	PI	Clay	M	M_{OPT}	GI
Average	14.7	10.9	11.0	24.8	14.6	12.7	5.60
Maximum	45	22	38 25 23	65 44 97.7	23	20	11
Minimum	4	4	18 1 -6	9 5 18	5	6	0

SCI-823-10.13 US 23 Existing

#	B #	Boring Location	Depth	To	Cut Fill	Standard Penetration n_2	n_3	N_m	Rig	N_{60}	N_L	Physical Characteristics LL	PL	PI	% Silt	% Clay	P 200	Moisture M	M_{OPT}	Classification Class	GI	Comments
1	1101	STA 587+78.88	1.0	3.0		20	10	30	A	30		24	18	6	20	10	30	10	10	2-4	0	Drilled on US 23
		31.2' L	3.0	5.0		8	8	16		16		27	17	10	12	9	21	13	10	2-4	0	Ramp B
											16											
2	1102	STA 590+60.94	1.0	3.0		10	7	17	A	17		35	17	18	49	37	86	17	16	6b	11	Drilled on US 23
		41.1' R	3.0	5.0		3	4	7		7		27	17	10	65	32	97	23	12	4b	8	Ramp B
											7											
3	1103	STA 593+59.03	1.0	3.0		3	5	8	A	8		28	17	11	31	19	50	12	14	6a	3	Drilled on the shoulde
		47.6' R	3.0	5.0		7	4	11		11		37	20	17	50	44	94	22	16	6b	11	Ramp B
											8											
4	1104	STA 596+29.56	1.0	3.0		6	8	14	A	14		31	18	13	51	33	84	15	14	6a	9	Drilled on US 23
		63.08' R	3.0	5.0		5	5	10		10		33	18	15	45	36	81	18	14	6a	10	Ramp B
			5.0	7.0		5	4	9		9		32	21	11	62	32	94	21	16	6a	8	
											9											
5	1105	STA 597+77.17	1.0	2.5	2.0	8	5	13	A	13		38	22	16	56	30	86	16	17	6b	10	Drilled on the shoulde
		50.13' R	3.5	5.0		5	7	12		12		18	24	-6	46	38	84	10	19	6b	8	Ramp B
											12											
6	1106	STA 599+27.81	1.0	2.5	1.2	7	6	13	A	13		32	17	15	61	37	98	17	14	6a	10	Drilled on the shoulde
		46.71' R	3.5	5.0		6	5	11		11		31	19	12	60	31	91	18	14	6a	9	Ramp B
											11											
7	1107	STA 600+76.5	1.0	2.5	1.0	7	6	13	A	13		23	14	9	18	11	29	12	10	2-4	0	Drilled on the shoulde
		40.82' R	3.5	5.0		5	6	11		11		np	np	NP	57	34	91	19	11	4b	8	Ramp B
											11											
8	1108	STA 602+28.12	1.0	2.5	1.0	5	4	9	A	9		18	14	4	31	13	44	14	10	4a	2	Drilled on US 23
		42.04' R	3.5	5.0		4	6	10		10		36	19	17	43	39	82	20	16	6b	11	Ramp B
											9											
9	1109	STA 603+74.36	1.0	2.5	1.0	2	2	4	A	4		27	15	12	48	24	72	19	14	6a	8	Drilled on US 23
		45.23' R	3.5	5.0		4	5	9		9		25	16	9	32	19	51	14	11	4a	3	Ramp B
											4											
10	1121	STA 617+66.55	1.0	2.5	2.0	4	5	9	A	9		36	23	13	38	30	67	17	18	6a	8	Drilled on the shoulde
		66.42' R	3.5	5.0		4	5	9		9		23	14	9	31	22	53	14	10	4a	4	Ramp C
											9											
11	1122	STA 619+61.75	1.0	2.5		5	6	11	A	11		24	1	23	28	15	44	16	10	4a	6	Drilled on US 23
		49.85' R	3.5	5.0		5	9	14		14		34	18	16	56	39	95	17	16	6b	10	Ramp C
											11											

Problem w/ Class	Problem w/ MN	Treatments LS	Treatments CS	Treatments UC Class	Treatments UC MN
4b	MN		16	3	3
	N		14		2
	MN		12		1
	MN		12		1
	MN		14		2
	MN		12		1
4b	MN		12	3	1
	MN		14		2
	MN		12		1
	MN		--		5
	N		14		1
	N		14		1
	MN		14		2
	MN				1

SCI-823-10.13 US 23 Existing

#	B #	Boring Location	Depth	To	Cut / Fill	Standard Penetration n_2	n_3	N_m	Rig	N_{60}	N_L	Physical Characteristics LL	PL	PI	% Silt	% Clay	P 200	Moisture M	M_{OPT}	Classification Class	GI	Comments	Problem w/ Class	w/ MN	Treatments LS	CS	UC Class	UC MN
12	1123	STA 621+9.82	1.0	2.5		5	6	11	A	11		24	18	6	34	16	50	14	13	4a	3	Drilled on US 23						
		49.69'R	3.5	5.0		5	4	9		9		34	19	15	45	38	83	19	14	6a	10	Ramp C		MN		14		2
											9																	
13	1125	STA 626+45.85	0.0	2.0	2.0	5	8	13	A	13									10	4a	5	Drilled on the shoulde						
		72.76' R	2.0	4.0		7	5	12		12		27	20	7	49	18	67	16	15	4a	6	Ramp C						
											12																	
14	1126	STA 630+14.13	1.0	3.0		6	7	13	A	13		38	20	16	62	35	97	17	16	6b	10	Drilled on US 23						
		51.43' R	3.0	5.0		6	5	11		11		31	18	13	37	32	69	16	14	6a	8	Ramp C						
			5.0	7.0		8	9	17		17									14	6a	8							
											11																	
15	1127	STA 633+10.96	0.0	2.0	2.0	3	3	6	A	6		31	21	10	45	29	74	16	16	4a	8	Drilled on the shoulde		N		16		3
		55.87' R	2.0	4.0		5	8	13		13		24	18	6	33	22	55	11	13	4a	4	Ramp C						
			4.0	6.0		16	16	32		32									10	4a	5							
											6																	
16	1128	STA 637+18.78	1.0	3.0		11	7	18	A	18		32	21	11	55	33	88	16	16	6a	8	Drilled on US 23						
		51.76' R	3.0	5.0		9	17	26		26		NP	NP	NP	17	5	22	7	6	1b	0	Ramp C						
			5.0	7.0		5	13	18		18									14	6a	8							
											18																	
17	1129	STA 641+21.96	1.0	3.0		6	20	26	A	26		31	25	6	55	32	87	19	20	4b	8	Drilled on US 23	4b				3	
		49.6' R	3.0	5.0		10	12	22		22		NP	NP	NP	17	8	25	7	8	3a	0	Ramp C						
			5.0	7.0		15	14	29		29									8	3a	0							
											22																	
18	1130	STA 644+56.1	1.0	2.5		30	15	45	A	45		NP	NP	NP	9	9	18	5	6	1b	0	Drilled on US 23						
		39.22' L	3.0	5.0		5	5	10		10		24	15	9	22	17	39	14	10	4a	1	Ramp C		MN		12		1
			5.0	7.0		3	2	5		5									10	4a	5			N				5
											5																	
19	1131	STA 639+55.69	1.0	3.0		4	5	9	A	9		18	14	4	18	12	30	8	8	3a	0	Drilled on US 23		N				1
		40.15' L	3.0	5.0		3	5	8		8		24	15	9	20	15	35	8	10	2-4	0	Ramp A		N		14		2
			5.0	7.0		3	3	6		6		30	17	13	57	30	87	14	14	6a	9			N		16		3
											6																	
20	1132	STA 635+46.02	1.0	3.0	0.5	5	5	10	A	10		24	15	9	18	20	38	11	10	4a	1	Drilled on US 23						
		48.6' L	3.0	5.0		6	6	12		12		26	15	11	18	20	38	13	14	6a	1	Ramp A						
			5.0	7.0		14	8	22		22		20	13	7	19	11	30	7	10	2-4	0							
											10																	
21	1133	STA 631+41.5	0.0	2.0	0.5	7	10	17	A	17		24	15	9	32	14	46	13	10	4a	2	Drilled on the shoulde						
		52.94' L	2.0	4.0		7	9	16		16		30	16	14	23	19	42	11	14	6a	2	Ramp A						
			4.0	6.0		12	16	28		28		20	15	5	27	11	38	9	10	4a	1							
											16																	
22	1149	STA 614+78.31	1.0	3.0	0.5	10	13	23	A	23		34	19	15	50	40	90		14	6a	10	Drilled on US 23						
		51.96' L	3.0	5.0		13	12	25		25		25	17	8	34	23	57		12	4a	4	Ramp D						
			5.0	7.0		8	10	18		18									10	4a	5							
											18																	
23	1150	STA 609+95.8	1.0	3.0		6	6	12	A	12		30	20	10	48	31	79	19	15	4a	8	Drilled on US 23		MN		12		1
		48.5' L	3.0	5.0		9	9	18		18		33	19	14	57	36	93	16	14	6a	10	Ramp D						
			5.0	7.0		7	8	15		15								19	14	6a	8							
											12																	
24	1151	STA 607+10.06	1.0	3.0		4	5	9	A	9		NP		NP	16	11	27	10	8	3a	0	Drilled on US 23		N				1
		38.00 ' L	3.0	5.0		8	5	13		13		38	21	17	42	42	84	21	16	6b	11	Ramp D		MN		12		1
			5.0	7.0		6	7	13		13								16	16	6b	10							
											9																	

III.C. Subgrade Checklist

C-R-S: SC-823-10.10 US 23	PID: 79977	Reviewer: AMJ	Date: 11-16-2007

If you do not have any subgrade work on the project, you do not have to fill out this checklist.

Y N X 1	Has the subsurface investigation adequately characterized the soil or rock according to Geotechnical Bulletin 1: Plan Subgrades (GB1)?	
Y N X 2	If soils classified as A-2-5, A-4b, A-5, or A-7-5 are present at the proposed subgrade (soil profile), do the plans specify that these materials need to be removed and replaced?	
Y N X	a If these materials are to be removed and replaced, have the station limits, depth, and lateral limits for the planned removal been provided?	
Y **N** X 3	If there is any rock, shale, or coal present at the proposed subgrade (CMS 204.05), do the plans specify the removal of the material?	
Y N **X**	a If removal of any rock, shale, or coal is required, have the station limits, depth, and lateral limits for the planned removal of the material at proposed subgrade been provided?	
Y N X 4	In accordance with GB1, do the SPT values and existing moisture contents for the proposed subgrade soils indicate the need for subgrade stabilization?	
Y **N** X	a If removal and replacement is applicable, has the detail of subgrade removal been shown on the plans, including depth of removal, station limits, lateral extent, replacement material, and plan notes (Item 204 – Subgrade Compaction and Proof Rolling)?	Refer to roadway cross-sections.
Y N **X**	b If chemical stabilization is applicable, has the detail of this treatment been shown on the plans, including depth, percentage of chemical, station limits, lateral extent, and plan notes?	
	Indicate type of subgrade treatment specified: 9 **cement treatment** 9 lime treatment 9 other List Other items:	GB-1 recommends cement treatment or undercutting. Undercutting was recommended for subgrade treatment.
Y N X 5	If drainage or groundwater is an issue with the proposed subgrade, has an appropriate drainage system (e.g., pipe, underdrains) been provided?	Refer to roadway cross-sections.
Y N **X** 6	Has an appropriate quantity of Proof Rolling been included in the plans (CMS 204.06)?	Refer to roadway cross-sections.
Y N X 7	Has a design CBR value been provided?	

APPENDIX C

DLZ

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PLANNERS • SURVEYORS

November 16, 2007

Michael D. Weeks, P.E., P.S.
TranSystems Corporation
5747 Perimeter Drive, Suite 240
Dublin, OH 43017

Re: **Pavement Design Information**
Phase 2 Mainline
SCI-823-10.13 Portsmouth Bypass
DLZ Job No.: 0121-3070.03
Document No. 0103

Dear Mr. Weeks:

We have evaluated the existing laboratory test results performed as of June 6, 2006, to estimate a recommended CBR value for the above-mentioned project. A minor amount of testing was performed subsequent to this date, but including the subsequent data should not substantially change the overall conclusions and recommendations. Because the vast majority of the project's alignment will be in rock cuts or on embankments, all of the laboratory test results for the Phase 2 area were considered. Accordingly, the results of Phase 2 only are presented in this letter.

The method used was essentially the same as the one used by the Office of Geotechnical Engineering to determine the design CBR for the Nelsonville Bypass project. The alignment for that project was similar to the Portsmouth Bypass alignment in that most of it will also be in rock cuts or on embankments.

It is understood that the Phase 2 area is inclusive of station 537+50 to 904+79.54. The results of the other Phases will be presented in separate documents.

A total of 395 samples have been tested for particle size and plasticity where necessary. A summary of the soil samples tested is presented on the following page.

Based upon the results of the laboratory testing, an average CBR value of 8.7 was calculated for Phase 2. Consequently, a CBR value of 9 is recommended for the pavement design on the mainline alignment and ramps of the new alignment in Phase 2.

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PLANNERS • SURVEYORS

Michael D. Weeks, P.E., P.S.
November 16, 2007

Summary of Soil Samples Tested

ODOT Classification	Number of Samples Tested
Gravel (A-1-a)	2
Gravel with sand (A-1-b)	27
Fine sand (A-3)	1
Coarse and Fine Sand (A-3a)	5
Gravel, sand and silt (A-2-4)	31
Gravel with sand, silt, and clay. (A-2-6)	10
Sandy silt (A-4a)	83
Silt (A-4b)	52
Silt and clay (A-6a)	89
Silty clay (A-6b)	57
Elastic clay (A-7-5)	1
Clay (A-7-6)	37

We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning our report.

Respectfully submitted,

DLZ OHIO, INC.

Steven J. Riedy
Geotechnical Engineer

Andrew M. Jalbrzikowski
Engineering Geologist

Pete Nix, P.E.
Geotechnical Division Manager

cc: File
M:\proj\0121\3070.03\Pavement Design\Documents\Mainline\Phase II\Recommended CBR Phase II.doc