

1500 ft from shore:
 $38^{\circ} 43' 41.20''$ N,
 $75^{\circ} 4' 26.60''$ W

4500 ft from shore:
 $38^{\circ} 43' 45.75''$ N,
 $75^{\circ} 3' 48.95''$ W

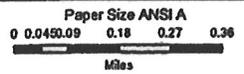
3000 ft from shore:
 $38^{\circ} 43' 43.45''$ N,
 $75^{\circ} 4' 7.86''$ W

6000 ft from shore:
 $38^{\circ} 43' 48.01''$ N,
 $75^{\circ} 3' 30.29''$ W

Legend

- Borings
- Proposed Force Main
- Proposed Outfall Pipe

Note: All borings to be located at least 50-feet north of pipe alignment



City of Rehoboth Beach
 Ocean Outfall Project

Job Number 86-14327
 Revision A
 Date May 11, 2011

Requested Boring Locations

GAGIS DATA - Copied From Network\8614327 - Rehoboth - Figures - Rehoboth - Geo Borings.mxd
 © 2011. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.
 Date created: Date Modified: Date Plotted: File: Mapset: Date: Created by: [unreadable]



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LOG OF BORING B-1

(Page 1 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 10/1/2011
End Date: : 10/1/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
0	Gray, saturated, soft to medium stiff, clayey SILT, with trace fine to medium sand		ML	1	3-2-3	Scale: 1" ~ 1.5 feet Started at 7:00 a.m. in 28 feet of water.
5				2	3-4-4	
10	Gray, saturated, dense, fine to medium SAND, with little silt, trace fine gravel		SM	3	11-17-22	
15	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace fine gravel		SP	4	10-14-10	
20	Gray, saturated, medium stiff, clayey SILT, with little fine to medium sand		MH	5	2-4-4	
25				6	4-3-4	
30	Gray, saturated, medium dense, fine to medium SAND, with little silt		SM	7	5-6-10	
35	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	8	7-9-19	
40	Gray, saturated, dense, fine SAND, with some silt		SM	9	7-8-14	
45	Gray, saturated, medium dense to very dense, fine to medium SAND, with trace silt		SP	10	9-16-18	
50				11	8-14-19	



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LOG OF BORING B-1

(Page 2 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 10/1/2011
End Date: : 10/1/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
50.5	Gray, saturated, medium dense to very dense, fine to medium SAND, with trace silt		SP	12	12-13-15	
55.5				13	11-14-17	
60.5				14	10-12-15	
65.5				15	12-16-17	
70.5				16	29-33-40	
75.5				17	27-31-38	
80.5	Boring terminated at 80.5 feet.					
85.5						
90.5						
95.5						
100.5						

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LOG OF BORING B-2

(Page 1 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 9/27/2011
End Date: : 9/27/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
0	Gray, saturated, very soft to medium stiff, clayey SILT, with some fine to medium sand		ML	1	1-1-2	Scale: 1" ~ 1.5 feet Started at 7:30 a.m. in 33 feet of water.
5				2	4-2-4	
10	Gray, saturated, medium dense to dense, fine to medium SAND, with little silt, trace fine gravel		SM	3	14-17-21	
15				4	7-7-8	
20				5	14-17-10	
25	Gray, saturated, very stiff, clayey SILT, and fine to medium SAND		ML/SM	6	8-10-18	
30	Gray, saturated, medium dense to very dense, fine to medium SAND with trace silt		SP	7	10-17-26	
35				8	10-10-16	
40				9	15-28-35	
45	Gray, saturated, medium dense to very dense, fine to medium SAND, with trace silt		SP	10	10-14-17	
50	Gray, saturated, dense to very dense, fine to medium SAND, with trace silt, trace fine gravel		SP	11	17-19-24	

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LOG OF BORING B-2

(Page 2 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 9/27/2011
End Date: : 9/27/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
50.5	Gray, saturated, dense to very dense, fine to medium SAND, with trace silt, trace fine gravel		SP	12	24-31-42	
55.5	Gray, saturated, very dense, medium to coarse SAND, with little fine gravel		SP	13	17-23-32	
60.5	Light gray, saturated, very dense, fine to medium SAND, with trace silt		SP	14	21-26-33	
65.5				15	19-27-35	
70.5				16	22-29-37	
75.5	Light gray, saturated, very dense, fine to medium SAND, with some silt, some fine gravel		SM	17	20-25-31	
80.5	Boring terminated at 80.5 feet.					
85.5						
90.5						
95.5						
100.5						



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LOG OF BORING B-3

(Page 1 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 9/30/2011
End Date: : 9/30/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
0	Dark brown, saturated, medium stiff, organic SILT, with trace fine to medium sand, trace clay		OL	1	3-4-6	Scale: 1" ~ 1.5 feet Started at 7:15 a.m. in 39 feet of water.
5	Brown, saturated, medium dense, fine to medium SAND, with little silt, trace gravel		SM	2	4-4-6	
10		3		6-6-8		
15		4		14-8-6		
20	Gray, saturated, medium dense, fine SAND, with little silt			SM	5	
25	Brown, saturated, very dense, fine to coarse SAND, with little silt, trace fine gravel		SM	6	8-24-28	
30	Gray, saturated, loose to medium dense, fine SAND, with some silt, trace clay		SM	7	4-4-3	
35		8		5-5-4		
40		9		3-3-3		
45		10		5-4-8		
50	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	11	7-12-17	

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LOG OF BORING B-3

(Page 2 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 9/30/2011
End Date: : 9/30/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
50.5	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP			
55.5	Light brown, saturated, dense to very dense, fine to coarse SAND, with trace silt		SP	12	13-16-17	
60.5				13	20-26-29	
65.5	Brown, saturated, dense to very dense, fine to coarse SAND, with trace silt, trace fine gravel		SP	14	17-22-27	
70.5			SP	15	18-25-31	
75.5	Gray, saturated, hard, clayey SILT, with some fine sand			16	16-24-30	
80.5	Boring terminated at 80.5 feet		ML	17	18-27-29	
85.5						
90.5						
95.5						
100.5						



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LOG OF BORING B-4

(Page 1 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 9/29/2011
End Date: : 9/29/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
0	Gray, saturated, very soft to medium stiff clayey SILT, with trace fine sand			1	4-2-1	Scale: 1" ~ 1.5 feet Started at 7:00 a.m. in 39 feet of water.
5			MH	2	2-4-5	
10				3	4-4-3	
15	Gray, saturated, very dense, fine to medium SAND, with trace silt, trace fine gravel, trace shells		SP	4	9-28-42	
20	Brown, saturated, dense, fine to medium SAND, with trace silt, trace fine gravel		SP	5	10-16-17	
25	Gray, saturated, dense, fine to medium SAND, with trace silt		SP	6	17-17-22	
30	Gray, saturated, vert dense fine to medium SAND, with little silt		SM	7	6-32-40	
35	Light brown, saturated, very dense, fine to coarse SAND, with trace silt		SP	8	24-40-57	
40	Light gray, saturated, very dense, fine SAND, with trace silt		SP	9	15-28-40	
45	Brown, saturated, hard, clayey SILT, with little fine to medium sand		ML	10	6-14-21	
50	Brown, saturated, medium dense to very dense, fine to medium SAND, with some silt, trace fine gravel		SM	11	15-16-6	

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LOG OF BORING B-4

(Page 2 of 2)

GHD
16701 Melford Boulevard, Suite 330
Bowie, Maryland 20715

Project Name: : Rehoboth Beach WWTP
: Ocean Outfall
Project Number: : JDH-10/11/205
Start Date: : 9/29/2011
End Date: : 9/29/2011

Logged By: : J. Boehm
Driller: : M. Hynes
Drilling Method: : HSA
Total Depth: : 80.5 Feet

Depth in Feet	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow Count	REMARKS
50.5	Brown, saturated, medium dense to very dense, fine to medium SAND, with some silt, trace fine gravel		SM	12	21-29-28	
55.5	Brown, saturated, very stiff, clayey SILT, with some fine to medium sand		ML	13	10-12-13	
60.5	Brown, saturated, dense, fine to coarse SAND, with trace silt, trace fine gravel		SP	14	15-21-22	
65.5	Gray, saturated, very dense, medium to coarse SAND, with trace fine gravel		SP	15	24-42-58	
70.5	Gray, saturated, very dense, fine SAND, with trace silt		SP	16	22-36-40	
75.5				17	24-42-51	
80.5	Boring terminated at 80.5 feet.					
85.5						
90.5						
95.5						
100.5						

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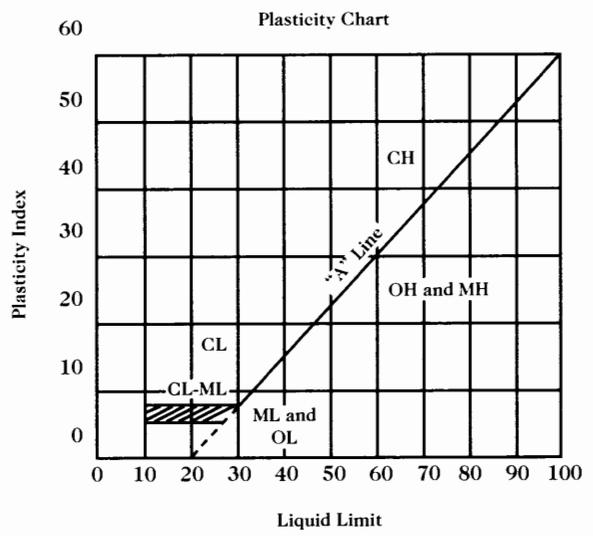


JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
 Monitoring Well Installation
 Construction Inspection and Materials Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Group Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No 200 sieve size)	Gravels (More than half of coarse fraction is larger than No 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel sand mixtures, little or no fines		
		Gravels with fines (Appreciable amount of fines)	GM ^a	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 Atterberg limits above "A" line with P.I. greater than 7	
			GC			Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction is smaller than No 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands.	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (Appreciable amount of fines)	SM ^a	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 Atterberg limits above "A" line with P.I. greater than 7	
			SC			Clayey sands, sand-clay mixtures
		Fine-grained soils (More than half material is smaller than No 200 sieve)	Silts and clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No 200 sieve size), coarse grained soils are classified as follows: Less than 5 percent More than 12 percent 5 to 12 percent Borderline cases requiring dual symbols ^b
				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 sandy or silty soils, elastic silts			
	CH	Inorganic clays of high plasticity, fat clays				
	OH	Organic clays of medium to high plasticity, organic silts				
Highly organic soils	Pt	Peat and other highly organic soils				





FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS (Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

PARTICLE SIZE IDENTIFICATION

Boulders	- 8 inch diameter or more
Cobbles	- 3 to 8 inch diameter
Gravel	- Coarse - 1 to 3 inch - Medium - 1/2 to 1 inch - Fine - 4.75 mm to 1/2 inch
Sand	- Coarse - 2.0 mm to 4.75 mm - Medium - 0.425 mm to 2.0 mm - Fine - 0.075 mm to 0.425 mm
Silt	- 0.075 mm to 0.002 mm

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS (Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Classification on logs are made by visual inspection of samples unless a sample has been subjected to laboratory classification testing.

Standard Penetration Test - Driving a 2.0" O.D., 1-3/8" I.D., splitspoon sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test value (N - value) can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.). (ASTM D-1586)

Strata Changes - In the column "Soil Descriptions," on the drill log, the horizontal lines represent strata changes. A solid line (—) represents an actually observed change, a dashed line (----) represents an estimated change.

Groundwater - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.