APPENDIX B

Geotechnical Soil Reports

SUBSURFACE EXPLORATION REPORT
KEY BISCAYNE POLICE STATION
KEY BISCAYNE, FLORIDA
FILE NO.: 93-2385
JULY 21, 1993

Ardaman & Associates, Inc.

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (813) 533-0858
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Port Charlotte, 740 Tamiami Trail, Unit 3, Port Charlotte, Florida 33954, Phone (813) 624-3393
Port St. Lucie, 1017 S.E. Holbrook Ct., Port St. Lucie, Florida 34952, Phone (407) 337-1200
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Tampa, 1406 Tech Boulevard, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2511 Westgate Avenue, Suite 10, West Palm Beach, Florida 33409, Phone (407) 687-8200

MEMBERS:
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Florida Institute of Consulting Engineers
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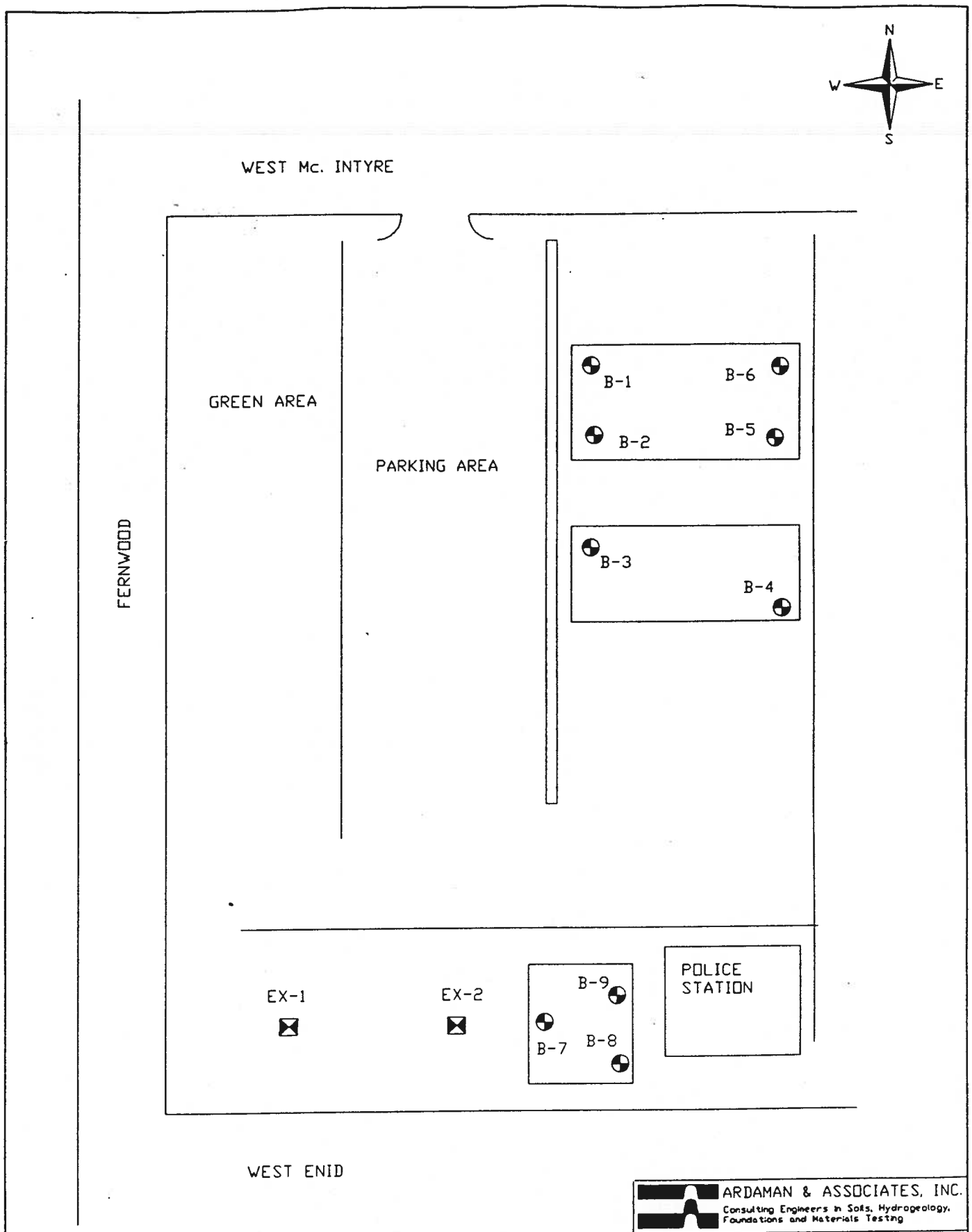


BORING LOCATION PLAN N.T.S.

THIS SKETCH IS FOR ILUSTRATION ONLY

ARDAMAN & ASSOCIATES, INC.
Consulting Engineers in Soils, Hydrogeology, Foundations and Materials Testing

KEY BISCAYNE POLICE STATION
ENID & FERNWOOD
KEY BISCAYNE, FLORIDA

DRAWN BY: E.H.	CHECKED BY:	DATE: 7/20/93
FILE NO 93-2385	APPROVED BY:	

Legend:

Symbol:	Description:	Symbol:	Description:
	Fill		Sand
	Sandy Limestone	7/6 5/6	SPT Sample No. of blows/ Penetration in inches
	Hand auger sample		Groundwater Table
	End of boring		

Notes:

ENGINEERING CLASSIFICATIONS

COHESIONLESS SOILS

DESCRIPTION	SPT "N" VALUE
VERY LOOSE	0 TO 4
LOOSE	5 TO 9
MED. DENSE	10 TO 29
DENSE	30 TO 49
VERY DENSE	> 50

COHESIVE SOILS

DESCRIPTION	SPT "N" VALUE
VERY SOFT	0 TO 2
SOFT	3 TO 4
MED. STIFF	5 TO 8
STIFF	9 TO 15
VERY STIFF	16 TO 30
HARD	> 30

SOIL TEST BORING SYMBOLIC LOGS

BORING B-1

Project: KEY BISCAYNE POLICE STATION — File No: 93-2385

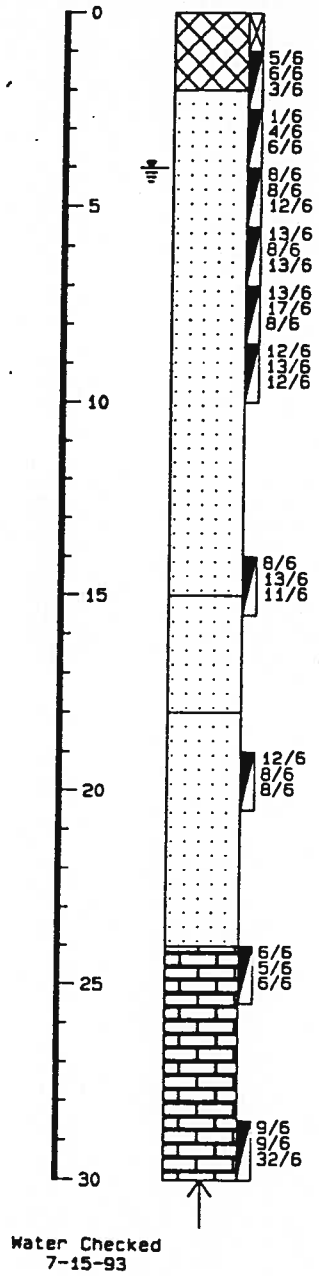
Boring No: B-1 — Date: 7-15-93 — Elevation: N/A

Boring Location: SEE PLAN

Casing Depth: N/A

Drill Method: SPT/HSA — Driller: S.G./C.E.

Depth of Watertable: 4.0' — Date Checked: 7-15-93



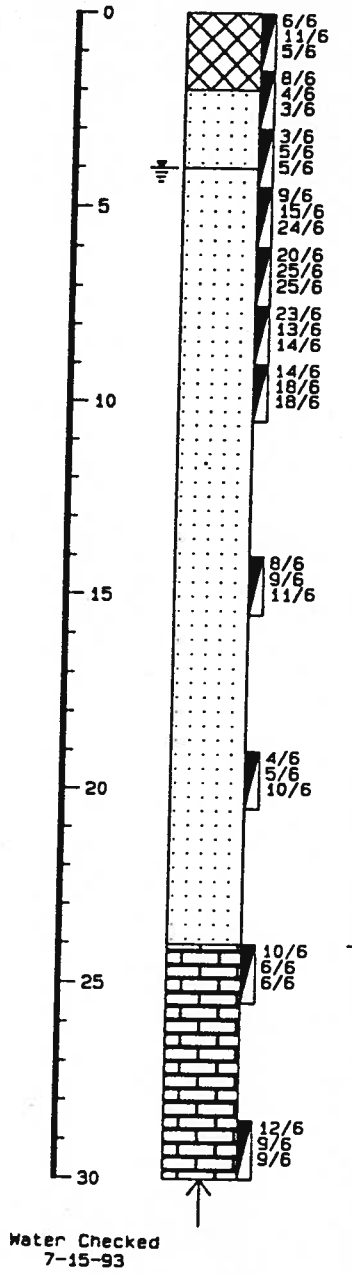
ELEV / DEPTH	SOIL SYMBOLS & BLOW COUNTS / INCHES OF PENETRATION	SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
		FILL, limerock.		
			1	9
		SAND, gray to brown fine to medium grained, some shells.	2	10
			3	20
			4	21
			5	25
			6	25
			7	24
		SAND lt gray fine grained, some silt.		
		SAND gray medium grained, some shells.		
			8	16
		SANDY LIMESTONE lt gray.	9	11
			10	41

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-2

Project: KEY BISCAYNE POLICE STATION
File No: 93-2385
Boring No: B-2
Date: 7-15-93
Elevation: N/A
Boring Location: SEE PLAN
Casing Depth: N/A
Drill Method: SPT/HSA
Driller: S.G./C.E.
Depth of Watertable: 4.0'
Date Checked: 7-15-93



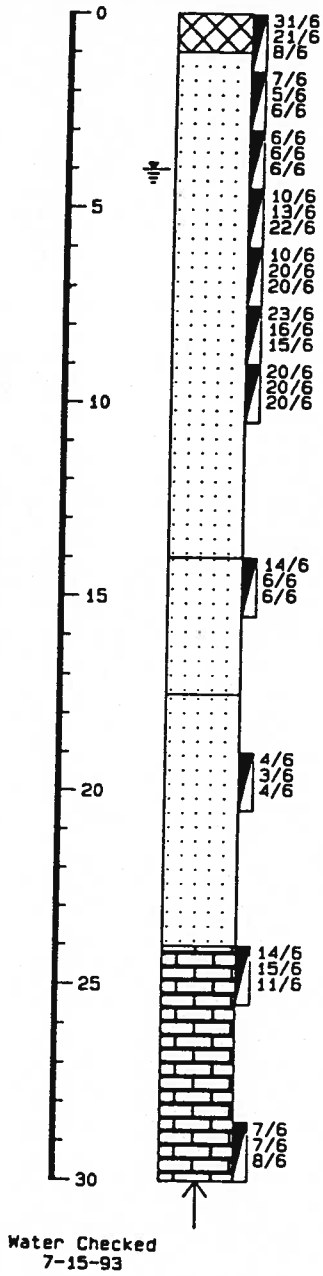
SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
FILL, limerock.	1	16
SAND lt brown fine grained few organics.	2	7
	3	10
SAND gray fine to medium grained some shells.	4	39
	5	50
	6	27
	7	36
	8	20
	9	15
SANDY LIMESTONE lt gray.	10	12
	11	18

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-3

Project: KEY BISCAYNE POLICE STATION
File No: 93-2385
Boring No: B-3
Date: 7-15-93
Elevation: N/A
Boring Location: SEE PLAN
Casing Depth: N/A
Drill Method: SPT/HSA
Driller: S.G./C.E.
Depth of Watertable: 4.0'
Date Checked: 7-15-93



SOIL DESCRIPTION	SAMPLE NO.	SPT"N" VALUE
FILL, limerock.	1	29
SAND gray to brown fine to medium grained some shells.	2	11
	3	12
	4	35
	5	40
	6	31
	7	40
SAND lt gray fine grained, some silt.	8	12
SAND gray medium grained some shells.	9	7
SANDY LIMESTONE lt gray.	10	26
	11	15

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-4

Project: KEY BISCAYNE POLICE STATION — File No: 93-2385

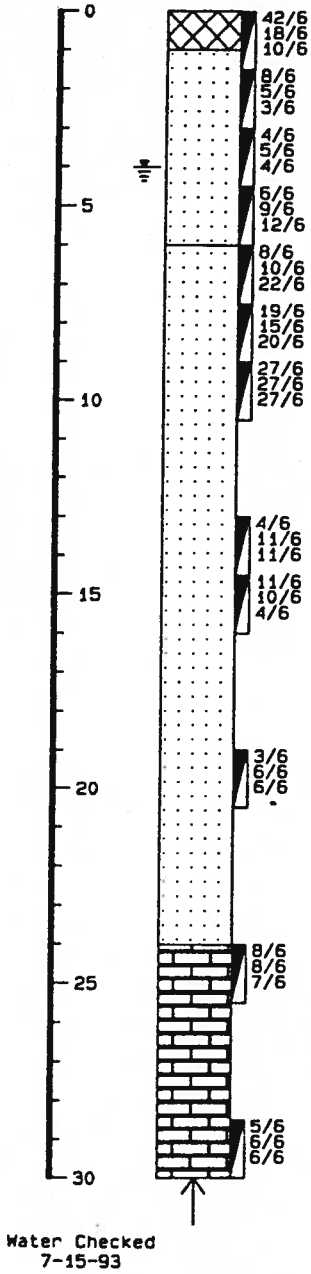
Boring No: B-4 — Date: 7-15-93 — Elevation: N/A

Boring Location: SEE PLAN

Casing Depth: N/A

Drill Method: SPT/HSA — Driller: S.G./C.E.

Depth of Watertable: 4.0' — Date Checked: 7-15-93



ELEV / DEPTH	SOIL SYMBOLS & BLOW COUNTS / INCHES OF PENETRATION	SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
	42/6 18/6 10/6	FILL, limerock.	1	28
	8/6 5/6 3/6	FILL brown fine to medium grained few organics.	2	8
	4/6 5/6 4/6		3	9
	6/6 9/6 12/6		4	21
	8/6 10/6 22/6	SAND gray fine to medium grained some shells.	5	32
	19/6 15/6 20/6		6	25
	27/6 27/6 27/6		7	54
	4/6 11/6 11/6		8	22
	11/6 10/6 4/6		9	14
	3/6 6/6 6/6		10	12
	8/6 8/6 7/6	SANDY LIMESTONE lt gray to yellow.	11	15
	5/6 6/6 6/6		12	12

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-5

Project: KEY BISCAYNE POLICE STATION — File No: 93-2385

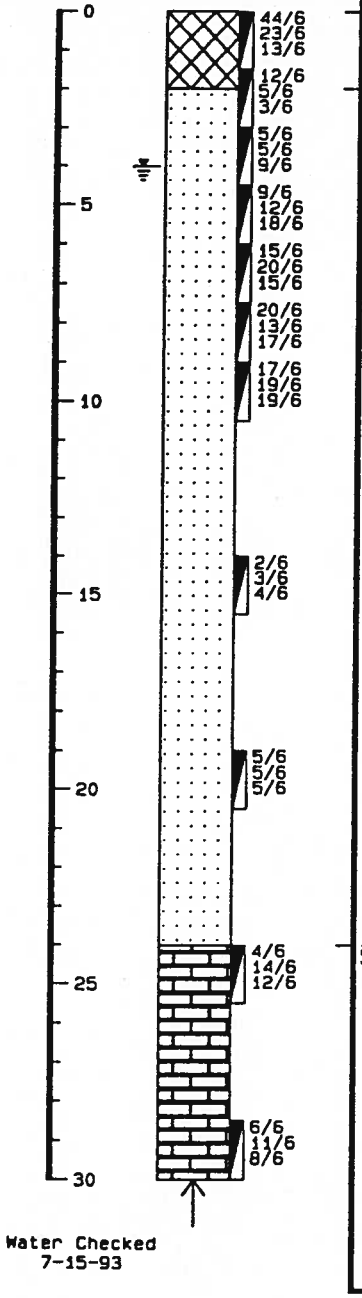
Boring No: B-5 — Date: 7-15-93 — Elevation: N/A

Boring Location: SEE PLAN

Casing Depth: N/A

Drill Method: SPT/HSA — Driller: S.G./C.E.

Depth of Watertable: 4.0' — Date Checked: 7-15-93



ELEV / DEPTH	SOIL SYMBOLS & BLOW COUNTS / INCHES OF PENETRATION	SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
		FILL, limerock.	1	36
		SAND gray fine to medium grained.	2	8
			3	14
			4	30
			5	35
			6	30
			7	38
			8	7
			9	10
		SANDY LIMESTONE lt gray to yellow.	10	26
			11	19

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-6

Project: KEY BISCAYNE POLICE STATION — File No: 93-2385

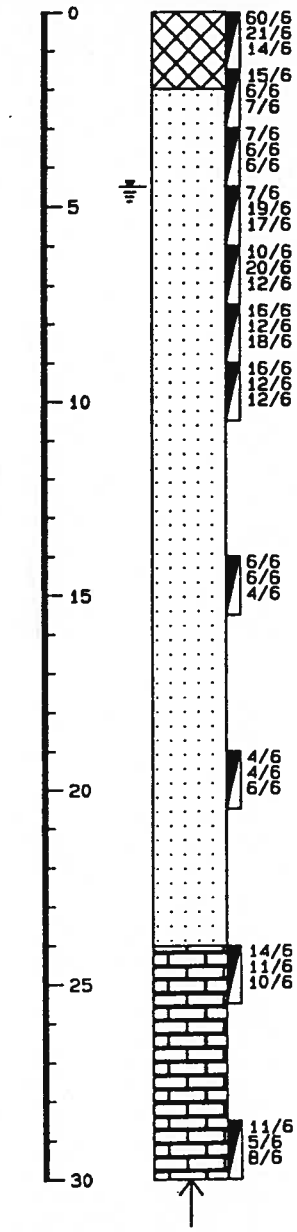
Boring No: B-6 — Date: 7-15-93 — Elevation: N/A

Boring Location: SEE PLAN

Casing Depth: N/A

Drill Method: SPT/HSA — Driller: S.G./C.E.

Depth of Watertable: 4.5' — Date Checked: 7-15-93



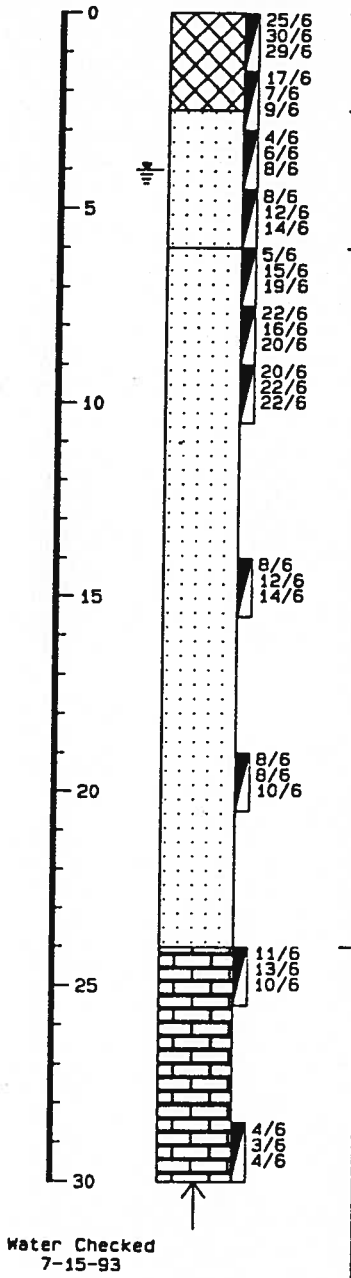
ELEV / DEPTH	SOIL SYMBOLS & BLOW COUNTS / INCHES OF PENETRATION	SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
		FILL, limerock.	1	35
		SAND gray fine to medium grained, few shells.	2	13
			3	12
			4	36
			5	32
			6	30
			7	24
			8	10
			9	10
		SANDY LIMESTONE lt gray.	10	21
			11	13

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-7

Project: KEY BISCAYNE POLICE STATION
File No: 93-2385
Boring No: B-7
Date: 7-15-93
Elevation: N/A
Boring Location: SEE PLAN
Casing Depth: N/A
Drill Method: SPT/HSA
Driller: S.G./C.E.
Depth of Watertable: 4.0'
Date Checked: 7-15-93



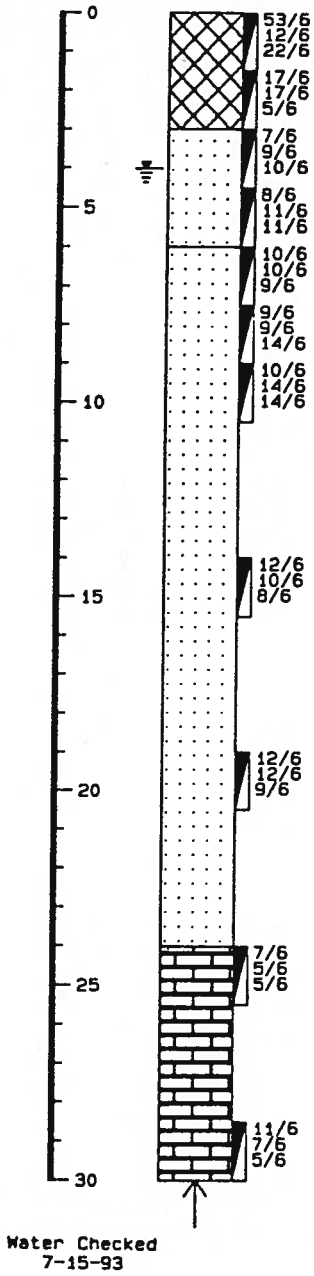
ELEV / DEPTH	SOIL SYMBOLS & BLOW COUNTS / INCHES OF PENETRATION	SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
		FILL, limerock.	1	59
			2	16
		SILTY SAND brown fine grained, little organics.	3	14
			4	26
		SAND gray fine to medium grained, few shells.	5	34
			6	36
			7	44
			8	26
			9	18
		SANDY LIMESTONE.	10	23
			11	7

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-8

Project: KEY BISCAYNE POLICE STATION
File No: 93-2385
Boring No: B-8
Date: 7-15-93
Elevation: N/A
Boring Location: SEE PLAN
Casing Depth: N/A
Drill Method: SPT/HSA
Driller: S.G./C.E.
Depth of Watertable: 4.0'
Date Checked: 7-15-93



SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
FILL sand and gravel gray.	1	34
	2	22
SILTY SAND mostly organics dark brown.	3	19
	4	22
SAND gray fine to medium grained, few shells.	5	19
	6	23
	7	28
	8	18
	9	21
SANDY LIMESTONE.	10	10
	11	12

END OF BORING 30'.

SOIL TEST BORING SYMBOLIC LOGS

BORING B-9

Project: KEY BISCAYNE POLICE STATION — File No: 93-2385

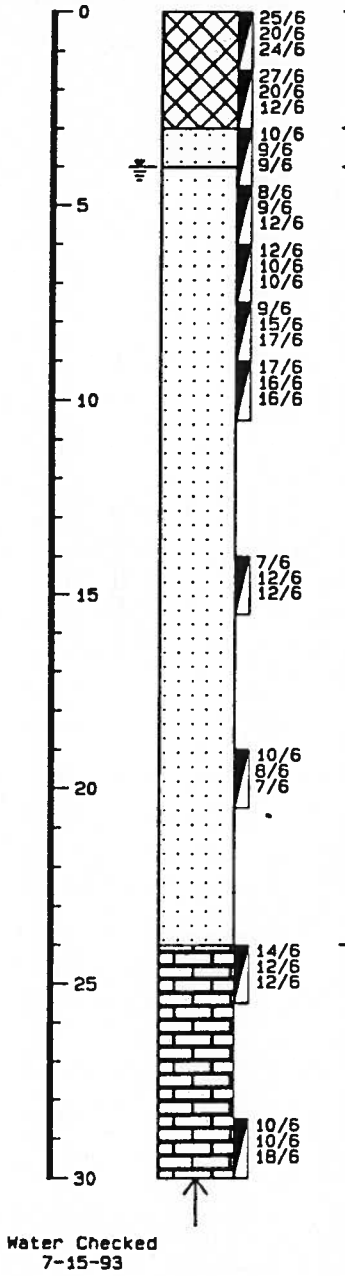
Boring No: B-9 — Date: 7-15-93 — Elevation: N/A

Boring Location: SEE PLAN

Casing Depth: N/A

Drill Method: SPT/HSA — Driller: S.G./C.E.

Depth of Watertable: 4.0' — Date Checked: 7-15-93



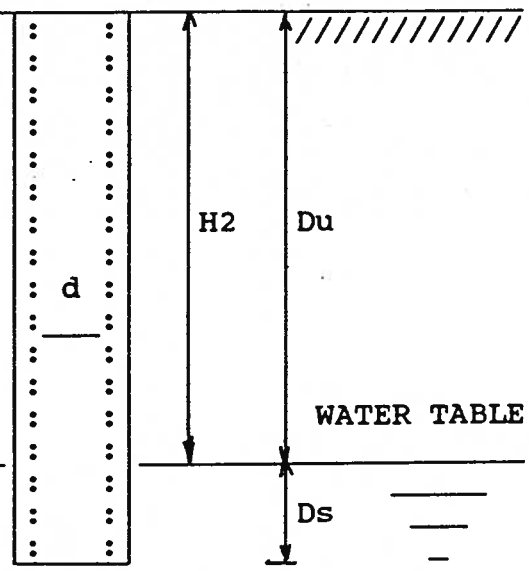
SOIL DESCRIPTION	SAMPLE NO.	SPT "N" VALUE
FILL limerock.	1	44
	2	32
SILTY SAND brown fine grained little organics.	3	18
SAND gray fine to medium grained, few shells.	4	21
	5	20
	6	32
	7	32
	8	24
	9	15
SANDY LIMESTONE.	10	24
	11	28

END OF BORING 30'.

July 19, 1993
File No. 93-2385

EXFILTRATION TEST RESULTS
CONSTANT HEAD TEST
TEST NO. 1

DEPTH	SOIL DESCRIPTION
0'-2.5'	FILL, limerock gravel
0.8'-10'	SAND brown to gray fine to medium grained



TEST DATE: 7-16-93
TEST LOCATION: SEE SKETCH

K = HYDRAULIC CONDUCTIVITY = 5.67E-05 (CFS/SQ.FT.- FT. HEAD)

Q = AVERAGE FLOW RATE = 1.92E-03 (CFS)

d = DIAMETER OF TEST HOLE = 0.33 (FT.)

H2 = DEPTH OF WATER TABLE = 4.00 (FT.)

Du = UNSATURATED HOLE DEPTH = 4.00 (FT.)

Ds = SATURATED HOLE DEPTH = 6.00 (FT.)

DEPTH OF HOLE = 10.00 (FT.)

Evelio Horta 7/21/93

Evelio Horta, Ph.D., P.E.
Project Engineer
Fla.Reg.No. 46625

ARDAMAN & ASSOCIATES, INC.
Consulting Engineers in Soils, Hydrogeology, Foundations and Materials Testing

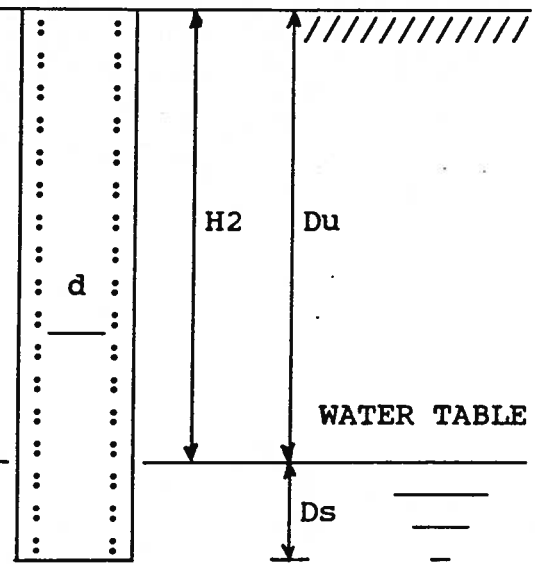
KEY BISCAYNE POLICE STATION
ENID AND FERNWOOD
KEY BISCAYNE, FLORIDA

DRAWN BY: E.H.	CHECKED BY:	DATE: 7/20/93
FILE NO. 93-2385	APPROVED BY:	

July 19, 1993
File No. 93-2385

EXFILTRATION TEST RESULTS
CONSTANT HEAD TEST
TEST NO. 2

DEPTH	SOIL DESCRIPTION
0'-2.5'	FILL, limerock gravel
0.8'-10'	SAND brown to gray fine to medium grained



TEST DATE: 7-16-93
TEST LOCATION: SEE SKETCH

K = HYDRAULIC CONDUCTIVITY = 1.41E-05 (CFS/SQ.FT.- FT. HEAD)

Q = AVERAGE FLOW RATE = 5.27E-04 (CFS)

d = DIAMETER OF TEST HOLE = 0.33 (FT.)

H2 = DEPTH OF WATER TABLE = 4.58 (FT.)

Du = UNSATURATED HOLE DEPTH = 4.58 (FT.)

Ds = SATURATED HOLE DEPTH = 5.42 (FT.)

DEPTH OF HOLE = 10.00 (FT.)

Evelio Horta 7/21/93

Evelio Horta, Ph.D., P.E.
Project Engineer
Fla.Reg.No. 46625

ARDAMAN & ASSOCIATES, INC.
Consulting Engineers in Soils, Hydrogeology, Foundations and Materials Testing

KEY BISCAYNE POLICE STATION
ENID AND FERNWOOD
KEY BISCAYNE, FLORIDA

DRAWN BY: E.H	CHECKED BY:	DATE: 7/20/93
FILE NO. 93-2385	APPROVED BY:	

IN-PLACE PERMEABILITY TEST RESULTS

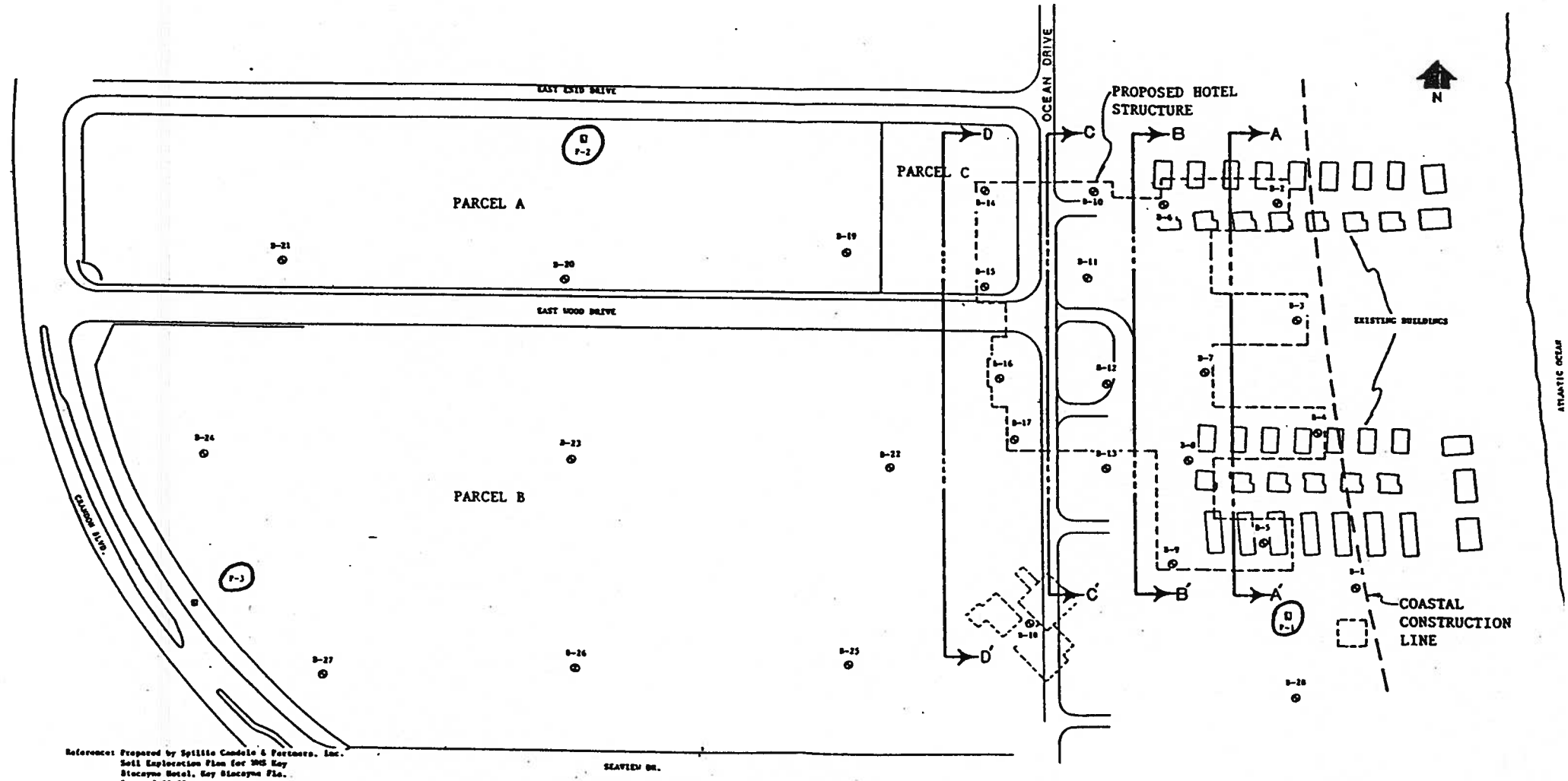
VMS Key Biscayne Hotel
Key Biscayne, Florida

Law Engineering Job No. SFD-G-4625

Date Performed: August 14, 1988

TEST NO.	DIAM. OF HOLE (IN.)	DEPTH OF THE HOLE (FT.)	GROUND WATER LEVEL DEPTH (FT.)	AVG. FLOW RATE (GPM)	K, HYDRAULIC CONDUCTIVITY (CFS/FT2-FT.HEAD)
P-1	12	10	2.8	10.4	3×10^{-4}
P-2	12	10	2.7	3.9	1×10^{-4}
P-3	12	10	3.8	6.0	1×10^{-4}

Note: The above hydraulic conductivities are for trench drains installed to the same depth as the borehole seepage test. The hydraulic conductivity is expressed as inflow per foot of head per linear foot of trench. The value represents an ultimate value. The designer should decide on the required factor of safety.



Reference: Prepared by Spillis Candela & Partners, Inc.
Soil Exploration Plan for VMS Key
Biscayne Hotel, Key Biscayne Fla.
Date: 7-22-88

Legend:
- Percolation Test
- Test Boring Location
- Proposed Building

0 50 100
Scale in Feet
Scale: 1"=100'

Note: The field tests performed at the time of this investigation are: Soil Test Borings B-1 thru B-22 and Percolation Tests P-1 thru P-3.

VMS Key Biscayne Hotel
Key Biscayne, Florida

FIELD EXPLORATI

DRAWN	ST
CHECKED	JS
APPROVED	GTM

Est. 1959
FLORIDA TESTING & ENGINEERING, INC.

August 16, 1993

Attn: Ms. Linda Bell
Williams Hatfield and Stoner
3191 Coral Way, Suite 804
Miami, FL 33145

Reference: Key Biscayne Stormwater Master Plan
Key Biscayne, Fl

Dear Ms. Bell:

This office has conducted a s subsoil investigation for the above referenced project. The purpose of this investigation was to define the current subsurface conditions and to determine the hydraulic conductivity of the soil at the sites for the Key Biscayne Stormwater Master Plan.

The testing consisted of 5 (five) hand auger borings, taken to a depth of 20 feet deep and 5 usual condition open hole percolation tests. The auger boring and percolation test locations are as indicated on the boring logs and exfiltration test result sheets and also in Figure 1 enclosed with this report. The borings show that the soil in the locations tested consists mostly of tan, gray to brown sand with shell.

Enclosed please find the results of our field testing as shown in the table shown below. Five Usual Condition Open Hole Percolation Tests were performed. Calculation of hydraulic conductivity yielded the following:

TEST NUMBER	HYDRAULIC CONDUCTIVITY (K) cfs/ft²-ft Head
P-1	0.49994×10^{-4}
P-2	0.86750×10^{-5}
P-3	0.30299×10^{-4}
P-4	0.53781×10^{-4}
P-5	0.64339×10^{-4}

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The above values for the hydraulic conductivity show that the soil can be defined as pervious.

If you have any questions please feel free to contact this office.

Sincerely Yours,

Abdul Moudud.
Staff Geotech. Engr.

Dr. Makbul Hossain, P.E.
Senior Engineer
Fla Registration No. 46834

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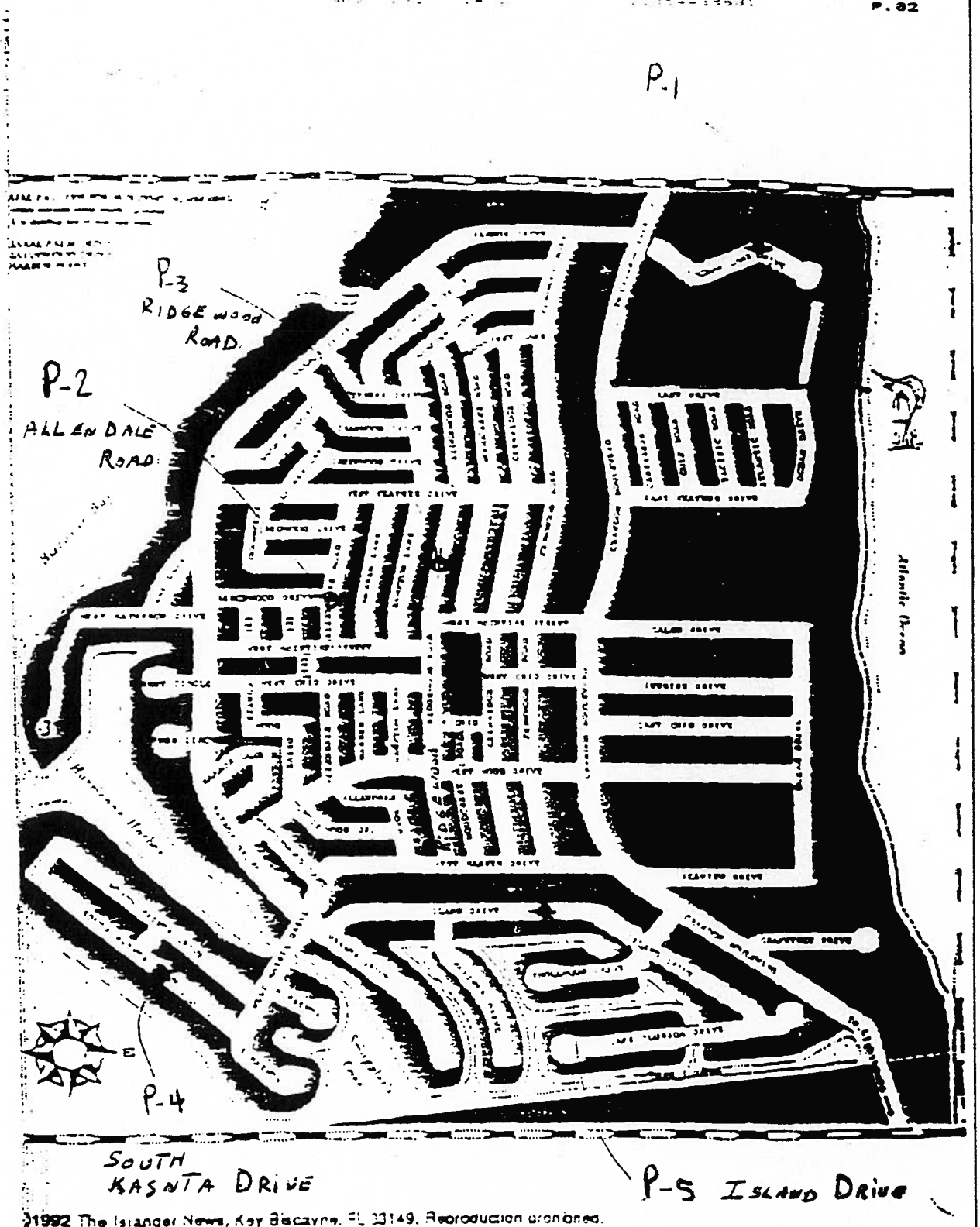

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Figure 1

Est. 1959

FLORIDA TESTING & ENGINEERING, INC.

TEST BORING REPORT

CLIENT:	Williams, Hatfield and Stoner	ORDER NUMBER:	930666
PROJECT:	Key Biscayne Storm Wtr. M.P.	BORING NUMBER:	1
:	Key Biscayne, FL	DRILLER:	Bruce Hill
LOCATION:	North Side of 150 Harbor Drive	WATER LEVEL:	3.5 Feet at 5:05 P.M.
:		S.P.T.: 140 lb HAMMER; 30 INCH DROP;	
DATE:	8/11/93	S.P.T.: 2 ft SPLIT SPOON SAMPLER	

DEPTH ft	VISUAL CLASSIFICATION	LAYER THICKNESS ft	HAMMER BLOWS on SAMPLER	HAMMER BLOWS on CASING	ELEVATION Unknown ft. M.S.L.
1	Tan Sand and Limerock.	1.0		Hollow Auger	
2	Brown Medium Fine Silica Sand with trace of Shell.				
3					
4		3.0			
5	Grey Medium Fine Silica Sand with Shell.				
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20		16.0			

PAGE 1 OF 1 TEST TERMINATED AT 20.0 FEET

The above test boring was conducted in accordance with A.S.T.M. designation D-1586

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Est. 1959

FLORIDA TESTING & ENGINEERING, INC.

TEST BORING REPORT

CLIENT:	Williams, Hatfield and Stoner	ORDER NUMBER:	930666
PROJECT:	Key Biscayne Storm Wtr. M.P.	BORING NUMBER:	2
:	Key Biscayne, FL	DRILLER:	Bruce Hill
LOCATION:	East Side of 525 Allen Dale Road	WATER LEVEL:	3.0 Feet at 2:30 P.M.
:		S.P.T.: 140 lb HAMMER; 30 INCH DROP;	
DATE:	8/11/93	S.P.T.: 2 ft SPLIT SPOON SAMPLER	

DEPTH ft	VISUAL CLASSIFICATION	LAYER THICKNESS ft	HAMMER BLOWS on SAMPLER	HAMMER BLOWS on CASING	ELEVATION Unknown ft. M.S.L.
1	Tan Medium Fine Silica Sand with Silt.			Hollow Auger	
2					
3		3.0			
4	Grey Medium Fine Silica Sand with Shell.				
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20		17.0			

PAGE 1 OF 1 TEST TERMINATED AT 20.0 FEET

The above test boring was conducted in accordance with A.S.T.M. designation D-1586

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Est. 1959

FLORIDA TESTING & ENGINEERING, INC.

TEST BORING REPORT

CLIENT:	Williams, Hatfield and Stoner	ORDER NUMBER:	930666
PROJECT:	Key Biscayne Storm Wtr. M.P.	BORING NUMBER:	3
:	Key Biscayne, FL	DRILLER:	Bruce Hill
LOCATION:	462 Ridgewood Road	WATER LEVEL:	3.5 Feet
:		S.P.T.: 140 lb HAMMER; 30 INCH DROP;	
DATE:	8/11/93	S.P.T.: 2 ft SPLIT SPOON SAMPLER	

DEPTH ft	VISUAL CLASSIFICATION	LAYER THICKNESS ft	HAMMER BLOWS on SAMPLER	HAMMER BLOWS on CASING	ELEVATION Unknown ft. M.S.L.
1	Brown and Tan Medium Fine Silica Sand.			Hollow Auger	
2					
3					
4					
5		5.0			
6	Tan Medium Fine Silica Sand.				
7					
8					
9		4.0			
10	Grey Medium Fine Silica Sand.				
11					
12					
13					
14					
15					
16					
17					
18					
19					
20		11.0			

PAGE 1 OF 1

TEST TERMINATED AT 20.0 FEET

The above test boring was conducted in accordance with A.S.T.M. designation D-1586

877 N.W. 61 Street • Fort Lauderdale, Florida 33309
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Est. 1959

FLORIDA TESTING & ENGINEERING, INC.

TEST BORING REPORT

CLIENT:	Williams, Hatfield and Stoner	ORDER NUMBER:	930666
PROJECT:	Key Biscayne Storm Wtr. M.P.	BORING NUMBER:	4
:	Key Biscayne, FL	DRILLER:	Bruce Hill
LOCATION:	East Side of 630 South Masnata Drive	WATER LEVEL:	3.5 Feet at 12:25 P.M.
:		S.P.T.: 140 lb HAMMER; 30 INCH DROP;	
DATE:	8/11/93	S.P.T.: 2 ft SPLIT SPOON SAMPLER	

DEPTH ft	VISUAL CLASSIFICATION	LAYER THICKNESS ft	HAMMER BLOWS on SAMPLER	HAMMER BLOWS on CASING	ELEVATION Unknown ft. M.S.L.
1	Tan Medium Fine Silica Sand with trace of Silt.			Hollow Auger	
2					
3					
4					
5		5.0			
6	Brown Medium Fine Silica Sand with trace of Marl.				
7					
8		3.0			
9	Tan Medium Fine Silica Sand with Shell.				
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20		12.0			

PAGE 1 OF 1 TEST TERMINATED AT 20.0 FEET

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TEST BORING REPORT

CLIENT:	Williams, Hatfield and Stoner	ORDER NUMBER:	930666
PROJECT:	Key Biscayne Storm Wtr. M.P.	BORING NUMBER:	5
:	Key Biscayne, FL	DRILLER:	Bruce Hill
LOCATION:	190 Island Drive, South Side of Road.	WATER LEVEL:	6.0 Feet at 10:35 A.M.
:		S.P.T.: 140 lb HAMMER; 30 INCH DROP;	
DATE:	8/11/93	S.P.T.: 2 ft SPLIT SPOON SAMPLER	

DEPTH ft	VISUAL CLASSIFICATION	LAYER THICKNESS ft	HAMMER BLOWS on SAMPLER	HAMMER BLOWS on CASING	ELEVATION Unknown ft. M.S.L.
1	Brown Medium Fine Silica Sand.			Hollow Auger	
2					
3					
4		4.0			
5	Grey Medium Fine Silica Sand with Shell.				
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20		16.0			

PAGE 1 OF 1 TEST TERMINATED AT 20.0 FEET

The above test boring was conducted in accordance with A.S.T.M. designation D-1586

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Report of Usual Condition Open Hole Percolation Test

Project Name	KEY BISCAYNE S.W.M.P.	Test Number	P-1
Client:	WILLIAMS, HATFIELD & STONER	Project Number:	930666
Project Location:	KEY BISCAYNE, FL	Tested By	BRUCE HILL
Test Location:	NORTH SIDE OF 150 HARBOR DR	Date Tested	AUGUST 11, 1993

Soil Description:

0 - 1'	TAN SAND AND LIMEROCK
1 - 4'	BROWN MEDIUM FINE SILICA SAND WITH TRACE OF ORGANIC
4 - 15'	GREY MEDIUM FINE SILICA SAND WITH SHELL

Remarks:

1. Water Table below existing grade 3.5 Ft
2. Test Depth 15 Ft
3. Diameter of Tube is 6 inches.

Time (min)	Water Input (gal)	Time (min)	Water Input (gal)	Time (min)	Water Input (gal)
1	5.00	11	2.25	21	2.00
2	4.00	12	2.25	22	1.75
3	3.25	13	2.25	23	1.75
4	3.00	14	2.25	24	1.75
5	3.00	15	2.25	25	1.75
6	3.00	16	2.00	26	1.50
7	3.00	17	2.00	27	1.50
8	2.75	18	2.00	28	1.50
9	2.50	19	2.00	29	1.50
10	2.25	20	2.00	30	1.50

Stabilized Flow (gal) 1.65

Hydraulic Conductivity (K) **0.049994 x 10^{-3} CFS/FT^2-FT HEAD**

I:\SMART\GEOTECH\9308\WH0666P1.SAM

FTE Est. 1959
FLORIDA TESTING & ENGINEERING, INC.

Report of Usual Condition Open Hole Percolation Test

Project Name	KEY BISCAYNE S.W.M.P.	Test Number	P-2
Client:	WILLIAMS, HATFIELD & STONER	Project Number:	930666
Project Location:	KEY BISCAYNE, FL	Tested By	BRUCE HILL
Test Location:	EAST SIDE OF 525 ALLEN DALE ROAD	Date Tested	AUGUST 11, 1993

Soil Description:

0 - 3'	TAN MEDIUM FINE SILICA SAND WITH SILT
3 - 15'	GREY MEDIUM FINE SILICA SAND WITH SHELL

Remarks:

1. Water Table below existing grade 3 Ft
2. Test Depth 15 Ft
3. Diameter of Tube is 6 inches.

Time (min)	Water Input (gal)	Time (min)	Water Input (gal)	Time (min)	Water Input (gal)
1	4.00	11	0.50	21	0.25
2	2.25	12	0.50	22	0.25
3	1.50	13	0.50	23	0.25
4	1.00	14	0.50	24	0.25
5	1.00	15	0.50	25	0.25
6	0.75	16	0.25	26	0.25
7	0.75	17	0.25	27	0.25
8	0.75	18	0.25	28	0.25
9	0.50	19	0.25	29	0.25
10	0.50	20	0.25	30	0.25

Stabilized Flow (gal) 0.25

Hydraulic Conductivity (K) **0.008675 x 10^{-3} CFS/FT²-FT HEAD**

I:\SMART\GEOTECH\9308\WH0666P2.SAM

FTE Est. 1959
FLORIDA TESTING & ENGINEERING, INC.

Report of Usual Condition Open Hole Percolation Test

Project Name	KEY BISCAYNE S.W.M.P.	Test Number	P-3
Client:	WILLIAMS, HATFIELD & STONER	Project Number:	930666
Project Location:	KEY BISCAYNE, FL	Tested By	AVERY YATES
Test Location:	462 RIDGEWOOD ROAD	Date Tested	AUGUST 12, 1993

Soil Description:

0 - 5'	BROWN AND TAN MEDIUM FINE SILICA SAND
5 - 9'	TAN MEDIUM FINE SILICA SAND
9 - 20'	GREY MEDIUM FINE SILICA SAND

Remarks:

1. Water Table below existing grade 3.5 Ft
2. Test Depth 15 Ft
3. Diameter of Tube is 6 inches.

Time (min)	Water Input (gal)	Time (min)	Water Input (gal)	Time (min)	Water Input (gal)
1	2.00	11	1.25	21	1.00
2	2.00	12	1.25	22	1.00
3	2.00	13	1.25	23	1.00
4	1.75	14	1.25	24	1.00
5	1.75	15	1.25	25	1.00
6	1.75	16	1.00	26	1.00
7	1.50	17	1.00	27	1.00
8	1.50	18	1.00	28	1.00
9	1.50	19	1.00	29	1.00
10	1.50	20	1.00	30	1.00

Stabilized Flow (gal) 1.00

Hydraulic Conductivity (K) **0.030299 x 10^{-3} CFS/FT²-FT HEAD**

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FTE Est. 1959
FLORIDA TESTING & ENGINEERING, INC.

Report of Usual Condition Open Hole Percolation Test

Project Name	KEY BISCAYNE S.W.M.P.	Test Number	P-4
Client:	WILLIAMS, HATFIELD & STONER	Project Number:	930666
Project Location:	KEY BISCAYNE, FL	Tested By	BRUCE HILL
Test Location:	EAST SIDE 630 SOUTH MASNATA DRIVE	Date Tested	AUGUST 11, 1993

Soil Description:

0 - 5'	TAN MEDIUM FINE SILICA SAND WITH TRACE OF SILT
5 - 8'	BROWN MEDIUM FINE SILICA SAND WITH TRACE OF MARL
8 - 15'	TAN MEDIUM FINE SILICA SAND WITH SHELL

Remarks:

1. Water Table below existing grade 3.5 Ft
2. Test Depth 15 Ft
3. Diameter of Tube is 6 inches.

Time (min)	Water Input (gal)	Time (min)	Water Input (gal)	Time (min)	Water Input (gal)
1	5.50	11	3.25	21	2.00
2	5.00	12	3.00	22	2.00
3	5.00	13	3.00	23	2.00
4	5.00	14	3.00	24	2.00
5	4.50	15	2.75	25	2.00
6	4.00	16	2.50	26	1.75
7	3.75	17	2.50	27	1.50
8	3.75	18	2.50	28	1.50
9	3.50	19	2.25	29	1.50
10	3.00	20	2.25	30	1.50

Stabilized Flow (gal) 1.78

Hydraulic Conductivity (K) **0.053781 x 10^{-3} CFS/FT^2-FT HEAD**

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FTE Est. 1959
FLORIDA TESTING & ENGINEERING, INC.

Report of Usual Condition Open Hole Percolation Test

Project Name	KEY BISCAYNE S.W.M.P.	Test Number	P-5
Client:	WILLIAMS, HATFIELD & STONER	Project Number:	930666
Project Location:	KEY BISCAYNE, FL	Tested By	BRUCE HILL
Test Location:	190 ISLAND DRIVE - APPROX. 15' SOUTH OF ROAD	Date Tested	AUGUST 11, 1993

Soil Description:

0 - 4'	BROWN MEDIUM FINE SILICA SAND
4 - 15'	GREY MEDIUM FINE SILICA SAND WITH SHELL

Remarks:

1. Water Table below existing grade 6 Ft
2. Test Depth 15 Ft
3. Diameter of Tube is 6 inches.

Time (min)	Water Input (gal)	Time (min)	Water Input (gal)	Time (min)	Water Input (gal)
1	8.00	11	3.75	21	3.50
2	7.00	12	3.75	22	3.50
3	5.50	13	3.50	23	3.25
4	4.50	14	3.50	24	3.25
5	4.50	15	3.50	25	3.25
6	4.25	16	3.50	26	3.25
7	4.25	17	3.50	27	3.25
8	4.25	18	3.50	28	3.25
9	4.25	19	3.50	29	3.25
10	4.00	20	3.50	30	3.25

Stabilized Flow (gal) 3.30

Hydraulic Conductivity (K) **0.064339 x 10^{-3} CFS/FT^2-FT HEAD**

I:\SMART\GEOTECH\9308\WH0666P5.SAM

Geotechnical Engineering Study

214

GEOTECHNICAL ENGINEERING STUD'

PROPOSED DRAINAGE IMPROVEMENTS
VILLAGE OF KEY BISCAYNI
KEY BISCAYNE, FLORIDA

Prepared Fo

WILLIAMS, HATFIELD & STONER, INC
3191 Coral Way, Suite 80-
Miami, FL 33145

305-931-8895

Prepared By:

LANGAN ENGINEERING AND
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Rudolph P. Frizzi, P.E.

K. Peter Yu, P.E.

6 January 199
6025101

Langan
Engineering and Environmental Services, Inc.

215

CONTENTS

	Page
INTRODUCTION	1
PROJECT DESCRIPTION	1
SUBSURFACE INVESTIGATION	1
Field Investigation	1
Laboratory Investigation	2
SUBSURFACE CONDITIONS	2
Fill (Stratum 1)	2
Intermixed Sand, Silt, and Peat (Stratum 2)	2
Shelly Sand (Stratum 3)	3
Limerock (Stratum 4)	3
Sand (Stratum 5)	3
Groundwater	3
FOUNDATION EVALUATION	4
FOUNDATION RECOMMENDATIONS	4
CONSTRUCTION DOCUMENTS AND ENGINEERING INSPECTION	5
LIMITATIONS	6

FIGURES

1 BORING LOCATION PLAN
2 BORING PROFILE A-A
3 BORING PROFILE B-B
4 BORING PROFILE C-C

APPENDICES

A BORING LOGS
B SUMMARY OF LABORATORY TEST RESULTS

INTRODUCTION

We have performed a geotechnical study for the proposed storm drainage basin and well system for the Village of Key Biscayne, Florida. The purpose of the study was to: 1) obtain subsurface site information in the vicinity of the proposed drainage basins and the general Village area, and 2) evaluate the results of the investigations and develop appropriate foundation recommendations for the proposed construction. Our work was done in general accordance with our 19 November 1993 proposal, and subsequent written authorization by Ms. Linda Bell of Williams, Hatfield & Stoner, Inc. given on 30 November 1993. Our understanding of the proposed project is based on information furnished by and discussions with Ms. Bell.

PROJECT DESCRIPTION

The proposed construction is to consist of a drainage basin and well system installed within the Village of Key Biscayne. A series of drainage basins with deep wells, settlement tanks, catch basins, and associated underground piping are to be constructed. Drainage basins and tanks are to extend about 9 ft to 10 ft below existing grades. The pipe is to be either 18-in or 24-in-dia corrugated bituminous coated steel or aluminum with invert about 5 ft below existing grades. No change in existing grades is proposed.

The existing grades within the roadway "right-of-way" typically range from about el +4 to el +5.5. Based on our review of historic aerial photographs on file at the Dade County Building and Zoning Department dating back to 1993, no noticeable significant changes in the existing shoreline or general Village topography appear to have occurred over the past 30 years.

SUBSURFACE INVESTIGATION

Field Investigation

A field investigation consisting of drilling 12 borings was performed on 13 and 14 December 1993. The borings are identified as B1 through B12 and their approximate locations are shown on Figure 1. Borings B3, B5, and B9 were each drilled to a depth of 30 ft, and the remaining borings were each drilled to a depth of 20 ft at general locations laid out by Ms. Bell. All borings were drilled by TMD Services, Inc. of Port St. Lucie, Florida using a Mobile Drill B53 All Terrain Vehicle (ATV) rig under the full time inspection of our Staff Engineer, Mr. Tony Nichlany. Complete underground utility mark-outs were ordered from Underground Notification Center Liaison for

217

Excavators (UNCLE) and performed by others prior to drilling any of the borings.

Standard Penetration Testing was done continuously in the upper 10 ft, and at 5 ft intervals thereafter in each boring. Standard Penetration Resistances, N-Values, along with classifications of the recovered soil and rock materials were recorded on field boring logs. Copies of these logs are given in Appendix A. Representative samples were taken from the borings and shipped to our Geotechnical Laboratory for confirmation of field classifications and testing. All boreholes were backfilled immediately after completion.

Laboratory Investigation

All soil and rock samples were visually examined and classified in our Geotechnical Laboratory. The laboratory investigation consisted of 29 natural water content (ASTM D-2216) soil index property determinations. The laboratory test results are summarized in Appendix B.

SUBSURFACE CONDITIONS

Based on the borings drilled for this study, the generalized subsurface conditions at the project site consist of five strata. They are, in descending order: fill; intermixed sand, silt, and peat; shelly sand; limerock; and sand. Boring profiles showing the generalized subsurface conditions are included as Figures 2 through 4, respectively. The following describes each stratum and the observed groundwater conditions.

Fill (Stratum 1)

The fill stratum generally consists of fine sand with some limerock fragments and varying proportions of silt. Its thickness ranges from about 1 ft to 6 ft, and averages about 3 ft thick. N-values ranged from 7 blows/ft to 32 blows/ft, and averaged 18 blows/ft.

Intermixed Sand, Silt, and Peat (Stratum 2)

Below the fill, a stratum of intermixed sand, silt, and peat was found at elevations ranging from about el +3 to el -1. N-values in this stratum typically ranged from 2 blows/ft to 7 blows/ft, and averaged 4 blows/ft. Natural water contents typically ranged from 31% to 389%, with the high natural water contents measured in samples containing higher proportions of peat. In the general Village area, the thickness of this stratum was typically found to range from about 3 ft to 5 ft. In

218

borings B1 and B2 drilled on Mashta Island, it was found to be about 17.5 ft and 14.5 ft thick, respectively. This stratum was found to be 8 ft thick in Boring B3 drilled on the western edge of the Village near Hurricane Harbor.

Shelly Sand (Stratum 3)

The shelly sand stratum was found at depths ranging from about 4 ft to 11 ft (about el 0 to el -6) below the ground surface in the general Village area. It was found at depths of about 19.5 ft (about el -15.1) and about 17.5 ft (about el -13.1) in borings B1 and B2, respectively drilled on Mashta Island. Based on borings that penetrated this stratum, its thickness was found to range from about 10 ft to 16 ft. This stratum is generally medium dense, with N-values typically ranging from 6 blows/ft to 33 blows/ft, and averaging 23 blows/ft.

Limerock (Stratum 4)

The limerock stratum is light tan to white oolitic limestone of the Miami Formation and was found in borings B3, B5, and B9 at depths ranging from about 19 ft to 22 ft (about el -15). The remaining borings were terminated above this stratum. Based on the two borings that penetrated this stratum, the limerock was found to range in thickness from about 7 ft to 9 ft. This stratum is moderately to well cemented with measured N-values ranging from 12 blows/ft to 34 blows/ft, and averaging 23 blows/ft.

Sand (Stratum 5)

The sand stratum found in borings B3 and B5 is comprised of loose to medium dense light gray to green fine sand of the Fort Thompson Formation. Two N-values in this stratum measured 8 blows/ft to 14 blows/ft.

Groundwater

Groundwater levels were first found in the borings at depths ranging from about 3 ft to 6.5 ft (about el -2.5 to el +1.5). The lower groundwater levels found in selected borings are not expected to reflect the overall groundwater level within the site area. Rather, the groundwater level within the site area is expected to be typically found at depths between about 2 ft to 4 ft (about el +1 to el +2) and to fluctuate with the tide in the nearby Biscayne Bay and Atlantic Ocean. The latest Flood Insurance Rate Map (FIRM) number 12025C0281H (panel 281 of 575)

219

effective 20 January 1993 indicates the 100 year flood level in the project site area varies from el +9 to el +12.

FOUNDATION EVALUATION

Potentially compressible soils were typically found within about 6 ft to 9 ft below the ground surface in the general Village area, and to as deep as about 19.5 ft in the Mashta Island area. Based on our review of historic aerial photographs, the existing Village of Key Biscayne does not appear to have had significant changes in shoreline or topography over the past 30 years. Therefore, the compressible soils have been consolidating for over 30 years under the existing overburden. Due to the presence of organic matter, long-term compression of these soils is expected to continue at a reduced rate in proportion to the logarthm of time. This is known as secondary compression. Based on our extensive experience concerning the long-term compression characteristics of similar soils, we anticipate the future compression of these soils over the next 30 years would be about 0.5 inch to 1 inch. This settlement is due to continuing secondary compression presuming no new fill is placed to raise grades in the area of the proposed construction. This magnitude of future settlement is expected to be within tolerable limits for typical storm drainage construction.

Since the proposed drainage basins and tanks are to extend to about 9 ft to 10 ft below existing grade, the potentially compressible soils of Stratum 2 would likely be removed in the mass excavation work done in the general Village area. At drainage basin and tanks installed on Mashta Island and along all pipe alignments, these soils would likely exist below the normally required excavation depths. Since the mass excavation would result in a reduced stratum thickness, future settlements due to continued consolidation of these soils are expected to be minimal during the design life of the proposed construction. Although future settlement could be practically eliminated if all the Stratum 2 soils were removed, this is not considered necessary or practical. Removal of these soils to 2 ft below the pipe or drainage basin/tank invert (or to the underlying shelly sand stratum, whichever is found first) and replacement with 3/4-inch crushed stone is expected to be satisfactory.

FOUNDATION RECOMMENDATIONS

The proposed drainage structures and pipes may bear on proper bedding placed on the

220

excavated subgrade after performing Stratum 2 removal as discussed the following criteria. In areas where soil of Stratum 2 is found at the proposed drainage basin, tank, or pipe subgrade levels, this soil should be removed to a depth of 2 ft below the invert level, or to the underlying shelly sand stratum (whichever is encountered first), and replaced with 3/4 inch crushed stone. The drainage basins and tanks should be placed, filled with water, and allowed to sit for at least 3 days before pipe connections are made. In areas where mass excavation results in the Stratum 2 soils being completely removed at the excavation subgrade level, a minimum of 6 inches of 3/4 inch crushed stone may be used. No other special procedures would be required.

To minimize the excavation area and to maintain a safe and stable excavation, we recommend sheetpiles be used for the installation of the drainage structures that are to extend 9 ft to 10 ft below existing grades. Trench boxes may be adequate for drainage pipe trench excavation support in areas where excavations are to be 5 ft below existing grades. If no lateral supports are used in the excavations, the excavation sides should be sloped in accordance with all applicable safety codes and regulations.

The excavated Stratum 2 soils should be immediately loaded and trucked off-site, and not left on-site in stockpiles. Inorganic granular soils excavated during the mass excavation work can be reused as compacted backfill. All necessary backfilling work should be done in properly dewatered excavations. The backfill should be placed in maximum 8-inch-thick loose lifts and compacted using a suitable hand operated vibratory compactor to at least 95% of the material's maximum dry density as determined by ASTM D-1557. If dewatering is not accomplished, 3/4 inch crushed stone should be used as backfill to the water table. A layer of filter fabric, such as Mirafi 140N or equivalent, should be placed over the crushed stone and the remaining trench should be backfilled and compacted as recommended above.

CONSTRUCTION DOCUMENTS AND ENGINEERING INSPECTION

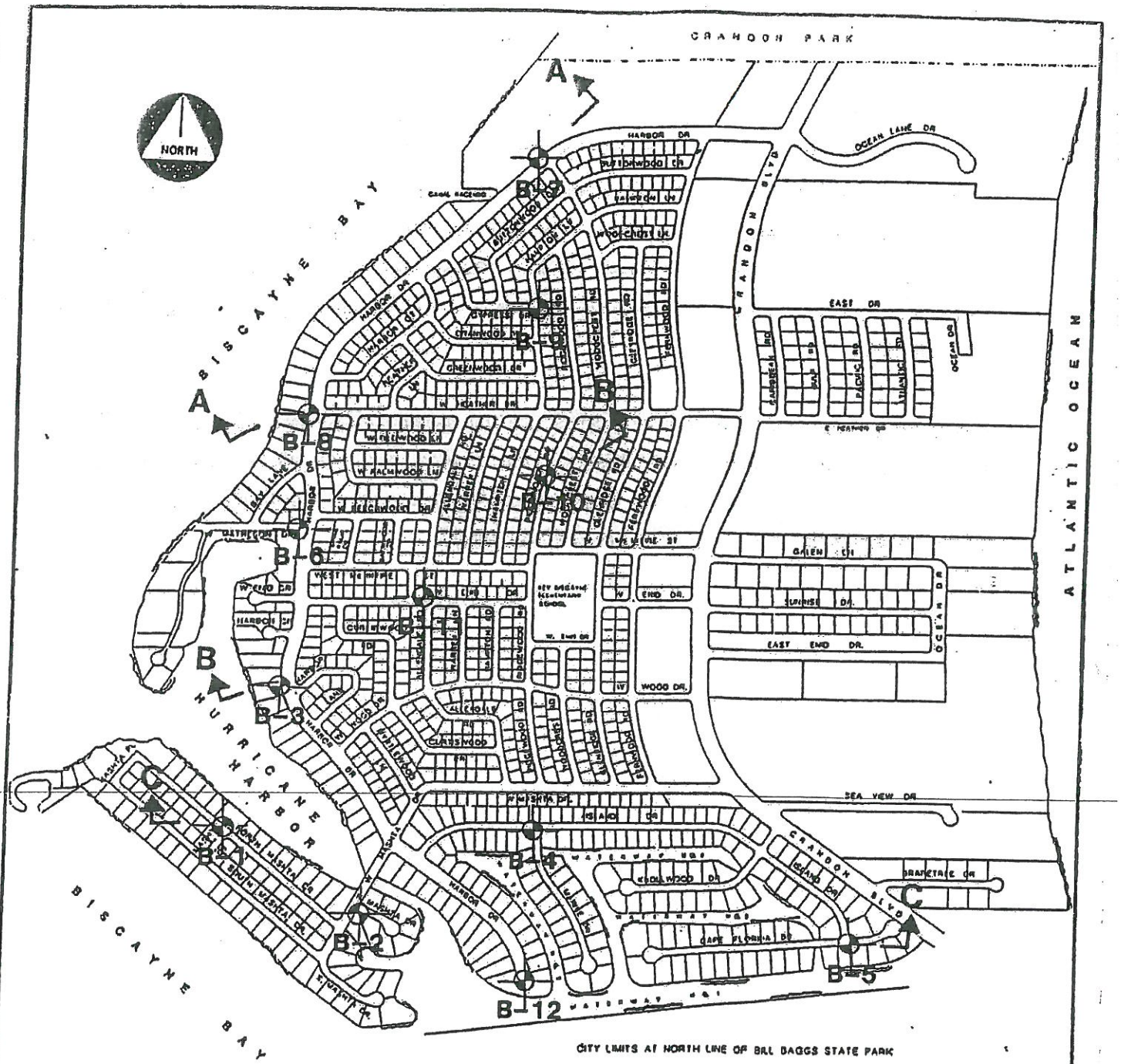
We should review the project construction documents to assure the recommendations given herein are properly incorporated. We also recommend that all excavation and backfilling work be inspected and tested by a representative of our firm. Our inspection is an integral part of the recommendations given herein, and is necessary to maintain the continuity of our responsibility on the project.

LIMITATIONS

The recommendations given in this report represent our best engineering judgement as to the appropriate foundation system and associated site preparation procedures for the proposed construction. Any changes or revisions in the current development plans may have a significant impact on the recommendations given herein. These changes or revisions (if any) must be immediately brought to our attention such that the appropriateness of our recommendations can be evaluated.

Due to the presence of organic soils and the fact that certain special site preparation procedures are required, our continued involvement on the project, including our review of the project construction documents and full-time inspection during the work, is necessary for us to assume any responsibility for the recommendations given herein.

222



VILLAGE OF KEY BISCAYNE, FLORIDA

WILLIAMS, HATFIELD & STONER, INC.

NOTES:

1. ALL BORING LOCATIONS ARE APPROXIMATE.
2. BORING LOGS ARE INCLUDED IN APPENDIX A.

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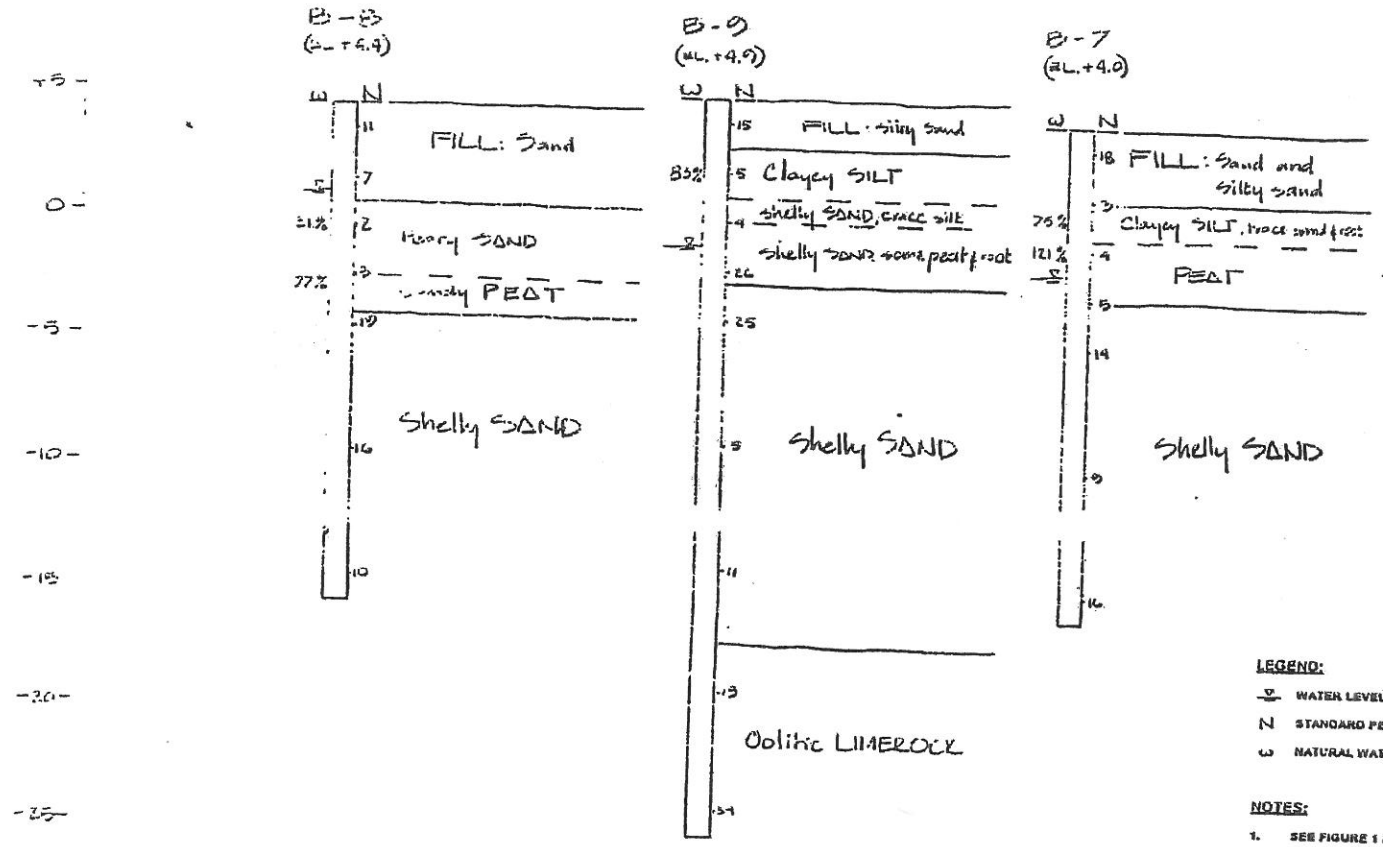
VILLAGE OF KEY BISCAYNE

BORING LOCATION PLAN

KEY BISCAYNE FLORIDA

PROJ	SCALE	DATE	FIG NO
6025101	N.T.S.	12/22/93	1

223



LEGEND:

- ▽ WATER LEVEL WHEN FIRST FOUND IN BORING.
- N STANDARD PENETRATION RESISTANCE, N-VALUE (BLOWS/FOOT).
- ω NATURAL WATER CONTENT (%).

NOTES:

1. SEE FIGURE 1 FOR BORING LOCATIONS.
2. THIS BORING PROFILE GIVES ONLY A GENERAL DESCRIPTION OF THE DIFFERENT STRATA ENCOUNTERED. REFER TO INDIVIDUAL BORING LOGS FOR MORE COMPLETE DESCRIPTIONS.
3. SOME VARIATIONS IN STRATUM THICKNESS AND MATERIAL CONSTITUENTS SHOULD BE EXPECTED BEYOND BORING LOCATIONS.
4. ELEVATIONS AT BORING LOCATIONS ARE APPROXIMATE AND WERE INFERRED FROM PRELIMINARY SURVEYS DONE BY WILLIAMS HATFIELD & STONER, INC.

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VILLAGE OF KEY BISCAYNE

BORING PROFILE A–A

KEY BISCAYNE FLORIDA

APPENDIX A

BORING LOGS

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LOG OF BORING. B-1 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.4
DRILLING AGENCY: TMA Services, Inc.	DATE STARTED: 10:20 12/14/93 — DATE FINISHED: 12/14/93
DRILLING EQUIPMENT: MOBILE CME B-53, ATV RIG	COMPLETION DEPTH: 20 ft — ROCK DEPTH: Not found.
SIZE AND TYPE OF BIT: 2 7/8 in ø TRICONE ROLLER BIT	NO. SAMPLES: DIST. 12 — UNDIST. — — CORE —
CASING: DRILLING MUD INLIEU OF CASING	WATER LEVEL: FIRST 3' — COMPL. — — 24 HR. —
CASING HAMMER: WEIGHT — — DROP —	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. — DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BL/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt - 1 1/2 in Tan silty f-m SAND & LIMEROCK	1	S1	SS	1.2	74, 20, 12, 5	32	Sample is dry
Gray clayey SILT, trace fine sand Gray shelly silty fine SAND, trace peat fibers	2, 3	S2A, S2B	SS	2.0	1, 2, 9, 11	11	Sample is moist
Tan and gray SAND and SILT, trace rock fragments	4, 5	S3A, S3B	SS	1.5	4, 6, 9, 4	14	Sample is wet
Grey silty fine SAND, trace shells Dark brown fibrous PEAT	6, 7, 8	S4A, S4B	SS	2.0	2, 2, 2, 2	4	
Grey shelly fine SAND and dark brown PEAT Grey shelly fine SAND	8, 9, 10	S5B, S5A	SS	2.0	2, 2, 2, 2	4	
	11, 12, 13						Soft drilling
Grey silty fine SAND trace root fibers and shells	14	S6	SS	1.1	0, 1, 0, 1	1	

228

GES-14

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JOB NO. 6025101
DATE 12/14/93

LOG OF BORING NO. B-1

SHEET 2 OF 2

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/in.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
						Smooth soft drilling
	16					
	17					
	18					
Gray and dark brown silty fine SAND and fibrous PEAT, trace shells	19	S7A	SS	1.2	2 2 3	5
Gray shelly fine SAND		S7B			5	
BORING TERMINATED @ d=20ft	20					Backfill hole with drill cuttings upon completion

Langan
Engineering and Environmental Services, Inc.

LOG OF BORING B-2 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. + 4.4
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 9:45 12/14/93 — DATE FINISHED: 12/14/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft — ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ø TRICONE ROLLER BIT	NO. SAMPLES: DIST. 11 — UNDIST. — — CORE —
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 3 ft — COMPL. — — 24 HR. —
CASING HAMMER: WEIGHT — — DROP —	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.A. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. — DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Grass with 4 in topsoil		S1A			4		
Tan fine SAND with rock fragments, trace roots	1	S1B	SS	1.5	3 5 4	13	sample moist
	2						
	3	S2A S2B	SS	1.2	4 12 3 2	15	Sample is wet
Gray silty fine SAND	4						
Gray clayey SILT, trace fine sand	5	S3	SS	2.0	0 1 1 1	2	
	6						
Dark brown fibrous PEAT	7	S4	SS	2.0	1 1 1 1	2	
	8						
Dark brown fibrous PEAT	9	S5	SS	2.0	1 2 3 3	5	
	10						
	11						
	12						Change in strata inferred from increase in rate of roller chance at 12 ft
	13						
Gray fish tan fine SAND, some silt, trace root fibers	14	S6	SS	2.0	0 1 0	1	

230

GES-16

Langan
Engineering and Environmental Services, Inc.

JOB NO. 6025101
DATE 12/14/93

LOG OF BORING NO. B-2

SHEET 2 OF 2

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV.FT.	PENETR. RESIST BLWS/6 in.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	16					
	17					
Gray shelly fine SAND	18	S7A	SP	0.8	2	change in strata inferred from decrease in rate of roller bit advance @ d=17
	19	S7B			3 5 16	6
BORING TERMINATED @ d=20 ft	20					Backfill hole with drill cuttings upon completion

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Engineering and Environmental Services, Inc.

LOG OF BORING B-3 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.1
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/13/93 — DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 30 ft — ROCK DEPTH: 19 ft
SIZE AND TYPE OF BIT: 2 7/8 in ø TRICONE ROLLER BIT	NO. SAMPLES: DIST. 12 — UNDIST. – — CORE –
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 5 ft. — COMPL. – — 24 HR. –
CASING HAMMER: WEIGHT – — DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. — DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt - 2 in Light-tan SAND & LIMEROCK					14		1st attempt w/ post hole auger, aborted
Grey silty fine SAND, some peat	1	S1	SS	1.4	10 6 7	16	2nd attempt completed @ 0' with 4" original boring Sample is dry
Tannish grey silty fine SAND, trace of rock fragments	2 3	S2	SS	0.8	6 5 2	3	Sample is moist
Grey fine sandy SILT	4	S3A	SS	1.5	1 1		Sample is wet.
Dark-brown fibrous PEAT	5	S3B			1 1	2	
Dark-brown fibrous PEAT, some sand	6 7	S4	SS	2.0	1 1 1	1	
Tannish-grey shelly fine SAND, trace peat fibers	8 9	S5A S5B	SS	1.6	1 5 7	6	
	10						Moderately soft drilling
	11 12						
Dark grey shelly f-m SAND	13 14	S6	SS	0.8	3 4 7 8	11	Change inferred from decrease in rate of roller bit advance @ d = 12.5 ft.

GES-18

Langan
Engineering and Environmental Services, Inc.

JOB NO. 6025101
DATE 12/14/03

LOG OF BORING NO. B-3

SHEET 2 OF 2

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLWS/6 in.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	16					Moderate drilling
	17					
Grey shelly fine SAND, trace root fibers	18	57A	SS	1.3	2 3	
Tan oolitic LIMEROCK	19	57B			9 12	12
	20					
	21					Moderate drilling Slight chatter
	22					
Light-tan oolitic LIMEROCK	23	58	SS	1.5	7 7 8 9	15
	24					
	25					Moderate drilling
	26					
	27					Chattery
Grey-tan fine SAND, some cemented sand	28	59	SS	1.2	4 3 5 4	8
	29					
BORING TERMINATED @ d=30 ft	30					Backfill hole with drillcuttings upon boring completion.

233

GES-19

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LOG OF BORING B-4 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. cl + 5.1
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/10/93 12:10 pm; DATE FINISHED: 12/10/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft; ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ø TERRANE ROLLER BIT	NO. SAMPLES: DIST. 10, UNDIST. –, CORE –
CASING: DRILLING MUD INLIED OF CASING	WATER LEVEL: FIRST 6.5 ft, COMPL. –, 24 HR. –
CASING HAMMER: WEIGHT –, DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs., DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLG IN.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt 2 in							
Tan SAND & LIMEROCK	1	S1	SS	1.0	16 5 9 8	14	
Tan fine SAND	2	S2A	SS	1.5	5 4 4 5	8	Sample is dry.
Tan sandy SILT trace of shell	3	S2B					
Dark brown organic SAND trace of shells	4	S3A	SS	1.8	2 2 5 7	7	Sample is moist
Greyish tan fine silty SAND trace of organic sand	5	S3B					
Tannish-grey silty fine SAND, trace shells	6	S4A	SS	2.0	5 10 15 15	25	Sample is wet
	7	S4B					
Grey shelly fine SAND	8	S5	SS	2.0	6 13 15 11	28	
	9						
	10						
	11						
	12						
	13						
Grey shelly fine SAND	14	S6	SS	1.0	7 7 8 9	15	

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JOB NO. 6025101
DATE 12/14/93

LOG OF BORING NO. B-4

SHEET 2 OF 2

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/6 in.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	16					Moderate drilling
	17					
	18					
Grey shelly fine SAND	19	S7	SS	1.2	10 13 11 15	24
BORING TERMINATED @ d=20 ft	20					Backfill hole with drill cuttings upon boring comple...

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LOG OF BORING B-5 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. + 5.2
DRILLING AGENCY: TMI Services, Inc.	DATE STARTED: 12/14/93 1:00 / DATE FINISHED: 12/14/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 30 ft / ROCK DEPTH: 21 ft
SIZE AND TYPE OF BIT: 2 7/8 in ø TRICONE ROLLER BIT	NO. SAMPLES: DIST. 13 / UNDIST. — / CORE —
CASING: DRILLING MUD INLIEU OF CASING	WATER LEVEL: FIRST 6.5ft / COMPL. — / 24 HR. —
CASING HAMMER: WEIGHT — / DROP —	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. / DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO./LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLG/6in.	N Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt 2 in thick. Light-tan f-m SAND, some rock fragments	1	S1	SS	1.2	26 12 12 10	24	
Brown fine SAND, some silt trace of rock fragment.	2	S2A	SS	1.5	8 12		
Brown fine shelly SAND	3	S2B			9 7	21	Sample is moist
Dark brown f. sandy SILT, trace root fibers	4	S3A	SS	1.5	1 2		
Dark brown silty f. SAND, trace root fibers	5	S3B			1 2	3	Sample is moist
Dark brown shelly fine SAND and SILT trace of root fibers	6	S4A	SS	1.0	6 9		
Tannish-grey shelly fine SAND, trace silt root/wood fibers	7	S4B			7 8	16	Sample is wet
Tannish-grey shelly fine SAND trace silt and peat	8	S5A	SS	2.0	7 9		
Tannish-grey shelly f-m SAND, trace silt	9	S5B			15 17	24	
	10						Moderate drilling
	11						
	12						
	13						
Grey shelly f-m SAND, lense of peat 1/4 in thick	14	S6	SS	1.5	4 4 5 6	9	

236

GES-22

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LOG OF BORING B-5 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. + 5.2
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/14/93 1:00 / DATE FINISHED: 12/14/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 30 ft / ROCK DEPTH: 21 ft
SIZE AND TYPE OF BIT: 2 7/8 in ø TRICONE COLLAPSE BIT	NO. SAMPLES: DIST. 13 / UNDIST. — / CORE —
CASING: DRILLING MUD INLIEU OF CASING	WATER LEVEL: FIRST 6.5 ft / COMPL. — / 24 HR. —
CASING HAMMER: WEIGHT — / DROP —	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NEHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. / DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLWS/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt 2 in thick. Light-tan f-m SAND, some rock fragments	1	S1	SS	1.2	26 12 12 10	24	
Brown fine SAND, some silt trace of rock fragment.	2	S2A	SS	1.5	8 12	21	Sample is moist
Brown fine shelly SAND	3	S2B			9 7		
Dark brown f. sandy SILT, trace root fibers	4	S3A	SS	1.5	1 2	3	Sample is moist
Dark brown silty f. SAND, trace root fibers	5	S3B			1 2		
Dark brown shelly fine SAND and SILT trace of root fibers	6	S4A	SS	1.0	6 9	16	Sample is wet
Tannish-grey shelly fine SAND, trace silt root/wood fibers	7	S4B			7 8		
Tannish-grey shelly fine SAND trace silt and peat	8	S5A	SS	2.0	7 9	24	
Tannish-grey shelly f-m SAND, trace silt	9	S5B			15 17		
	10						Moderate drilling
	11						
	12						
	13						
Grey shelly f-m SAND, lense of peat 1 1/4 in thick	14	S6	SS	1.5	4 4 5 6	9	

GES-22

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LOG OF BORING B-6 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.0
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 3:40pm 12/13/03 — DATE FINISHED: 12/13/03
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft — ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ϕ TRICONE ROLLER BIT	NO. SAMPLES: DIST. 10 — UNDIST. – — CORE –
CASING: DRILLING MUD INLIEU OF CASING.	WATER LEVEL: FIRST 5 ft — COMPL. – — 24 HR. –
CASING HAMMER: WEIGHT – — DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLONY
SAMPLER HAMMER: WEIGHT 140 lbs. — DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLWS/6 in.	No. Blows	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt-1.5 in above. 4 in. topsoil					16		
Light tan silty SAND & LIMEROCK	1	S1	SS	0.8	13 5 4	18	Sample is dry
Tannish-grey fine SAND, and grey SILT, lense of peaty sand, trace wood fragments	2–3	S2A S2B	SS	1.5	1 2 9 10	11	Sample is moist
Dark brown fibrous PEAT, some fine sand	4–5	S3	SS	0.5	3 5 2 3	7	Sample is wet
Dark brown fibrous PEAT, trace fine sand	6	S4A			4		
Tannish-gray shelly f-m SAND	7	S4B	SS	1.2	7 14 21	21	
Gray shelly f-m SAND	8–9	S5	SS	.5	7 12 14 11	26	
	10–12						Undercut [illegible]
Gray shelly fine SAND, trace silt	13–14	S6	SS	1.0	5 5 5	10	

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LOG OF BORING B-6 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.0
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 3:40 pm 12/13/03 — DATE FINISHED: 12/13/03
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft — ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ϕ TRICONE ROLLER BIT	NO. SAMPLES: DIST. 10, UNDIST. –, CORE –
CASING: DRILLING MUD INLIEU OF CASING.	WATER LEVEL: FIRST 5 ft, COMPL. –, 24 HR. –
CASING HAMMER: WEIGHT – DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST. BLS/IN.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Asphalt - 1.5 in above 4 in. topsoil					16		
Light tan silty SAND & LIMEROCK	1	S1	SS	0.8	13 5 4	18	Sample is dry
Tannish-grey fine SAND, and grey SILT, lense of peaty sand, trace wood fragments	2–3	S2A S2B	SS	1.5	1 2 9 10	11	Sample is moist
Dark brown fibrous PEAT, some fine sand	5	S3	SS	0.5	3 5 2 3	7	Sample is wet
Dark brown fibrous PEAT, trace fine sand	6						
Tannish-gray shelly f-m SAND	7	S4A S4B	SS	1.2	4 7 14 21	21	
Gray shelly f-m SAND	8–9	S5	SS	1.5	7 12 14 11	26	
	10–12						Undercut drilling
Gray shelly fine SAND, trace silt	13–14	S6	SS	1.5	5 5 =	10	

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LOG OF BORING B-7 SHEET 1 OF 2

PROJECT	PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.	6025101
LOCATION	Village of Key Biscayne, FL	ELEVATION AND DATUM	Approx. el + 4.0.
DRILLING AGENCY	TMS Services, Inc.	DATE STARTED 12/13/93	DATE FINISHED 12/13/93
DRILLING EQUIPMENT	MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH 11:30 20 ft	ROCK DEPTH Not found
SIZE AND TYPE OF BIT	2 7/8 in Φ TRICONE ROLLER	NO. SAMPLES	DIST. 10 / UNDIST. – / CORE –
CASING	DRILLING MUD IN LIEU OF CASING	WATER LEVEL	FIRST 6 ft / COMPL. – / 24 HR. –
CASING HAMMER	WEIGHT / DROP	FOREMAN	TONY MARTIN
SAMPLER	2 in O.D. Split Spoon	INSPECTOR	TONY NICHLANY
SAMPLER HAMMER	WEIGHT 140 lbs. / DROP 30 in		

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLW/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
3 in Topsoil							
Tan f-m shelly SAND, trace of rock fragment	1	S1A S1B	SS	1.8	3 11 7 7	13	Sample is dry
Greyish tan silty fine SAND, trace shell	2	S2A			5		
Grey clayey SILT, trace fine sand and root fibers	3	S2B	SS	2.0	1 1 3	3	Sample is moist
Darkbrown fine sandy fiborous PEAT	4	S3A S3B	SS	1.8	1 2 2 1	4	Sample is wet
	6						
	7		SS	1.4	1 2 3 5	5	
Grey shelly m-f SAND, trace root/wood fibers	8 9	S5	SS	1.2	4 11 9 13	4	
	10						Smooth drilling
	11						
	12						
	13						
Tannish grey shelly fine SAND	14	S6	SS	0.8	5 4 5	9	

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LOG OF BORING B-7 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el + 4.0.
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/13/93 — DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 11:30 20 ft — ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in Φ TRICONE ROLLER	NO. SAMPLES: DIST. 10 — UNDIST. – — CORE –
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 6 ft — COMPL. – — 24 HR. –
CASING HAMMER: — WEIGHT: — DROP: —	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: — WEIGHT: 140 lbs. — DROP: 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLOWS/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
3in Topsoil		S1A			3		
Tan f-m shelly SAND, trace of rock fragment	1	S1B	SS	1.8	11 7 7	13	Sample is dry
	2	S2A			5		
Greyish tan silty fine SAND, trace shell	3	S2B	SS	2.0	1 1 3	3	Sample is moist
Grey clayey SILT, trace fine sand and root fibers	4						
Dark brown fine sandy fiborous PEAT	5	S3A S3B	SS	1.8	1 2 2 1	4	Sample is wet
	6						
	7		SS	1.5	1 2 3 5	5	
Grey shelly m-f SAND, trace root/wood fibers	8 9	S5	SS	1.2	4 7 9 13	4	
	10						Smooth drilling
	11						
	12						
	13						
Tannish grey shelly fine SAND	14	S6	SS	0.8	5 4 5	9	

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LOG OF BORING B-8 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.4
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 2:30 pm 12/13/93 / DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft / ROCK DEPTH: Not found.
SIZE AND TYPE OF BIT: 2 7/8 in Φ TRICONE ROLLER	NO. SAMPLES: DIST. 11 / UNDIST. – / CORE –
CASING: DRILLING MUD IN LIEU OF CASING.	WATER LEVEL: FIRST 3.5 ft / COMPL. – / 24 HR. –
CASING HAMMER: WEIGHT – / DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. / DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
4 inches of 1/2" Φ gravel @ surface		S1A			4		
Brown-tan shelly fine SAND	1	S1B	SS	2.0	6 5 3	11	Sample is dry
Brown shelly fine SAND, trace silt and peat	2–3	S2	SS	1.2	2 3 4 3	7	Sample is wet
Grey and dark brown fine peaty SAND	4–5	S3	SS	.8	1 1 1 2	2	
Dark brown fine sandy PEAT	6–7	S4A / S4B	SS	1.5	1 1 2 3	3	
Grey shelly fine SAND	8–9	S5A / S5B	SS	2.0	3 9 10 13	19	
Grey shelly f.-m. SAND	13–14	S6	SS	0.8	5 7 9	16	

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LOG OF BORING B-8 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.4.
DRILLING AGENCY: TMI Services, Inc.	DATE STARTED: 2:30pm 12/13/93 / DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: NOBLE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft / ROCK DEPTH: Not found.
SIZE AND TYPE OF BIT: 2 7/8 in Φ TRICONE ROLLER	NO. SAMPLES: DIST. 11 / UNDIST. – / CORE –
CASING: DRILLING MUD IN LIEU OF CASING.	WATER LEVEL: FIRST 3.54 / COMPL. – / 24 HR. –
CASING HAMMER: WEIGHT – / DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANT
SAMPLER HAMMER: WEIGHT 140 lbs. / DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/in.	N Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
4 inches of 1/2" Φ gravel @ surface		S1A			4		
Brown-tan shelly fine SAND	1	S1B	SS	2.0	6 5 3	11	Sample is dry
Brown shelly fine SAND, trace silt and peat	2 3	S2	SS	1.2	2 3 4 3	7	Sample is wet
Grey and dark brown fine peaty SAND	4 5	S3	SS	.8	1 1 1 2	2	
Dark brown fine sandy PEAT	6 7	S4A S4B	SS	1.5	1 1 2 3	3	
Gray shelly fine SAND	8 9 10	S5A S5B	SS	2.0	3 9 10 13	19	
Green shelly fine SAND	11 12 13 14	S6	SS	0.8	5 7 [illegible]	16	

GES-28

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LOG OF BORING B9 SHEET 1 OF 2

PROJECT	PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.	6025101
LOCATION	Village of Key Biscayne, FL	ELEVATION AND DATUM	Approx. el, +4ft.
DRILLING AGENCY	TMS Services, Inc.	DATE STARTED 12/13/93 12:00PM	DATE FINISHED 12/13/93.
DRILLING EQUIPMENT	MOBILE DRILL B-53 ATV RIG.	COMPLETION DEPTH 30 ft	ROCK DEPTH 22 ft
SIZE AND TYPE OF BIT	2 7/8 in Ø TRICONE ROLLER	NO. SAMPLES DIST. 11	UNDIST. – CORE –
CASING	DRILLING MUD IN LIEU OF CASING	WATER LEVEL FIRST 6 ft	COMPL. – 24 HR. –
CASING HAMMER	WEIGHT / DROP	FOREMAN	TONY NAGEON
SAMPLER	2 in O.D. Split Spoon	INSPECTOR	TONY NICHOLAY
SAMPLER HAMMER	WEIGHT 140 lbs. DROP 30 in		

SAMPLE DESCRIPTION	DEPTH SCALE	NO./LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLG/in.	N Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
2in Grass & topsoil @ surface							
Yellowish-tan silty fine SAND	1	S1	SS	1.5	7 9 6 5	15	Sample is dry
	2						
Grey clayey SILT	3	S2	SS	.25	2 2 3 4	5	Sample is moist
Grey shelly m-f SAND, trace silt	4						
Brown-tan shelly fine SAND, some peat and root fibers	5	S3A S3B	SS	.8	2 2 2 5	4	Sample is moist
	6	S4A					
Grey shelly m-f SAND	7	S4B	SS	1.2	7 12 14 17	26	Sample is wet
	8						
Grey shelly m-f SAND	9	S5	SS	.3	6 11 14 9	25	
	10						Smooth medium drilling.
	11						
	12						
	13						Change in strata inferred from increase in rate of roller advance at d = 13 ft.
Grey shelly fine SAND, isolated	14	U	SS	V	1 2	5	

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LOG OF BORING B9 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el, +4 ft.
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/13/93 12:00 PM; DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG.	COMPLETION DEPTH: 30 ft; ROCK DEPTH: 22 ft
SIZE AND TYPE OF BIT: 2 7/8 in Ø TRICONE ROLLER	NO. SAMPLES: DIST. 11, UNDIST. –, CORE –
CASING: DRILLING MUD INSTEAD OF CASING	WATER LEVEL: FIRST 6 ft, COMPL. –, 24 HR. –
CASING HAMMER: WEIGHT: DROP:	FOREMAN: TONY NARVIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHOLAY
SAMPLER HAMMER: WEIGHT: 140 lbs. DROP: 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO./LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/6 in.	N Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
2 in Grass & topsoil @ surface							
Yellowish-tan silty fine SAND	1	S1	SS	1.5	7 9 6 5	15	Sample is dry
Grey clayey SILT	2–3	S2	SS	.25	2 2 3 4	5	Sample is moist
Grey shelly m-f SAND, trace silt	4	S3A			2 2	4	Sample is moist
Brown-tan shelly fine SAND, some peat and root fibers	5–6	S3B	SS	.8	2 5		
Grey shelly m-f SAND	6–7	S4A			7 12	26	Sample is wet
		S4B	SS	1.2	14 17		
Grey shelly m-f SAND	8–9	S5	SS	.2	6 11 14 9	25	
	10						Smooth moderate drilling.
	11						
	12						
	13						Change in strata inferred from increase in rate of roller advance @ el = 13 ft.
Grey shelly fine SAND, isolated	14	U	U	U	1 2	5	

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LOG OF BORING B-10 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.0
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/13/93 — DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG.	COMPLETION DEPTH: 20 ft — ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ϕ TRICONE DRILL BIT	NO. SAMPLES: DIST. 7, UNDIST. –, CORE –
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 6.5 ft, COMPL. –, 24 HR. –
CASING HAMMER: WEIGHT – DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: T. NICHLANT
SAMPLER HAMMER: WEIGHT 140 lbs. DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO./LOC.	TYPE	RECOV. FT.	PENETR. RESIST BL/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Grass @ ground surface Yellowish-grey silty fine SAND	1	S1	SS	1.5	17, 10, 8, 6	18	
Grey clayey SILT, trace peat and fine sand	3	S2A	SS	1.2	2, 2, 2, 3	4	Sample is moist
Grey-brown fine sandy, shelly SILT trace peat fibers	4	S2B					
Brown fibrous PEAT	5	S3A	SS	1.0	1, 1, 3, 5	4	Sample is moist
Dark brown peaty fine SAND	6	S3B					
Brownish-grey shelly fine SAND, some peat/root fibers	7	S4A	SS	1.5	1, 4, 10, 14	14	Sample is wet
	8	S4B					
Grey shelly f-m SAND	9	S5	SS	1.0	10, 10, 12, 14	22	
	10						Smooth moderate drilling
	11						
	12						
	13						
Grey shelly fine SAND	14	X	SS	1.5	5, 4, 3	7	

GEG 22

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LOG OF BORING B-10 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. +4.0
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/13/93 — DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG.	COMPLETION DEPTH: 20 ft — ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ϕ TRICONE DRILL BIT.	NO. SAMPLES: DIST. 7, UNDIST. –, CORE –
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 6.5 ft, COMPL. –, 24 HR. –
CASING HAMMER: WEIGHT –, DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: T. NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs., DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Grass @ ground surface Yellowish-grey silty fine SAND	1	S1	SS	2.5	17, 10, 8, 6	18	
Grey clayey SILT, trace peat and fine sand	2–3	S2A	SS	1.2	2, 2, 2, 3	4	Sample is moist
Grey-brown fine sandy, shelly SILT trace peat fibers	3–4	S2B					
Brown fibrous PEAT	4–5	S3A	SS	1.0	1, 1, 3, 5	4	Sample is moist
Dark brown peaty fine SAND	5–6	S3B					
Brownish-grey shelly fine SAND, some peat/root fibers	6–7	S4A	SS	1.5	1, 4, 10, 4	14	Sample is wet
	7–8	S4B					
Grey shelly f-m SAND	8–9	S5	SS	1.0	10, 10, 12, 14	22	
	9–10						
	10–11						Smooth moderate drilling
	11–12						
	12–13						
Grey shelly fine SAND	13–14	S6	SS	1.5	5, 4	7	

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LOG OF BORING B-11 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. + 4.3
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/17/93 DATE FINISHED: 12/13/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH: 20 ft ROCK DEPTH: Not found
SIZE AND TYPE OF BIT: 2 7/8 in ϕ TRICONE ROLLER BIT	NO. SAMPLES: DIST. 11 ft UNDIST. – CORE –
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 4 ft COMPL. – 24 HR. –
CASING HAMMER: WEIGHT – DROP –	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHOLSONY
SAMPLER HAMMER: WEIGHT 140 lbs. DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLG/in.	N Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Tan fine SAND, and few rock fragments	1	S1A	SS	1.5	8 5	7	Sample is moist
Gray clayey SILT, trace roots and fine sand	2	S1B			2 1		
Dark brown silty, peaty fine SAND	3	S2A S2B	SS	1.8	1 1 2 1	3	Sample is wet
Tannish-gray shelly f-m SAND	5	S3	SS	1.2	4 5 7 10	12	
Gray shelly f-m SAND	7	S4	SS	1.5	7 12 21 20	33	
Gray shelly fine SAND	9	S5	SS	1.0	13 14 13 17	27	
Gray fine SAND, trace root fibers	14	S6	SS	1.2	1 2 5	7	

GES-34

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LOG OF BORING B-11 SHEET 1 OF 2

PROJECT	PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.	6025101
LOCATION	Village of Key Biscayne, FL	ELEVATION AND DATUM	Approx. el. + 4.3
DRILLING AGENCY	TMI Services, Inc.	DATE STARTED 12/13/93 2:50	DATE FINISHED 12/13/93
DRILLING EQUIPMENT	MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH 20 ft	ROCK DEPTH Not found
SIZE AND TYPE OF BIT	2 7/8 in ϕ TRICONE ROLLER BIT	NO. SAMPLES DIST. 11 ft	UNDIST. - CORE -
CASING	DRILLING MUD IN LIEU OF CASING	WATER LEVEL FIRST 4 ft	COMPL. - 24 HR. -
CASING HAMMER WEIGHT —	DROP —	FOREMAN	TONY MARTIN.
SAMPLER	2 in O.D. Split Spoon	INSPECTOR	TONY NICHLINNY
SAMPLER HAMMER WEIGHT	140 lbs. DROP 30 in		

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLWS IN.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Tan fine SAND, and few rock fragments	1	S1A	SS	1.5	8 5	7	Sample is moist
Gray clayey SILT, trace roots and fine sand	2	S1B			2 1		
Dark brown silty, peaty fine SAND	3	S2A S2B	SS	1.3	1 1 2 1	3	Sample is wet
Tannish-gray shelly f-m SAND	5	S3	SS	1.2	4 5 7 10	12	
Gray shelly f-m SAND	7	S4	SS	1.5	7 12 21 20	33	
Gray shelly fine SAND	9	S5	SS	2.0	13 14 13 17	27	
Gray fine SAND, trace root fibers	14	S6	SS	1.2	1 2 5	7	

GFS-34

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LOG OF BORING B-12 SHEET 1 OF 2

PROJECT	PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.	6025101
LOCATION	Village of Key Biscayne, FL	ELEVATION AND DATUM	Approx. el. + 5.3.
DRILLING AGENCY	TMA Services, Inc.	DATE STARTED 11:30. 12/14/95	DATE FINISHED 12/14/95
DRILLING EQUIPMENT	MOBILE DRILL B-53 ATV RIG	COMPLETION DEPTH 20 ft	ROCK DEPTH Not found.
SIZE AND TYPE OF BIT	2 7/8 in & TRICONE ROLLER BIT	NO. SAMPLES	DIST. 9 / UNDIST. – / CORE –
CASING	ROLLING MUD IN LIEU OF CASING	WATER LEVEL	FIRST 5.5 ft / COMPL. – / 24 HR. –
CASING HAMMER	WEIGHT – / DROP –	FOREMAN	TONY MARTIN
SAMPLER	2 in O.D. Split Spoon	INSPECTOR	TONY NICHLANY
SAMPLER HAMMER	WEIGHT 140 lbs. / DROP 30 in		

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/6 in.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Grass and 3 in topsoil							
Tan shelly fine SAND, some rock fragments	1	S1	SS	1.2	11 9 12 4	21	Sample is dry
	2						
Tan and gray shelly fine SAND	3	S2	SS	1.7	6 7 9 11	16	Sample is moist
	4						
Tan shelly fine SAND	5	S3	SS	1.0	8 11 14 6	25	Sample is wet
	6						
Gray fine SAND, some shell	7	S4	SS	1.0	3 2 4 3	6	
	8						
Dark brown peaty fine SAND	9	S5	SS	0.5	2 2 3 2	5	
	10						
	11						Change in strata inferred from decrease in rate of roller reduction @ d = 11 ft.
	12						
	13						
Gray shelly f-m SAND,	14	S6	SS	1.0	6 5 7	13	

CES-36

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LOG OF BORING B-12 SHEET 1 OF 2

PROJECT: PROPOSED DRAINAGE AND WELL SYSTEM	PROJECT NO.: 6025101
LOCATION: Village of Key Biscayne, FL	ELEVATION AND DATUM: Approx. el. + 5.3.
DRILLING AGENCY: TMS Services, Inc.	DATE STARTED: 12/14/93 11:30. DATE FINISHED: 12/14/93
DRILLING EQUIPMENT: MOBILE DRILL B-53 ATV RIG.	COMPLETION DEPTH: 20 ft. ROCK DEPTH: Not found.
SIZE AND TYPE OF BIT: 2 7/8 in & TRICONE ROLLER BIT	NO. SAMPLES: DIST. 9 UNDIST. — CORE —
CASING: DRILLING MUD IN LIEU OF CASING	WATER LEVEL: FIRST 5.5 ft COMPL. — 24 HR. —
CASING HAMMER: WEIGHT — DROP —	FOREMAN: TONY MARTIN
SAMPLER: 2 in O.D. Split Spoon	INSPECTOR: TONY NICHLANY
SAMPLER HAMMER: WEIGHT 140 lbs. DROP 30 in	

SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLOWS/IN.	N-Values	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
Grass and 3 in topsoil							
Tan shelly fine SAND, some rock fragments	1	S1	SS	1.2	11 9 12 4	21	Sample is dry
	2						
Tan and gray shelly fine SAND	3	S2	SS	1.2	6 7 9 11	16	Sample is moist
	4						
Tan shelly fine SAND	5	S3	SS	1.0	8 11 14 6	25	Sample is wet
	6						
Gray fine SAND, some shell	7	S4	SS	1.0	3 2 4 3	6	
	8						
Dark brown peaty fine SAND	9	S5	SS	0.5	2 2 3 2	5	
	10						
	11						Change in strata inferred from decrease in rate of roller cone @ d = 11 ft.
	12						
	13						
Gray shelly f-m SAND,	14	S6	SS	1.0	6 5 7	13	

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JOB NO. 6025101
DATE 12/14/93

LOG OF BORING NO. B12

SHEET 2 OF 2

	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BLS/6IN.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		16					
		17					
		18					
	Gray shelly fine SAND	19	S7A S7B	SS	1.5	9 10 11 17	21
		20					
	BORING TERMINATED @ d = 20 ft						Backfill hole with drill cuttings upon boring completion.

APPENDIX B

SUMMARY OF LABORATORY TEST RESULTS

Job No. 602

SUMMARY OF LABORATORY TEST RESULTS

Boring & Sample Number	Depth	Classification	Natural Water Content	Atterberg Limits Liquid Limit	Atterberg Limits Plastic Limit	Unit Dry Weight	Specific Gravity	Cons
B1,S5B	9'-10'	Shelly fine SAND and PEAT	125%					
B1,S6	13'-15'	Silty fine SAND, trace root fibers and shells	42%					
B1,S7A	18'-19.5'	Silty fine SAND and fibrous PEAT	189%					
B2,S3	4'-6'	Clayey SILT, trace fine SAND	61%					
B2,S4A	6'-7'	Clayey SILT, trace fine SAND	59%					
B2,S4B	7'-8'	Fibrous PEAT	296%					
B2,S5	8'-10'	Fibrous PEAT	389%					
B2,S6	13'-15'	Fine SAND, some silt, trace root fibers	50%					
B3,S3B	5'-6'	Fibrous PEAT	210%					
B4,S2B	3'-4'	Sandy SILT, trace shells	57%					
B4,S3A	4'-5'	Organic SAND, trace shells	44%					
B5,S3A	4'-5'	Sandy Silt, trace root fibers	60%					
B5,S3B	5'-6'	Silty SAND, trace root fibers	44%					
B6,S2A	2'-3'	SAND and SILT	65%					
B6,S3	4'-6'	Fibrous PEAT, some fine sand	127%					
B6,S4A	6'-6.5'	Fibrous PEAT, trace fine sand	169%					

*See Test Curves

Job No. 60

SUMMARY OF LABORATORY TEST RESULTS

Boring & Sample Number	Depth	Classification	*Natural Water Content	Atterberg Limits Liquid Limit	Atterberg Limits Plastic Limit	Unit Dry Weight	Specific Gravity	Consc
B7,S2B	2.5'-4'	Clayey SILT, trace sand and root fibers	75%					
B7,S3B	4.5'-6'	Fine sandy fibrous PEAT	121%					
B8,S3	4'-6'	Peaty SAND	31%					
B8,S4B	7'-8'	Fine sandy PEAT	77%					
B9,S2	2'-4'	Clayey SILT	83%					
B10,S2A	2'-3.5'	Clayey SILT, trace peat and fine sand	72%					
B10,S2B	3.5'-4'	Fine sandy SILT, trace peat fibers	40%					
B10,S3A	4'-5'	Fibrous PEAT	116%					
B10,S3B	5'-6'	Peaty fine SAND	80%					
B10,S4A	6'-7'	Shelly fine SAND, some peat/root fibers	58%					
B11,S2A	2'-3'	Clayey SILT, trace roots and fine sand	79%					
B11,S2B	3'-4'	Silty, peaty fine SAND	42%					
B12,S5	8'-10'	Peaty fine SAND	57%					

*See Test Curves