

client: Ohio) Del	Ohio Department of Transportation	int of	Trans	Sports	ation	Project: ATH-33/SR 681 Realignment		Job No. 9821-1016.00	8
LOG OF:	മ	Boring B-3	3-3		707	Location:	Approx. Sta. 48+848, 18 m Lt. of US 33 Date Drilled: 12/21/04		STANDARD PENETRATION (N)	, (S)
		m et.o	[ii]	Sample No.		Hand		GRADATION	Blows per 0.30 m 0 30 40	
Depth Elev. (m) (m) [ft]	×		(ш) ၁Მଧ	θνħΩ	SS97 ^Q	Penetro- meter (KN/m²) [tsf]	Water level at completion: 6.43 m [21.17] Water level at completion: 6.43 m [21.17] Water level at completion: 6.43 m [21.17]	=. Sand Silk Slay	Moisture Content - % PL Natural X	* E
.62	8	┨╏	┨╏	11			%	%	10 20 30 40	:
[25] [674.0	[0	ب ش	.254	7			FILL: Medium dense brown COARSE AND FINE SAND (A-3a), little silt; moist.			
[27.4] _ [671.6] - 9.14 [30]	<u>[6</u>]	7 10	.457	5		215 [2.25]	Very stiff brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; contains interbedded sand seams; moist.		-	
9.91 203.14 [32.5] [666.5]	4 0. 8	-0	1				Severely weathered brown and reddish brown SHALE.			
10.67 [35]		. D)	(4. 81 118 118 118 118 118 118 118 118 118	2						
11.58 201.47 [38.0] [661.0] - 12.19 [40]	74 <u>0</u> .	φ -	.457	4.		168 [1.75]	Stiff reddish brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; moist. (severely weathered and decomposed shale)			
13.72	>	WOH 2 5	457	2 .		96 [1.0]	@ 13.26 m - 13.72 m [43.5' - 45.0'], gray.			
14.78 198.27 [48.5] [650.5] 15.09 197.96 [49.5] [649.5]		34 507.15	178	<u>.</u> 0			Severely weathered gray SILTSTONE, micaceous. Bottom of Boring - 15.09 m [49.5']			

Job No. 9821-1016.00	STANDARD PENETRATION (N)	Blows per 0.30 m 10 20 30 40	Moisture Content - % PL Natural	10 20 30 40											
!!	Date Drilled: 12/21/04	GRADATION	ggregate Sand 1. Sand Sand	v % o %		шь									
ATH-33/SR 681 Realign	. Sta. 48+836, on CL US 33	WATER OBSERVATIONS: Water seepage at: 2.59 m [8.5]	Water level at completion: 14.39 m [47.2]	DESCRIPTION	Portland Cement Concrete - 0.305 m [12"] Aggregate Base - 0.152 m [6"]	FILL: Loose to medium dense brown COARSE AND FINE SAND, (A-3a), little silt, trace to little gravel; contains occasional sandstone and shale fragments; damp to moist.									
ntation	Location:	Hand	Penetro- meter (KN/m²)	lied.						<u></u>					
Ohio Department of Transportation	Boring B-4	m ct.o.	lows per	7	698.6] 212.48 4	[697.1] 4 .203 1 4 [8]	1 3 .203 2 4 [8]	4 4 1181	4 .457 4 3 1181	6 7 457 5 8 [18]	5 6 .457 6 10 [18]	3 6 .457 7 10 [18]	4 11 .457 8 12 [18]	6 11 .457 9 13 [18]	
Cirent:	LOG OF:		Depth (m)	٦,		[6. 	1.52		3.05	 	4.57	,	6.10 [20]		T

Job No. 9821-1016.00	STANDARD PENETRATION (N)	Blows per 0.30 m O 10 20 30 40	Moisture Con Natura	10 20 30 40								\(\frac{\circ}{+09}\)
	12/21/04	GRADATION	alegergate bines .c. bines .c. cand cand digitalised	1% 1%								
ATH-33/SR 681 Realignment	Date Drilled: 12/21/04	59 m (8.57)	,39 m [47.2]	ON	T (A-4a), some fine to interbedded sand seams;			6), little fine to		NDY SILT (A-4a), some fine to coarse moist.		, gray SANDSTONE
Project: ATH-33	Approx. Sta. 48+836, on CL US 33	WATER OBSERVATIONS: Water seepage at: 2.59 m [8.5"]	Water level at completion: 14.39 m [47.2]	DESCRIPTION	Very stiff to hard brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; contains interbedded sand seams; moist.		-	Very stiff reddish brown CLAY (A-7-6), little fine to coarse sand; damp.		Very stiff brown SANDY SILT (A-4a sand, trace gravel; moist.		@ 14.78 m - 14.87 m [48.5' - 48.8'], gray SANDSTONE fragments, micaceous.
rtation	Location:	Hand	Penetro- meter (kN/m²) (tsf)		431+ [4,5+]	263 [2.75]	.	263 [2.75]		215 [2.25]	215 [2.25]	
Transpo		Sample No.	evinc ssen ^c	11	.	12		67	 ;	4	1 5	16
nent of	B-4	[u]]		┨╏	.457	.457		.457		457	.432	.076
Ohio Department of Transportation	Boring B-4	m &t.0		IJ	3 3	6 8 13	ols:	7 8 11	တွင်	5 2 7		77 50/.08
	JF.			205.32			5 203.19 [666.6]	1 -1 1	3 201.66 IR61.61		, , , , , , , , , , , , , , , , , , , 	7 198.07
Client:	LOG OF:		Depth (m)	7.62		9.14 [30]	9.75 [32.0]	10.67 [35]	11.28	12.19 [40]	13.72 [45]	14.87

Elev. (m) [ft]	Blows per 0.15 m Guio B	[in]	Samp No.		Location:	Approx. Sta. 20+000, New Ramp CL Date Drilled: WATER	12/2	20/0)4				STAN		NETRA	TION (N)
(m) [ft]		ſ		ole		MATEO										
(m) [ft]	ws per	- 1			Hand	OBSERVATIONS: Water seepage at: 1.83 m [6.0]		G	RAD	ATIO	N.		10	Blows p (20	er 0.30 i) 30	n 40
	8	Rec (m)	Drive	Press	Perietro- meter (kN/m²) [tsf]	Water level at completion: 3.81 m [12.5]	Aggregate	S. Sand	M. Sand	-, Sand	SIIt	% Clay	PL X	Moisture (Nat		- % X
		4.	<u> </u>	14	Livij	DESCRIPTION	%	C %	% M.	% F. S	%	%	10	20	30	40
03,04 666.1]	2 1 1	.381 [15]	1		120 [1.25]	Topsoil - 0.102 m [4"] FILL: Stiff brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; moist.			- the state of the	WANTED WATER TO THE PARTY OF TH						
01.30		.457 [18]	2	:	-	@ 1.07 m - 1.52 m [3.5' - 5.0'], contains coal and brick fragments.			***************************************	- Lawrence	200,000	# \$50 m	100 mm mm m m m m m m m m m m m m m m m			
	4 6	.432 [17]	3		431 [4.5]	Very stiff to hard brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; damp to moist.				-) 			
	3 4	.457 [18]	4		263 [2.75]	@ 3 35 m - 3 81 m [11 0' - 12 5'] stiff									1140	
	5 6	.457 [18]	5	į	168 [1.75]											
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97.46	42 27		7			Severely weathered gray SANDSTONE fragments.										69
647.8] 97.31	17 .50/.03	.152 [6]	.8			Severely weathered prown SHALE.										50+
97.31 647.3]	50/,03	 b 	8			Bottom of Boring - 5.82 m [19.1']					- 14 - 14 - 14 - 14 - 14 - 14 - 14 - 14					
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Client:	Ohio D	epartm	ent of	f Tran	spo	rtation	Project: ATH-33/SR 681 Realignment			••		 1 - 1 - 1	tui.	Jo	b No.	9821-	1016,00
LOG O	F:	Boring	B-6			Location:	Approx. Sta. 20+070 New Ramp CL Date Drilled	: 12	/21/	04				STAN			TION (N)
		0.15 m	[in]	Samp No.	- 1	Hand	WATER OBSERVATIONS: Water seepage at: 0.76 m [2.5]		G	RAD	ATIC	ΟŅ		10	Blows p (20	er 0.30 i) 30	m 40
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press/Run	Penetro- meter (kN/m²) [tsf]	Water level at completion: 1.34 m [4.4'] (includes drilling water)	Aggregate	C. Sand	M. Sand	E. Sand	% Silt	Clay	PL X	Moisture (Nai	Content ural	- % LL
0_0	200.72						DESCRIPTION DESCRIPTION	<u> %</u>	% C	% M.	% F.	86	8	10	20	30	40
	200.63 [658.2] 199.81	1 3 3	.203 [8]	1		48 [0.5]	Topsoil - 0.102 m [4"] Soft to medium stiff brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; moist. Note: Flowline creek at approx, depth of 0.94 m [3.1]			- A Committee of the Co	- The survivability is a survivability in the survivability in the survivability is a survivability in the surviva			0			
[3.0] - 1.52 1.68 [5.5]	[655.5] 199.04 [653.0]	3 2 8	.279 [11]	2			Loose to medium dense brown COARSE AND FINE SAND (A-3a), little silt, trace gravel; wet.										
274	197.98		.406 [16]	3		239 [2.5]	Very stiff brown and gray SANDY SILT (A-4a), "and" fine to coarse sand; moist.	!						D.			100 A
[9.0] 3,05	[649.5] 197.67	14 50/.13	.330 [13]	4			Severely weathered gray SILTSTONE, micaceous.										50+
[10] - - -	[648.5]	Core 1.524 m [60"]	Rec .965 m [38"]	RQD 43%	1		Medium hard gray SANDSTONE, fine to medium grained, moderately weathered; contains frequent thin interbedded mica seams.	i					And the state of t				
4.57 [15] -		Core 1.524 m [60"]	Rec 1.524 m [60"]		2		@ 4.82 m [15.8'], becomes hard.		Andreas de la company de la co				444				
6.10 [20] - - - 7.62		m	Rec 2.692 m [106"]	8	3		@ 6.43 m - 6.68 m [21.1' - 21.9'], contains thin calcareous layers. @ 6.68 m - 6.74 m [21.9' - 22.1'], limestone clast.					And the second s		and the second s			

Client:	Ohio D	epartn	nent o	f Trai	nspo	ortation	Project: ATH-33/SR 681 Realignment				······		:		Jol	No.	9	821-	1016	.00	
LOG O	F:	Boring	B-6			Location:	Approx. Sta. 20+070 New Ramp CL Date Drilled:	12/	21/0)4				S		ARD				I (N)	٦
		0.15 m	[in]	Samj No		Hand	WATER OBSERVATIONS: Water seepage at: 0.76 m [2.5']		G	RAD.	ATIO	N			10	Blow.			m 4	Ö	
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press/Run	Penetro- meter (kN/m²) [tsf]	Water level at completion: 1.34 m [4.4] (includes drilling water)	% Aggregate	C. Sand	% M. Sand	F. Sand	Silt	% Clay	F		1oistu	re Co Vatur		- %	LL X	
7.62	193.10					· · · · · · · · · · · · · · · · · · ·	DESCRIPTION	%	% C.	8	% F.	86	8		10	2	0	30	4	0	\perp
[25] - - 8.60 [28.2]	[633.5] 192.12 [630.3]	Core. 3.048 m [120"]	m	*	3		Hard gray SANDSTONE, fine to medium grained, micaceous.	-	Apply and the second	**************************************	And the second s										
9.14	191.58						Soft dark gray SHALE, @ 8.60 m - 8.66 m [28.2' - 28.4'], clay seam.								***************************************		var eftermer designation designation				
[30]	[628.5]						Bottom of Boring - 9.14 m [30.0']		A THE REST OF THE PARTY OF THE	The state of the s	The same of the sa	ent frameworkskytt fram Make Angelskyttp (m.				er peller un man eine geliche und Willer der Weiter der Weiter der Weiter der Weiter der Weiter der Weiter der		e de la companya de	er de seu en de seu de se de seu de se de seu d La companya de seu d		
															The state of the s						
12.19 [40] - - -	are the same and t																				
13.72 [45] - - - - 15.24										The state of the s											

Client:	Ohio E	Departn	ent o	f Trai	nspo	ortation	Project: ATH-33/SR 681 Realignment	-			-			Job No	9821- 1	016.00
LOG O	F:	Boring	B-7			Location:	Approx. Sta. 20+200 New Ramp CL Date Drilled:	12/	21/0	04				STANDAF	D PENETRA	TION (N). ^
		0.15 m	[in]	Samp No		Hand	WATER OBSERVATIONS; Water seepage at: 1.07 m [3,5']		G	RAD	ATIC	N.		Blo 10	ws per 0.30 n 20 30	n 40
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: none	% Aggregate	C. Sand	M. Sand	- Sand	Silt	Clay	Mois PL X	ture Content - Natural	· % LL X
0	209.30				1		DESCRIPTION	<u>%</u>	ن %	% M.	% F. S	%	%	10	20 30	40
0.09 	209.21 [686.4]	2 5 5	.229 [9]	1		215 [2.25]	Topsoil - 0.102 m [4"] Very stiff to hard brown and gray SILTY CLAY (A-6b), some fine to coarse sand, little gravel; contains shale and coal fragments; moist.									
1.52 [5]		5 6 7	.279 [11]	2		431+ [4.5+]			AND THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUM				to the substitute of the subst			
2.59	206.71		.330 [13]	3		239 [2.5]										
[8.5] 3.05 [10]	[678.2]	9 9	.406 [16]	4		-	Severely weathered brown, reddish brown, and gray SHALE.									
		5 12 15		5												
4.57 [15]	_	29 50/.13	,229 [9]	6												50+
		12 50/.13														50+
5.76 [18.9] 6.10 [20]	203.54	50/.13	.127 [5]	8			Bottom of Boring - 5.76 m [18.9']				AND BUILD SHIP.					50+



PRELIMINARY SUBSURFACE INVESTIGATION REPORT

ATH/MEG-033-30.980/0.000 South-Central Section, From Station 39+600 to 45+500 Athens and Meigs County, Ohio

Prepared For:

Sverdrup Associates, Inc. 50 West Broad Street, Suite 1700 Columbus, Ohio 43214

Prepared By:

Resource International, Inc. 281 Enterprise Drive Westerville, Ohio 43081

RI# W-7139

June, 1998

RECEIPT

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RESOURCE INTERNATIONAL

Engineering Consultants

June 12, 1998

Civil Engineering Surveying and Mapping Testing Laboratories Geotechnical/Environmental Environmental Drilling Construction Monagement System Design and Software Development

Mr. Terry Winebrenner, P.E. Sverdrup Associates, Inc. 50 West Broad Street, Suite 1700 Columbus, Ohio 43214

Re: Preliminary Subsurface Investigation ATH/MEG-033-30.980/0.000 PID 17974 South-Central Section, from Station 39+600 to 45+500 RI #W-7139

Dear Mr. Winebrenner:

We are pleased to submit this preliminary subsurface investigation report for the south-central section of the referenced project, ATH/MEG-033-30.980/0.000. In order to expedite the delivery of the subsurface investigation report for this project, the report has been divided into four (4) parts, north, south, north-central, and south-central. Engineering logs have been prepared and are attached to this report along with results of laboratory testing. Full size plan and profile sheets are being prepared, and will be submitted as a single submission for the entire project. For reference purposes, half-size plan and profile sheets for this section are being included in this submittal.

If you have any questions concerning the subsurface investigation or this report, please call.

Sincerely,

RESOURCE INTERNATIONAL, INC.

Christopher Merklin, P.E.

Director - Geotechnical Engineering

G. Philip Hall, P.E. Vice President

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1.0 INTRODUCTION

This report is a presentation of the subsurface investigation performed for ATH/MEG-033-30.980/0.000 - south-central section. The south-central section limits, for the purpose of this report, are between Stations 39+500 and 45+500.

The subject project is the design of a "super two" lane highway system linking the four-lane existing portion of USR 33 at Athens with the existing four-lane portion of USR 33 at Darwin. The total project length is 19.858 kilometers. The northern two-thirds of the alignment is within Athens County, traversing Athens, Alexander and Lodi Townships. The southern one-third (of the alignment) is within Bedford Township in Meigs County.

1.1 EXISTING LAND USAGE

The land usage along the entire alignment is generally described as alternating forest and pasture with very few cultivated fields. Typically, the valleys and steeply sloping hills are tree covered, and the flatter sidehills and hilltops are pasture. The field observations along Corridor A, as presented in the Geologic Study performed for Feasible Corridors A and B, are indicative of the land usage along the alignment in this south-central section. Because of the relief, the area is well drained with creeks at the bottom of every valley and drainage paths down the sides of most of the hills. Pratts Fork is the largest water crossing for the alignment, located at the very northern end of this section, at station 39+800. The valley in this vicinity creates sidehill fills for the section between stations 39+700 and 40+000. Drainage paths are easily identifiable by the erosion of the easily erodible surficial red clays and/or mudstone/shale. The alignment is traversed several times, typically along ridge tops, by county and township roads, with rural residences and farms scattered throughout.

The steep slopes and flatter hilltops show evidence of movement which is very common for this area. Many of the pastures exhibit hummocky terrain. Many signs of predominantly small surficial slumps have been observed on the steep slopes and near the valley bottoms, along creek beds. Much of the exposed red soils and rock (red beds) in the valleys and on the slopes show evidence of severe decomposition from erosion.

Coal mines are common in southeast Ohio. It was determined in the Geologic Study that there are one abandoned underground mine and three reclaimed strip mines within the Feasible Study Corridors. Strip mine #2 (SM2) is located well east of the south-central section, between stations 41+500 and 42+228, outside of the expected right-of-way. Another strip mine is noted on the quad map (for the area), just south of TR 68, and west of the alignment. The details of this strip mine were not identified within the geologic study, however, the right-of-way limits

appear to be east of the estimated limits of the strip mine. This should be confirmed as part of the final design (subsurface) investigation.

1.2 SITE GEOLOGY

Both Athens County and Meigs County lie entirely within the unglaciated section of the Allegheny Plateau. The area is maturely dissected, well-drained and is characterized by steep-sides, "V" shaped valleys and narrowly rounded hilltops. Elevations along the alignment range from approximately 200 meters at the southern most portion, at Darwin, to approximately 300 meters in the northern portion.

The uplands are covered with a thin layer of residual soils; soils formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials. Soils consist predominantly of sands and clays, very similar to the shales, mudstones, and sandstones on which they lie. The transition to bedrock is very subtle, and in most cases, not clearly identifiable, unless the parent rock is sandstone, siltstone, or limestone.

Soils in the valleys are generally described as colluvial (consisting of alluvial in part) soils overlying residual soils. Colluvial soils (colluvium) are loose and incoherent deposits typically found at the foot of a slope or cliff, brought there chiefly by gravity. Alluvial soils (Alluvium) are (intermixed) water-laid deposits. Typically, soils in the valley run deeper than on the slopes and hilltops, however, the soils are similar to those on the hills, consisting predominantly of sand and clay, and the transition to bedrock is equally difficult to identify.

Both Athens and Meigs Counties, along the alignment, are comprised of bedrock of Pennsylvania Age. The rock strata in this area of southeastern Ohio dips gently to the east-southeast at a rate of approximately 6 meters per kilometer. The top of the Conemaugh formation is estimated to be between elevations 260 and 270 meters at the north end of the alignment. It slopes downward to the east-southeast until it is entirely below any influence on the subject alignment at approximately Station 40+250.

The bedrock was deposited under regular succession of varying environmental conditions that were repeated many times. As a result, the rocks show a definite succession of strata representing one sequence of changing sedimentary conditions. A sequence of strata matching one depositional cycle is termed a cyclothem. Cyclothems are typically associated with unstable shelf or interior basin conditions in which alternate marine transgressions and regressions occur. The non-marine sediments occur in the lower half of the cyclothem and the marine sediments in the upper half. In Ohio, each cyclothem is usually defined as the series between a coal-to-coal interval. The lithology of the rocks that

comprise the Pennsylvania System in Ohio consist of alternating clay, coal, shale, limestone and sandstone beds. These beds lack a real persistence and vary greatly in thickness over a short distance.

1.2.1 CONEMAUGH FORMATION

The literature defines the apper boundary of the Conemaugh Formation as the top of the Upper Freeport No. 7 coal and the lever boundary being the base of the No. 8 Pittsburgh coal. The lithology of the Conemaugh consists of sandstone, sandy shale, shale, limestone, coal, under-clay and varicolored claystones (clay-shales, mudstones, etc.) referred to as "Red beds". Bedded marine shales and some thin marine limestone are present in the lower part of the series, whereas the upper part contains only non-marine strata, including abundant red calcareous claystones. Coal seams of minable thickness occur throughout the study area. The Conemaugh Formation has a reported thickness of approximately 108 meters.

1.2.2 MONONGAHELA FORMATION

The Monongahela Formation overlies the Conemaugh Formation. Its lower boundary is defined as the base of the No. 8 Pittsburgh coal and the upper limit is the top of the No. 1 Waynesburg coal bed. The lithology of the Monongahela Formation is similar to the upper portion of the Conemaugh Formation. The most significant difference is the occurrence of minable coal beds in the Monongahela in contrast to the thin coal beds of the Conemaugh only available by strip mining.

The Monongahela Formation is approximately 76 meters thick. A full thickness above drainage is displayed in Lodi and Bedford Townships. Athens and Alexander Townships show only parts of the Monongahela Series above drainage.

1.3 CUT/FILL SECTIONS

The entire alignment will be constructed on alternating, massive cuts (hilltops) and fills (valleys), however, the current alignment of this south-central section has substantially more fill than cut. The cut and fill sections projected for the south-central section are presented in Table 1 (based on centerline profiles).

Table 1: Cut/Fill Sections

Begin Station	End Station	Earth- work	Maximum Depth (Cut or Fill)
39+635	39+915	Fill	26 meters

39+915	40+170	Cut	15 meters	
40+170	40+605	Fill	22 meters	
40+605	40+650	Cut	3 meters	
40+650	40+669	Fill	6 meters	
40+669	40+827	Cut	10 meters	
40+827	40+985	Fill	19 meters	
40+985	41+048	Cut	5 meters	
41+048	41+204	Fill	12 meters	
41+204	41+247	Cut	3 meters	
41+247	41+424	Fill	34 meters	
41+424	41+944	Cut	25 meters	
41+944	42+191	Fill	16 meters	
42+191	42+340	Cut	10 meters	
42+340	43+195	Fill	33 meters	
43+195	43+332	Cut	9 meters	
43+332	43+463	Fill	7 meters	
43+463	43+642	Cut	6 meters	
43+642	44+104	Fill	37 meters	
44+104	4+104 44+310 Cut 11 m			
44+310	44+645	Fili	32 meters	
44+645	44+894	Cut	21 meters	
44+894	45+000	Fill	26 meters	

2.0 SUBSURFACE INVESTIGATION

Forty-three (43) engineering test borings, designated B-81 through B-122 (including B-114A), were planned for the south-central section. Rock outcrops adjacent to the location of B-122 were observed and mapped in place of drilling B-122. B-150 within the limits of the south section, was not drilled at the time

of delivery for the south section report, therefore, it's log has been included within this report.

The boring locations were specified (station and offset) by representatives of Resource International, Inc. (RI), based on the horizontal and vertical alignment current in December, 1997. It is noted that both the horizontal and vertical alignments have changed since the development and execution of this boring plan, thus, many of the borings extend to awkward depths and/or are located well off the alignment. The boring locations were converted to Project Coordinates and field located by representatives of Sverdrup Associates (Sverdrup), Canter Surveying, with the use of Global Positioning Satellite (GPS). Borings in cut sections were drilled along the alignment and left and/or right of centerline (within the proposed backslopes) to identify the soil and rock conditions in the cut sections and at the proposed subgrade. Borings in fill sections were drilled to a depth equivalent to the height of the proposed embankment or split-spoon refusal in bedrock, whichever was shallower. Split-spoon refusal is defined as exceeding 50 blows with less than 15 centimeters of penetration.

All but fifteen (15) of the borings in the south-central section were drilled with either a truck-mounted or ATV-mounted rotary drilling rig, utilizing hollow-stem continuous flight augers to advance the holes in soil. The remaining three (3) borings were advanced with a Geoprobe Model 4220, a vehicle-mounted, hydraulically-powered machine that utilizes static force and percussion to advanced a 122-centimeter long by 5.1-centimeter diameter soil sampler.

Where borings extended into the bedrock (after encountering split-spoon sample refusal), a double tube diamond bit core barrel (either wireline or conventional equipment) was used to core (the bedrock). Coring produced NX-sized (5.3-centimeter diameter) cores, from which the type of rock and its geological characteristics were determined.

For the borings advanced using a truck mounted rig, Standard Penetration testing was performed at 0.46 to 1.52-meter intervals. The Standard Penetration Test (ASTM D 1586) is conducted by using a 63.5-kilogram hammer falling 76.0 centimeters to drive a 5.1-centimeter O.D. split-barrel sampler 45.0 centimeters. Driving resistance is recorded on the boring logs in terms of blows per 15-centimeter interval of the driving distance. The second and third intervals are added to obtain the number of blows per 30 centimeters. Standard Penetration blow counts aid in determining soil properties applicable in embankment and roadway design.

A nominal 7.6-centimeter diameter Shelby tube, or thin-walled sampler, was employed (ASTM D-1587) to obtain undisturbed samples from borings B-81 and B-99. The Shelby tube is hydraulically pressed into the subsurface soils to obtain

an undisturbed sample.

Soil samples obtained from the drilling operation were preserved in jars (drill rig boreholes) or sealed tubes (geoprobe boreholes), tested for natural moisture content (ASTM 2216), and visually classified in the laboratory. Representative soil samples were tested in the laboratory to determine the following properties:

Liquid Limit, Plastic Limit

(AASHTO T89, T90) (AASHTO T 88)

Gradation

One-Dimensional Consolidation Properties

(AASHTO T 216)

The tests performed are necessary to classify existing soils according to the Ohio Department of Transportation (ODOT) Classification System and to infer engineering properties of importance in determining pavement, embankment, and backslope design and construction recommendations. Results of the laboratory testing are presented in Appendices C and D.

Rock cores were logged in the field and visually classified in the laboratory. They were analyzed to identify the type of rock, color, minerals, bedding planes and other geological and mechanical features of interest in this project. The Rock Quality Designation (RQD) for each type of rock was calculated according to the equation:

RQD = Σ segments equal or longer than 10.2 centimeters x 100 Core Run Length

The RQD aids in estimating the general quality of the rock and is used in conjunction with other parameters to designate the quality of the rock mass. Unconfined compressive strength testing of intact rock cores segments (ASTM D 2938) was performed on representative samples to identify their strength and hardness.

3.0 SUBSURFACE PROFILE

Interpreted engineering logs have been prepared from field geologist's logs, visual examination of samples, and laboratory testing. Classification follows the current ODOT Specifications for Subsurface Investigation. The following is a generalization of what was found in the test borings.

Soil drilled along the alignment is generally between 1.0 and 5.0 meters thick, averaging approximately 2.0 meters thick. However, there were several locations where residual soils were as great as 9.0 meters deep on the uplands (e.g. B-XX). The transition to bedrock is not easily discernable where the surface rock is shale,

clay-shale, or mudstone. Where sandstone, limestone, or siltstone is the surface rock, transition (to rock) was easily discernable. The soils are predominantly cohesive, described as reddish brown clay (silty clay, sandy clay) of medium to high plasticity. The soils are predominantly classified as ODOT A-6b as well as A-4a, A-6a, A-7-6, and A-3a.

Many soil properties, including soil consistency and shear strength (of cohesive samples), are primarily derived from Standard Penetration blow counts. The Standard Penetration blow counts recorded during the drilling process ranged from 1 blows per 30 centimeters to refusal, increasing with depth. Generally speaking, soils encountered from the ground surface to 1.5 meters± are described as soft to stiff, below 1.5 meters±, soils are very stiff to hard. Split-spoon refusal, defined as obtaining in excess of 50 blows with less than 15 centimeters of penetration, was encountered in virtually every boring in the transitional material (hard indurated clay/very soft bedrock).

Laboratory testing indicates that the natural moisture contents of the soil encountered to a depth of 1.5 meters± are typically at to well above their corresponding plastic limits. However, because of the highly plastic nature of the clays encountered, the moisture contents do not typically approach the soils' corresponding liquid limits. Below the surficial 1.5 meters±, moisture contents typically decrease, down to typically less than 1.0% in the transitional material.

3.1 Bedrock

Bedrock was cored when encountered in any proposed cut section above the proposed completion depth of the test boring. If bedrock was encountered above the completion depth in any boring drilled in a proposed fill section, the boring was terminated on the top of bedrock (defined as split-spoon refusal). The majority of the bedrock encountered in this section consisted of shale, clay-shale, or mudstone, predominantly in poor condition. Interbeds of sandstone, limestone, and siltstone were encountered throughout. The mudstone and some of the shale was frequently slickensided and deteriorated when exposed to water. As mentioned above, where these bedrocks were encountered, the rock condition was typically so poor that it was difficult to identify the transition from soil to rock.

In the cut section between stations 39+915 and 40+170, bedrock was encountered in B-82, above the proposed grade, consisting of alternating layers of sandstone, mudstone, and shale, overlying thick, good quality sandstone, from elevation 255.5 down.

In the cut section between stations 40+669 and 40+827, bedrock was encountered in B-88, B-89, and B-90 above the proposed grade, consisting of alternating layers of sandstone and mudstone overlying thick, good quality sandstone, from

elevation 256.5 to below the proposed grade.

In the cut section between 41+424 and 41+944, poor quality mudstone was encountered throughout B-95 and B-97 with few thin interbeds of clay-shale, shale, and siltstone, all of poor (very little fair) quality.

In the cut section between 42+191 and 42+340, poor quality mudstone was encountered throughout B-100.

In the cut section between 43+195 and 43+332, weathered mudstone was encountered in B-109 above the proposed grade. Sandstone and siltstone, both poor to fair quality, were encountered below the proposed grade, with thin shale and mudstone interbeds.

In the cut section between stations 44+104 and 44+310, B-116 exhibited mostly poor quality mudstone above the proposed grade with good quality sandstone encountered about 1.5 meters above the proposed grade and below.

In the cut section between stations 44+645 and 44+894, B-120 exhibited poor quality mudstone to elevation 258 meters, overlying fair quality sandstone and siltstone (with few mudstone interbeds) to well below the proposed grade.

3.2 Groundwater

With the exception of the Hocking River Valley, groundwater in Athens and Meigs Counties is scarce at best. Few perched lenses of groundwater (B-81) were encountered during the drilling process in the south-central section within the soil. It was impossible to identify groundwater in the rock sections since water was being used during the coring process. Groundwater for the area can be found in alternating layers of shale and thin sandstone with yields of less than 1.0 gallon per minute. Groundwater can be expected in the valleys, overlying impervious bedrock

4.0 CONCLUSIONS AND RECOMMENDATIONS

Data obtained from the drilling and testing program have been used to develop preliminary pavement, embankment, and backslope recommendations for the soils and bedrock encountered along the alignment. These parameters have been used to provide guidelines for the design of the pavement systems for the subject roadway which are discussed in the following paragraphs. It is noted that these recommendations are preliminary. Additional subsurface investigations will be performed to verify these recommendations along a finalized alignment.

4.1 Pavement Design

Because of the extensive earthwork necessary for this project, very little soil will remain in-place, in its current condition, as a pavement subgrade soil. Subgrades in most of the cut sections will be bedrock. The soils are almost exclusively cohesive, described as reddish brown clay (silty clay, sandy clay) of medium to high plasticity. The shales and mudstone deteriorate to a highly plastic clay when exposed to weathering (water) as well. Therefore, it is recommended that pavement designs be based on a Group Index value of 16. The corresponding design California Bearing Ratio (CBR) is approximately 4, and the equivalent Subgrade Resilient Modulus, $M_{\rm R}$, is 4800 psi (this value is left in English units since the current L&D manual presents it that way for use in a correlation chart).

Where bedrock is encountered in the subgrade, the rock shall be cut an additional 0.5 to 0.6 meters below the surface of the subgrade, depending on the pavement type, for the cross section width of the roadway between points 0.3 meters beyond the shoulders.

4.2 Embankment Design

Massive embankment fills are proposed at the locations presented in Table 1. The largest fill section is 37 meters, between stations 43+642 and 44+104. To estimate the settlement of the "in-situ" soils (and rock) due to the weight of the embankment, a one-dimensional consolidation test was performed on an undisturbed sample procured from B-81 (station 39+777). The results of this test (See Appendix D) was employed to verify the compressibility parameters of the soils along the alignment in the valleys. A worst case settlement, within the foundation soils alone, was determined beneath the centerline of the proposed highway at the maximum fill section at station 43+770. In this analysis, the top 2.0 meters was modeled as a normally consolidated clay, and the underlying sandstone was modeled as a pre-consolidated (clay). The total settlement caused by the consolidation of the "in-situ" subsoils is estimated to be 0.4 meters. Additional settlements can be expected within the embankment itself, on the order of 0.3 to 0.5 meters.

Total settlement on the order of 1.0 meter± for such an embankment is not considered out of the ordinary. The foundation soils and the fill soils will be predominantly clayey, therefore, the time-rate of settlement will be slow. However, the construction process for such an embankment will be slow as well, and the embankment will likely sit idle for a period of time before paving. In any case, the use of settlement plates is recommended to monitor the settlement of the soils in the larger embankments. Because of the notorious instability of the soils and rock in this area, the use of inclinometers is recommended to monitor the stability of these larger embankments as well. In the final design stage, it is recommended

that further analysis be performed on the embankment slope-stability.

The earthwork design of all fill sections (and cut sections) shall follow ODOT's Location and Design Manual (1995, or latest, edition). The maximum (steepest) recommended unreinforced slope for the embankments is 2:1 (horizontal:vertical).

4.3 Backslope Design

The study area is considered to be highly susceptible to slope movements due to the lithology, topography and amount of rainfall. Problems of instability typically occur where the red shales and claystones (mudstones) are the thickest. Much of the bedrock encountered consisted of (red) shale, clay-shale, or mudstone, predominantly in poor condition. The mudstone and some of the shale was frequently slickensided and deteriorated when exposed to water. As mentioned above, where these bedrocks were encountered, the rock condition was typically so poor that it was difficult to identify the transition from soil to rock.

Many small slumps and rock falls were observed during field reconnaissance and geological study, however, no "large" slumps were identified. The terrain is typically hummocked, indicating movement. The most common forms of landslides in southeastern Ohio are rock falls, where the soft shale bedrock is weathered out from underneath blocky sandstone or limestone, and rotational slumps.

Based on the soil and rock encountered in the proposed cut sections, backslope recommendations are presented below in Table 2, applying to both left and right backslopes as applicable.

Table 2: Backslope Recommendations

Cut Section	Maximum Cut	Recommended Backslope
39+915 to 40+170	15 meters	1:1 to top of sandstone (with 3.0-meter benches in mudstone and shale, underlying sandstone), 2:1 to daylight
40+669 to 40+827	10 meters	1:1 to top of sandstone at approximately elevation 256.5 meters, 2:1 to daylight
41+424 to 41+944	25 meters	2:1 to daylight.
42+191 to 42+340	10 meters	2:1 to daylight
43+195 to 43+332	9 meters	2:1 to daylight

44+104 to 44+310	11 meters	1:1 to top of sandstone/siltstone at approximately elevation 258.5 meters, 2:1 to daylight
44+645 to 44+894	21 meters	1:1 to top of sandstone/siltstone at approximately elevation 258 meters, 2:1 to daylight

The top 5.0 (vertical) meters of all backslopes should be considered soil and laid back at a 2:1 slope. Any cuts not addressed in this table should be laid back at a 2:1 slope.

Due to the lithologic character of the rock formations in this area, most of the cut slopes will be mixed-faced, consisting of various rock types. Differential weathering of the various rock types must be considered in the design of the cut slope. This is especially true where sandstone is overlying a less resistant shale. Because the shale weathers at a faster rate than the overlying sandstone, the sandstone may be left unsupported and subject to rock falls. Rock falls occur routinely in this area. Consequently, it is recommended that at least a 3-meter wide bench be constructed behind the roadway ditch to allow temporary accumulation of talus and rock fall material.

It is expected that blasting will be required for cuts in the limestone, siltstone, and sandstone bedrock. It is expected that the shales (and mudstone), even in an unweathered condition can be removed using standard ripping methods. We expect that even the upper, weathered sandstone can also be removed by ripping, due to the friable nature of the weathered sandstone.

It is recommended that sidehill benches be cut in the rock slopes which are greater than 15 meters high. Past experience has shown that these benches act to collect rock falls as well as minimize erosion of the exposed surface. The benches interrupt the velocity of runoff water washing down the slope and thus minimizes the erosion. Typically, these benches do not significantly increase hillside stability.

4.4 Construction Considerations

All site work shall conform to the latest ODOT <u>Construction and Materials Specifications</u> (January, 1997), including that all excavation and embankment preparation and construction should follow ODOT Item 200 (Earthwork).

Where existing structures will be razed, all foundations, floor slabs, basements, wells, and/or cistern walls shall be removed to a minimum of 0.3 meters below the grade of the surrounding area. All basements or cavities left by structure removal

shall be filled to the level of the surrounding ground. For those areas within the vicinity of construction, the fill shall be compacted in accordance with the specifications provided in ODOT's Specifications.

Prior to beginning excavation, grading, and/or embankment operations across the site, all necessary clearing and grubbing shall be completed. Topsoil, organic deposits, unsuitable fill materials (as determined by a soils engineer or an experienced soils technician), and/or existing pavement sections should be stripped away from proposed pavement areas prior to excavation. In constructing the embankments, if topsoil is encountered at the ground surface of the existing subgrade within 1.22 meters of the proposed subgrade elevation, the topsoil (and any other unsuitable material, as determined by the site soils engineer) should be stripped off and stockpiled. In areas where greater than 1.22 meters of fill is to be placed, the excavation is dependent on the soil conditions at the time of construction. In particular, if dry conditions exist, the topsoil will provide adequate stability, and can remain in place. If wet conditions exist, and excessive moisture contents are present, this topsoil will not provide adequate stability, and will require removal. Where a new pavement is to be constructed on an embankment which is less than 0.9 meters over an existing pavement, the existing pavement must be removed.

The proposed subgrade surfaces should be proofrolled prior to placing engineered fill. A soils engineer or an experienced soils technician should be present during proofrolling to determine if soft soils exist. When employing proofrolling to determine the soils that will require stabilization, the proposed profile of the roadway must be considered. A greater amount of subgrade deformation is acceptable at the base of an embankment than along sections of the subgrade where the roadway will be constructed at the existing grade.

The highway construction will cut through the Monongahela Formation. Therefore, we expect the predominant rock fill to consist of weathered shale and sandstone. It is our opinion that colluvium and residual soil, sandstone and most of the shale will be suitable for embankment fill material. It is recommended that the cut material available for fill be classified. The sandstone and limestone are best suited for fill. This is followed by the green and gray shale, colluvium and residual soils. The "Red Bed" shales and claystones (i.e., mudstone) are the least suitable for fill soil due to their rapid slaking and deterioration into a plastic unstable clay soil. This "Red Bed" shale and mudstone should be wasted whenever possible. Alternatively, special precautions and flatter slopes must be used if this red shale is used as fill.

Special design and construction techniques are recommended even when the gray and green, more stable shale is used for embankment fill. This shale requires the addition of water and special handling in order to construct a stable embankment

fill. Even with special precautions, however, the stability of subgrades in shale deteriorates with time. Shallow sloughing is common in 2:1 embankment slopes formed in shale, therefore, it is recommended that limitations be placed on the use of shale in embankment construction. It is recommended that shale not be allowed within the upper 0.6 meter of embankment fill. A 0.6 meter cap of soil will minimize weathering and deterioration of the underlying shale. Further limitations are recommended if the "Red Bed" shale must be used in embankment fill. The shale should be broken into pieces no larger than 150 millimeters of the initial pass of the compactor and should be broken into pieces smaller than 50 millimeters following compaction. The shale should be compacted at a range of moisture varying from optimum to 3% wetter than optimum. Past experience has shown "Red Bed" fill will perform better when compacted wetter than optimum, due to swelling. It has been found that less swelling occurs in the fill when it is compacted at a moisture content wetter than optimum.

When employed as embankment fill, excavated bedrock shall be placed in lifts not to exceed 0.9 meters. When rock and other embankment material are excavated at the same time, the rock shall be incorporated into the outer portions of the embankment as rock fill and the other material shall be incorporated into the inner portion as rolled embankment. The top 0.6 meters of all embankments shall be constructed of material other than excavated bedrock.

Due to the steeply sloping topography, sidehill fills are expected. It is critical that benches be cut into the hillside where the toe of the new slope starts on an existing slope. This bench should cut into the hillside wide enough to accommodate construction equipment. Wherever possible, benching should "key" into the underlying bedrock. Drains intercepting seepage would be installed in the back of the benches as dictated by site conditions. Landslide activity is common in areas of sidehill cut and fill operations. Consequently, landslides can be expected to occur if sidehill fills are improperly constructed. Individual stability analyses should be performed in the final investigation for the sidehill fill areas.

Groundwater does not occur in large quantities over the length of the alignment. A static water table is not expected within the depths of cuts for the proposed roadway. However, perched groundwater is expected in the more permeable sandstone beds of the Monongahela Formation. This is especially true where the more permeable sandstone is directly underlain by a relatively impervious shale. Also, groundwater should be expected along the soil/bedrock interface during wet weather. Horizontal drains may be needed on intermediate benches and along the roadway ditch line to lower the perched water table and minimize seepage emerging on the cut slopes. The need for horizontal drains will largely be controlled by the dip of the bedrock at the individual cut. As previously indicated, the regional dip of the rock is approximately 6 meters per kilometer to the east-southeast. Drains are used to dewater cut slopes when the rock is dipping toward

the cut. Horizontal drains are usually not necessary when the rock dips away from the highway cut.

5.0 LIMITATIONS OF STUDY

Our recommendations for this project were developed utilizing soil and bedrock information obtained from the test borings that were made at the proposed site. At this time we would like to point out that soil borings only depict the soil and bedrock conditions at the specific locations and time at which they were made. The conditions at other locations on the site may differ from those occurring at the boring locations.

The conclusions and recommendations herein have been based upon the available soil and bedrock information and the preliminary design details furnished by a representative of the owner of the proposed project. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the soils engineer to determine whether any changes in the foundation or earthwork recommendations are necessary. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the soils engineer.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted Geotechnical engineering principles and practices. Resource International is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein.



REPORT OF SOIL EXPLORATION

Clien	t Sve	erdrup A	ssociat	es, Inc.				rB-		
Proje	ct AT	H/MEG-	33 -3 0.5	980/0.000					1	
Proje	ct Numb	erV	V-7139		Com	oletio.	n De	epth	3.7 n	7
					1		Finis	ted: 5/ :hed: 5/ : M		
	, .	135483	1	DRILLING AND SAMPLING INFORMATION	ON <i>Borin</i>	- 44-	46	. 8.3	3 cm HS	Ά
	y	637608		·	Hami	-		·	3.5 kg	
	719	229.6 n			Hami			·" —	76 cm	
SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION	Hann	nei L	лор	MOISTURE	ATTER	
мо SS-1	PER 15cm	RECOVERY	DEF 771	Brown SILTY fine SAND, little organics, tr	ace	0.1	Γ,	CONTENT	LL	PL
	w		-	coarse sand, trace clay (Topsoil). Moist.	- /			27		
AS-2	W		-	Brown fine SANDY SILT, some clay, trace coarse sand. Very soft to stiff. Moist to				25		
				damp.						
			1.0							
ST-3		100	=	-groundwater initially encountered @ 1.1	m			26	38	21
			-	-ST-3: ODOT A-6b (8)						
			-							
SS-4		61	2.0					10		
	5 20					2.3	-			
			-	Gray weathered SANDSTONE. Very soft		2.3	2.27			
SS-5	3 9	88	=	bedrock.						
00 0	50/5cm	ÜÜ								
			3.0							
			-				:::			
			3	Auger refusal @ 3.7 m		3.7	:::			
SS-6	50/8cm	67	-	Bottom of Boring = 3.7 meters		3./	12-2-2			
				•						
NOTES		٠								

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

After 24 Hrs Y. N/A

BORING METHOD

HSA - Hollow Stem Augers SFA · Solid Flight Augers

MD - Mud Drilling WD - Wash Drilling

HC - Rock Coring



Clien	Sve	erdrup A.	ssociat	REPORT OF SOIL EXPLORATION es, Inc. Boring Number	er8-6	32	
Proje	4.			980/0.000 Sheet1	of	5	
•	ect Numb		/-7139			31.1	<u>m</u>
				Date Sta Date Fini Drilled By	shed: 5/	4/98	
Nort	hing	135236	.7	DRILLING AND SAMPLING INFORMATION Boring Metho	d8.3	cm HS	A/RC
East	ing	637650	.6	Hammer Wei	ght6	3.5 kg	
	-	269.9 m	7	Hammer Drop	, <u> 7</u>	'6 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTEI LL	RBERG PL
SS-1	2	67		Brown SILTY fine SAND, little organics, trace 0.1	22		
\$\$-2 \$\$-3	5 6	94	1.0	Ine gravel (Topsoil). Moist. Brown fine SANDY SILT, some clay, trace 0.5	18		
\$S-4	14 21 30	89	2.0	-SS-4: ODOT A-3a	14		
SS-5	14 25 28	94	3.0_	Brown weathered SANDSTONE. Very soft bedrock.	12		
SS-6	42	89	4.0		12		

SAMPLE TYPE

SS 5.1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

RC - Rock Core

AS - Auger Sample

GROUND WATER READING
At Completion W/A*

After 24 Hrs V/A

* Wash water used during the coring process.

BORING METHOD

HSA Hallow Stein Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling

RC - Rock Coring



Proje		-					31.1	m
Proje	ect Numb	erV	V-7139		Completion D			
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	RBERG
			5.0					
S-7	9 24	94	1	Brown to red INDURATED CLAY/WEATHERED MUDSTONE. Hard	5.7			
	38		6.0	soil/very soft bedrock.				
S-8	39 50/10cm	70	7.0					
			8.0_					
			-	Auger refusal @ 8.7 m	8.7			
IC-1			9.0	SANDSTONE; brown, medium, slightly broken, slightly jointed, medium grained, calcareous, moderately weatheredlost water circulation @ 8.9 m				
			10.0	-RC-1: Recovery = 96% -Core Loss = 8 cm -RQD = 34%	10.1			
				SANDSTONE; gray, medium to moderately hard, massive, fine grained, micaceous.	,			
₹C-2			11.0	SHALE; gray, very soft to soft, highly brok highly jointed, arenaceous, fissile.	10.9			



Client	, Sv	erdrup A	ssociat	es, Inc.	Boring NumberB-	82
Proiec		H/MEG-	33-30.9	080/0.000	Sheet3 or	55
•	ct Numb	1/	V-7139		Completion Depth _	31.1 m
MPLE	BLOWS PER 15cm	PERCENT RECOVERY	ДЕРТН	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG
NO	PER TOUR	1,000	- - -	-RC-2: Recovery = 97% -Core Loss = 7 cm -RQD = 8%	11.9	
			12.0	hard, slightly broken, slightly jointed, micaceous.	12.3	
			- - -	SHALE; gray, very soft to soft, highly bro- highly jointed, arenaceous, fissile.	12.8	
C-3			13.0	MUDSTONE; gray, soft to very soft, highl broken, highly jointed. silty.		
				SILTSTONE; gray, soft, massive.	13.4	
			14.0	-RC-3: Recovery = 83% -Core Loss = 36 cm	 	
				-RQD = 66% SANDSTONE; brown, medium to moderate hard, massive, coarse grained.	14.6	
C-4			15.0			
		. '	16.0		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
				-qr (@ 16.3 m) = 21.74 MPa		
			17.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 92%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
			:	1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	1		18.0	<u>:</u>		



Clien	, Sv	erdrup A	ssociates	s, Inc.	Boring Numbe	r <u>B-8</u>	32
Proje			33-30.98		Sheet4	of	
	ct Numb	erV	V-7139		Completion D		31.1 m
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG
RC-5			19.0	-cross-bedded and micaceous from 18.3 to 25.9 m			
			20.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 97%			
RC-6			21.0.				
			22.0				
			23.0	-RC-6: Recovery = 100% -No Care Loss -RQD = 82%			
RC-7			25.0		0 0 0 0 0 0 0 0 0 0		
NOTES	S:						



Proje	ct Numb	er <u>V</u>	V-7139		Completion D	epth	31.1	<u></u>
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	RBERG 1
			-	-RC-7: Recovery = 100% -No Core Loss -RQD = 44%	25.9			
			26.0	SANDSTONE; gray, moderately hard, slightly broken to massive, slightly jointed, coarse grained, cross-bedded, carbonaceous, micaceous.	y in			
3 C-8		:	27.0 _ 					
1C-a			28.0	-RC-8: Recovery = 86%				
3 C-9 ∶			29.0	-Core Loss = 21 cm -RQD = 50% SHALE; black, soft, highly broken, fissile, slickensided, carbonaceous, fossilfierous.	28.8			
			-	SANDSTONE; gray, moderately hard, slights broken, slightly jointed, carbonaceous, laminated, micaceous. -coal seam from 29.5 to 29.6 m MUDSTONE; gray, soft to very soft, highly	29.6			
			30.0	broken, highly jointed, fissile, carbonaceous laminated, sparsely fossiliferous. -RC-9: Recovery = 89% -Core Loss = 23 cm -ROD = 15% -coal seam from 30.5 to 30.6 m				
			31.0	Bottom of Boring = 31.1 meters	31.1			



REPORT OF SOIL EXPLORATION

Clien	, s	verdrup A	ssociate.	s, Inc.	Boring Numbe	r <u>B-8</u>	3
Proie				80/0.000	Sheet1		2
	ct Num		V-71 3 9		Completion De		11.0 m
Proje	Ct Ivum			DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	ted: 5/4 thed: 5/4 ; M.	1/98 F.
North	ning	135042		1 A	Boring Method	<u> 8.3</u>	cm HSA/H
Easti	ng	637696	. 1		Hammer Weig		
Eleva	ition	247.1 n	7		Hammer Drop		6 cm
SAMPLE NO	BLOWS PER 15cm	PERCENT NECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL P
SS-1		89		Brown SILTY fine SAND, little organics, tr clay (Topsoil). Moist.	ace 0.1	27	
SS-2	3	2 83	4/	Brown CLAYEY SILT, some fine sand. So Moist.		32	
	3	6	1.0	Red CLAY, little silt, trace fine sand. Stift very stiff. Moist.	10		
<i>\$\$-3</i>	4 8	78 9	=			22	
SS-4	3	100	1	Reddish-brown fine SANDY CLAY, some	1.8	26	
	3	4	2.0	trace coarse sand. Medium stiff to stiff. Moist.			
SS-5		100				25	
	4	4	3.0				
			4.0				
SS-6	3 4	100	4.0			29	
NOTES		5				.11	
		 IPLE TYPE		GROUND WATER READING		BORING N	METHOD

SS - 5.1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

RC - Ruck Core

AS - Auger Sample

At Completion : N/A* m

After 24 Hrs J. N/A

* Wash water used during the coring process.

HSA - Hallow Stem Augers

SFA Solid Flight Augers

MD - Mud Drilling WD - Wash Drilling

RC - Rock Coring



Clien	tSve	erdrup A	ssociat	es, Inc.	Baring Numbe	B-8	33	
Proje					Sheet2	of	2	
Projec	ct Numb	erV	V-7139		Completion D	·	11.0 i	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	BERG PL
SS-7		67	5.0	Gray CLAYEY SILT, trace coarse to fine sand, trace fine gravel. Medium stiff to ha Moist. -groundwater intially encountered @ 6.1	·******	29		
SS-8	18 38 50/8cm	93	7.0 - - - - 8.0 _	-SS-8: ODOT A-6b (11) Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	7.5	17	38	20
RC-2			9.0	-gray, medium limestone lens from 8.8 to 8.9 m MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty, pyritic, calcareo rare slickensidesRC-1: Recovery = 25% -Core Loss = 46 cm -RQD = 0%	8.8 us,	State County & Marking to the control of the county of the		
RC-3			10.0	-RC-2: Recovery = 66% -Core Loss = 41 cm -RQD = 25% -RC-3: Recovery = 46% -Core Loss = 16 cm -RQD = 0% Bottom of Boring = 11.0 meters	11.0			



SFA - Solid Flight Augers

MD - Mud Dulling

RC - Rock Caring

WD - Wesh Drilling

REPORT OF SOIL EXPLORATION

Clien	t Sv	erdrup A	ssociat	es, Inc.	Borin	ng Numbe	r <u>B-</u>	84	
Proje	ct A7	H/MEG-	33-30.5	980/0.000	Shee	et1	of	1	
Proje	ect Numb	ner W	V-7139		Com	pletion De	epth	4.3 n	n
·		134940	٥	DRILLING AND SAMPLING INFORM	ATION	Date Star Date Finis Drilled By	hed: 5/ : M		24
Norti	hing			models abhalfor when to diff on the second		ng Method	′ —		<u>~</u>
East	ing	637738	.4	1 10/17/1	Ham	mer Weig	<i></i>	3,5 kg	
Eleva	ation	231.9 m	7	<u> </u>	Ham	mer Drop		6 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	RBERG , P
SS-1	7	78	_	Gray fine to coarse GRAVEL. Loose.	Damo	0.1			
	8 9	,	-	Brownish-gray SILTY CLAY, trace fine trace fine gravel. Very stiff to hard.	sand,		14		
\$\$-2	7 9 17	61	1.0	-SS-2: Visual ODOT A-7-6			18		
SS-3	8 12 21	56	-				15		
\$\$-4	8 11 30	61	2.0				13		
SS-5	8 15 26	89	3.0_				9		
			 - - -						
33-6	50/5cm	50	4.0 <u>-</u> - -	Gray weathered SANDSTONE. Very s bedrock. Auger refusal @ 4.3 m Bottom of Boring = 4.3 meter	ſ	4.1			
NOTES	÷								
	SAMP SS - 5, 1cm O	LE TYPE		GROUND WATER READING At Completion = Dry	m		BORING I	METHOD	

After 24 Hrs Y N/A

GS - Geoprobe Sample

ST - Shelby Tube

A5 - Auger Sample

RC - Rock Core



REPORT OF SOIL EXPLORATION

Clien	t Sve	rdrup A	ssociati	es, Inc.	Boring Number		
Proje	ct ATI	H/MEG-	33-30.S	180/0.000	Sheet1	of	3
-	ect Numb	er M	/-7139		Completion De	pth	17.1 m
, , , , ,				DRILLING AND SAMPLING INFORMATION	Date Start Date Finis Drilled By: ON	hed: 5/2 M.	29/98 F.
Nort	hing	134817	.9	high 1 mg	Boring Method		cm HSA/
East	ing	637750	.9		Hammer Weig	·	3.5 kg
Eleva	ation:	256.3 n	7		Hammer Drop		6 cm
AMPLE	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBER LL
	3	44		Brown SILTY fine SAND, little organics, tr clay, trace coarse sand (Topsoil). Moist.	ace - 0.1	12	
SS-2	3 4 4 50/13cm	100		Brown coarse to fine SAND and GRAVEL (sandstone fragments), some silt. Loose. \Moist.	0.6	8	
S-3	50/8cm	33	1.0	Light brown to brown weathered SANDSTONE. Very soft bedrock.		5	
SS-4	50/13сп	60	2.0			5	
RC-1			3.0	SANDSTONE: brown, moderately hard, massive, slightly jointed, medium to fine grained, micaceous, friable, slightly weathered.	2.7		
			4.0	-RC-1: Recovery = 96% -Core Lass = 12 cm -RQD = 86%			

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Hock Core
- AS Auger Sample

GROUND WATER READING

At Completion Z Dry

After 24 Hrs J. N/A

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling RC Rock Caring



				REPORT OF SOIL EXPLORATION	1	
Clien	nt Sv	erdrup A	ssociat		Boring Number _	
Proje	ect A7	H/MEG-	33-30.5	980/0.000	Sheet2	
Proje	ect Numb	erV	/-7139		Completion Depth	_
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOIST CONT	
			5.0		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
RC-2			6.0		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
			7.0 	-RC-2: Recovery = 94% -Core Loss = 18 cm -RQD = 62%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
			8.0 - - -			
RC-3			9.0	-highly broken from 8.8 to 10.4 m		
			10.0	-RC-3: Recovery = 18% -Core Loss = 125 cm -RQD = 0%	10.4	
RC-4			11.0	SANDSTONE; gray, soft to moderately hat massive, slightly broken, slightly jointed, coarse grained, micaceous, friable, with traces of iron stainingRC-4: Recovery = 88% -Core Loss = 18 cm -RQD = 60%		

NOTES:



Client Sverdrup Associates, Inc.	Boring Number B-85
ProjectATH/MEG-33-30.980/0.000	Sheet 3 of 3
Project Number W-7139	Completion Depth 17.1 m

	ct Numb				ompletion			47700000	
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	₽₽РТH	SOIL DESCRIPTION		1	CONTENT	ATTERBER LL	RG PL
	127.7007			SANDSTONE; brown, moderately hard,					
		i	-	massive, slightly jointed, medium, micaceous	. :				
		1		laminated, with traces of iron staining.	',				
			l i	laininateu, with traces of fron staining.	:	:::			
7C-5		1	12.0						
			-		:				
		1	-		;				
]			:::			
			-		-				
		İ	−†						
		1	1 1		12.8				
			I I	SANDSTONE; gray, moderately hard,			į.		
			13.0	massive, slightly jointed, medium to coarse	l:		i	l	
			-	grained, micaceous, with carbonaceous	- 1		1		
		1	3	laminations.	- 13				
			-		1:	:::			
			-	-RC-5: Recovery = 88% -Core Loss = 37 cm					
		1	-		1:				
		1	-	-RQD = 81%			1		
			14.0				ŀ		
			/4.0			:::	1		
		i			1		į		
			1 -		13	:::	1		
			1	-coal seam from 14.4 to 14.5 m	1	:::	1		
]		14.6		1		
				MUDSTONE; gray to dark gray, very soft,	ł	900	1		
			-	highly broken, highly jointed, arenaceous,]			
RC-6			15.0	slickensided, slightly carbonaceous.	1	1/2	į		
IÇ-D			1 4		1	11/1/2			
				-calcareous from 15.2 to 16.2 m	1	77/4	1		
				33/33/33/33/73/2 to 73:2 m		8			
			-	700	1	43			
		ł		-RC-6: Recovery = 72%	j	200g			
		1	-1	-Core Loss = 34 cm	-	43	ł		
				-RQD = 0%	!	33	İ	ļ	
			16.0		į	wild.			
		į !			16.2	- 4			
₹C-7		1	l J	LIMESTONE; gray, hard, highly broken,	T L	П			
		1		highly jointed, fine crystalline.	16.5	-7-4	1		
?C-8		1	i -	RC-7: Recovery = $62%$, 0.0		1		
		1	1 2	-Core Loss = 12 cm	1	- 1	1		
₹C-9			-	-RQD = 0%	-	3	-		
		i	170	MUDSTONE; gray, very soft, highly broken,	⊣	24	-		
		}		wicestone, gray, very sort, nighty broken,	17.1	<u> </u>	-		
)		highly jointed, calcareous.			1	- 1	
			:	-RC-8: Recovery = 87%	1	- !	!	!	
		í		-Core Loss = 4 cm; RQD = 0%		- 1	1		
		1	:	-RC-9: Recovery = 62%	1	- 1	!	- 1	
			:	-Core Loss = 12 cm; RQD = 0%	· i	1	1		
			!	-gray, hard limestone lens from 17.0	1 1	i	1		
				to 17.1 m	i	- 1	1		
		1	I	Bottom of Boring = 17.1 meters	' 1	į			
		i	i						



WD - Wash Drilling

RC - Rock Coring

REPORT OF SOIL EXPLORATION

Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B</u> -8	6	
Proje	4.7	H/MEG-	33-30.9	980/0.000	•	of	1	
		erV	V-7139		Completion De	epth	1.6 m	7
710,0					Date Star Date Finis Drilled By	ted: 6/4 hed: 6/4	1/98 1/98	
North	nina	134828	.6	DRILLING AND SAMPLING INFORMATI	ON <i>Boring Method</i>	Geo _l	probe	
Eastii	_	637803	.8		Hammer Weig		/A	
Eleva	•	245.9 n	7		Hammer Drop		/A	
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	BERG PL
GS-2 GS-3		100	1.0	-dark brown to black from 1.2 to 1.3 m Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. Geoprobe refusal @ 1.5 m Bottom of Boring = 1.5 meters	1.3 1.5	10		
a	SAMP S - 5.1cm Ol S - Geoprobe T - Shelby Te	Sample		GROUND WATER READING At Completion V Dry m Atter 24 Hrs. V N/A on	HSA · Hollo	BORING M w Stem Auger Flight Augers Drilling		

RC - Rock Cure

AS - Auger Sample



REPORT OF SOIL EXPLORATION

Proje	ct A7	H/MEG-	33-30.	980/0.000	Boring No				
-	ect Numb		V-7139	Note the second	Completi			1.6 n	n
Fiuje	ect ivanii.	<i></i>			-		-		
							ted: 6/4 hed: 6/4		
						d By.			
				DRILLING AND SAMPLING INFORMATION	วง	-			
Nort	hing	134749	.4		Boring M	ethod	_ Geo	probe	
East	ing	637864	.8		Hammer .	Weig	htN	/A	
Eleva	-	246.0 п	,		Hammer	_		/A	
AMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION	7741111701		MOISTURE	ATTER	
мо 3S-1	PER 15cm	RECOVERY 100		Dark brown CLAYEY SILT, some fine sand	<i>l,</i> o.	2///	CONTENT 26		<u> </u>
S-2		100	_	Vittle coarse sand. Moist.		111	24		
			-	Brownish-gray CLAY, some silt, little coar. to fine sand. Moist.	se	\mathbf{H}			
				to fine sand. Woist.					
			-						
			1.0_			\parallel			
			-						
			-	Coonwide votices (6) 1.5 -		_#	İ		
				Geoprobe refusal @ 1.6 m Bottom of Boring = 1.6 meters		6			
				Sottom of Solling a 1.0 Meters					
		1 1							
] ,			
						,			
				•					
1									
							İ		
j									
IOTES:		,							

GS - Geoprobe Sample

ST Shelby Tube

RC - Rock Care

AS - Auger Sample

Aller 24 Hrs N/A m

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling

RC. Rock Coring



REPORT OF SOIL EXPLORATION

Clier	nt Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-8</u>	8
Proje	4 77	H/MEG-	33-30.5	980/0.000	Sheet1		
	ect Numb	er V	V-7139		Completion De	epth	12.2 m
				DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By ON	ted: 6/2 thed: 6/2 ; M.i	1/98 1/98
Nort	'''''y	134590		* Hd W	Boring Method	,	
East	#/9	637895		4-9-9-	Hammer Weig	··· —	3.5 kg
	auon	271.9 n	7		Hammer Drop		5 cm
ŞAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
SS-1	4	50	-	Brown fine SAND and SILT, little organics,	0.1	14	
	5		=	trace clay, trace fine gravel (Topsoil). Mon Brown coarse to fine SANDY CLAY, some	st.	/7	
SS-2	3	94		silt, trace coarse sand. Stiff to hard. Moi		16	
	4		1	·	122		
	6		1.0		1/2		
SS-3		100	7.0		- V/.	14	1
35-3	9	700	1		<i>\(\lambda\)</i>	/4	
	21		-		120	1	
			_		1.8	1	
SS-4	40	89		Brown weathered SANDSTONE. Very sof		10	
	50/8cm		2.0_	bedrock.	:::i]	
			_				
SS-5	50/13cm	100	-		<u> </u>	10	
			_				
			3.0_				
	1		_				
]		-				ļ
			4.0		:;:	l i	İ
SS-6	50/13cm	100				9	į
			-		lii:		:
NOTES	<u>.</u>	L	<u> </u>	1		1	<u>:</u>

SAMPLE TYPE

SS - 5.1cm OD Split Spnan

GS - Geoprobe Sample

ST · Shelby Tube

RC - Rack Core AS - Auger Sample At Completion - Dry

Alter 24 Hrs V. N/A

HSA - Hollow Stem Augers

SFA - Solid Flight Augers MD - Mud Drilling

WD Wash Drilling RC Rack Caring



	ntSve	HIMEG	33_30 Q	280/0.000	Sheet2	of	3	
Proje	ect _An			80/0.000			12.2	
	ect Numb	erV	V-7139		Completion De			
MPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RER.
			5.0					
	22	90	-	Gray INDURATED CLAY/WEATHERED	5.7			
S-7	50/10cm	80	6.0	MUDSTONE. Hard soil/very soft bedrock.				
			7.0					
S-8	50/13cn	100	-	Brown weathered SILTSTONE. Very soft bedrock.	7.2			
			8.0_					
S-9	32 42 26	72	9.0	Gray weathered SHALE. Very soft bedroc	8.7 × k.			
	20		-					
S-10	50/13cm	40	10.0	Gray weathered MUDSTONE. Very soft bedrock.	10.2			
C-1			11.0	SANDSTONE; gray, medium to moderately hard, massive, slightly jointed, medium to fine grained, micaceous, slightly calcareou	1:::			
IOTES					:::		<u>-</u>	i.,



Clien	t Sv	erdrup A	ssociate	s, Inc.	Boring Num	bei	. <u>B</u> -8	8	
Proje		TH/MEG-	33-30.9	80/0.000		3	of	3	
	ct Numb	ner V	V-7139		Completion	De	pth	12.2	m
SAMPLE NO	BLOWS PER 15cm	PERCENT	DEPTH	SOIL DESCRIPTION	·		MOISTURE CONTENT	ATTER LL	RBERG PL
			12.0	-RC-1: Recovery = 84% -Core Loss = 24 cm -RQD = 50%	12.2				
				Bottom of Boring = 12.2 meters		,			



REPORT OF SOIL EXPLORATION

Clien	, Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	,B-8	39
Proje	4.7	H/MEG-	33-30.9		Sheet1		2
•	ct Numb	er V	V-7139		Completion D	epth	10.1 m
7.1.5,1					Date Star Date Finis Drilled By	ted: 6/. hed: 6/.	2/98 2/98
Norti	hina	134612	.6	DRILLING AND SAMPLING INFORMATION	DN <i>Boring Metho</i> c	8.3	cm HSA
Easti	-	637981	.9		Hammer Weig	-	3.5 kg
Eleva	=	263.4 п	n .		Hammer Drop		6 cm
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	rianner Brop	MOISTURE CONTENT	ATTERBERG LL PL
SS-1		44		Brown SILTY fine SAND, little organics, tra	ace0.1	20	
\$\$-2 \$\$-3	6 11	56	1.0_	coarse sand (Topsoil). Moist. Brown SILTY CLAY, some coarse to fine sand, little to trace fine gravel. Stiff to ver stiff. Moist.	y 1.2	20	
SS-4	26 32	67	2.0	Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.		8	
SS-5 RC-1	50/8cm	33	3.0	Brown weathered SANDSTONE. Very sof bedrock. SANDSTONE: brown, medium, highly brok highly jointed, fine to medium grained,	3.0 × 1	3	
RC-2			4.0	micaceous, calcareous. -RC-1: Recovery = 67% -Core Loss = 50 cm -RQD = 0% MUDSTONE; brown, soft, highly broken, highly jointed, arenaceous, calcareous. SILTSTONE; brown, soft to moderately ha	4.0 4.3 ///		

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

GROUND WATER READING

At Completion ____ Dry ____ m

After 24 Hrs V/A

BORING METHOD

- HSA Hollow Stem Augers
- SFA Solid Flight Augers
- MD Mud Drilling WD - Wash Orilling
- HC Hock Coring



CIICII	t SV	erdrup A	<i>Issociat</i>	es, Inc.	Boring	Numt	er B-8	39	
Proje	47	H/MEG-	<i>33-30.</i> 9	980/0.000	Sheet .	:	? of	2	?
Proje	ct Numb	er	V-7139		Comple	tion I	Depth	10.1	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	<i>ДЕРТН</i>	SOIL DESCRIPTION			MOISTURE	ATTE. LL	RBERG I PL
RC-3			5.0	\text{\text{\fissile, micaceous.}} MUDSTONE; brown, very soft to soft, high broken, highly jointed, calcareous, arenaceousRC-2: Recovery = 80% -Core Loss = 15 cm	ſ	4.6 /			
RC-4			6.0_	-RQD = 0% -brown, medium siltstone lens from 5.2 to 5.3 m -limestone fragments from 5.3 to 5.8 m -RC-3: Recovery = 72% -Core Loss = 21 cm -RQD = 0% -limestone lens from 5.8 to 5.9 m					
			7.0	SANDSTONE; brown, moderately hard, massive, slightly jointed, coarse to medium grained, micaceous, calcareous, friable, slightly weathered.		6.9			
			8.0	-RC-4: Recovery = 77% -Core Loss = 67 cm -RQD = 47%					
RC-5			9.0	-RC-5: Recovery = 100%					
			10.0	-No Core Loss -RQD = 77% Bottom of Boring = 10.1 meters	1	0.1			



				REPORT OF SOIL EXPLORATION				
Client	Sve	rdrup A:	ssociate	es, Inc.	Boring Number	<i>B</i> -9	0	
Projec	47	H/MEG-3	33-30.9	80/0.000	Sheet1	of	3	
•	t Numb	er W	-7139		Completion De	epth	16.2 n	7
710,00					Date Start Date Finis Drilled By	hed: 6/-	4/98	
North	ina	134612.	.6	DRILLING AND SAMPLING INFORMATI	Boring Method		cm HS	A/RC
Eastir	-	638018	.7		Hammer Weig	ht6	3.5 kg	
Eleva	_	259.0 m	7**		Hammer Drop		6 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	BERG PL
	3 4	44		Brown SILTY fine SAND, little organics, to	race 0.1	19		
SS-2	5 3 2	83	- - -	Brown and gray SILTY CLAY, some fine sand, little coarse sand. Stiff to medium stiff. Moist.	· · · · · · · · · · · · · · · · · · ·	23	j	
SS-3	3 8	100	1.0		1.2	7		\
	50/10cm	1	- - -	Brown weathered SANDSTONE. Very so bedrock.	η	_		
SS-4	50/8cm	100	2.0		/ // // // //	7		
RC-1			3.0	SANDSTONE; brown, moderately hard, massive, slightly jointed, micaceous, cross-bedded, friable, with traces of iron staining.	3.0			
			4.0		a			
NOTES	: ** Eleve	ation is app	roximate	J				
i		PLE TYPE		GROUND WATER READING At Completion Dry	IISA - Ho	BORING	METHOD gers)

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- HC Rock Core
- AS Auger Sample

After 24 His Y N/A m

SFA - Solid Flight Augers

MD - Mud Drilling

WD Wash Drilling

RC Rock Coing



Clion	. Sv	erdrup A	ssociate	es, Inc.	Boring Number	, <u>B</u> -9	0.	
Droin	ct A7	TH/MEG-	- 33-30.9	80/0.000		of	3	
	ct Numl	1.4	V-7139		Completion De		16.2	m
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURÉ CONTENT	ATTEF LL	RBERG PL
RC-2	PER 15cm	RECOVERY	6.0	-RC-1: Recovery = 94% -Core Loss = 18 cm -RQD = 79%				
			7.0	-RC-2; Recovery = 98%				
			8.0 -	-Core Loss = 6 cm -RQD = 93%				· ·
RC-3			10.0					
NOTES	** 5	etion is app	11.0	-RC-3: Recovery = 96% -Core Loss = 18 cm -RQD = 63%			: -	



Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring Numb	er <u> </u>	o
Proje		H/MEG-	33-30.9	980/0.000	Sheet	of	
Proje	ct Numb	erV	V-7139		Completion L	Depth	16.2 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
RC-4			12.0				
			13.0				
			14.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 79%			
RC-5			15.0				
			16.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 100% Bottom of Boring = 16.2 meters	16.2		
NOTES:	** Elevat	ion is appo	oximate				



SFA - Solid Flight Augers

MD - Mud Drilling

WD Wash Drilling

RC - Rack Coring

Cherre	erdrup A		es, Inc.	Boring Numbe			
Project A7	H/MEG-	33-30.5	980/0.000	Sheet1	of		
Project Numb	erV	V-7139		Completion D	epth	5.9 n	7
				Date Star Date Finis Drilled By	shed: 6/5	/98	
Northing	134401	.4	DRILLING AND SAMPLING INFORMATIO)N Boring Metho	d 8.3	cm HS	Α
Easting	638162	. 7		Hammer Weig	~	3.5 kg	
	261.0 n	7**		Hammer Drop	7	5 cm	
AMPLE BLOWS NO PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE	ATTER	BERG F
SS-1 3	28		Brown SILT, some fine sand, little clay, tra	ce - 0.1	22		
3 4 4 6	44	- - - - -	organics (Topsoil). Moist. Brown SILTY CLAY, some fine sand, little coarse sand, trace fine gravel. Medium stite hard. Moist.	#	21		
55-3 9 17 20	44	1.0			15		
5S-4 15 21 19	61	2.0_			16		
SS-5 28 50/13cm	73	3.0			11		
		4.0	Gray to brown weathered SANDSTONE. Very soft bedrock.	3.3			
S-6 35 50/5cm	75			24.	7		

After 24 Hrs Y N/A

GS - Geoprobe Sample

ST - Shelby Tube

RC - Ruck Core

AS - Auger Sample



Oso!o	ct Numb	ar N	/-7139		Completion D	enth	5.9 m
AMPLE	BLOWS	PERCENT	ОЕРТН	SOIL DESCRIPTION	Completion	MOISTURE	ATTERBEI
мо SS-7	PER 15cm	necovery	5.0	Auger refusal @ 5.9 m Bottom of Boring = 5.9 meters	5.9	5	



Clien	Sv	erdrup A	ssociati	es, Inc.	Boring Number	B-9	2
Proje		11.170		080/0.000	Sheet1	of	1
-	ect Numb	ъег И	/-7139		Completion Dep		
FIOJE	ect mann.	Jei		DRILLING AND SAMPLING INFORMATI	Date Starte Date Finish Drilled By:	ed: 6/8	5/98 5/98
Nort	hina	134245	.3	DRILLING AND SAMPLING INFORMATI	Boring Method	Geo	probe
East	-	638290	.7		Hammer Weigh	tN	/A
	ation	263.3 n	7		Hammer Drop		/A
SAMPLE NO	BLOWS PER 15cm	PERCENT	DEPTH	SOIL DESCRIPTION		HOISTURE CONTENT	ATTERBERG LL PL
GS-1		67	1.0	Brownish-gray CLAY, some silt, little fine sand, trace coarse sand. Moist.		19	
GS-2				Geoprobe refusal @ 1.8 m			
			-	Bottom of Boring = 1.8 meters	1.8		
NOTES] G:		<u> </u>	1 			
1		Tube ore	,	GROUND WATER READING At Completion I Dry After 24 Hrs I N/A m	HSA - Hollov SFA - Solid f MD - Mud D WO - Wesh BC - Bock G	flight Augers rilling Drilling	975



WD - Wash Drilling

RC - Rock Coring

REPORT OF SOIL EXPLORATION

Client	Sv	erdrup A	ssociat	es, Inc.	Boring Number	er <u>B-9</u>	3
Project	_A7	H/MEG-	<i>33-30.</i> \$	980/0.000		of	
Project		erV	V-7139		Completion D		0.0
				DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	shed: 5/2	1/98
Northin	g	134144	.7	DALLEMO AND SAMI BING IN ORMANI	Boring Method	d Geor	orobe
Easting	·	638294	.9		Hammer Weig	A /	
Elevation		227.5 m	7		Hammer Drop		Ά
SAMPLE I	BLOWS ER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
GS-1 GS-2 GS-3		100		Dark brownish-gray CLAYEY SILT, little organics, trace fine sand (Topsoill). Moist. Brown SILTY CLAY, some fine sand, trace fine gravel. Moist. Brown weathered SANDSTONE. Very sof bedrock. Geoprobe refusal @ 0.6 m Bottom of Boring = 0.6 meter	0.6	35 20	
GS -				GROUND WATER READING At Campletion \(\overline{Y} \) \(Dity \) m Alter 24 Hrs \(\bullet \) \(\bullet N/A \) m	HSA - Hollo	BORING Mi w Stem Augers Flight Augers brilling	

BC Rock Core

AS - Auger Sample



Clier	ntSv	erdrup A	ssociat	es, Inc.	Boring Number	, <u>B</u> -9	4.	
Proje	ect A7	H/MEG-	33-30.9	980/0.000	Sheet1			
Proje	ect Numb	erV	V-7139		Completion De	epth	1.8 m	7
Monte	hing	134184	.3	DRILLING AND SAMPLING INFORMATI	Date Start Date Finis Drilled By. ON Boring Method	hed: 5/2 : S.E	1/98	
East	-	638387	.3		Hammer Weig			
	nny ation	229.2 n			Hammer Drop	///N		
SAMPLE	BLOWS	PERCENT	<i>DEPTH</i>	SOIL DESCRIPTION	папшет Бтор	MOISTURE	ATTER	
мо GS-1 GS-2	PER 16cm	100 100	1.0_	Dark brown CLAYEY SILT, little organics, trace coarse to fine sand (Topsoil). Moist Brownish-gray SILTY CLAY, trace coarse fine sand. Moist to damp. -GS-2: Visual ODOT A-6b Geoprobe refusal @ 1.8 m Bottom of Boring = 1.8 meters	t. / 🚃	30 28		<i>p</i> .
NOTES	<u>.</u>					i.	. 1	
NOTES	•							
	SAMPI SS - 5. Icm OC GS - Geoprobe ST - Shelhy Tu HC - Rock Core AS - Auger Sam	Sample be		GROUND WATER READING At Completion Dry		rilling Dritting		



REPORT OF SOIL EXPLORATION

Client	Sve	rdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B</u> -	95	
Project _	ATF	I/MEG-3	3 <i>3-30.</i> !	980/0.000	-	of		!
Project No	umbe	erN	/-7139		Completion De	epth _	25.0	m
					Date Star Date Finis Drilled By.	hed: 5/		
Northing_	1	33967.	.4	DRILLING AND SAMPLING INFORMATI	ON Boring Method	, 8.3	cm HS	A/RC
Easting _	6	38390.	1		Hammer Weig	,	3.5 kg	
Elevation	_2	93.1 m	,		Hammer Drop		76 cm	
SAMPLE BLOS NO PER S		PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RBERG PL
SS-1 1		78	-	Brown SILTY fine SAND, little organics, tr	ace 0.1	26		
SS-2 2	3	89	7	clay (Topsoil). Moist. Brown fine SANDY SILT, trace clay. Med stiff. Moist.	0.4	17		
6	16		1.0	Brown SILTY CLAY, trace fine sand. Very stiff to hard. Damp.	<i>'</i>			
SS-3 12		78				12		
SS-4 13 18	38	78	2.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	1.6			
<u>SS-5</u> 50/10	0cm	100	3.0					
			4.0					
NOTES:	!	ļ			4.6	}		
		TYPE		GROUND WATER READING At Completion \(\frac{\psi}{N} \ \mathcal{N} \/ A \ \ \ \ m \\ \ \ \ m \\ \ \ \ \ \ \ \	HSA - Hollow	BORING N		

- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

After 24 Hrs Y N/A

* Wash water used during the coring process.

- SFA Solid Flight Augers
- MD Mud Orilling
- WD Wash Drilling
- RC Rock Coring



00-	. Sv	erdrup A	Associate	S, Inc.		Numbe	r <u>B</u> -S	95
Clien	4.7			80/0.000	Sheet	2	of	4
Proje	ect Numb		N-7139			etion De	epth	25.0 m
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SQIL DESCRIPTION			MOISTURE CONTENT	ATTERBERG LL F
RC-1	72.7.72.3.7		5.0	MUDSTONE; variegated brown, gray, and red, very soft to medium, highly broken, slightly jointed, calcareous, non-bedded, s slightly weatheredRC-1: Recovery = 60% -Core Loss = 43 cm -RQD = 0%	ilty,			
110 2			6.0	-RC-2: Recovery = 41%				
			7.0	-Core Lass = 110 cm -RQD = 0%				
RC-3			8.0_	-RC-3: Recovery = 49% -Core Loss = 61 cm -RQD = 0%		146 166 166 166 166		
RC-4			9.0	-gray, medium limestone lenses up to 5 thick from 8.7 to 10.7 m -RC-4: Recovery = 67% -Core Loss = 15 cm -ROD = 0% CLAY-SHALE; brown, soft, highly broken, fissile, slickensided, slightly weathered.		9.1		
			10.0	-Core Loss = 15 cm -RQD = 0%		10.7	din adilla di la condicazi	
RC-6		!	11.0		v. ed.		सार्थिक क्यांत	
NOTES			-	-RC-6: Recovery = 100% -No Core Loss -RQD = 31%				



Clien	otSv	erdrup A	ssociat	es, Inc.	Boring Number	B-5	95`
Proje	47			980/0.000	Sheet3	of	4
•	ect Numb	erV	V-7139		Completion De	pth	25.0 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
	111		12.0	SILTSTONE; gray, medium, massive,	12.2		
			13.0	micaceous, argillaceousqr (@ 13.1 m) = 64.10 MPa			
RC-7			14.0	MUDSTONE; variegated red, gray, and purple, very soft to soft, highly broken, non-bedded, silty, calcareous, slickensided	13.7 /.		
RC-8		:	15.0	-RC-7; Recovery = 98% -Core Loss = 3 cm -RQD = 0%			
			16.0.	-RC-8: Recovery = 98% -Core Loss = 3 cm -RQD = 23%			
RC-9			17.0				
RC-10			18.0	-RC-9: Recovery = 100% -No Core Loss -RQD = 18%			
NOTES		į					



25.0 %

REPORT OF SOIL EXPLORATION

Clien	t Sv	erdrup A	Issociate	es, Inc.	Boring Number	B-9	5	
Proje	ct AT	H/MEG-	33-30.9	80/0.000	Sheet4	of .	4	
Proje	ct Numb	erv	V-7139		Completion Dep	th	25.0 r	n
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	рертн	SOIL DESCRIPTION		OISTURE ONTENT	ATTERI LL 1	BERG PL
RC-11			19.0	-RC-10: Recovery = 73% -Core Loss = 25 cm -RQD = 14%				
			20.0	-RC-11: Recovery = 96% -Core Loss = 5 cm -RQD = 9%				
RC-12			21.0.					
			22.0	-RC-12: Recovery = 76% -Core Loss = 51 cm -RQD = 8%				
RC-13			23.0	-massive from 22.7 to 25.0 m				
			24.0	-RC-13: Recovery = 95% -Core Loss = 11 cm -RQD = 52%	#5 200 200 200 200 200			

Bottom of Boring = 25.0 meters

25.0...

NOTES:



RC - Ruck Coring

WD - Wash Drilling

PEROPT OF SOIL EXPLORATION

Project Number	Clien	, Sv	erdrup A	ssociat	es, Inc.	• Boring Numb	erB-	96
Project Number W-7139 Completion Depth Date Started: 6/2/98 Date Finished: 6/2/98 Date F		47	H/MEG-	33-30.9	980/0.000		_	1
Date Started: 6/2/98 Date Finished: 6/2/98 D	•		erV	V-7139			Depth _	1.7 m
Elevation 256.9 m	,.				DRILLING AND SAMPLING INFORMATI	Date Fin Drilled B	ished: 6, ly: S	/2/98 .B.
Elevation 256.9 m Hammer Drop N/A SAMME BLOWS PERCENT NO 100 STUDE SANDY CLAY, some organics, Wittle silt, trace coarse sand (Topsoil). Moist. GS-1 100 STUDE STOWN SILTY CLAY, some fine to coarse sand, trace fine gravel. Moist. GS-3 100 1.0 Brown fine SANDY CLAY, little silt, trace fine gravel. Moist. GS-3 100 1.0 Brown fine SANDY CLAY, little silt, trace fine gravel. Moist. Geoprobe refusal © 1.7 m 1.7 Bottom of Boring = 1.7 meters NOTES:	North	hing	133823	.6		Boring Metho		
SAMPLE TYPE SOULD SERVICE SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION SOULD SECRETION ATTERBER ATTERBE	Easti	ing	638498	7.6	- HA-ANDERS	Hammer We		
NOTES: Sample type Sample type Source of the sample	Eleva	ation	256.9 n	n		Hammer Dro	P	
GS-7 100 100 Srown fine SANDY CLAY, some organics, Vittle silt, trace coarse sand (Topsoil). Moist. Brown SiLTY CLAY, some fine to coarse sand, trace fine gravel. Moist. GS-3 100 1.0 Brown fine SANDY CLAY, little silt, trace fine gravel. Moist. Geoprobe refusal @ 1.7 m	SAMPLE			DEPTH	SDIL DESCRIPTION			
Brown SiLTY CLAY, some fine to coarse sand, trace fine gravel. Moist. Brown fine SANDY CLAY, little silt, trace fine gravel. Moist. Geoprobe refusal @ 1.7 m			100		Brown fine SANDY CLAY, some organics,	0.1	31	
SAMPLE TYPE GROUND WATER READING BORING METHOD	GS-2		100	_		ist.		
GS-3 100 1.0 Brown fine SANDY CLAY, little silt, trace fine gravel. Moist. Geoprobe refusal @ 1.7 m Bottom of Boring = 1.7 meters NOTES: SAMPLE TYPE GROUND WATER READING BORING METHOD				_		<u> </u>	⊒ 23	
SAMPLE TYPE Brown fine SANDY CLAY, little silt, trace fine gravel. Moist. Geoprobe refusal @ 1.7 m				_	3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			
Geoprobe refusal @ 1.7 m 1.7 Bottom of Boring = 1.7 meters NOTES: SAMPLE TYPE GROUND WATER READING BORING METHOD			100		Prouga fine SANDV CLAV little eilt trace		17	
Geoprobe refusal @ 1.7 m 1.7 Bottom of Boring = 1.7 meters NOTES: SAMPLE TYPE GROUND WATER READING BORING METHOD	63-3		100	1.0_	gravel. Moist.	''iie	a ''	
NOTES: SAMPLE TYPE GROUND WATER READING BORING METHOD			1	=	3		a	
NOTES: SAMPLE TYPE GROUND WATER READING BORING METHOD				-		1	4	
NOTES: SAMPLE TYPE GROUND WATER READING BORING METHOD]			-		1.7	2	
SAMPLE TYPE GROUND WATER READING BORING METHOD					Bottom of Boring = 1.7 meters		1	
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD			1					
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD							1	
SAMPLE TYPE GROUND WATER READING BORING METHOD			-			1		
SAMPLE TYPE GROUND WATER READING BORING METHOD	İ		1					
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD								
SAMPLE TYPE GROUND WATER READING BORING METHOD			+					
SAMPLE TYPE GROUND WATER READING BORING METHOD							i	
SAMPLE TYPE GROUND WATER READING BORING METHOD	i							
SAMPLE TYPE GROUND WATER READING BORING METHOD			<u> </u>	<u> </u>	<u> </u>		1	
·	NOTES:	i						
·		CALID	or E TVDE		CROUND WATER READING		DODING:	METHOD
				,	At Completion # Dry m	HSA - Ho		
GS - Geoprobe Sample SFA - Solid Flight Augens ST - Shelty Tube After 24 Hrs W/A in MD - Mud Drilling		GS - Geoprob	e Sample			SFA - So	lid Flight Auge	

ST - Shelby Tube RC - Rack Core

AS - Auger Sample



REPORT OF SOIL EXPLORATION

Clier	I a remember	erdrup A			Boring Number		
Proje	ect A7	H/MEG-	33-30.5	980/0.000	Sheet1	of	3
Proje	ect Numb	er V	V-7139		Completion D	epth	18.0 m
				DRILLING AND SAMPLING INFORMATION	Date Fini Drilled By	rted: 5/1 shed: 5/1 /: M.	1/98
Nort	<i></i>	133685			Boring Metho	·	cm HSA/F
East	ing	638409	.0	100 PM 1000 PM 1000	Hammer Weig	ght <u>6</u> 3	3.5 kg
	ation	291.0 n	7		Hammer Drop	,	5 cm
NO NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG
S <i>S-1</i>	3 5	61	-	Brown SILTY fine SAND, little coarse sand trace organics (Topsoil). Moist.	0.1	16	
\$\$-2	35 35	61	-	Brown SILTY fine SAND, trace coarse sand trace clay. Stiff to very stiff. Moist.	<i>1,</i>	9	
	11 5		=		0.9		
SS-3	9 14 17	67	1.0	Variegated red, green, gray, brown, and purple INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-4	6 12 21	67	2.0_				
SS-5	13 42	78	3.0				
	17		3.0		35 25 25 34 44 44		
SS-6	50/13cm	100	4.0				
		1	-1		1.115	· i	

GS - Geoprobe Sample

5T - Shelby Tube

RC - Rock Core

AS - Auger Sample

After 24 Hrs T N/A

* Wash water used during the coring process.

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MO - Mud Drilling

WD - Wash Drilling

RC - Rock Coring



Clier				es, Inc.	Boring Number	B-9		
Proje	ect AT	H/MEG-	33-30.	980/0.000	Sheet2	of	3	
Proje	ect Numb	erV	V-7139		Completion De	pth	18.0	n
SAMPLE NO	BLQWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MQISTURE CONTENT	ATTER LL	BERG P
			5.0					
SS-7	50/13cm	40	-	Gray leached LIMESTONE. Soft bedrock.	5.5			
			6.0 - - -	Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	6.1			
00.0	50/10cm	100	7.0					
RC-1	307 rocm	700	8.0_	CLAY-SHALE; gray, soft, highly broken, fissile, slightly micaceous, with interbedde gray, medium limestone lenses up to 5 cm	7.6			
				thick.				
			9.0	-RC-1: Recovery = 92% -Core Loss = 24 cm -RQD = 14%				
			10.0_					
RC-2			11.0					



Proje	Ct				Sheet	3	of	
Proje	ct Numb	er V	V-7139	- Summers	Complet	ion D	epth	18.0 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	·		MOISTURE CONTENT	ATTERBER LL
			12.0	-black coal seams up to 8 cm thick from 11.7 to 12.4 m -RC-2: Recovery = 98% -Core Loss = 6 cm -RQD = 20%	12			
			13.0	MUDSTONE; gray, soft to medium, massiv calcareous, non-bedded, slickensided.		1100 1100 2400		
			- - -	-qr (@ 13.0 m) = 42.91 MPa		1000 1000 1000		
RC-3			14.0					
			15.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 52%				
RC-4				-variegated brown, gray, red, and purple from 15.2 to 18.0 m				
	-		16.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 17%		186 186 186 186 186	ab is a	
PC-5			17.0			1864 2011 1807		
			1	-RC-5: Recovery = 75% -Core Loss = 30 cm -RQD = 44%		9,		
	1		18.0	Bottom of Boring = 18.0 meters	18.	0		



RC - Rock Coring

REPORT OF SOIL EXPLORATION

Client Sv	erdrup As	sociat	es, Inc.	Boring Numbe	erB	98	
Project A	TH/MEG-3	<i>3-30.</i> 9	280/0.000	Sheet1		1	
Project Numi	berW	-71 <i>39</i>		Completion D		3.0 r	n
			DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	ted: 5/ shed: 5/	14/98	
Northing	133579.4	4	DAILLING AND SAMPLING INFORMATIO	JN <i>Boring Metho</i> c	d <u>8.3</u>	cm HS	A
Easting	<i>638467.</i> 3	1		Hammer Weig		3.5 kg	
Elevation	270.2 m			Hammer Drop	-	'6 cm	
SAMPLE BLOWS NO PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE	ATTER	BERG PL
SS-1 2 2 SS-2 2	56	-	Red SILT, some fine sand, little clay, trace organics (Topsoil). Moist. Red CLAY, some silt, little fine gravel, traccoarse to fine sand. Soft to very stiff. Mit to damp.	e H	37 26	48	21
SS-3 7 8 12	78	1.0	-SS-2; ODOT A-7-6 (16)		15	ļ	
SS-4 10 17 15	67	2.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	1.8			
SS-5 12 16 22	89	3.0	Bottom of Boring = 3.0 meters	3.0			
NOTES: SAMPI SS - 5. Tem OU GS - Geopraho 5T - Shelby Tu RC - Rock Con	Sample be		GROUND WATER READING At Completion A Dry m Atter 24 Hrs N/A m	HSA HOROV SFA - Soild I MID - Mud D.	light Augers		

AS - Auger Sample



					REPORT OF SUIL EXPLORATION	V					
Clier	nt	Sve	erdrup A	Ssociat	es, Inc.	Borin	g Num	ber	B- S	9	
Proje	ect _	AT.	H/MEG-	33-30.	980/0.000		t				
Proje	ect Nu	mb	er'	V-7139		Comp	oletion	Dep	th	4.2 r	n
						Ĺ	Date St Date Fil Drilled L	nishe		15/98	
A1			133420	2	DRILLING AND SAMPLING INFORMATION				83	cm HS	. 4
e East	hing_		638484				g Meth			3.5 kg	
	ing ation .	_	256.0 n		, TAIR		ner We	•	-	5.0 kg 6 cm	
SAMPLE	BLOW	5	PERCENT	DEPTH	SOIL DESCRIPTION	Hamr	ner Dro	<u> </u>	USTURE	ATTER	RBERG
SS-1	PER 150	m	RECOVERY 78	DEFIN	Brown SILT, some fine sand, little clay, tra	200	0.0	CC	NTENT	ш	Pt
	1		'	3	organics (Topsoil). Moist.	<i> </i>	- 0,0	=	27		
ST-2		2	100	-	Brown to brownish-gray SILTY CLAY, little fine sand, trace coarse sand, trace fine gravel. Soft to very stiff. Moist.	e					
				1.0			<u> </u>	\exists	1		
SS-3	3		89	=					21		
	6	7		=					ŀ		
		•]				\exists			
SS-4			50				<u> </u>	\exists	21		
	8	9		2.0_							
		3]							
]				-			
SS-5	8 11		72	-			Ė				
		15		3.0			F	=			
				-	Brown weathered SANDSTONE. Very sol bedrock.	ft	3.2				
				4.0				7.			
SS-6	50/5ci	27	100	1			4.2				
			ļ		Bottom of Boring = 4.2 meters						
NOTES:	* * Ele	vatio	on is appr	oximate			!				
											
	SAN	(PI.:	E TYPE		GROUND WATER READING			ВО:	RING M	ETHOD	

55 - 5.1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

RC - Hock Core

AS - Auger Sample

At Completion \(\sum \) Dry m

Aller 24 Hrs 👤 N/A

HSA - Hallow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WO - Wash Drilling

RC Book Coring



REPORT OF SOIL EXPLORATION

Clien	t Sve	erdrup A	ssociat	es, Inc.	Boring	Numbe	rB-	100	
Proje	ct AT	H/MEG-	33-30.S	980/0.000	Sheet	1	of	3	
Proje	ect Numb	erV	V-7139	Acceptable To	Compl	letion D	epth _	15.2	m
					Di Di	ate Star ate Finis rilled By	shed: 5/		
Nort	''''''	133285		DRILLING AND SAMPLING INFORMATION	Boring	Method	d8.3	cm HS	A/RC
East	"'y	638508			Hamm	er Weig			
Eleva	ation	281.0 n	7**		Hamm	er Drop		76 cm	
ŞAMPLE NÜ	BLÓWS PER 15cm	PERCENT RECOVERY	DEPTH	SQIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	BERG PL
SS-1	2	11	<u>-</u>	Brown SILTY CLAY, some fine sand, trace organics, trace fine gravel (Topsoil). Mois		0.1	23		
SS-2	5 4	83		Brown SILTY CLAY, little fine sand, trace ∖fine gravel. Medium stiff. Moist.		0.5			
	5 8		1.0	Brownish-gray to red INDURATED CLAY/WEATHERED MUDSTONE. Stiff to hard soil/very soft bedrock.					
SS-3	10 15 19	83							
SS-4	9 10 17	89	2.0						
SS-5	11 16 21	94	3.0						
			4.0						
	16 36 50/13cm	94	nvimate			33 33 1 11			
	50/13cm ** Elevati	ion is appr	oximate.	GROUND WATER READING		15 fr	BORING	METHOD	

GS - Geoprobe Sample

ST Shelby Tube

RC Rock Core

AS - Auger Sample

After 24 Hrs Y N/A

* Wash water used during the coring process.

SFA - Solid Flight Augers

MD Mud Drilling

WD - Wash Drilling RC - Rock Coring



Client Sverdrup A	Associates, Inc.	· · ·	Dornig Namber	-100
Project ATH/MEG-	33-30.980/0.000		Sheet2o	f3
	V-7139		Completion Depth _	15.2 m
SAMPLE BLOWS PERCENT NO PER 15cm RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL PL
\$5-7 29 100	5.0			
50/10cm	6.0			
SS-8 50/13cm 80	8.0			
SS-9 50/13cm 100	9.0			
<u>SS-10</u> 50/10cm 100 RC-1	MUDSTONE; rec broken, arenaced	d, very soft to soft, high ous, calcareous, non-bed	10.7 ly idded.	
NOTES: ** Elevation is app	oroximate.			



Çlien	t Sv	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-1</u>	00	
Proje	47	H/MEG-	33-30.9	980/0.000	Sheet3	of	3	
Proje	ect Numb	er V	V-7139		Completion D		15.2 1	
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	BERG PL
			12.0	-RC-1: Recovery = 43% -Core Loss = 87 cm -RQD = 0%	12.2 %			
RC-2			13.0	MUDSTONE; red to brown, soft, slightly broken, silty, non-bedded, with calcite-fill fractures. -RC-2: Recovery = 80%				
RC-3				-Core Loss = 30 cm -RQD = 47% CLAY-SHALE; variegated brown, gray, an red, soft, highly broken, fissile, silty.	13.7 d			
			14.0	-brown, soft sandstone from 14.0 to 14.3 m -RC-3: Recovery = 98% -Core Loss = 3 cm				
			15.0	-RQD = 0% Bottom of Boring = 15.2 meters	15.2			
NOTES	** Eleva	tion is app	roximate.			<u> </u>		



REPORT OF COIL EVALORATION

				REPORT OF SUIL EXPLORATION	,			
Clier	ntSv	erdrup A	ssociat	res, Inc.	Boring Numb	erE	3-101	
Proje	ect A7	H/MEG	33-30.5	980/0.000	Sheet	<u>'</u> c	of1	
Proje	ect Numb	erV	V-7139	,	Completion I	Depth _	2.7 n	n
				DRILLING AND GAMDLING INFORMATION	Date Sta Date Fin Drilled B	ished: {		
Nort	hing	133159	.4	DRILLING AND SAMPLING INFORMATION	ON Boring Meth	od 8.	3 cm HS	SA
East	_	638496	.6		Hammer We		63.5 kg	,
	_	270.0 n	7**		Hammer Dro		76 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTUR		RBERG PL
				Gray fine to coarse GRAVEL. Damp.	0.1			
SS-1	6 6 5	78		Mottled red and gray SILTY CLAY, little coarse to fine sand. Stiff. Moist.		16		
SS-2	6 4 6	56	1.0			15		
SS-3	10 16 50/10cm	75	2.0	\$\$-3: ODOT A-4a (5)	2.1	9	28	18
	50/10cm		-	Brown weathered SANDSTONE. Very sof bedrock. Bottom of Boring = 2.7 meters	2.7 2.7			
NOTES:	** Elevat	ion is appre	oximate.					

SAMPLE TYPE

SS - 5.1cm OD Split Spaan

GS - Geoprobe Sample

S7 - Shelby Tube

RC - Rock Core

AS - Auger Sample

GROUND WATER READING

At Completion V Dry

After 24 Hrs Y N/A

BORING METHOD

HSA - Hotlow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling

RC Rock Coring



				REPORT OF SOIL EXPLORATION	V			
Clie	nt Sv	erdrup A	\ssociat	tes, Inc.	Boring Numbe	B- B-	02	
Proj	ect AT	H/MEG-	33-30.	980/0.000	Sheet1			
Proj	ect Numb	erV	V-7139		Completion De	epth	11.0	m
					Date Star Date Finis Drilled By	hed: 5/	19/98	
A/	.4.+	133039	1	DRILLING AND SAMPLING INFORMATI			cm H\$	14/00
	hing	638549			Boring Method	,		A/AC
East 	"'y	274.0 п		· · · · · · · · · · · · · · · · · · ·	Hammer Weig		3.5 kg	
Elev Sample	ation	PERCENT		The second secon	Hammer Drop		5 cm	
NO	PER 15cm	RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	BERG PL
SS-1	3 5	17		Brown SANDY SILT, little organics, trace gravel (Topsoil). Moist.	fine 0.0	27	-	
	4		-	Reddish-brown SILTY CLAY, trace fine	······			
SS-2		67	-	gravel, trace coarse to fine sand. Stiff to		23		
	8		_	hard. Moist to damp. -SS-2: Visual ODOT A-7-6			İ	
			1.0					
SS-3	10	78			F	16		
	18		1			1 1	ĺ	
	24		-					
00.4	0		4		·			
SS-4	16	61	2.0			16		
	15		4		H			
		ļ			[-]-			
SS-5	° 8	83				20		
	14		3.0		3.0			
			4	Mottled purple, red, and gray INDURATED CLAY/WEATHERED MUDSTONE. Hard	1111			
İ		ļ		soil/very soft bedrock.				
			4					
	!		-					
	i	1	4.0			ľ		
SS-6	14	94	4			}	- 1	
	19		4			}		
NOTES	26	n is anno	vimete		[464]			
	Lievatio	лг ю аррп	annate.					
	SAMPL	TVDE						
	3AWPL:	L I I FE		GROUND WATER READING	7	CODING NO	2001 (/ 2010	

- SS 5.1cm OD Split Spann
- 65 Geoprobe Sample
- S1 Shelby Tube
- RC Ruck Care
- AS Auger Sample

At Completion 7 N/A*

After 24 Hrs Y N/A

* Wash water used during the coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Onlling

RC Rock Coring



Clier		erdrup A			Boring Numbe		_	
Proje	ectAT			980/0.000	Sheet2	of		
Proje	ect Numb	er <u> </u>	V-7139	· · · · · · · · · · · · · · · · · · ·	Completion D	epth	11.0	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	RBERG I F
					19/2			
			-			1		
			5.0					
]		_		199			
]					1 1		
	1		-					
SS-7	14	89			113	1		
JO 7	26	05	6.0		184			
	48		0.0		1/4			
] .				*			
			-					
			_		1171	1		
			_					
			7.0		1/4			
]	-			12	1 1		
	14	73	=		133		i	
	50/13cm				194			
			_					
			_					
		-	8.0					
					133			
	İ				194		1	
			7					
SS-9	50/3cm	100	j	SANDSTONE; gray, moderately hard,	8.7 13		1	
RC-1		İ	9.0_	massive, slightly jointed, micaceous,				
		ļ	-	laminated.				
	!	1	7					
		İ	1					
		İ	-		:::			
		l	1	-RC-1: Recovery = 98%		!		
		ļ	10.0	-Core Loss = 15 cm	:::			
			4	-RQD = 65%				
	į		Ė			i		
	į	!	7				1	
ĺ	j	1	11.0		11.0			
	}	ł	77.0	Bottom of Boring = 11.0 meters	77.0		İ	
			į	V = 1.1.0.000				
VOTES:	** Elevation		1			<u> </u>	l	
	-1E 101(II)	<i>- σ σ ρ ρ ι</i>	annote.					



				REPORT OF SOIL EXPLORATION	/			
Clier	nt Sv	erdrup A	ssociat	es, Inc.	Boring Numbe	r	B-10	3
Proje	ect A7	H/MEG-	33-30.5	980/0.000	Sheet1			
Proje	ect Numb	erV	V-7139		Completion De	epth		1.2 m
					Date Start Date Finis Drilled By:	hed:		
		*****	•	DRILLING AND SAMPLING INFORMATE	ON	_		_
Nort	•	132861 638523			Boring Method		eopr	
East	ing				Hammer Weig	ht _	N/A	
	ation	259.1 n	7	THE STATE OF THE S	Hammer Drop		N/A	
SAMPLE NO	RLOW\$ PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTU CONTEN		ATTERBERG LL PL
GS-1		100		Brown SILTY CLAY, little fine sand. Mois	0.6	23		
GS-2	•	100	7.0	Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. Geoprobe refusal @ 1.2 m Bottom of Boring = 1.2 meters	1.2			
NOTES:				_				
	SAMPI	E TYPE		GROUND WATER READING	F	BORING	MET	HOD

SS - 5.1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

RC - Rock Care

AS Augur Sample

At Completion \(\frac{\pi}{2}\) Dry \(\quad m\)

Atter 24 Hrs V. N/A m

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling RC - Rock Caring



			REPORT OF SOIL EXPLORATION	/			
ClientS	verdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-</u>	104	
Project A	TH/MEG-	<u>33-30.5</u>	980/0.000	Sheet1	of	2	
Project Num	ber	V-7139		Completion De	epth	4.9 п	7
				Date Star Date Finis Drilled By	hed: 5/	19/98	
Northing	132684	1.9	DRILLING AND SAMPLING INFORMATI	ON <i>Boring Method</i>	. 8.3	cm HS	Α
Easting	638556			Hammer Weig			
Elevation	252.7 n	n		Hammer Drop	7	'6 cm	
SAMPLE BLOWS NO PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	Transmer Brop	MOISTURE	ATTER	BERG PL
SS-1 2	83	-	Brown fine SANDY SILT, little organics, to	ace 0.1	20		
SS-2 3 4	2 78	1.0_	coarse sand (Topsoil). Moist. Light brown SiLTY CLAY, little fine sand, trace fine gravel, trace coarse sand. Soft medium stiff. MoistSS-2: Visual ODOT A-6b	-/ E	17		
SS-3 8 11 1			Very stiff. Damp.	1.8	18		
SS-4 16 24 2	83	2.0	Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.		13		
\$\$-5 20 37 4	94	3.0			14		
AS-6 50/13a	m o	4.0			6		

SAMPLE TYI	ŀΕ
------------	----

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Back Core
- AS Auger Sample

GROUND WATER READING

At Completion | Dry

After 24 Hrs J. N/A m

BORING METHOD

HSA - Hollow Stem Augers

SFA · Solid Flight Augus

MO - Mud Orilling

WD - Wash Drilling

RC - Rock Caring



Client Sverdrup Associates, Inc.						Boring NumberB-104					
	Proje		H/MEG-	33-30.	Sheet	2	of .	2			
		ct Numb	· -	V-7139	Completion Depth			4.9 m			
5.4	MPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		4	ONTENT	ATTERI LL	SERG PL	
				-	17 18 74		774				
				-	Bottom of Boring = 4.9 meters	4.9	1/2				
İ					·			1			
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	1										
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		j	i						i		
N/C	TES:										
///	ries:										



REPORT OF SOIL EXPLORATION

	verdrup A			Boring Numb	er <u> </u>	105			
Project A			980/0.000	Sheet1	of	2			
Project Num	ber	N-7139) 	Completion Depth6.1 m					
Northing	132604	1.2	DRILLING AND SAMPLING INFORMAT	Date Fin. Drilled B		19/98			
Easting	638631	Donning Wilder							
Elevation	261.4 n		Transition Project						
MPLE BLOWS	PÉRCENT	DEPTH		Hammer Drop	MOISTURE	ATTERBE			
NO PER 15cm S-1 4	RECOVERY	DEFIN	SOIL DESCRIPTION		CONTENT	LL			
3-1 4	67	-	Brown SANDY SILT, little clay, trace organics, trace fine gravel (Topsoil). Mois	st. 0.1	15				
S-2 4 5	100	- - -	Brown SILTY fine SAND, little coarse sand trace clay. Medium stiff to very stiff. Mo	<u>d</u>	14				
	5		-SS-2: Visual ODOT A-4a						
		1.0							
S-3 8 10	89	=			14				
10	3	-							
		-							
S-4 10	89] []					
20		2.0	Brown INDURATED CLAY/WEATHERED	2.0	1				
25	7	1	MUDSTONE. Hard soil/very soft bedrock.	[]1					
		_ F							
5-5 13	83			111	1 1				
21									
27		3.O.							
]	-			ĺ	ĺ			
	j ĺ	1		- IJ					
				[]]	ļ l				
İ		3	Gray weathered SHALE. Hard soil/very so	3.8					
		4.0	bedrock.						
5-6 40 50/8cm	40	-							
30/00/11	!!!								
TES:	·	سلمان		4.6 = =:-		i			
SAMPI	 LE TYPE		GROUND WATER READING						
SS - 5,1cm OL			AI Completion V/A *	HSA - Hallo	BORING ME	CORT			

ST - Shelby Tuhe

HC - Ruck Core

AS - Auger Sample

* Wash water used during the coring process.

MU - Mud Drilling

WD - Wash Drilling

AC - Rock Coring



Clier	ntSv	erdrup A	ssociat	es, Inc.	Boring Numbe	B-1	05	
Proje	ect _A7					of		
	ect Numb	·	V-7139		Completion D		6.1 n	7
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		CONTENT	ATTER LL	BERG PL
SAMPLE	RLOWS	PERCENT		W 700 min	hly	MOISTURE CONTENT	ATTER	BERG
]					:
· NOTES:								



WD - Wash Drilling

RC - Rock Coring

REPORT OF SOIL EXPLORATION

Client Sverdrup Associa				es, Inc.	Boring Number	r <u></u>	06
Projec		H/MEG-	33- 3 0.5	980/0.000		of	
	ct Numb	er V	V-7139		Completion D		0.6 m
, -				DRILLING AND SAMPLING INFORMATI	Date Star Date Finis Drilled By	ted: 5/2 shed: 5/2	21/98
North	ing	132439	.4		Boring Method	Geo	probe
Eastin	ng	638641	.5		Hammer Weig	ht N	<u> </u>
Eleva	tion	255.8 n	7	China 1 7 700 CO La management and a state of the Control of the C	Hammer Drop		/ A
NO NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBÉR LL
NOTES:		100		Brown fine SAND, little silt, trace coarse sand, trace clay (Topsoil). Damp. -GS-1: ODOT A-3a Brown weathered SANDSTONE. Very so bedrock. Geoprobe refusal @ 0.6 m Bottom of Boring = 0.6 meter	0.1 ::: ft 0.6	8	
ć				GROUND WATER READING At Completion → Dry M After 24 H/S → N/A m		BORING M w Stent Augets	

ST Shelby Tube RC - Rock Core

NS - Auger Sample



MD - Mud Drilling

RC Rock Coring

WD Wash Drilling

REPORT OF SOIL EXPLORATION

Clien	, Sve	rdrup A	ssociate	es, Inc.		Numbe		107	
Proje	ATI	H/MEG-3	33-30.9	80/0.000	Sheet	1	of	2	
	ct Numbe	er W	/-71 39		Compl	etion De	epth _	10.1	m
r roje	et manne.	<u></u>		THE VALUE OF THE COMMANDE IN ECODIMANT	Da Di	ate Star ate Finis rilled By	ted: 5/ :hed: 5/ : R.	22/98	
Mort	hing	132330	.2	DRILLING AND SAMPLING INFORMAT	Boring	Method	5.7	cm HS	iA_
	-	638742	.3		Hamm	er Weig	ht6	3.5 kg	
	_	274.9 m	7		Hamm	er Drop	7	'6 cm	
AMPLE NO	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTE:	RBER
SS-1	7	33	1	Brown SILTY CLAY, some organics, trace fine sand (Topsoil). Moist.	·	0.1	20		
SS-2	6 5 8 8 12	22		rine sand (Topsoli). Most. some fine sand, trace coarse sand. Stiff very stiff. Moist.	le to to		29		
SS-3	8 10 12	89	1.0_ - - - - -				30		
\$S-4	9 14 12	22	2.0			2.6	19		
\$\$-5	36 46 50/10cm	50	3.0	Variegated brown, gray, and red INDURA CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	TED	2.6			
SS-6	29 50/8cm	80	4.0_						
NOTES	S:								
	SAMP SS - 5.7cm O GS - Geoprob		···	GROUND WATER READING ALCOMPLETON V ALLA			BORING low Stem Au of Flight Auge		D

After 24 Hrs Y N/A

Cave-in depth @ 6.7 m

ST - Shelby Tube

RC Rock Care

AS - Auger Sample



			Boring Number .	<u>B-107</u>			
t AT	H/MEG-	33-30.980	/0.000	Sheet2	of .	2	
	erV	V-7139	4.4	Completion Dept	h	10.1 n	n
BLOWS	PERCENT	ДЕРТН	SOIL DESCRIPTION	мо	ISTURE	ATTERI LL	BERG PL
45 50/5cm	75	6.0					
29 50/10cm	60	8.0					
31 50/10cm	67	9.0					
41 50/10cm	60	10.0	Bottom of Boring = 10.1 meters	10.1			
	AT ATT ATT ATT ATT ATT ATT ATT ATT ATT	ATH/MEG- AT Number V BLOWS PERCENT PER 15cm PECOVERY 15 75 50/5cm 60 16 75 17 60/10cm 67	ATH/MEG-33-30.980 ATH/MEG-33-30.980 ATH/MEG-33-30.980 W-7139 BLOWS PERCENT DEPTH 5.0 5.0 75 60/50/5cm 60 7.0 80 80 80 80 80 80 80 80 80	ATH/MEG-33-30.980/0.000 AT Number	Sheet 2 Completion Depth St. Number W-7139 Completion Depth Soil Description Soil Description Signature Stat	ATH/MEG-33-30.980/0.000 Sheet 2 of Of Number W-7139 Completion Depth BLOWS PERCENT DEPTH SOIL DESCRIPTION MOST URE CONTENT SOIL DESCRIPTION MOST URE	Sheet 2 of 2 10.1 1 Str. Number W-7139 Completion Depth 10.1 1 SOLDESCRIPTION MOSTURE ATTER SOLDESCRIPT

NOTES:



MD Mud Orilling

WD Wash Drilling

RC Rock Coring

REPORT OF SOIL EXPLORATION

Sverdrup Associates, Inc.

RC - Rock Core

AS - Auger Sample

Clier	nt <u>Sv</u>	erdrup A	4ssocia:	tes, Inc.	Boring Numb	erB	-108	
Proje	ect A7	H/MEG-	<i>33-30.</i>	980/0.000	Sheet		f2	2
Proje	ect Numb	er\	N-7139	· · · · · · · · · · · · · · · · · · ·	Completion L		5.7	n
				DRILLING AND SAMPLING INFORMATE	Date Sta Date Fin Drilled B	ished: 5		
Nort	hing	132291	.0		Boring Metho	od5.	7 cm HS	5.4
East	"'y	63865C			Hammer Wei	ght	63.5 kg	
		269.2 n	n	200	Hammer Drop	,	76 cm	
SAMPLE NO	BLOWS PER 15çm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	1.01	MOISTURE	ATTE	RBERG
SS-1	5 6 7	56		Brown SILTY CLAY, little organics, trace coarse to fine sand, trace coarse to fine gravel (Topsoil). Moist.	0.1	24		
SS-2	3 3 6	44	1.0	Brown to reddish-brown SILTY CLAY, tracto to little fine sand. Stiff to very sitff. Mois	se st.	31		
SS-3	6 10 16	67	7.0			23		
SS-4	7 8 12	67	2.0			26		
	8 15 50/10cm	75	3.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	2.6			
is-6	50/3cm	100	4.0	Brown weathered SANDSTONE. Very soft bedrock.	4.1			
VOTES:					<u>i•••</u>	<u></u>	i.	
G	SAMPLE S - 5.1cm OD 3 S - Geopmbe S 7 - Shelby Tube	Split Spoon ample		GROUND WATER READING At Completion \(\frac{1}{2} \) Dry \(\frac{1}{2} \) Atter 24 lins \(\frac{1}{2} \) N/A \(\frac{1}{2} \)	HSA - Hellov SFA - Solid I MD - Mud O	light Augers		



Clier	Client Sverdrup Associates, Inc.				Boring Number B-108			
Proje	ect A7	H/MEG-	33-30.5	980/0.000	Sheet2		2	
	ect Numb		V-7139		Completion D	5.7 m		
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		CONTENT	ATTER LL	BERG PL
SS-7	50/3cm	100	5.0	Auger refusal @ 5.7 m Bottom of Boring = 5.7 meters	5.7	CONTENT		R



REPORT OF SOIL EXPLORATION

Sve	rdrun A:	ssociate	REPORT OF SOIL EXPLORATION es, Inc.	Boring Number	B-10	09
4 T				Sheet1_	of _	4
·				Completion De	oth	21.0 m
CI NUMBE		,		Date Finisi Drilled By:	hed: 5/1	9/98
	132310	.6	DRILLING AND SAMPLING INFORMATION	ON Boring Method	9.5	om HSA/RC
ning						3.5 kg
ng				Hammer Drop	78	cm
BLOWS	PERCENT		SOIL DESCRIPTION			ATTERBERG LL 1 PL
			Brown SILTY CLAY, little organics, trace	0.1		
4 5 5 4 9 26	67	-	coarse to fine sand (Topsoil). Moist. Brown SILTY CLAY, little to some fine sai	?	26	
26 26 38	44	1.0_	Variegated brown, red, and gray INDURA CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
36 50/15cm	83	2.0_				
48 50/3cm	86	3.0				
28 50/8cm	67	4.0				
	ning ning ntion BLOWS FER 15cm 4 5 4 9 26 26 26 38 36 50/15cm	ATH/MEG-3 ct Number	ATH/MEG-33-30.9 ATH/MEG-33-30.9 ATH/MEG-33-30.9 W-7139 AND 132310.6 638696.3 272.3 m BLOWS FERCENT RECOVERY RECOVERY RECOVERY FER 15cm RECOVERY DEPTM 4 5 67 9 26 1.0 26 44 26 38 36 50/15cm 83 2.0 48 50/3cm 3.0	DRILLING AND SAMPLING INFORMATION The state of the same of the sa	ATH/MEG-33-30.980/0.000 Sheet	ATH/MEG-33-30.980/0.000 Sheet

SA	MPI.	E	ΤY	PE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core AS - Auger Sample

GROUND	WATER	READING	

At Completion N/A *

After 24 H/S ___ N/A__

* Wash water used during the coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD Mud Drilling

IVD - Wash Drilling

RC - Rock Caring



D-4/-	at ATI	Ч/МЕG- 3	33-30.98	80/0.000	Sheet2	of		_
Proje	·		/-7139		Completion De	epth	21.0 m	1
Proje	ct Numb	PERCENT	DEPTH	SOIL DESCRIPTION		MOISTURE	ATTERS	ERG Pl
NO SS-7	PER 15cm	RECOVERY	5.0.		***			
	50/10cm		7.0	Brown weathered SANDSTONE. Very so	7.2 ½			
	50/5cm		6.0	bedrock.	7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7			
RC-1			10.0	Auger refusal @ 9.1 m SANDSTONE: brown to gray, soft to medium, slightly broken, medium grained cross-bedded, micaceous. -friable from 9.1 to 10.6 m -RC-1: Recovery = 98% -Core Loss = 3 cm -RQD = 15%	9,1	***		
RC-2		1	11.0					



	37			88/0.000	Boring Number	of	4	
Projec	t _A/			80/0.000	Silect		21.0 1	
	t Numb	·	N-7139	A STATE OF THE STA	Completion De			
AMPLE NO	BLOWS PER 15cm	PERCENT	DEPTH	SOR DESCRIPTION		MOISTURE CONTENT	ATTER LL	BERG
RC-3			12.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 52%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
			13.0	-RC-3: Recovery = 98% -Core Loss = 3 cm -RQD = 40%	13.6			
RC-4		:	14.0_	SHALE; dark gray, medium, highly broken, carbonaceous, fissile, silty.				
			15.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 15%				
RC-5			16.0	SILTSTONE; gray, medium, massive, sligh	15.8			
RC-6			-	-RC-5: Recovery = 99% -Core Loss = 2 cm -RQD = 52%			·	
			17.0	-RC-6: Recovery = 99% -Core Loss = 2 cm -ROD = 53%	17.7			
NOTES:			18.0	MUDSTONE; gray, soft to medium, highly broken, non-bedded. SILTSTONE; gray, medium, highly broken	18.0			



Clien	sv.	erdrup A	ssociat	es, Inc.	Boring Number		109	
Proje		H/MEG-	33-30.5	980/0.000	Sheet4		4	
_	ect Numb	erV	V-7139	And to your territory	Completion De		21.0 n	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERB	ERĞ PL
RC-7			19.0	argillaceous, micaceous. -RC-7: Recovery = 99% -Core Loss = 2 cm				
RC-8			20.0	-RQD = 0%				
			21.0	-RC-8: Recovery = 100% -No Core Loss -RQD = 0% Bottom of Boring = 21.0 meters	21.0			
					:			
NOTES		1		<u> </u>				



REPORT OF SOIL EXPLORATION

				REPORT OF SUIL EXPLORATION				
Clier	nt Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	r	-110	
Proje	ect AT	H/MEG-	33-30.	980/0.000	Sheet1	0	f3	·
Proje	ect Numb	erV	V-7139	· <u></u>	Completion D	epth _	17.1	m
					Date Star Date Finis Drilled By	hed: 5		
Nort	hina	132126	.5	DRILLING AND SAMPLING INFORMATION	ON <i>Boring Metho</i> e	. 9. ہ	5 cm HS	A/RC
	ū	638774	.5				63.5 kg	
East	"19	263.9 n			Hammer Weig Hammer Drop	··· —	76 cm	
SAMPLE NO	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	паттег Бгор	MOISTURE	ATTE	BERG PL
SS-1	3	89		Brown SILTY CLAY, trace organics, trace	fine0.1.		Ш	n.
<i>\$\$-2</i>	3 21 22 24	78	-	sand (Topsoil). Moist. Brown SILTY CLAY, some fine sand, trace coarse sand. Medium stiff. Moist. Brown SILTY fine SAND, trace coarse sand Hard. Moist.	0.5	13		
	28 50/10cm	67	1.0	Brown weathered SANDSTONE. Very sof bedrock.				
SS-4	50/10cm	100	2.0		v v v v v v v v v v			
\$\$-5	50/13cm	80	3.0	·				
SS-6	50/5cm	100	4.0		8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Gnoprobe Sample
- ST Shelby Tune
- BC Book Core
- AS Auger Sample

GROUND WATER READING

At Completion V/A*

After 24 Hrs Y N/A

Wash water used during the coring process.

BORING METHOD

- HSA Hollow Stein Augers
- SFA Solid Flight Augers
- MD Mud Drilling
- WD Wash Drilling BC Rock Coring



Clien	t Sv	erdrup A	ssociate	es, Inc.	Boring .	Numt	ber .	B-1	10	
Proje	47	H/MEG-	33-30 . 9	980/0.000	Sheet .		2	_ of	3	
_	ect Numb	erV	V-7139		Comple	tion i	Dept	h	17.1	n
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION				ISTURE NTENT	ATTER	BERĞ PL
				Auger refusal @ 4.9 m		4.9				Í
RC-1			5.0_	SANDSTONE; brown, soft, massive, slight jointed, coarse grained, micaceous, laminated.		5.5			·	
			6.0	MUDSTONE; gray, very soft to soft, highly broken, highly jointed, arenaceousRC-1: Recovery = 98% -Core Loss = 3 cm -RQD = 42%		100				
RC-2	<u>!</u> !		7.0_			8				
			7.0_	-RC-2: Recovery = 100% -No Core Loss -RQD = 29%						
RC-3			8.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, fine grained, micaceous, laminated.		7.9 %				
			9.0 _	-RC-3: Recovery = 97% -Core Loss = 5 cm -RQD = 84%						
RC-4			10.0							
RC-5			11.0	-RC-4: Recovery = 95% -Core Loss = 8 cm -RQD = 92% -calcareous from 10.7 to 12.5 m						
NOTES	3,		1			ļ:	::			



Clien	sv.	erdrup A	ssociat	es, Inc.	Boring Numbe	er <u>B-1</u>	10	
Proje	47	 H/MEG-	33-30.5	380/0.000	Sheet3	of	3	!
	ect Numb	er V	V-7139		Completion D	epth	17.1	m
SAMPLE NO	BLOWS PER 15cm	PERCENT	DEPTH	SOIL DESCRIPTION	A 0 T	MOISTURE CONTENT	ATTE!	RBERG PL
			12.0	-RC-5: Recovery = 98% -Core Loss = 3 cm -RQD = 50%	12.5			
RC-6			13.0	SANDSTONE; brown, moderately hard, highly broken, highly jointed, coarse grain calcareous, micaceous, slightly argillaceo	ned,			
RC-7			14.0	-RC-6: Recovery = 100% -No Core Loss -RQD = 0% -friable from 14.0 to 17.1 m				
AC-7			15.0	-RC-7: Recovery = 98% -Core Loss = 3 cm -RQD = 19% -gray, soft to moderately hard sandston from 14.9 to 15.2 m	ne			
RC-8			16.0					
			17.0_	-RC-8: Recovery = 98% -Core Loss = 3 cm -RQD = 0% Bottom of Boring = 17.1 meters	17.1			
				-				
NOTES		<u> </u>	J	j		اــــــا		



SFA - Solid Flight Augers

MD - Mud Drilling

RC Rock Coring

WD - Wash Drilling

REPORT OF SOIL EXPLORATION

Project ATH/MEG-33-30.980/0.000 Sheet 1 of 2	Client	Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	erB-	111	
Date Started: 4/22/98 Date Finished: 4/22/			H/MEG-	33-30.	200/0.000				
Date Started: 4/22/98 Date Finished: 4/22/			er N	/-7139					m
Northing	, , , , , ,	. ,,,,,,,,,	<u> </u>			Date Stat Date Fini Drilled By	rted: 4, shed: 4,	/22/98 /22/98	
Easting	Northii	na	131988.	.5	DRILLING AND SAMPLING INFORMATI	ON Boring Metho	d5.7	cm HS	Α
Elevation 267.8 m			638833.	2					
SS-4 27 50/8cm 275 50/8cm 585-6 35 50/5cm 585-6 585-6 58	-	•	267.8 m	,				76 cm	
SS-1 5 7 8 8 44 21 21	SAMPLE	BLOWS		ОЕРТН	SOIL DESCRIPTION	<u></u>	MOISTURE		
SS-2 10		En racin			Brown SILTY CLAY, little organics, trace	fine0.1	4		
SS-2 10 44 14 21 21 21 3 3.0 25 35-5 29 50/8cm 67 3.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2				_		/ []			
SS-3 25 75 Brown weathered SANDSTONE. Very soft bedrock. 11 SS-4 27 67 2.0 SS-5 29 67 3.0 SS-6 35 50/5cm 67 4.0	SS-2 10	_	44	=	coarse sand, trace fine gravel. Stiff to ha	ace + rd	18		
5S-3 25 75 Brown weathered SANDSTONE. Very soft bedrack. 11 SS-4 27 67 2.0 11 SS-5 29 67 3.0 9 5S-6 35 50/5cm 67 3.0 9				-		[+			
5S-3 25 50/5cm 75 Brown weathered SANDSTONE. Very soft bedrock. 11 1 11 11 11 11 11 11 11 11 11 11 11		21	{	10	-53-2: ODOT A-46	+			
50/5cm bedrock. 11 5S-4 27 67 2.0 9 5S-5 29 67 3.0 9 5S-6 35 50/5cm 67 4.0	SS-3 2	5	75		Brown weathered SANDSTONE. Very son		11		
50/8cm 2.0				-		` <u>;</u>			
50/8cm 2.0 9 5S-5 29 67 3.0 3.0 3.0 3.0 555-6 35 67 50/5cm 67				-					
50/8cm 2.0 9 5S-5 29 67 3.0 3.0 3.0 3.0 555-6 35 67 50/5cm 67						[<u>:</u> 2:	1		
SS-5 29 67 50/8cm 3.0 3.0 3.0 55-6 35 67 50/5cm 67			67	2.0		22	11		
50/8cm 3.0 _		U/8CM				[27]			
50/8cm 3.0 _				-		!			
50/8cm 3.0 _				-		7.5			
3.0			67	-		133	9		
5S-6 35 67 50/5cm 67		U/8¢m		3.0		[7.] . • • •			
5S-6 35 67 50/5cm 67				-					
5S-6 35 67 50/5cm 67									
5S-6 35 67 50/5cm 67				-			ij		
5S-6 35 67 50/5cm 67						111			
5S-6 35 67 50/5cm 67				40		123	:]		
50/5cm	55-6 3	5	67						
VOTES:			"	-				•	
NOTES:				_			<u> </u>	!	i.
	NOTES:								
	L								
SAMPLE TYPE GROUND WATER READING BORING METHOD SS - 5. tom OD Split Spoon At Completion DLY m HSA - Hollow Stem Augers	ce					UCA LIVE			

After 24 Hrs Y N/A m

GS - Geoprobe Sample

ST - Shelby Tube RC - Rock Core

AS - Auger Sample



SOIL DESCRIPTION	Boring Number Sheet 2 Completion Depth MOISTUCCONTEST 22 23 24 24 24 24 24 24 24 24	of2 10.1	TRBERG F
SOIL DESCAIPTION	MOISTU	RE ATTE	RBERG
SOIL DESCRIPTION	MOISTU CONTE	RE ATTE	
	× • •		
iray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock	8.7		
Bottom of Boring = 9.8 meters	9.8		
1	UDSTONE. Hard soil/very soft bedroci	UDSTONE. Hard soil/very soft bedrock.	UDSTONE. Hard soil/very soft bedrock.



WD - Wash Drilling

RC - Rock Coring

B-112

REPORT OF SOIL EXPLORATION

Sverdrup Associates, Inc.

RC - Hock Core

AS - Auger Sample

Client\$	verdrup A	Associa:	tes, Inc.	Boring Numbe	er <u>B-1</u>	12
ProjectA	TH/MEG-	33-30.	980/0.000	Sheet 1		
Project Num	ber	V-7139		Completion D	epth	1.2 m
	12102		DRILLING AND SAMPLING INFORMATION		shed: 6/2 : S.E	2/98 3.
Northing	131832		arvenenta area area area esta esta esta esta esta esta esta es	Boring Methor	·	orobe
Easting	638899		10-10-00/46	Hammer Weig		
Elevation _	232.7 n	n	Parameter State Control of the Contr	Hammer Drop		-
SAMPLE BLOWS NO PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
GS-1	100	-	Light brown weathered SANDSTONE. Ver soft bedrock.			
GS-2	100	1.0	Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. Geoprobe refusal @ 1.2 m Bottom of Boring = 1.2 meters	1.2	14	
VOTES:					į	
			GROUND WATER READING At Completion Dry m Atter 24 his N/A m	HSA - Hollas	BORING ME v Stem Augers Flight Augers	THOD



SFA Solid Flight Augers

MD Mud Drilling

WD - Wash Drilling

HC - Rock Caring

B-113

REPORT OF SOIL EXPLORATION

Sverdrup Associates, Inc.

GS - Geoprobe Sample

ST - Shalby Tube

AS - Auger Sample

RC - Rock Core

Clien	t Svi	erdrup A	ssociat	es, Inc.	Boring Numbe	_r	113	
Projec	ct AT	H/MEG-	33-30.	980/0.000	Sheet1			
Projec	ct Numb	erv	V-7139	.	Completion De	epth	1.8 r	n
					Date Star Date Finis Drilled By	hed: 6/.	2/98	
North	ning	131665	.2	DRILLING AND SAMPLING INFORMAT	ION Boring Method	, Geo	probe	
	•	638916	.3		Hammer Weig		/A	
	-	231.5 n	7	TOWN AREA ALL	Hammer Drop		/A	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	11-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12	MOISTURE	ATTE	RBERG PL
GS-1		100		Reddish-brown weathered SANDSTONE. Very soft bedrock.	0.7		:	,,,
GS-2		100	1.0	Brown SILTY CLAY, some coarse to fine sand. Moist.	110-140-1	17		
GS-3		100		Dark brown to black CLAYEY SILT, some sand, little coarse sand. Moist. Geoprobe refusal @ 1.8 m Bottom of Boring = 1.8 meters	1.6 fine 1.8	51		
s	SAMPL S - 5. 1cm OD	ETYPE Spik Spoon		GROUND WATER READING At Completion — Dry		BORING M		

After 24 Hrs V/A m



REPORT OF SOIL EXPLORATION

Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring N	lumbe	rB-1	14	
Proje	ct A7	H/MEG-	33-30.5	980/0.000	Sheet _		of	1	
	ect Numb	erV	V-7139		Complet	ion De	epth	1.6 n	7
•					Date Date Drill	e Star	ted: 6/2 shed: 6/2	2/98 2/98	
Mort	hing	131684	.8	DRILLING AND SAMPLING INFORMAT	ION <i>Boring N</i>	Nethod	, Geo	probe	
	•	638962	.3		Hammer			VA	,,,
	_	214.4 n	7		Hammer			//A	
SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION	T I G T T T T T T T T T T T T T T T T T	2,00	MOISTURE	ATTER	
6S-1	PER 18cm	RECOVERY 100		Reddish-brown SILTY CLAY, little coarse	to		CONTENT 27		PL
GS-2		100	-	fine sand. Moist. Brownish-gray INDURATED).6	10		
			1.0	CLAY/WEATHERED MUDSTONE. Hard		-			
GS-3		100	3	Dark brown to black CLAYEY SILT, some sand, little coarse sand. Moist. Geoprobe refusal @ 1.6 m Bottom of Boring = 1.6 meters		.5	22		
NOTES	·			f		1	IL		

SAMPLE TYPE

SS - 5.1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

AC - Rock Core

AS - Auger Sample

GROUND WATER READING

At Completion V Dry m

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling WD - Wash Drilling

RC Rock Coring



REPORT OF SOIL EXPLORATION

Clier	nt Sv	erdrup A	\ssociat	es, Inc.	Boring Numbe	_r	11:4A
Proje	ect AT	H/MEG-	33-30.5	980/0.000	Sheet1		
-	ect Numb	erV	V-7139		Completion De	epth	12.2 m
•		131732		DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By DN	ted: 5/ shed: 5/ : M	28/98
	my	639023			Boring Method	' —	3.5 kg
	y	258.4 n		THE PROPERTY OF THE PROPERTY O	Hammer Weig	··· —_	6 cm
Eleva	ation	PERCENT			Hammer Drop	Martin of Carrier (Co.)	
NO	PER 15cm	RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
SS-1	2 5 5	56 67	1. 5. 4. 1. 1.	Brown fine SAND and SILT, little organics, trace coarse sand (Topsoll). Moist. Brown SILTY CLAY, some fine sand, little coarse sand, trace fine gravel. Stiff to hard		23	
33-2	5 8	67	1.0	Moist.	7	20	
SS-3	10 15 19	61	1.1.2.2.1.1		1.8	14	
SS-4	37 50/5cm	63	2.0	Brown and gray weathered SANDSTONE. Very soft bedrock.	7.3		
	50/13cm	40	3.0		3.0		
RC-1			- - - - - - -	SANDSTONE; brown and gray, soft to moderately hard, slightly broken, slightly jointed, coarse to fine grained, slightly weathered.			
			4.0				
NOTES:		E TYPE		GROUND WATER READING	···	BORING N	4ETHOD

GS - Geaprobe Sample

ST Shelby Tube

RC - Rock Core AS - Auger Sample * Wash water used during the coring process.

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD Wash Drilling RC - Rock Coring



Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring N	lumbe	er <u>B-1</u>	14A	
Proje	ct A7	H/MEG-	33-30.	980/0.000	Sheet _	2	of	3	}
Proje	ct Numb	erv	V-7139	7807-45-41	Complet	ion D	epth	12.2	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTE:	RBERG PL
			5.0	-RC-1: Recovery = 88% -Core Loss = 37 cm -RQD = 25%					
RC-2			6.0	SANDSTONE; brown and gray, moderately	6.	1			
			7.0_	hard, slightly broken, slightly jointed, micaceous, laminated, cross-bedded.				ļ	
			8.0	-RC-2: Recovery = 73% -Core Loss = 66 cm -RQD = 46%	8.				
RC-3			9.0	MUDSTONE; gray, very soft, highly broker highly jointed. SANDSTONE; gray, medium, massive, slightly jointed. coarse grained. -RC-3: Recovery = 64% -Care Loss = 22 cm		5 %			
RC-4 RC-5				-RQD = 25% LIMESTONE; gray, moderately hard to hard highly broken, highly jointed, fine crystallin -RC-4: Recovery = 83% -Core Loss = 5 cm -RQD = 0%	/, ¢. 9.				
			11.0	gray, soft mudstone lens from 9.9-10.1 SHALE (55%); gray, soft to medium, slight broken, slightly jointed, arenaceous, micaceous, with interbedded SANDSTONE (45%); gray, medium, slightly broken, slightly jointed, micaceous, cross-bedded	tly				
NOTES			<u> </u>						



Proje	ct _A7	H/MEG-	<i>33-30.9</i>	80/0.000	Sheet3 or	_f 3
	ect Numb	ner V	V-7139		Completion Depth _	12.2 m
MPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	<i>DEPTH</i>	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG
			12.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 36% Bottom of Boring = 12.2 meters	12.2	
				bottom of boning = 12.2 meters		
i						



WD Wash Drilling

RC Rock Coring

REPORT OF SOIL EXPLORATION

Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-1</u>	15	
Proje	ct A	TH/MEG-	33-30.5	980/0.000		of		
Proje	ct Numi	berV	V-7139	··	Completion De	epth	3.0 n	יי
					Date Star Date Finis Drilled By	hed: 5/2	27/98	
Norti	hing	131546	.8	DRILLING AND SAMPLING INFORMATION	ON <i>Boring Method</i>	g Geo	probe	
Easti	-	639021	.0		Hammer Weig			
Eleva	ation	248.1 n	2	1740 V. data	Hammer Drop		/A	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	BERG PL
GS-1	endelle die Proposition Producti di	100	-	Dark brown SILTY CLAY, some fine to cos sand, trace fine gravel (Topsoil). Moist.	0.5	26		
GS-2		100	1.0_	Brown SILTY CLAY, little fine gravel, little coarse to fine sand. Moist. -GS-2: Visual ODOT A-6a	1.8	26		
GS-3		100	2.0 _ 	Reddish-brown CLAYEY SILT, some fine to coarse sand, trace fine gravel. Damp.	3.0	19		
NOTES:				Bottom of Boring = 3.0 meters				
				GROUND WATER READING At Completion: Dry M Atter 24 Hrs. N/A	HSA - Hollow	BORING M v Stein Augers		

RC - Hock Core

AS - Auger Sample



REPORT OF SOIL EXPLORATION

Date Started: 5/20/98 Date Finished: 5/20/	Clier	nt Sv	erdrup A	ssociat	es, Inc.	Boring Numbe	er <u>B-1</u>	116
Date Started: 5/20/98 Date Finished: 5/20/98 Drilled By: M.F.	Proje	ect A7	H/MEG-	33-30.s	980/0.000	Sheet1	of	5
Date Finished: 5/20/98 Drilled By: M.F.	Proje	ect Numb	oerV	V-7139		Completion D	epth	30.2 m
Easting			131450	. 6	DRILLING AND SAMPLING INFORMAT	Date Finis Drilled By ION	shed: 5/. .: M.	20/98 F.
SS-4 12 21 38 38-6 13 100 213 33 3 3 3 3 3 3 3 3		_				-	·	
SS-4 12 21 38 SS-5 21 49 49 3.0 SS-6 13 100 3.3 21 33 33 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.3 3.0 SS-6 13 3.0 SS-6		"'Ig				-	///	
NO PER 15cm RECOVERY DEFM SUIL DESCRIPTION CONTENT LL			4-10-1-1-1-1-1		The second secon	Hammer Drop	gr. 9 gr.	and the state of t
A			RECOVERY	DEPTH	SOIL DESCRIPTION		CONTENT	ATTERBERG LL P
SS-3 12 94 100	SS-1	4	`	 	coarse sand, trace fine gravel (Topsoil).	little 0.1	18	
SS-3 12 94	SS-2	5		10	coarse sand, trace fine gravel. Medium s	atiff //	15	
SS-5 21 100 3.0 3.0 3.0 3.0 3.3 3.3 3.3 3.3 3.3 3	\$S-3	19		7.0	CLAY/WEATHERED MUDSTONE. Hard	43 43 43	12	
3.0 = 42 49 3.0 = 4.0 =	SS-4	21		2.0			11	
SS-6 13 100 21 33	SS-5	42		3.0 <u>-</u>			10	
SS-6 13 100 21 33				40		\$2.5 \$4.5 		
NOTES:		21		4,0				
	NOTES	7						

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

At Completion \(\frac{\frac}{\frac{\fint}}}}{\frac{\fin}}}}{\firac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fir}}}}{\firac{\frac{\frac{\frac{\firi}}{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fraccc}\frac{\frac{\frac{\fr

After 24 Hrs Y N/A

* Wash water used during the coring process.

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD Wash Dritting RC - Rock Caring



Cliei	nt Sve	erdrup A	ssociate	s, Inc.	Bor	ing Number	B-1	16	
Proje	ect AT	H/MEG-	33-30.98	20/0.000		et2		5	<u> </u>
	ect Numb		V-7139	u	Сог	mpletion De	pth	30.2	<u>m</u>
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESC	RIPTION	[MOISTURE CONTENT	ATTE!	RBERG PL
SS-7	48	75	5.0_						
33-7	50/8cm	79	7.0						
SS-8	35 50/10cm	67	8.0						
<i>SS-9</i>	50/13cm	80	9.0						
SS-10	50/10cm	75	11.0						
NOTES:				<u></u>					



Clier	nt Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	er <u>B</u> -1	16	
Proje		H/MEG-	33-30.9	980/0.000	Sheet3	of	5	
	ect Numb	er V	V-7139		Completion D	 	30.2 1	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MQIŞTURE CONTENT	ATTER	BERG PL
SS-11 RC-1	50/13cm	100	12.0	MUDSTONE; red to gray, soft, highly brok highly jointed, calcareous, non-bedded, silt				
	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		13.0_	-RC-1: Recovery = 25% -Core Loss = 114 cm -RQD = 0%				
RC-2			14.0					
RC-3			15.0	-RC-2: Recovery = 25% -Core Loss = 84 cm -RQD = 0% -micaceous from 15.2 to 16.5 m				
			16.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 47%	16.5			
RC-4			17.0	SILTSTONE; gray, medium, massive, micaceous, argillaceous. SANDSTONE; gray, medium, massive, ver fine to medium grained, micaceous, cross-bedded, micaceous, silty.	16.8 – - Y			
	 - - -		18.0					
NOTES	:							



Clier	ntSv	erdrup A	ssociat	es, Inc.	Boring Numbe	B-1	116	51701 (CTS
Proje	ct A7	H/MEG-	33-30.	980/0.000	Sheet4	of	5	
Proje	ect Numb	perV	V-7139		Completion D	epth	30.2	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RBERG PL
			19.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 69%				
RC-5			20.0					
			21.0_	-RC-5: Recovery = 98% -Core Loss = 6 cm -RQD = 61% -qr (@ 21.2 m) = 24.29 MPa	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
			22.0	CLAY-SHALE; gray, very soft to soft, high broken, fissile. SHALE; gray, medium, slightly broken, micaceous, arenaceous, fissile, with limestone nodules.	21.9 ly 22.2			·
RC-6			23.0	-RC-6: Recovery = 90% -Core Loss = 31 cm -RQD = 32%				
			24.0	SILTSTONE; gray, medium to moderately hard, slightly broken, micaccous, argillaceous, cross-bedded, rare slickenside MUDSTONE; red and gray, very soft to	24.1 ====================================			
NOTES:			25.0	medium, highly broken, highly jointed, non-bedded, silty, rare slickensides, with	st.			



Clien	t	erarup A	SSUCIO	es, mc.	Boring Nur	nbei	B-1	116
Proje	ct AT	H/MEG-	33-30.	980/0.000	Sheet	5	of	5
Proje	ct Numb	erV	V-7139		Completion	n De	pth	30.2 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION			MOISTURE CONTENT	ATTERBERG
				limestone nodules.				
RC-7			27.0	-RC-7: Recovery = 30% -Core Loss = 106 cm -RQD = 0%				
RC-8			28.0		28.3			
			29.0	SHALE; gray, medium to moderately hard, massive, slightly jointed, silty, micaceous, slightly weatheredqr (@ 28.5 m) = 65.90 MPa -RC-8: Recovery = 90%				
			30.0	-Core Loss = 27 cm -RQD = 48% Bottom of Boring = 30.2 meters	30.2			
NOTES:								



REPORT OF SOIL EXPLORATION

Client	Sv	erdrup A	ssocia	tes, Inc.	Boring	Numbe	r <u>B-1</u>	1/	
Projec	t _A7	H/MEG-	33-30.	980/0.000	Sheet	1	of		
Projec	t Numb	erV	V-7139	,	Compl	etion D	epth	3.0 n	7
Northi		131296	1.3	DRILLING AND SAMPLING INFORMATI	Di Di ON			7/98	
Easting	g	639126	.6	4 · · · · · · · · · · · · · · · · · · ·	Hamm	er Weig	ht N	'A	
Elevati	ion	252.7 n	7		Hamm	er Drop	N	'A	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE	ATTER LL	BERG PI
GS-1 GS-2	IN PRINCE	100 100	-	Dark brown CLAYEY SILT, some fine to coarse sand, trace organics (Topsoil). Mo Brown to red CLAYEY SILT, trace fine gratrace coarse to fine sand. Moist.		0.1	25 19		
			1.0	-sandy shale seam from 0.8 to 0.9 m					
GS-3		100	2.0	-GS-3: Visual ODOT A-6a			19		
GS-4		100	2.0_			2.3	19		
GS-5		100	- - -	Brown weathered SANDSTONE. Very soil bedrock.	ft	2.3	16		
			3.0	Geoprobe refusal @ 3.0 m		3.0			
				Bottom of Boring = 3.0 meters					
NOTES:		<u></u>	<u></u>	<u> </u>					

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

GROUND WATER READING

At Completion Dry m

After 24 Hrs V/A m

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling WD Wash Drilling BC Bock Coring



SEA Solid Flight Augers

MO - Mud Drilling

RC - Rock Caring

WD - Wash Drilling

B-118

REPORT OF SOIL EXPLORATION

Sverdrup Associates, Inc.

GS - Geopratie Sample

ST - Shelby Tube

AS - Auger Sample

RC Rock Core

Client3	VCIOIOP F	13300101	es, Inc.	Boring Number	r <u> </u>		
ProjectA	TH/MEG-	33-30.9	380/0.000	Sheet1	of	1	
Project Nun	nberV	V-7139		Completion De	epth	1.8 n	7
,			DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	hed: 5/2	27/98	
Northing	131187	7.9	——————————————————————————————————————	Boring Method	g Geo	probe	
Easting	639173	7.6		Hammer Weig	ht N	/A	
Elevation _	226.8 n	n .		Hammer Drop	N,	/A	
SAMPLE BLOWS NO PER 15cr		DEPTH	SOIL DESCRIPTION	•	MOISTURE CONTENT	ATTER	BERG
GS-1 GS-2	100 100	-	Brown CLAYEY SILT, some fine to coarse sand, trace fine gravel, trace organics (Topsoil). Moist.	0.1	24 22		
		-	Brown fine to coarse SANDY CLAY, some silt, trace fine gravel. Moist.				
		1.0					
		-	Geoprobe refusal @ 1.8 m	1.8			
		-	Bottom of Boring = 1.8 meters				
ļ							
	ļ						
				1			
ļ				į.			
NOTES:					······································	. '	
CAN	PLE TYPE		GROUND WATER READING		BORING M	ETHOD	

Atter 24 Hrs V. N/A



WO - Wash Drilling

RC - Rock Coring

REPORT OF SOIL EXPLORATION

Clien	sve	rdrup A	ssociate	es, Inc.	Boring Numbe		41.00	
Proje	ct ATE	H/MEG-	33-30.9	980/0.000	Sheet1_	of	3	
Projec	ct Numbe	erV	V-7139	a distance	Completion De	epth	15.2	<u>m</u>
•				DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	hed: 5/2	27/98	
North	ning	131006	.5	DRILLING AND SAMI LING INTOKMATI	Boring Method	8.3	cm HS	A/R
Eastii		639207	.2		Hammer Weig	ht6	3.5 kg	
	-	261.7 n	n		Hammer Drop	7	6 cm	
SAMPLE	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTE!	RBEKG PL
SS-1	PER 15cm	28		Brown SILT and fine SAND, little organics	,0.1			
	3		1	trace coarse sand (Topsoil). Moist.	<i></i> / ⊞	29		
SS-2	3 2 3	39	-	Brown to reddish-brown CLAY, some silt, little fine sand, trace coarse sand. Medius stiff. Moist.	n	31		
	4		1.0		\Box			
<i>SS-3</i>	7 13 16	78	7.0_	Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Very st to hard soil/very soft bedrock.	iff			
SS-4	11 12 15	56	2.0			Ì		
			-		4			
SS- 5	8	67						
	14 19		3.0			!		
			4.0					
	26 46	100	=	-becomes tan and more sandy and silty @ 4.2 m	18			
NOTES:	50/13cm	J	i	i	1 i.!	1		<u> </u>
	SAMPI SS - 5.1cm OL	.F. TYPE Split Spoor		GROUND WATER READING At Completion WA*		BORING Now Stem Auger	ırs	

* Wash water used during the coring process.

S1 - Shelby Tube RC - Rock Care

AS Auger Sample



Clier	t Sve	erdrup A	ssociat	es, Inc.	Boring Number	. <u>B-1</u>	19	
Proje	ect AT	H/MEG-	33-30.5	980/0.000	Sheet2	of		
Proje	ect Numb	erV	V-7139	A A M I	Completion De		15.2 m	
ŞAMPLÊ NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERB	ERG PL
·	4.100		5.0_					
<i>\$\$</i> -7	50/10cm	25	6.0	Brown weathered SANDSTONE. Very soft bedrock.	1:21			
RC-1			-	SANDSTONE; gray, moderately hard, massive, slightly jointed, coarse grained, micaceous, laminated, slightly calcareous.	6.1			
			7.0					
			8.0 _ - -	-RC-1: Recovery = 98% -Core Loss = 6 cm -RQD = 55%				
RC-2			9.0					
			10.0	-RC-2: Recovery = 92% -Care Loss = 12 cm -RQD = 9% SHALE; gray, soft to medium, highly broke highly jointed, fissile.	9.9	1		
RC∙3			11.0	MUDSTONE; gray, very soft to soft, highly broken, highly jointed.	11.0			
NOTES	į.							



Clien	, Sv	erdrup A	ssociat	es, Inc.	Boring Number	. <u>B-1</u>	119	
Proje				980/0.000	Sheet3		<i>3</i>	
-	ect Numb		V-7139		Completion De	pth	15.2 m	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBE LL	RG PL
RC-4			12.0	SHALE; gray, soft to medium, slightly broken, slightly jointed, micaceous, laminated. -RC-3: Recovery = 87% -Care Loss = 20 cm -RQD = 38% -highly jointed from 12.2 to 14.6 m				
			13.0					
			14.0	-RC-4: Recovery = 95% -Core Loss = 14 cm -RQD = 18%				
RC-5			15.0	MUDSTONE; variegated red and gray, sof highly broken, highly jointed, slightly weathered. -RC-5: Recovery = 0% -Core Loss = 30 cm	14.6			
				Bottom of Boring = 15.2 meters	/			
NOTES	S:					<u> </u>		



REPORT OF SOIL EXPLORATION

Clien	t Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	erB-1	20	
Proie	ect AT	H/MEG-	33-30.5	980/0.000	Sheet1	of	5	
	ct Numb				Completion D	epth	28.0 /	n
Nort	hing	130911	.8	DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By ON Boring Method	ted: 5/2 shed: 5/2 : M.	22/98 F. cm HS	A/RC
East	"'y	639291			Hammer Weig		3.5 kg	
	30001	271.7 n	7		Hammer Drop	MOISTURE	6 cm	
SAMPLE NO	,	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		CONTENT	ATTER LL	
SS-1	3 6 6	61	-	Brown SILT and fine SAND, some clay, lit organics, trace coarse sand (Tospoil). Brown SANDY SILT, little to some clay.	tle	19		
SS-2		67	-	Stiff. Moist.	0.9	16	:	
SS-3	7 15 17	78	1.0	Brown SILTY CLAY, trace fine sand. Hard Damp.		13		
SS-4	8 12 15	44	2.0	Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	1.8			
SS-5	9 12 18	67	3.0					
	25 50/13cm	62	4.0					
								_

SAMPLE TYPE

- SS 6.1cm OD Split Spoon
- G5 Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

GROUND WATER READING At Completion W/A*

Allei 24 His VA

* Wash water used during the coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling RC - Rock Coring



Client	Sverdrup A	ssociate	s, Inc.	Boring Number	B-120	
	ATH/MEG-	33-30.9	80/0.000	Sheet2		5
Project Nu	mber V	V-7139		Completion Depth	28.0) m
SAMPLE BLOW NO PER 15	S PERCENT	DEPTH	SOIL DESCRIPTION	MOISTU	RE ATT	TERBERG PL
100		5.0_				
SS-7 27 50/10	100 cm	6.0				
SS-8 50/13	9cm 60	7.0				
SS-9 50/13	em 60	9.0	-brown and purple from 8.7 to 9.2 m			
SS-10 45 50/80	67	10.0	-red and gray from 10.2 to 13.7 m			
NOTES:		=				



Proje			V-7139		Sheet3		of	28.0	5 80 m	
SAMPLE BLOWS PERCENT			DEPTH	SOIL DESCRIPTION	Completion	A	40ISTURE	ATTERBERG		
NO S-11	PER 15cm	100					CONTENT	LL	P.L.	
			13.0							
C-1			14.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, fine to medium grained, micaceous, calcareous.	13.7					
			15.0	SILTSTONE; gray, soft, slightly broken, slightly jointed, fissile. MUDSTONE; gray, very soft to soft, highly broken, highly jointed.	14.6 / 15.2					
				SILTSTONE; gray, soft, slightly broken, slightly jointed, fissileRC-1: Recovery - 97% -Core Loss = 9 cm -ROD = 45% SANDSTONE; gray, moderately hard, massive, slightly jointed, fine to coarse grained, micaceous, calcareous.						
C-2			17.0_							
	:		18.0							



Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring Number		<u>B-120</u>		
Proje	ect _AT	H/MEG-	33-30.9	Sheet 4	of	5			
Proje	ect Numb	erV	V-7139		Completion Depth		28.0 m		
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RERG PL	
RC-3			19.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 82% SILTSTONE; dark gray, soft to moderately hard, highly broken, highly jointed,	19.6				
			21.0	micaceous, fissile, slickensided. SILSTONE; gray, moderately hard to hard, massive, slightly jointed, arenaceous, micaceous, slightly calcareous. -RC-3: Recovery = 98% -Core Loss = 6 cm -RQD = 47%	20.4				
RC-4			23.0	-laminated from 22.9 to 24.1 m -RC-4: Recovery = 65% -Core Loss = 53 cm -RQD = 46%			:		
RC-5			24.0	-gray, hard sandstone lens from 23.9 to 24.1 m MUDSTONE: variegated dark gray, gray, a red, very soft to soft, highly broken, highly jointed, calcareous, arenaceous, slickensid	/		:		
NOTES:									



Clien	, Sv	erdrup A	ssociate	es, Inc.	Boring Numb	per	20
Proje		H/MEG-	33-30.9	380/0.000	Sheet	5 of	5
	ct Numb	er V	V-7139		Completion .	Depth	28.0 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION	-	MOISTURE CONTENT	ATTERBERG LL PL
RC-6			26.0	-RC-5: Recovery = 80% -Core Loss = 30 cm -RQD = 16% SILTSTONE; gray, hard, slightly broken, slightly jointed, arenaceous, micaceous, calcareous from 25.9 to 28.0 m	25.6		
			27.0_	-RC-6: Recovery = 100% -No Core Loss -RQD = 45%			
			28.0	Bottom of Baring = 28.0 meters	28.0		
:	:						
:			-				
NOTES					: :		



SFA Solid Flight Augers

MD Mud Drilling

WD Wash Dillling

RC Rock Coring

REPORT OF SOIL EXPLORATION

ClientS	verdrup A	Associa	tes, Inc.	Boring Num	ber E	3-1 <i>21</i>
Project	TH/MEG	33-30.	980/0.000	Sheet		
Project Nun	nberl	N-7139	·	Completion		
			DDILLING AND SAMPLING INFORMATION	Date St Date Fil Drilled L	arted: 5 nished: 5	5/27/98
Northing	130764	.5	DRILLING AND SAMPLING INFORMATI	ON <i>Boring Meth</i>	nd Ge	eoprobe
Easting	639353	3.6		Hammer We		N/A
Elevation _	242.9 n	n		Hammer Dro	•	N/A
SAMPLE BLOWS NO PER 15cm	PERCENT	DEPTH	SOIL DESCRIPTION		MOISTUR	
GS-2	100	1.0_	Reddish-brown CLAY, some silt, little coat to fine sand. Moist. Light brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. Geoprobe refusal @ 1.7 m Bottom of Boring = 1.7 meters	1.2	9	LL A
NOTES: SAMP SS - 5 1 cm O. GS - Generalis			GROUND WATER READING As Completion — Dry		BORING N	

Afrei 24 His Y N/A

GS - Geoprobe Sample

ST - Shelby Tube

AS - Auger Sample

RC Hock Cure

RESOURC E

281 Enterprise Drive Westerville, Ohio 43081 Telephone: (614) 885-1959 Fax Number: (614) 885-3341

CONSOLIDATION TEST

ASTM D 2435

PROJECT	Ath/Megs	-33-33.98	30/0.000
LOCATION			
JOB No.	W-7139		BORING N. B-81
SAMPLE No.		ST-3	
SAMPLE DE	EPTH	3.5-5.5' (sample @ 4')	
SOIL DESC	RIPTION	Brn, SiCi	, sm c-f sa, tr. f. gr.
DATE OF TESTING		5/12/98	
TESTED BY	,	Straub/H	ostetter

CONSOLIDOMETER TYPE	Fixed Ring	RING No. 3	
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA: <u>31.67</u> cm ²	HEIGHT: 22.3 mm
NITIAL HT. OF SOIL, Hi:	22.3 mm		
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT		WATER CONTENT DETERMIN	ATION
BEGINNING OF TEST:	180.98_g		
M. OF RING:	64.11_g	M. OF CAN + WET SOIL:	204.86 g
M, OF WET SOIL, Mt:	116.87_g	M. OF CAN + DRY SOIL:	168.12 g
COMPUTED DRY WEIGHT		M. OF CAN:	28.37 g
OF SOIL, M's:	9	M. OF WATER:	36.74 g
OVEN DRY M. OF SOIL, Ms:(a)	94.33_g	M, OF DRY SOIL:	139.75 g
COMPUTED HT. OF SOLIDS, Hs:(b)	1.327 cm	INITIAL WATER CONTENT:	26.29%
INITIAL HT. OF VOIDS, Hv:	0.903_cm		
INITIAL VOID RATIO, ei:	0.681		
FINAL TEST DATA		FINAL WATER CONTENT DET	ERMINATION
(Obtained at end of load testing)			
INITIAL DIAI, READING:	0.0596 in	FINAL WET M. + RING:(c)	177.25 g
FINAL DIAL READING:	0.1821_in	FINAL DRY M. + RING:	158.44 g
EQUIP. DEF. @ FINAL LOAD:	7.00E-04_in	OVEN DRY M, OF SOIL, Ms:	94.33 g
CHANGE IN SAMPLE HT.:	0.309372 cm	FINAL M. OF WATER:	18.81 g
FINAL HT. OF VOIDS, H _{VF} .	0.594 cm	FINAL WATER CONTENT, wf:	19.94%
FINAL VOID RATIO, ef:	0.448	FINAL DEGREE OF SAT. S:	100% (assumed)

- (b) Use either Gs of final water-content data for S-100%
- (c) Be sure to include any soil extruded from ring which is in consolidometer

RESOURC E

281 Enterprise Drive Westerville, Ohio 43081 Telephone: (614) 885-1959 Fax Number: (614) 885-3341

CONSOLIDATION TEST RESULTS ASTM D 2435

PROJECT LOCATION Ath/Megs-33-33.980/0.000

JOB No.

W-7139 BORING B-81

SAMPLE No.

ST-3

SAMPLE DEPTH SOIL DESCRIPTION

3.5-5.5' (sample @ 4')

DATE OF TESTING

Brn, SiCl, sm c-f sa, tr. f. gr. 5/12/98

TESTED BY

Straub/Hostetter

 INITIAL SAMPLE VOL., VI
 70.622 cm³

 SPECIFIC GRAVITY, Gs
 2.67

 INITIAL HT. OF VOIDS, Hv
 0.9033 cm

DRY WT. OF SOIL SOLIDS, Ms

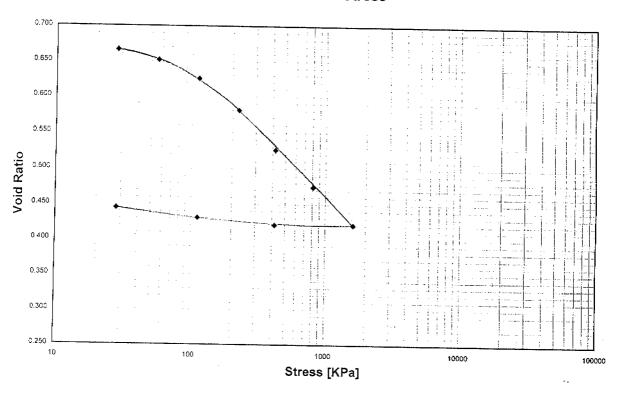
94.33 g

HT. OF SOLIDS, Hs INITIAL VOID RATIO, ei 1,3267 cm 0.6809

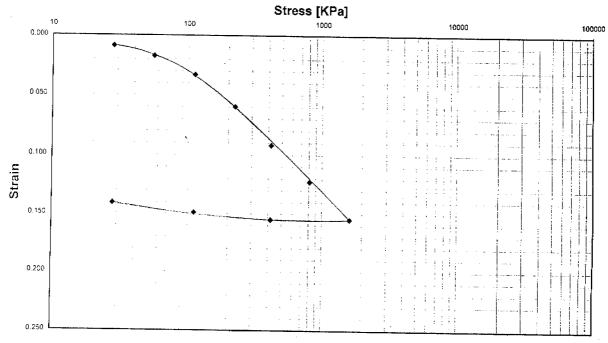
fi <u>22.3</u> mm

Load increment (kPa)	Det, dial reading at end of load (x.0001")	D ₅₀ (x.00017)	O ₁₀₀ (x.0001")	Equip, Def. ΔHe (x.0001")	Change in sample Ht., &H (x.0001")	s = 스H / HI	e = e ₀ - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t50 (min)	Caeff. of consol., c _V , (cm²/min)
. 0	596	0	.0	. 0	0	, o	. 0	.0	. 0	.0	0.00E+00
28	694	666.85	680.7	7	77.7	0.0089	0.6660	0.872	1,1069	0.98	2.46E-01
56	774	741.8	759.8	11	152.8	0.0174	0.6516	0.864	1,0979	1.25	1.90E-01
112	932	866.25	904	17	291	0.0331	0.6252	0.853	1.0828	1.9	1.22E-01
223	1189	1072.75	1146.5	25	525.5	0.0599	0.5803	0.833	1.0576	0.61	3.61E-01
418	1463	1356	1436	32	808	0.0920	0.5262	0.805	1.0225	1.58	1.30E-01
809	1745	1627	1714	42	1076	0.1226	0.4749	0.779	0.9894	1.95	9.89E-02
1617	2043	1912	2012	57	1359	0.1548	0.4207	0.752	0.9551	1.9	9.46E-02
418	1987		1989.95	32	1361.95	0.1551	0.4201				
112	1915		1921.2	17	1308.2	0.1490	0.4304	}	ļ		
28	1821		1839.2	7	1236.2	0.1408	0.4442				
112				17							
1617			1	57	İ			- 1			

Void Ratio vs. Stress



Strain vs. Stress





PRELIMINARY SUBSURFACE INVESTIGATION REPORT

ATH/MEG-033-30.980/0.000
South Section, From Station 45+500 to 49+600
Meigs County, Ohio

Prepared For:

Sverdrup Associates, Inc. 50 West Broad Street, Suite 1700 Columbus, Ohio 43214

Prepared By:

Resource International, Inc. 281 Enterprise Drive Westerville, Ohio 43081

RI# W-7139

June, 1998



45 M. Carlotter

1981 - HER

6+++C8 - F MATERIAL SHOWN AGENTS HE

RESOURCE INTERNATIONAL Engineering Consultants

June 9, 1998

Civil Engineering Surveying and Mapping Testing Laboratories Geotechnical/Environmental Environmental Drilling Construction Mahagement System Design and Systema Development

Mr. Terry Winebrenner, P.E. Sverdrup Associates, Inc. 50 West Broad Street, Suite 1700 Columbus, Ohio 43214

Re: Preliminary Subsurface Investigation ATH/MEG-033-30.980/0.000 PID 17974 South Section, from Station 45+500 to 49+600 RI #W-7139

Dear Mr. Winebrenner:

We are pleased to submit this preliminary subsurface investigation report for the south section of the referenced project, ATH/MEG-033-30.980/0.000. In order to expedite the delivery of the subsurface investigation report for this project, the report has been divided into four (4) parts, north, south, north-central, and south-central. Engineering logs have been prepared and are attached to this report along with results of laboratory testing. Full size plan and profile sheets are being prepared, and will be submitted as a single submission for the entire project. For reference purposes, half-size plan and profile sheets for this section are being included in this submittal.

If you have any questions concerning the subsurface investigation or this report, please call.

Sincerely.

RESOURCE INTERNATIONAL, INC.

Christopher Merklin, P.E.

Director - Geotechnical Engineering

G. Philip Hall P.E.

Vice President

• Vallagetaile

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1.0 INTRODUCTION

This report is a presentation of the subsurface investigation performed for ATH/MEG-033-30.980/0.000 - south section. The south section limits, for the purpose of this report, are between Stations 45+000 and 49+600.

The subject project is the design of a "super two" lane highway system linking the four-lane existing portion of USR 33 at Athens with the existing four-lane portion of USR 33 at Darwin. The total project length is 19.858 kilometers. The northern two-thirds of the alignment is within Athens County, traversing Athens, Alexander and Lodi Townships. The southern one-third (of the alignment), including the entire south section, is within Bedford Township in Meigs County.

1.1 EXISTING LAND USAGE

The land usage along the entire alignment is generally described as alternating forest and pasture with very few cultivated fields. Typically, the valleys and steeply sloping hills are tree covered, and the flatter sidehills and hilltops are pasture. The field observations along Corridor A, as presented in the Geologic Study performed for Feasible Corridors A and B, are indicative of the land usage along the alignment in this southern section. Because of the relief, the area is well drained with creeks at the bottom of every valley and drainage paths down the sides of most of the hills. Drainage paths are easily identifiable by the erosion of the easily erodible surficial red clays and/or mudstone/shale. The alignment is traversed several times, typically along ridge tops, by county and township roads, with rural residences and farms scattered throughout.

The steep slopes and flatter hilltops show evidence of movement which is very common for this area. Many of the pastures exhibit hummocky terrain. Many signs of predominantly small surficial slumps have been observed on the steep slopes and near the valley bottoms, along creek beds. Much of the exposed red soils and rock (red beds) in the valleys and on the slopes show evidence of severe decomposition from erosion.

Coal mines are common in southeast Ohio. It was determined in the Geologic Study that there are one abandoned underground mine and three reclaimed strip mines within the Feasible Study Corridors. One (1) of the reclaimed strip mines (SM3) and the underground mine are west and east of this south section, respectively. However, neither is impacted by the proposed alignment.

1.2 SITE GEOLOGY

Both Athens County and Meigs County lie entirely within the unglaciated section of the Allegheny Plateau. The area is maturely dissected, well-drained and is

characterized by steep-sides, "V" shaped valleys and narrowly rounded hilltops. Elevations along the alignment range from approximately 200 meters at the southern most portion, at Darwin, to approximately 300 meters in the northern portion.

The uplands are covered with a thin layer of residual soils; soils formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials. Soils consist predominantly of sands and clays, very similar to the shales, mudstones, and sandstones on which they lie. The transition to bedrock is very subtle, and in most cases, not clearly identifiable, unless the parent rock is sandstone, siltstone, or limestone.

Soils in the valleys are generally described as colluvial (consisting of alluvial in part) soils overlying residual soils. Colluvial soils (colluvium) are loose and incoherent deposits typically found at the foot of a slope or cliff, brought there chiefly by gravity. Alluvial soils (Alluvium) are (intermixed) water-laid deposits. Typically, soils in the valley run deeper than on the slopes and hilltops, however, the soils are similar to those on the hills, consisting predominantly of sand and clay, and the transition to bedrock is equally difficult to identify.

Both Athens and Meigs Counties, along the alignment, are comprised of bedrock of Pennsylvania Age. The rock strata in this area of southeastern Ohio dips gently to the east-southeast at a rate of approximately 6 meters per kilometer. The top of the Conemaugh formation is estimated to be between elevations 260 and 270 meters at the north end of the alignment. It slopes downward to the east-southeast until it is entirely below any influence on the subject alignment at approximately Station 40+250.

The bedrock was deposited under regular succession of varying environmental conditions that were repeated many times. As a result, the rocks show a definite succession of strata representing one sequence of changing sedimentary conditions. A sequence of strata matching one depositional cycle is termed a cyclothem. Cyclothems are typically associated with unstable shelf or interior basin conditions in which alternate marine transgressions and regressions occur. The non-marine sediments occur in the lower half of the cyclothem and the marine sediments in the upper half. In Ohio, each cyclothem is usually defined as the series between a coal-to-coal interval. The lithology of the rocks that comprise the Pennsylvania System in Ohio consist of alternating clay, coal, shale, limestone and sandstone beds. These beds lack a real persistence and vary greatly in thickness over a short distance.

1.2.1 CONEMAUGH FORMATION

The literature defines the upper boundary of the Conemaugh Formation as the top

of the Upper Freeport No. 7 coal and the lower boundary being the base of the No. 8 Pittsburgh coal. The lithology of the Conemaugh consists of sandstone, sandy shale, shale, limestone, coal, under-clay and varicolored claystones (clay-shales, mudstones, etc.) referred to as "Red beds". Bedded marine shales and some thin marine limestone are present in the lower part of the series, whereas the upper part contains only non-marine strata, including abundant red calcareous claystones. Coal seams of minable thickness occur throughout the study area. The Conemaugh Formation has a reported thickness of approximately 108 meters.

1.2.2 MONONGAHELA FORMATION

The Monongahela Formation overlies the Conemaugh Formation. Its lower boundary is defined as the base of the No. 8 Pittsburgh coal and the upper limit is the top of the No. 1 Waynesburg coal bed. The lithology of the Monongahela Formation is similar to the upper portion of the Conemaugh Formation. The most significant difference is the occurrence of minable coal beds in the Monongahela in contrast to the thin coal beds of the Conemaugh only available by strip mining.

The Monongahela Formation is approximately 76 meters thick. A full thickness above drainage is displayed in Lodi and Bedford Townships. Athens and Alexander Townships show only parts of the Monongahela Series above drainage.

1.3 CUT/FILL SECTIONS

The entire alignment will be constructed on alternating, massive cuts (hilltops) and fills (valleys). The cut and fill sections projected for the south section are presented in Table 1 (based on centerline profiles).

Table 1: Cut/Fill Sections

Begin Station	End Station	Earth- work	Maximum Depth (Cut or Fill)
45+000	45+052	Fill	15 meters
45+052	45+256	Cut	21 meters
45+256	45+349	Fill	20 meters
45+349	45+380	Cut	2 meters
45+380	45+848	Fill	25 meters
45+848	45+998	Cut	17 meters

45+998	46+084	Fill	11 meters
46+084	46+558	Cut	23 meters
46+558	46+606	Fill	3 meters
46+606	46+880	Cut	9 meters
46+880	46+966	Fill	6 meters
46+966	47+110	Cut	7 meters
47+110	47+163	Fill	6 meters
47+163	47+448	Cut	11 meters
47+448	47+787	Fill	13 meters
47+787	47+898	Cut	5 meters
47+898	47+910	Fill	1 meter
47+910	48+113	Cut	8 meters
48+113.	48+232	Fill	11 meters
48+232	48+282	Cut	4 meters
48+282	48+313	Fill	3 meters
48+313	48+635	Cut	14 meters
48+635	48+714	Fill	10 meters
48+714	48+796	Cut	15 meters
48+796	48+942	Fill	11 meters
48+942	49+318	Cut	21 meters
49+318	49+427	Fill	2 meters

2.0 SUBSURFACE INVESTIGATION

Thirty-nine (39) engineering test borings, designated B-123 through B-161, were planned for the south section. The boring locations were specified (station and offset) by representatives of Resource International, Inc. (RI), based on the horizontal and vertical alignment current in December, 1997. It is noted that both the horizontal and vertical alignments have changed since the development and execution of this boring plan, thus, many of the borings extend to awkward depths

and/or are located off the alignment. The boring locations were converted to Project Coordinates and field located by representatives of Sverdrup Associates (Sverdrup), Canter Surveying, with the use of Global Positioning Satellite (GPS). Borings in cut sections were drilled along the alignment and left and/or right of centerline (within the proposed backslopes) to identify the soil and rock conditions in the cut sections and at the proposed subgrade. Borings in fill sections were drilled to a depth equivalent to the height of the proposed embankment or split-spoon refusal in bedrock, whichever was shallower. Split-spoon refusal is defined as exceeding 50 blows with less than 15 centimeters of penetration.

All but one (1) of the borings in the south section were drilled with either a truck-mounted or ATV-mounted rotary drilling rig, utilizing hollow-stem continuous flight augers to advance the holes in soil. The remaining one (1) boring was advanced with a Geoprobe Model 4220, a vehicle-mounted, hydraulically-powered machine that utilizes static force and percussion to advanced a 122-centimeter long by 5.1-centimeter diameter soil sampler.

Where borings extended into the bedrock (after encountering split-spoon sample refusal), a double tube diamond bit core barrel (either wireline or conventional equipment) was used to core (the bedrock). Coring produced NX-sized (5.3-centimeter diameter) cores, from which the type of rock and its geological characteristics were determined.

For the borings advanced using a truck mounted rig, Standard Penetration testing was performed at 0.46 to 1.52-meter intervals. The Standard Penetration Test (ASTM D 1586) is conducted by using a 63.5-kilogram hammer falling 76.0 centimeters to drive a 5.1-centimeter O.D. split-barrel sampler 45.0 centimeters. Driving resistance is recorded on the boring logs in terms of blows per 15-centimeter interval of the driving distance. The second and third intervals are added to obtain the number of blows per 30 centimeters. Standard Penetration blow counts aid in determining soil properties applicable in embankment and roadway design.

A nominal 7.6-centimeter diameter shelby tube, or thin-walled sampler, was employed (ASTM D-1587) to obtain undisturbed samples from borings B-126, B-128, B-26, B-134, B-138, B-149, B-154, and B-160. The shelby tube is hydraulically pressed into the subsurface soils to obtain an undisturbed sample.

Soil samples obtained from the drilling operation were preserved in jars (drill rig boreholes) or sealed tubes (geoprobe boreholes), tested for natural moisture content (ASTM 2216), and visually classified in the laboratory. Representative soil samples were tested in the laboratory to determine the following properties:

Liquid Limit, Plastic Limit

(AASHTO T89, T90)

Gradation (AASHTO T 88)
Unconfined Compressive Strength (of Cohesive Soils)
(Wet) Unit Weight (EM 1110-2-1906)

One-Dimensional Consolidation Properties (AASHTO T 216)

The tests performed are necessary to classify existing soils according to the Ohio Department of Transportation (ODOT) Classification System and to infer engineering properties of importance in determining pavement, embankment, and backslope design and construction recommendations. Results of the laboratory testing are presented in Appendices C, D, and E.

A majority of the cohesive soil samples obtained with the drill rigs were tested to determine their unconfined compressive strengths by means of a hand penetrometer. These values are reported on the boring logs in kilopascals (kPa). The unconfined compressive strength of cohesive soils is used to estimate their undrained shear strength. It is noted that split-spoon samples are considered to be disturbed samples, and the laboratory determination of their shear strengths may vary slightly from undisturbed conditions.

Rock cores were logged in the field and visually classified in the laboratory. They were analyzed to identify the type of rock, color, minerals, bedding planes and other geological and mechanical features of interest in this project. The Rock Quality Designation (RQD) for each rock core run was calculated according to the equation:

RQD = Σ segments equal or longer than 10.2 centimeters x 100 Core Run Length

The RQD aids in estimating the general quality of the rock and is used in conjunction with other parameters to designate the quality of the rock mass. Unconfined compressive strength tests of intact rock cores segments (ASTM D 2938) were performed on representative samples to identify their strength and hardness.

3.0 SUBSURFACE PROFILE

Interpreted engineering logs have been prepared from field geologist's logs, visual examination of samples, and laboratory testing. Classification follows the current ODOT Specifications for Subsurface Investigation. The following is a generalization of what was found in the test borings.

Soil drilled along the alignment is generally between 1.0 and 5.0 meters thick, averaging approximately 2.0 meters thick on the uplands and 3.0 meters thick in

the valleys. The transition to bedrock is not easily discernable where the surface rock is shale, clay-shale, however, the predominant bedrock type in this section is sandstone. Where sandstone, limestone, or siltstone is the surface rock, transition (to rock) was easily discernable. The soils are best described as sandy silts, silty sands, and/or sandy clays with some intervals of silty clay and clay. The soils encountered in the south section exhibit more sand and silt than those encountered in the north section, however, there are still a few areas exhibiting clays of medium to high plasticity. The soils are predominantly classified as ODOT A-4a as well as A-3a, A-6a, A-6b and A-7-6.

It was very common, in the valleys of this section, to encounter very loose sand, exhibiting high moisture contents, interbedded with soft clays. This is best identified in B-128 (station+ 45+627), where 8.7 meters of very loose water bearing sand with soft clay interbeds was encountered. Similar types of soils were also encountered in B-154 (2.7 meters) and B-156 (3.8 meters).

Many soil properties, including soil consistency and shear strength (of cohesive samples), are primarily derived from Standard Penetration blow counts. The Standard Penetration blow counts recorded during the drilling process ranged from 0 blows per 30 centimeters to refusal, increasing with depth. With the exception of those borings discussed in the preceding paragraph, generally speaking, soils encountered from the ground surface to 1.5 meters± are described as very soft to stiff (very loose to loose), below 1.5 meters±, soils are very stiff to hard (medium dense to very dense). Split-spoon refusal, defined as obtaining in excess of 50 blows with less than 15 centimeters of penetration, was encountered in virtually every boring in the transitional material (hard indurated clay/very soft bedrock). Where 0 blow counts were recorded, the split-spoon penetrated the soil under the weight of the tools.

Laboratory testing indicates that the natural moisture contents of the soil encountered to a depth of 1.5 meters± are typically at to well above their corresponding plastic limits. Also within this surface depth, many non-plastic soils with high moisture contents (>20%) were encountered, such as B-136, B-142, and B-146. Valley borings, including B-128, B-129, B-149, B-154, and B-156 exhibited relatively thick intervals (>1.5 meters) of non-plastic soils with high moisture contents and/or cohesive soils at or near their corresponding liquid limits. With the exception of a few borings (i.e., B-128), moisture contents typically decrease below the surficial 1.5 meters±, down to typically less than 10% in the transitional material (soft weathered bedrock).

3.1 Bedrock

Bedrock was cored when encountered in any proposed cut section above the proposed completion depth of the test boring. If bedrock was encountered above

the completion depth in any boring drilled in a proposed fill section, the boring was terminated on the top of bedrock (defined as split-spoon refusal). Much of the bedrock encountered consisted of medium to moderately hard sandstone and siltstone with very soft to soft shale, clay-shale, and mudstone interbeds of varying thicknesses. The sandstone is generally friable (poorly cemented), especially in the vicinity of Stations 48+350 to 48+750. In this section, the sandstone was not cored for fear of locking the equipment in the hole. Much of the sandstone and siltstone is in fair to good condition, as exhibited by the RQDs. however, several sandstone sections exhibited very poor RQDs. In most of these cases, the sandstone was in very thin chips, commonly referred to as the poker chip phenomenon. This is possibly a result of wetting and drying the rock, causing shrinkage. The shale, clay-shale and mudstone are all typically of poor quality. The mudstone and shale were frequently slickensided and deteriorated when exposed to water. Very few, thin, limestone interbeds, typically less than 1.0 meter thick were encountered.

In the cut section between stations 45+052 and 45+256, bedrock was encountered in all borings above the proposed grade. About half of the bedrock consists of poor quality (soft and broken) shale and mudstone, and half poor to fair quality sandstone and siltstone.

In the cut section between stations 45+848 and 45+998, sandstone bedrock was encountered exclusively, starting very near the ground surface in all three borings (B-131, 132, and 133) and extending to below the proposed cut section. The sandstone, described as brown, medium (hardness), medium-grained, and massive, is generally in very good condition.

In the cut section between stations 46+084 and 46+558, sandstone was predominantly encountered, with smaller intervals of mudstone and shale, at the centerline and right of centerline, in B-135 and B-137, respectively. However, mudstone was predominantly encountered left of centerline, in B-136, with lesser intervals of shale and sandstone. The sandstone is in poor to good condition, and the mudstone and shale are both in very poor condition.

In the cut section between stations 46+606 and 46+880, B-139 exhibited weathered, friable sandstone (with clay interbeds) to elevation 243.8, overlying very soft clay-shale and mudstone to below the proposed grade. B-140 exhibited fair to good quality sandstone to elevation 243.8 meters, overlying soft, poor quality mudstone, assumed to extend to the proposed grade.

In the cut section between stations 46+996 and 47+110, B-141 exhibited poor to fair quality sandstone to below the proposed grade.

In the cut section between stations 47+163 and 47+448, B-142 and B-143

exhibited sandstone (poor to fair quality) overlying mudstone (poor quality), overlying siltstone (fair to good quality). Siltstone is at the proposed grade in B-143 and likely in B-142.

In the cut sections between stations 47+787 and 47+898, and 47+910 and 48+113, B-147 and B-148 exhibited exclusively sandstone of poor to fair quality.

In the cut section between stations 48+313 and 48+635, B-151, B-152, and B-153 all exhibited highly friable sandstone with shale interbeds. As mentioned previously, the sandstone was so friable, rock coring was not attempted for fear that much of the rock would become sand, suspended in the wash water, and lock in the core barrel once water circulation was stopped. B-153 exhibited the same poor quality of rock, however, it was cored.

In the cut section between stations 48+714 and 48+796, B-155 exhibited exclusively sandstone of poor to fair quality.

In the cut section between stations 48+942 and 49+318, B-159 predominantly exhibited sandstone of fair to good quality, with shale and limestone interbeds of fair quality.

3.2 Groundwater

With the exception of the Hocking River Valley, groundwater in Athens and Meigs Counties is scarce at best. Few perched lenses of groundwater were encountered during the drilling process within the soil. The most notable groundwater condition encountered was in B-128, where water-bearing sand caused heaving of sand (under hydrostatic pressure) in the augers during the drilling process. Groundwater was encountered within the sandstone bedrock in B-151, at elevation 226.4 meters. It is noted that, since this bedrock was augered full depth, not requiring the use of water, groundwater could be identified within the rock. Typically, within the rock, it was impossible to identify groundwater since water was being used during the coring process. Groundwater for the area can be found in alternating layers of shale and thin sandstone with yields of less than 1.0 gallon per minute.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Data obtained from the drilling and testing program have been used to develop preliminary pavement, embankment, and backslope recommendations for the soils and bedrock encountered along the alignment. These parameters have been used to provide guidelines for the design of the pavement systems for the subject roadway which are discussed in the following paragraphs. It is noted that these

recommendations are preliminary. Additional subsurface investigations will be performed to verify these recommendations along a finalized alignment, as part of the final design.

4.1 Pavement Design

Because of the extensive earthwork necessary for this project, very little soil will remain in-place, in its current condition, as a pavement subgrade soil. Subgrades in most of the cut sections will be bedrock. The soils in this section are less clayey than in the north section. The predominant bedrock in this section is sandstone, although shales and mudstone are present. Therefore, assuming that soils and bedrock used as fill in this section are excavated from this section, it is recommended that pavement designs be based on a Group Index value of 11. The corresponding and design California Bearing Ratio (CBR) is approximately 6, and the equivalent Subgrade Resilient Modulus, M_R, is 7200 psi (this value is left in English units since the current L&D manual presents it that way for use in a correlation chart).

Where bedrock is encountered in the subgrade, the rock shall be cut an additional 0.5 to 0.6 meters below the surface of the subgrade, depending on the pavement type, for the cross section width of the roadway between points 0.3 meters beyond the shoulders.

4.2 Embankment Design

Massive embankment fills are proposed at the locations presented in Table 1. The largest fill section is 25 meters, between stations 45+380 and 45+848. To estimate the settlement of the "in-situ" soils (and rock) due to the weight of the embankment, one-dimensional consolidation tests were performed on undisturbed samples procured from B-128 (station 45+627) and B-160 (station 49+170). The results of these tests (See Appendix F) were employed to verify the compressibility parameters of the soils along the alignment in the valleys. A worst case settlement, within the foundation soils alone, was determined beneath the centerline of the proposed highway at the maximum fill section at station 45+540. The total settlement caused by the consolidation of the "in-situ" subsoils is estimated to be between 0.9 and 1.0 meters. Additional settlements can be expected within the embankment itself, on the order of 0.2 to 0.4 meters.

Total settlement on the order of 1.0 meter± for such an embankment is not considered out of the ordinary. The foundation soils in the vicinity of station 45+540 (and many of the valley fill sections in this south section) are primarily sandy, which will allow for a faster time-rates of settlement. However, the use of settlement plates is recommended to monitor the settlement of the soils in the larger embankments. Because of the notorious instability of the soils and rock in

this area, the use of inclinometers is recommended to monitor the stability of these larger embankments as well. In the final design stage, it is recommended that further analysis be performed on the embankment slope-stability.

The earthwork design of all fill sections (and cut sections) shall follow ODOT's Location and Design Manual (1995, or latest, edition). The maximum (steepest) recommended unreinforced slope for the embankments is 2:1 (horizontal:vertical).

4.3 Backslope Design

The study area is considered to be highly susceptible to slope movements due to the lithology, topography and amount of rainfall. Problems of instability typically occur where the red shales and claystones (mudstones) are the thickest. Although this section exhibited substantially more sandstone (than the north section), shale, clay-shale, and mudstone, predominantly in poor condition, was also encountered. The mudstone and some of the shale was frequently slickensided and deteriorated when exposed to water.

No significant slumps were identified during reconnaissance of this section, unlike the north section. This section is considered to be a flatter section with more stable (sandstone and siltstone) bedrock. The terrain is typically hummocked, indicating movement. The most common forms of landslides in southeastern Ohio are rock falls, where the soft shale bedrock is weathered out from underneath blocky sandstone or limestone, and rotational slumps.

Based on the soil and rock encountered in the proposed cut sections, backslope recommendations are presented below in Table 2, applying to both left and right backslopes as applicable.

Table 2: Backslope Recommendations

Cut Section	Maximum Cut	Recommended Backslope			
		1:1 to top of siltstone/sandstone, 2:1 to 3.0-meter bench at elevation 251 (bottom of sandstone), 1:1 to elevation 255, 2:1 to daylight			
45+848 to 45+998	17 meters	1:1 to top of sandstone, 2:1 to daylight			

46+084 to 46+558	23 meters	2:1 in all shale and mudstone with a 3.0-meter bench below sandstone, 1:1 in all sandstone, 2:1 to daylight in surface soil. Expect more mudstone in the left slope and more sandstone in the right slope (and along centerline)
46+606 to 46+880	9 meters	2:1 from 46+606 to 46+770; 2:1 to 3.0-meter bench at elevation 244 (bottom of sandstone), 1:1 to top of sandstone bedrock, 2:1 to daylight
46+966 to 47+110	7 meters	1:1 to top of sandstone, 2:1 to daylight
47+163 to 47+448	ll meters	2:1 in all mudstone with a 3.0-meter bench below sandstone and siltstone), 1:1 in all sandstone and siltstone, 2:1 to daylight in surface soil
47+787 to 48+113	8 meters	1:1 to top of sandstone, 2:1 to daylight
48+313 to 48+635	14 meters	2:1 in shale to 3.0-meter bench at bottom of sandstone, 1:1 to top of sandstone, 2:1 to daylight
48+714 to 48+796	15 meters	1:1 to top of sandstone, 2:1 to daylight
48+942 to 49+318	21 meters	2:1 in shale to 3.0-meter bench at bottom of sandstone, 1:1 to top of sandstone, 2:1 to daylight

The top 5.0 (vertical) meters of all backslopes should be considered soil and laid back at a 2:1 slope. Any cuts not addressed in this table should be laid back at a 2:1 slope.

Due to the lithologic character of the rock formations in this area, most of the cut slopes will be mixed-faced, consisting of various rock types. Differential weathering of the various rock types must be considered in the design of the cut slope. This is especially true where sandstone is overlying a less resistant shale. Because the shale weathers at a faster rate than the overlying sandstone, the sandstone may be left unsupported and subject to rock falls. Rock falls occur routinely in this area. Consequently, it is recommended that at least a 3-meter wide bench be constructed behind the roadway ditch to allow temporary accumulation of talus and rock fall material.

It is expected that blasting will be required for cuts in the limestone, sandstone, and siltstone bedrock. It is expected that the shales (and mudstone), even in an

unweathered condition can be removed using standard ripping methods. We expect that even the upper, weathered sandstone can also be removed by ripping, due to the friable nature of the weathered sandstone.

It is recommended that sidehill benches be cut in the rock slopes which are greater than 15 meters high. Past experience has shown that these benches act to collect rock falls as well as minimize erosion of the exposed surface. The benches interrupt the velocity of runoff water washing down the slope and thus minimizes the erosion. Typically, these benches do not significantly increase hillside stability.

4.4 Construction Considerations

All site work shall conform to the latest ODOT <u>Construction and Materials Specifications</u> (January, 1997), including that all excavation and embankment preparation and construction should follow ODOT Item 200 (Earthwork).

Where existing structures will be razed, all foundations, floor slabs, basements, wells, and/or cistern walls shall be removed to a minimum of 0.3 meters below the grade of the surrounding area. All basements or cavities left by structure removal shall be filled to the level of the surrounding ground. For those areas within the vicinity of construction, the fill shall be compacted in accordance with the specifications provided in ODOT's Specifications.

Prior to beginning excavation, grading, and/or embankment operations across the site, all necessary clearing and grubbing shall be completed. Topsoil, organic deposits, unsuitable fill materials (as determined by a soils engineer or an experienced soils technician), and/or existing pavement sections should be stripped away from proposed pavement areas prior to excavation. In constructing the embankments, if topsoil is encountered at the ground surface of the existing subgrade within 1.22 meters of the proposed subgrade elevation, the topsoil (and any other unsuitable material, as determined by the site soils engineer) should be stripped off and stockpiled. In areas where greater than 1.22 meters of fill is to be placed, the excavation is dependent on the soil conditions at the time of construction. In particular, if dry conditions exist, the topsoil will provide adequate stability, and can remain in place. If wet conditions exist, and excessive moisture contents are present, this topsoil will not provide adequate stability, and will require removal. Where a new pavement is to be constructed on an embankment which is less than 0.9 meters over an existing pavement, the existing pavement must be removed.

The proposed subgrade surfaces should be proofrolled prior to placing engineered fill. A soils engineer or an experienced soils technician should be present during proofrolling to determine if soft soils exist. When employing proofrolling to

determine the soils that will require stabilization, the proposed profile of the roadway must be considered. A greater amount of subgrade deformation is acceptable at the base of an embankment than along sections of the subgrade where the roadway will be constructed at the existing grade.

The highway construction will cut through the Monongahela Formation. Therefore, we expect the predominant rock fill to consist of shale and sandstone. It is our opinion that colluvium and residual soil, sandstone and most of the shale will be suitable for embankment fill material. It is recommended that the cut material available for fill be classified. The sandstone and limestone are best suited for fill. This is followed by the green and gray shale, colluvium and residual soils. The "Red Bed" shales and claystones (i.e., mudstone) are the least suitable for fill soil due to their rapid slaking and deterioration into a plastic unstable clay soil. The "Red Bed" shales and mudstone should be wasted whenever possible. Alternatively, special precautions and flatter slopes must be used if this red shale is used as fill.

Special design and construction techniques are recommended even when the gray and green, more stable shale is used for embankment fill. This shale requires the addition of water and special handling in order to construct a stable embankment fill. Even with special precautions, however, the stability of subgrades in shale deteriorates with time. Shallow sloughing is common in 2:1 embankment slopes formed in shale, therefore, it is recommended that limitations be placed on the use of shale in embankment construction. It is recommended that shale not be allowed within the upper 0.6 meter of embankment fill. A 0.6 meter cap of soil will minimize weathering and deterioration of the underlying shale. limitations are recommended if the "Red Bed" shale must be used in embankment fill. The shale should be broken into pieces no larger than 150 millimeters of the initial pass of the compactor and should be broken into pieces smaller than 50 millimeters following compaction. The shale should be compacted at a range of moisture varying from optimum to 3% wetter than optimum. Past experience has shown "Red Bed" fill will perform better when compacted wetter than optimum, due to swelling. It has been found that less swelling occurs in the fill when it is compacted at a moisture content wetter than optimum.

When employed as embankment fill, excavated bedrock shall be placed in lifts not to exceed 0.9 meters. When rock and other embankment material are excavated at the same time, the rock shall be incorporated into the outer portions of the embankment as rock fill and the other material shall be incorporated into the inner portion as rolled embankment. The top 0.6 meters of all embankments shall be constructed of material other than excavated bedrock.

Due to the steeply sloping topography, sidehill fills would be expected. It is critical that benches be cut into the hillside where the toe of the new slope starts on an

existing slope. This bench should cut into the hillside wide enough to accommodate construction equipment. Wherever possible, benching should "key" into the underlying bedrock. Drains intercepting seepage would be installed in the back of the benches as dictated by site conditions. Landslide activity is common in areas of sidehill cut and fill operations. Consequently, landslides can be expected to occur if sidehill fills are improperly constructed.

Individual stability analyses should be performed in the final investigation for the sidehill fill areas.

Groundwater does not occur in large quantities over the length of the alignment. A static water table is not expected within the depths of cuts for the proposed roadway. However, perched groundwater is expected in the more permeable sandstone beds of the Conemaugh and Monongahela Formations. This is especially true where the more permeable sandstone is directly underlain by a relatively impervious shale. Also, groundwater should be expected along the overburden/shale interface during wet weather. Horizontal drains may be needed on intermediate benches and along the roadway ditch line to lower the perched water table and minimize seepage emerging on the cut slopes. The need for horizontal drains will largely be controlled by the dip of the bedrock at the individual cut. As previously indicated, the regional dip of the rock is approximately 6 meters per kilometer to the east-southeast. Drains are used to dewater cut slopes when the rock is dipping toward the cut. Horizontal drains are usually not necessary when the rock dips away from the highway cut.

5.0 LIMITATIONS OF STUDY

Our recommendations for this project were developed utilizing soil and bedrock information obtained from the test borings that were made at the proposed site. At this time we would like to point out that soil borings only depict the soil and bedrock conditions at the specific locations and time at which they were made. The conditions at other locations on the site may differ from those occurring at the boring locations.

The conclusions and recommendations herein have been based upon the available soil and bedrock information and the preliminary design details furnished by a representative of the owner of the proposed project. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the soils engineer to determine whether any changes in the foundation or earthwork recommendations are necessary. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the soils engineer.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted Geotechnical engineering principles and practices. Resource international is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein.



REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc. Project ATH/MEG-33-30.980/0.000	Boring Number B-123
Project Number W-7139	Completion Depth 12.2 m
, in the second	Date Started: 2/18/98 Date Finished: 2/18/98 Drilled By: M.F.
DRILLING AND SAMPLING INFO	RMATION Reging Mathed 8.3 cm HSA/R
Northing 130591.396 5ating 639506.659	Butting Weathou
Easing	76
Elevation	MOISTURE ATTERBERG
NO PER 15cm RECOVERY DEPTH	CONTENT EE ,
2 \(\((Topsoil\)\). Moist.	<i>"</i>
SS-2 3 56 Brown to red and brown SILTY CL coarse to fine sand, trace fine grav Medium stiff to hard. Moist to dan	vel. — 27
SS-3 12 100 1.0 - 15 40 15	22
SS-4 25 73 2.0 -SS-4: ODOT A-6b (11) 48 50/8cm CLAY/WEATHERED MUDSTONE. soil/very soft bedrock.	2.0 16 34 1 Hard
SS-5 26 67 31 3.0 3.0	15
4.0 _ \$\$-6 39 100	13
48 50/5cm	
NOTES:	

SAMPLE TYPE

SS - 5.1cm OD Split Spoon GS - Geogroph Sample

SI - Shelby Tobe

RC - Rack Care

AS Auger Sample

GROUND WATER READING BORIN

At Completion N/A * m

Aller 2-J Hrs ▼ N/A

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stein Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD - Wash Dulling

F.C. Rock Coring



Clier	, Sve	erdrup A	ssociat	es, Inc.	Boring Nui	nber	B-1	23	
Proje	··				Sheet			3	
	ct Numb		V-7139		Completio			12.21	n
SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	·	м	OISTURE ONTENT	ATTER LL	BERG PL
			5.0						
<i>SS</i> -7	16 19 26	72	6.0			**************************************	15		
SS-8	48 50/8cm	89	7.0_			***	6		
i			8.0 _ - - -	•					
SS-9 RC-1	50/5cm	0	9.0	SANDSTONE; gray, medium, massive, fine grained, micaceous, slightly weathered.	8.8	***			<u>.</u>
			10.0	-qr (@ 9.3 m) = 38.02 MPa -RC-1: Recovery = 95% -Core Loss = 15 cm -RQD = 63%					
NOTES	·		11.0	· ·					



Clian	t Sve	erdrup A	ssociate	es, Inc.	Boring Number <u>B-123</u>					
Proje		H/MEG-	33-30.9	80/0.000	Sheet3	3				
	ct Numb		V-7139		Completion De		12.2 m	7		
SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERB LL i	PERG PL		
	BLOWS		12.0	-RC-2: Recovery = 100% -No Care Loss -RQD = 100% Bottom of Boring = 12.2 meters	12.2	MOISTURE				
: 						:				
							1			
			:		:	:				



REPORT OF SOIL EXPLORATION

Clier	<i>''</i>		Associat	* ************************************		Numbe	'	B-1.		
Proje	ect	TH/ME		980/0.000	Sheet			of .		
Proje	ect Nun	nber _	W-7139		Compl	etion D	epth		30.2	77
					De	ate Star ate Finis illed By	hed:		0/98	
Nort	hina	1305	62.053	DRILLING AND SAMPLING INFORMATION		Method	4 <u> </u>	3.3	m HS	A/R
East.	_	6394	39.637		Hamm	er Weig	ht _	63	.5 kg	
	ation _	259.0) m	·	Hamm	er Drop		76	ст	
IMPLE NO	BLOWS PER 15c	PERCEN RECOVE		SOIL DESCRIPTION			CONTE		ATTER LL	BERG Pl
S-1	1 1	83	-	Brown SILT, some fine sand, little clay, tre organics (Topsoil). Moist.	ace _	0.1	32			
		2	-	Brown CLAY, some silt, little to trace fine		\Box				
S-2		44		sand. Soft to hard. Moist to dry.			29			
	2	3								
			1.0			\Box				
S-3	4	44					19			
	8									
		9	-							
S-4		50				-	11			
3-4	20	50	2.0			#	′′	1		
		24				Ŧ	1	1		
			!			2.5		1		
5 F	50/5			Brown SHALE. Hard soil/very soft bedroc	k	2.7		:		
S-5 C-1	50/5cr	$n \mid O$		SHALE; brown, soft, highly broken,				i		
,			3.0	micaceous, silty.				- 1		
		i	-	: -		=				
		i				3.4				
		1	; . -	SANDSTONE; brown and gray, medium, highly broken, fine grained, micaceous, slightly weathered.		:::	İ			
		i	4.0	Sagnay weathered.		:::				
			4.0	-RC-1: Recovery = 100%			1			
		1		· -NC-1: Necovery = 100% · -No Core Loss		:::				
			-	-RQD = 18%		:::	ł			

SAMPLE TYPE

- SS 5.1cm OD Split Spann
- GS Geoprobe Sample
- ST Shelby Tube RC - Rock Core
- AS Auger Sample

GROUND WATER READING

At Completion . N/A *

Atter 24 HIS V N/A

. m *Wash water used during the rock coring process.

BORING METHOD

- HSA Hollow Stem Augers SFA Solid Flight Augers
- MD dud Drilling
- WD Clash Drilling
- RC Rock Coing



Client Sverdrup Associates, Inc.				es, Inc.	Boring Number <u>B</u> -		124		
Proje	4.7	H/MEG-	<i>33-30.5</i>	980/0.000	Sheet2	of			
Proje	ct Numb	erV	V-7139		Completion De	epth	30.2	m	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RBERG PL	
			5.0	-qr (@ 4.4 m) = 45.78 MPa					
RC-2			6.0		4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-			
			7.0	-massive from 7.0 to 7.6 m -RC-2: Recovery = 97% -Core Loss = 9 cm -RQD = 20%	7.9				
			8.0 <u> </u>	MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty, with gray clay seams up to 0.1 m thick.	y (%)				
RC-3			9.0						
			10.0	-RC-3: Recovery = 96% -Core Loss = 6 cm -RQD = 16%	10.0				
			-	SILTSTONE; gray, medium, micaceous, slightly broken.	10.4			1	
RC-4			11.0	SANDSTONE; gray, medium, massive, fin grained, cross-bedded, micaceous. -RC-4; Recovery = 100% -No Core Loss -ROD = 41% -gray, medium hard SILTSTONE lens from 11.0 11.2 m	e 11.2				



Clier	st Sv	erdrup A	ssociat	tes, Inc.	Boring Nu	rB-1	<u>B-124</u>		
Proje	47	ATH/MEG-33-30.980/0.000					of	5	
•	ect Numb	berV	V-7139		Completio			30.2	m
SAMPLE NO	BLOWS PER 15cm	PERCENT	DEPTH	SOIL DESCRIPTION	<u> </u>		MOISTURE	ATTE	RBERG PL
RC-5			12.0_	MUDSTONE; variegated gray, red, and purple, very soft to soft, highly broken, non-bedded, slightly calcareous, with limestone nodules.		146 167 1400			
			-			11/2. 11/2.			
j			13.0_	-RC-5: Recovery = 33% -Core Loss = 82 cm -RQD = 0%		200 2000 30			
RC-6			- - -	-RC-6: Recovery = 90% -Core Loss = 6 cm		% % %			
RC-7			14.0	-RQD = 0% -RC-7: Recovery = 56% -Core Loss = 40 cm					
RC-8			15.0	-RQD = 0% -RC-8: Recovery = 90% -Core Loss = 6 cm -RQD = 38%					
RC-9			75.0	SILTSTONE; gray, medium, massive, micaceous, argillaceous, with limestone nodules.					
			16.0	-RC-9: Recovery = 100% -No Core Loss -ROD = 67% -qr (@ 16.3 m) = 56.31 MPa					
			17.0	SANDSTONE; gray, medium to moderately hard, massive, fine grained, micaceous, silt	16.8 ty,				
			18.0						
NOTES:				-			;····		-



Clier	ssociat	Boring Nun	nber	B-1	24			
Proje	ect _A7	H/MEG-	33-30.	980/0.000	Sheet		of .	_
Proje	ect Numb	oerV	V-7139	T WA	Completion	Dep	oth	30.2 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			OISTURE ONTENT	ATTERBERG LL PL
RC-10			20.0	gray, medium hard SHALE lens from 18.20 to 18.25 m SANDSTONE; brown to gray, moderately hard, massive, fine to coarse grained, micaceous, slightly weathered, with limestone nodules. -RC-10: Recovery = 100% -No Core Loss -RQD = 70% -friable from 21.3 to 24.3 m	78.3			
			23.0	-RC-11: Recovery = 100% -No Core Loss -RQD = 60%				
RC-12			25.0	-RC-12: Recovery = 95% -Core Loss = 8 cm -RQD = 68%				



Clien	t Sv	erdrup A	es, Inc.	Boring	, Nun	nbe	r <u>В-1</u>	24	~	
Proje	ect A7	H/MEG-	33-30.5	080/0.000	Sheet		5	of		5
-	ect Numb	erV	V-7139		Completion Depth			30.2		
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		·-··· ,		MOISTURE CONTENT	LL	RBERG PL
RC-14			27.0	SHALE; brown, soft to medium, highly broken, silty, slightly jointed. SANDSTONE; gray, medium, massive, fir grained, micaceous, cross-bedded. SILTSTONE; gray, medium, micaceous, argillaceous, slightly brokenRC-13: Recovery = 98% -Core Loss = 3 cm -RQD = 38% SANDSTONE; brown to light gray, medium moderately hard, slightly broken, coarse grained, micaceous, slightly jointed, with interbedded light gray clay seams up to 6 m thick. -RC-14: Recovery = 95% -Core Loss = 14 cm -RQD = 48% -medium grained from 29.2 to 29.6	um to	25.3 25.6 26.2 26.8				



RESOURCE INTERNATIONAL, INC. 281 ENTERPRISE DRIVE WESTERVILLE, OHIO 43081

(614) 885-1959

REPORT OF SOIL EXPLORATION

Clier	nt = Sv	erarup A	ISSOCIAL	es, inc. Bori	ing Number	B	25	
Proje	ect AT	H/MEG-	33-30.	980/0.000 She	et1	of	2	<u> </u>
Proje	ect Numb	erv	V-7139	Con	npletion De	pth	8.8 /	n
					Date Start Date Finis Drilled By:	hed: 2/	18/98	
Nort	thing	130542	.491	DRILLING AND SAMPLING INFORMATION Bori	ng Method	8.3	cm HS	SA/RC
East	ing	639393	.623	Нәл	nmer Weigi	ht6	3.5 kg	
Elev	ation	257.3 n	n	Han	nmer Drop	7	6 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ДЕРТН	SOIL DESCRIPTION		MOISTURE CONTENT	ATTE:	RBERG PL
SS-1	1 1	94	-	Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist.	0.1	29		
SS-2	5 8 15	89	- - - -	Brown CLAY and SILT, some fine sand, trace coarse sand, trace fine gravel. Soft to very stiff. MoistSS-2: ODOT A-6a (9)	[2.] [2.]	16	29	15
SS-3	36 40 50/10cm	88	1.0	Brown weathered SANDSTONE. Very soft bedrock.	7.7			
SS-4	 50/13cm	60	2.0_		* * * * * * * * * * * * * * * * * * *			
]50/8cm	100	- - -		2.8	:		į

SANDSTONE; brown, soft to medium, highly 3.0 broken, fine to medium grained, silty, friable, micaceous.

> -RC-1: Recovery = 95% -Core Loss = 15 cm -RQD = 0%

NOTES:

RC-1

SAMPLE TYPE

4.0

- SS 5.1cm OO Splu Spean
- GS Geoprobe Sample ST - Shelby Tube
- RC Rock Cure
- AS Anger Sample

GROUND WATER READING

At Completion N/A

▼ N/A Alter 24 Hrs

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stem Augers SEA Solid From Augers

- AND Med Dr. mg
- WO Wash Shing
- BC Book Co to



Clien	t _Sv	erdrup A	ssociat	es, Inc.	Boring	Num	bei	B-1	25		
Proje	ect AT	H/MEG-	33-30.9	980/0.000	Sheet		2	of		2	
=	ect Numb	er V	V-7 139		Comple	etion	De	pth	8. 8	m	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION				MOISTURE CONTENT	ATTERBE		PL
RC-2			5.0	CLAY-SHALE, brown, soft, highly broken, silty. MUDSTONE; greenish gray, very soft to so highly broken, non-bedded, slightly jointed -RC-2: Recovery = 61% -Core Loss = 99 cm -RQD = 0%	oft,						
RC-3			8.0	SILTSTONE; gray, medium, highly broken, argillaceous, cross-bedded, pyriticRC-3: Recovery = 100% -No Core Loss -RQD = 0% Bottom of Boring = 8.8 meters		8.2					



REPORT OF SOIL EXPLORATION

Clien	t Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	er B-	126	
Proje	4.7	H/MEG-	33-30.5	980/0.000	Sheet1	01	. 1	
	ct Numb	er V	V-7139		Completion D	epth	4.0 m	7
rioje		- -			Date Star Date Finis Drilled By	ted: 2, shed: 2		
Norti	hing	130362	. 252	DRILLING AND SAMPLING INFORMATIO	N Boring Methol	d <u>8.</u> 3	3 cm HS	'A
Easti	ing	639468	.074		- Hammer Weig	iht	53.5 kg	
Eleva	ation	211.0 п	7**		Hammer Drop	;	76 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE	ATTER	BERG PL
4	2	89	_	Brown SILT, some fine sand, little organics	O.1	18		
ST-2	4	100	1.1.1	(Topsoil). Moist. Brown fine SANDY CLAY, some silt, trace coarse sand, trace fine gravel. Medium stil to very stiff. Moist.	4	21	34	14
<i>SS</i> -3	3 4 10	39	1.0	-ST-2: ODOT A-6b (10); qu = 126.88 ki	Pa	20		
SS-4	7 12 16	56	2.0_			22		
\$\$-5	6 5 7	39	3.0	Brown CLAY, some silt, trace coarse to fine sand, trace fine gravel. Stiff. MoistSS-5: ODOT A-7-6 (14)	2.6	21	44	21
SS-6	50/3cm	100	4.0		4.0			
NOTES:	* * Elevati	on is appr	oximate.	Battom of Baring = 4.0 meters	:			

SAMPLE TYPE

SS - 5.1cm OD Split Spoon

GS Geoprobe Sample

ST - Shelby Tube

RC - Rock Core AS - Auger Sample

GROUND WATER READING
At Completion _____ Dry _____ m

After 24 Hrs. V. N/A

BORING METHOD

HSA · Hallow Stem Augers

SFA - Solid Flight Augers MD - Mud Drilling

WD - Wash Dritting

RC - Ruck Coring



REPORT OF SOIL EXPLORATION

				REPORT OF SOIL EXPLORATION				
Clier	ntSv	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B</u> -	127	
Proje	ect AT	H/MEG-	33-30.	980/0.000	Sheet1	of	2	· · · · - · · · · · · · · · · · · · · ·
	ect Numb	erV	V-7139		Completion D	epth _	7.3 /	n
					Date Star Date Finis Drilled By	hed: 2/	23/98	
Nort	hing	130191	.568	DRILLING AND SAMPLING INFORMATION	ON Boring Method	8.3	cm HS	5.4
	•	639598	.227		Hammer Weig	_	3.5 kg	
	-	205.9 п	7**		Hammer Drop		6 cm	
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MQISTURE CONTENT	ATTE:	RBERG I PL
		1		13 cm - Asphalt	0.1			
			_	15 cm - Sand and gravel base	0.3		00	
SS-1	4 4	67	1.0	Brown SILTY CLAY, some coarse to fine sand, trace fine gravel. Stiff. Moist to dampSS-1: ODOT A-6b (9)		16	38	19
ŜS-2	4 5 5	17	-			10		
\$S-3	20 21 23	72	2.0	Brown to gray arenaceous, weathered SHALE. Very soft bedrock.	7.8			
SS-4	31 50/10cm	80	3.0_					
	23 48 50/10cm		4.0					

SAMPLE TYPE

- SS 5.1cm OD Spir Spoon
- GS Geoprobe Sample
- ST Shelby Tube RC Rock Core
- AS Auger Sample

After 24 Hrs

V/A

BORING METHOD

- HSA Hollow Stein Augers
- SFA Solid Flight Augers
- MD Mud Drilling
- MC Wash Dolling

m

RC - Bock Carma



Clier	, Sve	erdrup A	ssociate	es, Inc.	Boring	Number	. <u>B</u> -1	<u> 27</u>	
Proje		H/MEG-	33-30.9	80/0.000	Sheet		of	2	
	ect Numb	er V	V-7139			tion De	pth	7.3 n	7
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	ŞQIL DEŞCRIPTION			MOISTURE CONTENT	ATTER	BERG PL
			5.0				-		
SS-6	50/3cm	100	6.0						
<i>SS-7</i>	50/10cn	100	7.0	Auger refusal @ 7.3 meters Bottom of Boring = 7.3 meters		7.3			
			:						
: ! ! !						:	:		



REPORT OF SOIL EXPLORATION

Clier	ntS	Sverdrup A	Associat	es, Inc.	Boring Numbe	er <u>B</u> -	128	
Proje	ect	TH/MEG	33-30.5	980/0.000	Sheet1	of	2	
Proje	ect Nun	nber\	N-7139	(Completion D	epth _	11.0	m
					Date Star Date Finis Drilled By	shed: 3/	2/98	
Nort	hina	130101	.909	DRILLING AND SAMPLING INFORMATIO	N Boring Metho	d 8.3	cm HS	SA
East	-	639635	5.257		lammer Weig	,	3.5 kg	
	ation _	204.8 /	n		lammer Drop		6 cm	
SAMPLE	BLOWS		DEPTH	SOIL DESCRIPTION	Million Drop	MOISTURE	ATTE	
NO SS-1	PER 15ci	n RECOVERY		Brown fine SANDY SILT, little organics, trac	ce (0.0 //	26 CONTENT	LL	PL.
\$T-2	2	4 100	-	clay (Topsoill. Moist. Brown CLAYEY SILT, little fine sand. Medium stiff to soft. Moist. -ST-2: ODOT A-6a (10)		25	<i>35</i>	20
SS-3	1 1	78	1.0	-SS-3: $qu = 80.76 kPa$		26		
SS-4	2	67	2.0_			24		
\$\$-5	2 1	78	3.0	-groundwater initially encountered @ 2.4 of Gray fine SAND, some silt, little clay, trace coarse sand. Loose to very loose. Moist to wetSS-5: ODOT A-4a (2)	2.7	22	NP	NP
SS-6	3 2	44	4.0	Gray fine to coarse SAND, trace silt. Very loose. Moist to wet.	4.1	29		

NOTES: NP -- Non-plastic sample

SAMPLE TYPE

- SS 5.1cm OD Split Spaon
- GS Geoprobe Sample
- ST Shelby Tube
- ST Shelby Tube BC Rock Core
- AS Auger Sample

GROUND WATER READING

At Completion . Seepage

Atter 24 Hrs V/A

BORING METHOD

HSA - Hollow Stem Augers SFA - Solid Flight Augers

MD - Mud Dolling WD - Wash Drilling

RC Rock Coring



Clien	s Sv	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-1</u>	28	
Proje		H/MEG-	33-30.5		Sheet2		2	
,	ct Numb	er V	V-7139		Completion De	epth	11.0 n	n
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERE LL	BERG PL
			5.0	-heaving sands encountered @ 4.6 meter	rs (
<i>SS-7</i>	1 1 1	56	6.0	Gray SILTY CLAY, trace fine sand. Soft. Moist.	5.6	27		
SS-8	4 9	22	7.0	Brown coarse SAND, little fine sand. Medium dense. Moist to wet.	6.7	27		
	10		8.0					
SS-9	14 16 22	50	9.0	Reddish-brown SILTY CLAY, trace coarse fine sand. Hard. Damp.	8.7'to	22		
			10.0					
\$\$-10	18 25 33	78 3	11.0	-SS-10: ODOT A-6b (11)	11.0	13	36	18
			11.0	Bottom of Boring = 11.0 meters				



REPORT OF SOIL EXPLORATION

Clier	Sve	erdrup A	ssociat	es, Inc.	Boring Nun	nber	B-1	29	
Proje	"			980/0.000	Sheet		of	2	
	ect Numb	erV	V-71 <u>3</u> 9		Completion			5.8 n	7
·						itarted: inished: By:		4/98	
Nort	hing	129912	.782	DRILLING AND SAMPLING INFORMATI	ON Boring Met	hod	8.3	cm HS	<u>A</u>
East	-	639650	,462		Hammer W	leight _	6	3.5 kg	
		206.3 n	n		Hammer D.	гор	_ 70	5 cm	
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOIST CONT		ATTER	BERG PL
	1 2	56 0	1.0	Brown fine SANDY SILT, little clay, little organics (Topsoil). Moist. Brown fine SAND, some silt, little coarse sand, trace clay. Very loose. MoistAS-2: Visual ODOT A-3a	1.6	2: 2: 2:			
SS-4	4 3 1	17	2.0	Brown fine SANDY SILT, little coarse san little clay, trace fine gravel. Soft. Moist. -SS-4: ODOT A-4a (3)	d,	20)	26	16
SS-5	"12 33 - 48	50	3.0	Gray weathered MUDSTONE. Very soft bedrock.	2.6	10	? ;		

SAMPLE TYPE

100

4.0

SS - 5. Jem OD Split Spoon

GS Geoprobe Sample

 $ST + Strettiv_{-} Tune$

HC - Hock Core AS - Auger Scripto

__ 50/8cm

SS-6 39

NOTES:

GROUND WATER READING

Al Completion - N/A

After 24 Hrs



BORING METHOD

HSA Hollow Stem Augers SEA - Solid Flight Augers MD - Mad Drilling IVD - Wash Drilling

AC Rock Coring



Clier	Sve	erdrup A	ssociate	es, Inc.	Borina	Numbe	er <u>B-1</u>	29	
Proje				80/0.000	Sheet	2	of	2	
	ct Numb		V-7139			etion D		5.8 n	n
SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTER	BERG PL
NO	PER 15cm	RECOVERY		and the same of th	*.41				
			5.0						
<i>SS</i> -7	50/10cm	100				5.8			
			1	Bottom of Boring = 5.8 meters					
						`	1		
	1		!!!						
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REPORT OF SOIL EXPLORATION

Client _	Sv	erdrup A	ssociat	es, Inc.	Borin	ng Nu	mbe	r	B-1	30	
Project _	A7	H/MEG-	33-30.			et					
Project N	lumb	erV	V-7139			pletio				3.0 п	7
•						Date Date Drilled	Finis	hed:	2/2 2/2 M.	4/98	
Northing .		129917	.851	DRILLING AND SAMPLING INFORMATIO		ng Me	tho	d	8. <i>3</i>	cm HS	:A
Easting		639713	.504			mer \			63	8.5 kg	
Elevation		222.3 п	7	<i></i>	lan:	mer L) Гор		76	cm	
SAMPLE BLO	1W5 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION				MOIST		ATTER LL	BERG PL
SS-1 1		56		Brown SILTY fine SAND, little clay, trace		0.1	H	. 22	•		
SS-2 2	2	39	-	organics (Topsoil). Moist. Brown CLAY, some silt, trace coarse to fine sand, trace fine gravel. Soft to hard. Mois) t.			31		66	21
	4		1.0	-SS-2: ODOT A-7-6 (20)							
SS-3 8 1	1 16	56	- - -					22	!		
SS-4 12 1	7 23	67	2.0					18	,	1	
SS-5 8		78	3.0			3.0	,] 14			
: 	30		3.0_	Bottom of Boring = 3.0 meters							
		1									
:									1		 :

SAMPLE TYPE

SS - 5. Tem OD Split Social

GS - Geoprobe Sample

ST - Shelby Tube

RC - Rock Core

35 Auger Sample

GROUND WATER READING

At Completion — N/A

After 24 Hrs V N/A

BORING METHOD

HSA - Hollow Stem Augers SFA · Solid Flight Augers MD · Mud Dritting

WD Wash Drilling RC - Rock Coring



REPORT OF SOIL EXPLORATION

Client Sve	erdrup A	ssociat	es, Inc.	Boring	Numbe	r <u>B-1</u>	31
Project _AT	H/MEG-	33-30.9	980/0.000	Sheet	1	of	
Project Numb	erV	V-7139		Compl	etion De	epth	10.1 m
		100	DRILLING AND SAMPLING INFORMAT	Da Di ION	ate Finis rilled By.		25/98
MOTUTING	129882		Mari e	_	Method		3.5 kg
easung	639782				er Weig -	····	6 cm
Elevation	248.2 n			Hamm	er Drop	MOISTURE	ATTERBERG
AMPLE BLOWS NO PER 15cm	RECOVERY	DEPTH	SOIL DESCRIPTION		**************************************	CONTENT	LL PL
S-1 2 2	83	=	Brown SILT, some fine sand, little clay, to organics (Topseil). Moist.	race —	0.1	24	i
3 55-2 8	78	- -	Brown SILTY CLAY, little fine sand, trace coarse sand. Medium stiff to hard. Mois			22	:
25 44		-					1
		1.0			1.1		1
SS-3 50/13cm	90	-	SANDSTONE; brown, moderately hard, massive, medium to coarse grained, micaceous.			8	:
		2.0					
	1	· -					
RC-1	i						
	į						
	1	3.0					
			-qr (@ 3.5 m) = 23.82 MPa				
		4.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 77%			:: :- :- :-	
					- :::		
NOTES.							

SAMPLE TYPE

- 55 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelliy Tuba
- AC Hock Com AS - Auger Sample

GROUND WATER READING m

Alter 24 H/s ▼ N/A

"Wash water used during the rock coring process.

BORING METHOD

HSA - Hollaw Stem Augers SFA Solid Flight Augers

- MD Med Driding
- WO Wash Di ng
- BC Book Co. cg



Clier	,, Sv	erdrup A	ssociate	s, Inc.	Boring :	Numbe	B-1	31	
Proje	··			80/0.000	Sheet .	2	of	2	<u> </u>
_	ect Numb	berV	V-71 3 9		Comple	tion D	epth	10.1	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	417		MOISTURE CONTENT	ATTE	RBERG PL
RC-3		RECOVERY	5.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 78%					
			9.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 92% Bottom of Boring = 10.1 meter		0.1			



REPORT OF SOIL EXPLORATION

Clier	nt Sve	erdrup A	Associat	es, Inc.	Boring Nu	ımbe	r <u>B</u> -	132	
Proie	ect AT	H/MEG-	33-30.5	980/0.000	Sheet	1	of	3	3
•	ect Numb	erV	V-7139		Completic				m
		40000		DRILLING AND SAMPLING INFORMATION	Date Drille	Finis d By		25/98 .F.	0.4/0.0
Nort	mry	129825			Boring Me	ethod			
East	"'y	639752			Hammer	Weig	ht6	3.5 kg	
Elev	ation	247.1 n	n		Hammer I	Drop		'6 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE:	ATTE LL	RBERG PL
SS-1 SS-2	8	61 50	-	Brown SiLT, some fine sand, little clay, tra organics (Topsoil). Moist. Brown SILTY CLAY, little fine sand, trace coarse sand. Medium stiff. Moist.	o.e		11		
\$\$-3 RC-1	28 50/13cm	60	2.0	Red and brown weathered SANDSTONE. Very soft bedrock. SANDSTONE; light brown, medium, mass. medium grained, friable, cross-bedded, slightly weathered, slightly jointed. -qr (@ 2.4 m) = 13.25 MPa -RC-1: Recovery = 95% -Core Loss = 13 cm	1.:				
RC-2			3.0	-Core Loss = 13 cm -RQD = 75%					

SAMPLE TYPE

- SS · 5.1cm QD Split Spoon
- GS Geoprobe Sample
- RC Rock Care AS Auger Sample
- ST Shelby lube

"Wash water used during the rock coring process.

GROUND WATER READING

4: Completion - N/A *

array 24 Hrs V N/A

BORING METHOD

- HSA Hollow Stem Augus SFA Solid Flight Augus
- 51D Mud Drilling
- UVD Wash Drillow;
- RC Rock Coring



Clien	t Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	er <u>B</u> -1	32
Proje	4.7	H/MEG-	33-30.5	980/0.000	Sheet 2		3
-	ct Numb	erV	V-7139		Completion D		17.1 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL FL
			5.0	-RC-2: Recovery = 97% -Core Loss = 9 cm -RQD = 66%			
RC-3			7.0	-loss of water circulation @ 6.8 m SANDSTONE; gray to brown, moderately hard, massive, fine to coarse grained, micaceous, cross-beddedcalcareous from 7.2 to 9.0 meters	7.1		
			8.0	-qr (@ 8.2 m) = 38.76 MPa		:	; ; ;
			9.0	-RC-3: Recovery = 99% -Core Loss = 3 cm -RQD = 80%			
RC-4			10.0				· ·
		:	11.0		4 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		



Project Number W-7139 Completion Depth 17.1 n SAMPLE SLOWS FERCENT RECOVERY RECOVER	Clier	, Sv	erdrup A	ssociate	s, Inc.	Boring Nu	mbe.	r	B-1	32	
SAMPLE		47	H/MEG-	33-30.9	80/0.000				of	3	?
SAMPLE SLOWS FRCENT DePth SON DESCRIPTION MOSTREE LT	-		oer V	V-7139	, <u>.</u>	Completio	n De	epth		17.1	m
12.0Care Lass = 3 cm -RQD = 71% 13.0RC-5: Recovery = 99% -Core Lass = 3 cm -RQD = 70% 16.0 -RC-6: Recovery = 84% -Care Lass = 12 cm -RQD = 35%	SAMPLE	BLOWS	PERCENT	DEPTH	SQIL DESCRIPTION						RBERG PL
16.0 -Core Loss = 3 cm -RQD = 70% 16.0 -RC-6: Recovery = 84% -Core Loss = 12 cm -RQD = 35% -RQD =				13.0	-Core Loss = 3 cm						
RC-6: Recovery = 84% -Core Lass = 12 cm -RQD = 35%				15.0	-Core Loss = 3 cm						
	RC-6				-Core Loss = 12 cm -RQD = 35%	m ,,			:		
Bottom of Boring = 17.1 meters		_!			Bottom of Boring = 17.1 meters			1			1



REPORT OF SOIL EXPLORATION

	_			REPORT OF SOIL EXPLORATION		. àa	
Clier	· · · · · · · · · · · · · · · · · · ·	erdrup A			er <u> </u>	133	
Proje	ect A			980/0.000 Sheet1	of		
Proje	ect Numi	berV	V-7139	Completion D	epth	7.9 n	7
				Date Stal Date Fini Drilled By	shed: 2/	26/98	
Non	thing	129779	.229	DRILLING AND SAMPLING INFORMATION Boring Metho	d 8.3	cm HS	A/RC
	ting	639745	.270	Hammer Weig	_	3.5 kg	
	ation	238.9 n		Hammer Drop	٠ -	6 cm	
SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION	MOISTURE	ATTER	
NO 1	PER 15cm	RECOVERY	DEPIH		CONTENT	NP.	PL NP
SS-1	2 2	17		Brown SILTY fine SAND, little organics, trace 0.1] '/	/V/	IVI
SS-2	2	67	1.0_	Brown SILTY SAND, trace clay. Soft to very stiff. MoistSS-1: Visual ODOT A-3a	15		
SS-3	14 14 13	34	-	Brown weathered SANDSTONE. Very soft & X bedrock.			
SS-4	15 24 50/13cm	71	2.0				
SS-5 RC-1	50/15cr	n 67	3.0	SANDSTONE; brown, medium, highly broken, coarse grained, friable, moderately weathered.			
	i 1		4.0	-RC-1: Recovery = 60% -Core Loss = 122 cm -RQD = 0%			
NOTES	l:						

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- S1 Sheiby Tube
- HC Rock Core
- VS Vager Simple

GROUND WATER READING

At Completion = N/A *

After 24 m. VA

*Wash water used during the rock coring process.

BORING METHOD

- HSA Hollow Stem Augers SFA - Solid Flight Augers
- SFA Solid Flight Auge MD - Mud Drilling
- WD Wash Drilling RC - Rock Coring



Clier	, Sv	erdrup A	ssociate	es, Inc.	Boring .	Numbe	B-1	<i>33</i>	
Proje	4.7	H/MEG-	33-30.9	80/0.000	Sheet	_	of	2	
•	ect Numb	er V	V-7139		Comple	etion D	epth	7.9 /	<u> </u>
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ДЕРТН	SQIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	BERG PL
			5.0	-brown siltstone lens from 5.7 to 5.8 m		5.8			
RC-2			6.0	SANDSTONE; brown, medium, highly brok medium grained, micaceous, with highly weathered SILTSTONE lenses up to 1 cm thick. -RC-2: Recovery = 48%	ken,				
			7.0_	-Core Lass = 111 cm -RQD = 0%		7.9			
				Bottom of Boring = 7.9 meters					
	i i								



REPORT OF SOIL EXPLORATION

			Siz	erdrup A	esociat	es Inc	£	134	
Clie				•		BUILING INDITION			
Proj		_				980/0.000 Sheet 1	0		2
Proj	ect	Nu	mb	erv	V-7139	Completion L	epth _	5.8	<i>m</i>
						Date Sta Date Fin. Drilled B	shed: 3		
Non	hin	a		129706	.500	DRILLING AND SAMPLING INFORMATION Boring Methol	nd 8.	3 cm HS	SA
East		•		639740	.332	Hammer Wei		63.5 kg	
Elev	-			217.5 n	,**	Hammer Oron	9,,,,	76 cm	
SAMPLE NO	T 4	BLOW.		PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTUR CONTENT		RBERG
SS-1	1	.,, ,,,,		11		Brown fine SANDY SILT, little organics, trace 0.050	id. 17	- 4	P(
	2	1	2 5	72		clay (Topsoil). Moist. Brown fine to coarse SAND, little clayey silt, trace fine gravel. Very loose to medium dense. MoistSS-2: ODOT A-2-4 (0)	16	24	15
SS-3	4	6	7	56	1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	19		
ST-4				69	2.0	Brown and gray CLAY, some silt, trace coarse to fine sand. Very stiff to hard. MoistST-4: ODOT A-7-6 (17); uw = 19.34 KN/m3	29	51	22
SS-5			17	44	3.0		25		
SS-6 ,		25 3	86	67			13		
NOTES:		Elev	/ati	on is appro	xımate				

SAMPLE TYPE

- SS 5.1cm QD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core
- AS Auger Sample

GROUND WATER READING

At Completion S. N/A m

Alter 24 Hrs V. N/A

BORING METHOD

HSA - Hollow Stem Augers SFA - Solid Flight Augers

MD - Mod Drilling

WD - Wash Drilling

RC Rock Coring



Clier	t = Sve	erdrup A	ssociat	es, Inc.	Boring Number	B-134
Proje	ect AT			980/0.000	_	of2
Proje	ct Numb	erV	V-7139		Completion Depth	
ŞAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SQIL DESCRIPTION	MOISTU CONTEN	
SS-7	4 7	86	5.0_	Gray SHALE. Hard soil/very soft bedrock.	5.6	
	50/3cm			Bottom of Boring = 5.8 meters		
			:			



REPORT OF SOIL EXPLORATION

Clien	ntSve	erdrup A	ssociat	es, Inc.	Boring Number	r	135
Proje	ect AT	H/MEG-	33 <u>-30.</u> 5	980/0.000	Sheet1	of	3
-	ect Numb	erV	V-7139		Completion De	epth _	17.1 m
,				DRILLING AND SAMPLING INFORMATION	Date Star. Date Finis Drilled By.	hed: 3/ : M	/3/98 .F.
Norti	hing	129568	.141		Boring Method	,	cm HSA/RC
East	ing	639862	.175	A = 0.4457777	Hammer Weig	,,,	53.5 kg
Eleva	ation	255.5 n	7		Hammer Drop	, <u>.</u>	76 cm
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
	2	44	_	Brown SILT, little organics, trace coarse to	, , ,	34	
\$S-2	2 3 4	78	-	Vine sand (Topsoil). Moist. Brown SILT and CLAY, little coarse to fine sand. Soft to very stiff. Moist.		21	
	16 27 50/15cm	67	1.0	Light brown CLAY-SHALE. Hard soil/very soft bedrock.	0.9		
SS-4	50/15cn	67	2.0_				
RC-1			3.0	SANDSTONE; brown and gray, medium to moderately hard, slightly broken, medium coarse grained, micaceous, cross-bedded, friable.			
			4.0	-RC-1: Recovery = 95% -Core Loss = 10 cm -RQD = 31%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
NOTES.	:		·			·	···

SAMPLE TYPE

- SS 5.1cm OD Spin Spoon
- GS Geoprobe Sample
- 57 Shelby Tuse FC Book Corr
- AS Auger Sample

After 24 Hrs X N/A m

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

IVD Wash Drilling

RC - Back Coring



Çlier	, Sv	erdrup A	ssociat	es, Inc.	Boring Number	B-1	35	
Proje		H/MEG-	33-30.9			of	3	,
=	ect Numb		V-7139		Completion Dep		17.1	m
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION	MC	DISTURE DISTURE	ATTEI LL	RBERG PL
RC-3	PER 15cm	RECOVERY	5.0	-qr (@ 6.0 m) = 14.64 MPa -RC-2: Recovery = 97% -Core Loss = 9 cm -RQD = 28%		WEN	u.	PL.
RC-4 RC-5			10.0	-RC-3: Recovery = 97% -Core Loss = 9 cm -RQD = 11% -RC-4: Recovery = 0% -Core Loss = 30 cm -RQD = 0% MUDSTONE; gray, very saft, highly broker non-bedded, sifty, slickensided, with rare chert nodules.	10.7			
NOTES					· · · · · · · · · · · · · · · · · · ·			• •



Client	verarup +	SSUCIBI	es, mc.	Boring Nu	ımbe	r	130	
ProjectA	TH/MEG-	33-30.5	980/0.000	Sheet	3	of	3	ľ
Project Num	berV	V-7139		Completio			17.1	m
SAMPLE BLOWS NO PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	RBERG FL
RC-6		12.0	-RC-5: Recovery = 96% -Core Loss = 6 cm -ROD = 0% SILTSTONE; gray, medium, highly broken, micaceous. CLAY-SHALE; brown, soft, highly broken, silty, slightly micaceous. SANDSTONE; brown, medium, massive, fi to medium grained, cross-bedded, slightly		, i			
		13.0	friable. -RC-6: Recovery = 100% -No Core Loss -RQD = 29%					
3 <i>C</i> -7		15.0	-qr (@ 15.5 m) = 16.38 MPa					
		16.0	-RC-7: Recovery = 93% -Core Loss = 13 cm -RQD = 64% Bottom of Boring = 17.1 meters	17.1				



REPORT OF SOIL EXPLORATION

Cliei	<i>"</i>	erdrup A		A STATE OF THE STA	Boring	Num	be.	r	136	
Proje	ect <u>A</u> 7	H/MEG-	33-30.5	980/0.000	Sheet		1	of		
Proje	ect Numb	perV	V-71 3 9		Compl	etion	De	epth	26.5	מד
					Da	ate S ate Fi rilled	inis	hed: 3/		
Mad	hing	129478	.282	DRILLING AND SAMPLING INFORMATION	ON <i>Boring</i>	Mari	haa	, 8.3	cm HS	A/RO
East	-	639967			Hamm				3.5 kg	-
	ation	263.0 п	7**		Hamm		•		6 cm	
NO NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			,	MOISTURE CONTENT	ATTER LL	BERĞ PL
S-1	1 12	83		Brown SILTY fine SAND, little organics, to clay (Topsoil). Moist.	ace /	0.0	П	23	NP	NP
S-2	20 14 20 26	67	- - - - - - - - - - - - - - - - - - -	Brown CLAYEY SILT, little fine sand, trace coarse sand. Hard. Moist. -SS-1: ODOT A-4a	?			10		
	33 44 50/15cm	100	1.0	Variegated brown, red, and gray weathere MUDSTONE. Very soft bedrock.	d	1.0	134			
S-4	26 36 44	89	2.0				2013 132 233			
S-5	26 50/13cm	73	3.0			1				
S-6		100	4.0			:			:	
	50/8cm		Ţ	MUDSTONE; variegated red, brown, and		4.4	- 13	1		

SAMPLE TYPE

- SS 5,1cm OD Split Spoon
- GS Geoprobe Sample
- S7 Shelby Tube
- BC Ruck Care AS - Nuger Sample

GROUND WATER READING

At Completion

Afrer 24 His V N/A

*Wash water used during the rock coring process.

BORING METHOD

- HSA Hollow Stem Augers
- SFA · Solid Flight Augers
- MD Mud Drilling
- NVD Vash Dritting
- AC Rock Corny



RC-2 Signature	
SAMPLE BLOWS PERCENT OEPTH SOIL DESCRIPTION MOISTURE CONTENT ATTERN RECOVERY OEPTH RECOVERY OEPTH SOIL DESCRIPTION MOISTURE CONTENT ATTERN RECOVERY OEPTH OEPTH RECOVERY OEPTH RECOVERY OEPTH RECOVERY OEPTH RECOVERY OEPTH OEPTH RECOVERY OEPTH OEPTH RECOVERY OEPTH	
SAMPLE NO PER 15cm PERCENT RECOVERY DEPTH SOIL DESCRIPTION MOISTURE CONTENT IL SOIL D	
RC-2 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-4 RC-3 RC-3 RC-4 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-3 RC-4 RC-3	RG PL
RC-2	- · ·
RC-3 -RC-2: Recovery = 98% -Core Loss = 3 cm -RQD = 0% -RC-3: Recovery = 44% -Core Loss = 39 cm -RQD = 0%	
8.0RC-3: Recovery = 44% Core Loss = 39 cm -RQD = 0%	
RC-4	
-RC-4: Recovery = 22% -Core Loss = 64 cm -RQD = 0%	
-RC-5: Recovery = 60% -Core Loss = 30 cm -RQD = 0%	
RC-6 10.0 - RC-6; Recovery = 72% - Core Loss = 14 cm - RQD = 0%	
11.0	



Clien	otSv	erdrup A	ssocia	es, Inc.	Boring No	ımber	B-1	36
Proje	ct A	TH/MEG-	<i>33-30</i> .	980/0.000	Sheet	3	of	5
Proje	ct Numl	berV	V-7139	The second state of the se	Completic	on Dep	th	26.5 m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			DISTURE DINTENT	ATTERBERG LL PL
RC-8			12.0	-RC-7: Recovery = 10% -Core Loss = 137 cm -RQD = 0%			7 77	
AC-6			13.0	-RC-8: Recovery = 88% -Core Loss = 16 cm -RQD = 0%				
RC-9 RC-10			14.0	-RC-9: Recovery = 100% -No Core Loss -RQD = 0% -slickensided from 13.7 to 15.2 m				
RC-11			15.0	-RC-10: Recovery = 96% -Core Loss = 6 cm -RQD = 8% -gray, medium hard SILTSTONE lens from 15.1 to 15.4 m SANDSTONE; brown to gray, medium,	7 15.4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
			16.0	massive, fine to medium grained, cross-bedded, micaceous, slightly friableRC-11: Recovery = 100% -No Core Loss -RQD = 80% -qr (@ 16.2 m) = 21.24 MPa				
RC-12		:	17.0					
NOTES	++ E/a	:	18.0	-RC-12: Recovery = 96% -Core Loss = 6 cm -RQD = 35%				!



Clien	nt\$vo	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-1</u>	36	
Proje	ect AT	H/MEG-	33-30.5	980/0.000	Sheet4	of	5	<u> </u>
	ect Numb	G1	V-7139	Walter Marie Control of the Control	Completion De		26.5	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTEI LL	RBERG PL
RC-13			19.0	-slightly broken from 18.3 to 21.1 m -RC-13: Recovery = 100% -No Core Loss -RQD = 33%				
RC-14			20.0		• • • • • • • • • • • • • • • • • • •			
			21.0	-RC-14: Recovery = 96% -Care Loss = 6 cm -RQD = 27% CLAY-SHALE; gray, soft to medium, high!	21.1			
RC-15			-	broken, silty, slightly pyritic, with interbedded gray, moderately hard SILTSTONE lenses up to 8 cm thick.				
			22.0	-qr on siltstone (@ 21.9) = 52.08 MPa -RC-15: Recovery = 100% -No Core Loss -RQD = 16%				
RC-16			23.0	-RC-16: Recovery = 50% -Core Loss = 30 cm -RQD = 0%	7.5 23.4 23.4			
RC-17			24.0 <u> </u>	MUDSTONE; red and gray, very soft to medium hard, highly broken, calcareous, non-bedded, slickensided, silty. -RC-17: Recovery = 58% -Core Loss = 40 cm -RQD = 0%			-	
RC-18		. :	25.0	-reddish brown fine SANDY SILT present from 24.3 to 24.7 m -RC-18: Recovery = 100% -No Core Loss -RQD = 0%				



Clier	nt <u>Sv</u>	erdrup A	ssocia	tes, Inc.	Boring Nur	nbe	r <u>B-</u> 1	136	
Proje	ect A7			980/0.000	Sheet	5	of	5	:
Proje	ct Numb	er <u>V</u>	V-7139	WILL S	Completion	n De	epth	26.5	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTEI LL	RBERG PL
RC-19			- - - - -	-RC-19: Recovery = 25% -Core Loss = 46 cm -RQD = 0%					
			26.0	-RC-20: Recovery = 95% -Core Loss = 5 cm -RQD = 0%	26.5				
				Bottom of Boring = 26.5 meters					
								:	
		!							
; ;	;								
	; ; ;								
			!		:	•			
NOTES:	** Elevation	on is appro	ximate: I	NP = Non-plastic sample.		:			



REPORT OF SOIL EXPLORATION

Clie	···	erdrup A			Boring I	Vumbe	r	B-137	
Proj	ect A7			980/0.000	Sheet _	1		of	2
Proj	ect Numb	perv	V-7139	·	Comple	tion De	epth	10.	1 m
					Dat		hed:	3/3/98 3/3/98 M.F.	
Non	thing	129392	.130	DRILLING AND SAMPLING INFORMATI	ON <i>Boring (</i>	/lethoc	, _8	.3 cm l	-ISA/R(
East	ting	639882	.672		Hamme.	. Weig	ht _	63.5 k	g
Elev	ation	258.1 n	7		Hamme	_		76 cm	
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	r. No on the security formal		MOISTU		TERBERG PL
S-1	1 2	44	-	Dark brown CLAYEY SILT, little organics, trace fine sand (Topsoil). Moist.	$\int_{-\epsilon}^{\epsilon}$		32		
S-2	2 3 4	83	1.0	Brown to red SILTY CLAY, trace fine grav trace coarse to fine sand. Soft to stiff. Moist. -SS-2: ODOT A-6b (11)	el,		27	37	18
S-3	4 4 7	56					28		
	30 36 50/10cm	63	2.0	Brown highly weathered SANDSTONE. Vissoft bedrock.		8			
S-5	12 20 35	72	3.0						
			4.0		ā	.1			
C-1			1	SANDSTONE; brown to gray, medium, massive, medium grained, micaceous, cross-bedded, friable.				!	

SAMPLE TYPE

- SS 5 1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core AS - Auger Sample

After 24 Hrs 👤 N/A

*Wash water used during the rock curing princess.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling WD - Wash Drilling

AC - Hock Corng



Clier	ntSv	erdrup A	ssociat	tes, Inc.	Boring Nui	nbe	, <u>B-1</u>	37	
Proje	ect A7	H/MEG-	33-30.		Sheet	2	of	2	
	ect Numb	erV	V-71 <i>3</i> 9	100.00	Completion	n De		10.1	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTEI LL	RBERG PL
			5.0	-RC-1: Recovery ≈ 99% -Core Loss = 3 cm -RQD = 64% -qr (@ 6.9 m) = 24.24 MPa					
			9.0	-RC-2: Recovery = 100% -No Core Loss -ROD = 62% MUDSTONE; gray, very soft to soft, highly broken, non-bedded, micaceous, slightly pyritic. Bottom of Boring = 10.1 meters	9.1				
NOTES:		<u></u> 1				!			



REPORT OF SOIL EXPLORATION

Client Sverdru	up Associate	es, Inc B	oring Numbe	r <u>B-1</u>	38	
	1EG-33-30.9			of		
Project Number			ompletion De	epth	1.7 n	7
Project Number	****	DRILLING AND SAMPLING INFORMATION	Date Start Date Finis Drilled By:	ted: 3/. hed: 3/. : M.	2/98 2/98 F.	
Northing 129	273.649		oring Method	8.3	cm HS	'A
•	987.372		lammer Weig	ht <u>6</u>	3.5 kg	
-	3.6 m	<i>h</i>	lammer Drop	7	6 cm	
SAMPLE BLOWS PERI	CENT DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	BERG PL
	51	Brown SILTY fine SAND, little organics, trac	e	·		
	7.0	clay (Topsoil). Moist. Brown fine SANDY SILT, little coarse sand, little clay, trace fine gravel. Soft to medium stiff. MoistSS-1: Visual ODOT A-4a Brown SILTY CLAY, trace coarse to fine sand, trace fine gravel. MoistST-2: ODOT A-7-6 (15) Brown highly weathered SANDSTONE. Ver soft bedrock. Auger refusal @ 1.7 meters Bottom of Boring = 1.7 meters	1.1	23	46	21
NOTES: SAMPLE T SS - 5. tem OO Spin		GROUND WATER READING At Completion = N/A m		BORING ow Stem Augen Flight Augen	ers	

After 24 Hrs V/A m

MD - Mud Drilling

WD - Wash Dolling

RC - Rock Coring

GS - Geoprobe Sample

57 - Shelby Tube

AS - Auger Sample

RC Back Core



REPORT OF SOIL EXPLORATION

Clien	, Sve	erdrup A	ssociat	es, Inc.	Boring Numb	nerB-	139	
Proie	ct ATI	H/MEG-	33- <i>30.</i> 9	980/0.000	Sheet	1 of	2	
Proje	ct Numb	er V	V-7139		Completion (Depth _	9.2 n	7
						arted: 3/ nished: 3/ By: M.	6/98	
Norti	hing	129119	.547	DRILLING AND SAMPLING INFORMATI	ON Boring Meth	od 8.3	cm HS	:A/RC
East	ū	640059	.404		Hammer We	ight6	3.5 kg	
Eleva	_	249.6 n	7 * *		Hammer Dro	7	'6 cm	
SAMPLE	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTE!	RBERG PL
SS-1	2	44		Brown SILTY fine SAND, little organics, to clay (Topsoil). Moist.	race 0.0	20		
SS-2	2 3 6 10	89	-	Brown SILTY fine SAND, little clay, trace gravel, trace coarse sand. Soft to very st MoistSS-2: ODOT A-4a (1)		15	NP	NP
SS-3	7 10 15	78	1.0			15		
SS-4	14 44 50/8cm	80	2.0	Brown highly weathered fine grained SANDSTONE. Very soft bedrockSS-4: Visual ODOT A-3a	1.8	10		

NOTES: ** Elevation is approximate; NP = Non-plastic sample.

3.0

4.0

SAMPLE TYPE

73

94

- SS 5.1cm OD Spin Spoon
- GS Geoprobe Sample
- ST Shalby Tube RC - Rock Core

13 16

SS-5

SS-6 12

41 50/13cm

AS - Auger Sample

GROUND WATER READING

Brown SILTY CLAY, little coarse to fine sand.

Al Completion = N/A *

After 24 Hrs V N/A

Very stiff. Moist.

*Wash water used during the rock coring process.

BORING METHOD

H\$A Hallow Stem Augers

7

18

- SFA Solid Flight Augers
- MD Mud Drilling
- IVO Wash Dolling
- AC Rock Coring



REPORT OF SOIL EXPLORATION

Clien	_t Sv	erdrup A	ssociate	es, Inc.	Boring	Numbe	r	33	
Proje	47	H/MEG-	33-30.5	980/0.000	Sheet .	2	of	2	
-	ct Numb	oerV	v-7139		Comple	etion De		9.2 m	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTERI LL	BERG PL
			5.0	Brown changing to gray, highly weathered fine grained SANDSTONE. Very soft bedrock.		4.9			
RC-1			6.0	CLAY-SHALE; gray, soft, highly broken, sin micaceous, slightly weathered. MUDSTONE; red and gray, very soft to sof highly broken, non-bedded, silty, with nodular limestone.		6.1			
RC-2			7.0	-RC-1: Recovery = 79% -Core Loss = 26 cm -RQD = 0% -RC-2: Recovery = 40%		1000 1000 1000 1000			
RC-3			8.0_	-Care Loss = 37 cm -RQD = 0% -RC-3: Recovery = 50% -Care Loss = 23 cm -RQD = 0%					
RC-4			9.0	$_{\perp}$ -RQD = 0%		9.1			
				Bottom of Boring ≈ 9.1 meters					

.....



SFA · Solid Flight Augers

MD · Mud Drilling

RC - Rock Coring

WD - Wash Drilling

REPORT OF SOIL EXPLORATION

Clier	Sve	erdrup A	ssociat	es, Inc.	Boring Number	. <u>B-1</u>	40	
	,, <u> </u>				Sheet1	of		
-	ct Numb	1/	V-7139		Completion De	oth	9.1 n	7
rioje	ect Namb			DRILLING AND SAMPLING INFORMATION	Date Start Date Finis Drilled By:	ed: 2/2 hed: 2/2 M.	27/98 F.	
Nort	hing	128997	.562	DRIBBING THE STATE BATTON TO THE STATE OF TH	Boring Method	8.3	cm HS	A/RC
East	ing	640104	.744		Hammer Weigi	ht6	3.5 kg	
	~	251.6 n	7		Hammer Drop	7	6 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE	ATTER LL	BERG PL
\$ S -1	3	78		Brown SILTY fine SAND, little clay, trace	0.1	20		
	2			organics (Topsoil). Moist.	/			
SS-2	2	83	-	Brown SILTY fine SAND, little clay, trace coarse sand, trace fine gravel. Soft to still	y .	18		
33-2	6		-	Moist.	.			
	8	İ	-	-SS-2: Visual ODOT A-4a				
			1.0		1.1			
SS-3	1	100	-	Brown weathered SANDSTONE. Very sof bedrock.	t 🔀	14		
	33 50/15cm		_	bedrock.				
	90/15cm		_		7.			
00.4	50/40	co	_					
55-4	50/13cm	60	2.0 _		7.			
			-					
)					
	i	į	-		2.7			
RC-1		:	20-	SANDSTONE; brown to dark brown, medi fine grained, slightly broken, micaceous.	um,			
			3.0_	inte grained, siightiy broken, micaccous.				
	1		-	<u>:</u> }				
			-	<u>:</u> !				
	İ		-		:::	ļ		
		:	:	-RC-1: Recovery = 75%				1
			4.0	- ·Core Loss = 46 cm 				
	i		-	- 11db = 00 %	:::	i		
1	1			<u>.</u>				1
	i 			-gray limestone lens from 4.4 to 4.5 m	4.5	1		<u> </u>
NOTES	\$ <i>t</i>							
! !								
	SAMP	LE TYPE	•	GROUND WATER READING		BORING I		
	\$\$ - 5.1cm O	Split Spoor	,	At Completion — N/A * m	HSA - Holla	w Stem Aug	ers	

Atter 24 Hrs V. N/A

*Wash water used during the rock coring process.

GS - Geoprate Sample

ST - Shelby Tube

AS - Auger Sample

RC - Rock Core



REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.	Boring NumberB-140
Project ATH/MEG-33-30.980/0.000	Sheet2 of2
Project Number W-7139	Completion Depth9.1 m

Proje	ect Numb	er	V-/139	Comp	letion De	epth	9,111	<u></u>
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	BERG PL
RC-2			5.0	SANDSTONE; gray, hard, massive, fine grained, calcareous, micaceousqr (@ 4.7 m) = 52.30 MPa				
			6.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 70%	6.4			
			7.0	SANDSTONE; dark brown to brown, medium to moderately hard, slightly broken, slightly jointed, fine to medium grained, micaceous, cross-bedded, slightly carbonaceous.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
RC-3			8.0	MUDSTONE; brownish gray, soft, highly broken, non-bedded, silty.	7.8			
			9.0	-RC-3: Recovery = 100% -No Core Lass -RQD = 24%	9.1			
			-	Bottom of Boring = 9.1 meters				
						!		
						* a		

NOTES:



REPORT OF SOIL EXPLORATION

Clien	. Sve	erdrup A	ssociat	es, Inc.	Boring Number	r <u>B-1</u>	41
	"			980/0.000	_	of	2
Proje		1.4	V-7139		Completion De		
Proje	ect Numb	er <u>*</u>	<i></i>	DRILLING AND SAMPLING INFORMATI	Date Star Date Finis Drilled By	ted: 3/8 hed: 3/8 : M	3/98 3/98 F.
Nort	hing	128784	.330	DRILLING AND UNIN BING IN GRANT	Boring Method		cm HSA/RC
East	ing	640191	.047		Hammer Weig	ht6	3.5 kg
Eleve	-	244.2 n	7**	LWF9	Hammer Drop	70	5 cm
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
SS-1	16 34 42	78	-	Gray fine to coarse GRAVEL. Very dense Damp. Brown highly weathered SANDSTONE with silty clay interbeds. Very soft bedrock.	/ /::	11	
\$S-2	50/10cm	50	1.0	SANDSTONE; brown, soft, highly broken, very fine grained, silty, micaceous, friable			
SS-3	50/8cm	100	2.0				
RC-1			3.0 _ - - -				
			4.0	-RC-1: Recovery = 96% -Core Loss = 7 cm -RQD = 0%			
NOTES	: •• Eleva	tion is app	roximate.	No. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.			
<u></u>	CANID			GROUND WATER READING		BORING M	METHOD

SAMPLE TYPE

\$\$ 5.1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

RC Rock Core

AS - Auger Sample

After 2-1 Hrs . Y N/A

*Wash water used during the rock coring process.

HSA - Hollow Stem Augets

SFA - Solid Flight Augers

MD Mud Drilling WO - Wash Oriting

RC - Bock Coring



Clien	, Sve	erdrup A	ssociate	es, Inc.	Boring	Nur	nbe	. <u>B-1</u>		
Proje		H/MEG-	33-30.9	080/0.000	Sheet		2	of	2	<u>:</u>
-	ct Numb	er V	V-7139		Comple	etioi	n De	epth	6.1 r	<u>n</u>
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SQIL DESCRIPTION				MOISTURÉ CONTENT	ATTEI LL	RBERG PL
RC-2			5.0_	SANDSTONE; dark brown, medium, slight broken, micaceous, cross-bedded.	tly	4.6				
			6.0	-qr (@ 5.3 m) = 26.43 MPa -RC-2: Recovery = 83% -Core Loss = 26cm -RQD = 45%		6.1				
			1	Bottom of Boring = 6.1 meters						
								.		



REPORT OF SOIL EXPLORATION

ATI		33- 30 .9	980/0.000	Sheet	1 of	2	
Numbe	er V		101	meet	or		
		V-7139		Completion .	Depth	7.9 n	1
					arted: 3/ nished: 3/ By: M.	13/98	
ıg	128629	.446	DRILLING AND SAMPLING INFORMATIO	N Boring Meth	<i>ou</i>	cm HS	A/RC
•	640261	.239		Hammer We	eight <u>6</u>	3.5 kg	
	247.0 n	າ		Hammer Dro	op7	6 cm	
BLOWS	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION	4.100	MOISTURE CONTENT	ATTER	BERG PL
2	56		Brown SILTY fine SAND, little organics, trac clay (Topsoil). Moist.	ce - 0.1	23		
6 11	83	101	Brown fine SAND, little coarse sand, little s and clay, trace fine gravel. Very loose to very dense. Moist. -SS-2: ODOT A-3a	ilt .	15		
17 24	100	1.0			. 14		-
9 0/1 <i>3cm</i>	73	2.0	-SS-4: ODOT A-3a Brown SANDSTONE. Very soft bedrock.	2.0	10		
			·	2.7	• •		
		3.0	SANDSTONE; brown, medium, highly broke fine to medium grained, micaceous, cross-bedded, friable.	en,			
		4.0	-RC-1: Recovery = 95% -Core Loss = 9 cm -RQD = 0%				
9	2 2 6 11 17 24	247.0 n LOWS FEACENT RECOVERY 56 2 2 83 6 11 100 17 24	247.0 m LOWS FERCENT RECOVERY OFFTH 2 83 6 11 1.0 100 17 24 73 2.0 3.0	TOWNS PERCENT DEPTH SOIL DESCRIPTION 1 SOIL D	THE PROPERTY SOIL DESCRIPTION A 15cm PERCENTY RECOVERY PARTY SOIL DESCRIPTION Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. Brown fine SAND, little coarse sand, little silt and clay, trace fine gravel. Very loose to very dense. Moist. -SS-2: ODOT A-3a 1100 17 24 73 2.0 SANDSTONE: brown, medium, highly broken, fine to medium grained, micaceous, cross-bedded, frieble. -RC-1: Recovery = 95% -Core Loss = 9 cm	TOWNS PERCENT OFFTH SOIL DESCRIPTION MOISTURE CONTENT 2 2 83 Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. Brown fine SAND, little coarse sand, little silt and clay, trace fine gravel. Very loose to very dense. MoistSS-2: ODOT A-3a 117 24 73 2.0 Brown SANDSTONE. Very soft bedrock. SANDSTONE; brown, medium, highly broken, fine to medium grained, micaceous, cross-bedded, friable. -RC-1: Recovery = 95% -Core Loss = 9 cm	THE COVERY DEPTH SOIL DESCRIPTION SOIL D

SAMPLE TYPE

SS - 5.1cm QD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

RC - Rack Cure AS - Auger Sample

GROUND WATER READING
At Completion = N/A * ____ m

Aller 24 Hrs Y. N/A

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD · Mud Drilling

WD Wash Drilling

RC - Rock Corne



REPORT OF SOIL EXPLORATION

SAMPLE		erdrup A H/MEG-			Boring Numbe		-
Proje SAMPLE	·				Sheet2	of .	2
SAMPLE	Ct Mailin	ر م V	V-7139	WW	Completion De		7.9 m
NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SQIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
RC-3			5.0	MUDSTONE; gray, very soft to soft, highly broken, silty, non-beddedRC-2: Recovery = 100% -No Core Loss -ROD = 0% -RC-3: Recovery = 100% -No Core Loss -ROD = 7% SILTSTONE; gray, medium, massive, arenaceous, micaceous, cross-beddedqr (@ 7.8 m) = 48.35 MPa Bottom of Boring = 7.9 meters	7.7		
							: :

NOTES:



REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc. Project ATH/MEG-33-30.980/0.000			Boring NumberB-143			
			Sheet1	of	3	
Project Number W-7139			Completion D	epth	18.0	n
		DRILLING AND SAMPLING INFORMATIO	Date Sta Date Fini Drilled By	shed: 3/	12/98	
Northing 128	3553.600		Boring Metho	d8.3	cm HS	A/RC
Easting 640337.139			Hammer Weight63.5 kg			
Elevation247	7.9 m		Hammer Drop	,	6 cm	
	CENT DEPTH	SOIL DESCRIPTION		MOISTURE	ATTER LL	BERG PL
SS-1 2 8	39 -	Brown SILT, some fine sand, little organics	, 0.1	27	NAME OF BRIDE	
SS-2 3 6	37	\trace clay (Topsoil). Moist. Brown SiLTY CLAY, little fine sand, trace fine gravel, trace coarse sand. Medium still to very stiff. MoistSS-2: ODOT A-6a (8)	<u> </u>	22	30	17
SS-3 8 8 8	39 1.0_ - - -			18		
SS-4 6 5	2.0.			19		
<u>SS-5</u> 50/13cm 6 RC-1	3.0	Brown SANDSTONE. Very soft bedrock. SANDSTONE; brown, medium, highly brok micaceous, fine grained, cross-bedded. -qr (@ 2.9 m) = 12.05 MPa	2.6 2.7 en,			
	4.0_	-RC-1: Recovery = 95% -Core Loss = 9 cm -RQD = 19%	4.0			
į.	-	MUDSTONE; brown to gray, very soft to soft, highly broken, silty, non-bedded,				

SAMPLE TYPE

- S5 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube RC Rock Core
- AS Auger Sample

GROUND WATER READING

At Completion = N/A *

Alter 24 His V N/A

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD Mud Drilling VVD - Wash Dolling

RC - Rock Coring



REPORT OF SOIL EXPLORATION

Clier	Svi	erdrup A	ssociate	es. Inc.	* Boring Numbe	, B-1	43	
Ciler				280/0.000	Sheet2	of	3	
	ect Numb		V-7139		Completion De		18.0	m
SAMPLE	BLOWS	PERCENT	ОЕРТН	SOIL DESCRIPTION	Completion 2	MOISTURE	ATTE	
NO RC-2	PER 15cm	RECOVERY		351, 555	1000	CONTENT	ш	PL
RC-2			5.0	00.00 000000000000000000000000000000000				
RC-3			6.0	-RC-2: Recovery = 40% -Core Loss = 91 cm -RQD = 0%	1000 1000 1000			
710 0				-RC-3: Recovery = 62%	(%) (%) (%) (%)			
RC-4			7.0	-Core Loss = 58 cm -RQD = 0% SILTSTONE; gray, moderately hard, mass	7.5			
AC-4			8.0	micaceous, arenaceous, cross-beddedqr (@ 8.0 m) = 59.75 MPa				
			9.0	-RC-4: Recovery = 100% -No Care Loss -RQD = 89%				
RC-5			11.0			1		

NOTES:



Client Sverdrup /	es, Inc.	Boring	Number	. <u>B-7</u>	43		
Project ATH/MEG	-33-30.5	980/0.000	Sheet	3_	of	3	
Project Number	W-7139		Comple	etion De	pth	18.0	m
SAMPLE BLOWS PERCENT NO PER 15cm RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	BERG PL
RC-6	12.0	-RC-5: Recovery = 95% -Core Loss = 9 cm -RQD = 44%					
	13.0	SANDSTONE; brown to light brown, moderately hard, massive, medium to coa grained, micaceous, cross-bedded, slightly friable.	rse	12.9			
	14.0	-RC-6: Recovery = 98% -Core Loss = 6 cm -RQD = 53%					
RC-7	15.0						
	16.0						•
	17.0	-RC-7: Recovery = 100% -No Core Loss -RQD = 76%					
NOTES:	18.0	Bottom of Boring = 18.0 meters		18.0			



REPORT OF SOIL EXPLORATION

Clien	,,		Sve	erdrup A	ssociat	es, Inc.	Bori	ng Nu	mbe.	r <u>B-</u>	44	
Proje			AT.	H/MEG-	33-30.5	380/0.000	She	et	1	of		
Proie			mb	erV	V-7139		Con	pletio	n De	epth	3.0 n	7
, , , , ,		,,,,		•		DRILLING AND SAMPLING INFORMATI	(ON		Finis	ted: 3/ hed: 3/ : M.	8/98	
Nort	hin	·σ_		128411	.184	BRILLING AND SAMPLING INFORMATI	Bori	ng Me	thod	8.3	cm HS	'A
East		-		640360	.868	· · · · · · · · · · · · · · · · · · ·		mer \		_	3.5 kg	
Elev	-			233.0 n	7		Han	mer L	rop	7	6 cm	
SAMPLE NO	-	BLOW ER 18		PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION				MOISTURÉ CONTENT	ATTER LL	BERG PL
SS-1	2	1		78	-	Brown fine SANDY SILT, little organics, to clay (Topsoil). Moist.	race	0.1		27	LANGE	
SS-2	4	4	3 6	67	1.0	Brown to red SILTY CLAY, some to trace gravel (rock fragments), trace coarse to fi sand. Soft to stiff. Moist. -SS-2: ODOT A-7-6 (12)				25	41	19
\$\$-3	4	5	8	61	-					27		
SS-4	3	5	5	89	2.0_					29		
SS-5	4	6	6	94	3.0_	Bottom of Boring = 3.0 meters	•	3.0	,	25		
NOTES												

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core 35 Auger Sample

GROUND WATER READING

At Completion - Dry m

After 24 Hrs Y N/A m

BORING METHOD

HSA - Hollow Stein Augers

ŞFA · Salid Flight Augers

MD - Mud Drilling WO - Wash Orilling

HC - Rack Coung



REPORT OF SOIL EXPLORATION

Clier	, Sve	erdrup A	ssociat	es, Inc.	Boring Nui	mber	B-1	45	
Proje		H/MEG-	33-30.5		Sheet	1	of	1	
•			V-7139		Completio	n Oon		2.7 n	7
Proje	ect Numb	er <u> </u>			Date : Date i Drilled	Starte Finish	d: 3/2 ed: 3/2 M.I	.7/98 27/98	
Nort	hing	128314	.725	DRILLING AND SAMPLING INFORMATIO)N <i>Boring Me</i>	thod	8.3	cm HS	<u> </u>
East	ina '	640413	. 720	,	Hammer V	Veigh	63	3.5 kg	
Eleva	•	226.6 n	7**		Hammer D	rop .	76	cm c	
SAMPLE NO	BLOWS	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION			OISTURE ONTENT	ATTÉR LL	BEAG PL
SS-1	7 2 2	72		Brown fine SANDY SILT, little coarse sand trace organics, trace clay (Topsoil). Moist Brown SILTY CLAY, some fine sand, little		7	24		
<i>SS-2</i>	2 3 4	83	1.0	fine gravel, trace coarse sand. Soft to stiff Moist. -SS-2: Visual ODOT A-6b	•		20		
SS-3	5 9 14	100	- - - -				19		
SS-4	11 19 49	61	2.0_	Brown SANDSTONE. Very soft bedrock.	2.0	• • • • • • • • • • • • • • • • • • • •	13		
SS-5	50/10cm	75	- - - -	Bottom of Boring = 2.7 meters	2.7		8		
			<u> </u>	·	·				
NOTES.	: ** Elevati	ion is appi	oximate.						

SAMPLE TYPE

SS - 5,1cm OD Split Spoon

GS - Geoprobe Sample

ST · Shelby Tube

RC - Rook Core AS - Auger Sample GROUND WATER READING

At Completion - Dry m

After 24 firs ▼ N/A

BORING METHOD

HSA · Hallaw Stem Augers

SFA - Solid Flight Augers

MD - Mud D-Wing

WD - Wash Drilling

RC - Rock Coring



R-146

REPORT OF SOIL EXPLORATION

Client	Sve	erdrup A	\ssociat	tes, Inc.	Boring Nu	mbe	r <u>B-</u>	146	
Proiec	4.	H/MEG-	33-30.5	980/0.000	Sheet	1	of	1	
	et Numb	er V	V-7139		Completio			2.0 n	
North	ning	128187	7.583	DRILLING AND SAMPLING INFORMATION	Date Date Drilled	Stari Finis d By:	ted: 3/ hed: 3/ M	/8/98 .F. I cm HS	
Eastin	ng	640493	3,258		Hammer \	Neig	· · · · · · · · · · · · · · · · · · ·	3.5 kg	
Elevat	tion	222.0 n	77	NAME OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OWNER OF THE OWNER OWNE	Hammer L	Эгор	7	76 cm	
NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MQISTURE CONTENT	ATTER LL	RBERG PL
SS-1 1	2 1	33 67	1.0	Brown SILTY fine SAND, little organics, tr. \clay (Topsoil), Moist. Brown SILTY fine SAND, little clay, trace coarse sand, trace fine gravel. Soft to ver stiff. Moist. -SS-1: ODOT A-4a (3)			16	NP	NP
55-3	5 11 12	61	7.0 	Brown SANDSTONE. Very soft bedrock.	1.5		14		
SS-4 5	50/13cm	80	2.0	Bottom of Boring = 2.0 meters	2.0		5		

SAMPLE TYPE

SS - 5.1cm OD Split Spoon

GS Geoprobe Sample

ST - Shelby Tube

RC - Rock Care

AS - Auger Sample

GROUND WATER READING

At Completion ___ Dry

Aller 24 Hrs. Y N/A

BORING METHOD

HSA - Hollow Stem Augers

SEA Solid Flight Augers

MD - Mud Drilling WD - Wash Drilling

RC - Rock Coring



REPORT OF SOIL EXPLORATION

	tion D e Star e Finis	epth . rted: :	of 6.1 3/16/98	2 m
Date S Date Fi Drilled	e Star e Finis	epth : rted: : shed: :	6.1	m
Date S Date Fi Drilled	e Star e Finis	rted: :	3/16/98	
ring Met			3/16/98 M.F.	
	Metho	d	.3 cm H	
mmer W	r Weig	ght	63.5 kg	7
mmer Dr	r Drop	_	76 cm	
		MOISTUR		ERBERG PL
0.1	D. 7	22		
		15		
		12		
2.0	2.0	9		
2.7	2.7			

SS - 5.1em OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube RC - Rock Core

AS - Auger Sample

At Complesion N/A *

Aller 24 Hrs 💹 N/A

*Wash water used during the rock coring process.

HSA - Hollow Stem Augers

SFA Salid Flight Augers

MD - Mod Drilling

170 Wash Dolling

BC Bock Comp



REPORT OF SOIL EXPLORATION

Clien	, Sv	erdrup A	ssociat	es, Inc.	Boring .	Numbe	r <u>B-1</u>	47	
Proje		H/MEG-	33-30.9		Sheet .		of	2	- ALPERTON
	ct Numb	er V	V-7139		Comple	etion De	epth	6.1 n	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ОЕРТН	SOIL DESCRIPTION			MQIŞTURE CONTENT	LL	REAG PL
RC-2	PER 15cm	AECOVERY .	5.0	SANDSTONE; brown, medium, highly brok medium grained, micaceous. -RC-2: Recovery = 98% -Core Loss = 3 cm -RQD = 8% Bottom of Boring = 6.1 meters	ken,	6.7	CONTENT		
						:			

NOTES:



B-148

REPORT OF SOIL EXPLORATION

Clien	s Sve	erdrup A	ssociat	es, Inc.	Boring Nun	nber .	B-1	<u>48</u>
Proje					Sheet	1	of	2
	ct Numb		V-7139		Completion			7.0 m
		er <u> </u>		DRILLING AND SAMPLING INFORMATION	Date S Date F Drilled	itarted inishe By:	f: 3/1 d: 3/1 M.	6/98
Norti	mig	127947			Boring Met			3.5 kg
East	mg	640673			Hammer W	_		6 cm
Eleva	10011	235.7 n	n	- MARKET AND AND AND AND AND AND AND AND AND AND	Hammer D	<u> </u>	ISTURE	ATTERBERG
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			NTENT	LL PI
SS-1	2 2	61	=	Brown fine SANDY SILT, little organics, tra coarse sand (Topsoil). Moist.	oce 0.1		22	
SS-2	2	67	-	Brown fine SANDY CLAY, some silt, trace coarse sand. Soft to medium stiff. Moist			20	i
SS-3	7 6	44	1.0	Brown SILT, trace clay, trace fine sand. S	1.2	+	13	
20.4	16 24 50/13cm		-	to hard. Moist. Brown SANDSTONE. Very soft bedrock.	1.7	+ + - +	8	
33-4	50/13011		2.0					÷
RC-1			3.0	SANDSTONE; brown, medium, slightly broken, medium grained, micaceous, cross-bedded, friable.	2.6			
			4.0_	-brown clay seam from 3.8 to 3.9 m -RC-1: Recovery = 98% -Core Loss = 4 cm -RQD = 0%				

SAMPLE TYPE

- \$\$ 5.1cm OD Split Spoon
- GS Geoprotie Sample
- ST Shelby Tube RC - Rack Com
- AS Auger Sample

GROUND WATER READING

At Completion N/A *

Alter 24 Hrs . V N/A

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling WD - Wash Drilling

RC - Rock Coring



REPORT OF SOIL EXPLORATION

Clien	Client Sverdrup Associates, Inc.				Boring Number					
Proje	ect AT	H/MEG-	<i>33-30.</i> 5	980/0.000	Sheet	2	of			
Proje	ct Numb	erV	V-7139		Completion	De	pth	7.0 n		
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	RE ATTERBER		
RC-2			5.0_	-RC-2: Recovery = 100%						
			7.0	-No Core Loss -Na Core Loss -ROD = 43% Bottom of Boring = 7.0 meters	7.0					
				Bottom of Boring = 7.0 meters						į
}						1	:			
						1	:			İ
		:	:		!					
	:	:								

NOTES:



REPORT OF SOIL EXPLORATION

Clie	ntSv	erdrup A	ssociat	es, Inc.	Boring Number	r <u>B-</u> :	149	
Proi	ect A7	H/MEG-	33-30.5	980/0.000	Sheet1		1	
Proj.	ect Numb	erV	V-7139		Completion D			
		127824	946	DRILLING AND SAMPLING INFORMATI		shed: 3/ : M.	17/98	٠,٨
	y ,	640730		- 	Boring Method	,	3.5 kg	
	,,,g	216.1 n			Hammer Weig		6 cm	
Elev SAMPLE	ation	PERCENT			Hammer Drop	MOISTURE	ATTER	RERG
NO	PER 15cm	RECOVERY	DEPTH	SOIL DESCRIPTION		CONTENT	LL	PL
SS-1	1 2	100	=	Brown SILTY CLAY, some fine sand, little organics, trace coarse sand (Topsoil). Mo		<u> </u> -		
ST-2	7	100		Brown SILTY fine SAND, some clay, little coarse sand, trace fine gravel. Soft to medium stiff. Moist.		42 18	20	12
SS-3	3 4 3	100	1.0	-ST-2: ODOT A-4a (3)		17		
SS-4	3 3 3	22	2.0	-SS-4: ODOT A-4a (2)		19	2 2	12
SS-5	9 50/3cm	43		Brown SANDSTONE. Very soft bedrock. Bottom of Boring = 2.8 meters	2.7	8		
NOTES	· ** Elevan	ion is appr	oximate.	Sandstone bedrock observed in stream bed adjacent t	o boring, approxim	ate elevati	on of 213	3.4 m.

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- SC Bock Core
- AS Auger Sample

GROUND WATER READING

At Completion - Dry m

Aher 24 Prs V/A m

BORING METHOD

HSA - Hollow Stem Augers

SFA - Salid Flight Augers

MD - Mud Drilling

WD Wash Drilling

RC - Rock Caring



REPORT OF SOIL EXPLORATION

<i>nem</i>	erdrup A			Boring	Numbe		151
roject <u>AT</u>			980/0.000	Sheet	1	of	
oject Numb	erV	V-7139		Comp	letion D	epth _	12.2 m
			DRIVELING AND CAMPLING INCORMATION	D. D.	ate Star ate Finis rilled By	shed: 3/	
orthing	127687	.642	DRILLING AND SAMPLING INFORMATION		Metho	d8.3	cm HSA
•	640925	.371		_	er Weig		3.5 kg
-	235.5 n	n			er Drop	-	6 ст
LE BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	11411111	.c, 2.0p	MOISTURE	ATTERBI
1 1 2 2	78	-	Brown SILTY fine SAND, some organics, I. clay (Topsoil). Moist. Brown fine SANDY SILT, trace clay. Stiff.		0.2	26	
2 2 4 8	61	1.0_	Moist.			16	
3 6 14 23	83		Brown SILTY CLAY, some fine sand, trace coarse sand. Hard. Moist.	,	1.1	21	
4 10 22	89	2.0			2.1	11	
34 5 33	91	-	Brown fine SAND, some silt, trace clay, tr coarse sand. Very similar to a highly weathered sandstone. Very dense. Moist -SS-4: ODOT A-1-b				
50/13cm	1 .	3.0	·			4	
:		4.0	SANDSTONE; brown, soft, weathered, friable, fine to coarse grained.		3.7		
6 50/13cm	100	-				6	

SAN		

\$\$ 5.1cm OO Split Spoon

GS - Geoprobe Sample ST - Shelby Tube

RC - Borr Coin

AS - Auger Sample

GROUND WATER READING

At Completion : 9.8 m

After 24 Hrs V. N/A

BORING METHOD

HSA · Hollow Stein Augers

SFA · Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling

RC Rock Coing



Clien	, Sve	rdrup A	ssociat	es, Inc.	Boring Number	- <u>B-1</u>	51	
Proje		Ч/MEG-	33-30.5		Sheet2	of	3	
	ct Numb	erV	V-7139		Completion De		12.2 r	
SAMPLE NO	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	BERG PL
	50/13cm		5.0			9		
			6.0		# # # # # # # # # # # # # # # # # # #			
SS-8	50/15cm	83	8.0			11		
SS-9	50/13cm	100	9.0	-groundwater initially encountered @ 9.1	^r m	14		
SS-10	50/10cm	100	10.0	SHALE; gray, soft, weathered.	10.2			
NOTES			: -	<u> </u>		=		



Clier	t Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-1</u>	<u>51</u>	
Proje				980/0.000	Sheet3	of		
Proje	ct Numb	erV	V-7139		Completion D		12.2 r	<u>n</u>
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERI	BERG PL
	50/5cm	100	-	SANDSTONE; brown, soft, weathered, friable, fine to coarse grained. Bottom of Boring = 11.9 meters	11.9	9		
:								
NOTES:		: :						



REPORT OF SOIL EXPLORATION

ClientS	verdrup ,	4ssocia	ates, Inc.	Design Alvert	R.	152
ProjectA	TH/MEG	-33-30	.980/0.000	Boring Number		
Project Num	ber	W-713:	9	Sheet1		
				Completion D	epth _	4.7 m
			DRILLING (A)	Date Star Date Finis Drilled By	shed: 3/	/17/98 /17/98 .F.
Northing	127663	3.118	DRILLING AND SAMPLING INFORMATION			440.4
Easting	640893	. 770		Boring Method		
Elevation	233.6 n	7		Hammer Weig		3.5 kg
SAMPLE BLOWS	PERCENT	-7:-		Hammer Drop	7	6 cm
NO PER 15cm	RECOVERY	DEPTH	SQL DESCRIPTION		MOISTURE	ATTERBERG LL PL
SS-1 2 2	44	-	Brown SILTY fine SAND, little organics, litt clay (Topsoil). Moist.	tle 0.1		- PE
		-	Brown fine SAND, some silty clay, trace	/	21	
SS-2 4	94	-	COBISE SAIDS, Trace charge ground Coffees	111	12	
6 7	.	-	hard. Moist. -SS-2: Visual ODOT A-4a			
		1.0_	35 2. Visual ODO / A-49		-	
SS-3 6	100	-		1111		ĺ
13	1 1	1		[20	
				111		
		Ė		, , , , , , , , ,		
SS-4 38 50/13cm	82	2.0	SANDSTONE; brown, soft, weathered,	1.8	8	
		7	friable, fine to coarse grained.			
]			1	Ì
		1				1
SS-5 40	89	Á			9	
50/8cm	i	3.0 _		:::	9	
		3.0				į į
	1				-	
1		1			i	
		4				1 1
	:			:::	!	:
		4.0				
	į					
SS-6 43	100	3	SHALE: brown	4.4	ĺ	
NOTES:		1.	SHALE; brown, soft, weathered.			

SAMPLE TYPE SS + 5 1cm OD Split Spoon

- GS Geoprobe Sample
- ST Snelby Tube
- 90 House Core
- AS Actor Sample

GROUND WATER READING

At Completion = Dry

After 24 Hrs J N/A

BORING METHOD

HSA - Hollow Stem Augers

SFA · Solid Flight Augers MD Mud Drilling

WD - Wash Drilling RC - Rock Coring



Clier	ntSv	erdrup A	ssocia	tes, Inc.	Boring Nu	mber	B-1	52	
Proje	ect AT	H/MEG-	33-30.	980/0.000	Sheet				
	ect Numb	erV	V-7139)	Completio	п Дер	oth	4.7 n	7
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		N C	ONTENT	ATTER LL	BERG PL
	50/10cm			Bottom of Boring = 4.7 meters	4.7				
1									
	 -								
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i	į								
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NOTES							i		



REPORT OF SOIL EXPLORATION

Clien	, Sve	rdrup A	ssociat	es, Inc.	Boring Number	. <u>B-1</u>	53	
Proie	4 -	 H/MEG	33-30.9	980/0.000	Sheet1	of .	3	
•	ct Numb	14	V-71 39		Completion De	pth	14.0 n	מ
Proje	et Numb	e/	•		Date Start Date Finis Drilled By:	ted: 3/1 hed: 3/1	6/98	
		127536	717	DRILLING AND SAMPLING INFORMATI	ON <i>Boring Method</i>	, 8.3	cm HS/	A/RC
Nort	'''''y	640991			Hammer Weig		3.5 kg	
East	'''y	233.9 n		A 1990	Hammer Drop		cm	
Eleva SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION	Tianimor Brop	MOISTURE CONTENT	ATTERL	BERG PL
SS-1	PER 15cm	RECOVERY		Brown SILTY fine SAND, some organics,	0.1	1		7.
	2	'-	-	trace clay (Topsoil). Moist.	/	17		
SS-2	3	100	= =	Brown fine to coarse SAND, little silt, trac clay. Very loose to very dense. Moist.	e	10		
00 -	17		=	-SS-2: ODOT A-3a			1	
	40		1.0		183		į	
	31	67	-			7	i	
	50/15cm		=					
					[1414] [1314]		i	
SS-4	6	89				9		
	18		2.0_		100			
	41]]		ļ.; 			
					2.6			
\$S-5	21 48	88	_	SANDSTONE; brown, very soft, highly broken, medium grained, silty, micaceous	,	9		
	50/5cm	•	3.0	friable, weathered.				
		•	_			:		
			-		• • • •	: i		
			-			: ;		
İ			4.0			: :		
SS-6	31	100	-			10		
	50/8cm		-					
NOTES			<u> </u>	: 1		1		
i								

SAMPLE TYPE

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample ST - Shelby Tube
- RC Rock Core
- A5 Auger Sample

After 24 Hrs Y N/A

*Wash water used during the rock coring process

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD · Mud Dritting WD - Wash Drilling

RC Rock Corng



REPORT OF SOIL EXPLORATION

Clien	t Sve	erdrup A	ssociati	es, Inc.	Boring f	Vumbe	,B-	153	
Proje		H/MEG-	33-30. S		Sheet _	_	of	3	3
	ect Numb		V-7139		Comple		epth	14.0	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTÉI LL	RBERG PL
			5.0						
RC-1			6.0	-brown clay seam from 6.1 to 6.7 m					
			7.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 0%					
RC-2			8.0	SANDSTONE; brown, very soft to soft, highly broken, medium grained, micaceous, friable.		7.6			
			9.0	-RC-2: Recovery = 67% -Core Loss = 101 cm -RQD = 0%					
			10.0						
RC-3			11.0	SANDSTONE; brown, medium, highly brok micaceous, friable, slightly weathered.		0.7			

NOTES:



Clier	ot Sv	erdrup /	Ssociat	es, Inc.	Boring Number	er B-1	53	
Proje	ect AT	H/MEG-	33-30.	980/0.000		of	3	
	ect Numb		V-7139		Completion D		14.0	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RBERG PL
			12.0	-RC-3: Recovery = 82% -Core Loss = 55 cm -RQD = 0%				
RC-4			14.0	-RC-4: Recovery = 65% -Core Loss = 11 cm -RQD = 0% Bottom of Boring = 14.0 meters	14.0			
		:						
						:		:
			:			i	i	
NOTES:								



REPORT OF SOIL EXPLORATION

Clien	st Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	r <u>B-1</u>	54	
		H/MEG-		980/0.000	Sheet1			
	ect Numb		V-7139		Completion D			
	hing	127407 641046		DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	ted: 3/3 shed: 3/3 : M.	18/98 18/98 F.	
	my	207.8 n			Hammer Drop	··· —_	6 cm	
SAMPLE NO	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	Transmer Drop	MOISTURE CONTENT	ATTER	BERG PL
SS-1	W	56		Brown SILTY fine SAND, little organics	0.1			
	W W 7 1 W W W W	61 56	1.0	(Topsoil). Moist. Brown fine SAND, some coarse sand, little silt, trace clay. Very loose. MoistSS-2: ODOT A-3a Gray SILTY CLAY, trace coarse to fine sat trace fine gravel. Very stiff to hard. Mois damp.	1.4	26 26 26	43	19
SS-5	12 50/5cm	100		-ST-4: ODOT A-7-6 (15) Gray SHALE. Very soft bedrock. Bottom of Boring = 2.9 meters	2.7	6		
NOTES	cievati	on is appi	oximate.					

SAMPLE TYPE

SS - 5 1cm OD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube RC - Rack Core

AS - Auger Sample

GROUND WATER READING

At Completion - Dry

Aller 24 Hrs V N/A

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling WD Wash Drilling

RC - Rock Comig



SFA - Solid Flight Augers

MD - Mud Drilling

WO - Wash Drilling

BC - Bock Cornig

R-155

REPORT OF SOIL EXPLORATION

Clien	, Sve	erdrup A	ssociat	es, Inc.	Boring Number	. <u>B-1</u>	55	
Proje	4.7	H/MEG-	33-30.9	980/0.000	Sheet1			
•	ect Numb	ar V	V-7139		Completion De		16.2 m	
Proje	eci Numb	<i>ci</i>		. ,	Date Start Date Finis Drilled By:	ed: 3/2 hed: 3/2	23/98	
Norti	hina	127369	.931	DRILLING AND SAMPLING INFORMATI	ON <i>Boring Method</i>	8.3	cm HSA	/RC
East	•	641127	.633		Hammer Weigi	c	3.5 kg	
		231.0 n	7**		Hammer Drop	7	6 cm	
SAMPLE	BLOWS	PERCENT	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBE	ERG PL
SS-1	PER 15cm	RECOVERY 39		Gray fine to coarse GRAVEL. Very loose.	0.1			
SS-2	3 2			Damp. Brown CLAYEY SILT, some fine sand, litt coarse sand. Medium stiff to very stiff. Moist.	/	15		
\$\$-3	16	72	1.0_ - - -	-SS-2: Visual ODOT A-4a		13		
SS-4A SS-4B	16 17	94	2.0	Brown coarse to fine SAND, little silt, trac clay. Dense. Moist. Brown fine SANDY SILT, little clay, trace coarse sand. Hard. Moist.	1.8	11 13		
SS-5	18 50/10cm	80	3.0	Brown to gray weathered SANDSTONE. Very soft bedrock.	2.7	9		
			4.0		4.1		:	
RC-1		:	٠.	SANDSTONE; brown, medium, slightly broken, coarse to medium grained, cross-bedded, friable.	(
NOTES	: ** Elevat	tion is app	roximate.					
	SAMPI SS - 5.1cm Ol	I.E. TYPE		GROUND WATER READING At Completion N/A		BORING N w Stem Augu		

Alter 24 lits V. N/A m

*Wash water used during the rock coring process.

GS - Geoprobe Sample

ST - Shelby Tube

AS Auger Sample

BC Foce Com



Clien	. Sv	erdrup A	ssociate	es, Inc.	Boring Number	B- 1	55
Proje				080/0.000		of	
	ct Numb		V-7139		Completion De	pth	16.2 m
SAMPLE	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
			5.0	-RC-1: Recovery = 99% -Core Loss = 2 cm			
80.0			6.0	$-\hat{R}\hat{Q}\hat{D} = 22\%$			
RC-2			-		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
			7.0	-brown shale lens from 7.2 to 7.3 m			
			8.O	-RC-2: Recovery = 89% -Core Loss = 34 cm -RQD = 25%			i i
			'		9,0		:
RC-3			9.0	SANDSTONE; brown to gray, medium, massive, medium to coarse grained, micaceous, cross-bedded, friable.	9.0		
			10.0		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
			11.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 47%	4 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
NOTES	** Eleva	 tion is app	 Iroximate.				



REPORT OF SOIL EXPLORATION

Clien	, Sv	erdrup A	ssociate	es, Inc.	Borina	Numbe	r <u>B</u> -1	55	
Proje		H/MEG-	33-30.9	80/0.000	Sheet	_			}
-	ect Numb		V-7139		Compl	etion De	epth	16.2	m
SAMPLE	BLOWS	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE	ATTE LL	RBERG PL
RC-4	PER 15cm	RECOVERY	12.0_			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
			13.0			0 d 0 d 0 d 0 d 0 d 0 d 0 d 0 d 0 d 0 d	-		
			14.0	-RC-4: Recovery = 90% -Core Loss = 31 cm -RQD = 42%		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
RC-5			15.0	-slightly carbonaceous from 15.1 to 16.	2 m				
			16.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 21% -qr (@ 15.7 m) = 14.24 MPa		16.2			
* · · · · · · · · · · · · · · · · · · ·	1			Bottom of Boring = 16.2 meters					
	i								

NOTES: ** Elevation is approximate.



REPORT OF SOIL EXPLORATION

Client Sverdrup A	ssociates, Inc.	Boring Numbe	B-156	
A T11/84℃₽	33-30.980/0.000	Sheet1	of1	<u>'</u>
Troject	V-7139	 Completion D		m
Project Number <u> </u>		Date Star Date Fini Drilled By	ted: 3/22/98 shed: 3/22/98	
Northing 127283		PLING INFORMATION Boring Metho	d8.3 cm H	SA
CA1100	3.058	Hammer Weig		7
Easung		Hammer Drop	76 000	
AMPLE BLOWS PERCENT	DERTH	SOIL DESCRIPTION	MOISTURE ATT	ERBERG F
S-1 3 44	Dark brown SILT, som	ne clay, little fine sand, 0.1	24	
3 4	Dark brown fine SANL little silty clay, trace fi	D. some coarse sand,	21	
S-3 3 78	-SS-2: ODOT A-3a		24	
3 3		1.8		
SS-4 2 56	2.0 Medium stiff, Moist.	Y CLAY, little fine sand.	22	
3	stiff. Moist.	,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	22	ŀ
5S-5 2 61 2 4	3.0			
		3.8		
	4.0 Gray SANDSTONE.	Very soft bedrock. al @ 4.2 meters4.2		i
SS=6 50/5cm 100	Bottom of Bor	ring = 4.2 meters		1

SAMI	D1 12	TV	DE

55 - 5.1cm QD Split Spoon

GS - Geoprobe Sample

ST - Shelby Tube

AC Back Care AN - Auger Sample GROUND WATER READING

At Completion - Dry _____ m

Attor 24 Hrs Y N/A m

BORING METHOD

HSA - Hollow Stem Augers SFA - Solid Flight August MD Mud Drilling VVO Wash Drilling RC - Bock Caring



REPORT OF SOIL EXPLORATION

ClientSV	erdrup A	ssociat	es, Inc.	Boring Numb	er <u>B-1</u>	3/
ProjectA7	H/MEG-	33-30.5	980/0.000	Sheet	of	1
Project Numb	nerV	V-7139	- MA-T	Completion I	Depth	3.2 m
Northing	127196	.370	DRILLING AND SAMPLING INFORMATI	Date Fin Drilled B		23/98
Easting	641333			Hammer Wei		3.5 kg
Elevation	201.8 n			Hammer Dro		cm
AMPLE BLOWS NO PER 15cm	PERCENT RECOVERY	ДЕРТН	SOIL DESCRIPTION	Tidinine Bio	MOISTURE	ATTERBERG
SS-1 15	100	-	Gray fine to coarse GRAVEL. Very loose.	0.2	1.	
13 5S-2 2 3	89	† 1 1 1	Damp. Brown CLAYEY SILT, some fine sand, little fine gravel, trace coarse sand. Medium st Moist.	/e	10 23	
SS-3 2 2	56	1.0	-SS-2: ODOT A-4a		18	
3 SS-4 2 4	83	2.0	-groundwater initially encountered @ 1.5 Brown fine to coarse SANDY CLAY, some	2.0	20	
3 SS-5 1 12	80		silt, trace fine gravel. Medium stiff. Mois	2.9	7	
50/8cm		3.0	Gray SANDSTONE. Very soft bedrock. Auger refusal @ 3.2 meters Bottom of Boring = 3.2 meters	3.2		
; ;		:		1	:	
IOTES: ** Elevai	tion is appr	oximate.				

SAMPLE TYPE

SS - 5 1cm OD Spit Spaan

GS - Geoprope Sample

ST - Shelby Tube

BC - Bock Cure

AS - Auger Sample

GROUND WATER READING At Completion = 1.7*

Aller 24 Hrs VA

* cave-in depth upon boring completion @ 2.3 m

BORING METHOD

HSA · Hollow Stem Augers

SFA · Solid Flight Augers

MD - Mud Drilling

WD - Wash Drilling

RC - Ruck Coring



REPORT OF SOIL EXPLORATION

				7127 0717 07 0012 270 2070 1110	•	P	160	
Clier	/	rdrup A		4	Boring Numbe	′ —	158	
Proje	ect AT	H/MEG-	33-30.9	980/0.000	Sheet1	of		
Proje	ect Numb	erV	V-7139		Completion De	epth	4.9 n	7
ŕ					Date Star Date Finis Drilled By	hed: 3/	24/98	
Nort	hing	127157	.112	DRILLING AND SAMPLING INFORMAT	ION Baring Method	8.3	çm HS	A/RC
East		641285	.619		Hammer Weig	ht6	3.5 kg	
	-	214.1 n	7		Hammer Drop	7	'6 cm	
AMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER	BERG PL
SS-1 SS-2	1 2 3	72		Brown SILTY fine SAND, some organics, clay (Topsoil). Moist. Brown SILTY CLAY, some fine sand, traction course sand. Medium stiff. Moist.	<i>_</i> _	23		
	4 7	1	1.0	Brown SILTY fine SAND, little clay, trace coarse sand. Stiff. Moist.	1.1	24	E0	22
5S-3	5 8	56	- - -	Brown and gray CLAY, some silt, trace f to coarse sand, trace fine gravel. Stiff. Moist. -SS-3: ODOT A-7-6 (17)	1.8	24	50	22
SS-4	14 50/13cm	91	2.0	Black COAL. Very soft bedrock.				
SS-5	31 50/10cm	80	3.0	Gray MUDSTONE. Very soft bedrock. Auger refusal @ 3.0 m	3.0	11		
RC-1			-	MUDSTONE; gray, soft, highly broken, non-bedded, silty.	:			
			4.0	-RQD = 0%	4,3	<u>.</u>	:	
	i		-	LIMESTONE; gray, moderately hard, high	n/y			
NOTES	5:							

SAMPLE TYPE

- \$\$ 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube
- RC Rock Core AN Auger Sample

GROUND WATER READING

After 24 Hrs Y N/A m

*Wash water used during the rock coring process.

BORING METHOD

HSA - Hollow Stem Augers

SFA - Solid Flight Augers

MD - Mud Drilling

WD Wash Drilling

EC Ruck Coring



REPORT OF SOIL EXPLORATION

Clier	nt <u>Sv</u>	erdrup A	ssocia	tes, Inc.	Boring	Numbe	r <u> </u>	58	
		H/MEG-	33-30.	980/0.000	Sheet	2	of		
Proje	ect Numb	erV	V-7139		Comp	letion De		4.9 n	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	RBERG PL
RC-2	PER 15cm	RECOVERY	DEFIN	\broken, fine crystalline, slightly jointed. MUDSTONE; gray, soft, highly broken, non-bedded, siltyRC-2: Recovery = 50% -Core Loss = 15 cm -RQD = 0% Bottom of Boring = 4.9 meters		4.9	CONTENT	ш	PL.
							:		

NOTES:



REPORT OF SOIL EXPLORATION

Clien	, Sve	erdrup A	ssociat	es, Inc.	Boring Numbe	, <u>B</u> -	159	
		H/MEG-	33-30.5			of	5	
•		V	V-7139		Completion De		29.0	77
Proje	ect Numb	er . <u></u>		DRILLING AND SAMPLING INFORMATION	Date Star Date Finis Drilled By	ted: 3/ hed: 3/ : M	/24/98 I.F.	
Nort	hing	127107	.549		Boring Method		3 cm HS	A/RC
East	ing	64122 <u>2</u>	.649	<i>+</i>	lammer Weig	ht <u> </u>	53.5 kg	
Elevi	ation	239.0 n	7**	<i></i>	lammer Drop		76 cm	
SAMPLÉ NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTER LL	RBERG PL
SS-1	2 3 5	44	- - -	Reddish-brown CLAY, some silt, little organics, trace fine sand (Topsoil). Moist. Reddish-brown CLAY, some fine gravel, littl	0.1	35		
SS-2	3 4 7	56	1.0_	silt, trace coarse to fine sand. Medium stift to stiff. Moist. -SS-1: Visual ODOT A-7-6	1.1	28		
SS-3	5 19 50/15cm	94	1	Brown and gray CLAYEY SILT, trace coarse to fine sand. Very stiff to hard. Moist.		11		
SS-4	50/5cm	100	2.0	Brown SANDSTONE. Very soft bedrock.	1.9	22		
RC-1		1	3.0	SHALE; brown, medium, highly broken, micaceous, silty.	2.7			
			_	-RC-1: Recovery = 82% -Core Loss = 30 cm -RQD = 0%				
			4.0 _	-brown clay seam from 4.0 to 4.3 m SANDSTONE; brown to light gray,	4.3			
RC-2	; ** Elevat	ion is appi	oximate.	OANGOTONE, DIOWIT to light gray,		! :	l	<u>. </u>
	SAMPL SS - 5. 1cm OL	LE TYPE		GROUND WATER READING At Completion : N/A * m	HSA - Holla		METHOD	

- SS 5.1cm OD Split Spoon
- GS Geoprobe Sample
- ST Shelby Tube RC - Rock Core
- AS Auger Sample

*Wash water used during the rock coring process. WD Wash Drilling RC Rock Coring

- HSA Hollow Stem Augers SFA Solid Flight Augers

 - MD · Mud Dnlling



	. Sv	erdrup A	ssociati	es. Inc.	Boring No	ımber	B-1	59	
Clien					Sheet		of	5	
Proje			V-7139		Completic			29.0	n
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MO	NSTURE INTENT	ATTER	BERG PL
			5.0 ~	moderately hard to hard, massive, medium coarse grained, micaceous, cross-bedded.	i to				
			6.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 65% -qr (@ 6.6 m) = 64.61 MPa					
RC-3			7.0	-brown clay seam from 7.2 to 7.3 m -friable from 7.5 to 13.6 m					
			8.0						
			9.0	-RC-3: Recovery = 100% No Core Loss -RQD = 87%					
•			10.0	:					
RC-4			11.0	 - - - - -					
NOTES	S Fleva	itian is and	oroximate						



REPORT OF SOIL EXPLORATION

Clien	Sv	erdrup A	ssociate	es, Inc.	Boring Number	B-1	<u>59</u>	
Proje					Sheet3	of .	5	
-			V-7139		Completion De	oth	29.0	n
SAMPLE	ect Numb	PERCENT	DEPTH	SOIL DÉSCRIPTION		MOISTURE CONTENT	ATTER	BERĞ PL
NO	PER 15cm	RECOVERY	DEFIN			CONTENT	LL	
			12.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 88%				
			13.0		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
RC-5			14.0					
			15.0	-RC-5: Recovery = 92% -Core Loss = 24 cm -RQD = 44% -dark gray, soft to medium hard shale let from 15.1 to 15.4 m -highly broken from 16.0 to 16.6 m	75			
RC-6			17.0	-gray, soft shale lens from 17.1 to 17.2	m			
	:		78.0	SHALE; gray to dark gray, soft to very so highly broken, carbonaceous, slickensideo sparsely fossiliferous. -RC-6: Recovery = 99%	77.7 : : : : : : : : : : : : : : : : : :	!		

NOTES: ** Elevation is approximate.



Clier	. Sv	erdrup A	ssociati	es, Inc.	Boring	Numbe	er B-1	· 59	
Proje					Sheet .		of	5	
-	ect Numb		V-7139		Comple		epth	29.0	m
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION			MOISTURE	ATTER LL	RBERG I PL
	PER 156m	RELOVENT	19.0	-Core Loss = 3 cm -RQD = 53% SANDSTONE; brown to gray, medium to moderately hard, massive, medium grained micaceous, cross-bedded, slightly weather shale seam @ 19.1 m		8.4			
RC-7			20.0			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
			22.0	-RC-7: Recovery = 99% -Core Loss = 3 cm -RQD = 68%					
RC-8			23.0	SHALE; gray, medium, highly broken, carbonaceous, pyritic, slickensided, sparse fossiliferous. -RC-8: Recovery = 100% -No Core Loss -RQD = 25%		23.0::			
RC-9			25.0	-black, hard coal seam from 25.0 to 25.	3 m				



Clien	t Sv	erdrup A	ssociat	es, Inc.	Boring N	lumbe	r	159	
Proje	4.7	H/MEG-	3 3-3 0.9	980/0.000	Sheet _	5	of		
-	ect Numb	erV	V-7139		Complet	ion D		29.0	
SAMPLE NO	BLOWS PER 15cm	PERCENT	DEPTH	SOIL DESCRIPTION			MOISTURE CONTENT	ATTER LL	
			26.0	-RC-9: Recovery = 80% -Core Loss = 61 cm -RQD = 7% LIMESTONE; gray, hard, highly broken, fin	26	i.6			
DO 10			27.0	crystalline, slightly jointed.	27	7.3			
RC-10			28.0	SHALE (60%); gray, medium, highly brokk calcareous, slightly jointed, with interbeda LIMESTONE (40%); gray, medium, highly broken, fine crystalline, argillaceous, slight jointed. -RC-10: Recovery = 80% -Core Loss = 27 cm -ROD = 0% -RC-11: Recovery = 100%	led				
RC-11			29.0	-No Care Loss -RQD = 0% Bottom of Boring = 29.0 meters	25	9.0			
				action of boning – 23.0 meters					
	1								•



B-160

REPORT OF SOIL EXPLORATION

Sverdrup Associates, Inc.

Clien	t <u>Sv</u>	erdrup /	ssociat	es, Inc.	Boring Number	er <u>B</u> -	160	
Proje	ct _A7	H/MEG-	33-30.9	380/0.000	Sheet1	of	2	1
Proje	ct Numb	erV	V-7139		Completion D	epth _	4.9 r	n
				DRILLING AND SAMPLING INFORMATI	Date Star Date Finis Drilled By	shed: 3/		
North	ning	127022	2.596	***************************************	Boring Method	d <u>8.3</u>	3 cm HS	iA
Eastii	ng	641360	.884	- 17 18807749	Hammer Weig	ght <u> </u>	53.5 kg	
Eleva	tion	203.0 n	n**		Hammer Drop		76 cm	
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	ДЕРТН	SOIL DESCRIPTION		MOISTURE CONTENT	ATTES LL	RBERG PL
SS-1	1 2	78		Brown SILT and fine SAND, little organics. trace clay (Topsoil). Moist.		20		
ST-2	3	100	 	Brown CLAYEY fine SAND, little coarse su little silt, trace fine gravel. Medium stiff. Moist.	and,	19	29	16
SS-3	9	89	1.0	-ST-2: ODOT A-6a (3) Brown to gray SILTY CLAY, some fine sai	1.1	20	32	15
33-3	2 4		-	trace coarse sand, trace fine gravel. Medi stiff to stiff. Moist. -SS-3: ODOT A-6b (9)		20	32	75
SS-4	3 6 8	72	2.0		**.4 M ***	18		
SS-5 8	9 18	72	 		2.8	5		
	44		3.0	Brown weathered SILTSTONE. Very soft bedrock.				
			4.0_			<u> </u> - -		
		! !	-		<u></u> -	:		
NOTES:	* * Elevar	ion is appr	oximate.			<u> </u>	i	
G 5 R	SAMPI S - 5. Icm OL S - Geoprobe T - Shelov Tu C - Rock Core S - Auger Sam	Sample be		GROUND WATER READING At Completion — DIY of Atter 24 Hrs V N/A of the Market State of		Drilling	ers	



REPORT OF SOIL EXPLORATION

Clie	nt <u>Sv</u>	erdrup A	ssocia	tes, Inc.	Boring Number	, <u>B-1</u>	60	
Proj	ect A7			980/0.000		of .		
	ect Numb		V-7139	1	Completion De	pth	4.9 m	1
SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	- '' - '	MOISTURE CONTENT	ATTERE	BERG PL
SS-6		65				7		
	50/13cm		-	Bottom of Boring = 4.9 meters	4.9			
	Ì			Bottom of Boring = 4.9 meters				
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NOTES: ** Flevation is approximate.



REPORT OF SOIL EXPLORATION

ClientSv	rerdrup A	ssociat	es, Inc.	Boring Numbe	r = B-1	51
ProjectA7	TH/MEG	33-30.	980/0.000	Sheet 1	of .	1
Project Numb	berW	/-7139	74	Completion De	epth	2,7 m
Atomick .	126879.	544	DRILLING AND SAMPLING INFORMATION		hed: 3/2 : M.F	3/98
Northing	641390			Boring Method		
Easting	204.2 m		TV-Note Read	Hammer Weig	···	.5 kg cm
Elevation	PERCENT		7 77 A Marian	Hammer Drop		
NO PER 15cm	RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL PL
SS-1 2 2 2	56	1111	Brown SILTY fine SAND, some organics, trace fine gravel (Topsoil). Moist. Brown SILTY CLAY, some fine sand, little	0.5	26	
SS-2 3 3 3	100	1	coarse sand, trace fine gravel. Soft to medium stiff, Moist. Brown fine SAND, some silt, little coarse		21	
SS-3 2 3	94	1.0	sand, trace clay, trace fine gravel. Loose. Moist. -SS-3: ODOT A-3a		20	
SS-4 2 3	89	2.0	Brown fine SANDY CLAY, little silt, trace coarse sand, trace fine gravel. Stiff. Mois	1.8 St.	21	
SS-550/13cm	60		Gray weathered SILTSTONE. Very soft bedrock. Bottom of Boring = 2.7 meters	2.6	6	
NOTES: SAMPL 55 · 5. tem OD	E TYPE		GROUND WATER READING At Completion — Dry 20		SORING ME	ТНОО

GS Geoprobe Sample 57 - Sheloy Tube

RC Rock Core

38 - Auger Sample

Afrer 24 Hrs Y N/A

HSA Hallow Stem Augers

SEA Solid Flight Augers

MD Mud Daring W/O Wash Dr. ng

RC Ruck Conng

$R^{\tt ESOURC}_{\tt INTERNATIONAL}E$

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(b) Use either Gs of final water-content data for S-100%

(c) Be sure to include any soil extruded from ring which is in consolidometer

CONSOLIDATION TEST ASTM D 2435

PROJECT Ath/Meg-33

LOCATION

JOB No. W-7139 BORING N. B-128

SAMPLE No. ST-2

SAMPLE DEPTH 1.5' - 3.5' (Sample @ 2.0' - 2'9")

SOIL DESCRIPTION Red-brn SiCl; lif sa; tr. roots

DATE OF TESTING 3/12/98

TESTED By Hostetter/Straub

CONSOLIDOMETER TYPE	Fixed Ring	RING No. 1				
MULT. RATIO OF LOAD DEVICE	9					
RING DIM.: DIAMETER:	63.5 mm	AREA: 31.67 cm²	HEIGHT: 20 mm			
INITIAL HT. OF SOIL, HI:	20_mm					
SPECIFIC GRAVITY OF SOIL:	2.67	***				
M. RING + SPECIMEN AT		WATER CONTENT DETERMINATION				
BEGINNING OF TEST:	188.78 g					
M. OF RING:	67.04_g	M. OF CAN + WET SOIL:	298.18 g			
M. OF WET SOIL, Mt:	<u>121.74</u> g	M. OF CAN + DRY SOIL:	<u>243.42</u> g			
COMPUTED DRY WEIGHT		M. OF CAN:	<u>28.11</u> g			
OF SOIL, M's:	g	M. OF WATER:	<u>54.76</u> g			
OVEN DRY M. OF SOIL, Ms. (a)	97.04 g	M. OF DRY SOIL:	215.31_g			
COMPUTED HT. OF SOLIDS, Hs:(b)	1.128_cm	INITIAL WATER CONTENT:	25.43%			
INITIAL HT. OF VOIDS, Hv:	0.872 cm					
INITIAL VOID RATIO, ej:	0.773					
FINAL TEST DATA		FINAL WATER CONTENT DE	TERMINATION			
(Obtained at end of load testing)						
INITIAL DIAL READING:	0.0363_in	FINAL WET M. + RING:(c)	185.84_g			
FINAL DIAL READING:	0.1099 in	FINAL DRY M. + RING:	164.08 g 97.04 g 21.76 g			
EQUIP. DEF. @ FINAL LOAD:	7.00E-04_in	OVEN DRY M. OF SOIL, Ms:				
CHANGE IN SAMPLE HT.:	0.185166 _{cm}	FINAL M. OF WATER:				
FINAL HT. OF VOIDS, H _{vf} :	IAL HT. OF VOIDS, H _{vf} : 0.687 cm		22.42%			
FINAL VOID RATIO, eg:	0.609	FINAL DEGREE OF SAT. S:	100% (assumed)			

RESOURC E

281 Enterprise Drive Westerville, Ohio 43081 Telephone: (614) 885-1959 Fax Number: (614) 885-3341

CONSOLIDATION TEST RESULTS ASTM D 2435

	PROJECT	Ath/Meg-	33						
	LOCATION								
	JOB No.	W-7139	BORING <u>B-128</u>						
	SAMPLE No.		ST-2						
	SAMPLE DEPTH SOIL DESCRIPTION DATE OF TESTING TESTED BY		1.5' - 3.5' (Sample @ 2.0' - 2'9")						
			Red-brn SiCl; li f sa; tr. roots 3/12/98 Hostetter/Straub						
:									

INITIAL SAMPLE VOL., VI	63.338 cm
SPECIFIC GRAVITY, Gs	2.67
INITIAL HT. OF VOIDS, HV	0.8723 cm
Li	20 mm

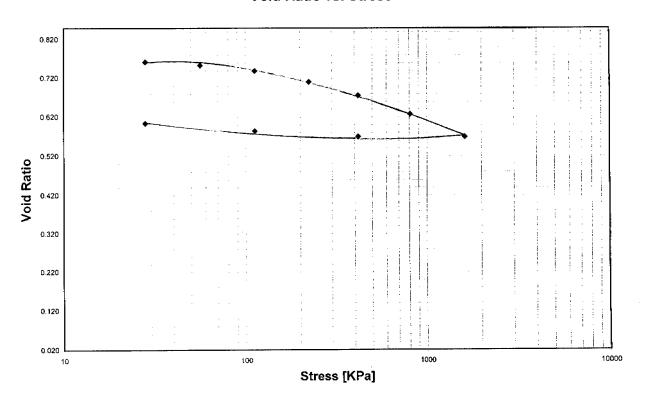
 DRY WT. OF SOIL SOLIDS, Ms
 97.04 g

 HT. OF SOLIDS, Hs
 1.1277 cm

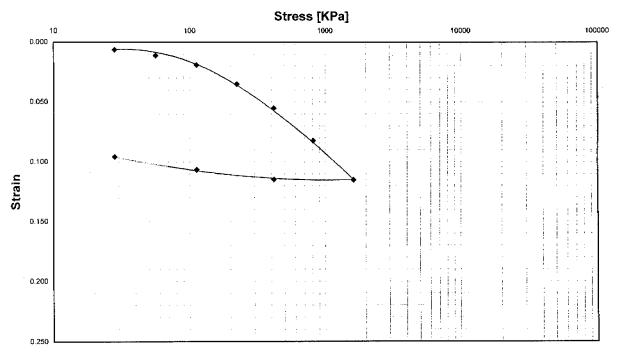
 INITIAL VOID RATIO, ei
 0.7735

Load increment (kPa)	Def. dial reading at end of load (x.0001")	D ₅₀ (x.0001")	D ₁₀₀ (x.0001")	Equip. Def. ΔHe (x.0001")	Change in sample Ht., ΔH (x.0001*)	ε = Δ H / Hi	e = eg - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t50 (min)	Coeff. of consol., c _V , (cm ² /min)
0	363	0	0	0	0	D	0	0	0	0	0.00E+00
28	430	412	419.3	7	49.3		0.7624	0.783	0.9947	0.56	3.48E-01
56		454.4	463.2	11	89.2	0.0113	0.7534	0.779	0.9898	1.25	1.54E-01
112	550	514.75	532	17	152	0.0193	0.7392	0.774	0.9829	0.67	2.84E-01
223	687	629.75	665.5	25	277.5	0.0352	0.7110	0.763	0.9693	0.52	3.56E-01
418	854	778.75	829.5	32	434.5	0.0552	0.6756	0.749	0.9513	1.1	1.62E-01
809	1083	976.25	1052.5	42	647.5	0.0822	0.6276	0.730	0.9275	1.2	1.41E-01
1617	1354	1224.5	1327	57	907	0.1152	0.5692	0.707	0.8978	1.24	1.28E-01
418	1294		1299.4	32	904.4	0.1149	0.5698				
112	1208		1220.2	17	840.2	0.1067	0.5842				1
28	1099		1123	7	753	0.0956	0.6039	}			
112	1			17	1						
1617		_		57		ļ <u>.</u>					

Void Ratio vs. Stress



Strain vs. Stress



RESOURC E

281 Enterprise Drive Westerville, Ohio 43081 Telephone: (614) 885-1959 Fax Number: (614) 885-3341

CONSOLIDATION TEST

ASTM D 2435

PROJECT	Ath /Meg	33
LOCATION		
JOB No.	W-7139	BORING N. B-160
SAMPLE NO) .	St - 2
SAMPLE DE	PTH	1.5-3.5' (2.5')
SOIL DESC	RIPTION	Greenish Br SiCl; Sm C-F Sa; Tr FGr
DATE OF T	ESTING	4/3/98
TESTED BY	•	Straub/ Hostetter

CONSOLIDOMETER TYPE	Fixed Ring	RING No. 1	-
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA: <u>31.67</u> cm ²	HEIGHT: 20 mm
INITIAL HT. OF SOIL, Hi:			
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT		WATER CONTENT DETERMI	NATION
BEGINNING OF TEST:	<u>194.59</u> g		
M. OF RING:	64.73 g	M. OF CAN + WET SOIL:	293.14 g
M, OF WET SOIL, Mt:	129.86 g	M. OF CAN + DRY SOIL:	<u>250.93</u> g
COMPUTED DRY WEIGHT		M. OF CAN:	27.63 g
OF SOIL, M's:	g	M. OF WATER:	<u>42.21</u> g
OVEN DRY M. OF SOIL, Ms:(a)	109.04 g	M. OF DRY SOIL:	223.3 g
COMPUTED HT. OF SOLIDS, Hs:(b)	1.219 cm	INITIAL WATER CONTENT:	18.90%
INITIAL HT, OF VOIDS, Hv:	0,781 cm		
INITIAL VOID RATIO, ej:	0.641		
FINAL TEST DATA		FINAL WATER CONTENT DE	TERMINATION
(Obtained at end of load testing)			
INITIAL DIAL READING:	<u>0.0166</u> in	FINAL WET M. + RING:(c)	192.31_g
FINAL DIAL READING:	0.0944_in	FINAL DRY M. + RING:	<u>173.77</u> g
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in	OVEN DRY M. OF SOIL, Ms:	<u>109.04</u> g
CHANGE IN SAMPLE HT.:	0.195834 cm	FINAL M. OF WATER:	18.54_g
FINAL HT. OF VOIDS, H _{vf} :	0.585 cm	FINAL WATER CONTENT, wf	17.00%
FINAL VOID RATIO, ef:	0.480	FINAL DEGREE OF SAT. S:	100% (assumed)

NOTES: (a) Obtained from Final Water-Content data

- (b) Use either Gs of final water-content data for S-100%
- (c) Be sure to include any soil extruded from ring which is in consolidometer

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CONSOLIDATION TEST RESULTS ASTM D 2435

PROJECT	Ath /Meg	33
LOCATION		
JOB No.	W-7139	BORING <u>B-160</u>
SAMPLE No.		St - 2
SAMPLE DEPTH		1.5-3.5' (2.5')
SOIL DESCRIPTION	ON	Greenish Br SiCl; Sm C-F Sa; Tr FGr
DATE OF TESTIN	IĢ	4/3/98
TESTED BY		Straub/ Hostetter
I		

INITIAL SAMPLE VOL., Vi	63.338 cm ³
SPECIFIC GRAVITY, Gs	2.67
INITIAL HT. OF VOIDS, HV	0.7813 _{cm}
Hi	20 mm

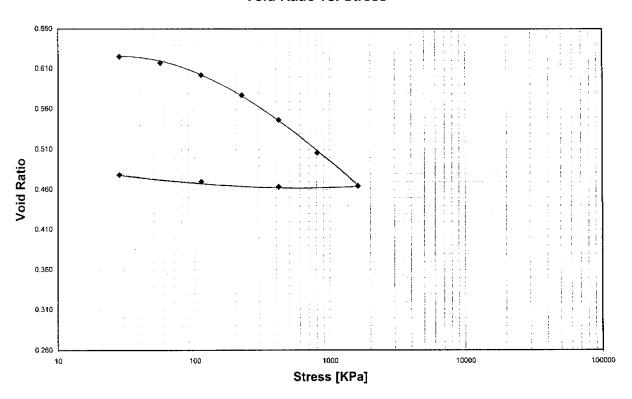
 DRY WT. OF SOIL SOLIDS, Ms
 109.04 g

 HT. OF SOLIDS, Hs
 1.2187 cm

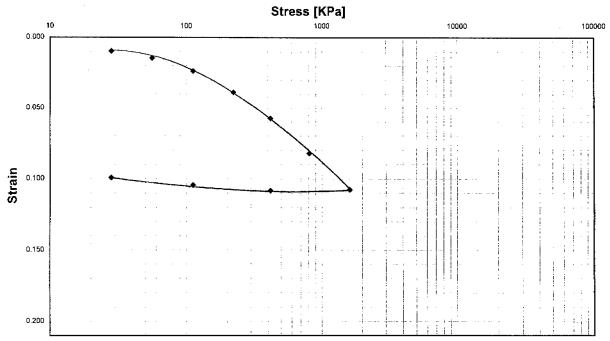
 INITIAL VOID RATIO, ei
 0.641

Load increment (kPa)	Def. dial reading at and of load (x.0001")	D ₅₀ (x.0001")	D ₁₀₀ (x.0001")	Equip. Def. ΔHe (x.0001*)	Change in sample Ht., ΔH (x.0001")	$\varepsilon = \Delta H / HI$	e ≖ eo - ∆H / Hs	Average Sample ht. H (in)	Length longest drainage path H (cm)	Time for 50% consol, t50 (min)	Coeff. of consol., cy, (cm²/min)
0	166	0	0	0	0	0	0		0	ó	0.00E+00
28	255	240.1	248.7	7	75.7	0.0096	0.6253	0.781	0.9915	0.72	2.69E-01
56	299	281.5	291.5	11	114.5	0.0145	0.6172	0.777	0.9867	1	1.92E-01
112	379	350.55	369.3	17	186.3	0.0237	0.6022	0,771	0.9787	0.57	3.31E-01
223	508	465.75	496.5	25	305.5	0.0388	0.5774	0.760	0.9651	0.44	4.17E-01
418	668	608	650.5	32	452.5	0.0575	0,5467	0.746	0.9479	0.34	5.21E-01
809	877	798.5	855	42	647	0.0822	0.5062	0.728	0.9250	0.41	4.11E-01
1617	1093	993	1070	57	847	0.1076	0.4645	0.710	0.9022	0.4	4.01E-01
418	1050		1050	32	852	0.1082	0.4635				
112	996		1003.75	17	820.75	0.1042	0.4700				
28	944		954	7	781	0.0992	0.4783				
112				17	1		ļ				1
1617				57							

Void Ratio vs. Stress



Strain vs. Stress



RESOURC]

281 Enterprise Drive Westerville, Ohio 43081 Telephone: (614) 885-1959 Fax Number: (614) 885-3341

UNCONFINED COMPRESSION

PROJECT LOCATION

ASTM D -2166 Athens/Meigs 33

JOB No.

W-7139

BORING / SAMPLE No. SAMPLE DEPTH SOIL DESCRIPTION

B-126 / ST-2 1,5-3.5' (2.5-3.2')

DATE OF TESTING TESTED BY

3/19/98 T.K.

72.542 mm DIAMETER, Do. 2.856 in 6.4063 in² 41.331 cm² AREA, Ao 172.16 mm HEIGHT, LO 6.778 in 711.56 cm³ VOLUME, Vo. 43.422 in³ 0.06778 MACH. RATE in/min WATER CONT. 19.86

WET SOIL MASS PAN MASS DRY SOIL + PAN MASS

WET DENSITY

DRY DENSITY

STRAIN RATE

1457.34 133.46 ġ 1349.36 g lb/ft3 127.86

%/min

lb/ft3

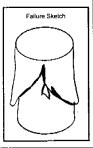
UNCONFINED COMPRESSION STRESS, qu COHESION, Su = qu / 2 =

psf 2650 1325 psf 126.88 kPa 63.44 kPa

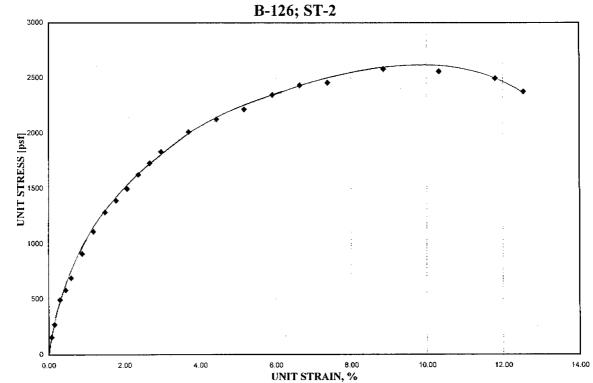
106.67

Remarks

Sample Def., \L (in)	Total Load on Sample (lb)	Unit Strain, ε ΔL/Lg (x 10 ⁻²)	Area Cor. Factor, (1-r.)	Corrected Area, A' (in ²)	Sample Stress, σ1 (psf)	Sample Stress, n ₁ (kPa)
0.0050	7.00	0.0738	0.9993	6,4110	157.23	7.53
0.0100	12.00	0.1475	0.9985	6,4158	269.34	12.90
0.0200	22.00	0.2951	0.9970	6.4252	493.06	23.61
0.0300	26.00	0.4426	0.9956	6.4348	581.84	27.86
0.0400	31.00	0.5901	0.9941	6.4443	692.70	33.17
0.0600	41.00	0.8852	0.9911	6.4635	913 44	43.74
0.0800	50.00	1.1803	0.9862	6.4828	1110.63	53.18
0.1000	58.00	1.4754	0.9852	6.5022	1284.49	61.50
0.1200	63.00	1.7704	0.9823	6.5217	1391 04	66,60
0.1400	68.00	2.0655	0.9793	6.5414	1496.93	71.67
0.1600	74.00	2.3606	0.9764	6.5612	1624.10	77.76
0.1800	79.00	2.6557	0.9734	6.5811	1728.60	82.77
0.2000	84.00	2.9507	0.9705	6.6011	1832.43	87.74
0 2500	93.00	3.6884	0.9631	6 6516	2013.34	96.40
0,3000	99.00	4.4261	0.9557	6 7030	2126.82	101 83
0.3500	104.00	5.1638	0,9484	6.7551	2216.99	106.15
0.4000	111.00	5.9014	0.9410	6.8081	2347 81	112,41
0.4500	116.00	6 6391	0.9336	6.8619	2434.33	116.56
0.5000	118.00	7.3768	0.9262	6.9165	2456.73	117.63
0.6000	126.00	8.8522	0.9115	7.0285	2581.51	123.60
0.7000	127.00	10.3275	0.8967	7.1441	2559.88	122.57



UNCONFINED COMPRESSION TEST



RESOURC E

281 Enterprise Drive Westerville, Ohio 43081 Telephone: (614) 885-1959 Fax Number: (614) 885-3341

UNCONFINED COMPRESSION ASTM D -2166

PROJECT

Athens/Meigs 33

LOCATION JOB No.

W-7139 BORING / SAMPLE No.

B-128/ss-3 3,5-5.0

SAMPLE DEPTH SOIL DESCRIPTION DATE OF TESTING

STRAIN RATE

3/18/98

%/min

TESTED BY

T.K.

1.395 in 35.433 mm DIAMETER, Do. 9.8607 cm² AREA, Ao 1.5284 in² 86.131 mm HEIGHT, LO 3.391 in 84.931 cm³ 5.1828 in³ VOLUME, Vn. 0.03391 in/min MACH, RATE WATER CONT. 26.12 %

169.61 WET SOIL MASS 9 27.42 g PAN MASS 161.9 g DRY SOIL + PAN MASS ib/ft³ 124.67 WET DENSITY lb/ft3 98.85 DRY DENSITY

UNCONFINED COMPRESSION STRESS, QL COHESION, Su = qu / 2 =

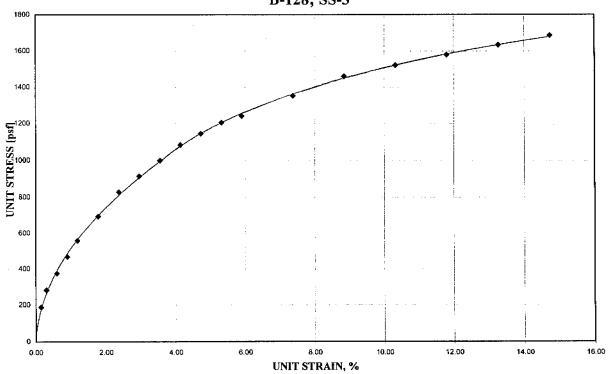
psf 1690 845 psf

kPa 80.92

40.46 kPa

Sample Def., AL (in)	Total Load on Sample (lb)	Unit Strain, ε ΔL/L ₀ (x 10 ⁻²)	Area Cor. Factor, (1-8)	Corrected Area, A ⁴ (in ²)	Sample Stress, σ ₁ (psf)	Sample Stress, σ1: (kPa)	Remarks
0,0050	2.00	0.1474	0.9985	1.5307	188.15	9.01	
0.0100	3.00	0.2949	0.9971	1.5329	281.81	13.49	
0.0200	4.00	0.5898	0.9941	1.5375	374,64	17.94	
0.0300	5.00	0.8847	0.9912	1.5420	468.91	22.36	
0.0400	6.00	1.1796	0.9882	1.5466	558 63	26.75	
0.0600	7.50	1.7694	0.9823	1.5559	694.12	33.23	
0.0800	9.00	2.3592	0.9764	1.5653	827.94	39.64	
0.1000	10.00	2.9490	0.9705	1.5748	914.37	43.78	
0.1200	11.00	3.5388	0.9646	1.5845	999.70	47.87	
0.1400	12.00	4,1286	0.9587	1.5942	1083.91	51,90	
0.1600	12.75	4.7184	0 9528	1.6041	1144.57	54.80	Failure Sketch
0.1800	13.50	5.3082	0.9469	1.6141	1204 40	57.67	
0.2000	14.00	5.8980	0.9410	1.6242	1241.23	59.43	
0.2500	15.50	7.3725	0,9263	1.6501	1352.68	64.77	
0.3000	17.00	8.8469	0.9115	1.6767	1459.97	69.90	
0.3500	18,00	10.3214	0.8968	1.7043	1520 85	72.82	
0.4000	19.00	11.7959	0.8820	1.7328	1578.94	75.60	
0.4500	20.00	13.2704	0 8673	1.7623	1634.26	78.25	
0.5000	21.00	14.7449	0.8526	1.7927	1686.80	80 76	\
0 5500	22.00	16.2194	0.8378	1.8243	1736.56	83.15	

UNCONFINED COMPRESSION TEST B-128; SS-3



Client:	Ohio [Departr	nent d	of Tra	nsp	ortation	Project: ATH-33-40.981				-				Job I	Vo,	98	21-32	200.00)
LOG O	F:	Boring	R-40)		Location:	Sta. 39+634.71, 37.50 m Right of US 33 Centerline Date Drilled.	6/2	2/00)				STA	ND/	RD F	PENE	TRAT	ION (N	i)
		0.15 m	[in]	Sam _i No		Hand	WATER OBSERVATIONS: Water seepage at: 2.26 m [7.4]		Ģ	RAD	ATIC	N			10	Vows 20	per 0	.30 m 30	40	
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (KN/m²) [tsf]	Water level at completion: none	Aggregate	C. Sand	M. Sand	- Sand	S#t	Clay	PL X			Cont atural		% LL X	
0_	265.80				_		DESCRIPTION	<u>₹</u>	38	%	76 IT.	86	Šē.		10	20		30	40	
0.37 [1.2]	265,43 [870.8]	2 3	.330 [13]	1		215	Topsoil - 0.356 m [14"] Very stiff brown SILT AND CLAY (A-6a), 'and' fine to coarse sand, little gravel; damp.	15	12		29	17	28	0	7		x			
0,91 [3.0] - 1.52 1.68	264.89 [869.1] 264.12	9 6	.406 [16]	2		[2.25] 263 [2.75]	Very stiff brown SILTY CLAY (A-6b), some fine to coarse sand, little gravel; damp.	15	15	_	10	24	34		þ	•		#		
[5.5] _ - 2,44	[866.5] 263.36	2 4 6	.229	3		359 [3.75]	Very stiff brown and gray SILTY CLAY (A-6b), trace fine to coarse sand; contains occasional rust staining; damp.								\$					
[8.0] 3.05 [10]	[864.0]	7 8 8	.229	4		_	Very stiff purple and brown SILTY CLAY (A-6b), trace fine to coarse sand; damp.									2				
3.66 [12.0]	262.14 [860.0]	4 9 21	.279 [11]	5		383 [4.0]	Hard dark gray and black SILT AND CLAY (A-6a), trace fine to coarse sand (decomposed shale); damp.	-										9		
4.27 [14.0] 4.57 4.72 [15.5]	261.53 [858.0] 261.08 [856.6]	28 50/.05	.330 [13]	6			Very dense gray GRAVEL WITH SAND (A-1-b) (decomposed limestone): damp.												50	\ - -
5.03 [16.5]	260.77 [855.5]		.305 [12]	7		431+ [4.5+]	Hard gray SANDY SILT (A-4a), some clay (decomposed siltstone); dry to damp.												ø	
6.10 [20] - - - 7.62							Bottom of Boring - 5.33 m [17.5']													

Cilent:	Ohio E	epartn	nent o	f Trar	rspe	ortation	Project: ATH-33-40.981								lob No	D.	9821	1-320	0.00	
LOG O	F:	Boring	R-41			Location:	Sta. 39+635.00, 63.52m Right of US 33 Centerline Date Drilled:	6/2	2/00)				STA				RATIC	N (N)	
		0.15 m	[m]	Samp No.		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIC	N		1	<i>B</i> Ic		er 0.3 0 30		40	
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tst]	Water level at completion: none	% Aggregate	C. Sand		- Sand	žš.	Clay	PL X-	Mois		Contei turai	nt - %	-· х	
0_	235,98						DESCRIPTION	<u>%</u>	8	%	% r.	Ж	36	1	0	20	30	, , ,	40	_
0.40 (1.3)	<u>235.58</u> [772.9]	1 2 3	.406 [16]	1		144 [1.5]	Topsoil - 0.381 m [15"] Stiff brown SiLT AND CLAY (A-6a), some fine to coarse sand; trace gravel; slightly organic; damp. @ 0.91 m [3.0], little fine to coarse sand, micaceous.	2	11		21	35	31	0=	1	•				
1.52 1.68 [5.5]	234.30 [768.7]	2 2 3	.381 [15]	2		144 [1.5]								0						!
-		2 2	.356 [14]	3A 3B		192 192 [2.0]	Very soft brown and gray CLAY (A-7-6), some fine to coarse sand; damp to moist. @ 1.98 m [6.5], thin organic layer encountered.	0	8	-	15	32	45	φ.			•		-x	
3.05 3.20 [10.5]	232.78 [763.7]	3 4	.203 [8]	4		335 [3.5]	Very stiff brownish gray SILT AND CLAY (A-6a), trace to							þ						
-		8 13	.305 [12]	5		335 [3,5]	little fine to coarse sand; damp.									B				
4.42 - 4.57 [15.0] 4.88 [16.0]	231.56 [759.7] 231.10 [758.2]	16 50/.13	.406 [16]	6		431+ [4.5+]	Hard brown SiLT AND CLAY (A-6a), trace to little fine to coarse sand (decomposed shale); damp.												50+	١.
	[100:2]	35 34	.432 [17]	7		431+ [4.5+]	Hard gray SILT AND CLAY (A-6a), trace to little fine to coarse sand (decomposed claystone); damp.												69	
6.10 (20)	229.88 [754.2]	33 51	.457 (18)	8		431+ [4.5+]	Bottom of Boring - 6.10 m [20.0']												84	
7.62																				

ient:					spo	ortation	Project: ATH-33-40.981							J	ob No.	9821-	3200.00
OG O	F:	Boring	R-42	2		Location:	Sta. 40+029.131, 58.19m Right of US 33 Centerline Date Drilled:	6/2	7/00)				STA	VDARD I	PENETRA	TION (N)
		0.15 m	[w]	Samp No.	io	Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIO	N		11		per 0.30 (m 40
Depth (m) [ft]	Elev. (m) (ft)	Błows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: none (prior to coring) 2.74 m [9.0*] (after coring, including drill water)	Aggregate	C. Sand	M. Sand	F. Sand	N.S.	Clay	PL X	Moisture	Content	-% Ц
0_	266.26						DESCRIPTION DESCRIPTION	<u> 8</u>	8	36	8	%	%	1	20	30	40
0.21 7] -	266,05/ [872.9]	3 4 6	.356 [14]	1			Topsoil - 0.203 m [8"] Very stiff brown SILT AND CLAY (A-6a), trace to little fine to coarse sand; damp. @ 0.91 m [3.0"], little fine to coarse sand, trace gravel.	0	2		19	48	31	Q,	*	*	
1.52	264.43 [867.6] 263.82	35	.406 [16] .457 [18]	3			Hard brown SANDY SILT (A-4a), little gravel, trace to little clay (decomposed siltstone); damp.									6	80
.05	[865.6]	16 16 13	.432 [17]	4			Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace to little gravel (decomposed shale); damp. @ 3.35 m [11.0], grayish brown.	•								(S)	
.96] .57	262.30 [860.6]	18	.432 [17] .356 [14]	5 6.			Very dense brown GRAVEL WITH SAND AND SILT (A-2-4) (decomposed limestone); damp.										50+
1.88)] -	261.38 [857.5]	Core	Rec .660 m [26"] Rec 1.37	RQD 87% RQD 68%			Hard gray LIMESTONE; weathered to moderately weathered; contains micaceous arenaceous laminae. @ 5.43 m [17.81], healed high angle fault. @ 5.55 m - 5.88 m [18.2' - 19.3], very broken with low angle fractures containing clay infilling. @ 5.88 m - 6.00 m [19.3' - 19.7], near vertical fracture with clay infilling.										
-	[853.5]		(54")				Hard gray SANDSTONE; weathered; contains limestone clasts. @ 6.61 m - 6.68 m [21.7' - 21.9'], limestone. @ 6.95 m [22.8'], limestone laminae. @ 7.10 m - 7.16 m [23.3' - 23.5'], limestone.										
7.32 0]	258.94 [849.5]				-	ŀ	Hard gray SILTSTONE, micaceous; weathered.		ļ								

Client:	Ohio D	epartn	nent o	f Trans	port	tation	Project: ATH-33-40.981								Job	No.	98	21-32	200.0	00
LOG O	F:	Boring	R-42		Lo	ocation:	Sta. 40+029.131, 58.19m Right of US 33 Centerline Date Drilled:	6/2	7/00)				s		ARD F				(N)
		0.15 m	[m]	Sample No.		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD.	ATIO	W			10	Blows 20	O	.30 m 30	40	
Depth (m) [lt]	Elev. (m) [ft]	Blows per	Rec (m)	Drive		Penetro- meter (kN/m²) [tsf]	Water level at completion: none (prior to coring) 2.74 m [9.01] (after coring, including drill water)	% Aggregate	C. Sand	% M. Sand	% F. Sand	Silk	Cfay	P	L	olsture N	Con-		٤	X
7.62	258.64						DESCRIPTION	₹.	86	8	86	æ	86	ļ.,,	10	20	1	30	40	
[25] - 8.56	[848.6] 257.70	Core : 1.524 : m [60"]	Rec 1.524 m [60"]	RQD 20%			Soft gray CLAYSTONE; severely weathered.								-					
[28.1] [9.14 [30]	[845.5] 257.12 [843.6]	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 88%			Hard gray LIMESTONE, argillaceous; weathered; pyritic. Hard brown SANDSTONE, argillaceous; weathered; contains													
9,45 [31.0] - 10.03	256.81 [842.6] 256.23	[55]	(co]				clav laminae Hard gray LIMESTONE; weathered. @ 9.85 m - 10.03 m [32.3' - 32.9'], very soft brown CLAYSTONE: micaceous: sev. weathered													
[32.9] - 10.67	[840.6]	Core 1.524 m	Rec 1.524 m	RQD 85%			Medium hard brown SANDSTONE; moderately weathered. @ 10.21 m - 10.39 m [33.5' - 34.1'], very broken.		٠											
10.82 [35,5] _	255.44 [838.1]	[60"]	[60°]				Hard gray LIMESTONE; brown laminations; slightly weathered.													
11.73 [36.5] _ [36.5] _ 12.19 [40] _ -	254.53 [835.1]	Core 1,524 m [60"]	Rec 1.473 m [58"]	RQD 0%			Medium hard to soft brown SANDSTONE, micaceous; laminated; severely weathered; very broken.													
13.72 [45]		Core 1.524 m [60"]	Rec 1.295 m [51"]	RQD 22%			@ 13.96 m - 15.00 m [45.8' - 49.2'], broken.													
15.24							@ 15.12 m [49.6'], becomes argillaceous.													

Client:	Ohio E	epartn	nent o	f Tra	nsp	ortation	Project: ATH-33-40.981								Job	No.	982	1-320	0.00
LOG O	F:	Boring	R-42			Location:	Sta. 40+029.131, 58.19m Right of US 33 Centerline Date Drilled:	6/2	7/0	0				S				RATIO	N (N)
:		0.15 m	[m]	Sam _l No		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIC)N	٠		10	Blows 20	0		40
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: none (prior to coring) 2.74 m [9.0] (after coring, including drill water)	% Aggregate	Send .	ff. Sand	% F. Sand	菠	% Clay	 - 			Conte	nt - %	<u>и</u>
15.24	251.02					,,	DESCRIPTION	8	8	8.	%	is si	%		10	20	3	0	40
[50] - -	[823.6]	Core 1.524 m	Rec 1,524 m	RQD 15%			Medium hard to soft hard brown SANDSTONE, micaceous; laminated; severely weathered; very broken.												
		Core 1.524 m [60"]	Rec 1.295 m [51"]	RQD 7%															
17.83 [58.5]	248.43 [815.1]				ļ.,		@ 17.62 m [57.8], broken.												
18.29 [60] – –							Bottom of Boring - 17.83 m [58.5']		}										
19.81 [65] -																			
21.34 [70] - - - - 22.86																			

Client:	Ohio E	Departr	nent c	of Tra	nsp	ortation	Project: ATH-33-40.981					_		J	lob No.	9821-	-3200.0	0
LOG O	F:	Boring	R-43	}		Location:	Sta. 40+487.98, 36.98m Left of US 33 Centerline Date Drilled:								NDARD I			
		0.15 m	[in]	Sam		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	АПО)N		1	Blows	рег 0.30 О 30	m 40	
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (kIV/m²) [tsf]	Water level at completion: 2.44 m [8.0]	% Aggregate	Sand	A. Sand	. Sand	産	% Clay	PL X	M oisture N	Conteni atural	:- % LL	
0_	236,93				-		DESCRIPTION	×	رن بع	%.	% F.	悲迷	%		0 20	30	40	
-		3 3 3	.356 [1.4]	1			Loose brown SANDY SILT (A-4a); trace to little clay; moist.											
1.52 1.68 [5.5]	235,25 [771.8]	2 3 5	.406 [1,6]	2			@ 1.07 m - 1.52 m [3.5' - 5.0'], has trace organics.							0				
		2 2 5	.330 [13]	3		48 [0.5]	Medium stiff gray SILTY CLAY (A-6b); trace organics; moist.											
3.05 3.20 [10.5]	233.73 [766.8]	10 7	.305 [12]	4			@ 2.59 m - 3.05 m [8.5' - 10.0'], becomes damp to moist, has some iron staining.								Ø			
3.97 [13]	232.96 [764.3]	7 7 8	.330 [13]	5			Medium dense brown SANDY SILT (A-4a), trace to little gravel; damp to moist.											
4.57 4.73	232.20	12 16 32	.305 [12]	6		_	Hard gray SILTY CLAY (A-6b), trace to little gravel; dry to damp.											1
[15.5] _ 	[761.8] 231.59	20 50 /.13	.254 [10]	7			Soft reddish brown weathered SILTSTONE.										50	+ (
[17,5] - - - - - -	[75 9.8]	Core 0.686 m [27"]	Rec .305 m [12"]	33%			Soft gray and red CLAYSTONE; severely weathered; contains Limestone clasts.											
[20]		m	Rec : 1.194 m [47"]	RQD 25%														
7.62																		

Client:	Ohio [)epartr	nent c	of Tra	nsp	ortation	Project: ATH-33-40.981								Job No	. 9	821-3	3200.	00
LOG O	F:	Boring	R-43	3		Location:	Sta. 40+487.98, 36.98m Left of US 33 Centerline Date Drilled:							ST	NDARI				(N)
		0.15 m	[m]	Sam No		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIO	N				ws per 20		n 40	,
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Отив	Press	Penetro- meter (kN/m²) [tst]	Water level at completion: 2.44 m [8.0"]	% Aggregate	% C. Sand	% M. Sand	. Sand	損	% Clay	PL X		ure Co Natur		-	LL X
7.00	200 04					[[10]	DESCRIPTION Soft gray and red CLAYSTONE; severely weathered; contains Limestone clasts.	36	38	8	%	₹S %	8		10	20	30	40	
7.62 [25] 7.92 [26.0]	[752.3] 229.01	Core 0.406	Rec .279	RQD	1		Soft gray and red CLAYSTONE; severely weathered; contains								Ш	Ш			
7.92 [26.0] - - 9.14 [30] - - - 10.67 [35]		0.406 m [16"]	.279 m [11"]				Limestone clasts. Bottom of Boring - 7.92 m [26.0]												
12.19 [40] - - 13.72 [45] -																			

Client:	Ohio E	epartn	nent c	f Tra	nsp	ortation	Project: ATH-33-40.981								Job No.	9821-	3200.00
LOG O	F:	Boring	R-44			Location:	Sta. 40+603.64, 51.83m Left of US 33 Centerline Date Drilled:	6/2	9/00	5				STA	NDARD F		
		0.15 m	[in]	Sam No		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIO	N			Blows 10 20	per 0.30 i	m 40
Depth (m) (ft)	Elev. (m)	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: 3.05 m [10.0] (after coring including drill water)	% Aggregate	C. Sand	M. Sand	Sand	NES.	Clay	PL ¥		Content atural	- %
0_	244.16	~			-		DESCRIPTION	8	86	% ₹	% n.	šé	*		10 20	30	40
0.18 [0.6]	243.98 [800.4]			1	l		Topsoil - 0.178 m [7"]	-							111111		
0.92	243.25	3 7 10	.279 [11]	1			Loose brown SANDY SILT (A-4a), trace clay, trace gravel; contains roots; damp to moist.								Q		
[3] - 1.52 1.68	[798.0] 242.48	3 7 11	.356 .[14]	2			Stiff mottled brown and gray SANDY SILT (A-4a), trace to little clay; contains roots; moist.								0		
[5.5] _ - 2.44	[795.5] 241.72	47 44 37	.406 [16]	3	ļ		Hard gray SILTY CLAY (A-8b), trace to little gravel; contains shale fragments; dry to damp.										81
[8] - 3.05 3.20	[793.0] 240.96	4 7 17	.305 [12]	4		431+ [4.5+]	Very stiff reddish brown SILTY CLAY (A-6b), trace fine to coarse sand; damp to moist.										
[10.5] _ 3.97	[790.6] 240.19	17 50/.10	.203 [8]	5			Dense gray SANDY SILT (A-4a), trace to little gravel; dry. (decomposed to severely weathered sitistone)										50+
[13] 4.57	[788.0] 239,59	50/.13	.127 [5]	6			Soft gray weathered SILTSTONE.									· .	50+
[15] - 5.22 [17.1]	[786.1] 238.94 [783.9]	Core 1.219 m [48"]	Rec .940 m [37"]	40%			Soft to medium hard gray SILTSTONE; moderately weathered to severely weathered; very broken.										
-	[1/03.9]		5				Medium hard gray SANDSTONE; slightly broken; contains Limstone clasts,										
6.07 [19.9] - - - 7.62	238.09 [781.1]	Core 1.524 m [60"]	Rec 1.524 m [60"]	67%			Medium hard gray SILTSTONE, micaceous; weathered; broken. @ 6.37 m - 6.49 m [20.9' - 21.3'], severely weathered.										

lient:					portation	Project: ATH-33-40.981								lab No.	982	1-3200.0)0
OG O	F:	Boring	R-44		Location:	Sta. 40+603.64, 51.83m Left of US 33 Centerline Date Drilled:	6/2	29/0	0				STA			RATION ((N)
		E		Sample		WATER OBSERVATIONS:		a		ATIC	367			Blow	s per 0.3	10 m	
		0.15	[m]	No,	Hand	Water seepage at; none			r vrita	<i>,</i> ,,,,,	,,,,		,	0 2	, O 3	0 40	
Depth	Elev.	ě	1 _ [Penetro- meter	Water level at completion: 3.05 m [10.0] (after coring	æ	T.,									_
(m)	(m)	Blows p	(iii)	و ا		including drill water)	% Aggregate	Sand	Sand	Sand		L	PL		re Conte Vatural	nt-%- ∐	_
[ft]	[ft]	윰	Rec	Orive	[tsf]		\$	28	% ₹	% F.S	ぎる	% Clay	X-		•		X
7.62 5]	236.54 [776.0]	Core	Rec	RQD		DESCRIPTION	38	1%	36	36	>€	86	h	10 2 	<i>о</i> з	<u>9 40</u>	П
- 4	·	1.524 m	1.473 m	72%		Medium hard gray SILTSTONE, micaceous; weathered; broken.											
	00¢ 74	[60"]	[58"]			Ø 7.59 m - 7.74 m [24.9' - 25.4'], very broken. Ø 7.89 m [25.9'], becomes brown.											
8.45 7.7]	235.71 [773.3]					@ 7.89 m [25.9], becomes brown.	-				ļ						П
	i i					Hard brown and gray SANDSTONE, micaceous; thick bedded; weathered.											П
9.14		Core	Rec	RQD 100%	i	bedded, wedtileted.											П
9.14		1.524 m	1.524 m	700%		@ 9.14 m - 9.30 m [30.0' - 30.5'], calcareous.		ŀ									
-		[60"]	[60"]				1									11111	
_																	
_									İ		ļ	İ					
0.67		Core 1.524	Rec 1.524	RQD 100%]]]]				
1.07		m	m	100%	-											11111	
-		[60"]	[60"]														
4								-									i
4									į								i
				l i													
2.19	[Core 1.524	Rec 1.524	RQD 73%		@ 11.89 m - 12.44 m [39.0' - 40.8'], gray with dark gray											
		m	m	10,0	İ	laminae, very micaceous.											
┪		[60"]	[60"]														
4																	
_	}						-	ĺ								+	i
						@ 13.20 m - 13.56 m [43.3' - 44.5'], gray with dark gray	1										
1.72		Core 1.524	Rec 1.524	RQD 97%		laminae, contains rust staining.											
	ļ	m [60"]	m	- "													
7	l	, oo j	[60"]														
4																	
4									l								
4.94	229.22																1
0) 5.24	[752.0]					Bottom of Boring - 14.94 m [49.0"]						-					

Client:	Ohio D	epartn	nent d	f Trar	spo	ortation	Project: ATH-33-40.981		_						Joi	No.	98	21-32	00.00	
LOG O	F:	Boring	R-45		-	Location;	Sta. 40+824.99, on Centerline of US 33 Centerline Date Drilled:	6/2	7/00)				s	TAN				ION (N)
		0.15 m	[m]	Samp No.		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIC	N		_	10	Blows 2	O	30 m	40	
Depth (m) [ft]	Elev. (m)	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [ts/]	Water level at completion: 2.19 m [7.2] (after coring including drill water)	% Aggregate	Sand .	A. Sand	Sand	轰	% Clay		A >L X∴—		e Con Vatura	tent - '	% Ц	
0	255.03	ر ق	145	ч	ш.	[tion]	DESCRIPTION	8	رن عو	% ₹	% T	ぎ %	%		10	2	0	30	40	
	254.85						Topsoil - 0.19 m [7.5"]	1					ĺ	Ш						
[0.6] _	[836.1]	3 7 32	.457 [18]	1			Medium dense brown SANDY SILT (A-4a); contains root fragments.												o	
1.07 1.37 1.52	253.96 [833.2] 253.66 [832.2]	Core 1.524 m	Rec 1.372 m	RQD 28%			Hard gray LIMESTONE: weathered.	-					•							
[5] -		[60"]	[54"]				Medium hard brown SANDSTONE, micaceous, weathered, broken. @ 1.37 m - 2.47 m [4.5' - 8.1'], contains dark brown interbeds.													
-		Core 1.524	Rec	RQD 10%																
3.05 [10] -		m	1.524 m [60"]																	
- - 4.57 [15]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 32%																
- 6.10 [20]		Core 1.524 m [60"]	Rec 1.473 m [58"]	RQD 32%																
- - 7.62		Core 1.524 m [60"]	Rec 1.295 m [51"]	RQD 0%																

Client:	Ohio [Departn	nent c	of Tra	nsp	ortation	Project: ATH-33-40.981	_							Job i	Vo.	982	1-320	0.00
LOG O	F:	Boring	R-45	5		Location:	Sta. 40+824.99, on Centerline of US 33 Centerline Date Drilled:	6/2	7/0	0				S7	ANDA	RD P	ENET	RATIC	N (N)
		0.15 m	(In)	Sam No		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIO	N			10		per 0,3 O 3		40
Depth (m) [ft]	Elev. (m) [ft]	Slows per	Rec (m)	Отие	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: 2.19 m [7.2] (after coring including drill water)	% Aggregate	% C. Sand	A. Sand	% F. Sand	#S %	Zlay	P	<u>.</u>		Conte	nt - %	LL — X
7,62	247.41				1		DESCRIPTION	1 8	8	%	%	86	86		10	20	3	0	40
[25]	[811.7]						Medium hard brown SANDSTONE, micaceous, weathered, broken.												
9.14 [30]		Core 1.524 m [60"]	Rec 1.397 m [55"]	RQD 8%															
10.67 [35]		Core 1.524 m [60"]	Rec .965 m [38"]	RQ0 0%															
12.19 [40]		Core 1.524 m [60"]	Rec 1.473 m [58"]	RQ0 15%			@ 11.67 m [38,3], becomes gray.												
13.72 [45]		Core 1.524 m [60"]	Rec 1,499 m [59"]	RQD 48%			@ 13.56 m - 13.62 m [44.5' - 44.7'], near vertical fracture.												
15.15 15.24	239.88 [787.0]	Core 1.524 m [60"]	Rec 1.270 m [50"]	RQD 28%			Verv soft dark gray CLAYSTONE: severely weathered		İ										

	Departm			spo	rtation	Project: ATH-33-40.981								Job	No.	9821	-3200.00
OG OF:	Boring	R-45			Location:	Sta. 40+824.99, on Centerline of US 33 Centerline Date Drilled:	6/2	7/0	0				s				RATION (N
	0.15 m	[m]	Sample No.	Ð	Hand	WATER OBSERVATIONS: Water seepage at; none		G	RAD	ATK	ON			10	3lows ₁ . 20	er 0,3 0 30	
Depth Elev. (m) (m) [ft] [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: 2.19 m [7.2] (after coring including drill water)	% Aggregate	% C. Sand	f. Sand	Sand	超	% Clay		Me ZL	oisture Na	Contei turei	t - % LL
15.24 239.79	1			4_ 1	17	DESCRIPTION	× ×	36	% ₹	86	葱米	8		10	20	30	
[786.7] -	1.524 m	Rec 1.270 m [50"]	28%			Very soft dark gray CLAYSTONE; severely weathered. @ 16.15 m [53.0], becomes soft.											
16.76 5] 17.16 237.87	1,524 m [60"]	Rec 1.473 m [58"]	RQD 50%														
[780.4] - - - - - - - - - - - - - - - - - - -	Core 1.524	Rec 1.524	RQD 47%			Soft black COAL; weathered; with interbedded carbonaceous SHALE. @ 17.77 m [58.3], clay seam.	-					!					
18.29 [777.1] 0] 19.11 235.92	[60,]	[60"]				Medium hard gray CLAYSTONE; weathered. @ 18.75 m [61.5], severly weathered.											
2.7] [774.0] 19.35 235.68						Hard gray LIMESTONE; weathered; broken.										Н	!
3.5] [773.2] 19.81 5] - - - 21.34						Bottom of Boring - 19.35 m [63.5']											***************************************

Client:	Ohio E	epartn	nent o	of Tra	nspo	ortation	Project: ATH-33-40.981							J	ob No.	9821-3	200.00
LOG O	F:	Boring	R-46	ì		Location:	Sta. 41+229.99, 0.03m Left of US 33 Centerline Date Drilled:	6/2	7/0)				STA		PENETRA	
Depth (m)	Elev.	wsper 0.15 m	; (m) [m]	Sam, No		Hand Penetro- meter (kN/m²)	WATER OBSERVATIONS: Water seepage at: none Water level at completion: 2.19 m [7.2] (after coring including drill water)	Aggregate	Sand	RAD	ATIC			1 PL	0 20 Moistur	s per 0.30 n 30 30 Content -	40
[ft]	[ft]	Biows	Rec	Drive	Press	[tsf]] &	IJ	×	% F. S	箦	Clay	X-		•	—х
0_ 0.15	263.26 263.11			п —	_		DESCRIPTION Topsoil - 0.152 m [6"]	86	38	96	86	38	%		0 2	30	40
0.76	[863.2] 262.50	7 11 12	.254 [10]				Medium dense brown SANDY SILT (A-4a), trace to little clay, trace gravel; damp.									O,	
[2.5] _ 1.52 [5]	[861.2]	15 37 50/.08	.356 [14]				Very soft light brown SHALE, argillaceous; severely weathered.										60+
-	 	23 27 48	.381 [15]	•													75 (
3.05 [10] 3.35	259,91	21 27 32	.279 (11)														59 (
[11.0] - -	[852.7]	12 19 27	.381 [15]				Very soft red SHALE, argillaceous; severely weathered.										φ.
4.57 [15]			.406 [16]														58
5.33 [—] [17.5] _	257.93 [846.2]	50/.13	.102 [4]				Very soft gray LIMESTONE, argillaceous, severely weathered.										50+ (
6.10 [20]	257.16 [843.7]	50/,08 Core	.076 [3] Rec	RQD			Medium hard brown CLAYSTONE, argillaceous, weathered.										60+ C
6,58 - [21.6] _ - 7.62	256.68 [842.1]	1,219 m [48"]	1.041 m [41"]	56%			@ 6.10 m - 6.40 m [20.0' - 21.0'], severely weathered. Medium hard to hard gray and brown SANDSTONE; weathered. @ 6.55 m - 6.86 m [21.6' - 22.5'], calcareous. @ 6.86 m [22.5'], becomes argillaceous. @ 6.95 m - 7.38 m [22.8' - 24.2'], contains claystone clasts. @ 7.16 m - 7.53 m [23.5' - 24.7'], low angle fracture with rust staining.										

		epartr	nent c	f Trai	nsp	ortation	Project: ATH-33-40.981								Jo	b No.	98	21-32	00.00
LOG O	F:	Boring	R-46	<u> </u>		Location:	Sta. 41+229.99, 0.03m Left of US 33 Centerline Date Drille	1: 6/2	7/0	0] ;	STAN		PENE		ON (N)
		0.15 m	[m]	Samp No.		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAE	ATIC	ON.			10		s per 0	.30 m 30	40
Depth (m) [ft]	Elev. (m) (ft)	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: 2.19 m [7.2] (after coring including drill water)	% Aggregate	% C. Sand	% M. Sand	% F. Sand	#S 28	% Clay		PL X—		re Cont Natural	'	
7. 62 7.77	255.64 255.49	Core	Rec	RQD		·	DESCRIPTION Medium hard to hard gray and brown SANDSTONE	- ×è	38	<u>₹</u>	₹.	36	96	١.,	10	1 2	0	30	40
(25.5) _ - 8.53	[838.2] 254.73 [835.7]	1.829 m [72"}	1.524 m [60"]	71%			Medium hard to hard gray SILTSTONE, micaceous; weathered. @ 8.32 m - 8.53 m [27.3' - 28.0'], brown.												
9.14	254,12						Hard gray SANDSTONE, calcareous; micaceous; weathered; contains dark gray laminae.												
[30]	[833.7]						Bottom of Boring - 9.14 m [30.0']												
12.19 [40] - - - 13.72 [45]																			
15.24																			

Cilent:	Ohio [Departn	nent o	f Trai	ispo	ortation	Project: ATH-33-40.981								Job	No. 9821-3	200.00
LOG O	F;	Boring	R-47			Location:	Sta. 41+599,99, 0.01m Right of US 33 Centerline Date Drilled:	6/2	9/00)				ST		ARD PENETRA	
		0.15 т	[m]	Samj No		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIO	N			10	Blows per 0.30 m	40
Depth (m) [ft]	Elev. (m) [ft]	Hows per	Rec (m)	Orive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: 1,37 m [4.5'] (after coring includes drill water)	% Aggregate	% C. Sand	% M. Sand	F. Sand	% S#	% Clay	P!	<u>.</u>	oisture Content - Natural	<u>χ</u>
0_	274.18						DESCRIPTION	86	≥€	96	% 7.	Ж.	₩.		10	20 30	40
0,10 [.33] _ 0,76	[899.2]	2 4	.381 [15]	1		192	Topsoil - 0.102 m [4"] Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; damp.								a		
[2.5] _ 1. 22	[897.0] 2 7 2.96	4 5 20	.330 [13]	2		[2.0] 335	Very stiff brown SANDY SILT (A-4a); micaceous; damp.										
[4] 1.52 1.68	[895.5] 272.50	15 13	.406 [16]	3A 3B		[3.5] 431+ [4.5+]	Hard brown SILT AND CLAY (A-6a); damp.										
[5.5] _	[894.0]	5 7	.457 [18]	4		263 [2.75]	Very stiff brown and red SILTY CLAY (A-6b); damp to moist.									Q	
3.05 [10]			.457 [18]	5		263 [2.75]	@ 3.20 m [10.5], becomes hard (decomposed to severely weathered claystone).									, , , ø	
-		15 26 25	.457 [18]	6		407 [4.25]											51
4.57 [15]		39 50/.13	.279 [11]	7		431+ [4.5+]	@ 4.72 m [15.5'], brown and red.										50+
-		50 50/.10	.254 [10]	8		431+ [4.5+]						-					50+ (
6.10 [20]		31 46 51	.432 [17]	9		431+ [4.5+]											97 (
6.40 [21]	267.78 [878.5]	50/.10	.102 [4]	10			Soft red CLAYSTONE; severely weathered.										50+
7 62		50/.08	,076 [3]	11													50+

Client:	Ohio E	epartn	nent c	f Trai	ıspe	ortation	Project: ATH-33-40.981								Job No.	. 91	321-32	00.00
LOG O	F:	Boring	R-47			Location:	Sta. 41+599.99, 0.01m Right of US 33 Centerline Date Drilled:	6/2	9/00	3				ST				ON (N)
	·	0.15 т	(in)	Samp No		Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAD	ATIC	N				vs per 20	0.30 m 30	40
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Orive	Press	Penetro- meter (kN/m²) [tsf]	Water level at completion: 1.37 m [4.5] (after coring includes drill water)	% Aggregate	% C. Sand	f. Sand	Sand	轰	% C/ay	PL.	Moist	ure Coi Natur	ntent - 9 al	6 Ц. —— х
7.62	266.56					1 1,447	DESCRIPTION	36	36	%	76 IT.	is %	36		10	20	30	40
[25] - -	[874.5]	Core 1.524 m [60"]	Rec 1,346 m [537]	RQD 45%			Soft red CLAYSTONE; moderately weathered; very broken.											
9.14 [30] - - -		Core 1,524 m [60"]	Rec 1.219 m [48"]	RQD 50%			@ 8.99 m [29.5'], slickensided shear.											
10.67 [35]		Gore 1.524 m [60"]	Rec 1.245 m [49"]	RQD 28%														
12.19 [40] - -		Core 1.524 m [60"]	Rec 1.422 m [56"]	RQD 90%			(2.31 m [40.4], becomes medium hard, gray and red, slightly broken. (2.62 m [41.4], slickensided shear. (2.31 m [43.1], slickensided shear.											
13.72 [45] - - - 15.24		Core 1.524 m [60"]	Rec 1.422 m [56"]	RQD 77%			@ 14.26 m [46.8'], slickensided shear.											

Client:	Ohio D	epartn	nent c	f Tran	spo	ortation	Project: ATH-33-40.981								Je	b No.		9821-	3200.	.00
LOG O	F:	Boring	R-47	,		Location:	Sta. 41+599.99, 0.01m Right of US 33 Centerline Date Drilled:	6/2	9/0	0				-	TΑN				ATION	(N)
		0.15 m	(In)	Samp No.	e	Hand	WATER OBSERVATIONS: Water seepage at: none		G	RAC	АТЮ	N			10		vs pe 20	r 0.30) 30	m 40	,
Depth (m) [ft]	Elev. (m) [ft]	Blows per	Rec (m)	Drive	Press	Penetro- meter (kN/m²) (tsf)	Water level at completion: 1.37 m [4.5] (after coring includes drill water)	% Aggregate	C. Sand	M. Sand	- Sand	Ē	Clay		PL X—	Moist	ure C Nati	ontent Iral		LL · X
15.24	258.94				_		DESCRIPTION	<u> 8</u>	ς; γ	% ₹	7,	86	%	L.,	10		20	30	40	
15.33 [50.3]	258,85 [849.2]	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 100%			Medium hard gray SILTSTONE, micaceous, weathered.													
16.76 [55] 		Core 1.524 m [60"]	Rec 1.524 m (60")	RQD 100%																
18.29 [60] - 19.17	255.01	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 100%			@ 18.20 m - 19.17 m [59.7' - 62.9'], contains interbedded sandstones.													
[62.9] - 19.81	[836.6]	Core	Rec	ROD		:	Medium hard gray CLAYSTONE; weathered, contains limestone clasts and arenaceous layers.													
[23] - -		1.524 m [60"]	1.524 m [60"]	100%			 @ 20.15 m [66.1'], slickensided shears. @ 20.30 m [66.6'], slickensided shears. @ 20.42 m [67.0'], slickensided shears. 													
21.34 [70] - - 22.86		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 100%			@ 22.37 m - 22.62 m [73.4' - 74.2'], high angle fracture, moderately weathered.													

Client:	Ohio E	epartr	nent c	of Tra	nsp	ortation	Project: ATH-33-40,981					_			Job	No.	982	1-320	0.00
LOG O	F:	Boring	R-47	7		Location:	Sta. 41+599.99, 0.01m Right of US 33 Centerline Date Drilled:	6/2	9/0)				57				RATIC	ON (N)
Depth Elev. (m) (m) [ft] [ft]		Blows per 0.15 m	Rec (m) [in]	Sample No.		Hand Penetro- meter (KN/m²) [tst]	WATER OBSERVATIONS: Water seepage at: none Water level at completion: 1.37 m [4.5] (after coring includes drill water)	GRADATION						Blows per 0.30 m C 10 20 30 40				40	
					Press			% Aggregate	Sand .	A. Sand	Sand	敖	Clay	Pi	L		Conte	ent - %	LL X
22.86	251.32					1440	DESCRIPTION	86	χ. Ω	%	76 TT	₹S %	86		10	20	- 3	30	40
[75] - -	[824.5]	Core 1.524 m [60"]	Rec 1.448 e [57"]	RQD 95%			Medium hard gray CLAYSTONE; weathered, contains limestone clasts and arenaceous layers.												
-							@ 22.92 m - 23.10 m [75.2' - 75.8'], limestone with high angle fracture.												
24.38	249.80						@ 24.17 m [79.3'], becomes red and gray, moderately weathered.	1											
[80] - -	[819.6]						Bottom of Boring - 24.38 m [80.0']												
25.91 [85] -																			
- - 27.43 (90)																			
- -																			
28.96 [95]																			
30.48	1												L.						