

MEMORANDUM

Date: May 17 2016
To: Mr. Art Leventis
From: Lee Weishar, Ph.D.; PWS
Re: Task 3 Wetlands Delineation Memorandum and Sediment Sampling

Introduction

On April 27, 2016, Woods Hole Group conducted a site assessment and wetland delineation of the coastal resource areas along the western side of Coughlin Park in Winthrop, MA for the Town of Winthrop. The work was performed at low tide to ensure all resource areas were visible and the assessment and delineation could be performed accurately. Figure 1 shows the location of Coughlin Park and identifies the area covered by the assessment and delineation.

Woods Hole Group delineated and flagged salt marsh, rocky intertidal, and coastal bank resource areas along the western shoreline of Coughlin Park. There is also a coastal beach seaward of the toe of the coastal bank. Each resource area will be described below in this memorandum. Additionally, a draft map of the locations of these resource areas is provided in Figure 2. This draft map is meant to help facilitate the discussion of the field work and the description of the resource areas and is not to be used for detailed planning or design purposes. The flags set out during the resource area delineation will be picked up and accurately mapped by the surveyor.

Salt Marsh delineation:

The Salt Marsh delineation was performed pursuant to 310 CMR 10.32 (2), to include all plants adapted to saline conditions. The dominant plant observed at the time of the delineation was salt marsh cord grass (*Spartina alterniflora*). Because it is so early in the season, the *S. alterniflora* was just beginning to sprout again for this growing season. However, the extent of the salt marsh could be discerned from the partially remaining *S. alterniflora* stems from last year. Flagging stations were marked as M-1 to M-40 (Figure 2).

The plant density throughout the salt marsh area was variable. At the far southern end (M-1 to M-6 and M-36 to M-40; Figure 2), the *S. alterniflora* stems are sparse, and were growing in a mix of sand and cobble (Figure 3). This sparse area was separated from a denser section of *S. alterniflora* that was growing in peat by a section of cobble devoid of salt marsh (Figure 4). This bare section is located in the drainage path of the large outfall pipe extending from the end of the stone revetment. This area is captured by wetland flags M-27 to M-32 (Figure 2). The denser, more robust area of *S. alterniflora* north of this drainage area also impounds a tidal pool area between the salt marsh and coastal beach (M-9 to M-15; Figure 2); the *S. alterniflora* grass in

this area had more new shoot growth than in the sparse, more cobble dominated areas (Figure 5). The tidal pool contained a variety of snails, crabs, and macroalgae, as well as schools of small fish.



Figure 1. Locator Map. The left-hand figure shows Coughlin Park's location in the regional context, while the right-hand figure shows the area of Coughlin Park that was evaluated during the April 27, 2016 site visit and wetland delineation.

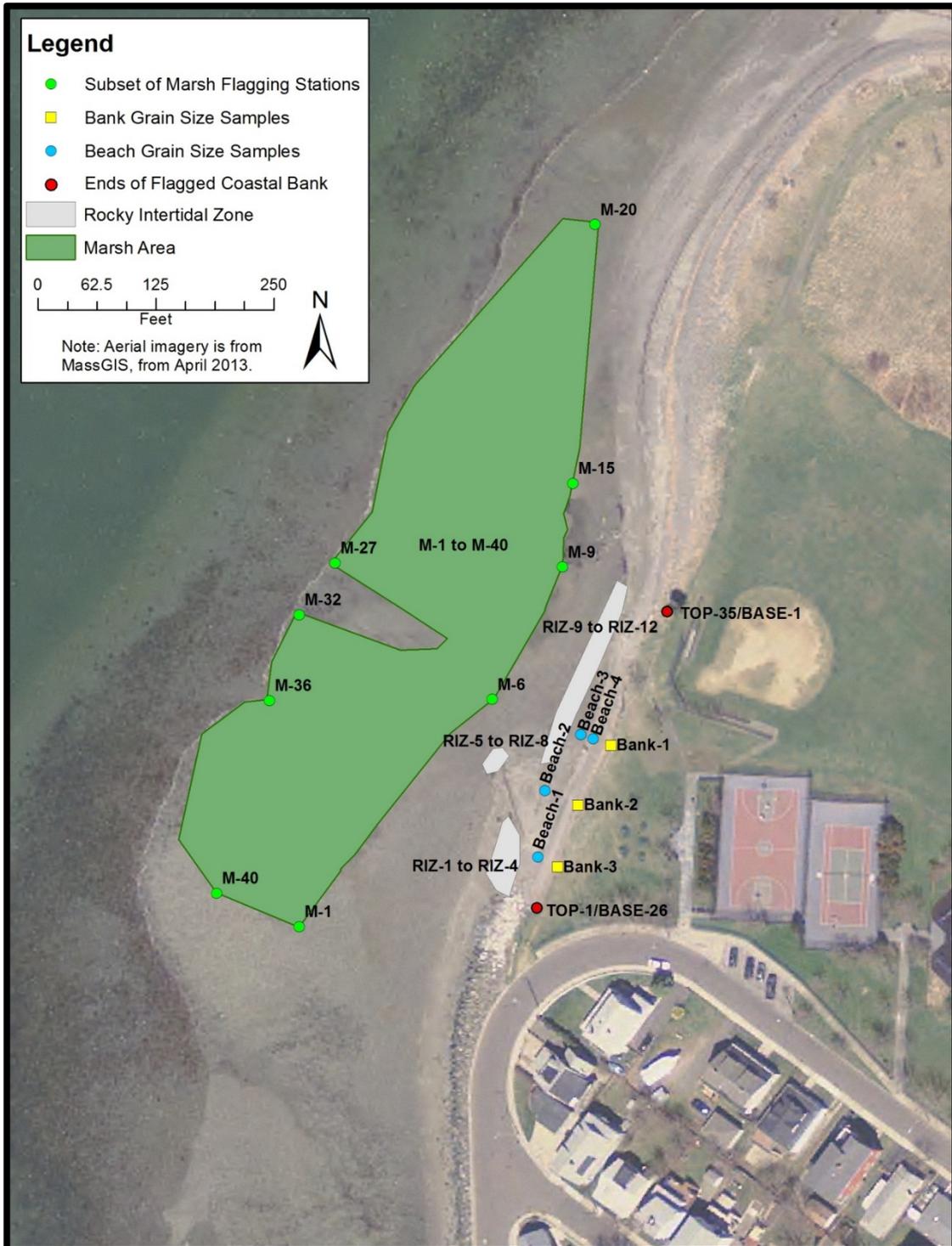


Figure 2. Estimated locations of mapped wetland resources at Coughlin Park.



Figure 3. Sparse *S. alterniflora* growing at the southern end of the salt marsh.



Figure 4. Sparse and dense areas of *S. alterniflora* separated by drainage from outfall pipe.



Figure 5. Dense section of *S. alterniflora* with new shoots in the salt marsh fronting an impounded tide pool.

Coastal Bank Delineation:

The Coastal Bank delineation was performed pursuant to 310 CMR 10.30 (2). The top of bank was marked with flagging stations labeled TOP-1 to TOP-35, in a south to north direction, while the toe of bank was marked with flagging stations labeled BASE-1 to BASE-26 in a north to south direction (Figure 2). TOP-1 and BASE-26 are located adjacent to the end of the large stone revetment along Grand View Avenue. Most of the top of the Coastal Bank is lawn, and is severely undercut and eroding (Figure 6). Much of this area is fronted by deteriorating hay bales that were placed for runoff control during the construction of the updated recreation facilities at the park last year. The ongoing erosion has exposed sidewalk framing material, filter fabric, and roots, among other objects, as the bank continues to recede. The exception to this, however, is the northern end of the Coastal Bank that was mapped (TOP-33 to TOP-35) less scarped and is an area of transition with a mix of grass and cobble berm (Figure 7).

Three samples were collected from the coastal bank to be analyzed for grain size; these were labeled BANK-1, BANK-2, and BANK-3. BANK-1 was collected from the southern end of the Coastal Bank, BANK-2 was collected from approximately the middle portion of the Coastal Bank, and BANK-3 was collected from the northern end of the Coastal Bank (Figure 2). Figure 8 shows an example of the different soil layers observed in the exposed face of the Coastal Bank.



Figure 6. Eroding coastal bank along southwestern edge of Coughlin Park.



Figure 7. Northern end of Coastal Bank (TOP-35) where it transitions to a cobble berm.



Figure 8. Grain size sample collected from BANK-3. Note the different soil layers, including a significant clay layer at the bottom.

Rocky Intertidal Shore Delineation:

The Rocky Intertidal Shore delineation was performed pursuant to 310 CMR 10.31 (2), to include all boulder strewn areas between the mean high water line and the mean low water line. Three Rocky Intertidal Shore areas were marked with flagging stations labeled RIZ-1 to RIZ-4, RIZ-5 to RIZ-8, and RIZ-9 to RIZ-12 (Figure 2). The most southern Rocky Intertidal Shore area (RIZ-1 to RIZ-4) was a cluster of large boulders located between the revetment and the outfall pipe. The next Rocky Intertidal Shore area (RIZ-5 to RIZ-8) was a cluster of large boulders around the end of the outfall pipe. The third, and largest of the Rocky Intertidal Shore areas, was comprised of small boulders (10 to 24 inches) located in a 15- to 20-foot wide band landward of the salt marsh (Figure 9).



Figure 9. Larger area of Rocky Intertidal Shore (RIZ-9 to RIZ-12) landward of the salt marsh.

Coastal Beach:

The Coastal Beach at the site was not delineated explicitly, however, all areas seaward of the toe of the bank that are not delineated as Salt Marsh or Rock Intertidal Shore are in fact Coastal Beach pursuant to 310 CMR 10.27 (2). In addition to the grain size samples collected from the Coastal Bank as described above, four additional sediment samples were collected from the Coastal Beach for grain size analysis (BEACH-1 to BEACH-4; Figure 2). BEACH-1 was collected seaward of BANK-1, and was predominantly sand. BEACH-2 was collected seaward of BANK-2, and was predominantly gravel and cobble with some sand. Finally, BEACH-3 and BEACH-4 were collected seaward of BANK-3, which had a mix of finer sand and gravel; the sampling team opted to collect two sediment samples located at different elevations of the Coastal Beach to more appropriately capture the range in grain size observed at the site.

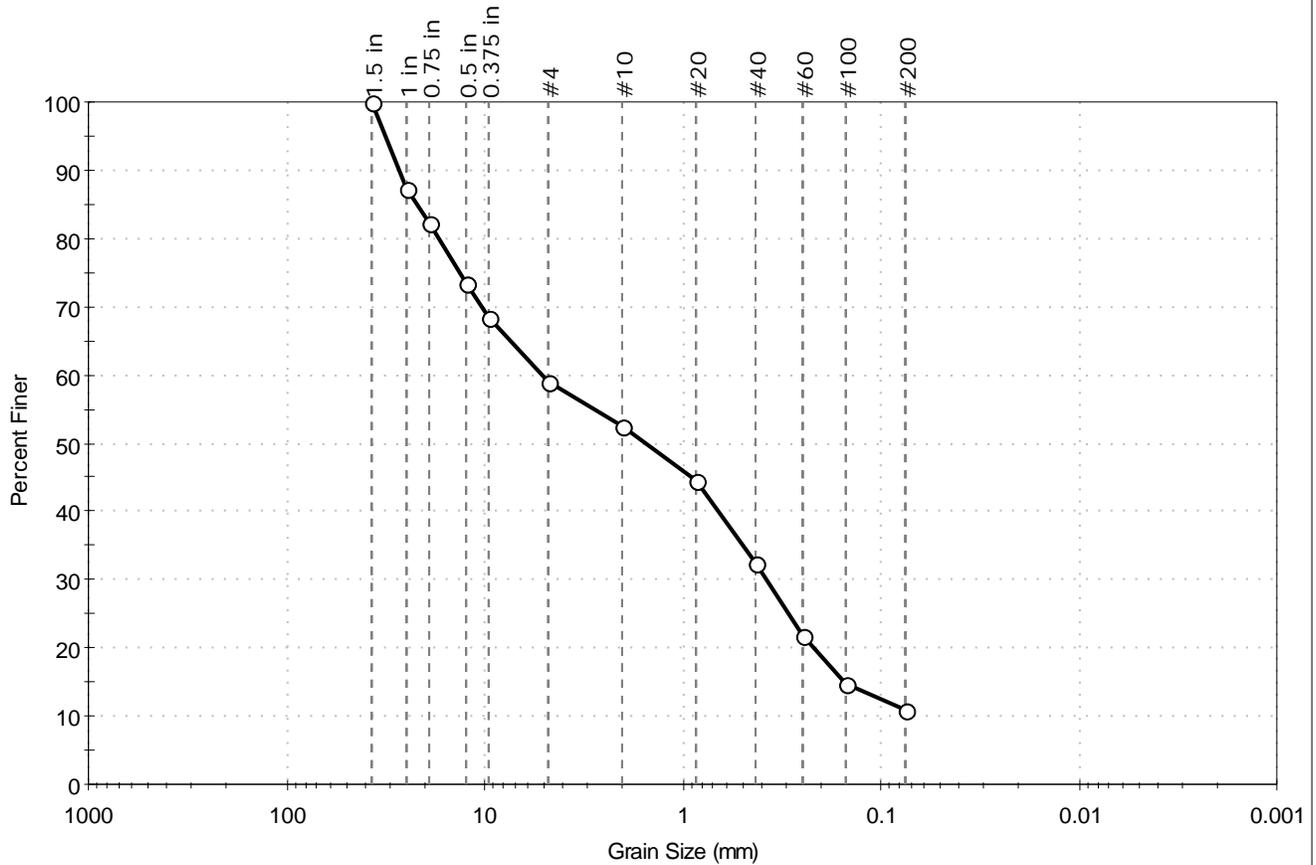
Grain Size Analysis

The results of the grain size analyses are attached to this memorandum. The results of the analyses show that the sediment have a cobble and gravel fraction that is intermixed with sand.



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Bank #1	Test Date: 05/10/16
Depth: ---	Test Id: 376419
Test Comment: ---	Tested By: jbr
Visual Description: Moist, brown sand with silt and gravel	Checked By: emm
Sample Comment: ----	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	40.9	48.3	10.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	87		
0.75 in	19.00	82		
0.5 in	12.50	74		
0.375 in	9.50	69		
#4	4.75	59		
#10	2.00	52		
#20	0.85	44		
#40	0.42	33		
#60	0.25	22		
#100	0.15	15		
#200	0.075	11		

<u>Coefficients</u>	
D ₈₅ = 22.0655 mm	D ₃₀ = 0.3755 mm
D ₆₀ = 5.0846 mm	D ₁₅ = 0.1542 mm
D ₅₀ = 1.5348 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

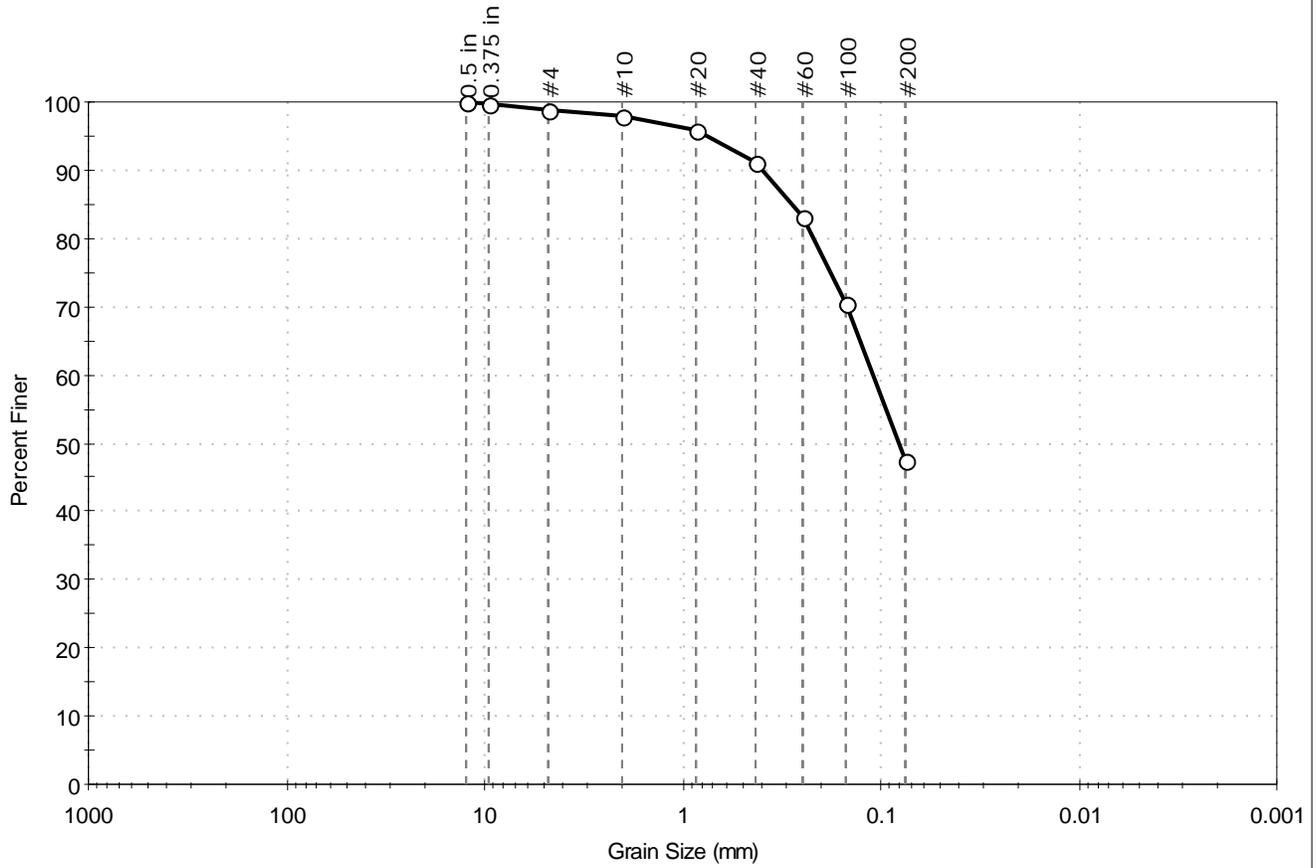
<u>Classification</u>	
ASTM	N/A
AASHTO	Stone Fragments, Gravel and Sand (A-1-b (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Bank #2	Tested By: jbr
Depth: ---	Test Date: 05/10/16
Test Comment: ---	Checked By: emm
Visual Description: Moist, very dark brown silty sand	Test Id: 376420
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	1.1	51.4	47.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	98		
#20	0.85	96		
#40	0.42	91		
#60	0.25	83		
#100	0.15	71		
#200	0.075	47		

<u>Coefficients</u>	
D ₈₅ = 0.2826 mm	D ₃₀ = N/A
D ₆₀ = 0.1092 mm	D ₁₅ = N/A
D ₅₀ = 0.0809 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

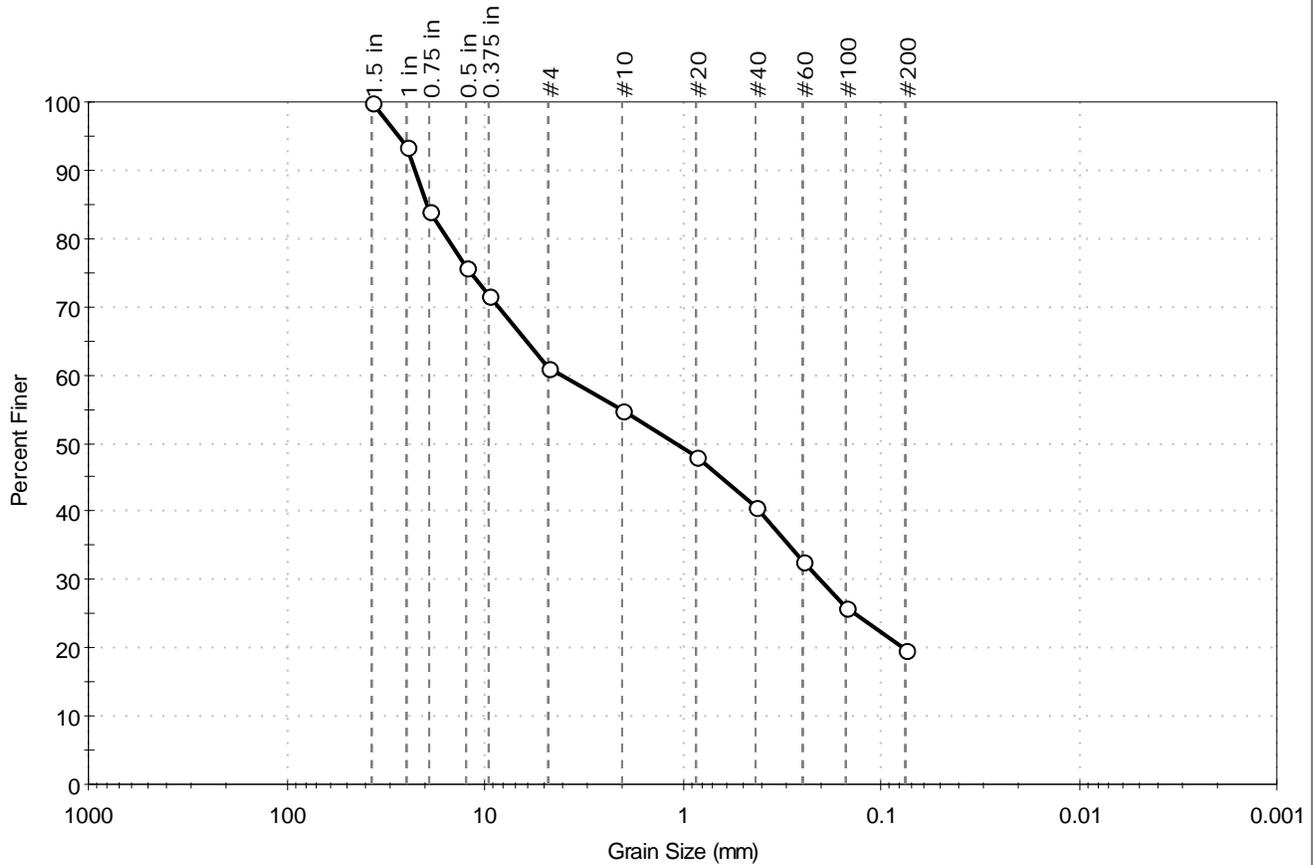
<u>Classification</u>	
ASTM	N/A
AASHTO	Silty Soils (A-4 (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Bank #3	Tested By: jbr
Depth: ---	Test Date: 05/10/16
Test Comment: ---	Checked By: emm
Visual Description: Moist, dark brown silty sand with gravel	Test Id: 376421
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	38.9	41.4	19.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	94		
0.75 in	19.00	84		
0.5 in	12.50	76		
0.375 in	9.50	72		
#4	4.75	61		
#10	2.00	55		
#20	0.85	48		
#40	0.42	41		
#60	0.25	33		
#100	0.15	26		
#200	0.075	20		

<u>Coefficients</u>	
D ₈₅ = 19.4975 mm	D ₃₀ = 0.2021 mm
D ₆₀ = 4.1026 mm	D ₁₅ = N/A
D ₅₀ = 1.0893 mm	D ₁₀ = N/A
C _u = N/A	C _c = N/A

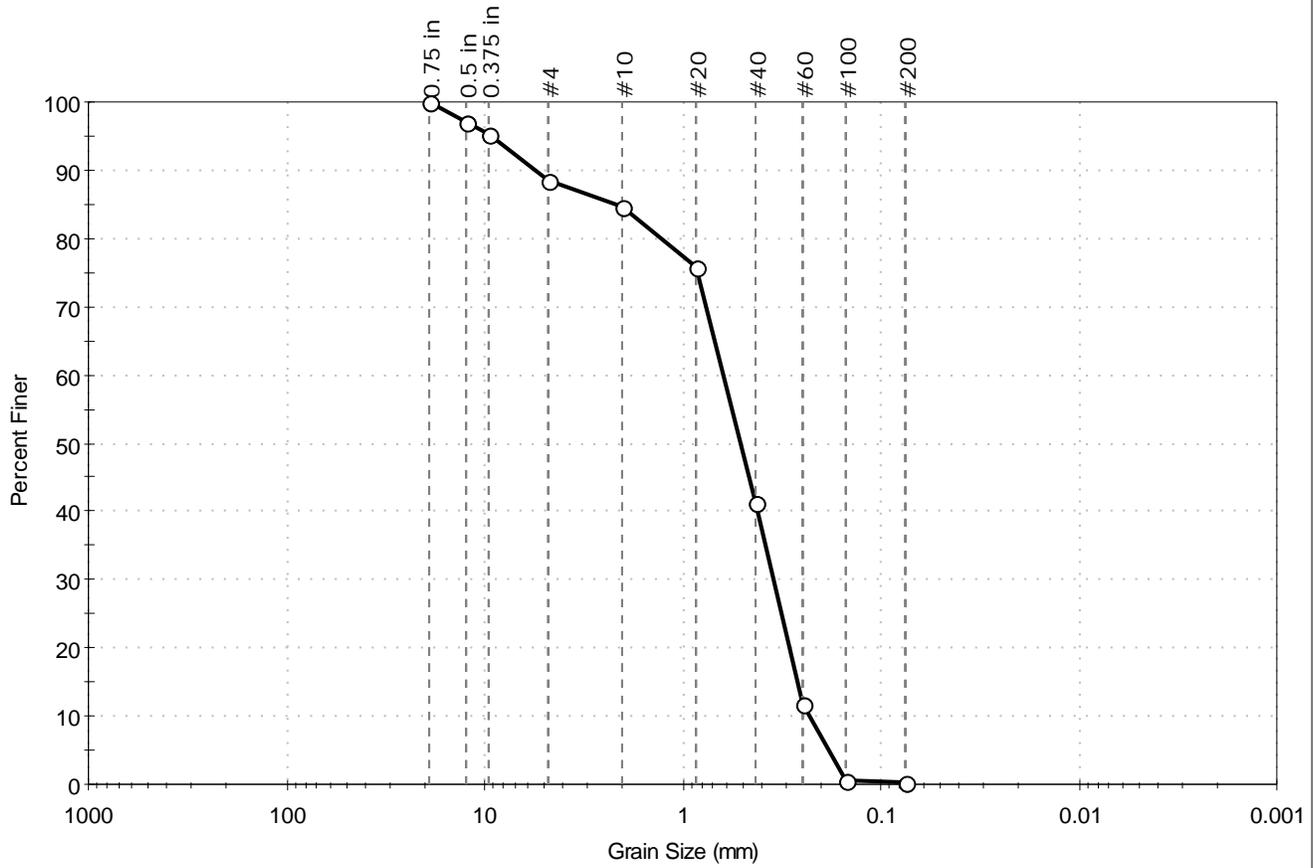
<u>Classification</u>	
ASTM	N/A
AASHTO	Stone Fragments, Gravel and Sand (A-1-b (0))

<u>Sample/Test Description</u>
Sand/Gravel Particle Shape : ROUNDED
Sand/Gravel Hardness : HARD



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Beach #1	Tested By: jbr
Depth: ---	Test Date: 05/10/16
Test Comment: ---	Checked By: emm
Visual Description: Moist, olive sand	Test Id: 376415
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	11.6	88.1	0.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	97		
0.375 in	9.50	95		
#4	4.75	88		
#10	2.00	85		
#20	0.85	76		
#40	0.42	41		
#60	0.25	12		
#100	0.15	1		
#200	0.075	0.3		

<u>Coefficients</u>	
D ₈₅ = 2.2304 mm	D ₃₀ = 0.3471 mm
D ₆₀ = 0.6188 mm	D ₁₅ = 0.2651 mm
D ₅₀ = 0.5063 mm	D ₁₀ = 0.2308 mm
C _u = 2.681	C _c = 0.844

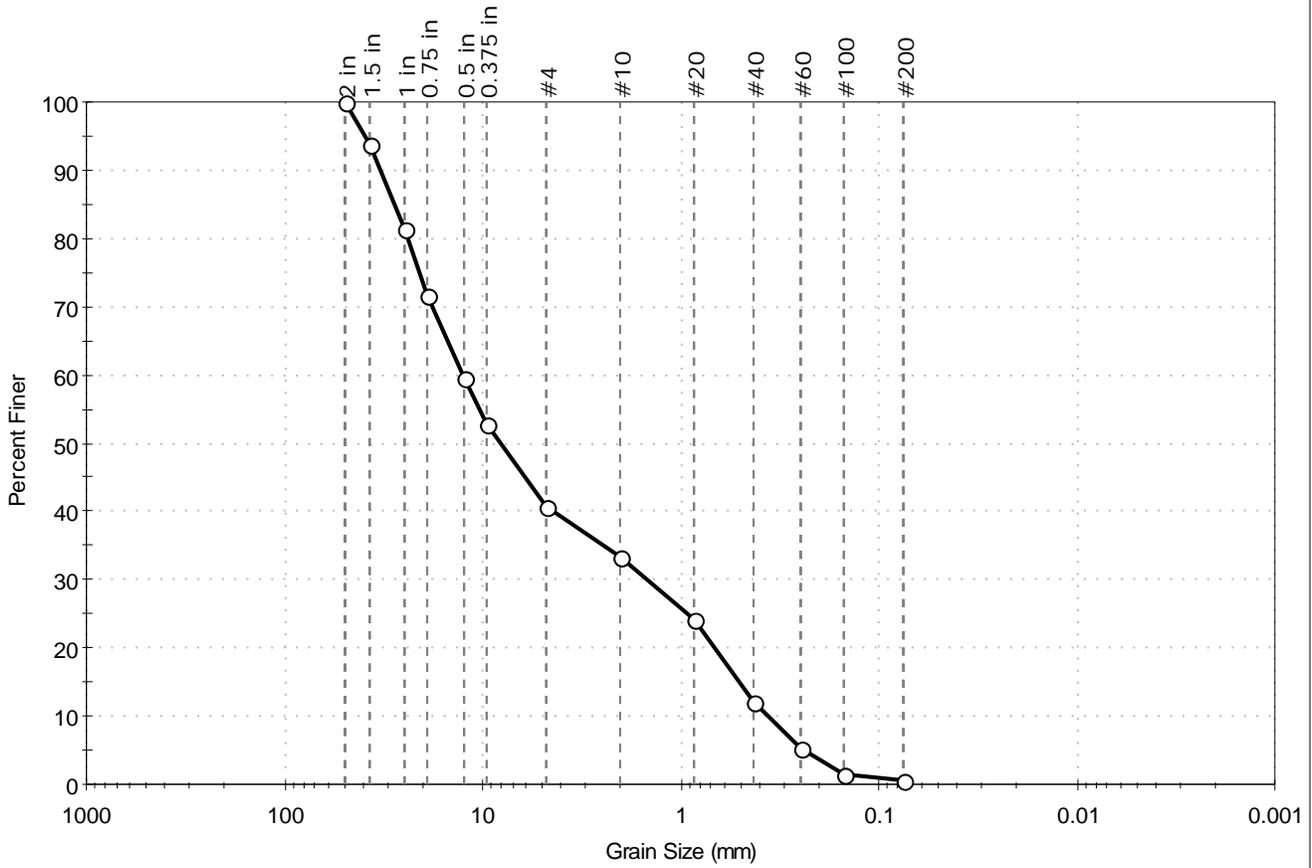
<u>Classification</u>	
<u>ASTM</u>	Poorly graded sand (SP)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-b (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape :	ROUNDED
Sand/Gravel Hardness :	HARD



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Beach #2	Test Date: 05/10/16
Depth: ---	Test Id: 376416
Test Comment: ---	Tested By: jbr
Visual Description: Moist, dark brown gravel with sand	Checked By: emm
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	59.2	40.3	0.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	94		
1 in	25.00	81		
0.75 in	19.00	72		
0.5 in	12.50	59		
0.375 in	9.50	53		
#4	4.75	41		
#10	2.00	33		
#20	0.85	24		
#40	0.42	12		
#60	0.25	5		
#100	0.15	1		
#200	0.075	0.5		

<u>Coefficients</u>	
D ₈₅ = 28.0541 mm	D ₃₀ = 1.4489 mm
D ₆₀ = 12.7171 mm	D ₁₅ = 0.5020 mm
D ₅₀ = 8.1061 mm	D ₁₀ = 0.3618 mm
C _u = 35.150	C _c = 0.456

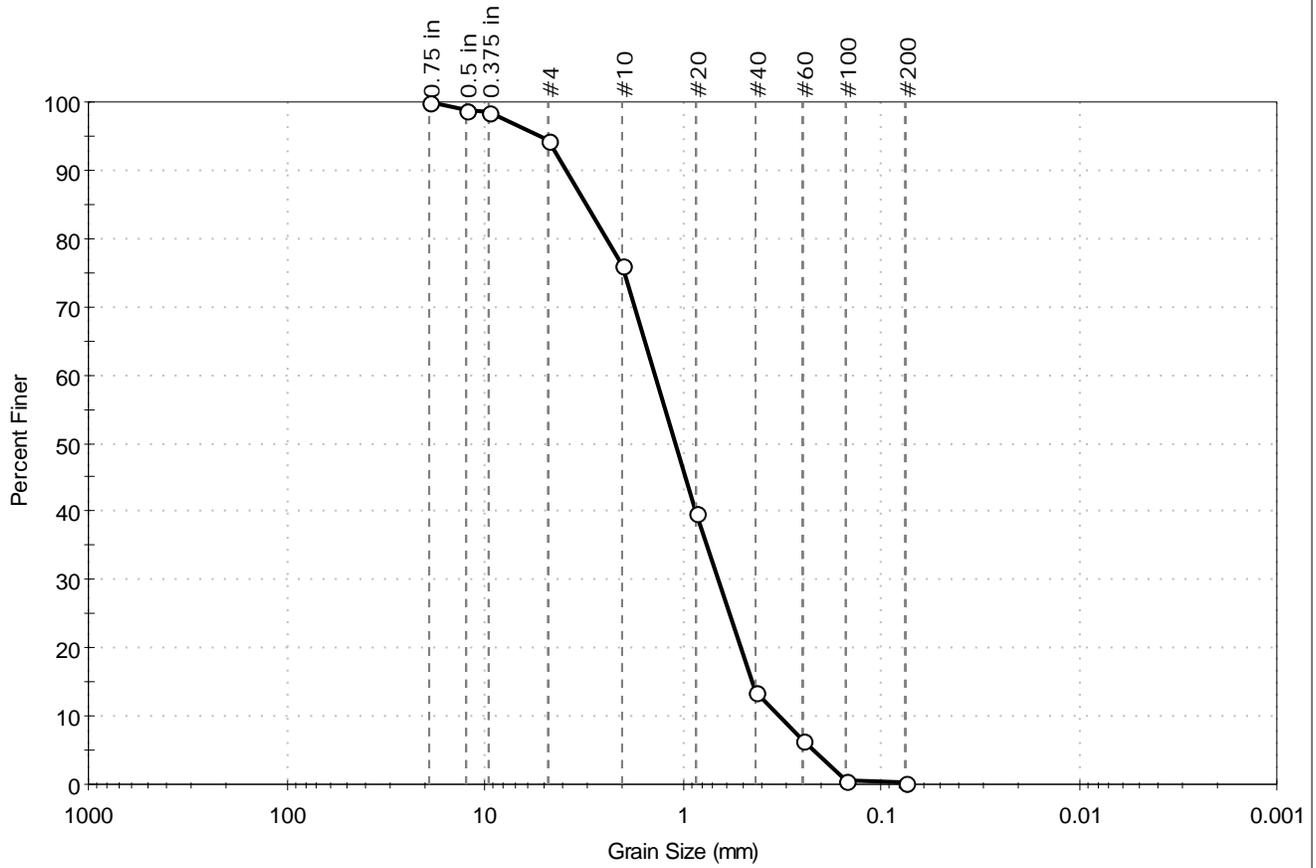
<u>Classification</u>	
<u>ASTM</u>	Poorly graded gravel with sand (GP)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-a (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape :	ROUNDED
Sand/Gravel Hardness :	HARD



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Beach #3	Tested By: jbr
Depth: ---	Test Date: 05/10/16
Test Comment: ---	Checked By: emm
Visual Description: Moist, very dark olive gray sand	Test Id: 376417
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	5.6	94.1	0.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	99		
0.375 in	9.50	98		
#4	4.75	94		
#10	2.00	76		
#20	0.85	40		
#40	0.425	13		
#60	0.25	7		
#100	0.15	1		
#200	0.075	0.3		

<u>Coefficients</u>	
D ₈₅ = 3.0387 mm	D ₃₀ = 0.6578 mm
D ₆₀ = 1.3694 mm	D ₁₅ = 0.4423 mm
D ₅₀ = 1.0829 mm	D ₁₀ = 0.3245 mm
C _u = 4.220	C _c = 0.974

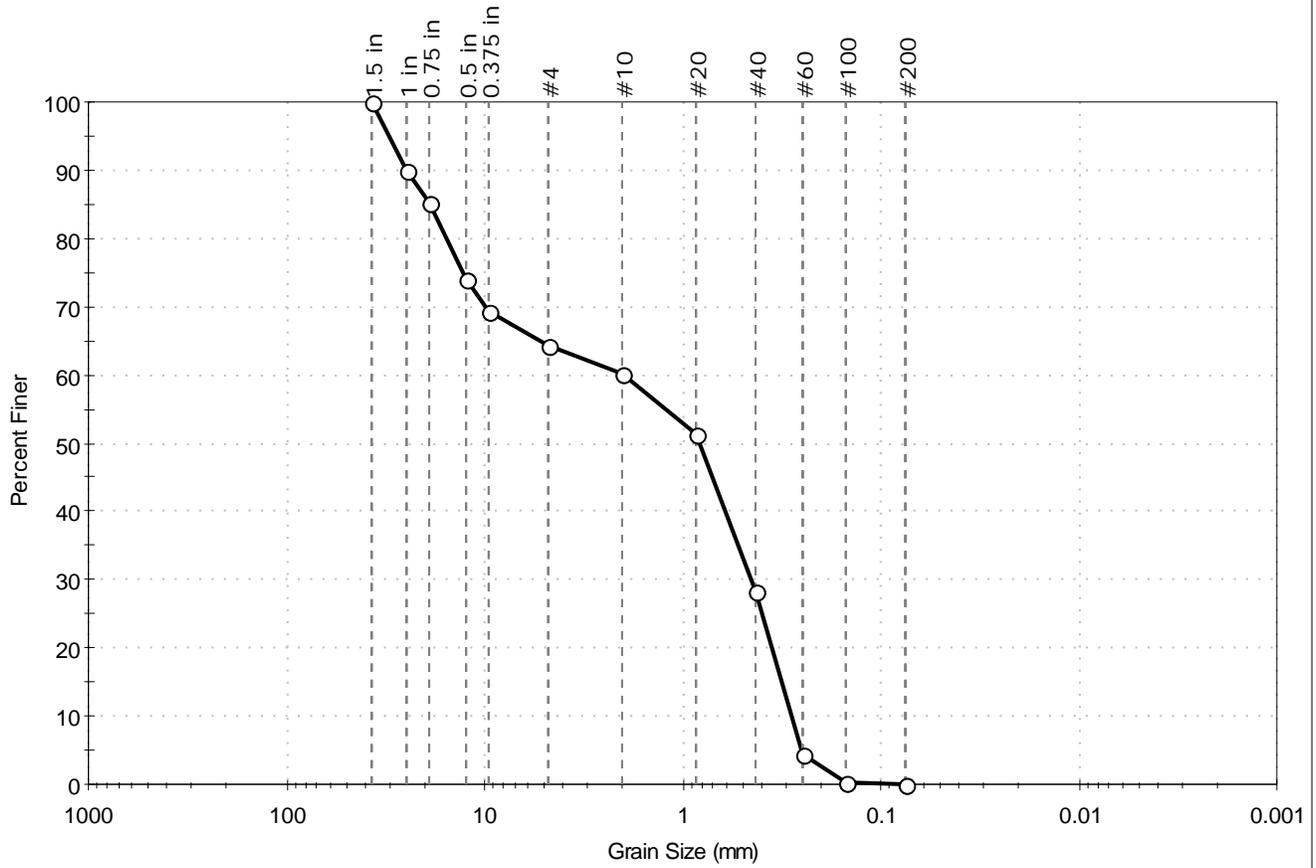
<u>Classification</u>	
<u>ASTM</u>	Poorly graded sand (SP)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-b (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape :	ROUNDED
Sand/Gravel Hardness :	HARD



Client: Woods Hole Group	Project No: GTX-304691
Project: Sand Samples	
Location: ---	
Boring ID: ---	Sample Type: bag
Sample ID: Beach #4	Tested By: jbr
Depth: ---	Test Date: 05/10/16
Test Comment: ---	Checked By: emm
Visual Description: Moist, gray sand with gravel	Test Id: 376418
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	35.8	64.1	0.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	90		
0.75 in	19.00	85		
0.5 in	12.50	74		
0.375 in	9.50	69		
#4	4.75	64		
#10	2.00	60		
#20	0.85	51		
#40	0.42	28		
#60	0.25	5		
#100	0.15	0		
#200	0.075	0.1		

<u>Coefficients</u>	
D ₈₅ = 18.8262 mm	D ₃₀ = 0.4476 mm
D ₆₀ = 1.9725 mm	D ₁₅ = 0.3158 mm
D ₅₀ = 0.8147 mm	D ₁₀ = 0.2823 mm
C _u = 6.987	C _c = 0.360

<u>Classification</u>	
<u>ASTM</u>	Poorly graded sand with gravel (SP)
<u>AASHTO</u>	Stone Fragments, Gravel and Sand (A-1-b (1))

<u>Sample/Test Description</u>	
Sand/Gravel Particle Shape : ANGULAR	
Sand/Gravel Hardness : HARD	