

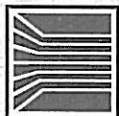
Report of Geotechnical Exploration
For

**New Mass Burn WTE Facility
Solid Waste Authority of Palm Beach County**

Malcolm Pirnie, Inc.
8201 Peters Road, Suite 3400
Plantation, FL 33324
Project Number: 3582-054

Prepared by:

Williams Earth Sciences, Inc.
Reference # 6308-016-00



W I L L I A M S
E A R T H S C I E N C E S



WILLIAMS
EARTH SCIENCES, INC.

Choose Integrity.

10600 Endeavour Way
Largo, Florida 33777
Office: (727) 541-3444
Fax: (727) 541-1510

www.williamsearthsciences.com

July 2, 2008

Malcolm Pirnie, Inc.
8201 Peters Road, Suite 3400
Plantation, Florida 33324

Attention: Leah Richter, P.E.
Senior Project Engineer

Subject: Report of Geotechnical Exploration for New Mass Burn WTE Facility
Solid Waste Authority of West Palm Beach
Palm Beach County, Florida.
Williams Project No.: 6308-016-00

Dear Ms. Richter:

Williams Earth Sciences, Inc. (Williams) is pleased to submit this Preliminary Geotechnical Report for the above referenced project. The analyses in the following report are based on information gathered by Williams and/or provided by Malcolm Pirnie, Inc.

Included herein are project information, the geotechnical exploration and laboratory results, site and subsurface conditions, and preliminary considerations for site development recommendations.

We appreciate the opportunity to provide our engineering services for the New Mass Burn WTE Facility project. If you have any questions or need additional information, please contact either of the undersigned.

Sincerely,

WILLIAMS EARTH SCIENCES, INC.

Osvaldo Vargas, E.I.
Geotechnical Project Manager

Lawrence D. Spears, P.E.
Senior Geotechnical Engineer
Florida Registration No. 52105

Distribution: Addressee (3)
File (1)

C:\Documents and Settings\Owner.YOUR-42FBF34787\Desktop\Preliminary Geotech Report Malcom Pirnie Landfill.doc



TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 <i>Project information</i>	1
1.2 <i>Purpose and Scope of Services</i>	1
2.0 SUBSURFACE EXPLORATION	1
2.1 <i>Field Testing</i>	1
2.2 <i>Laboratory Testing</i>	2
2.2.1 <i>Moisture Content</i>	2
2.2.2 <i>Grain Size Analysis</i>	2
3.0 GEOTECHNICAL SITE AND SUBSURFACE CONDITIONS	2
3.1 <i>Site Conditions</i>	2
3.2 <i>Subsurface Conditions</i>	2
3.3 <i>Groundwater</i>	3
4.0 PRELIMINARY ENGINEERING EVALUATION AND RECOMMENDATIONS	3
5.0 LIMITATIONS OF STUDY	4

APPENDICES

Appendix A SITE LOCATION MAP & FIELD EXPLORATION PLAN

Site Location Map

Field Exploration Plan

Appendix B FIELD EXPLORATION REPORTS

Appendix C LABORATORY TEST RESULTS

Table 1 – Summary of Laboratory Test Results

1.0 INTRODUCTION

1.1 Project information

The project site is located at the west side of North Jog Road in between Bee Line Highway and 45th Street in Palm Beach County, Florida. More specifically, the project site is located within the Solid Waste Authority Landfill Facility in the city of West Palm Beach, Florida. The project consists of the construction of a New Mass Burn WTE Facility by the Solid Waste Authority. Based on the information obtained on or around March 27, 2008 from Malcolm Pirnie, for the proposed construction, the northern portion of an on-site lake, the South Lake, will be dredged and the dredged material will be used as fill for the southern portion of the lake. Additional project specific information, including building design and grading criteria, was not provided to Williams at the time of the investigation. The Site Location map included in Appendix A illustrates the general location of the referenced project.

1.2 Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions within and around the perimeter of the northern portion of the South Lake, and subsequently develop preliminary geotechnical engineering considerations for the proposed project. More specifically, the study included:

- Standard Penetration Test borings to explore the subsoil and groundwater conditions;
- Laboratory testing of representative soil samples to define their characteristics;
- Engineering analyses of the field data to develop general geotechnical recommendations for the project.

The preliminary geotechnical site development considerations relative to the design are generally included in Section 4.0. Our findings, conclusions and recommendations in this report are subject to the Limitations found in Section 5.0.

2.0 SUBSURFACE EXPLORATION

2.1 Field Testing

Prior to the initiation of fieldwork, "Sunshine State One Call" was notified to clear underground utilities within the site. Our subsurface investigation was performed between June 6, 2008 and June 12, 2008. To explore the subsurface conditions on this site, a total of four Standard Penetration Test (SPT) borings (B-1 to B-4) were drilled. Borings B-1 and B-2 were performed around the perimeter of the South Lake with one of Williams' truck-mounted drill rigs. These two borings were drilled to a depth of 56 feet (approximately 50 feet below the water surface of the lake). Borings B-3 and B-4 were performed within the lake with Williams' Pontoon Barge. These two borings were drilled to depths of 45 and 50 feet, respectively, below the water surface of the lake. For borings B-1 and B-2, soil samples were taken at 5 feet intervals in the upper 35 feet and at 2.5 feet intervals thereafter. For borings B-3 and B-4, soil samples were taken at 2.5 feet intervals. The approximate locations of the borings are shown on the Field Exploration Plan in Appendix A. Samples of each soil encountered were placed in glass jars that were sealed and transported to our laboratory for further review by an engineer or geologist. The results of the SPT borings are shown on the boring

logs in Appendix B. The equipment and procedures used in the SPT borings are also described in Appendix B.

2.2 Laboratory Testing

Representative soil samples collected from the SPT borings were classified and stratified in general accordance with the Unified Soil Classification System. Our classification was based on visual observations, using the results of laboratory testing to confirm the visual classification. Laboratory index property testing consisting of grain size analysis and moisture content were performed on selected samples to assist in soil classification and to provide a general indication of the engineering properties of the soils. The test results are summarized in Appendix C.

2.2.1 Moisture Content

The moisture content, w , is defined as the ratio of the weight of water in a sample to the weight of solids. The wet sample is weighed, then oven-dried to a constant weight at a temperature of about 110° C. The weight after drying is the weight of solids. The change in weight which has occurred during drying is equivalent to the weight of water. Tests were performed in accordance with ASTM D2216. The moisture content is valuable in determining the index properties of soils and can be correlated with other parameters.

2.2.2 Grain Size Analysis

The grain size analysis provides a direct measurement of the particle size distribution of soil by causing the sample to pass through a series of wire screens with progressively smaller openings of known size. The amount of material retained on each sieve is weighed. Results are reported on a combined grain size distribution plot as the percentage of sample smaller than, by weight, versus the log of the particle diameter. This data is necessary for classification of the soil. Tests were performed in accordance with ASTM D422.

3.0 GEOTECHNICAL SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The project site is located within the landfill facility of the Solid Waste Authority of West Palm Beach. More specific, the area under which the investigation was focused is the South Lake. This lake has an approximate area of 28 acres and ranges from 35 to over 40 feet deep. The lake is bordered to the east by North Jog Road and to the north, west and south by an access road to the landfill facility. The areas around the perimeter of the lake are mainly grassy areas with some shrubs and trees.

3.2 Subsurface Conditions

The subsurface soil conditions as encountered in the borings, in the order of depth below the ground surface, are described in the following paragraphs. These descriptions are only intended to be a generalization of the soil conditions. For more detailed information, please refer to the Boring Logs in Appendix B. It is noted that the relative density of the soils encountered in the borings was estimated as a result of the correlation with the SPT values.

Subsurface conditions encountered in borings B-1 and B-2, generally consisted of loose to dense clean sands (SP) below the ground surface to depths of 25 and 15 feet, respectively. Standard penetration test resistances (N-values) in this layer ranged from 4 to 29 blows per foot (bpf). Below

this layer of clean sands, intermittent layers of very loose to medium dense silty, slightly silty, and clean sands (SM, SP-SM, SP) were encountered to a depth of 50 feet. In these layers, the standard penetration test resistances (N-values) ranged from 1 to 16 blows per foot. Finally from a depth of 50 feet to the boring termination depth of 56 feet, a layer of medium dense slightly silty sand with sandstone fragments (SP-SM) was encountered. Standard penetration test resistances (N-values) in this layer ranged from 10 to 17 blows per foot.

For boring B-3, performed around the central area of the lake, the subsurface soil conditions generally consisted of a layer of loose clean sand (SP) from the mudline (encountered at a depth of 33.5 feet below the top of the water) to a depth of 35 feet. The SPT resistance (N-value) in this layer was 7 blows per foot (bpf). Below this layer of clean sand, a layer of loose to medium dense slightly silty sand with sandstone fragments (SP-SM) was encountered to a depth of 44.5 feet. SPT (N-values) in this layer ranged from 5 to 17 blows per foot. Finally from a depth of 44.5 feet to the boring termination depth of 45 feet, a layer of medium dense clayey sand (SC) was encountered.

For boring B-4, performed around the northern area of the lake, the subsurface soil conditions generally consisted of intermittent layers of very loose to medium dense silty, slightly silty, and clean sands (SM, SP-SM, SP) from the mudline (encountered at a depth of 42 feet below the top of the water) to the boring termination depth of 50 feet. For these layers, the SPT resistances (N-values) ranged from 2 to 18 blows per foot (bpf).

3.3 Groundwater

Groundwater observations were made during drilling operations at all boring locations. In borings B-1 and B-2, the groundwater depth was observed to be at an average of 6.0 feet below the ground surface. In borings B-3 and B-4, the water depth was measured to be 33.5 and 42 feet, respectively. In addition to the boring locations, three other additional locations in the lake were selected to measure the depth of the water. In these additional locations, the depth of the water was observed to range from 35 to more than 40 feet deep. The Field Exploration Plan in Appendix A shows the three locations where the water depth was measured.

It should be noted that the elevation of the groundwater is not constant, but varies during the year depending upon the season, recent precipitation, and site drainage characteristics.

4.0 PRELIMINARY ENGINEERING EVALUATION AND RECOMMENDATIONS

From the results of our field exploration and the laboratory testing, it is observed that the soils below the bottom of the lake consist primarily of very loose to medium dense sands with varying contents of silt and rock fragments. From the information provided, we understand that these are the soils that will be dredged for the proposed construction. Based on the results of our investigation and the ease of drilling of these materials, we anticipate that no difficult conditions should be encountered in the dredging operations of these types of materials. However, at the time of the investigation, no information was provided regarding the depth of the dredging operations or the technique to be used for dredging. It should also be noted that the borings performed were widely spaced and that due to the large area of the lake, variations in the soil conditions can occur. Should unexpected dense soil or rock formations be encountered, it can potentially affect the dredging operations.

It is our opinion that the type of soils encountered during our investigation below the bottom of the lake could be acceptable materials to use as fill for the southern portion of the lake, provided that adequate procedures of fill preparation and placement are followed. However, as previously stated,

due to the large area of the lake, variations in the soil conditions can occur. Should unsuitable materials such as clay or muck be encountered during the dredging operations, these materials should be disposed and not used as fill. Finally, we would recommend that once more details regarding the depth of the dredging, the technique to be used for dredging, and the type of structures to be constructed become available, additional borings be performed in order to better delineate the subsurface conditions throughout the site.

5.0 LIMITATIONS OF STUDY

Williams' professional services have been performed, our findings obtained, and our preliminary recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied. Williams Earth Sciences, Inc. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

We wish to point out that a preliminary geotechnical study is inherently limited in that the preliminary engineering recommendations are developed from information obtained from the widely spaced soil test borings that only depict subsurface conditions at the specific locations, times and depth shown on the logs. Soil conditions at other locations may differ from those encountered in the test borings, and the passage of time may cause the soils conditions to change from those described in this report.

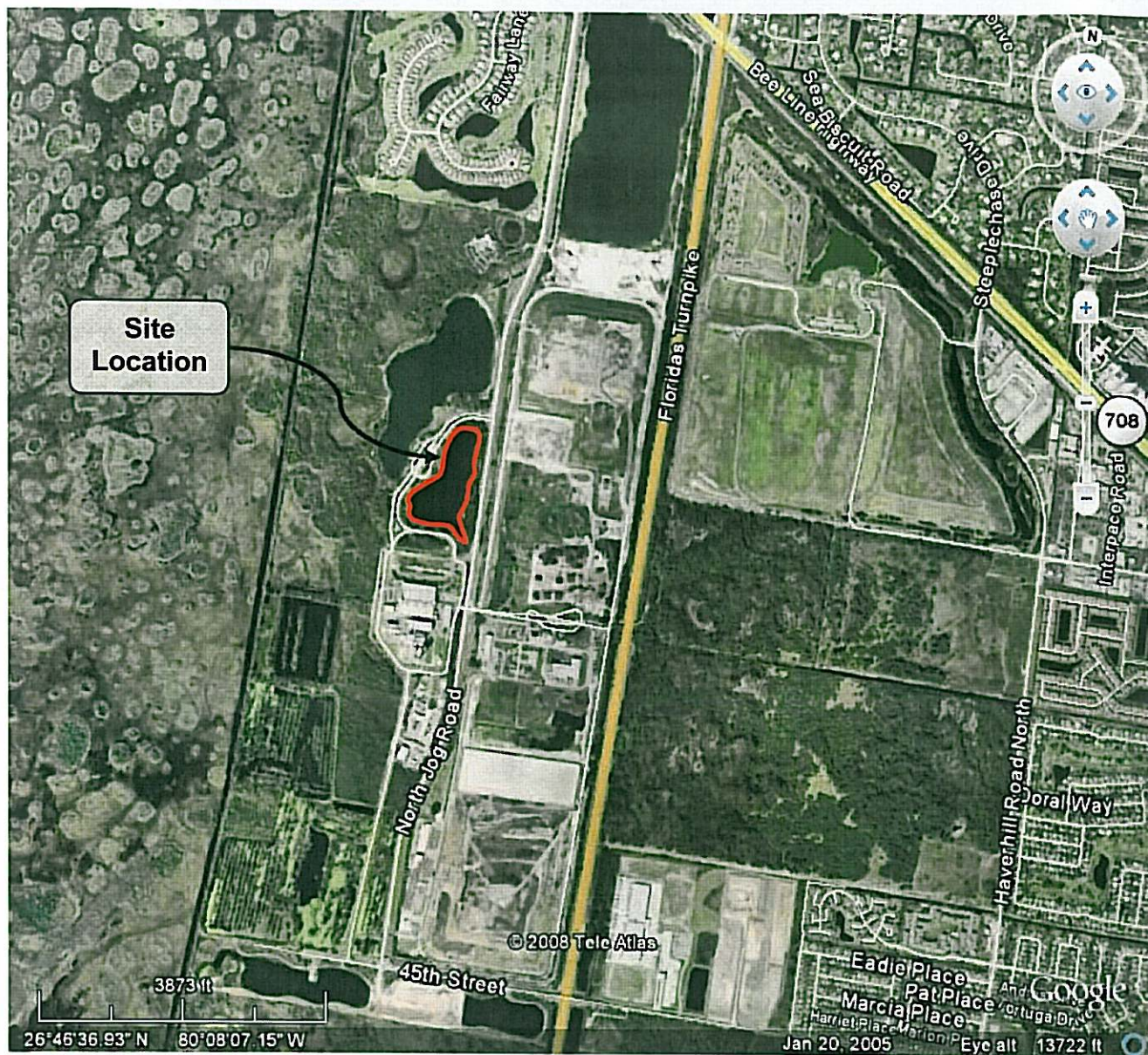
This report is intended for use by the designers of this project. While Williams has no objections to it being provided for review by other parties for this project, it is not a complete geotechnical study and is not intended as such. To that end, additional exploration at the actual building locations will be required to develop design recommendations.

Furthermore, if the project characteristics are altered significantly from those discussed in this report, if the project information contained in this report is incorrect or if additional information becomes available, a review must be made by this office to determine if any modifications in the recommendations will be necessary.

The scope of our services does not include any environmental assessments or investigations for the presence or absence of hazardous or toxic materials in the soil, groundwater or surface water or beyond the site studied. Any statements in this report or on the test boring logs regarding unusual subsurface conditions and/or composition, odor, staining origin or other characteristics of the surface and/or subsurface materials are strictly for the information of our client.

**SITE LOCATION MAP
&
FIELD EXPLORATION PLAN**

**A
P
P
E
N
D
I
X
A**



New Mass Burn WTE Facility
 West Palm Beach
 Palm Beach County, Florida

Williams Project No.: 6308-016-00

Figure 1

SITE LOCATION MAP



WILLIAMS
 EARTH SCIENCES INC.

LEGEND

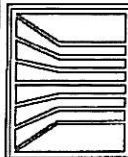
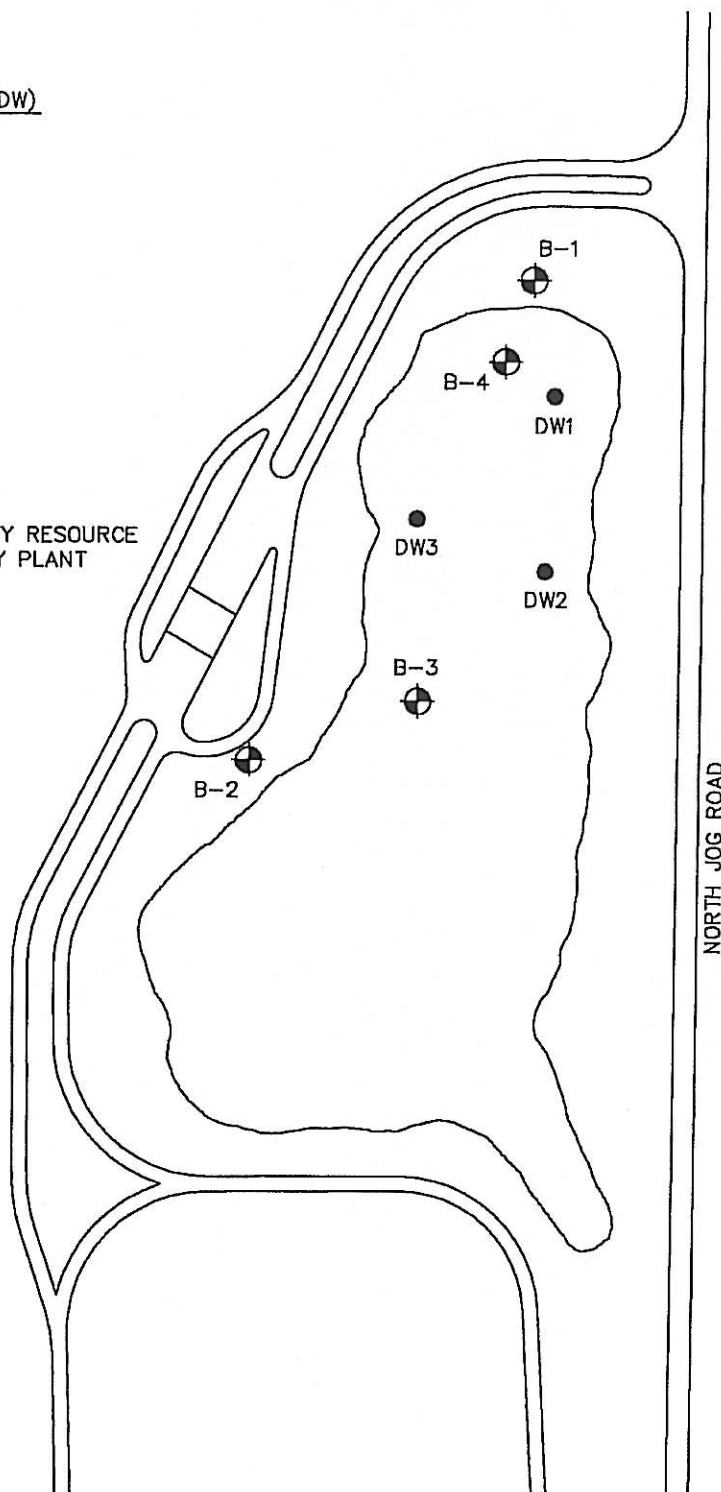
DEPTH OF WATER (DW)

DW1 > 40 FEET

DW2 > 40 FEET

DW3 ~ 35 FEET

NORTH COUNTY RESOURCE
RECOVERY PLANT



WILLIAMS EARTH SCIENCES, INC.

CORPORATE OFFICE 10800 Endeavour Way, Largo, FL 33777

Jacksonville:	(904) 282-8852	FAX: (904) 282-8864
Largo:	(727) 541-3444	FAX: (727) 541-1510
FL. Lauderdale:	(954) 972-7570	FAX: (954) 972-6608
FL. Myers:	(239) 337-9781	FAX: (239) 337-9783
Panama City:	(850) 747-9419	FAX: (850) 763-2454

**NEW MASS BURN WTE FACILITY
PALM BEACH COUNTY, FLORIDA**

FIELD EXPLORATION PLAN

Drawn By: TEJ
Checked By: OJV

Date: 6/17/2008
Report No. 6308-016-00

Scale: N.T.S.
Figure No. 2

field

The background of the page is a detailed geological cross-section. It features several vertical columns representing different geological units. These units are distinguished by various patterns: some have a brick-like pattern, others have a pattern of small circles, and some have diagonal hatching. The columns are separated by thin vertical lines, and the overall structure shows a complex, layered geological formation.

FIELD EXPLORATION REPORTS

**A
P
P
E
N
D
I
X

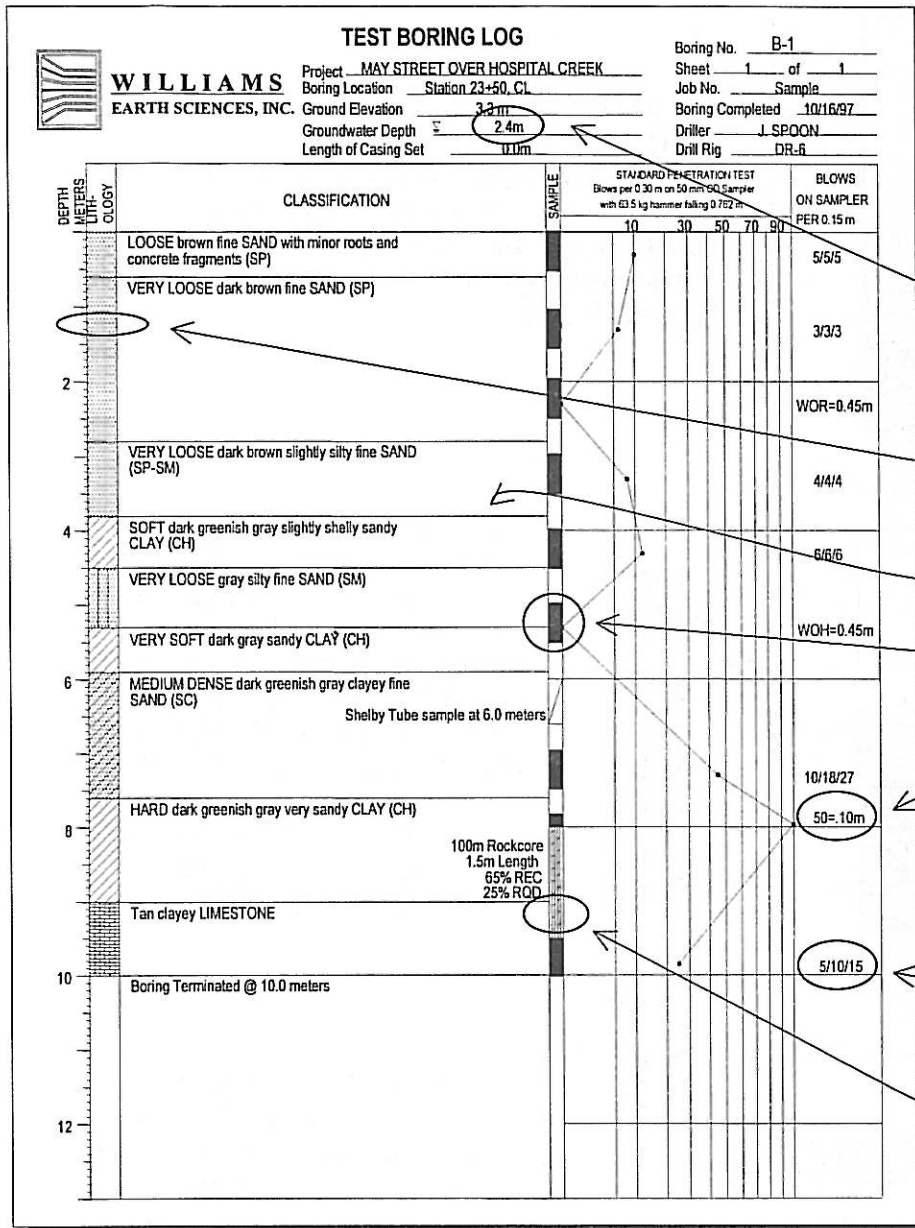
B**

UNIFIED CLASSIFICATION SYSTEM				
MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILTS AND CLAYS Liquid Limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
	SILTS AND CLAYS Liquid Limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH	Inorganic clays or high plasticity, fat clays	
		OH	Organic clays of medium to high plasticity	
	Highly Organic Soils		PT	Peat, muck and other highly organic soils
* Based on the material passing the 3-in. (75-mm) sieve.				

AASHTO CLASSIFICATION SYSTEM												
Classification ^a of Soils and Soil-Aggregate Mixtures (with Suggested Subgroups)												
General Classification	Granular Materials (35% or less passing No. 200)							Silt-Clay Materials (More than 35% passing No. 200)				
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-8 ^c
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5	
Sieve analysis, percent passing:												
No. 10	50 max.											
No. 40	30 max.	50 max.	51 min.									
No. 200	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.	
Characteristics of fraction passing No. 40:												
Liquid limit				40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	
Plasticity index		6 max.	NP	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min. ^b	
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils		Organic soils
General rating as												
subgrade	← Excellent to good →			← Fair to poor →			poor					
^a Classification procedure: With required test data available, proceed from left to right on above chart and correct group will be found by the process of elimination. The first group from the left into which the test data will fit is the correct classification.												
^b A-7-5 if $PI \leq LL - 30$; if $PI > LL - 30$. ^c A-8 Group refers to Peat and Muck Soils.												



UNDERSTANDING THE BORING LOG



This sample boring log is a visual and descriptive representation of what was sampled in the field. The reader cannot safely infer any conclusion on any single item of information, but rather the entire log, along with the other boring logs, must be analyzed relative to the proposed structure.

Water depth is important to the designer when constructing ponds, roadways and foundations.

Lithology (see Unified Classification System or AASHTO Classification System)

Approximate stratum break

Length of sampling operation

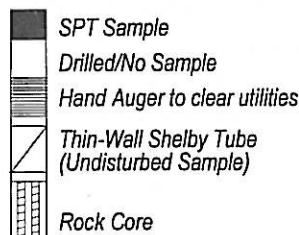
If at 50 blows, there is less than 6" or 0.15m of penetration, then it's plotted @ 100 and actual length of sample is shown.

The total number of blows for the last two 6" (0.30m) increments of the sample is termed the blow count (N-Value). In this case: 10 + 15 = 25 which is plotted on the boring log.

Indicates Rock coring operation (ASTM D 2113). Core size diameter = 4" (100mm); core length = 5' (1.5m). Recovery = 65% is actual length recovered divided by length cored.

RQD = 25% Rock Quality Designation determined by the sum of all lengths of 4" (100mm) or greater (mechanical breaks excluded) divided by the length cored expressed as a percent.

Symbols / Boring Log Legend

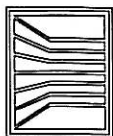


WOH Weight of Hammer
 WOR Weight of Rod
 50 = # 50 blows with a specified penetration

Project New Mass Burn WTE Facility

Boring No. B-1
Sheet 2 of 2
Job No. 6308-016-00

[illegible]



WILLIAMS
EARTH SCIENCES, INC.

TEST BORING LOG

Project New Mass Burn WTE Facility
Boring Location Refer to Boring Location Plan
Ground Elevation N/A
Groundwater Depth 6.5'
Length of Casing Set 10'

Boring No. B-2
Sheet 1 of 2
Job No. 6308-016-00
Boring Completed 6/6/2008
Driller R. Miller
Drill Rig Truck-Mounted CME-55

DEPTH FEET	LITH- OLOGY	CLASSIFICATION	SAMPLE	STANDARD PENETRATION TEST Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30"					BLOWS ON SAMPLER PER 6"
				10	30	50	70	90	
5		MEDIUM DENSE tan to brown fine SAND (SP)		•					2/4/4
					•				6/6/9
10		MEDIUM DENSE tan fine to medium SAND with limestone fragments (SP)		•					3/4/4
15				•					5/5/5
20		MEDIUM DENSE brown slightly silty fine SAND (SP-SM)		•					3/6/6
25		MEDIUM DENSE brown fine SAND (SP)		•					4/5/5
30				•					5/5/7

Project **New Mass Burn WTE Facility**

Boring No. B-2
Sheet 2 of 2
Job No. 6308-016-00

DEPTH FEET	LITH- OLOGY	CLASSIFICATION	SAMPLE	STANDARD PENETRATION TEST Blows per foot on 2" O.D. Sampler with 140 lb. hammer falling 30"					BLOWS ON SAMPLER	
				10	30	50	70	90	PER 6"	
35										4/7/9
		LOOSE dark gray slightly silty fine SAND (SP-SM)								2/2/2
		LOOSE gray slightly silty fine SAND with some sandstone fragments (SP-SM)								2/1/3
40										
		MEDIUM DENSE to LOOSE gray slightly silty fine SAND with some sandstone fragments (SP-SM)								4/3/5
										6/7/5
45										
		LOOSE gray slightly silty fine SAND with traces of shells (SP-SM)								2/1/2
										3/2/3
50										
		MEDIUM DENSE gray slightly silty fine SAND with some sandstone fragments (SP-SM)								5/5/5
										4/4/8/7
55										
		Boring Terminated @ 56 ft. CME Automatic Hammer used.								
60										
65										



Project	New Mass Burn WTE Facility
Boring Location	Refer to Boring Location Plan
Mudline Elevation	N/A
Water Depth	33.5'
Length of Casing Set	35'

Boring No. B-3
 Sheet 1 of 1
 Job No. 6308-016-00
 Boring Completed 6/11/2008
 Crew Chief R. Miller
 Drill Rig Tri-Pod Mounted on Barge

[illegible]



Project	New Mass Burn WTE Facility
Boring Location	Refer to Boring Location Plan
Mudline Elevation	N/A
Water Depth	42'
Length of Casing Set	45

Boring No. B-4
Sheet 1 of 1
Job No. 6308-016-00
Boring Completed 6/12/2008
Crew Chief R. Miller
Drill Rig Tri-Pod Mounted on Barge

[illegible]

LABORATORY TEST RESULTS

**A
P
P
E
N
D
I
X

C**



WILLIAMS EARTH SCIENCES

1900 NW 40th Court
Pompano Beach, FL 33064
Phone (954) 972-7570, Fax (954) 972-6608

TABLE 1: SUMMARY OF LABORATORY TEST RESULTS

Project: New Mass Burn WTE Facility
Williams Earth Sciences Project No.: 6308-016-00
Prepared for: Malcolm Pirnie, Inc.

Boring ID		Sample Depth (ft)		Soil Description	Soil Class (USC)	Sieve Analysis (Percent Passing)										Natural Moisture	
						1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	#200	(%)	
B1	S9	36.0	- 37.5	GRAY SAND W/LIMESTONE	SP	100	100	97	94	83	79	64	36	14	2.4	19	
B1	S11	41.0	- 42.5	GREENISH GRAY SILTY F.SAND	SM	100	100	100	100	100	100	96	90	67	13	29	
B1	S15	51.0	- 52.5	L. GRAY SLIGHTLY SILTY F.SAND	SP-SM	100	100	95	93	84	64	35	20	13	7.7	20	
B2	S10	38.5	- 40.0	L. GRAY SLIGHTLY SILTY F.SAND & SANDSTONE	SP-SM	100	97	85	79	64	49	29	21	13	7.6	20	
B2	S12	43.5	- 45.0	GRAY SLIGHTLY SILTY F.SAND & SANDSTONE	SP-SM	100	95	82	79	66	51	35	24	16	6.3	18	
B2	S15	51.0	- 52.5	L. GRAY SLIGHTLY SILTY F.SAND W/S. SANDSTONE	SP-SM	87	87	80	80	74	71	63	51	33	8.6	19	
B3	S1	33.5	- 35.0	BROWN FINE SAND	SP	100	100	100	100	100	100	95	69	30	3.1	27	
B3	S3	38.5	- 40.0	L. GREEN SLIGHTLY SILTY F.SAND W/S. SANDSTONE	SP-SM	100	100	88	84	74	70	66	63	47	9.4	23	
B4	S1	42.0	- 43.5	D. BROWN SILTY FINE SAND	SM	100	100	100	100	100	100	98	92	75	17	44	
B4	S3	46.0	- 47.5	D. BROWN SLIGHTLY SILTY F.SAND W/T. SANDSTONE	SP-SM	100	100	100	98	97	96	80	43	20	5.4	26	

