Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00
LOG OF:	Boring B-3	Location:	Approx. Sta. 48+848, 18 m Lt. of US 33	Date Drilled:	12/21/04

WATER OBSERVATIONS:
Water seepage at: 1.83 m [6.0']
Water level at completion: 6.43 m [21.1']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m
0	213.05													
	[699.0]	13 9 5	.305 [12]	1			Portland Cement Concrete - 0.279 m [11"] Aggregate Base - 1.245 m [49"]							
1.22	211.83	2												
[4.0] 1.52	[695.0]	2 3	.457 [18]	2			FILL: Loose to medium dense brown COARSE AND FINE SAND (A-3a), little silt; damp.							
[5]		3 3 4	.457 [18]	3										
		10 12 12	.457 [18]	4										
3.05														
[10]		5 7 9	.457 [18]	5										
4.11	208.94													
[13.5] 4.57	[685.5]	2 4 6	.457 [18]	6		192 [2.0]	FILL: Stiff to very stiff brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; moist.							
[15] 4.88	208.17													
[16.0]	[683.0]	4 5 6	.457 [18]	7			FILL: Medium dense brown COARSE AND FINE SAND (A-3a), little silt, trace gravel; contains occasional silty clay fragment; moist.							
		8 8 9	.457 [18]	8										
6.10														
[20] 6.40	206.65													
[21.0]	[678.0]	4 4 11	.457 [18]	9			FILL: Medium dense brown GRAVEL WITH SAND (A-1-b), little silt; consists primarily of sandstone fragments; moist.							
7.01	206.04													
[23.0]	[676.0]	8 11 13	.457 [18]	10			FILL: Medium dense brown and gray COARSE AND FINE SAND (A-3a), little silt, trace gravel; moist.							
7.62														

GRADATION

Moisture Content - %
PL Natural LL

Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00

LOG OF: Boring B-3 **Location:** Approx. Sta. 48+848, 18 m Lt. of US 33 **Date Drilled:** 12/21/04

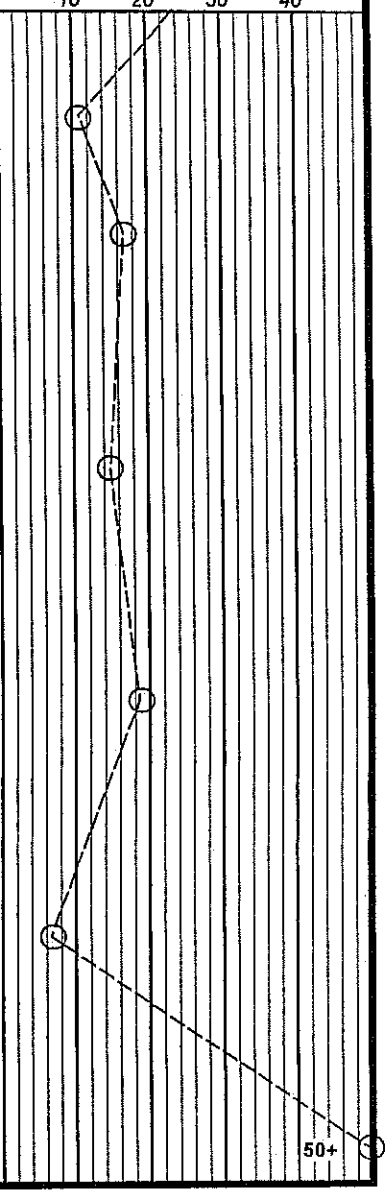
WATER OBSERVATIONS:
Water seepage at: 1.83 m [6.0']
Water level at completion: 6.43 m [21.1']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION
7.62	205.43						
[25]	[674.0]						FILL: Medium dense brown COARSE AND FINE SAND (A-3a), little silt; moist.
		4 3 8	.254 [10]	11			
8.35	204.70						
[27.4]	[671.6]						Very stiff brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; contains interbedded sand seams; moist.
		3 7 10	.457 [18]	12		215 [2.25]	
9.14							
[30]							
9.91	203.14						
[32.5]	[666.5]						Severely weathered brown and reddish brown SHALE.
		8 6 9	.457 [18]	13			
10.67							
[35]							
11.58	201.47						
[38.0]	[661.0]						Stiff reddish brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; moist. (severely weathered and decomposed shale)
		5 8 11	.457 [18]	14		168 [1.75]	
12.19							
[40]							
		WOH 2 5	.457 [18]	15		96 [1.0]	@ 13.26 m - 13.72 m [43.5' - 45.0'], gray.
13.72							
[45]							
14.78	198.27						Severely weathered gray SILTSTONE, micaceous.
[48.5]	[650.5]	34	.178				Bottom of Boring - 15.09 m [49.5']
15.09	197.96	50/.15	[7]	16			
[49.5]	[649.5]						

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40



Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00
LOG OF:	Boring B-4	Location:	Approx. Sta. 48+836, on CL US 33	Date Drilled:	12/21/04

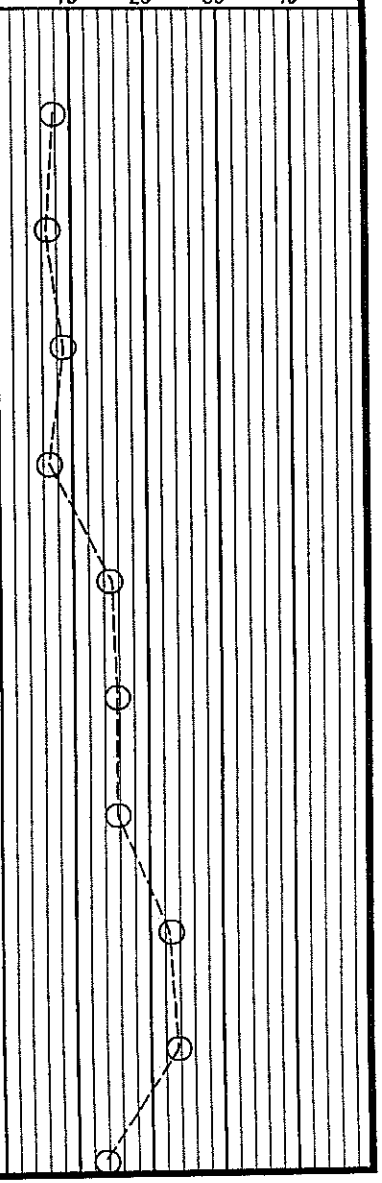
WATER OBSERVATIONS:
Water seepage at: 2.59 m [8.5']
Water level at completion: 14.39 m [47.2']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION
0	212.94 [698.6]						Portland Cement Concrete - 0.305 m [12"] Aggregate Base - 0.152 m [6"]
0.46 [1.5]	212.48 [697.1]	4 4 4	.203 [8]	1			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.
1.52 [5]		1 3 4	.203 [8]	2			
		4 5 4	.457 [18]	3			
3.05 [10]		4 4 3	.457 [18]	4			
		6 7 8	.457 [18]	5			
4.57 [15]		5 6 10	.457 [18]	6			
		3 6 10	.457 [18]	7			
6.10 [20]		4 11 12	.457 [18]	8			
		6 11 13	.457 [18]	9			
7.62		7 7 7	.457 [18]	10			

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40



Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00
LOG OF:	Boring B-4	Location:	Approx. Sta. 48+836, on CL US 33	Date Drilled:	12/21/04

WATER OBSERVATIONS:
Water seepage at: 2.59 m [8.5']
Water level at completion: 14.39 m [47.2']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40) / Moisture Content - % PL Natural LL (10 20 30 40)
7.62	205.32													
[25]	[673.6]	2 3 5	.457 [18]	11		431+ [4.5+]	Very stiff to hard brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; contains interbedded sand seams; moist.							
		6 8 13	.457 [18]	12		263 [2.75]								
9.14														
[30]														
9.75	203.19													
[32.0]	[666.6]	7 8 11	.457 [18]	13		263 [2.75]	Very stiff reddish brown CLAY (A-7-6), little fine to coarse sand; damp.							
10.67														
[35]														
11.28	201.66													
[37.0]	[661.6]	5 5 7	.457 [18]	14		215 [2.25]	Very stiff brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; moist.							
12.19														
[40]														
		3 5 7	.432 [17]	15		215 [2.25]								
13.72														
[45]														
14.87	198.07	50/.08	.076 [3]	16			@ 14.78 m - 14.87 m [48.5' - 48.8'], gray SANDSTONE fragments, micaceous.							50+
[48.8] 15.24	[649.8]						Bottom of Boring - 14.87 m [48.8']							

Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00

LOG OF: Boring B-5 **Location:** Approx. Sta. 20+000, New Ramp CL **Date Drilled:** 12/20/04

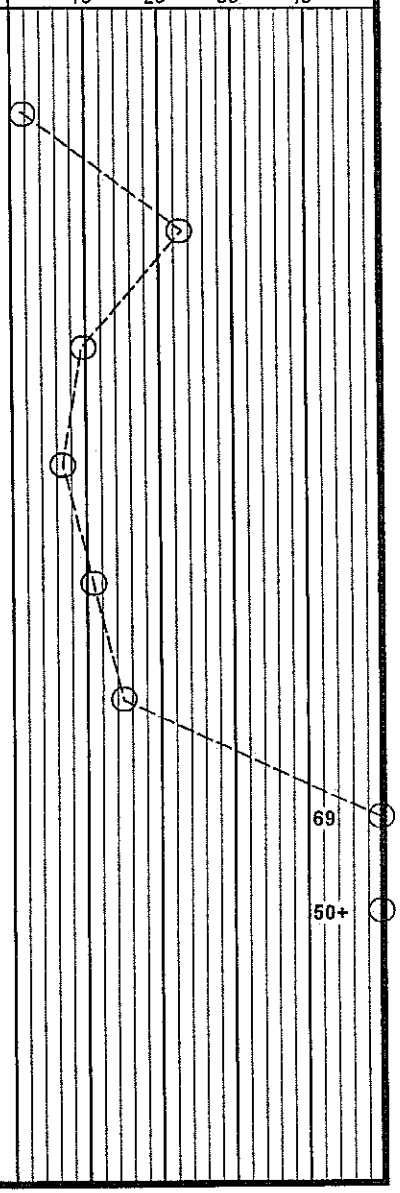
WATER OBSERVATIONS:
Water seepage at: 1.83 m [6.0']
Water level at completion: 3.81 m [12.5']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION
0	203.13						
0.09	203.04						Topsoil - 0.102 m [4"]
[0.3]	[666.1]	2 1 1	.381 [15]	1		120 [1.25]	FILL: Stiff brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; moist.
		7 9 14	.457 [18]	2		–	@ 1.07 m - 1.52 m [3.5' - 5.0'], contains coal and brick fragments.
1.52							
[5]							
1.83	201.30						
[6.0]	[660.4]	4 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.
		2 3 4	.457 [18]	4		263 [2.75]	
3.05							
[10]		3 5 6	.457 [18]	5		168 [1.75]	@ 3.35 m - 3.81 m [11.0' - 12.5'], stiff.
		WOH 12 3	.406 [16]	6		24 [0.25]	@ 4.11 m - 4.57 m [13.5' - 15.0'], very soft to soft.
4.57							
[15]							
4.88	198.25						
[16.0]	[650.4]	1 42 27	.457 [18]	7			Severely weathered gray SANDSTONE fragments.
5.67	197.46						
[18.6]	[647.8]	17	.152				Severely weathered brown SHALE.
5.82	197.31	50/.03	[6]	8			
6.10	[647.3]						Bottom of Boring - 5.82 m [19.1']
[20]							
7.62							

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

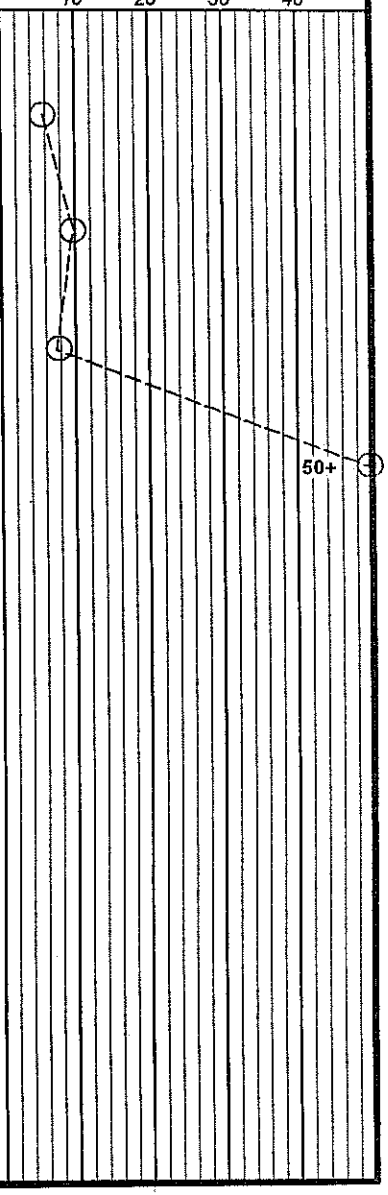
Moisture Content - %
PL Natural LL
10 20 30 40



Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00
LOG OF:	Boring B-6	Location:	Approx. Sta. 20+070 New Ramp CL	Date Drilled:	12/21/04

WATER OBSERVATIONS:
Water seepage at: 0.76 m [2.5']
Water level at completion: 1.34 m [4.4'] (includes drilling water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press/Run	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40) / Moisture Content - % PL Natural LL (10 20 30 40)
0	200.72													
0.09	200.63						Topsoil - 0.102 m [4"]							
[0.3]	[658.2]	1 3 3	.203 [8]	1		48 [0.5]	Soft to medium stiff brown SANDY SILT (A-4a), some fine to coarse sand, trace gravel; moist.							
0.91	199.81						Note: Flowline creek at approx. depth of 0.94 m [3.1']							
[3.0]	[655.5]	3 2 8	.279 [11]	2			Loose to medium dense brown COARSE AND FINE SAND (A-3a), little silt, trace gravel; wet.							
1.52														
1.68	199.04													
[5.5]	[653.0]	2 3 5	.406 [16]	3		239 [2.5]	Very stiff brown and gray SANDY SILT (A-4a), "and" fine to coarse sand; moist.							
2.74	197.98	3												
[9.0]	[649.5]	14	.330	4			Severely weathered gray SILTSTONE, micaceous.							
3.05	197.67	50/.13	[13]											
[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.							
4.57														
[15]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 68%	2		@ 4.82 m [15.8'], becomes hard.							
6.10														
[20]		Core 3.048 m [120"]	Rec 2.692 m [106"]	RQD 63%	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.							
7.62														



Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00
LOG OF:	Boring B-6	Location:	Approx. Sta. 20+070 New Ramp CL	Date Drilled:	12/21/04

WATER OBSERVATIONS:
Water seepage at: 0.76 m [2.5']
Water level at completion: 1.34 m [4.4'] (includes drilling water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press/Run	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m 10 20 30 40	Moisture Content - % PL Natural LL 10 20 30 40
7.62	193.10						DESCRIPTION								
[25]	[633.5]	Core 3.048 m [120"]	Rec 2.692 m [106"]	RQD 63%	3		Hard gray SANDSTONE, fine to medium grained, micaceous.								
8.60	192.12														
[28.2]	[630.3]						Soft dark gray SHALE, @ 8.60 m - 8.66 m [28.2' - 28.4'], clay seam.								
9.14	191.58														
[30]	[628.5]						Bottom of Boring - 9.14 m [30.0']								
10.67															
[35]															
12.19															
[40]															
13.72															
[45]															
15.24															

Client:	Ohio Department of Transportation	Project:	ATH-33/SR 681 Realignment	Job No.	9821-1016.00

LOG OF: Boring B-7 **Location:** Approx. Sta. 20+200 New Ramp CL **Date Drilled:** 12/21/04

WATER OBSERVATIONS:
Water seepage at: 1.07 m [3.5']
Water level at completion: none

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m
0	209.30													
0.09	209.21						Topsoil - 0.102 m [4"]							
[0.3]	[686.4]	2 5 5	.229 [9]	1		215 [2.25]	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 6 7	.279 [11]	2		431+ [4.5+]								
[5]		3 5 7	.330 [13]	3		239 [2.5]								
2.59	206.71													
[8.5]	[678.2]	9 9 9	.406 [16]	4			Severely weathered brown, reddish brown, and gray SHALE.							
3.05														
[10]		5 12 15	.305 [12]	5										
		29 50/.13	.229 [9]	6										50+
4.57														
[15]		12 50/.13	.127 [5]	7										50+
5.76	203.54	50/.13	.127	8										50+
[18.9]	[667.8]		[5]				Bottom of Boring - 5.76 m [18.9']							
6.10														
[20]														
7.62														

GRADATION

Moisture Content - %
PL Natural LL
10 20 30 40

RESOURCE
INTERNATIONAL
ENGINEERING CONSULTANTS

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

WORLDWIDE PROFESSIONAL SERVICES ORGANIZATION

RESOURCE INTERNATIONAL
Engineering Consultants

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

June 12, 1998

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

TABLE OF CONTENTS

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 ~~upper~~ lower boundary of the Conemaugh Formation as the top of the Upper Freeport No. 7 coal and the ~~lower~~ upper 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	44+310	Cut	11 meters
44+310	44+645	Fill	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)
- Gradation (AASHTO T 88)
- 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:

$$RQD = \frac{\Sigma \text{segments equal or longer than 10.2 centimeters}}{\text{Core Run Length}} \times 100$$

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 10% 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_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 Construction and Materials Specifications (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.

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-81
Sheet: 1 of 1
Completion Depth: 3.7 m

Date Started: 5/6/98
Date Finished: 5/6/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 135483.1
Easting: 637608.7
Elevation: 229.6 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 W W	39		Brown SILTY fine SAND, little organics, trace coarse sand, trace clay (Topsoil). Moist. 0.1	27		
AS-2				Brown fine SANDY SILT, some clay, trace coarse sand. Very soft to stiff. Moist to damp.	25		
			1.0				
ST-3		100		-groundwater initially encountered @ 1.1 m -ST-3: ODOT A-6b (8)	26	38	21
SS-4	3 5 20	61	2.0	2.3	10		
SS-5	39 50/5cm	88	3.0	Gray weathered SANDSTONE. Very soft bedrock.			
SS-6	50/8cm	67		Auger refusal @ 3.7 m 3.7 Bottom of Boring = 3.7 meters			

NOTES:

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 ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-82
Sheet: 1 of 5
Completion Depth: 31.1 m

Date Started: 5/4/98
Date Finished: 5/4/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 135236.7
Easting: 637650.6
Elevation: 269.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 3	67		Brown SILTY fine SAND, little organics, trace fine gravel (Topsoil). Moist.	22		
			0.1				
SS-2	3 5 6	94		Brown fine SANDY SILT, some clay, trace coarse sand, trace fine gravel. Medium stiff. Moist.	18		
			0.5				
			1.0	Brown fine SAND, some silt, little to trace clay, trace coarse sand, trace fine gravel. Medium dense to very dense. Moist.			
SS-3	4 14 21	78			14		
SS-4	14 21 30	89	2.0	-SS-4: ODOT A-3a	14		
			2.6				
SS-5	14 25 28	94	3.0	Brown weathered SANDSTONE. Very soft bedrock.	12		
			4.0				
SS-6	18 42 40	89			12		

NOTES:

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 ▽ N/A * m
After 24 Hrs ▼ N/A m
* 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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-82
Sheet: 2 of 5
Completion Depth: 31.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.7			
SS-7	9 24 38	94	6.0	Brown to red INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			7.0				
SS-8	39 50/10cm	70					
			8.0				
				Auger refusal @ 8.7 m 8.7			
RC-1			9.0	SANDSTONE; brown, medium, slightly broken, slightly jointed, medium grained, calcareous, moderately weathered. -lost water circulation @ 8.9 m -RC-1: Recovery = 96% -Core Loss = 8 cm -RQD = 34%			
			10.0	10.1			
RC-2				SANDSTONE; gray, medium to moderately hard, massive, fine grained, micaceous. 10.9			
			11.0	SHALE; gray, very soft to soft, highly broken, highly jointed, arenaceous, fissile.			

NOTES:

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WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-82
Sheet: 3 of 5
Completion Depth: 31.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-2: Recovery = 97% -Core Loss = 7 cm -RQD = 8%			
				11.9			
			12.0	SANDSTONE; gray, medium to moderately hard, slightly broken, slightly jointed, micaceous.			
				12.3			
				SHALE; gray, very soft to soft, highly broken, highly jointed, arenaceous, fissile.			
				12.8			
			13.0	MUDSTONE; gray, soft to very soft, highly broken, highly jointed. silty.			
RC-3							
				13.4			
				SILTSTONE; gray, soft, massive.			
			14.0	-RC-3: Recovery = 83% -Core Loss = 36 cm -RQD = 66%			
				14.6			
				SANDSTONE; brown, medium to moderately hard, massive, coarse grained.			
			15.0				
RC-4							
			16.0				
				-qr (@ 16.3 m) = 21.74 MPa			
			17.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 92%			
			18.0				

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-82
Project: ATH/MEG-33-30.980/0.000
Sheet: 4 of 5
Project Number: W-7139
Completion Depth: 31.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-5				-cross-bedded and micaceous from 18.3 to 25.9 m			
			19.0				
			20.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 97%			
			21.0				
RC-6							
			22.0				
			23.0	-RC-6: Recovery = 100% -No Core Loss -RQD = 82%			
			24.0				
RC-7							
			25.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-82
Sheet: 5 of 5
Completion Depth: 31.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-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.			
			27.0				
RC-8							
			28.0				
				-RC-8: Recovery = 86% -Core Loss = 21 cm -RQD = 50%			
				28.8			
RC-9			29.0	SHALE; black, soft, highly broken, fissile, slickensided, carbonaceous, fossilifierous.			
				29.0			
				SANDSTONE; gray, moderately hard, slightly broken, slightly jointed, carbonaceous, laminated, micaceous. -coal seam from 29.5 to 29.6 m			
				29.6			
			30.0	MUDSTONE; gray, soft to very soft, highly broken, highly jointed, fissile, carbonaceous, laminated, sparsely fossiliferous. -RC-9: Recovery = 89% -Core Loss = 23 cm -RQD = 15% -coal seam from 30.5 to 30.6 m			
			31.0				
				31.1			
				Bottom of Boring = 31.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-83
Sheet: 1 of 2
Completion Depth: 11.0 m

Date Started: 5/4/98
Date Finished: 5/4/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 135042.2
Easting: 637696.1
Elevation: 247.1 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	89		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	27		
SS-2	3 3 6	83		Brown CLAYEY SILT, some fine sand. Soft. Moist. 0.4 Red CLAY, little silt, trace fine sand. Stiff to very stiff. Moist.	32		
SS-3	4 8 9	78	1.0		22		
SS-4	3 3 4	100	2.0	1.8 Reddish-brown fine SANDY CLAY, some silt, trace coarse sand. Medium stiff to stiff. Moist.	26		
SS-5	3 4 4	100	3.0		25		
SS-6	3 4 5	100	4.0		29		

NOTES:

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

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: N/A m
* 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

RESOURCE INTERNATIONAL, INC.
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-83
Sheet: 2 of 2
Completion Depth: 11.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	3 2 4	67		5.7 Gray CLAYEY SILT, trace coarse to fine sand, trace fine gravel. Medium stiff to hard. Moist. -groundwater intially encountered @ 6.1 m	29		
			6.0				
			7.0				
SS-8	18 38 50/8cm	93		-SS-8: ODOT A-6b (11) 7.5 Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	17	38	20
			8.0				
				-gray, medium limestone lens from 8.8 to 8.9 m 8.8			
RC-1			9.0	MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty, pyritic, calcareous, rare slickensides. -RC-1: Recovery = 25% -Core Loss = 46 cm -RQD = 0%			
RC-2			10.0	-RC-2: Recovery = 66% -Core Loss = 41 cm -RQD = 25%			
RC-3				-RC-3: Recovery = 46% -Core Loss = 16 cm -RQD = 0%			
			11.0	11.0 Bottom of Boring = 11.0 meters			

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-84
Sheet: 1 of 1
Completion Depth: 4.3 m

Date Started: 5/6/98
Date Finished: 5/6/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 134940.8
Easting: 637738.4
Elevation: 231.9 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	7 8 9	78		Gray fine to coarse GRAVEL. Loose. Damp. 0.1			
				Brownish-gray SILTY CLAY, trace fine sand, trace fine gravel. Very stiff to hard. Damp.	14		
SS-2	7 9 17	61		-SS-2: Visual ODOT A-7-6	18		
			1.0				
SS-3	8 12 21	56			15		
SS-4	8 11 30	61	2.0		13		
SS-5	8 15 26	89	3.0		9		
			4.0				
				4.1			
SS-6	50/5cm	50		Gray weathered SANDSTONE. Very soft bedrock. 4.3			
				Auger refusal @ 4.3 m			
				Bottom of Boring = 4.3 meters			

NOTES:

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 ▼ N/A m

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

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-85
Sheet: 1 of 3
Completion Depth: 17.1 m

Date Started: 5/29/98
Date Finished: 5/29/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 134817.9
Easting: 637750.9
Elevation: 256.3 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 3 4	44		Brown SILTY fine SAND, little organics, trace clay, trace coarse sand (Topsoil). Moist. 0.1	12		
SS-2	4 50/13cm	100		Brown coarse to fine SAND and GRAVEL (sandstone fragments), some silt. Loose. Moist. 0.6	8		
			1.0	Light brown to brown weathered SANDSTONE. Very soft bedrock.			
SS-3	50/8cm	33			5		
SS-4	50/13cm	60	2.0		5		
				2.7			
RC-1			3.0	SANDSTONE; brown, moderately hard, massive, slightly jointed, medium to fine grained, micaceous, friable, slightly weathered.			
			4.0	-RC-1: Recovery = 96% -Core Loss = 12 cm -RQD = 86%			

NOTES:

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 ▼ N/A m

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

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-85
Sheet: 2 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
RC-2			6.0				
			7.0	-RC-2: Recovery = 94% -Core Loss = 18 cm -RQD = 62%			
			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 hard, massive, slightly broken, slightly jointed, coarse grained, micaceous, friable, with traces of iron staining. -RC-4: Recovery = 88% -Core Loss = 18 cm -RQD = 60%			
				11.3			

NOTES:

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REPORT OF SOIL EXPLORATION

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

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				SANDSTONE; brown, moderately hard, massive, slightly jointed, medium, micaceous, laminated, with traces of iron staining.			
RC-5			12.0				
				12.8			
			13.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, medium to coarse grained, micaceous, with carbonaceous laminations.			
				-RC-5: Recovery = 88% -Core Loss = 37 cm -RQD = 81%			
			14.0				
				-coal seam from 14.4 to 14.5 m			
				14.6			
				MUDSTONE; gray to dark gray, very soft, highly broken, highly jointed, arenaceous, slickensided, slightly carbonaceous.			
RC-6			15.0				
				-calcareous from 15.2 to 16.2 m			
				-RC-6: Recovery = 72% -Core Loss = 34 cm -RQD = 0%			
			16.0				
				16.2			
RC-7				LIMESTONE; gray, hard, highly broken, highly jointed, fine crystalline.			
				16.5			
RC-8				-RC-7: Recovery = 62% -Core Loss = 12 cm -RQD = 0%			
RC-9							
			17.0	MUDSTONE; gray, very soft, highly broken, highly jointed, calcareous.			
				17.1			
				-RC-8: Recovery = 87% -Core Loss = 4 cm; RQD = 0% -RC-9: Recovery = 62% -Core Loss = 12 cm; RQD = 0% -gray, hard limestone lens from 17.0 to 17.1 m			
				Bottom of Boring = 17.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-86
Sheet: 1 of 1
Completion Depth: 1.6 m

Date Started: 6/4/98
Date Finished: 6/4/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 134828.6
Easting: 637803.8
Elevation: 245.9 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Light brownish-gray SILTY CLAY, little coarse to fine sand. Moist.	15		
			1.0				
GS-2		100		-dark brown to black from 1.2 to 1.3 m			
				1.3			
GS-3		100		Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	10		
				1.5			
				Geoprobe refusal @ 1.5 m			
				Bottom of Boring = 1.5 meters			

NOTES:

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: ▼ N/A m

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

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-87
Sheet: 1 of 1
Completion Depth: 1.6 m

Date Started: 6/4/98
Date Finished: 6/4/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 134749.4
Easting: 637864.8
Elevation: 246.0 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Dark brown CLAYEY SILT, some fine sand, little coarse sand. Moist. 0.2	26		
GS-2		100		Brownish-gray CLAY, some silt, little coarse to fine sand. Moist.	24		
			1.0				
				Geoprobe refusal @ 1.6 m 1.6			
				Bottom of Boring = 1.6 meters			

NOTES:

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: N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-88
Sheet: 1 of 3
Completion Depth: 12.2 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 134590.9
Easting: 637895.1
Elevation: 271.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	4 5 4	50		Brown fine SAND and SILT, little organics, trace clay, trace fine gravel (Topsoil). Moist. 0.1	14		
SS-2	3 4 6	94	1.0	Brown coarse to fine SANDY CLAY, some silt, trace coarse sand. Stiff to hard. Moist.	16		
SS-3	9 11 21	100		1.8	14		
SS-4	40 50/8cm	89	2.0	Brown weathered SANDSTONE. Very soft bedrock.	10		
SS-5	50/13cm	100	3.0		10		
			4.0				
SS-6	50/13cm	100			9		

NOTES:

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: ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-88
Sheet: 2 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.7			
SS-7	22 50/10cm	80	6.0	Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			7.0				
				7.2			
SS-8	50/13cm	100		Brown weathered SILTSTONE. Very soft bedrock.			
			8.0				
				8.7			
SS-9	32 42 26	72	9.0	Gray weathered SHALE. Very soft bedrock.			
			10.0				
				10.2			
SS-10	50/13cm	40		Gray weathered MUDSTONE. Very soft bedrock.			
				10.7			
RC-1			11.0	SANDSTONE; gray, medium to moderately hard, massive, slightly jointed, medium to fine grained, micaceous, slightly calcareous.			

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-88
Sheet 3 of 3
Completion Depth 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-1: Recovery = 84%			
				-Core Loss = 24 cm			
				-RQD = 50%			
			12.0				
			12.2	Bottom of Boring = 12.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-89
Sheet: 1 of 2
Completion Depth: 10.1 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 134612.6
Easting: 637981.9
Elevation: 263.4 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO.	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 6 4	44		Brown SILTY fine SAND, little organics, trace coarse sand (Topsoil). Moist. 0.1	20		
SS-2	3 6 11	56	1.0	Brown SILTY CLAY, some coarse to fine sand, little to trace fine gravel. Stiff to very stiff. Moist.	20		
SS-3	17 26 32	67		1.2 Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	15		
SS-4	25 50/10cm	67	2.0		8		
SS-5	50/8cm	33		2.5 Brown weathered SANDSTONE. Very soft bedrock.	3		
RC-1			3.0	3.0 SANDSTONE; brown, medium, highly broken, highly jointed, fine to medium grained, micaceous, calcareous. -RC-1: Recovery = 67% -Core Loss = 50 cm -RQD = 0%			
			4.0	4.0 MUDSTONE; brown, soft, highly broken, highly jointed, arenaceous, calcareous. 4.3			
RC-2				SILTSTONE; brown, soft to moderately hard,			

NOTES:

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 ▼ N/A m

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

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-89
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 10.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				fissile, micaceous. 4.6			
			5.0	MUDSTONE; brown, very soft to soft, highly broken, highly jointed, calcareous, arenaceous.			
RC-3				-RC-2: Recovery = 80% -Core Loss = 15 cm -RQD = 0%			
RC-4				-brown, medium siltstone lens from 5.2 to 5.3 m -limestone fragments from 5.3 to 5.8 m			
			6.0	-RC-3: Recovery = 72% -Core Loss = 21 cm -RQD = 0% -limestone lens from 5.8 to 5.9 m			
				6.9			
			7.0	SANDSTONE; brown, moderately hard, massive, slightly jointed, coarse to medium grained, micaceous, calcareous, friable, slightly weathered.			
				-RC-4: Recovery = 77% -Core Loss = 67 cm			
			8.0	-RQD = 47%			
RC-5			9.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 77%			
			10.0	10.1			
				Bottom of Boring = 10.1 meters			

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-90
Sheet: 1 of 3
Completion Depth: 16.2 m

Date Started: 6/4/98
Date Finished: 6/4/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 134612.6
Easting: 638018.7
Elevation: 259.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 4 5	44		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	19		
SS-2	3 2 3	83		Brown and gray SILTY CLAY, some fine sand, little coarse sand. Stiff to medium stiff. Moist.	23		
			1.0				
SS-3	8 50/10cm	100		1.2 Brown weathered SANDSTONE. Very soft bedrock.	7		
SS-4	50/8cm	100	2.0		7		
			3.0	3.0			
RC-1				SANDSTONE; brown, moderately hard, massive, slightly jointed, micaceous, cross-bedded, friable, with traces of iron staining.			
			4.0				

NOTES: ** Elevation is approximate.

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: ▼ N/A ____ m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-90
Sheet: 2 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0	-RC-1: Recovery = 94% -Core Loss = 18 cm -RQD = 79%			
			6.0				
RC-2			7.0				
			8.0	-RC-2: Recovery = 98% -Core Loss = 6 cm -RQD = 93%			
			9.0				
RC-3			10.0				
			11.0	-RC-3: Recovery = 96% -Core Loss = 18 cm -RQD = 63%			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-90
Sheet: 3 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0				
RC-4			13.0				
				-RC-4: Recovery = 100% -No Core Loss -RQD = 79%			
			14.0				
			15.0				
RC-5							
				-RC-5: Recovery = 100% -No Core Loss -RQD = 100%			
			16.0				
				16.2 Bottom of Boring = 16.2 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-91
Sheet: 1 of 2
Completion Depth: 5.9 m

Date Started: 6/5/98
Date Finished: 6/5/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 134401.4
Easting: 638162.7
Elevation: 261.0 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 4 4	28		Brown SILT, some fine sand, little clay, trace organics (Topsoil). Moist. 0.1	22		
SS-2	3 4 6	44	1.0	Brown SILTY CLAY, some fine sand, little coarse sand, trace fine gravel. Medium stiff to hard. Moist.	21		
SS-3	9 17 20	44			15		
SS-4	15 21 19	61	2.0		16		
SS-5	28 50/13cm	73	3.0	3.3 Gray to brown weathered SANDSTONE. Very soft bedrock.	11		
SS-6	35 50/5cm	75	4.0		7		

NOTES: ** Elevation is approximate.

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-91
Sheet: 2 of 2
Completion Depth: 5.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	50/13cm	100		Auger refusal @ 5.9 m	5		
			5.9	Bottom of Boring = 5.9 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-92
Sheet: 1 of 1
Completion Depth: 1.8 m

Date Started: 6/5/98
Date Finished: 6/5/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 134245.3
Easting: 638290.7
Elevation: 263.3 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		67		Brownish-gray CLAY, some silt, little fine sand, trace coarse sand. Moist.	19		
			1.0				
GS-2		0					
			1.8	Geoprobe refusal @ 1.8 m			
				Bottom of Boring = 1.8 meters			

NOTES:

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: ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-93
Sheet: 1 of 1
Completion Depth: 0.6 m

Date Started: 5/21/98
Date Finished: 5/21/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 134144.7
Easting: 638294.9
Elevation: 227.5 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Dark brownish-gray CLAYEY SILT, little organics, trace fine sand (Topsoil). Moist.	0.1	35		
GS-2		100			0.3	20		
GS-3		100		Brown SILTY CLAY, some fine sand, trace fine gravel. Moist.	0.6			
				Brown weathered SANDSTONE. Very soft bedrock.				
				Geoprobe refusal @ 0.6 m				
				Bottom of Boring = 0.6 meter				

NOTES:

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: ▼ N/A ... m

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

RESOURCE INTERNATIONAL, INC.
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-94
Sheet: 1 of 1
Completion Depth: 1.8 m

Date Started: 5/21/98
Date Finished: 5/21/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 134184.3
Easting: 638387.3
Elevation: 229.2 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Dark brown CLAYEY SILT, little organics, trace coarse to fine sand (Topsoil). Moist. 0.1	30		
GS-2		100		Brownish-gray SILTY CLAY, trace coarse to fine sand. Moist to damp.	28		
			1.0	-GS-2: Visual ODOT A-6b			
				Geoprobe refusal @ 1.8 m 1.8			
				Bottom of Boring = 1.8 meters			

NOTES:

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 ▼ N/A ... m

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

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-95
Sheet: 1 of 4
Completion Depth: 25.0 m

Date Started: 5/12/98
Date Finished: 5/12/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133967.4
Easting: 638390.1
Elevation: 293.1 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 3	78		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	26		
SS-2	2 6 16	89		Brown fine SANDY SILT, trace clay. Medium stiff. Moist. 0.4	17		
			1.0	Brown SILTY CLAY, trace fine sand. Very stiff to hard. Damp.			
SS-3	12 16 26	78		1.6	12		
SS-4	13 18 38	78	2.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-5	50/10cm	100	3.0				
			4.0	4.6			

NOTES:

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: ▽ N/A* m
After 24 Hrs: ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-95
Sheet: 2 of 4
Completion Depth: 25.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-1			5.0	MUDSTONE; variegated brown, gray, and red, very soft to medium, highly broken, slightly jointed, calcareous, non-bedded, silty, slightly weathered. -RC-1: Recovery = 60% -Core Loss = 43 cm -RQD = 0%			
RC-2			6.0	-RC-2: Recovery = 41% -Core Loss = 110 cm -RQD = 0%			
			7.0				
RC-3			8.0	-RC-3: Recovery = 49% -Core Loss = 61 cm -RQD = 0%			
RC-4			9.0	-gray, medium limestone lenses up to 5 cm thick from 8.7 to 10.7 m -RC-4: Recovery = 67% -Core Loss = 15 cm -RQD = 0%			
RC-5			9.1	CLAY-SHALE; brown, soft, highly broken, fissile, slickensided, slightly weathered.			
			10.0	-RC-5: Recovery = 90% -Core Loss = 15 cm -RQD = 0%			
RC-6			10.7	SHALE; gray, medium, highly broken, silty, fissile, rare slickensides, slightly weathered.			
			11.0	-RC-6: Recovery = 100% -No Core Loss -RQD = 31%			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-95
Sheet: 3 of 4
Completion Depth: 25.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0				
				12.2			
				SILTSTONE; gray, medium, massive, micaceous, argillaceous.			
			13.0	-qr (@ 13.1 m) = 64.10 MPa			
				13.7			
RC-7			14.0	MUDSTONE; variegated red, gray, and purple, very soft to soft, highly broken, non-bedded, silty, calcareous, slickensided.			
				-RC-7: Recovery = 98% -Core Loss = 3 cm -RQD = 0%			
			15.0				
RC-8							
			16.0	-RC-8: Recovery = 98% -Core Loss = 3 cm -RQD = 23%			
RC-9							
			17.0				
				-RC-9: Recovery = 100% -No Core Loss -RQD = 18%			
			18.0				
RC-10							

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-95
Sheet: 4 of 4
Completion Depth: 25.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			19.0	-RC-10: Recovery = 73% -Core Loss = 25 cm -RQD = 14%			
RC-11			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%			
			25.0	25.0 Bottom of Boring = 25.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-96
Sheet: 1 of 1
Completion Depth: 1.7 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 133823.6
Easting: 638498.6
Elevation: 256.9 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Brown fine SANDY CLAY, some organics, little silt, trace coarse sand (Topsoil). Moist. 0.1	31		
GS-2		100		Brown SILTY CLAY, some fine to coarse sand, trace fine gravel. Moist. 0.9	23		
GS-3		100	1.0	Brown fine SANDY CLAY, little silt, trace fine gravel. Moist.	17		
				Geoprobe refusal @ 1.7 m 1.7			
				Bottom of Boring = 1.7 meters			

NOTES:

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 ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-97
Sheet: 1 of 3
Completion Depth: 18.0 m

Date Started: 5/11/98
Date Finished: 5/11/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133685.3
Easting: 638409.0
Elevation: 291.0 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 5 4	61		Brown SILTY fine SAND, little coarse sand, trace organics (Topsoil). Moist. 0.1	16		
SS-2	35 11 5	61		Brown SILTY fine SAND, trace coarse sand, trace clay. Stiff to very stiff. Moist. 0.9	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 17	78	3.0				
SS-6	50/13cm	100	4.0				

NOTES:

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 ⊥ N/A* m
After 24 Hrs ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-97
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 3
Project Number: W-7139
Completion Depth: 18.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.5 Gray leached LIMESTONE. Soft bedrock.			
SS-7	50/13cm	40	6.0	6.1 Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			7.0				
SS-8	50/10cm	100		7.6			
RC-1			8.0	CLAY-SHALE; gray, soft, highly broken, fissile, slightly micaceous, with interbedded gray, medium limestone lenses up to 5 cm thick.			
			9.0	-RC-1: Recovery = 92% -Core Loss = 24 cm -RQD = 14%			
			10.0				
RC-2			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-97
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 18.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			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%			
			12.5	MUDSTONE; gray, soft to medium, massive, calcareous, non-bedded, slickensided.			
			13.0	-qr (@ 13.0 m) = 42.91 MPa			
RC-3			14.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 52%			
			15.0				
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%			
RC-5			17.0				
				-RC-5: Recovery = 75% -Core Loss = 30 cm -RQD = 44%			
			18.0	18.0 Bottom of Boring = 18.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-98
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 5/14/98
Date Finished: 5/14/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133579.4
Easting: 638467.1
Elevation: 270.2 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	56		Red SILT, some fine sand, little clay, trace organics (Topsoil). Moist. 0.1	37		
SS-2	2 3 3	44	1.0	Red CLAY, some silt, little fine gravel, trace coarse to fine sand. Soft to very stiff. Moist to damp. -SS-2: ODOT A-7-6 (16)	26	48	21
SS-3	7 8 12	78			15		
SS-4	10 17 15	67	2.0	1.8 Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-5	12 16 22	89	3.0	3.0 Bottom of Boring = 3.0 meters			

NOTES:

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: ▼ N/A ___ m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-99
Sheet: 1 of 1
Completion Depth: 4.2 m

Date Started: 5/15/98
Date Finished: 5/15/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133420.2
Easting: 638484.0
Elevation: 256.0 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	78		Brown SILT, some fine sand, little clay, trace organics (Topsoil). Moist. 0.0	27		
ST-2		100	1.0	Brown to brownish-gray SILTY CLAY, little fine sand, trace coarse sand, trace fine gravel. Soft to very stiff. Moist.			
SS-3	3 6 7	89			21		
SS-4	3 8 9	50	2.0		21		
SS-5	8 11 15	72	3.0	3.2			
				Brown weathered SANDSTONE. Very soft bedrock.			
SS-6	50/5cm	100	4.0	4.2 Bottom of Boring = 4.2 meters			

NOTES: ** Elevation is approximate.

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

GROUND WATER READING
At Completion ▽ Dry ____ m
After 24 Hrs ▼ N/A ____ m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-100
Sheet: 1 of 3
Completion Depth: 15.2 m

Date Started: 5/14/98
Date Finished: 5/14/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133285.6
Easting: 638508.7
Elevation: 281.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 5	11		Brown SILTY CLAY, some fine sand, trace organics, trace fine gravel (Topsoil). Moist. 0.1	23		
SS-2	4 5 8	83		Brown SILTY CLAY, little fine sand, trace fine gravel. Medium stiff. Moist. 0.5			
			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				
SS-6	16 36 50/13cm	94					

NOTES: ** Elevation is approximate.

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 ▽ N/A* m
After 24 Hrs ▼ N/A m
* 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

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281 ENTERPRISE DRIVE
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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-100
Sheet: 2 of 3
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	29 50/10cm	100	6.0				
			7.0				
SS-8	50/13cm	80	8.0				
SS-9	50/13cm	100	9.0				
			10.0				
SS-10	50/10cm	100					
RC-1			11.0	MUDSTONE; red, very soft to soft, highly broken, arenaceous, calcareous, non-bedded.			
				10.7			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-100
Sheet: 3 of 3
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-1: Recovery = 43% -Core Loss = 87 cm -RQD = 0%			
			12.0	12.2			
RC-2				MUDSTONE; red to brown, soft, slightly broken, silty, non-bedded, with calcite-filled fractures.			
			13.0	-RC-2: Recovery = 80% -Core Loss = 30 cm -RQD = 47%			
				13.7			
RC-3				CLAY-SHALE; variegated brown, gray, and red, soft, highly broken, fissile, silty. -brown, soft sandstone from 14.0 to 14.3 m			
			14.0				
				-RC-3: Recovery = 98% -Core Loss = 3 cm -RQD = 0%			
			15.0	15.2			
				Bottom of Boring = 15.2 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-101
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 5/14/98
Date Finished: 5/14/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133159.4
Easting: 638496.6
Elevation: 270.0 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG 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		
			1.0				
SS-2	6 4 6	56		1.6	15		
SS-3	10 16 50/10cm	75	2.0	Brownish-gray CLAYEY SILT, little fine sand, little fine gravel, trace coarse sand. Hard. Damp. -SS-3: ODOT A-4a (5) 2.1	9	28	18
				Brown weathered SANDSTONE. Very soft bedrock.			
SS-4	50/10cm	75		2.7 Bottom of Boring = 2.7 meters			

NOTES: ** Elevation is approximate.

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-102
Sheet: 1 of 2
Completion Depth: 11.0 m

Date Started: 5/19/98
Date Finished: 5/19/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 133039.1
Easting: 638549.7
Elevation: 274.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3, 5, 4	17	0.0	Brown SANDY SILT, little organics, trace fine gravel (Topsoil). Moist.	27		
SS-2	5, 8, 12	67	1.0	Reddish-brown SILTY CLAY, trace fine gravel, trace coarse to fine sand. Stiff to hard. Moist to damp. -SS-2: Visual ODOT A-7-6	23		
SS-3	10, 18, 24	78			16		
SS-4	9, 16, 15	61	2.0		16		
SS-5	6, 8, 14	83	3.0		20		
			3.0	Mottled purple, red, and gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-6	14, 19, 26	94	4.0				

NOTES: ** Elevation is approximate.

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 ▽ N/A* ___ m
After 24 Hrs ▼ N/A ___ m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-102
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 11.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	14 26 48	89	6.0				
			7.0				
SS-8	14 50/13cm	73	8.0				
SS-9 RC-1	50/3cm	100	8.7 9.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, micaceous, laminated.			
			10.0	-RC-1: Recovery = 98% -Core Loss = 15 cm -RQD = 65%			
			11.0	Bottom of Boring = 11.0 meters			

NOTES: * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-103
Sheet: 1 of 1
Completion Depth: 1.2 m

Date Started: 5/21/98
Date Finished: 5/21/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 132861.6
Easting: 638523.0
Elevation: 259.1 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Brown SILTY CLAY, little fine sand. Moist.	23		
				0.6			
GS-2		100		Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			1.0	Geoprobe refusal @ 1.2 m			
				1.2			
				Bottom of Boring = 1.2 meters			

NOTES:

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: ▼ N/A ___ m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-104
Sheet: 1 of 2
Completion Depth: 4.9 m

Date Started: 5/19/98
Date Finished: 5/19/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 132684.9
Easting: 638556.6
Elevation: 252.7 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 2	83		Brown fine SANDY SILT, little organics, trace coarse sand (Topsoil). Moist. 0.1	20		
SS-2	3 4 8	78		Light brown SILTY CLAY, little fine sand, trace fine gravel, trace coarse sand. Soft to medium stiff. Moist. -SS-2: Visual ODOT A-6b 0.8	17		
SS-3	8 11 16	61	1.0	Brown CLAYEY SILT, little coarse to fine sand, trace fine gravel (rock fragments). Very stiff. Damp. 1.8	18		
SS-4	16 24 28	83	2.0	Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	13		
SS-5	20 37 45	94	3.0		14		
			4.0				
AS-6	50/13cm	0			6		

NOTES:

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: ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.

Project ATH/MEG-33-30.980/0.000

Project Number W-7139

Boring Number B-104

Sheet 2 of 2

Completion Depth 4.9 m

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				4.9			
				Bottom of Boring = 4.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-105
Sheet: 1 of 2
Completion Depth: 6.1 m

Date Started: 5/19/98
Date Finished: 5/19/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 132604.2
Easting: 638631.8
Elevation: 261.4 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	4 4 3	67		Brown SANDY SILT, little clay, trace organics, trace fine gravel (Topsoil). Moist.	15		
			0.1				
SS-2	4 5 6	100		Brown SILTY fine SAND, little coarse sand, trace clay. Medium stiff to very stiff. Moist.	14		
				-SS-2: Visual ODOT A-4a			
			1.0				
SS-3	8 10 13	89			14		
SS-4	10 20 25	89	2.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
					2.0		
SS-5	13 21 27	83	3.0				
					3.8		
			4.0	Gray weathered SHALE. Hard soil/very soft bedrock.			
SS-6	40 50/8cm	40					
					4.6		

NOTES:

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: ▽ N/A * m
After 24 Hrs: ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-105
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 6.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-1				MUDSTONE; gray, soft, highly broken, highly jointed, arenaceous.			
			5.0				
				5.2			
				SILTSTONE; gray, soft to moderately hard, highly broken, highly jointed, fissile, micaceous, laminated, slightly weathered.			
				-RC-1: Recovery = 93%			
				-Core Loss = 11 cm			
			6.0	-RQD = 16%			
				6.1			
				Bottom of Boring = 6.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-106
Sheet: 1 of 1
Completion Depth: 0.6 m

Date Started: 5/21/98
Date Finished: 5/21/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 132439.4
Easting: 638641.5
Elevation: 255.8 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Brown fine SAND, little silt, trace coarse sand, trace clay (Topsoil). Damp. -GS-1: ODOT A-3a	0.1	8		
GS-2		100		Brown weathered SANDSTONE. Very soft bedrock.	0.6			
				Geoprobe refusal @ 0.6 m				
				Bottom of Boring = 0.6 meter				

NOTES:

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-107
Sheet: 1 of 2
Completion Depth: 10.1 m

Date Started: 5/22/98
Date Finished: 5/22/98
Drilled By: R.G.

DRILLING AND SAMPLING INFORMATION

Northing: 132330.2
Easting: 638742.3
Elevation: 274.9 m

Boring Method: 5.7 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	7 6 5	33		Brown SILTY CLAY, some organics, trace fine sand (Topsoil). Moist. 0.1			
SS-2	8 8 12	22	1.0	Brown to brownish-gray SILTY CLAY, little to some fine sand, trace coarse sand. Stiff to very stiff. Moist.	20 29		
SS-3	8 10 12	89			30		
SS-4	9 14 12	22	2.0		19		
				2.6			
SS-5	36 46 50/10cm	50	3.0	Variegated brown, gray, and red INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			4.0				
SS-6	12 29 50/8cm	80					

NOTES:

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: ▼ N/A ____ m
Cave-in depth @ 6.7 m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-107
Sheet: 2 of 2
Completion Depth: 10.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	45 50/5cm	75	6.0				
			7.0				
SS-8	29 50/10cm	60	8.0				
SS-9	31 50/10cm	67	9.0				
SS-10	41 50/10cm	60	10.0				
			10.1	Bottom of Boring = 10.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-108
Sheet: 1 of 2
Completion Depth: 5.7 m

Date Started: 5/19/98
Date Finished: 5/19/98
Drilled By: R.G.

DRILLING AND SAMPLING INFORMATION

Northing: 132291.0
Easting: 638650.3
Elevation: 269.2 m

Boring Method: 5.7 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
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			
SS-2	3 3 6	44		Brown to reddish-brown SILTY CLAY, trace to little fine sand. Stiff to very sitff. Moist.	24		
			1.0		31		
SS-3	6 10 16	67			23		
SS-4	7 8 12	67	2.0		26		
				2.6			
SS-5	8 15 50/10cm	75	3.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			4.0				
				4.1			
SS-6	50/3cm	100		Brown weathered SANDSTONE. Very soft bedrock.			

NOTES:

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 ▼ N/A ____ m

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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-108
Project ATH/MEG-33-30.980/0.000
Sheet 2 of 2
Project Number W-7139
Completion Depth 5.7 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	50/3cm	100		Auger refusal @ 5.7 m 5.7 Bottom of Boring = 5.7 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-109
Sheet: 1 of 4
Completion Depth: 21.0 m

Date Started: 5/19/98
Date Finished: 5/19/98
Drilled By: R.G.

DRILLING AND SAMPLING INFORMATION

Northing: 132310.6
Easting: 638696.3
Elevation: 272.3 m

Boring Method: 9.5 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	4 5 5	78		Brown SILTY CLAY, little organics, trace coarse to fine sand (Topsoil). Moist. 0.1	21		
SS-2	4 9 26	67		Brown SILTY CLAY, little to some fine sand, trace coarse sand. Stiff to hard. Damp to moist.	26		
SS-3	26 26 38	44	1.0	Variegated brown, red, and gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. 1.0			
SS-4	36 50/15cm	83	2.0				
SS-5	48 50/3cm	86	3.0				
SS-6	28 50/8cm	67	4.0				

NOTES:

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 ▽ N/A * m
After 24 Hrs ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-109
Sheet: 2 of 4
Completion Depth: 21.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	12 18 50/10cm	88	6.0				
			7.0				
				7.2			
SS-8	50/5cm	100		Brown weathered SANDSTONE. Very soft bedrock.			
			8.0				
SS-9	50/5cm	100					
			9.0	Auger refusal @ 9.1 m			
				9.1			
RC-1				SANDSTONE; brown to gray, soft to medium, slightly broken, medium grained, cross-bedded, micaceous. -friable from 9.1 to 10.6 m			
			10.0	-RC-1: Recovery = 98% -Core Loss = 3 cm -RQD = 15%			
RC-2							
			11.0				

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-109
Sheet: 3 of 4
Completion Depth: 21.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 52%			
RC-3			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%			
				15.8			
RC-5			16.0	SILTSTONE; gray, medium, massive, slightly micaceous.			
				-RC-5: Recovery = 99% -Core Loss = 2 cm -RQD = 52%			
RC-6			17.0	-RC-6: Recovery = 99% -Core Loss = 2 cm -RQD = 53%			
				17.7			
			18.0	MUDSTONE; gray, soft to medium, highly broken, non-bedded.			
				18.0			
				SILTSTONE; gray, medium, highly broken,			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-109
Sheet: 4 of 4
Completion Depth: 21.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-7				argillaceous, micaceous.			
			19.0	-RC-7: Recovery = 99% -Core Loss = 2 cm -RQD = 0%			
RC-8			20.0	-RC-8: Recovery = 100% -No Core Loss -RQD = 0%			
			21.0	21.0 Bottom of Boring = 21.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-110
Sheet: 1 of 3
Completion Depth: 17.1 m

Date Started: 5/26/98
Date Finished: 5/26/98
Drilled By: R.G.

DRILLING AND SAMPLING INFORMATION

Northing: 132126.5
Easting: 638774.5
Elevation: 263.9 m

Boring Method: 9.5 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 3 4	89		Brown SILTY CLAY, trace organics, trace fine sand (Topsoil). Moist. 0.1	20		
SS-2	21 22 24	78		Brown SILTY CLAY, some fine sand, trace coarse sand. Medium stiff. Moist. 0.5 Brown SILTY fine SAND, trace coarse sand. Hard. Moist. 1.0	13		
SS-3	28 50/10cm	67	1.0	Brown weathered SANDSTONE. Very soft bedrock.			
SS-4	50/10cm	100	2.0				
SS-5	50/13cm	80	3.0				
SS-6	50/5cm	100	4.0				

NOTES:

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 ▽ N/A* m
After 24 Hrs ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-110
Sheet: 2 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				Auger refusal @ 4.9 m			
			4.9				
RC-1			5.0	SANDSTONE; brown, soft, massive, slightly jointed, coarse grained, micaceous, laminated.			
			5.5	MUDSTONE; gray, very soft to soft, highly broken, highly jointed, arenaceous. -RC-1: Recovery = 98% -Core Loss = 3 cm -RQD = 42%			
			6.0				
RC-2							
			7.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 29%			
			7.9				
RC-3			8.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, fine grained, micaceous, laminated.			
			9.0	-RC-3: Recovery = 97% -Core Loss = 5 cm -RQD = 84%			
RC-4							
			10.0	-RC-4: Recovery = 95% -Core Loss = 8 cm -RQD = 92% -calcareous from 10.7 to 12.5 m			
RC-5			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-110
Sheet: 3 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-5: Recovery = 98% -Core Loss = 3 cm -RQD = 50%			
			12.5				
RC-6				SANDSTONE; brown, moderately hard, highly broken, highly jointed, coarse grained, calcareous, micaceous, slightly argillaceous.			
			13.0	-RC-6: Recovery = 100% -No Core Loss -RQD = 0%			
			14.0	-friable from 14.0 to 17.1 m			
RC-7				-RC-7: Recovery = 98% -Core Loss = 3 cm -RQD = 19%			
			15.0	-gray, soft to moderately hard sandstone from 14.9 to 15.2 m			
RC-8							
			16.0	-RC-8: Recovery = 98% -Core Loss = 3 cm -RQD = 0%			
			17.0				
			17.1	Bottom of Boring = 17.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-111
Sheet: 1 of 2
Completion Depth: 10.1 m

Date Started: 4/22/98
Date Finished: 4/22/98
Drilled By: R.G.

DRILLING AND SAMPLING INFORMATION

Northing: 131988.5
Easting: 638833.2
Elevation: 267.8 m

Boring Method: 5.7 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PI
SS-1	5 7 8	78		Brown SILTY CLAY, little organics, trace fine sand (Topsoil). Moist. 0.1	21		
SS-2	10 14 21	44	1.0	Brown SILT, some clay, little fine sand, trace coarse sand, trace fine gravel. Stiff to hard. Moist. -SS-2: ODOT A-4b 1.1	18		
SS-3	25 50/5cm	75		Brown weathered SANDSTONE. Very soft bedrock.	11		
SS-4	27 50/8cm	67	2.0		11		
SS-5	29 50/8cm	67	3.0		9		
SS-6	35 50/5cm	67	4.0				

NOTES:

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-111
Sheet: 2 of 2
Completion Depth: 10.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	38 50/5cm		6.0				
			7.0				
SS-8	44 50/5cm		8.0				
				8.7			
SS-9	29 39 50/3cm		9.0	Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-10	44 50/5cm			9.8			
				Bottom of Boring = 9.8 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-112
Sheet: 1 of 1
Completion Depth: 1.2 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 131832.1
Easting: 638899.7
Elevation: 232.7 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Light brown weathered SANDSTONE. Very soft bedrock.			
				0.7			
GS-2		100	1.0	Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	14		
				Geoprobe refusal @ 1.2 m			
				1.2			
				Bottom of Boring = 1.2 meters			

NOTES:

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-113
Sheet: 1 of 1
Completion Depth: 1.8 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 131665.2
Easting: 638916.3
Elevation: 231.5 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG 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.	17		
				1.6			
GS-3		100		Dark brown to black CLAYEY SILT, some fine sand, little coarse sand. Moist.	51		
				1.8			
				Geoprobe refusal @ 1.8 m			
				Bottom of Boring = 1.8 meters			

NOTES:

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-114
Sheet: 1 of 1
Completion Depth: 1.6 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 131684.8
Easting: 638962.3
Elevation: 214.4 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Reddish-brown SILTY CLAY, little coarse to fine sand. Moist.	27		
				0.6			
GS-2		100	1.0	Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	10		
				1.5			
GS-3		100		Dark brown to black CLAYEY SILT, some fine sand, little coarse sand. Moist. 1.6	22		
				Geoprobe refusal @ 1.6 m			
				Bottom of Boring = 1.6 meters			

NOTES:

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-114A
Sheet: 1 of 3
Completion Depth: 12.2 m

Date Started: 5/28/98
Date Finished: 5/28/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 131732.6
Easting: 639023.5
Elevation: 258.4 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 5 5	56		Brown fine SAND and SILT, little organics, trace coarse sand (Topsoil). Moist. 0.1	23		
SS-2	4 5 8	67	1.0	Brown SILTY CLAY, some fine sand, little coarse sand, trace fine gravel. Stiff to hard. Moist.	20		
SS-3	10 15 19	61		1.8	14		
SS-4	37 50/5cm	63	2.0	Brown and gray weathered SANDSTONE. Very soft bedrock.			
SS-5	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:

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 ▽ N/A * m
After 24 Hrs ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-114A
Sheet: 2 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0	-RC-1: Recovery = 88% -Core Loss = 37 cm -RQD = 25%			
			6.0				
				6.1			
RC-2				SANDSTONE; brown and gray, moderately hard, slightly broken, slightly jointed, micaceous, laminated, cross-bedded.			
			7.0				
				-RC-2: Recovery = 73% -Core Loss = 66 cm -RQD = 46%			
			8.0				
				8.2			
				MUDSTONE; gray, very soft, highly broken, highly jointed.			
				8.5			
RC-3				SANDSTONE; gray, medium, massive, slightly jointed. coarse grained.			
				8.8			
			9.0	-RC-3: Recovery = 64% -Core Loss = 22 cm -RQD = 25%			
RC-4				LIMESTONE; gray, moderately hard to hard, highly broken, highly jointed, fine crystalline.			
RC-5				-RC-4: Recovery = 83% -Core Loss = 5 cm -RQD = 0%			
				9.9			
			10.0	-gray, soft mudstone lens from 9.9-10.1 m			
				SHALE (55%); gray, soft to medium, slightly broken, slightly jointed, arenaceous, micaceous, with interbedded SANDSTONE (45%); gray, medium, slightly broken, slightly jointed, micaceous, cross-bedded.			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-114A
Project ATH/MEG-33-30.980/0.000
Sheet 3 of 3
Project Number W-7139
Completion Depth 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-5: Recovery = 100% -No Core Loss -RQD = 36%			
			12.0				
			12.2	Bottom of Boring = 12.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-115
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 5/27/98
Date Finished: 5/27/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 131546.8
Easting: 639021.0
Elevation: 248.1 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Dark brown SILTY CLAY, some fine to coarse sand, trace fine gravel (Topsoil). Moist.	26		
				0.5			
GS-2		100		Brown SILTY CLAY, little fine gravel, little coarse to fine sand. Moist.	26		
			1.0	-GS-2: Visual ODOT A-6a			
				1.8			
GS-3		100	2.0	Reddish-brown CLAYEY SILT, some fine to coarse sand, trace fine gravel. Damp.	19		
			3.0	3.0			
				Bottom of Boring = 3.0 meters			

NOTES:

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: ▼ N/A ... m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-116
Sheet: 1 of 5
Completion Depth: 30.2 m

Date Started: 5/20/98
Date Finished: 5/20/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 131450.6
Easting: 639127.1
Elevation: 276.2 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	4 4 3	44		Brown fine SANDY SILT, some organics, little coarse sand, trace fine gravel (Topsoil). Moist. 0.1	18		
SS-2	6 5 8	44		Brown SILT and CLAY, little fine sand, trace coarse sand, trace fine gravel. Medium stiff to stiff. Moist. 1.0	15		
SS-3	12 19 42	94	1.0	Brown to red INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	12		
SS-4	12 21 38	94	2.0		11		
SS-5	21 42 49	100	3.0		10		
SS-6	13 21 33	100	4.0				

NOTES:

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 ▽ N/A* m
After 24 Hrs ▼ N/A m
* 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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-116
Project ATH/MEG-33-30.980/0.000
Sheet 2 of 5
Project Number W-7139
Completion Depth 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	48 50/8cm	75	6.0				
			7.0				
SS-8	35 50/10cm	67	8.0				
SS-9	50/13cm	80	9.0				
			10.0				
SS-10	50/10cm	75	11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-116
Sheet: 3 of 5
Completion Depth: 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-11	50/13cm	100	12.0				
				12.2			
RC-1				MUDSTONE; red to gray, soft, highly broken, highly jointed, calcareous, non-bedded, silty.			
			13.0	-RC-1: Recovery = 25% -Core Loss = 114 cm -RQD = 0%			
RC-2			14.0				
				-RC-2: Recovery = 25% -Core Loss = 84 cm -RQD = 0%			
			15.0				
RC-3				-micaceous from 15.2 to 16.5 m			
			16.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 47%			
				16.5			
				SILTSTONE; gray, medium, massive, micaceous, argillaceous.			
				16.8			
RC-4			17.0	SANDSTONE; gray, medium, massive, very fine to medium grained, micaceous, cross-bedded, micaceous, silty.			
			18.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-116
Sheet: 4 of 5
Completion Depth: 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			19.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 69%			
RC-5			20.0	-RC-5: Recovery = 98% -Core Loss = 6 cm -RQD = 61%			
			21.0	-qr (@ 21.2 m) = 24.29 MPa			
			22.0	21.9 CLAY-SHALE; gray, very soft to soft, highly broken, fissile. 22.2 SHALE; gray, medium, slightly broken, micaceous, arenaceous, fissile, with limestone nodules.			
RC-6			23.0	-RC-6: Recovery = 90% -Core Loss = 31 cm -RQD = 32%			
			24.0	24.1 SILTSTONE; gray, medium to moderately hard, slightly broken, micaceous, argillaceous, cross-bedded, rare slickensides. 24.7			
			25.0	MUDSTONE; red and gray, very soft to medium, highly broken, highly jointed, non-bedded, silty, rare slickensides, with			

NOTES:

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WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-116
Project ATH/MEG-33-30.980/0.000
Sheet 5 of 5
Project Number W-7139
Completion Depth 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				limestone nodules.			
RC-7			26.0	-RC-7: Recovery = 30% -Core Loss = 106 cm -RQD = 0%			
			27.0				
RC-8			28.0				
				28.3 SHALE; gray, medium to moderately hard, massive, slightly jointed, silty, micaceous, slightly weathered. -qr (@ 28.5 m) = 65.90 MPa			
			29.0	-RC-8: Recovery = 90% -Core Loss = 27 cm -RQD = 48%			
			30.0				
				30.2 Bottom of Boring = 30.2 meters			

NOTES:

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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-117
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 5/27/98
Date Finished: 5/27/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 131296.3
Easting: 639126.6
Elevation: 252.7 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
~~GS-1~~		100		Dark brown CLAYEY SILT, some fine to	25		
GS-2		100		coarse sand, trace organics (Topsoil). Moist. (0.1)	19		
				Brown to red CLAYEY SILT, trace fine gravel, trace coarse to fine sand. Moist.			
				-sandy shale seam from 0.8 to 0.9 m			
			1.0				
GS-3		100		-GS-3: Visual ODOT A-6a	19		
			2.0				
GS-4		100			19		
				(2.3)			
GS-5		100		Brown weathered SANDSTONE. Very soft bedrock.	16		
				Geoprobe refusal @ 3.0 m (3.0)			
			3.0	Bottom of Boring = 3.0 meters			

NOTES:

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: N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-118
Sheet: 1 of 1
Completion Depth: 1.8 m

Date Started: 5/27/98
Date Finished: 5/27/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 131187.9
Easting: 639173.6
Elevation: 226.8 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
~~GS-1~~		100		Brown CLAYEY SILT, some fine to coarse sand, trace fine gravel, trace organics (Topsoil). Moist. 0.1	24		
GS-2		100		Brown fine to coarse SANDY CLAY, some silt, trace fine gravel. Moist.	22		
			1.0				
				Geoprobe refusal @ 1.8 m 1.8			
				Bottom of Boring = 1.8 meters			

NOTES:

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 ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-119
Sheet: 1 of 3
Completion Depth: 15.2 m

Date Started: 5/27/98
Date Finished: 5/27/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 131006.5
Easting: 639207.2
Elevation: 261.7 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 3	28		Brown SILT and fine SAND, little organics, trace coarse sand (Topsoil). Moist. 0.1	29		
SS-2	2 3 4	39	1.0	Brown to reddish-brown CLAY, some silt, little fine sand, trace coarse sand. Medium stiff. Moist. 1.1	31		
SS-3	7 13 16	78		Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Very stiff to hard soil/very soft bedrock.			
SS-4	11 12 15	56	2.0				
SS-5	8 14 19	67	3.0				
			4.0				
SS-6	26 46 50/13cm	100		-becomes tan and more sandy and silty @ 4.2 m			

NOTES:

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 ▽ N/A * m
After 24 Hrs ▼ N/A m
* 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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-119
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 3
Project Number: W-7139
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.7			
SS-7	50/10cm	25		Brown weathered SANDSTONE. Very soft bedrock.			
			6.0	6.1			
RC-1				SANDSTONE; gray, moderately hard, massive, slightly jointed, coarse grained, micaceous, laminated, slightly calcareous.			
			7.0				
				-RC-1: Recovery = 98% -Core Loss = 6 cm -RQD = 55%			
			8.0				
			9.0				
RC-2				-RC-2: Recovery = 92% -Core Loss = 12 cm -RQD = 9%			
				9.9			
			10.0	SHALE; gray, soft to medium, highly broken, highly jointed, fissile.			
RC-3							
			11.0				
				MUDSTONE; gray, very soft to soft, highly broken, highly jointed.			
				11.3			

NOTES:

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281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-119
Sheet: 3 of 3
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	SHALE; gray, soft to medium, slightly broken, slightly jointed, micaceous, laminated. -RC-3: Recovery = 87% -Core Loss = 20 cm -RQD = 38% -highly jointed from 12.2 to 14.6 m			
RC-4			13.0	-RC-4: Recovery = 95% -Core Loss = 14 cm -RQD = 18%			
			14.0				
				14.6			
RC-5			15.0	MUDSTONE; variegated red and gray, soft, highly broken, highly jointed, slightly weathered. -RC-5: Recovery = 0% -Core Loss = 30 cm			
				15.2 Bottom of Boring = 15.2 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-120
Sheet: 1 of 5
Completion Depth: 28.0 m

Date Started: 5/22/98
Date Finished: 5/22/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130911.8
Easting: 639291.0
Elevation: 271.7 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 6 6	61		Brown SILT and fine SAND, some clay, little organics, trace coarse sand (Tospoil). 0.1	19		
SS-2	3 4 7	67		Brown SANDY SILT, little to some clay. Stiff. Moist. 0.9	16		
SS-3	7 15 17	78	1.0	Brown SILTY CLAY, trace fine sand. Hard. Damp. 1.8	13		
SS-4	8 12 15	44	2.0	Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-5	9 12 18	67	3.0				
			4.0				
SS-6	25 50/13cm	62					

NOTES:

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

GROUND WATER READING
At Completion ▽ N/A * m
After 24 Hrs ▼ N/A m
* 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

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-120
Sheet: 2 of 5
Completion Depth: 28.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	27 50/10cm	100	6.0				
			7.0				
SS-8	50/13cm	60	8.0				
SS-9	50/13cm	60	9.0	-brown and purple from 8.7 to 9.2 m			
			10.0				
SS-10	45 50/8cm	67	11.0	-red and gray from 10.2 to 13.7 m			

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-120
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 5
Project Number: W-7139
Completion Depth: 28.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-11	50/10cm	100	12.0				
			13.0				
				13.7			
RC-1			14.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, fine to medium grained, micaceous, calcareous.			
				14.3			
				SILTSTONE; gray, soft, slightly broken, slightly jointed, fissile. 14.6			
				MUDSTONE; gray, very soft to soft, highly broken, highly jointed.			
			15.0				
				15.2			
				SILTSTONE; gray, soft, slightly broken, slightly jointed, fissile. -RC-1: Recovery = 97% -Core Loss = 9 cm -RQD = 45% 15.8			
			16.0	SANDSTONE; gray, moderately hard, massive, slightly jointed, fine to coarse grained, micaceous, calcareous.			
RC-2			17.0				
			18.0				

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-120
Project: ATH/MEG-33-30.980/0.000
Sheet: 4 of 5
Project Number: W-7139
Completion Depth: 28.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			19.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 82%			
				19.8			
RC-3			20.0	SILTSTONE; dark gray, soft to moderately hard, highly broken, highly jointed, micaceous, fissile, slickensided.			
				20.4			
				SILSTONE; gray, moderately hard to hard, massive, slightly jointed, arenaceous, micaceous, slightly calcareous.			
			21.0	-RC-3: Recovery = 98% -Core Loss = 6 cm -RQD = 47%			
			22.0				
RC-4			23.0	-laminated from 22.9 to 24.1 m -RC-4: Recovery = 65% -Core Loss = 53 cm -RQD = 46%			
			24.0	-gray, hard sandstone lens from 23.9 to 24.1 m			
				24.1			
RC-5				MUDSTONE; variegated dark gray, gray, and red, very soft to soft, highly broken, highly jointed, calcareous, arenaceous, slickensided.			
			25.0				

NOTES:

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281 ENTERPRISE DRIVE
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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-120
Sheet: 5 of 5
Completion Depth: 28.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-5: Recovery = 80% -Core Loss = 30 cm -RQD = 16%			
				25.6			
RC-6			26.0	SILTSTONE; gray, hard, slightly broken, slightly jointed, arenaceous, micaceous, calcareous. -calcareous from 25.9 to 28.0 m			
			27.0	-RC-6: Recovery = 100% -No Core Loss -RQD = 45%			
				28.0			
			28.0	Bottom of Boring = 28.0 meters			

NOTES:

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281 ENTERPRISE DRIVE
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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-121
Sheet: 1 of 1
Completion Depth: 1.7 m

Date Started: 5/27/98
Date Finished: 5/27/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 130764.5
Easting: 639353.6
Elevation: 242.9 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Reddish-brown CLAY, some silt, little coarse to fine sand. Moist.	22		
			1.0				
GS-2		100		Light brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	9		
			1.7	Geoprobe refusal @ 1.7 m			
				Bottom of Boring = 1.7 meters			

NOTES:

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 ▼ N/A m

BORING METHOD
HSA Hollow Stem Augers
SFA Solid Flight Augers
MD Mud Drilling
WD Wash Drilling
RC Rock Coring

RESOURCE INTERNATIONAL

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

CONSOLIDATION TEST

ASTM D 2435

PROJECT Ath/Megs-33-33.980/0.000
LOCATION
JOB No. W-7139 BORING N. B-81
SAMPLE No. ST-3
SAMPLE DEPTH 3.5-5.5' (sample @ 4')
SOIL DESCRIPTION Brn, SiCl, sm c-f sa, tr. f. gr.
DATE OF TESTING 5/12/98
TESTED BY Straub/Hostetter

CONSOLIDOMETER TYPE	Fixed Ring
MULT. RATIO OF LOAD DEVICE	9
RING DIM.: DIAMETER:	63.5 mm
INITIAL HT. OF SOIL, Hi:	22.3 mm
SPECIFIC GRAVITY OF SOIL:	2.67
M. RING + SPECIMEN AT BEGINNING OF TEST:	180.98 g
M. OF RING:	64.11 g
M. OF WET SOIL, Mt:	116.87 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g
OVEN DRY M. OF SOIL, Ms:[a]	94.33 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.327 cm
INITIAL HT. OF VOIDS, Hv:	0.903 cm
INITIAL VOID RATIO, e_i:	0.681

RING No. 3

AREA: 31.67 cm^2 HEIGHT: 22.3 mm

WATER CONTENT DETERMINATION

M. OF CAN + WET SOIL:	204.86 g
M. OF CAN + DRY SOIL:	168.12 g
M. OF CAN:	28.37 g
M. OF WATER:	36.74 g
M. OF DRY SOIL:	139.75 g
INITIAL WATER CONTENT:	26.29%

FINAL TEST DATA

(Obtained at end of load testing)

INITIAL DIAL READING:	0.0596 in
FINAL DIAL READING:	0.1821 in
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in
CHANGE IN SAMPLE HT.:	0.309372 cm
FINAL HT. OF VOIDS, H_{vf}:	0.594 cm
FINAL VOID RATIO, e_f:	0.448

FINAL WATER CONTENT DETERMINATION

FINAL WET M. + RING:[c]	177.25 g
FINAL DRY M. + RING:	158.44 g
OVEN DRY M. OF SOIL, Ms:	94.33 g
FINAL M. OF WATER:	18.81 g
FINAL WATER CONTENT, wf:	19.94%
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

RESOURCE INTERNATIONAL

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

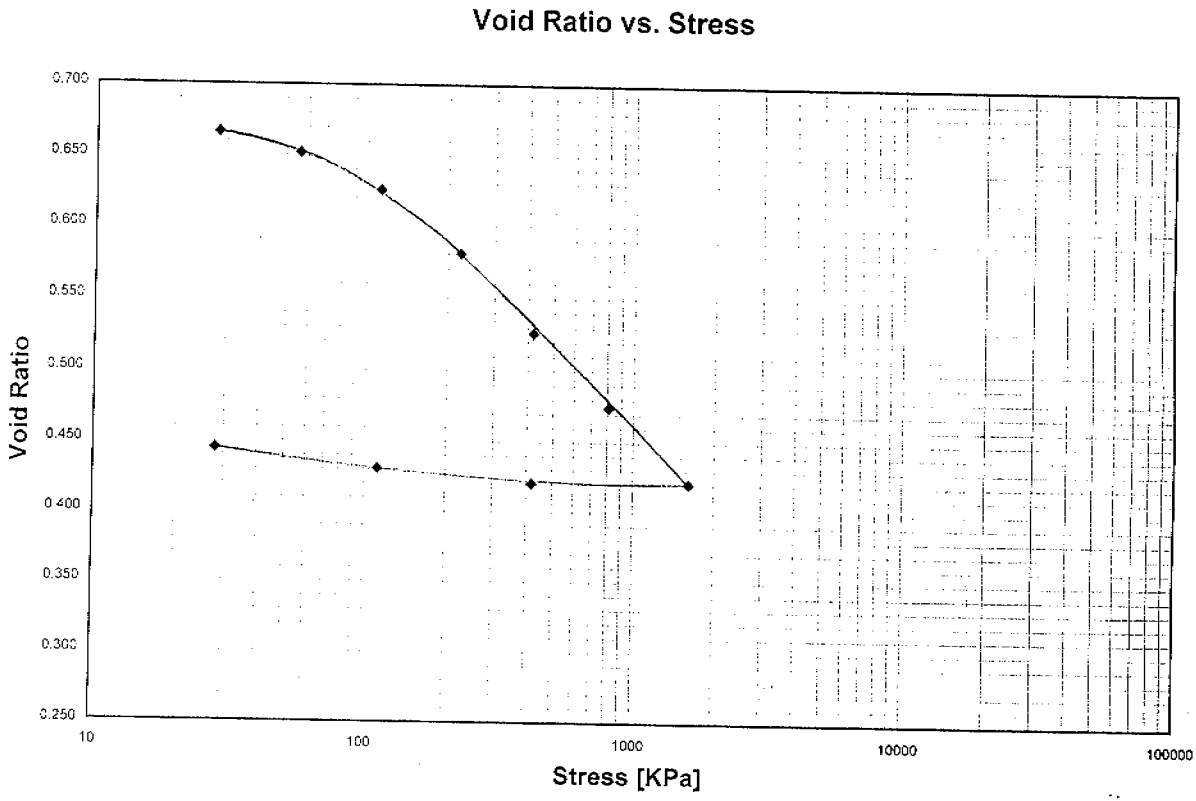
CONSOLIDATION TEST RESULTS

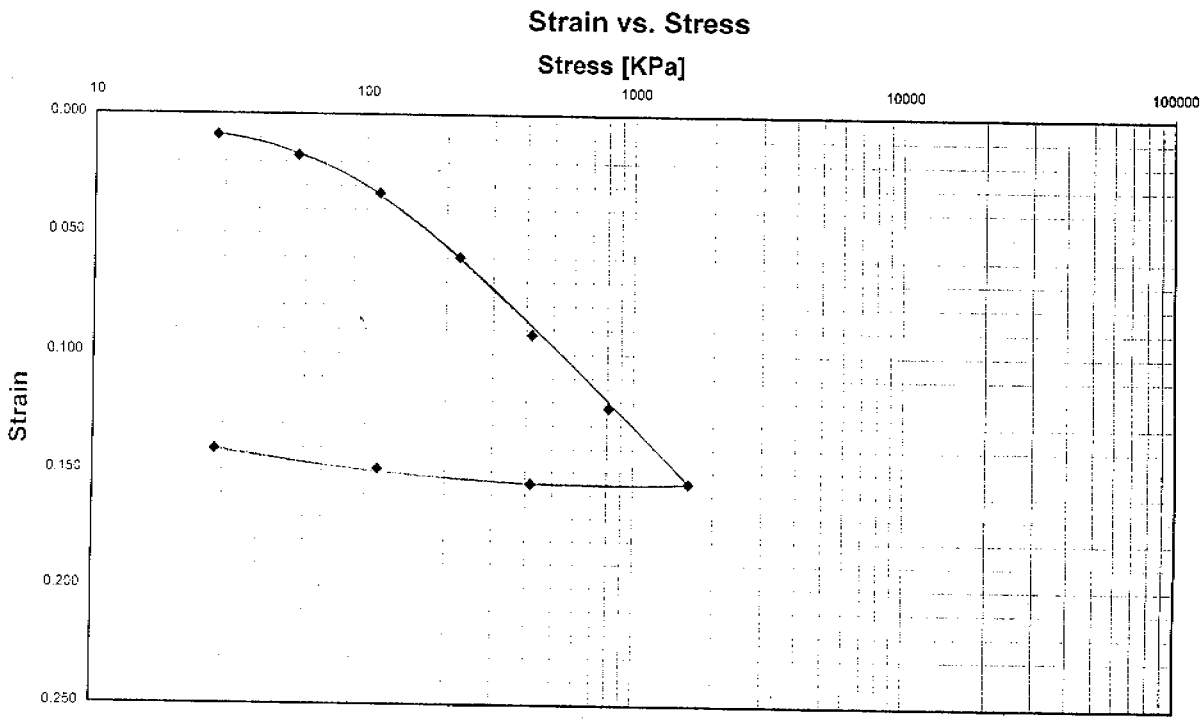
ASTM D 2435

PROJECT	Ath/Megs-33-33.980/0.000
LOCATION	
JOB No.	W-7139 BORING B-81
SAMPLE No.	ST-3
SAMPLE DEPTH	3.5-5.5' (sample @ 4')
SOIL DESCRIPTION	Brn, SiCl, sm c-f sa, tr. f. gr.
DATE OF TESTING	5/12/98
TESTED BY	Straub/Hostetter

INITIAL SAMPLE VOL., Vi	70.622 cm^3	DRY WT. OF SOIL SOLIDS, Ms	94.33 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.3267 cm
INITIAL HT. OF VOIDS, Hv	0.9033 cm	INITIAL VOID RATIO, ei	0.6809
Hi	22.3 mm		

Load increment (kPa)	Det. 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 = ΔH / Hi	e = e_0 - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol. t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	596	0	0	0	0	0	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				
28	1821		1839.2	7	1236.2	0.1408	0.4442				
112				17							
1617				57							


Void Ratio vs. Stress
Void Ratio
0.700
0.650
0.600
0.550
0.500
0.450
0.400
0.350
0.300
0.250
10
100
1000
10000
100000
Stress [KPa]


Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
0.000
0.050
0.100
0.150
0.200
0.250
Strain

RESOURCE
INTERNATIONAL
ENGINEERING CONSULTANTS

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

RESOURCE INTERNATIONAL
Engineering Consultants

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

June 9, 1998

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

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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) (AASHTO T 208)
- (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:

$$RQD = \frac{\Sigma \text{segments equal or longer than 10.2 centimeters}}{\text{Core Run Length}} \times 100$$

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
45+052 to 45+256	21 meters	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	11 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 Construction and Materials Specifications (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. 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 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.

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-123
Sheet: 1 of 3
Completion Depth: 12.2 m

Date Started: 2/18/98
Date Finished: 2/18/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130591.396
Easting: 639506.659
Elevation: 264.6 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	78		Brown CLAY, some silt, little organics (Topsoil). Moist. 0.1	31		
SS-2	3 5 11	56	1.0	Brown to red and brown SILTY CLAY, trace coarse to fine sand, trace fine gravel. Medium stiff to hard. Moist to damp.	27		
SS-3	12 15 40	100			22		
SS-4	25 48 50/8cm	73	2.0	-SS-4: ODOT A-6b (11) 2.0 Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	16	34	17
SS-5	26 31 48	67	3.0		15		
			4.0				
SS-6	39 48 50/5cm	100			13		

NOTES:

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: N/A * m
After 24 Hrs: ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-123
Sheet: 2 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	16 19 26	72	6.0		15		
			7.0				
SS-8	48 50/8cm	89			6		
			8.0				
SS-9 RC-1	50/5cm	0	9.0	8.8 SANDSTONE; gray, medium, massive, fine grained, micaceous, slightly weathered. -qr (@ 9.3 m) = 38.02 MPa			
			10.0	-RC-1: Recovery = 95% -Core Loss = 15 cm -RQD = 63%			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-123
Sheet 3 of 3
Completion Depth 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			12.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 100%			
			12.2	Bottom of Boring = 12.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-124
Sheet: 1 of 5
Completion Depth: 30.2 m

Date Started: 2/19/98
Date Finished: 2/20/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130562.053
Easting: 639439.637
Elevation: 259.0 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	83		Brown SILT, some fine sand, little clay, trace organics (Topsoil). Moist. 0.1	32		
SS-2	2 2 3	44	1.0	Brown CLAY, some silt, little to trace fine sand. Soft to hard. Moist to dry.	29		
SS-3	4 8 9	44			19		
SS-4	13 20 24	50	2.0		11		
				2.5			
SS-5	50/5cm	0		Brown SHALE. Hard soil/very soft bedrock. 2.7			
RC-1			3.0	SHALE; brown, soft, highly broken, micaceous, silty.			
				3.4			
			4.0	SANDSTONE; brown and gray, medium, highly broken, fine grained, micaceous, slightly weathered. -RC-1: Recovery = 100% -No Core Loss -RQD = 18%			

NOTES:

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: N/A * m
After 24 Hrs: ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-124
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 5
Project Number: W-7139
Completion Depth: 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-qr (@ 4.4 m) = 45.78 MPa			
			5.0				
RC-2			6.0				
			7.0	-massive from 7.0 to 7.6 m -RC-2: Recovery = 97% -Core Loss = 9 cm -RQD = 20%			
				7.9			
			8.0	MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty, with gray clay seams up to 0.1 m thick.			
RC-3			9.0				
				-RC-3: Recovery = 96% -Core Loss = 6 cm -RQD = 16%			
			10.0				
				SILTSTONE; gray, medium, micaceous, slightly broken.			
				10.4			
RC-4				SANDSTONE; gray, medium, massive, fine grained, cross-bedded, micaceous.			
				-RC-4: Recovery = 100% -No Core Loss			
			11.0	-RQD = 41% -gray, medium hard SILTSTONE lens from 11.0 11.2 m			
				11.2			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-124
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 5
Project Number: W-7139
Completion Depth: 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				MUDSTONE; variegated gray, red, and purple, very soft to soft, highly broken, non-bedded, slightly calcareous, with limestone nodules.			
RC-5			12.0	-RC-5: Recovery = 33% -Core Loss = 82 cm -RQD = 0%			
RC-6			13.0	-RC-6: Recovery = 90% -Core Loss = 6 cm -RQD = 0%			
RC-7			14.0	-RC-7: Recovery = 56% -Core Loss = 40 cm -RQD = 0%			
RC-8				-RC-8: Recovery = 90% -Core Loss = 6 cm -RQD = 38%			
			14.9				
RC-9			15.0	SILTSTONE; gray, medium, massive, micaceous, argillaceous, with limestone nodules.			
			16.0	-RC-9: Recovery = 100% -No Core Loss -RQD = 67% -qr (@ 16.3 m) = 56.31 MPa			
			16.8				
			17.0	SANDSTONE; gray, medium to moderately hard, massive, fine grained, micaceous, silty.			
			18.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-124
Project: ATH/MEG-33-30.980/0.000
Sheet: 4 of 5
Project Number: W-7139
Completion Depth: 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-10				-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.			
			19.0				
			20.0	-RC-10: Recovery = 100% -No Core Loss -RQD = 70%			
			21.0				
RC-11				-friable from 21.3 to 24.3 m			
			22.0				
			23.0	-RC-11: Recovery = 100% -No Core Loss -RQD = 60%			
			24.0				
RC-12				-RC-12: Recovery = 95% -Core Loss = 8 cm -RQD = 68%			
			25.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-124
Sheet: 5 of 5
Completion Depth: 30.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				25.3			
				SHALE; brown, soft to medium, highly broken, silty, slightly jointed.			
				25.6			
				SANDSTONE; gray, medium, massive, fine grained, micaceous, cross-bedded.			
RC-13			26.0				
				26.2			
				SILTSTONE; gray, medium, micaceous, argillaceous, slightly broken.			
				-RC-13: Recovery = 98%			
				-Core Loss = 3 cm			
				26.8			
				-RQD = 38%			
			27.0	SANDSTONE; brown to light gray, medium to moderately hard, slightly broken, coarse grained, micaceous, slightly jointed, with interbedded light gray clay seams up to 0.1 m thick.			
RC-14							
			28.0				
				-RC-14: Recovery = 95%			
				-Core Loss = 14 cm			
			29.0	-RQD = 48%			
				-medium grained from 29.2 to 29.6			
			30.0				
				30.2			
				Bottom of Boring = 30.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-125
Sheet: 1 of 2
Completion Depth: 8.8 m

Date Started: 2/18/98
Date Finished: 2/18/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130542.491
Easting: 639393.623
Elevation: 257.3 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 3	94		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	29		
SS-2	5 8 15	89	1.0	Brown CLAY and SILT, some fine sand, trace coarse sand, trace fine gravel. Soft to very stiff. Moist. -SS-2: ODOT A-6a (9) 1.1	16	29	15
SS-3	36 40 50/10cm	88		Brown weathered SANDSTONE. Very soft bedrock.			
SS-4	50/13cm	60	2.0				
SS-5	50/8cm	100		2.8			
RC-1			3.0	SANDSTONE; brown, soft to medium, highly broken, fine to medium grained, silty, friable, micaceous.			
			4.0	-RC-1: Recovery = 95% -Core Loss = 15 cm -RQD = 0%			

NOTES:

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: N/A * m
After 24 Hrs: ▼ N/A m
*Wash water used during the rock coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud D[illegible]
WD - Wash D[illegible]
RC - Rock Co[illegible]

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-125
Sheet: 2 of 2
Completion Depth: 8.8 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
RC-2			6.0				
				6.1 — CLAY-SHALE, brown, soft, highly broken, silty.			
				6.4 — MUDSTONE; greenish gray, very soft to soft, highly broken, non-bedded, slightly jointed.			
			7.0	-RC-2: Recovery = 61% -Core Loss = 99 cm -RQD = 0%			
			8.0				
				8.2 — SILTSTONE; gray, medium, highly broken, argillaceous, cross-bedded, pyritic.			
RC-3				-RC-3: Recovery = 100% -No Core Loss -RQD = 0%			
				8.8 — Bottom of Boring = 8.8 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-126
Sheet: 1 of 1
Completion Depth: 4.0 m

Date Started: 2/23/98
Date Finished: 2/23/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130362.252
Easting: 639468.074
Elevation: 211.0 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2, 4, 4	89		Brown SILT, some fine sand, little organics (Topsoil). Moist. 0.1	18		
ST-2		100		Brown fine SANDY CLAY, some silt, trace coarse sand, trace fine gravel. Medium stiff to very stiff. Moist.	21	34	14
			1.0				
SS-3	3, 4, 10	39		-ST-2: ODOT A-6b (10); qu = 126.88 kPa	20		
SS-4	7, 12, 16	56	2.0		22		
				2.6			
SS-5	6, 5, 7	39	3.0	Brown CLAY, some silt, trace coarse to fine sand, trace fine gravel. Stiff. Moist. -SS-5: ODOT A-7-6 (14)	21	44	21
				3.3			
SS-6	50/3cm	100		Gray weathered SANDSTONE. Very dense soil/very soft bedrock.			
			4.0	Auger refusal @ 4.0 meters 4.0			
				Bottom of Boring = 4.0 meters			

NOTES: ** Elevation is approximate.

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: ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-127
Sheet: 1 of 2
Completion Depth: 7.3 m

Date Started: 2/23/98
Date Finished: 2/23/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130191.568
Easting: 639598.227
Elevation: 205.9 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				13 cm - Asphalt (0.1)			
				15 cm - Sand and gravel base (0.3)			
SS-1	4 4 4	67	1.0	Brown SILTY CLAY, some coarse to fine sand, trace fine gravel. Stiff. Moist to damp. -SS-1: ODOT A-6b (9)	16	38	19
SS-2	4 5 5	17			10		
				(1.8)			
SS-3	20 21 23	72	2.0	Brown to gray arenaceous, weathered SHALE. Very soft bedrock.			
SS-4	31 50/10cm	80	3.0				
			4.0				
SS-5	23 48 50/10cm	100					

NOTES: ** Elevation is approximate.

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: N/A m
After 24 Hrs: ▼ N/A m

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

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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-127
Sheet 2 of 2
Completion Depth 7.3 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-6	50/3cm	100	6.0				
			7.0				
SS-7	50/10cm	100		Auger refusal @ 7.3 meters 7.3 Bottom of Boring = 7.3 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-128
Sheet: 1 of 2
Completion Depth: 11.0 m

Date Started: 2/26/98
Date Finished: 3/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 130101.909
Easting: 639635.257
Elevation: 204.8 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 4	44		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.0	26		
ST-2		100		Brown CLAYEY SILT, little fine sand. Medium stiff to soft. Moist.	25	35	20
				-ST-2: ODOT A-6a (10)			
			1.0				
SS-3	1 1 2	78		-SS-3: qu = 80.76 kPa	26		
SS-4	2 1 2	67	2.0		24		
				-groundwater initially encountered @ 2.4 m			
SS-5	2 1 4	78		2.7	22	NP	NP
			3.0	Gray fine SAND, some silt, little clay, trace coarse sand. Loose to very loose. Moist to wet.			
				-SS-5: ODOT A-4a (2)			
			4.0	4.1			
SS-6	3 2 1	44		Gray fine to coarse SAND, trace silt. Very loose. Moist to wet.	29		

NOTES: NP = Non-plastic sample

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: Seepage m
After 24 Hrs: ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-128
Sheet: 2 of 2
Completion Depth: 11.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0	-heaving sands encountered @ 4.6 meters			
				5.6			
SS-7	1 1 1	56	6.0	Gray SILTY CLAY, trace fine sand. Soft. Moist.	27		
				6.7			
			7.0	Brown coarse SAND, little fine sand. Medium dense. Moist to wet.			
SS-8	4 9 10	22			27		
			8.0				
				8.7			
SS-9	14 16 22	50	9.0	Reddish-brown SILTY CLAY, trace coarse to fine sand. Hard. Damp.	22		
			10.0				
SS-10	18 25 33	78		-SS-10: ODOT A-6b (11)	13	36	18
			11.0		11.0		
				Bottom of Boring = 11.0 meters			

NOTES: NP = Non-plastic sample

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-129
Sheet: 1 of 2
Completion Depth: 5.8 m

Date Started: 2/24/98
Date Finished: 2/24/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129912.782
Easting: 639650.462
Elevation: 206.3 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 2	56		Brown fine SANDY SILT, little clay, little organics (Topsoil). Moist. 0.1	27		
AS-2		0		Brown fine SAND, some silt, little coarse sand, trace clay. Very loose. Moist. -AS-2: Visual ODOT A-3a	21		
			1.0				
SS-3	2 3 3	61		1.6	25		
SS-4	4 3 1	17	2.0	Brown fine SANDY SILT, little coarse sand, little clay, trace fine gravel. Soft. Moist. -SS-4: ODOT A-4a (3) 2.6	20	26	16
SS-5	12 33 48	50	3.0	Gray weathered MUDSTONE. Very soft bedrock.	10		
			4.0				
SS-6	39 50/8cm	100					

NOTES:

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: N/A m
After 24 Hrs: ▼ N/A m

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

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281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-129
Sheet: 2 of 2
Completion Depth: 5.8 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	50/10cm	100	5.8	Bottom of Boring = 5.8 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-130
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 2/24/98
Date Finished: 2/24/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129917.851
Easting: 639713.504
Elevation: 222.3 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	56		Brown SILTY fine SAND, little clay, trace organics (Topsoil). Moist. 0.1	22		
SS-2	2 4 4	39	1.0	Brown CLAY, some silt, trace coarse to fine sand, trace fine gravel. Soft to hard. Moist. -SS-2: ODOT A-7-6 (20)	31	66	21
SS-3	8 11 16	56			22		
SS-4	12 17 23	67	2.0		18		
SS-5	8 13 30	78	3.0	3.0	14		

Bottom of Boring = 3.0 meters

NOTES:

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 — N/A m
After 24 Hrs ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-131
Sheet: 1 of 2
Completion Depth: 10.1 m

Date Started: 2/25/98
Date Finished: 2/25/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129882.196
Easting: 639782.993
Elevation: 248.2 m

Boring Method: 8.3 cm HSA/WD/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	83		Brown SILT, some fine sand, little clay, trace organics (Topsoil). Moist. 0.1	24		
SS-2	8 25 44	78	1.0	Brown SILTY CLAY, little fine sand, trace coarse sand. Medium stiff to hard. Moist. 1.1	22		
SS-3	50/13cm	90	2.0	SANDSTONE; brown, moderately hard, massive, medium to coarse grained, micaceous.	8		
RC-1			3.0	-qr (@ 3.5 m) = 23.82 MPa -RC-1: Recovery = 100% -No Core Loss -RQD = 77%			
			4.0				

NOTES:

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 ▽ N/A * m
After 24 Hrs ▼ 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 Boring
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-131
Sheet 2 of 2
Completion Depth 10.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0				
			6.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 78%			
			7.0				
RC-3			8.0				
			9.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 92%			
			10.0				
			10.1	Bottom of Boring = 10.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-132
Sheet: 1 of 3
Completion Depth: 17.1 m

Date Started: 2/25/98
Date Finished: 2/25/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129825.822
Easting: 639752.628
Elevation: 247.1 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 3	61		Brown SILT, some fine sand, little clay, trace organics (Topsoil). Moist. 0.1	21		
SS-2	4 8 28	50		Brown SILTY CLAY, little fine sand, trace coarse sand. Medium stiff. Moist. 0.8	11		
			1.0	Red and brown weathered SANDSTONE. Very soft bedrock.			
SS-3	50/13cm	60		1.3			
RC-1				SANDSTONE; light brown, medium, massive, medium grained, friable, cross-bedded, slightly weathered, slightly jointed.			
			2.0				
				-qr (@ 2.4 m) = 13.25 MPa -RC-1: Recovery = 95% -Core Loss = 13 cm			
			3.0	-RQD = 75%			
			4.0				
RC-2							

NOTES:

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 — N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-132
Sheet: 2 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				-RC-2: Recovery = 97% -Core Loss = 9 cm -RQD = 66%			
			6.0				
				-loss of water circulation @ 6.8 m			
			7.0				
				7.1			
RC-3				SANDSTONE; gray to brown, moderately hard, massive, fine to coarse grained, micaceous, cross-bedded. -calcareous from 7.2 to 9.0 meters			
			8.0				
				-qr (@ 8.2 m) = 38.76 MPa			
				-RC-3: Recovery = 99% -Core Loss = 3 cm -RQD = 80%			
			9.0				
			10.0				
RC-4							
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-132
Sheet: 3 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-4: Recovery = 99% -Core Loss = 3 cm -RQD = 71%			
			13.0				
RC-5			14.0				
			15.0	-RC-5: Recovery = 99% -Core Loss = 3 cm -RQD = 70%			
			16.0				
RC-6			17.0	-RC-6: Recovery = 84% -Core Loss = 12 cm -RQD = 35% -gray siltstone lens from 16.9 to 17.0 m			
			17.1	Bottom of Boring = 17.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-133
Sheet: 1 of 2
Completion Depth: 7.9 m

Date Started: 2/26/98
Date Finished: 2/26/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129779.229
Easting: 639745.270
Elevation: 238.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	17		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	17	NP	NP
SS-2	3 4 16	67	1.0	Brown SILTY SAND, trace clay. Soft to very stiff. Moist. -SS-1: Visual ODOT A-3a 1.1	15		
SS-3	14 14 13	44		Brown weathered SANDSTONE. Very soft bedrock.			
SS-4	15 24 50/13cm	71	2.0				
SS-5	50/15cm	67		2.7			
RC-1			3.0	SANDSTONE; brown, medium, highly broken, coarse grained, friable, moderately weathered.			
			4.0	-RC-1: Recovery = 60% -Core Loss = 122 cm -RQD = 0%			

NOTES:

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

GROUND WATER READING
At Completion: N/A * m
After 24 hrs: ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-133
Sheet: 2 of 2
Completion Depth: 7.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				-brown siltstone lens from 5.7 to 5.8 m			
				5.8			
RC-2			6.0	SANDSTONE; brown, medium, highly broken, medium grained, micaceous, with highly weathered SILTSTONE lenses up to 1 cm thick.			
			7.0	-RC-2: Recovery = 48% -Core Loss = 111 cm -RQD = 0%			
				7.9			
				Bottom of Boring = 7.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-134
Sheet: 1 of 2
Completion Depth: 5.8 m

Date Started: 3/2/98
Date Finished: 3/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129706.500
Easting: 639740.332
Elevation: 217.5 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	11		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.0	17		
SS-2	2 4 5	72	1.0	Brown fine to coarse SAND, little clayey silt, trace fine gravel. Very loose to medium dense. Moist. -SS-2: ODOT A-2-4 (0)	16	24	15
SS-3	4 6 7	56			19		
ST-4		69	2.0	1.8 Brown and gray CLAY, some silt, trace coarse to fine sand. Very stiff to hard. Moist. -ST-4: ODOT A-7-6 (17); uw = 19.34 KN/m3	29	51	22
SS-5	3 7 11	44	3.0		25		
SS-6	10 25 36	67	4.0		13		

NOTES: ** Elevation is approximate

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 N/A m
After 24 Hrs ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-134
Project ATH/MEG-33-30.980/0.000
Sheet 2 of 2
Project Number W-7139
Completion Depth 5.8 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.6			
SS-7	47 50/3cm	86		Gray SHALE. Hard soil/very soft bedrock. 5.8 Bottom of Boring = 5.8 meters			

NOTES: ** Elevation is approximate

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-135
Sheet: 1 of 3
Completion Depth: 17.1 m

Date Started: 3/3/98
Date Finished: 3/3/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129568.141
Easting: 639862.175
Elevation: 255.5 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	44		Brown SILT, little organics, trace coarse to fine sand (Topsoil). Moist. 0.1	34		
SS-2	3 4 16	78	1.0	Brown SILT and CLAY, little coarse to fine sand. Soft to very stiff. Moist. 0.9	21		
SS-3	27 50/15cm	67		Light brown CLAY-SHALE. Hard soil/very soft bedrock.			
SS-4	50/15cm	67	2.0	2.7			
RC-1			3.0	SANDSTONE; brown and gray, medium to moderately hard, slightly broken, medium to coarse grained, micaceous, cross-bedded, friable.			
			4.0	-RC-1: Recovery = 95% -Core Loss = 10 cm -RQD = 31%			

NOTES:

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: N/A * m
After 24 Hrs: 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
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-135
Sheet: 2 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0				
			6.0	-qr (@ 6.0 m) = 14.64 MPa -RC-2: Recovery = 97% -Core Loss = 9 cm -RQD = 28%			
			7.0				
RC-3			8.0				
			9.0	-RC-3: Recovery = 97% -Core Loss = 9 cm -RQD = 11%			
			10.0				
RC-4				-RC-4: Recovery = 0% -Core Loss = 30 cm -RQD = 0%			
RC-5			10.7				
			11.0	MUDSTONE; gray, very soft, highly broken, non-bedded, silty, slickensided, with rare chert nodules.			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-135
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-5: Recovery = 96% -Core Loss = 6 cm -RQD = 0%			
			11.7				
			12.0	SILTSTONE; gray, medium, highly broken, micaceous.			
			12.0	CLAY-SHALE; brown, soft, highly broken, silty, slightly micaceous.			
			12.3	SANDSTONE; brown, medium, massive, fine to medium grained, cross-bedded, slightly friable.			
RC-6			13.0	-RC-6: Recovery = 100% -No Core Loss -RQD = 29%			
			14.0				
			15.0				
RC-7				-qr (@ 15.5 m) = 16.38 MPa			
			16.0				
				-RC-7: Recovery = 93% -Core Loss = 13 cm -RQD = 64%			
			17.0				
			17.1	Bottom of Boring = 17.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-136
Sheet: 1 of 5
Completion Depth: 26.5 m

Date Started: 3/4/98
Date Finished: 3/5/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129478.282
Easting: 639967.747
Elevation: 263.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 12 20	83		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.0	23	NP	NP
SS-2	14 20 26	67	1.0	Brown CLAYEY SILT, little fine sand, trace coarse sand. Hard. Moist. -SS-1: ODOT A-4a 1.0	10		
SS-3	33 44 50/15cm	100		Variegated brown, red, and gray weathered MUDSTONE. Very soft bedrock.			
SS-4	26 36 44	89	2.0				
SS-5	26 50/13cm	73	3.0				
			4.0				
SS-6	44 50/8cm	100					
RC-1				MUDSTONE; variegated red, brown, and 4.4			

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

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 N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-136
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 5
Project Number: W-7139
Completion Depth: 26.5 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				gray, very soft to medium, highly broken, non-bedded, silty, calcareous, slightly jointed, with rare nodular limestone.			
			5.0	-RC-1: Recovery = 77% -Core Loss = 39 cm -RQD = 0%			
			6.0				
RC-2				-RC-2: Recovery = 98% -Core Loss = 3 cm -RQD = 0%			
			7.0				
RC-3				-RC-3: Recovery = 44% -Core Loss = 39 cm -RQD = 0%			
			8.0				
RC-4				-RC-4: Recovery = 22% -Core Loss = 64 cm -RQD = 0%			
			9.0				
RC-5				-RC-5: Recovery = 60% -Core Loss = 30 cm -RQD = 0%			
			10.0				
RC-6				-RC-6: Recovery = 72% -Core Loss = 14 cm -RQD = 0%			
RC-7							
			11.0				

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-136
Sheet: 3 of 5
Completion Depth: 26.5 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-7: Recovery = 10% -Core Loss = 137 cm -RQD = 0%			
			12.0				
RC-8				-RC-8: Recovery = 88% -Core Loss = 16 cm -RQD = 0%			
			13.0				
RC-9				-RC-9: Recovery = 100% -No Core Loss -RQD = 0%			
RC-10			14.0	-slickensided from 13.7 to 15.2 m			
				-RC-10: Recovery = 96% -Core Loss = 6 cm -RQD = 8%			
			15.0				
RC-11				-gray, medium hard SILTSTONE lens from 15.1 to 15.4 m			
				15.4 SANDSTONE; brown to gray, medium, massive, fine to medium grained, cross-bedded, micaceous, slightly friable. -RC-11: Recovery = 100% -No Core Loss -RQD = 80% -qr (@ 16.2 m) = 21.24 MPa			
			16.0				
RC-12			17.0				
				-RC-12: Recovery = 96% -Core Loss = 6 cm -RQD = 35%			
			18.0				

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-136
Project: ATH/MEG-33-30.980/0.000
Sheet: 4 of 5
Project Number: W-7139
Completion Depth: 26.5 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-13				-slightly broken from 18.3 to 21.1 m			
			19.0	-RC-13: Recovery = 100% -No Core Loss -RQD = 33%			
RC-14			20.0	-RC-14: Recovery = 96% -Core Loss = 6 cm -RQD = 27%			
			21.0	21.1 CLAY-SHALE; gray, soft to medium, highly broken, silty, slightly pyritic, with interbedded gray, moderately hard SILTSTONE lenses up to 8 cm thick.			
RC-15			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%			
RC-17				23.4 MUDSTONE; red and gray, very soft to medium hard, highly broken, calcareous, non-bedded, slickensided, silty. -RC-17: Recovery = 58%			
			24.0	-Core Loss = 40 cm -RQD = 0%			
RC-18				-reddish brown fine SANDY SILT present from 24.3 to 24.7 m -RC-18: Recovery = 100% -No Core Loss			
			25.0	-RQD = 0%			

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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-136
Project ATH/MEG-33-30.980/0.000
Sheet 5 of 5
Project Number W-7139
Completion Depth 26.5 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-19				-RC-19: Recovery = 25% -Core Loss = 46 cm -RQD = 0%			
RC-20			26.0	-RC-20: Recovery = 95% -Core Loss = 5 cm -RQD = 0%			
				26.5 Bottom of Boring = 26.5 meters			

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-137
Sheet: 1 of 2
Completion Depth: 10.1 m

Date Started: 3/3/98
Date Finished: 3/3/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129392.130
Easting: 639882.672
Elevation: 258.1 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 1	44		Dark brown CLAYEY SILT, little organics, trace fine sand (Topsoil). Moist. 0.1	32		
SS-2	2 3 4	83	1.0	Brown to red SILTY CLAY, trace fine gravel, trace coarse to fine sand. Soft to stiff. Moist. -SS-2: ODOT A-6b (11)	27	37	18
SS-3	4 4 7	56		1.8	28		
SS-4	30 36 50/10cm	63	2.0	Brown highly weathered SANDSTONE. Very soft bedrock.			
SS-5	12 20 35	72	3.0				
			4.0	4.1			
RC-1				SANDSTONE; brown to gray, medium, massive, medium grained, micaceous, cross-bedded, friable.			

NOTES:

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 — N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-137
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 10.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				-RC-1: Recovery = 99% -Core Loss = 3 cm -RQD = 64%			
			6.0				
			7.0	-qr (@ 6.9 m) = 24.24 MPa			
RC-2							
			8.0				
				-RC-2: Recovery = 100% -No Core Loss -RQD = 62%			
			9.0				
				9.1 MUDSTONE; gray, very soft to soft, highly broken, non-bedded, micaceous, slightly pyritic.			
			10.0				
				10.1 Bottom of Boring = 10.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-138
Sheet: 1 of 1
Completion Depth: 1.7 m

Date Started: 3/2/98
Date Finished: 3/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129273.649
Easting: 639987.372
Elevation: 243.6 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 2	61		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. (0.1)	27		
ST-2		100		Brown fine SANDY SILT, little coarse sand, little clay, trace fine gravel. Soft to medium stiff. Moist. (0.5) -SS-1: Visual ODOT A-4a	23	46	21
			1.0	Brown SILTY CLAY, trace coarse to fine sand, trace fine gravel. Moist. (1.1)			
SS-3	13 30 50/8cm	80		-ST-2: ODOT A-7-6 (15)	12		
				Brown highly weathered SANDSTONE. Very soft bedrock. (1.7) Auger refusal @ 1.7 meters Bottom of Boring = 1.7 meters			

NOTES:

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 ▽ N/A m
After 24 Hrs ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-139
Sheet: 1 of 2
Completion Depth: 9.2 m

Date Started: 3/6/98
Date Finished: 3/6/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 129119.547
Easting: 640059.404
Elevation: 249.6 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	44		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.0	20		
SS-2	3 6 10	89	1.0	Brown SILTY fine SAND, little clay, trace fine gravel, trace coarse sand. Soft to very stiff. Moist. -SS-2: ODOT A-4a (1)	15	NP	NP
SS-3	7 10 15	78			15		
SS-4	14 44 50/8cm	80	2.0	1.8 Brown highly weathered fine grained SANDSTONE. Very soft bedrock. -SS-4: Visual ODOT A-3a	10		
SS-5	41 50/13cm	73	3.0		7		
			4.0	4.1			
SS-6	12 13 16	94		Brown SILTY CLAY, little coarse to fine sand. Very stiff. Moist.	18		

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

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 ▽ N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-139
Sheet: 2 of 2
Completion Depth: 9.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				4.9			
			5.0	Brown changing to gray, highly weathered fine grained SANDSTONE. Very soft bedrock.			
				5.8			
RC-1			6.0	CLAY-SHALE; gray, soft, highly broken, silty, micaceous, slightly weathered. 6.1			
				MUDSTONE; red and gray, very soft to soft, highly broken, non-bedded, silty, with nodular limestone. -RC-1: Recovery = 79% -Core Loss = 26 cm -RQD = 0%			
RC-2			7.0	-RC-2: Recovery = 40% -Core Loss = 37 cm -RQD = 0%			
RC-3				-RC-3: Recovery = 50% -Core Loss = 23 cm -RQD = 0%			
RC-4			8.0	-RC-4: Recovery = 32% -Core Loss = 52 cm -RQD = 0%			
RC-5			9.0	-RC-5: Recovery = 60% -Core Loss = 12 cm -RQD = 0% 9.1			
				Bottom of Boring = 9.1 meters			

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-140
Sheet: 1 of 2
Completion Depth: 9.1 m

Date Started: 2/27/98
Date Finished: 2/27/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128997.562
Easting: 640104.744
Elevation: 251.6 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 2 2	78		Brown SILTY fine SAND, little clay, trace organics (Topsoil). Moist. 0.1	20		
SS-2	2 6 8	83	1.0	Brown SILTY fine SAND, little clay, trace coarse sand, trace fine gravel. Soft to stiff. Moist. -SS-2: Visual ODOT A-4a 1.1	18		
SS-3	16 33 50/15cm	100		Brown weathered SANDSTONE. Very soft bedrock.	14		
SS-4	50/13cm	60	2.0				
RC-1			3.0	SANDSTONE; brown to dark brown, medium, fine grained, slightly broken, micaceous. 2.7			
			4.0	-RC-1: Recovery = 75% -Core Loss = 46 cm -RQD = 36%			
				-gray limestone lens from 4.4 to 4.5 m 4.5			

NOTES:

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 — N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-140
Sheet: 2 of 2
Completion Depth: 9.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0	SANDSTONE; gray, hard, massive, fine grained, calcareous, micaceous. -qr (@ 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.			
RC-3				7.8			
			8.0	MUDSTONE; brownish gray, soft, highly broken, non-bedded, silty.			
				-RC-3: Recovery = 100% -No Core Loss -RQD = 24%			
			9.0	9.1			
				Bottom of Boring = 9.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-141
Sheet: 1 of 2
Completion Depth: 6.1 m

Date Started: 3/8/98
Date Finished: 3/8/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128784.330
Easting: 640191.047
Elevation: 244.2 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				Gray fine to coarse GRAVEL. Very dense. Damp. 0.1	11		
SS-1	16 34 42	78	1.0	Brown highly weathered SANDSTONE with silty clay interbeds. Very soft bedrock. 1.1			
SS-2	50/10cm	50		SANDSTONE; brown, soft, highly broken, very fine grained, silty, micaceous, friable.			
SS-3	50/8cm	100	2.0				
RC-1			3.0	-RC-1: Recovery = 96% -Core Loss = 7 cm -RQD = 0%			
			4.0				

NOTES: ** Elevation is approximate.

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 ▽ N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-141
Sheet 2 of 2
Completion Depth 6.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0	SANDSTONE; dark brown, medium, slightly broken, micaceous, cross-bedded. 4.6			
				-qr (@ 5.3 m) = 26.43 MPa -RC-2: Recovery = 83% -Core Loss = 26cm -RQD = 45%			
			6.0	6.1			
				Bottom of Boring = 6.1 meters			

NOTES: * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-142
Sheet: 1 of 2
Completion Depth: 7.9 m

Date Started: 3/13/98
Date Finished: 3/13/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128629.446
Easting: 640261.239
Elevation: 247.0 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 2	56		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	23		
SS-2	5 6 11	83	1.0	Brown fine SAND, little coarse sand, little silt and clay, trace fine gravel. Very loose to very dense. Moist. -SS-2: ODOT A-3a	15		
SS-3	9 17 24	100			14		
SS-4	29 50/13cm	73	2.0	-SS-4: ODOT A-3a 2.0	10		
				Brown SANDSTONE. Very soft bedrock. 2.7			
RC-1			3.0	SANDSTONE; brown, medium, highly broken, fine to medium grained, micaceous, cross-bedded, friable.			
			4.0	-RC-1: Recovery = 95% -Core Loss = 9 cm -RQD = 0%			

NOTES:

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 — N/A * ... m
After 24 Hrs ▼ 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
RC - Rock Corrie

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-142
Sheet: 2 of 2
Completion Depth: 7.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0				
				5.2 MUDSTONE; gray, very soft to soft, highly broken, silty, non-bedded. -RC-2: Recovery = 100% -No Core Loss -RQD = 0%			
RC-3			6.0				
			7.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 7%			
				7.7 SILTSTONE; gray, medium, massive, arenaceous, micaceous, cross-bedded. -qr (@ 7.8 m) = 48.35 MPa			
				7.9 Bottom of Boring = 7.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-143
Sheet: 1 of 3
Completion Depth: 18.0 m

Date Started: 3/12/98
Date Finished: 3/12/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128553.600
Easting: 640337.139
Elevation: 247.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	89		Brown SILT, some fine sand, little organics, trace clay (Topsoil). Moist. 0.1	27		
SS-2	3 5 10	67	1.0	Brown SILTY CLAY, little fine sand, trace fine gravel, trace coarse sand. Medium stiff to very stiff. Moist. -SS-2: ODOT A-6a (8)	22	30	17
SS-3	8 12 16	89			18		
SS-4	6 10 14	56	2.0	2.6	19		
SS-5	50/13cm	60		Brown SANDSTONE. Very soft bedrock. 2.7			
RC-1			3.0	SANDSTONE; brown, medium, highly broken, micaceous, fine grained, cross-bedded. -qr (@ 2.9 m) = 12.05 MPa -RC-1: Recovery = 95% -Core Loss = 9 cm -RQD = 19%			
			4.0	4.0 MUDSTONE; brown to gray, very soft to soft, highly broken, silty, non-bedded, slightly jointed, slickensided.			

NOTES:

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 = N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-143
Sheet: 2 of 3
Completion Depth: 18.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0	-RC-2: Recovery = 40% -Core Loss = 91 cm -RQD = 0%			
			6.0				
RC-3			7.0	-RC-3: Recovery = 62% -Core Loss = 58 cm -RQD = 0%			
			7.5	SILTSTONE; gray, moderately hard, massive, micaceous, arenaceous, cross-bedded.			
RC-4			8.0	-qr (@ 8.0 m) = 59.75 MPa			
			9.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 89%			
			10.0				
RC-5			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-143
Project ATH/MEG-33-30.980/0.000
Sheet 3 of 3
Project Number W-7139
Completion Depth 18.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-5: Recovery = 95% -Core Loss = 9 cm -RQD = 44%			
RC-6							
			12.9				
			13.0	SANDSTONE; brown to light brown, moderately hard, massive, medium to coarse grained, micaceous, cross-bedded, slightly friable.			
				-RC-6: Recovery = 98% -Core Loss = 6 cm -RQD = 53%			
			14.0				
			15.0				
RC-7							
			16.0				
				-RC-7: Recovery = 100% -No Core Loss -RQD = 76%			
			17.0				
			18.0				
			18.0	Bottom of Boring = 18.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-144
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 3/8/98
Date Finished: 3/8/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128411.184
Easting: 640360.868
Elevation: 233.0 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 3	78		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	27		
SS-2	4 4 6	67	1.0	Brown to red SILTY CLAY, some to trace fine gravel (rock fragments), trace coarse to fine sand. Soft to stiff. Moist. -SS-2: ODOT A-7-6 (12)	25	41	19
SS-3	4 5 8	61			27		
SS-4	3 5 5	89	2.0		29		
SS-5	4 6 6	94	3.0	3.0	25		
				Bottom of Boring = 3.0 meters			

NOTES:

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: ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-145
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 3/27/98
Date Finished: 3/27/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128314.725
Easting: 640413.720
Elevation: 226.6 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	7 2 2	72		Brown fine SANDY SILT, little coarse sand, trace organics, trace clay (Topsoil). Moist	24		
SS-2	2 3 4	83	0.1	Brown SILTY CLAY, some fine sand, little fine gravel, trace coarse sand. Soft to stiff. Moist. -SS-2: Visual ODOT A-6b	20		
SS-3	5 9 14	100	1.0		19		
SS-4	11 19 49	61	2.0	Brown SANDSTONE. Very soft bedrock.	13		
SS-5	50/10cm	75	2.7	Bottom of Boring = 2.7 meters	8		

NOTES: ** Elevation is approximate.

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: ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-146
Sheet: 1 of 1
Completion Depth: 2.0 m

Date Started: 3/8/98
Date Finished: 3/8/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128187.583
Easting: 640493.258
Elevation: 222.0 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 1	33		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	21	NP	NP
SS-2	2 4 6	67	1.0	Brown SILTY fine SAND, little clay, trace coarse sand, trace fine gravel. Soft to very stiff. Moist. -SS-1: ODOT A-4a (3)	16		
SS-3	5 11 12	61		1.5	14		
				Brown SANDSTONE. Very soft bedrock.			
SS-4	50/13cm	80	2.0	2.0	5		
				Bottom of Boring = 2.0 meters			

NOTES: NP = Non-plastic sample

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 ▼ N/A ____ m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-147
Sheet: 1 of 2
Completion Depth: 6.1 m

Date Started: 3/16/98
Date Finished: 3/16/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 128073.940
Easting: 640574.984
Elevation: 234.1 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 3	89		Brown SILTY fine SAND, little organics, trace coarse sand (Topsoil). Moist. 0.1	22		
SS-2	5 7 10	78	1.0	Brown SILTY fine SAND, little clay, trace coarse sand, trace fine gravel. Medium stiff to hard. Moist to damp. -SS-2: Visual ODOT A-4a	15		
SS-3	7 13 21	67			12		
SS-4	27 50/13cm	91	2.0	Brown SANDSTONE. Very soft bedrock. 2.0	9		
RC-1			3.0	SANDSTONE; dark brown, medium to moderately hard, highly broken, medium grained, slightly jointed, with interbedded brown CLAY seams up to 3 cm thick. 2.7			
			4.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 6%			

NOTES:

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: N/A * m
After 24 Hrs: ▼ 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
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-147
Sheet 2 of 2
Completion Depth 6.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0	SANDSTONE; brown, medium, highly broken, medium grained, micaceous. 4.6 -RC-2: Recovery = 98% -Core Loss = 3 cm -RQD = 8%			
			6.0	6.1 Bottom of Boring = 6.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-148
Sheet: 1 of 2
Completion Depth: 7.0 m

Date Started: 3/16/98
Date Finished: 3/16/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127947.519
Easting: 640673.054
Elevation: 235.7 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL · PL
SS-1	2 2 2	61		Brown fine SANDY SILT, little organics, trace coarse sand (Topsoil). Moist. 0.1		
				Brown fine SANDY CLAY, some silt, trace coarse sand. Soft to medium stiff. Moist.	22	
SS-2	3 4 7	67	1.0		20	
SS-3	6 16 24	44		Brown SILT, trace clay, trace fine sand. Stiff to hard. Moist. 1.2 / 1.7	13	
SS-4	50/13cm	80	2.0	Brown SANDSTONE. Very soft bedrock. 2.6	8	
RC-1			3.0	SANDSTONE; brown, medium, slightly broken, medium grained, micaceous, cross-bedded, friable.		
			4.0	-brown clay seam from 3.8 to 3.9 m -RC-1: Recovery = 98% -Core Loss = 4 cm -RQD = 0%		

NOTES:

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 — N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-148
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 7.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2			5.0				
			6.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 43%			
			7.0	Bottom of Boring = 7.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-149
Sheet: 1 of 1
Completion Depth: 2.8 m

Date Started: 3/17/98
Date Finished: 3/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127824.846
Easting: 640730.283
Elevation: 216.1 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1, 2, 1	100		Brown SILTY CLAY, some fine sand, little organics, trace coarse sand (Topsoil). Moist. 0.3			
ST-2		100		Brown SILTY fine SAND, some clay, little coarse sand, trace fine gravel. Soft to medium stiff. Moist.	42 18	20	12
			1.0	-ST-2: ODOT A-4a (3)			
SS-3	3, 4, 3	100			17		
SS-4	3, 3, 3	22	2.0	-SS-4: ODOT A-4a (2)	19	22	12
SS-5	9, 50/3cm	43		2.7 Brown SANDSTONE. Very soft bedrock. 2.8	8		
				Bottom of Boring = 2.8 meters			

NOTES: ** Elevation is approximate. Sandstone bedrock observed in stream bed adjacent to boring, approximate elevation of 213.4 m.

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-151
Sheet: 1 of 3
Completion Depth: 12.2 m

Date Started: 3/17/98
Date Finished: 3/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127687.642
Easting: 640925.371
Elevation: 235.5 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 2	78		Brown SILTY fine SAND, some organics, little clay (Topsoil). Moist. 0.2	26		
SS-2	2 4 8	61	1.0	Brown fine SANDY SILT, trace clay. Stiff. Moist. 1.1	16		
SS-3	6 14 23	83		Brown SILTY CLAY, some fine sand, trace coarse sand. Hard. Moist.	21		
SS-4	10 22 34	89	2.0	Brown fine SAND, some silt, trace clay, trace coarse sand. Very similar to a highly weathered sandstone. Very dense. Moist. 2.1 -SS-4: ODOT A-1-b	11		
SS-5	33 50/13cm	91	3.0		9		
				SANDSTONE; brown, soft, weathered, friable, fine to coarse grained. 3.7			
			4.0				
SS-6	50/13cm	100			6		

NOTES:

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: ▼ 9.8 m
After 24 Hrs: ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-151
Sheet: 2 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	50/13cm	80	6.0		9		
SS-8	50/15cm	83	7.0		11		
			8.0				
SS-9	50/13cm	100	9.0	-groundwater initially encountered @ 9.1 m	14		
			10.0				
SS-10	50/10cm	100	10.2	SHALE; gray, soft, weathered.			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-151
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			11.7				
SS-11	50/5cm	100	11.9	SANDSTONE; brown, soft, weathered, friable, fine to coarse grained.	9		
				Bottom of Boring = 11.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-152
Sheet: 1 of 2
Completion Depth: 4.7 m

Date Started: 3/17/98
Date Finished: 3/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127663.118
Easting: 640893.770
Elevation: 233.6 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	44		Brown SILTY fine SAND, little organics, little clay (Topsoil). Moist. 0.1			
SS-2	4 6 7	94	1.0	Brown fine SAND, some silty clay, trace coarse sand, trace coarse gravel. Soft to hard. Moist. -SS-2: Visual ODOT A-4a	21 12		
SS-3	6 13 17	100			20		
SS-4	38 50/13cm	82	2.0	SANDSTONE; brown, soft, weathered, friable, fine to coarse grained. 1.8	8		
SS-5	40 50/8cm	89	3.0		9		
			4.0				
SS-6	43	100		SHALE; brown, soft, weathered. 4.4			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
WS - Water Sample

GROUND WATER READING
At Completion: Dry
After 24 Hrs: N/A

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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-152
Project ATH/MEG-33-30.980/0.000
Sheet 2 of 2
Project Number W-7139
Completion Depth 4.7 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
	50/10cm			4.7			
				Bottom of Boring = 4.7 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-153
Sheet: 1 of 3
Completion Depth: 14.0 m

Date Started: 3/16/98
Date Finished: 3/16/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127536.717
Easting: 640991.866
Elevation: 233.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 1	72		Brown SILTY fine SAND, some organics, trace clay (Topsoil). Moist. 0.1	17		
SS-2	3 17 40	100	1.0	Brown fine to coarse SAND, little silt, trace clay. Very loose to very dense. Moist. -SS-2: ODOT A-3a	10		
SS-3	31 50/15cm	67			7		
SS-4	6 18 41	89	2.0	2.6	9		
SS-5	21 48 50/5cm	88	3.0	SANDSTONE; brown, very soft, highly broken, medium grained, silty, micaceous, friable, weathered.	9		
SS-6	31 50/8cm	100	4.0		10		

NOTES:

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 = N/A * m
After 24 Hrs ▼ 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-153
Sheet: 2 of 3
Completion Depth: 14.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
RC-1			6.0	-brown clay seam from 6.1 to 6.7 m -RC-1: Recovery = 100% -No Core Loss -RQD = 0%			
			7.0				
				7.6			
RC-2			8.0	SANDSTONE; brown, very soft to soft, highly broken, medium grained, micaceous, friable.			
			9.0	-RC-2: Recovery = 67% -Core Loss = 101 cm -RQD = 0%			
			10.0				
				10.7			
RC-3			11.0	SANDSTONE; brown, medium, highly broken, micaceous, friable, slightly weathered.			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-153
Sheet: 3 of 3
Completion Depth: 14.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-3: Recovery = 82% -Core Loss = 55 cm -RQD = 0%			
			13.0				
RC-4			14.0	-RC-4: Recovery = 65% -Core Loss = 11 cm -RQD = 0%			
			14.0	Bottom of Boring = 14.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-154
Sheet: 1 of 1
Completion Depth: 2.9 m

Date Started: 3/18/98
Date Finished: 3/18/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127407.994
Easting: 641046.195
Elevation: 207.8 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	W W W	56		Brown SILTY fine SAND, little organics (Topsoil). Moist. 0.1	39		
SS-2	W 1 1	61	1.0	Brown fine SAND, some coarse sand, little silt, trace clay. Very loose. Moist. -SS-2: ODOT A-3a	26		
SS-3	W W W	56		1.4	26		
ST-4		100	2.0	Gray SILTY CLAY, trace coarse to fine sand, trace fine gravel. Very stiff to hard. Moist to damp. -ST-4: ODOT A-7-6 (15)	24	43	19
SS-5	12 50/5cm	100		2.7 Gray SHALE. Very soft bedrock. 2.9 Bottom of Boring = 2.9 meters	6		

NOTES: ** Elevation is approximate.

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: ▼ N/A m

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

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-155
Sheet: 1 of 3
Completion Depth: 16.2 m

Date Started: 3/23/98
Date Finished: 3/23/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127369.931
Easting: 641127.633
Elevation: 231.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 2	39		Gray fine to coarse GRAVEL. Very loose. Damp. 0.1	22		
SS-2	2 6 16	89	1.0	Brown CLAYEY SILT, some fine sand, little coarse sand. Medium stiff to very stiff. Moist. -SS-2: Visual ODOT A-4a	15		
SS-3	9 10 13	72		1.8	13		
SS-4A	16 17	94	2.0	Brown coarse to fine SAND, little silt, trace clay. Dense. Moist. 2.1	11		
SS-4B	16			Brown fine SANDY SILT, little clay, trace coarse sand. Hard. Moist.	13		
SS-5	18 50/10cm	80	3.0	2.7 Brown to gray weathered SANDSTONE. Very soft bedrock.	9		
RC-1			4.0	4.1 SANDSTONE; brown, medium, slightly broken, coarse to medium grained, cross-bedded, friable.			

NOTES: ** Elevation is approximate.

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: = N/A * m
After 24 Hrs: ▼ 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
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-155
Sheet: 2 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0	-RC-1: Recovery = 99% -Core Loss = 2 cm -RQD = 22%			
RC-2			6.0				
			7.0	-brown shale lens from 7.2 to 7.3 m -RC-2: Recovery = 89% -Core Loss = 34 cm -RQD = 25%			
			8.0				
			9.0	-brown shale lens from 9.0 to 9.1 m	9.0		
RC-3				SANDSTONE; brown to gray, medium, massive, medium to coarse grained, micaceous, cross-bedded, friable.			
			10.0				
				-RC-3: Recovery = 100% -No Core Loss -RQD = 47%			
			11.0				

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-155
Sheet: 3 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0				
RC-4							
			13.0				
				-RC-4: Recovery = 90% -Core Loss = 31 cm -RQD = 42%			
			14.0				
			15.0				
RC-5				-slightly carbonaceous from 15.1 to 16.2 m -RC-5: Recovery = 100% -No Core Loss -RQD = 21% -qr (@ 15.7 m) = 14.24 MPa			
			16.0				
				Bottom of Boring = 16.2 meters			

16.2

NOTES: * * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-156
Sheet: 1 of 1
Completion Depth: 4.2 m

Date Started: 3/22/98
Date Finished: 3/22/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127283.915
Easting: 641188.058
Elevation: 201.3 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 3 4	44		Dark brown SILT, some clay, little fine sand, trace organics (Topsoil). Moist. 0.1	24		
AS-2				Dark brown fine SAND, some coarse sand, little silty clay, trace fine gravel. Loose. Moist. -SS-2: ODOT A-3a	21		
SS-3	3 3 3	78	1.0		24		
SS-4	2 4 3	56	2.0	1.8 Brown and gray SILTY CLAY, little fine sand. Medium stiff. Moist. 2.1	22		
SS-5	2 2 4	61	3.0	Gray fine SANDY SILT, trace clay. Medium stiff. Moist.	22		
			4.0	3.8 Gray SANDSTONE. Very soft bedrock.			
SS-6	50/5cm	100		Auger refusal @ 4.2 meters 4.2 Bottom of Boring = 4.2 meters			

NOTES:

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 ▼ N/A — m

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

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-157
Sheet: 1 of 1
Completion Depth: 3.2 m

Date Started: 3/23/98
Date Finished: 3/23/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127196.370
Easting: 641333.790
Elevation: 201.8 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	15 13 5	100		Gray fine to coarse GRAVEL. Very loose. Damp. 0.2	10		
SS-2	2 3 2	89	1.0	Brown CLAYEY SILT, some fine sand, little fine gravel, trace coarse sand. Medium stiff. Moist. -SS-2: ODOT A-4a	23		
SS-3	2 2 3	56		-groundwater initially encountered @ 1.5 m	18		
SS-4	2 4 3	83	2.0	2.0 Brown fine to coarse SANDY CLAY, some silt, trace fine gravel. Medium stiff. Moist.	20		
SS-5	1 12 50/8cm	80	3.0	2.9 Gray SANDSTONE. Very soft bedrock. Auger refusal @ 3.2 meters 3.2 Bottom of Boring = 3.2 meters	7		

NOTES: ** Elevation is approximate.

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 = 1.7* m
After 24 Hrs ▼ N/A m
* 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 - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-158
Sheet: 1 of 2
Completion Depth: 4.9 m

Date Started: 3/24/98
Date Finished: 3/24/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127157.112
Easting: 641285.619
Elevation: 214.1 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 3	72		Brown SILTY fine SAND, some organics, little clay (Topsoil). Moist. 0.1	23		
				Brown SILTY CLAY, some fine sand, trace coarse sand. Medium stiff. Moist. 0.5			
SS-2	2 4 7	100		Brown SILTY fine SAND, little clay, trace coarse sand. Stiff. Moist.	16		
			1.0	1.1			
SS-3	4 5 8	56		Brown and gray CLAY, some silt, trace fine 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. 2.6			
SS-5	31 50/10cm	80		Gray MUDSTONE. Very soft bedrock.	11		
			3.0	Auger refusal @ 3.0 m 3.0			
RC-1				MUDSTONE; gray, soft, highly broken, non-bedded, silty.			
			4.0	-RC-1: Recovery = 22% -Core Loss = 119 cm -RQD = 0%			
				LIMESTONE; gray, moderately hard, highly 4.3			

NOTES:

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: N/A * m
After 24 Hrs: 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
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-158
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 4.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2				broken, fine crystalline, slightly jointed. 4.6			
				MUDSTONE; gray, soft, highly broken, non-bedded, silty. 4.9 -RC-2: Recovery = 50% -Core Loss = 15 cm -RQD = 0%			
				Bottom of Boring = 4.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-159
Sheet: 1 of 5
Completion Depth: 29.0 m

Date Started: 3/24/98
Date Finished: 3/24/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127107.549
Easting: 641222.649
Elevation: 239.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 5	44		Reddish-brown CLAY, some silt, little organics, trace fine sand (Topsoil). Moist. 0.1	35		
SS-2	3 4 7	56		Reddish-brown CLAY, some fine gravel, little silt, trace coarse to fine sand. Medium stiff to stiff. Moist. -SS-1: Visual ODOT A-7-6	28		
			1.0	1.1			
SS-3	5 19 50/15cm	94		Brown and gray CLAYEY SILT, trace coarse to fine sand. Very stiff to hard. Moist. 1.9	11		
SS-4	50/5cm	100	2.0	Brown SANDSTONE. Very soft bedrock. 2.7	22		
RC-1			3.0	SHALE; brown, medium, highly broken, micaceous, silty. -RC-1: Recovery = 82% -Core Loss = 30 cm -RQD = 0%			
			4.0	-brown clay seam from 4.0 to 4.3 m 4.3			
RC-2				SANDSTONE; brown to light gray,			

NOTES: ** Elevation is approximate.

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 = N/A * m
After 24 Hrs ▼ 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
RC Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-159
Sheet: 2 of 5
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				moderately hard to hard, massive, medium to coarse grained, micaceous, cross-bedded.			
			5.0				
			6.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 65%			
				-qr (@ 6.6 m) = 64.61 MPa			
			7.0	-brown clay seam from 7.2 to 7.3 m			
RC-3				-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: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-159
Sheet: 3 of 5
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 88%			
			13.0				
RC-5			14.0				
			15.0	-RC-5: Recovery = 92% -Core Loss = 24 cm -RQD = 44% -dark gray, soft to medium hard shale lens from 15.1 to 15.4 m			
			16.0	-highly broken from 16.0 to 16.6 m			
RC-6			17.0	-gray, soft shale lens from 17.1 to 17.2 m			
					17.7*		
			18.0	SHALE; gray to dark gray, soft to very soft, highly broken, carbonaceous, slickensided, sparsely fossiliferous. -RC-6: Recovery = 99%			

NOTES: * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-159
Sheet: 4 of 5
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-Core Loss = 3 cm -RQD = 53%			
			18.4	SANDSTONE; brown to gray, medium to moderately hard, massive, medium grained, micaceous, cross-bedded, slightly weathered.			
			19.0	-shale seam @ 19.1 m			
RC-7							
			20.0				
			21.0	-RC-7: Recovery = 99% -Core Loss = 3 cm -RQD = 68%			
			22.0				
RC-8			23.0				
				SHALE; gray, medium, highly broken, carbonaceous, pyritic, slickensided, sparsely fossiliferous.			
				-RC-8: Recovery = 100% -No Core Loss -RQD = 25%			
			24.0				
RC-9							
			25.0	-black, hard coal seam from 25.0 to 25.3 m			

NOTES: * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-159
Sheet: 5 of 5
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			26.0	-RC-9: Recovery = 80% -Core Loss = 61 cm -RQD = 7%			
				26.6			
			27.0	LIMESTONE; gray, hard, highly broken, fine crystalline, slightly jointed.			
				27.3			
RC-10			28.0	SHALE (60%); gray, medium, highly broken, calcareous, slightly jointed, with interbedded LIMESTONE (40%); gray, medium, highly broken, fine crystalline, argillaceous, slightly jointed. -RC-10: Recovery = 80% -Core Loss = 27 cm -RQD = 0%			
RC-11				-RC-11: Recovery = 100% -No Core Loss -RQD = 0%			
			29.0	29.0			
				Bottom of Boring = 29.0 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-160
Sheet: 1 of 2
Completion Depth: 4.9 m

Date Started: 3/27/98
Date Finished: 3/27/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 127022.596
Easting: 641360.884
Elevation: 203.0 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1, 2, 3	78		Brown SILT and fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	20		
ST-2		100		Brown CLAYEY fine SAND, little coarse sand, little silt, trace fine gravel. Medium stiff. Moist. -ST-2: ODOT A-6a (3)	19	29	16
			1.0	1.1			
SS-3	3, 2, 4	89		Brown to gray SILTY CLAY, some fine sand, trace coarse sand, trace fine gravel. Medium stiff to stiff. Moist. -SS-3: ODOT A-6b (9)	20	32	15
SS-4	3, 6, 8	72	2.0		18		
SS-5	8, 18, 44	72		2.8	5		
			3.0	Brown weathered SILTSTONE. Very soft bedrock.			
			4.0				

NOTES: ** Elevation is approximate.

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 ▼ N/A m

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

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.

Project ATH/MEG-33-30.980/0.000

Project Number W-7139

Boring Number B-160

Sheet 2 of 2

Completion Depth 4.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-6	18 41 50/13cm	65			7		
				4.9			
				Bottom of Boring = 4.9 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-161
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 3/23/98
Date Finished: 3/23/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 126879.544
Easting: 641390.959
Elevation: 204.2 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	56		Brown SILTY fine SAND, some organics, trace fine gravel (Topsoil). Moist. 0.1	26		
SS-2	3 3 3	100		Brown SILTY CLAY, some fine sand, little coarse sand, trace fine gravel. Soft to medium stiff. Moist. 0.5	21		
SS-3	2 3 3	94	1.0	Brown fine SAND, some silt, little coarse sand, trace clay, trace fine gravel. Loose. Moist. -SS-3: ODOT A-3a 1.8	20		
SS-4	2 3 6	89	2.0	Brown fine SANDY CLAY, little silt, trace coarse sand, trace fine gravel. Stiff. Moist. 2.6	21		
SS-5	50/13cm	60		Gray weathered SILTSTONE. Very soft bedrock. 2.7	6		
				Bottom of Boring = 2.7 meters			

NOTES:

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: N/A m

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

RESOURCE INTERNATIONAL

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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; fi f sa; tr. roots
DATE OF TESTING	3/12/98
TESTED BY	Hostetter/Straub

CONSOLIDOMETER TYPE	Fixed Ring
MULT. RATIO OF LOAD DEVICE	9
RING DIM.: DIAMETER:	63.5 mm
INITIAL HT. OF SOIL, Hi:	20 mm
SPECIFIC GRAVITY OF SOIL:	2.67
M. RING + SPECIMEN AT BEGINNING OF TEST:	188.78 g
M. OF RING:	67.04 g
M. OF WET SOIL, Mt:	121.74 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g
OVEN DRY M. OF SOIL, Ms:[a]	97.04 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.128 cm
INITIAL HT. OF VOIDS, Hv:	0.872 cm
INITIAL VOID RATIO, e_i:	0.773

RING No. 1

AREA: 31.67 cm^2 HEIGHT: 20 mm

WATER CONTENT DETERMINATION

M. OF CAN + WET SOIL:	298.18 g
M. OF CAN + DRY SOIL:	243.42 g
M. OF CAN:	28.11 g
M. OF WATER:	54.76 g
M. OF DRY SOIL:	215.31 g
INITIAL WATER CONTENT:	25.43%

FINAL TEST DATA

(Obtained at end of load testing)

INITIAL DIAL READING:	0.0363 in
FINAL DIAL READING:	0.1099 in
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in
CHANGE IN SAMPLE HT.:	0.185166 cm
FINAL HT. OF VOIDS, H_{vf}:	0.687 cm
FINAL VOID RATIO, e_f:	0.609

FINAL WATER CONTENT DETERMINATION

FINAL WET M. + RING:[c]	185.84 g
FINAL DRY M. + RING:	164.08 g
OVEN DRY M. OF SOIL, Ms:	97.04 g
FINAL M. OF WATER:	21.76 g
FINAL WATER CONTENT, wf:	22.42%
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

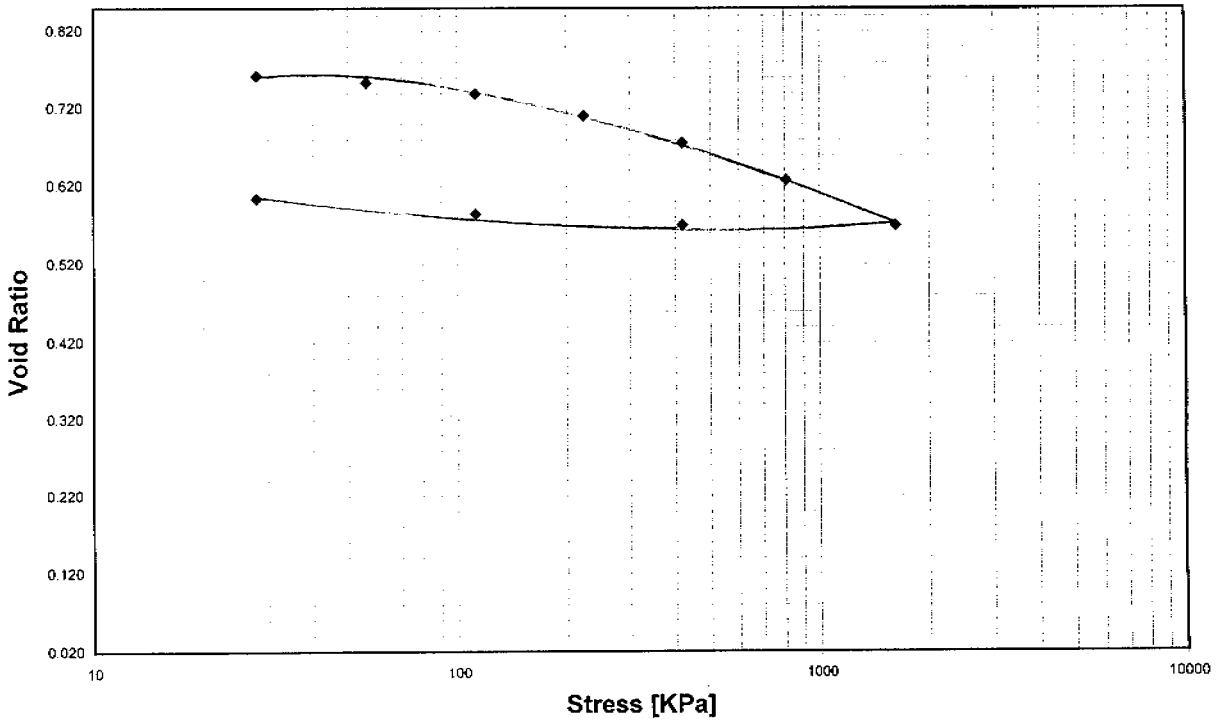
ASTM D 2435

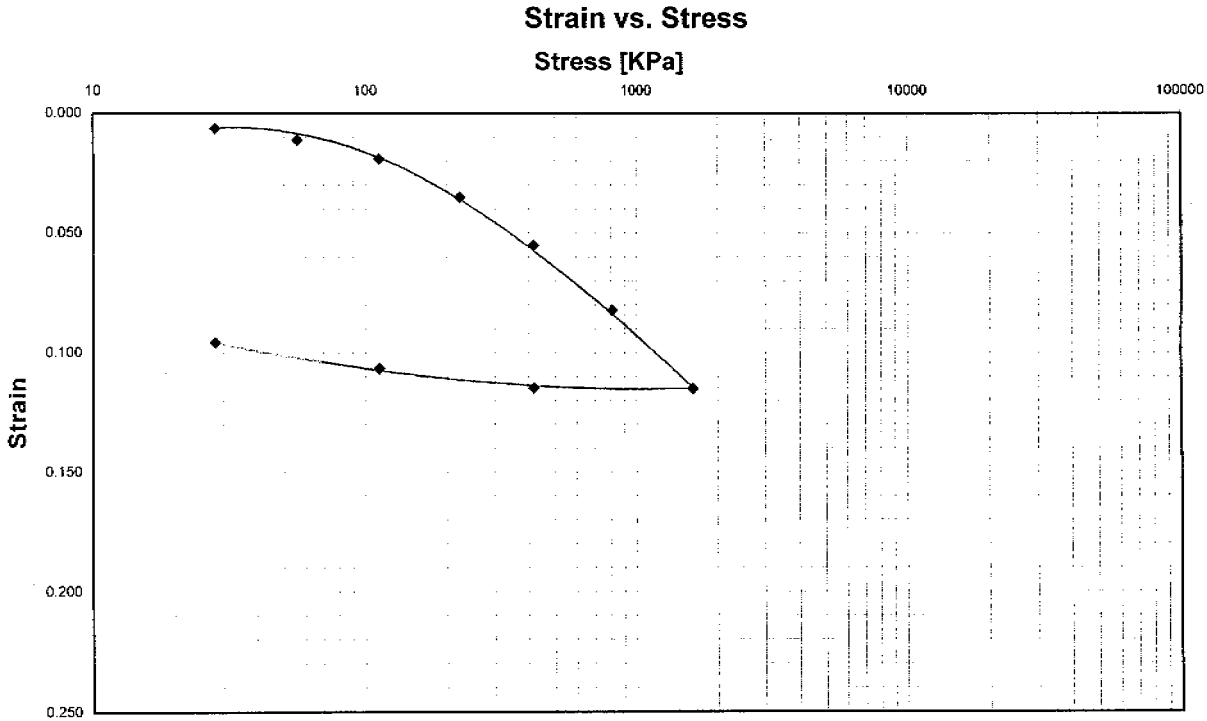
PROJECT	Ath/Meg-33
LOCATION	
JOB No.	W-7139 BORING B-128
SAMPLE No.	ST-2
SAMPLE DEPTH	1.5' - 3.5' (Sample @ 2.0' - 2'9")
SOIL DESCRIPTION	Red-brn SiCl; li f sa; tr. roots
DATE OF TESTING	3/12/98
TESTED BY	Hostetter/Straub

INITIAL SAMPLE VOL., Vi	63.338 cm^3	DRY WT. OF SOIL SOLIDS, Ms	97.04 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.1277 cm
INITIAL HT. OF VOIDS, Hv	0.8723 cm	INITIAL VOID RATIO, ei	0.7735
Hi	20 mm		

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 = ΔH / Hi	e = e0 - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	363	0	0	0	0	0	0	0	0	0	0.00E+00
28	430	412	419.3	7	49.3	0.0063	0.7624	0.783	0.9947	0.56	3.48E-01
56	478	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				
28	1099		1123	7	753	0.0956	0.6039				
112				17							
1617				57							

Void Ratio vs. Stress




Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200
0.250

RESOURCE INTERNATIONAL

281 Enterprise Drive
Westerville, Ohio 43081
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CONSOLIDATION TEST

ASTM D 2435

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

CONSOLIDOMETER TYPE	Fixed Ring
MULT. RATIO OF LOAD DEVICE	9
RING DIM.: DIAMETER:	63.5 mm
INITIAL HT. OF SOIL, Hi:	20 mm
SPECIFIC GRAVITY OF SOIL:	2.67
M. RING + SPECIMEN AT BEGINNING OF TEST:	194.59 g
M. OF RING:	64.73 g
M. OF WET SOIL, Mt:	129.86 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g
OVEN DRY M. OF SOIL, Ms:[a]	109.04 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.219 cm
INITIAL HT. OF VOIDS, Hv:	0.781 cm
INITIAL VOID RATIO, ei:	0.641

RING No. 1

AREA: 31.67 cm^2 HEIGHT: 20 mm

WATER CONTENT DETERMINATION

M. OF CAN + WET SOIL:	293.14 g
M. OF CAN + DRY SOIL:	250.93 g
M. OF CAN:	27.63 g
M. OF WATER:	42.21 g
M. OF DRY SOIL:	223.3 g
INITIAL WATER CONTENT:	18.90%

FINAL TEST DATA

(Obtained at end of load testing)

INITIAL DIAL READING:	0.0166 in
FINAL DIAL READING:	0.0944 in
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in
CHANGE IN SAMPLE HT.:	0.195834 cm
FINAL HT. OF VOIDS, H_{Vf}:	0.585 cm
FINAL VOID RATIO, ef:	0.480

FINAL WATER CONTENT DETERMINATION

FINAL WET M. + RING:[c]	192.31 g
FINAL DRY M. + RING:	173.77 g
OVEN DRY M. OF SOIL, Ms:	109.04 g
FINAL M. OF WATER:	18.54 g
FINAL WATER CONTENT, wf:	17.00%
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

RESOURCE INTERNATIONAL

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CONSOLIDATION TEST RESULTS

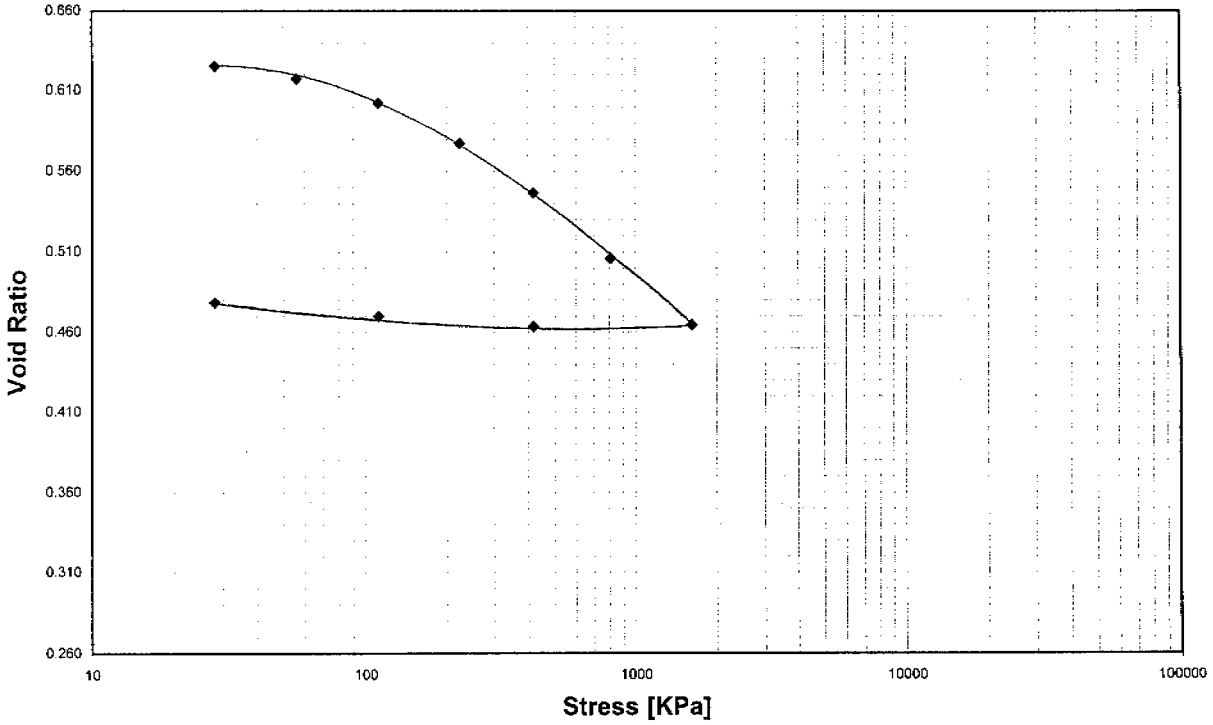
ASTM D 2435

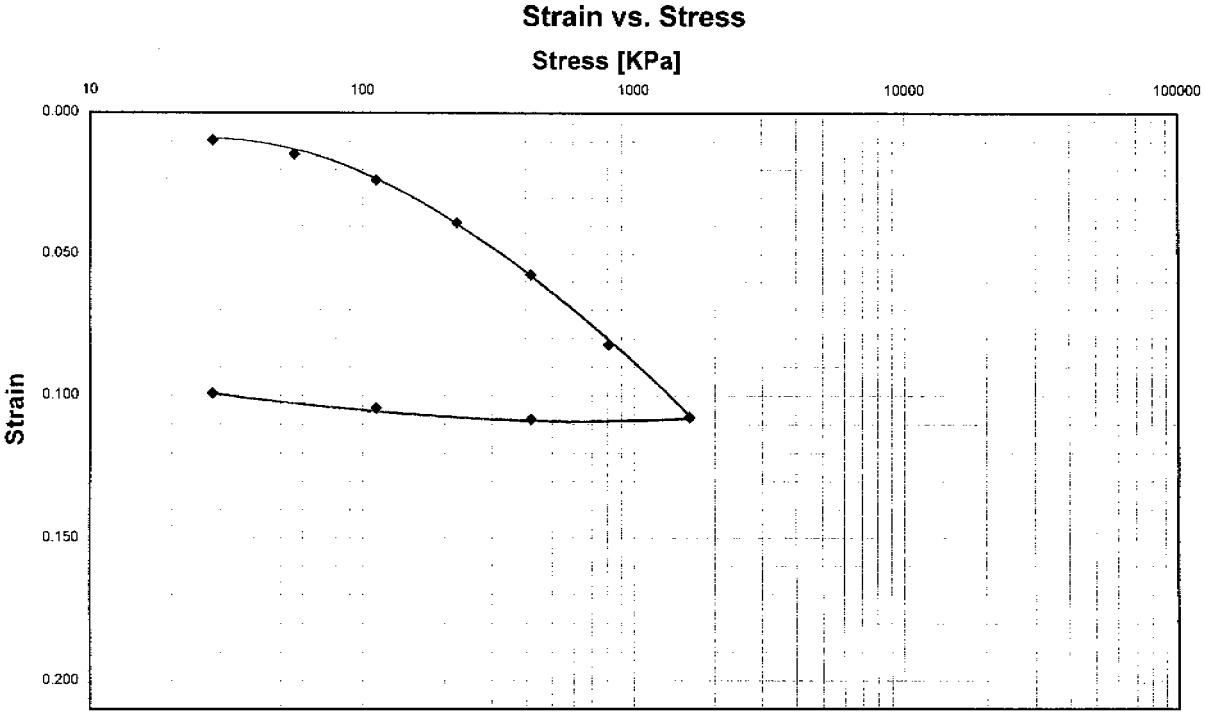
PROJECT	Ath /Meg 33
LOCATION	
JOB No.	W-7139 BORING B-160
SAMPLE No.	St - 2
SAMPLE DEPTH	1.5-3.5' (2.5')
SOIL DESCRIPTION	Greenish Br SiCl; Sm C-F Sa; Tr FGr
DATE OF TESTING	4/3/98
TESTED BY	Straub/ Hostetter

INITIAL SAMPLE VOL., Vi	63.338 cm^3	DRY WT. OF SOIL SOLIDS, Ms	109.04 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.2187 cm
INITIAL HT. OF VOIDS, Hv	0.7813 cm	INITIAL VOID RATIO, ei	0.641
Hi	20 mm		

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 = ΔH / Hi	e = e0 - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol. t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	166	0	0	0	0	0	0	0	0	0	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	0.5487	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							
1617				57							

Void Ratio vs. Stress




Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200

RESOURCE INTERNATIONAL

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UNCONFINED COMPRESSION

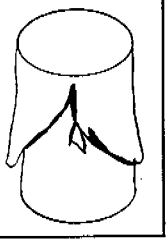
ASTM D -2166

PROJECT	Athens/Meigs 33
LOCATION	
JOB No.	W-7139
BORING / SAMPLE No.	B-126 / ST-2
SAMPLE DEPTH	1.5-3.5' (2.5-3.2')
SOIL DESCRIPTION	
DATE OF TESTING	3/19/98
TESTED BY	T.K.

DIAMETER, D_0	2.856 in	72.542 mm	STRAIN RATE	1	%/min
AREA, A_0	6.4063 in^2	41.331 cm^2	WET SOIL MASS	1457.34	g
HEIGHT, L_0	6.778 in	172.16 mm	PAN MASS	133.46	g
VOLUME, V_0	43.422 in^3	711.56 cm^3	DRY SOIL + PAN MASS	1349.36	g
MACH. RATE	0.06778	in/min	WET DENSITY	127.86	lb/ft^3
WATER CONT.	19.86	%	DRY DENSITY	106.67	lb/ft^3

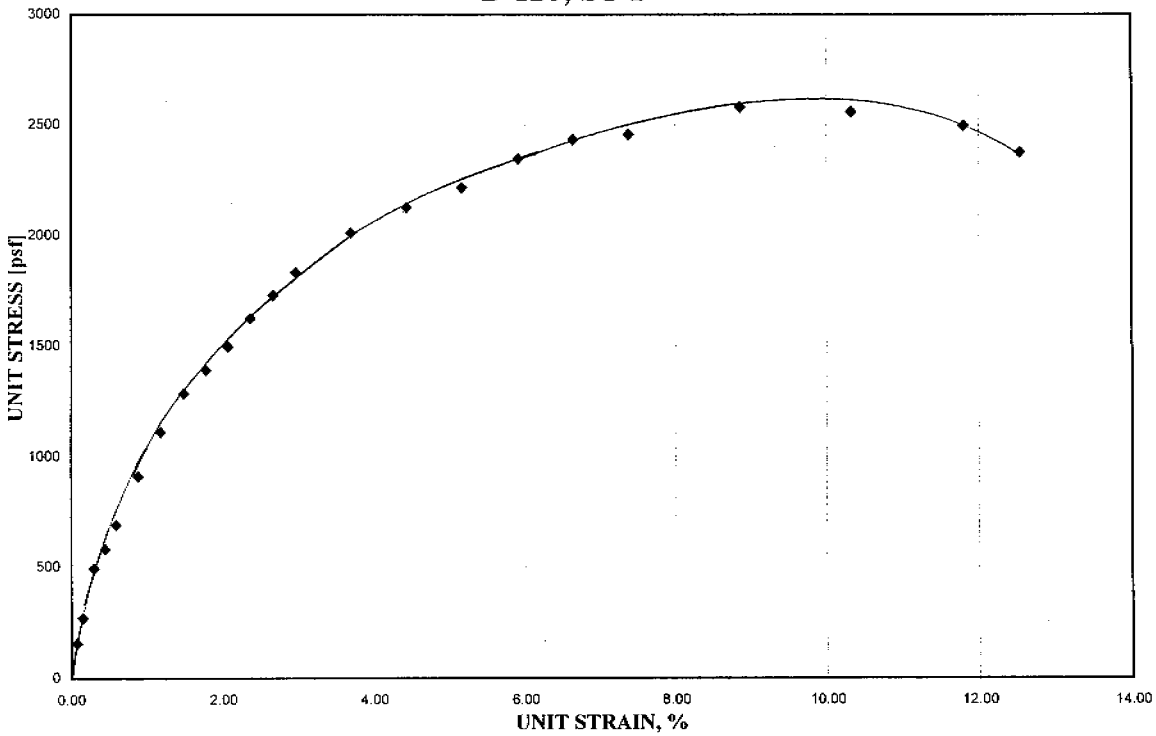
UNCONFINED COMPRESSION STRESS, q_u	2650	psf	126.88	kPa
COHESION, $S_U = q_U / 2 =$	1325	psf	63.44	kPa

Sample Def., ΔL (in)	Total Load on Sample (lb)	Unit Strain, ε $\Delta L/L_0$ (x 10^{-2})	Area Cor. Factor, (1 - ε)	Corrected Area, A' (in^2)	Sample Stress, σ_1 (psf)	Sample Stress, σ_1 (kPa)	Remarks
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	0.9882	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	Failure Skelch
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

B-126; ST-2



RESOURCE INTERNATIONAL

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UNCONFINED COMPRESSION

ASTM D -2166

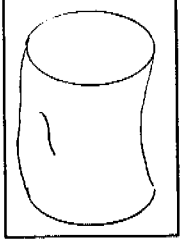
PROJECT	Athens/Meigs 33
LOCATION	
JOB No.	W-7139
BORING / SAMPLE No.	B-128/ss-3
SAMPLE DEPTH	3.5-5.0
SOIL DESCRIPTION	
DATE OF TESTING	3/18/98
TESTED BY	T.K.

DIAMETER, D_0	1.395 in	35.433 mm	STRAIN RATE	1	%/min
AREA, A_0	1.5284 in^2	9.8607 cm^2	WET SOIL MASS	169.61	g
HEIGHT, L_0	3.391 in	86.131 mm	PAN MASS	27.42	g
VOLUME, V_0	5.1828 in^3	84.931 cm^3	DRY SOIL + PAN MASS	161.9	g
MACH. RATE	0.03391	in/min	WET DENSITY	124.67	lb/ft^3
WATER CONT.	26.12	%	DRY DENSITY	98.85	lb/ft^3

UNCONFINED COMPRESSION STRESS, q_U	1690	psf	80.92	kPa
COHESION, $S_U = q_U / 2$ =	845	psf	40.46	kPa

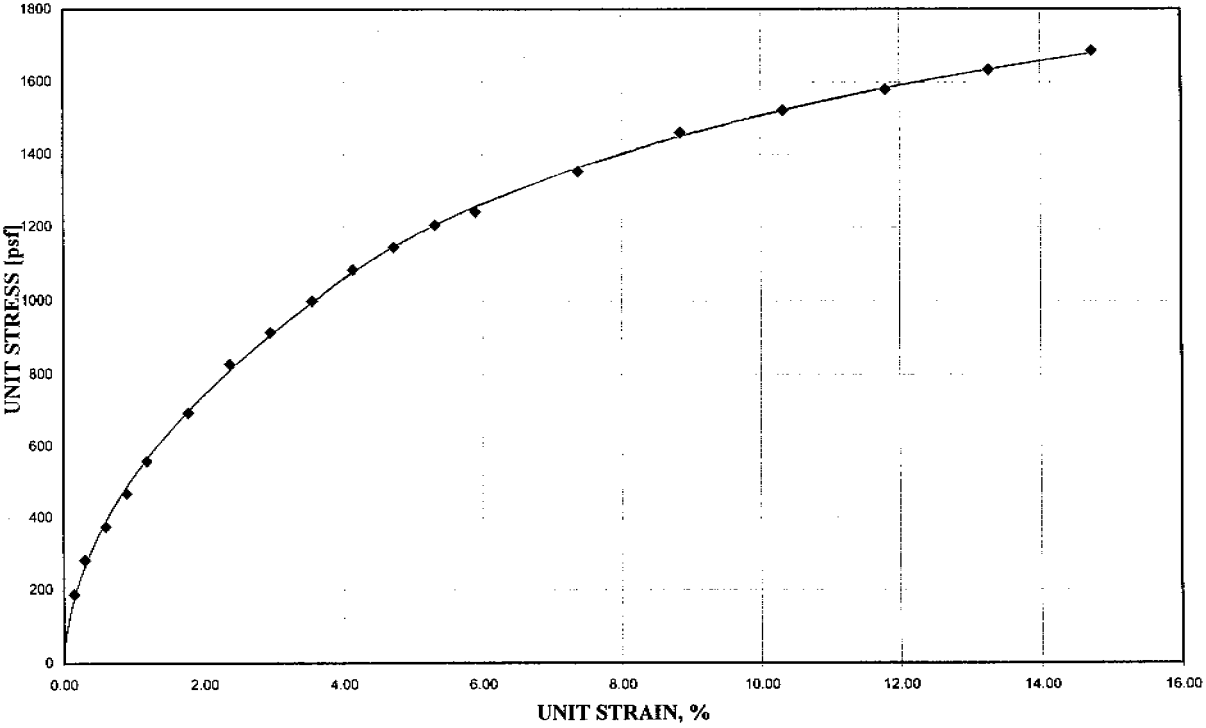
Sample Def., ΔL (in)	Total Load on Sample (lb)	Unit Strain, ϵ $\Delta L/L_0$ ($\times 10^{-2}$)	Area Cor. Factor, (1 - ϵ)	Corrected Area, A' (in^2)	Sample Stress, σ_1 (psf)	Sample Stress, σ_1 (kPa)	Remarks
0.0050	2.00	0.1474	0.9985	1.5307	188.15	9.01	
0.0100	3.00	0.2949	0.9971	1.5329	281.81	13.49	
0.0200	4.00	0.5898	0.9941	1.5375	374.64	17.94	
0.0300	5.00	0.8847	0.9912	1.5420	466.91	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	
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	

Failure Sketch



UNCONFINED COMPRESSION TEST

B-128; SS-3



Client: Ohio Department of Transportation | Project: ATH-33-40.981 | Job No. 9821-3200.00

LOG OF: Boring R-40 | Location: Sta. 39+634.71, 37.50 m Right of US 33 Centerline | Date Drilled: 6/22/00

WATER OBSERVATIONS:
Water seepage at: 2.26 m [7.4']
Water level at completion: none

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m
0	265.80						Topsoil - 0.356 m [14"]							
0.37 [1.2]	265.43 [870.8]	1 2 3	.330 [13]	1		215 [2.25]	Very stiff brown SILT AND CLAY (A-6a), 'and' fine to coarse sand, little gravel; damp.	15	12	—	29	17	28	
0.91 [3.0]	264.89 [869.1]													
		9 6 6	.406 [16]	2		263 [2.75]	Very stiff brown SILTY CLAY (A-6b), some fine to coarse sand, little gravel; damp.	15	15	—	10	24	34	
1.52 [5.5]	264.12 [866.5]													
		2 4 6	.229 [9]	3		359 [3.75]	Very stiff brown and gray SILTY CLAY (A-6b), trace fine to coarse sand; contains occasional rust staining; damp.							
2.44 [8.0]	263.36 [864.0]													
		7 8 8	.229 [9]	4		—	Very stiff purple and brown SILTY CLAY (A-6b), trace fine to coarse sand; damp.							
3.05 [10]														
		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.							
3.66 [12.0]	262.14 [860.0]													
4.27 [14.0]	261.53 [858.0]	7 28 50/.05	.330 [13]	6			Very dense gray GRAVEL WITH SAND (A-1-b) (decomposed limestone); damp.							50+
4.57 [15.5]	261.08 [856.6]													
		18 15 26	.305 [12]	7		431+ [4.5+]	Hard gray SANDY SILT (A-4a), some clay (decomposed siltstone); dry to damp.							
5.03 [16.5]	260.77 [855.5]						Bottom of Boring - 5.33 m [17.5']							
6.10 [20]														
7.62														

Moisture Content - % PL Natural LL

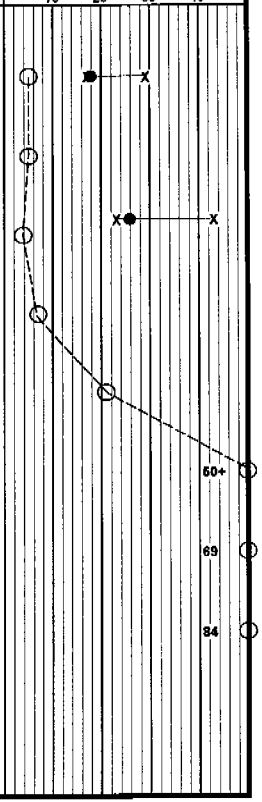
Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-41	Location:	Sta. 39+635.00, 63.52m Right of US 33 Centerline	Date Drilled:	6/22/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: none

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	235.98						Topsoil - 0.381 m [15"]						
0.40 [1.3]	235.58 [772.9]	1 2 3	.406 [16]	1		144 [1.5]	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
1.52		2 2 3	.381 [15]	2		144 [1.5]							
1.68 [5.5]	234.30 [768.7]	4 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
3.05		2 3 4	.203 [8]	4		335 [3.5]							
3.20 [10.5]	232.78 [763.7]	2 8 13	.305 [12]	5		335 [3.5]	Very stiff brownish gray SILT AND CLAY (A-6a), trace to little fine to coarse sand; damp.						
4.42	231.56	13 16 50/.13	.406 [16]	6		431+ [4.5+]							
4.57 [15.0]	[759.7]						Hard brown SILT AND CLAY (A-6a), trace to little fine to coarse sand (decomposed shale); damp.						
4.88 [16.0]	231.10 [758.2]	28 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.						
6.10	229.88	19 33 51	.457 [18]	8		431+							
[20]	[754.2]					[4.5+]	Bottom of Boring - 6.10 m [20.0']						
7.62													



Client: Ohio Department of Transportation | Project: ATH-33-40.981 | Job No. 9821-3200.00

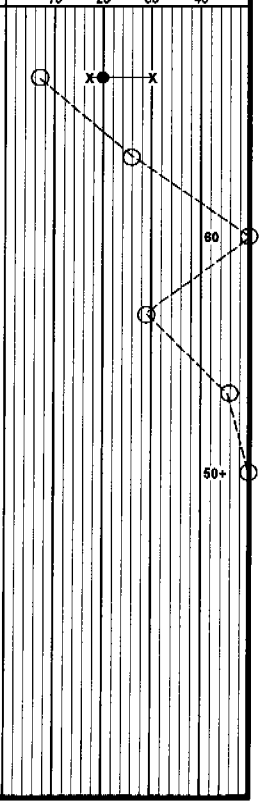
LOG OF: Boring R-42 | Location: Sta. 40+029.131, 58.19m Right of US 33 Centerline | Date Drilled: 6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: none (prior to coring)
2.74 m [9.0'] (after coring, including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	266.26						Topsoil - 0.203 m [8"]						
0.21 [0.7]	266.05 [872.9]	2 3 4	.356 [14]	1			Very stiff brown SILT AND CLAY (A-6a), trace to little fine to coarse sand; damp.	0	2	—	19	48	31
							@ 0.91 m [3.0'], little fine to coarse sand, trace gravel .						
1.52 [5]		6 13 13	.406 [16]	2									
1.83 [6.0]	264.43 [867.6]	16 35 25	.457 [18]	3			Hard brown SANDY SILT (A-4a), little gravel, trace to little clay (decomposed siltstone); damp.						
2.44 [8.0]	263.82 [865.6]												
3.05 [10]		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.						
3.96 [13.0]	262.30 [860.6]	12 18 28	.432 [17]	5									
4.57 [15]		12 32 50/.05	.356 [14]	6			Very dense brown GRAVEL WITH SAND AND SILT (A-2-4) (decomposed limestone); damp.						
4.88 [16.0]	261.38 [857.5]	Core 0.762 m [30"]	Rec .660 m [26"]	RQD 87%			Hard gray LIMESTONE; weathered to moderately weathered; contains micaceous arenaceous laminae.						
							@ 5.43 m [17.8'], healed high angle fault.						
		Core 1.524 m [60"]	Rec 1.37 m [54"]	RQD 68%			@ 5.55 m - 5.88 m [18.2' - 19.3'], very broken with low angle fractures containing clay infilling.						
6.10 [20]	260.16 [853.5]						@ 5.88 m - 6.00 m [19.3' - 19.7'], near vertical fracture with clay infilling.						
							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.						
7.32 [24.0]	258.94 [849.5]						@ 7.10 m - 7.16 m [23.3' - 23.5'], limestone.						
7.62							Hard gray SILTSTONE, micaceous; weathered.						

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40



Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-42	Location:	Sta. 40+029.131, 58.19m Right of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: none (prior to coring)
2.74 m [9.0'] (after coring, including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Sample No.	Blows per 0.15 m	Rec (m) [ft]	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
7.62	258.64					**DESCRIPTION**								
[25]	[848.6]	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 20%		Soft gray CLAYSTONE; severely weathered.								
8.56	257.70													
[28.1]	[845.5]	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 88%		Hard gray LIMESTONE, argillaceous; weathered; pyritic.								
9.14	257.12													
[30]	[843.6]					Hard brown SANDSTONE, argillaceous; weathered; contains clay laminae								
9.45	256.81													
[31.0]	[842.6]					Hard gray LIMESTONE; weathered.								
						@ 9.85 m - 10.03 m [32.3' - 32.9'], very soft brown CLAYSTONE; micaceous; sev. weathered..								
10.03	256.23													
[32.9]	[840.6]	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 85%		Medium hard brown SANDSTONE; moderately weathered.								
10.67						@ 10.21 m - 10.39 m [33.5' - 34.1'], very broken.								
10.82	255.44													
[35.5]	[838.1]					Hard gray LIMESTONE; brown laminations; slightly weathered.								
11.73	254.53													
[38.5]	[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.								
12.19														
[40]														
13.72		Core 1.524 m [60"]	Rec 1.295 m [51"]	RQD 22%										
[45]						@ 13.96 m - 15.00 m [45.8' - 49.2'], broken.								
15.24						@ 15.12 m [49.6'], becomes argillaceous.								

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-42	Location:	Sta. 40+029.131, 58.19m Right of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: none (prior to coring)
2.74 m [9.0'] (after coring, including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
15.24	251.02												
[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%									
16.76													
[55]							@ 17.62 m [57.8'], broken.						
17.83	248.43												
[58.5]	[815.1]						Bottom of Boring - 17.83 m [58.5']						
18.29													
[60]													
19.81													
[65]													
21.34													
[70]													
22.86													

GRADATION

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-43	Location:	Sta. 40+487.98, 36.98m Left of US 33 Centerline	Date Drilled:	

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.44 m [8.0']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Moisture Content - % (PL / Natural / LL)
0	236.93													
		3 3 3	.356 [14]	1			Loose brown SANDY SILT (A-4a); trace to little clay; moist.							
		2 3 5	.406 [16]	2			@ 1.07 m - 1.52 m [3.5' - 5.0'], has trace organics.							
1.52 [5.5]	235.25 [771.8]													
		2 2 5	.330 [13]	3		48 [0.5]	Medium stiff gray SILTY CLAY (A-6b); trace organics; moist.							
		10 10 7	.305 [12]	4		—	@ 2.59 m - 3.05 m [8.5' - 10.0'], becomes damp to moist, has some iron staining.							
3.05 [10.5]	233.73 [766.8]													
		7 7 8	.330 [13]	5			Medium dense brown SANDY SILT (A-4a), trace to little gravel; damp to moist.							
3.97 [13]	232.96 [764.3]													
		12 16 32	.305 [12]	6		—	Hard gray SILTY CLAY (A-6b), trace to little gravel; dry to damp.							
4.57 [15.5]	232.20 [761.8]													
		20 50/.13	.254 [10]	7			Soft reddish brown weathered SILTSTONE.							50+
5.34 [17.5]	231.59 [759.8]	Core 0.686 m [27"]	Rec .305 m [12"]	RQD 33%			Soft gray and red CLAYSTONE; severely weathered; contains Limestone clasts.							
6.10 [20]		Core 1.524 m [60"]	Rec 1.194 m [47"]	RQD 25%										
7.62														

GRADATION

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-43	Location:	Sta. 40+487.98, 36.98m Left of US 33 Centerline	Date Drilled:	

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.44 m [8.0']

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
7.62	229.31														
[25] 7.92	[752.3] 229.01	Core 0.406 m [16"]	Rec .279 m [11"]	RQD 0%			Soft gray and red CLAYSTONE; severely weathered; contains Limestone clasts.								
[26.0]	[751.3]						Bottom of Boring - 7.92 m [26.0']								
9.14															
[30]															
10.67															
[35]															
12.19															
[40]															
13.72															
[45]															
15.24															

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-44	Location:	Sta. 40+603.64, 51.83m Left of US 33 Centerline	Date Drilled:	6/29/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 3.05 m [10.0'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% G. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
0	244.16						**DESCRIPTION**								
0.18 [0.6]	243.98 [800.4]						Topsoil - 0.178 m [7"]								
		3 7 10	.279 [11]	1			Loose brown SANDY SILT (A-4a), trace clay, trace gravel; contains roots; damp to moist.								
0.92 [3]	243.25 [798.0]														
		3 7 11	.356 [14]				Stiff mottled brown and gray SANDY SILT (A-4a), trace to little clay; contains roots; moist.								
1.52 [5.5]	242.48 [795.5]			2											
		47 44 37	.406 [16]	3		—	Hard gray SILTY CLAY (A-6b), trace to little gravel; contains shale fragments; dry to damp.								81
2.44 [8]	241.72 [793.0]														
		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.								
3.05 [10.5]	240.96 [790.6]														
		17 50/.10	.203 [8]	5			Dense gray SANDY SILT (A-4a), trace to little gravel; dry. (decomposed to severely weathered siltstone)								50+
3.97 [13]	240.19 [788.0]														
		50/.13	.127 [5]	6			Soft gray weathered SILTSTONE.								50+
4.57 [15]	239.59 [786.1]	Core 1.219 m [48"]	Rec .940 m [37"]	RQD 40%			Soft to medium hard gray SILTSTONE; moderately weathered to severely weathered; very broken.								
5.22 [17.1]	238.94 [783.9]						Medium hard gray SANDSTONE; slightly broken; contains Limstone clasts.								
6.07 [19.9]	238.09 [781.1]	Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 67%			Medium hard gray SILTSTONE, micaceous; weathered; broken. @ 6.37 m - 6.49 m [20.9' - 21.3'], severely weathered.								
7.62															

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-44	Location:	Sta. 40+603.64, 51.83m Left of US 33 Centerline	Date Drilled:	6/29/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 3.05 m [10.0'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m 10 20 30 40	Moisture Content - % PL Natural LL 10 20 30 40
7.62 [25]	236.54 [776.0]	Core 1.524 m [60"]	Rec 1.473 m [58"]	RQD 72%			Medium hard gray SILTSTONE, micaceous; weathered; broken. @ 7.59 m - 7.74 m [24.9' - 25.4'], very broken. @ 7.89 m [25.9'], becomes brown.								
8.45 [27.7]	235.71 [773.3]						Hard brown and gray SANDSTONE, micaceous; thick bedded; weathered.								
9.14 [30]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 100%			@ 9.14 m - 9.30 m [30.0' - 30.5'], calcareous.								
10.67 [35]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 100%											
12.19 [40]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 73%			@ 11.89 m - 12.44 m [39.0' - 40.8'], gray with dark gray laminae, very micaceous.								
13.72 [45]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 97%			@ 13.20 m - 13.56 m [43.3' - 44.5'], gray with dark gray laminae, contains rust staining.								
14.94 [49.0]	229.22 [752.0]						Bottom of Boring - 14.94 m [49.0']								
15.24															

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-45	Location:	Sta. 40+824.99, on Centerline of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.19 m [7.2'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	255.03												
0.18	254.85						Topsoil - 0.19 m [7.5"]						
[0.6]	[836.1]	3											
		7	.457	1			Medium dense brown SANDY SILT (A-4a); contains root fragments.						
		32	[18]										
1.07	253.96												
	[833.2]	Core	Rec	RQD									
1.37	253.66	1.524	1.372	28%			Hard gray LIMESTONE; weathered.						
1.52	[832.2]	m	m										
[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	Rec	RQD									
		1.524	1.524	10%									
3.05		m	m										
[10]		[60"]	[60"]										
		Core	Rec	RQD									
		1.524	1.524	32%									
4.57		m	m										
[15]		[60"]	[60"]										
		Core	Rec	RQD									
		1.524	1.473	32%									
6.10		m	m										
[20]		[60"]	[58"]										
		Core	Rec	RQD									
		1.524	1.295	0%									
7.62		m	m										
		[60"]	[51"]										

GRADATION

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-45	Location:	Sta. 40+824.99, on Centerline of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.19 m [7.2'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
7.62 [25]	247.41 [811.7]						Medium hard brown SANDSTONE, micaceous, weathered, broken.								
		Core 1.524 m [60"]	Rec 1.397 m [55"]	RQD 8%											
9.14 [30]															
		Core 1.524 m [60"]	Rec .965 m [38"]	RQD 0%											
10.67 [35]															
		Core 1.524 m [60"]	Rec 1.473 m [58"]	RQD 15%			@ 11.67 m [38.3'], becomes gray.								
12.19 [40]															
		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.								
13.72 [45]															
		Core 1.524 m [60"]	Rec 1.270 m [50"]	RQD 28%											
15.15	239.88														
15.24	[787.0]						Very soft dark gray CLAYSTONE; severely weathered.								

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-45	Location:	Sta. 40+824.99, on Centerline of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.19 m [7.2'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Sample No.	Blows per 0.15 m [in]	Rec (m) [in]	Drive	Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
15.24	239.79							**DESCRIPTION**								
[50]	[786.7]		Core 1.524 m [60"]	Rec 1.270 m [50"]	RQD 28%			Very soft dark gray CLAYSTONE; severely weathered.								
								@ 16.15 m [53.0'], becomes soft.								
			Core 1.524 m [60"]	Rec 1.473 m [58"]	RQD 50%											
16.76																
[55]																
17.16	237.87															
[56.3]	[780.4]							Soft black COAL; weathered; with interbedded carbonaceous SHALE.								
								@ 17.77 m [58.3'], clay seam.								
18.17	236.86		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 47%											
18.29	[777.1]							Medium hard gray CLAYSTONE; weathered.								
[60]								@ 18.75 m [61.5'], severly weathered.								
19.11	235.92															
[62.7]	[774.0]															
19.35	235.68							Hard gray LIMESTONE; weathered; broken.								
[63.5]	[773.2]							Bottom of Boring - 19.35 m [63.5']								
19.81																
[65]																
21.34																
[70]																
22.86																

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-46	Location:	Sta. 41+229.99, 0.03m Left of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.19 m [7.2'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m
0	263.26						Topsoil - 0.152 m [6"]							
0.15 [0.5]	263.11 [863.2]	7 11 12	.254 [10]				Medium dense brown SANDY SILT (A-4a), trace to little clay, trace gravel; damp.							60+
0.76 [2.5]	262.50 [861.2]	15 37 50/.08	.356 [14]				Very soft light brown SHALE, argillaceous; severely weathered.							75
1.52 [5]		23 27 48	.381 [15]											69
3.05 [10]		21 27 32	.279 [11]											
3.35 [11.0]	259.91 [852.7]	12 19 27	.381 [15]				Very soft red SHALE, argillaceous; severely weathered.							
4.57 [15]		13 21 37	.406 [16]											68
5.33 [17.5]	257.93 [846.2]	50/.13	.102 [4]											50+
6.10	257.16	50/.08	.076 [3]				Very soft gray LIMESTONE, argillaceous, severely weathered.							50+
[20]	[843.7]	Core 1.219 m [48"]	Rec 1.041 m [41"]	RQD 56%			Medium hard brown CLAYSTONE, argillaceous, weathered. @ 6.10 m - 6.40 m [20.0' - 21.0'], severely weathered.							
6.58 [21.6]	256.68 [842.1]						Medium hard to hard gray and brown SANDSTONE; weathered. @ 6.58 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.							
7.62														

GRADATION

Moisture Content - %
PL Natural LL
10 20 30 40

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-46	Location:	Sta. 41+229.99, 0.03m Left of US 33 Centerline	Date Drilled:	6/27/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 2.19 m [7.2'] (after coring including drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
7.82	255.64						**DESCRIPTION**								
7.77 [25.5]	255.49 [838.2]	Core 1.829 m [72"]	Rec 1.524 m [60"]	RQD 71%			Medium hard to hard gray and brown SANDSTONE								
							Medium hard to hard gray SILTSTONE, micaceous; weathered. @ 8.32 m - 8.53 m [27.3' - 28.0'], brown.								
8.53 [28.0]	254.73 [835.7]						Hard gray SANDSTONE, calcareous; micaceous; weathered; contains dark gray laminae.								
9.14 [30]	254.12 [833.7]						Bottom of Boring - 9.14 m [30.0']								
10.67 [35]															
12.19 [40]															
13.72 [45]															
15.24															

Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-47	Location:	Sta. 41+599.99, 0.01m Right of US 33 Centerline	Date Drilled:	6/29/00

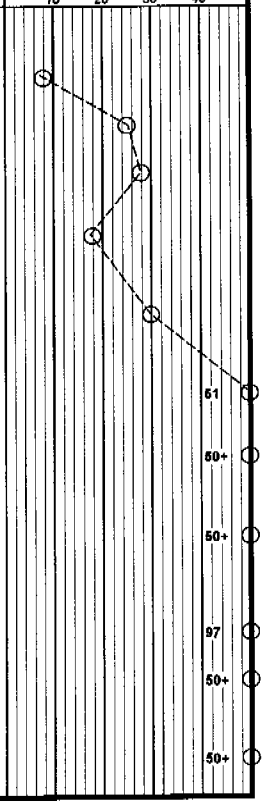
WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 1.37 m [4.5'] (after coring includes drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m²) [tsf]	DESCRIPTION
0	274.18						
0.10 [.33]	274.08 [899.2]						Topsoil - 0.102 m [4"]
		2 4 4	.381 [15]	1		192 [2.0]	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; damp.
0.76 [2.5]	273.42 [897.0]	4 5 20	.330 [13]	2		335 [3.5]	Very stiff brown SANDY SILT (A-4a); micaceous; damp.
1.22 [4]	272.96 [895.5]	7 15 13	.406 [16]	3A 3B		431+ [4.5+]	Hard brown SILT AND CLAY (A-6a); damp.
1.52 [5.5]	272.50 [894.0]	5 7 11	.457 [18]	4		263 [2.75]	Very stiff brown and red SILTY CLAY (A-6b); damp to moist.
3.05 [10]		11 14 16	.457 [18]	5		263 [2.75]	@ 3.20 m [10.5'], becomes hard (decomposed to severely weathered claystone).
		15 26 25	.457 [18]	6		407 [4.25]	
4.57 [15]		39 50/.13	.279 [11]	7		431+ [4.5+]	@ 4.72 m [15.5'], brown and red.
		50 50/.10	.254 [10]	8		431+ [4.5+]	
6.10 [20]		31 46 51	.432 [17]	9		431+ [4.5+]	
6.40 [21]	267.78 [878.5]	50/.10	.102 [4]	10			Soft red CLAYSTONE; severely weathered.
7.62		50/.08	.076 [3]	11			

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Blows per 0.30 m
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40



Client:	Ohio Department of Transportation	Project:	ATH-33-40.981	Job No.	9821-3200.00
LOG OF:	Boring R-47	Location:	Sta. 41+599.99, 0.01m Right of US 33 Centerline	Date Drilled:	6/29/00

WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 1.37 m [4.5'] (after coring includes drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m [in]	Rec (m)	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
7.62	266.56						**DESCRIPTION**								
[25]	[874.5]	Core 1.524 m [60"]	Rec 1.346 m [53"]	RQD 45%			Soft red CLAYSTONE; moderately weathered; very broken.								
9.14							@ 8.99 m [29.5'], slickensided shear.								
[30]		Core 1.524 m [60"]	Rec 1.219 m [48"]	RQD 50%											
10.67															
[35]		Core 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%			@ 12.31 m [40.4'], becomes medium hard, gray and red, slightly broken. @ 12.62 m [41.4'], slickensided shear.								
13.72							@ 13.14 m [43.1'], slickensided shear.								
[45]		Core 1.524 m [60"]	Rec 1.422 m [56"]	RQD 77%			@ 14.26 m [46.8'], slickensided shear.								
15.24															

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WATER OBSERVATIONS:
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Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m [ft]	Rec (m) [ft]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
15.24	258.94														
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%			@ 16.86 m - 18.17 m [55.3' - 59.6'], contains moderately weathered zones.								
18.29 [60]		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.								
19.17 [62.9]	255.01 [836.6]						Medium hard gray CLAYSTONE; weathered, contains limestone clasts and arenaceous layers.								
19.81 [65]		Core 1.524 m [60"]	Rec 1.524 m [60"]	RQD 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]		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.								
22.86															

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WATER OBSERVATIONS:
Water seepage at: none
Water level at completion: 1.37 m [4.5'] (after coring includes drill water)

Depth (m) [ft]	Elev. (m) [ft]	Blows per 0.15 m	Rec (m) [in]	Sample No. Drive	Sample No. Press	Hand Penetrometer (kN/m^2) [tsf]	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per 0.30 m (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
22.86	251.32														
[75]	[824.5]	Core 1.524 m [60"]	Rec 1.448 m [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.								
[80]	[819.6]						Bottom of Boring - 24.38 m [80.0']								
25.91															
[85]															
27.43															
[90]															
28.96															
[95]															
30.48															