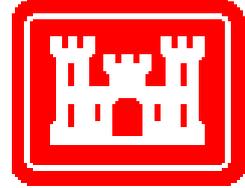




**US Army Corps of Engineers  
Alaska District  
Soils and Geology Section**



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**COASTAL STORM DAMAGE REDUCTION  
GRAVEL EXPLORATION  
(CWIS 013656)  
Barrow, Alaska**



March 2005

# **COASTAL STORM DAMAGE REDUCTION GRAVEL EXPLORATION BARROW, ALASKA MARCH 2005**

## **1. Introduction**

The City of Barrow, Alaska has a severe erosion problem due to storm wave action during summer and fall on the beach adjacent to town. The North Slope Borough and the U.S. Army Corps of Engineers have agreed to identify and explore for approximately two million cubic yards of gravel for the purpose of beach nourishment at Barrow. A literature search and a site visit identified three areas near Barrow as potential gravel sources. These potential source locations are shown on the Project Location and Vicinity Map presented as Figure 1. The sites have been designated as Cooper Island, BIA Prospect, and the Submerged Spit. The investigation presented in this report discusses the exploration performed at Cooper Island, the BIA Prospect and the Submerged Spit as well as four borings drilled along the beach adjacent to the City of Barrow (Beach Area Site) to help define the existing beach conditions.

The purpose of this exploration effort was to determine the characteristics of the soils along the beach adjacent to Barrow and to explore for a source of gravel or sand (approximately two million cubic yards) at the potential source locations identified as Cooper Island, the BIA Prospect, and the Submerged Spit.

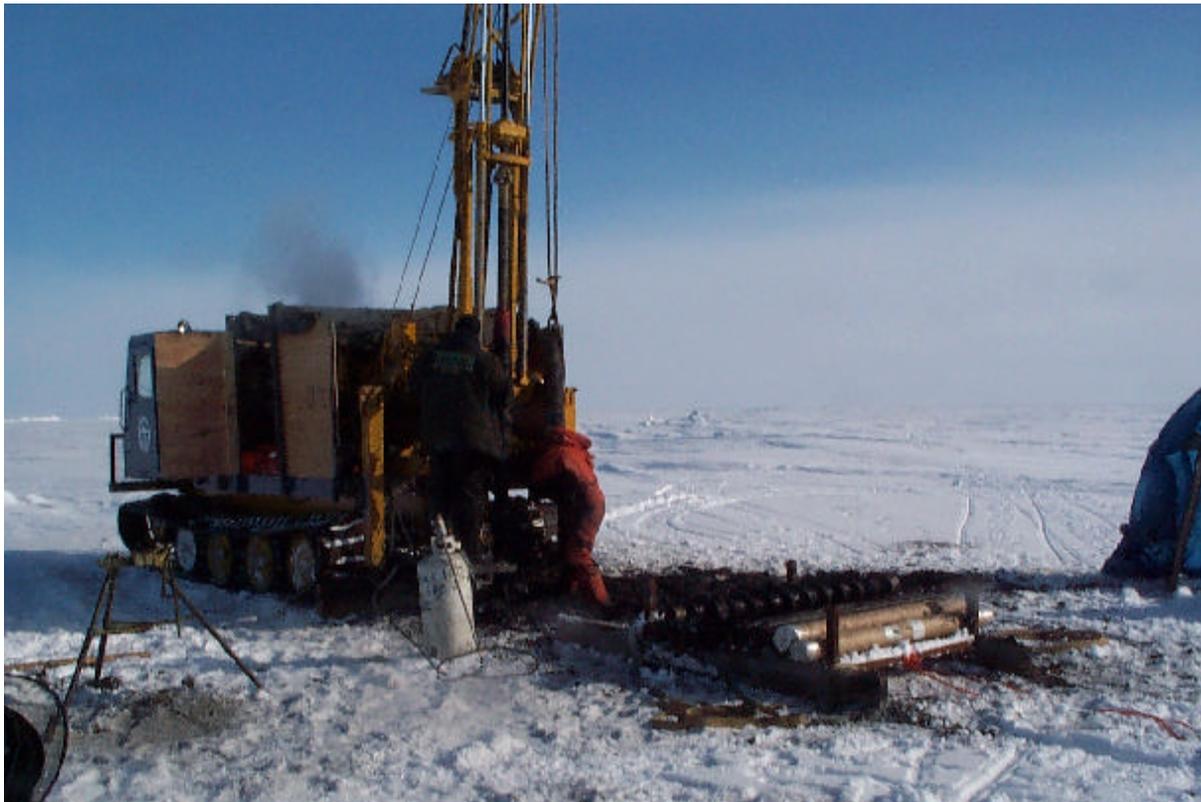


**Photo 1. View of beach area in front of Barrow in mid-April 2004.**

## **2. Field Exploration**

### **Onshore Exploration:**

The onshore subsurface exploration for the project was conducted 28 March through 27 April 2004. Two drill rigs owned and operated by Denali Drilling of Anchorage, Alaska were mobilized to Barrow for the exploration. The drill rigs were CME-45's mounted on N-60 Nodwell carriers. During the exploration, covered enclosures were constructed over the drill engines to allow heating the engines prior to starting. The engines of the Nodwell carriers remained running during the entire exploration. The exploration was performed in temperatures ranging from -25 to 15 degrees Fahrenheit with wind chills to -60 degrees. The drill rigs were fitted with continuous flight, eight-inch diameter, hollow-stem auger. An engineer with the Corps supervised the drilling. The engineer from the Corps and a geologist under contract to the Corps from R&M Consultants Inc. logged the test borings in accordance with ASTM D-2488, "Description and Identification of Soils (Visual - Manual Procedure)". Each drill rig was accompanied by a trained "bear-guard" supplied by LCMF, LLC (under contract to the North Slope Borough). The bear-guard's responsibility was to patrol the drilling area and watch for polar bears that are a constant threat in the area.



**Photo 2. Drilling operation on Cooper Island.**

The test boring locations were determined using a handheld GPS unit and referencing existing topographic features. These locations are only as accurate as the method implies. The coordinates for each of the boring locations shown on the boring logs are in NAD 83, UTM (feet). The boring locations are shown on the enclosed Test Boring Location Maps, Figures 2, 3, 4 and 5.



**Photo 3. Wind blown surface of Cooper Island.**

Soil samples generally were procured near the ground surface, at five feet below the surface, and at five-foot intervals thereafter. Grab samples were taken at the surface. Subsequent samples were taken with a 2.5-inch inside diameter, split spoon sampler driven with a 340-pound hammer falling 30 inches operated with a cathead and rope system. The sampler was driven 18 inches ahead of the auger or to refusal. The number of blows required to drive each six-inch increment is recorded on the exploration logs. The blow count is an indication of the relative density or consistency of the soil, but in this case, most of the soils are in a frozen state and the blow counts are not indicative of the thawed density of the soil encountered. In some cases where significant quantity of sample could not be recovered with the split spoon sampler, a grab sample was obtained from the auger flight upon reaching the surface. In the relatively smooth sided holes augered into the frozen soils, the drill advance

was purposefully stopped at the top of the sample interval to clear auger cuttings from the hole. Then the auger was advanced a foot and the cuttings were sampled as they were transported to the surface on the auger flight.



**Photo 4. Drilling operation at the BIA Prospect.**

**Offshore Exploration:**

The offshore exploration was conducted from 3 to 14 August, 2004. The drilling operation was performed from a 127-foot landing craft from Anchorage, Alaska. Two track mounted Mobile B-61 drill rigs and backup drilling equipment were transported aboard the landing craft from Anchorage to Barrow. The drilling operation and landing craft were furnished and operated by Denali Drilling under contract to the Corps. The transit time from Anchorage to Barrow required about 12 days each way. The offshore drilling operation was impacted by several weather conditions that included significant winds, seas to six feet or more, and extensive floating ice and ice bergs.

An engineer with the Corps supervised the drilling. The supervising engineer and a geologist under contract to the Corps from R&M Consultants Inc. logged

the test borings in accordance with ASTM D-2488, "Description and Identification of Soils (Visual - Manual Procedure)". The borings were drilled by setting four-inch conductor pipe into the sea bottom to the depth of sampling and then drilling the soil out of the pipe with a tri-cone bit and wash rotary drill methods. Soil samples generally were procured at five feet below mud-line, and at five-foot intervals thereafter. Samples were acquired with a 2.5-inch inside diameter, split spoon sampler driven with a 340-pound hammer falling 30 inches operated with an automatic hammer system. The sampler was driven 18 inches ahead of the conductor pipe drive-shoe. The number of blows required to drive each 6-inch increment is recorded on the exploration logs. The blow count is an indication of the relative density or consistency of the soil.



**Photo 5. Drilling operation on the landing craft off Point Barrow.**

The test boring locations were determined using the GPS unit on board the landing craft. The coordinates for each of the boring locations shown on the boring logs are in NAD 83, UTM (feet). The boring locations are shown on the enclosed Test Boring Location Map, Figure 5.

### **3. Laboratory Testing and Soils Classification**

A laboratory testing program was established to classify and determine physical properties of the soils encountered. The testing program consisted of a total of 144 sieve analyses. The samples recovered from the borings along the beach and the offshore samples were all tested and the samples from the BIA Prospect and Cooper Island that consisted of granular soil were generally selected for testing. Samples from the BIA Prospect and Cooper Island that were obviously silt/clay by visual classification were not selected for testing. The tests were performed in accordance with the latest edition of the following methods.

- ASTM D 422, "Standard Test Method for Particle Size Analysis of Soils".
- ASTM D 2487, "Standard Practice for Classification of Soils for Engineering Purposes (Uniform Soil Classification System)".

The soil descriptions and classifications contained in this report and presented on the final exploration logs are the project engineer's interpretation of the field logs and results of the laboratory testing program. The stratification lines represent approximate boundaries between soil types; the transitions are often gradual or not discernible by drill action. The exploration logs and the laboratory test results that apply to those logs are enclosed as Appendix A (Beach Borings), Appendix B (Cooper Island), Appendix C (BIA Prospect) and Appendix D (Submerged Spit).

### **4. Regional Geology**

General: The arctic coastal plain of Alaska is a broad, roughly triangular area bordered by the arctic foothills on the south and the Arctic Ocean on the north, and extending from Cape Beaufort on the west to the international boundary on the east. It is more than 400 miles long with a maximum width of 85 miles, and encompasses roughly 25,000 square miles. It is characterized by low topographic relief, thousands of lakes and swamps, and numerous meandering streams. For the most part, the plain is underlain by Cretaceous strata capped unconformably by a thin mantle of dominantly marine Quaternary sediments, called the Gubik formation. The surface continues beneath the ocean, and forms the shallow continental shelf, which is terminated offshore by the rim of the deeper basin of the Arctic Ocean.



**Photo 6. Example of a high ice content sample from the BIA Prospect.**

It is estimated that 50-75 percent of the coastal plain near Barrow is covered by lakes or marshes that occupy low areas of former lake basins. The basins are elongated and their long axes are parallel and oriented a few degrees west of north.

Plant assemblages range in composition from place to place according to the type, texture, and drainage of the land on which they grow. They are generally characterized by a mat that includes lichens, mosses, grasses, sedges, and shrubs. Near Barrow, all shrubs are dwarf and prostrate, but further south willows and alders may grow several feet high along rivers and streams. Factors affecting plant distribution include temperature, moisture, soil texture, fertility, site stability, snow depth, and wind exposure.



**Photo 7. Example of the silt with high ice content encountered at the BIA Prospect.**

## **5. Site Conditions**

### Surface:

At the time of the land-based exploration all areas were snow and ice covered although in some areas the ground surface was exposed by the wind. At Cooper Island the area is relatively flat and rises about eight to 10 feet above sea level. It appears that little or no vegetation exists on the island although driftwood and other scattered debris were observed protruding from the snow. The borings at Cooper Island were all drilled in areas where the snow could be removed and sand or gravel exposed.

The beach area adjacent to Barrow was covered with heavy snow and broken ice. Ice ridges to five feet in the work area and ridges to 40 feet or more could be seen a short distance offshore. The borings along the beach were all drilled through the sea ice.

The BIA Prospect area is gently rolling tundra with scattered lakes. The BIA Prospect area was wind blown and heavily drifted with snow to three feet.

During the offshore portion of the exploration the temperatures were generally in the 30's to low 40's and the wind was blowing constantly at 15 to 35 miles per hour. The wave action is a product of the ocean currents merging between the Beauford Sea and the Chukchi Sea and the wind. In general, the waves in the submerged spit area were seldom less than five feet in height. Although the tides are generally less than one foot in amplitude, the currents in the submerged spit area are on the order of at least three miles per hour. At times icebergs were numerous in the area and a hazard to the landing craft.



**Photo 8. Typical "gravel" deposit in sidewall of existing borrow area.**

Subsurface:

Beach Area—The four borings along the beach were drilled at increasing distances from the beach as they progress from east to west. These borings were given the designations BE-01 to BE-04. The soils encountered in the borings nearest the beach consisted of clean sand and as the distance from the surf-zone increased the soils contained more silt. Samples contained up to 30 percent gravel, but in general the soils have only about 10 percent gravel sized



**Photo 9. Typical Poorly Graded Sand with Gravel (SP) encountered on the BIA Prospect.**

material. The soil classifications ranged from clean sands (SP and SW) to silty sand (SM) and silt with sand (ML). The grain size analyses performed on the samples from the four borings along the beach consist predominately of fine sands. Boring BE-03 encountered sediments with a strong sewer odor assumed to be a result of sewage discharge from the nearby sewer lagoon.

Cooper Island—Ten borings were drilled on Cooper Island and the extension of Cooper Island to the east. The borings stretch over a distance of about four miles. These borings indicate that the island consists of a relatively clean sand layer above the silt and clay that compose the shallow sea floor. In general the sands extend only a few feet below sea level. The sands contain up to 40 percent gravel near the surface and the gravel content decreases with depth. Also, the silt content is near zero at the surface and increases with depth. In general, the sands contain 10-20 percent gravel and about five percent silt. The thickness of the sand layer varies with the topography of the island, but the average thickness of the sand layer encountered in the ten borings was 11 feet.



**Photo 10. Typical sand encountered during the drilling operation.**

BIA Prospect—The purpose of the exploration in the BIA Prospect area was to determine if the deposit currently used as the gravel borrow pit for projects in Barrow extends to the south. The general conclusion from this exploration is that the existing pit may be expanded but that expansion is limited by the gravel available. The entire area is underlain with permafrost. In general, the near surface soils at the site consist of frozen silts (ML) and silty sand (SM). These silty soils generally contain some organics and in some areas the ice content exceeds the percentage of soil. In general this surface layer is from 10 to 20 feet thick. Below the surface layer the soils generally consist of sands. In some areas the sands have sufficient silt content to classify as silty sand (SM). In other areas the sands are relatively clean and contain variable amounts of gravel that are generally less than ¾-inch in diameter. The most extensive deposit of relatively clean sand with gravel was encountered within the area defined by test borings BIA-16, BIA-30, BIA-31 and BIA-21. The soils below the sand generally consist of frozen silt (ML).

Submerged Spit—The soils recovered from the borings in the submerged spit area generally consist of silt (ML) or fine sand with 10 to 40 percent silt (SP-SM or SM). None of the samples recovered contained more than five percent gravel sized particles. The six borings drilled from Point Barrow north cover a substantial area but none of the borings encountered any material that appears to be appropriate for borrow.

## **6. Conclusions**

Beach Area—The soils along the Barrow beach consist generally of fine sands with variable silt contents. Most of the soils encountered contain only minor percentages of gravel sized particles.

Cooper Island—The soils on Cooper Island consist of clean sands with variable percentages of gravel. The granular soils extend from the island surface to the approximate elevation of the surrounding ocean surface. In general, this average thickness is about 10 feet or less. The granular soils are exposed at the surface and no overburden removal will be required for extraction. It appears that there is more than two million cubic yards of granular material available on the island.

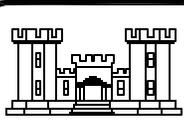
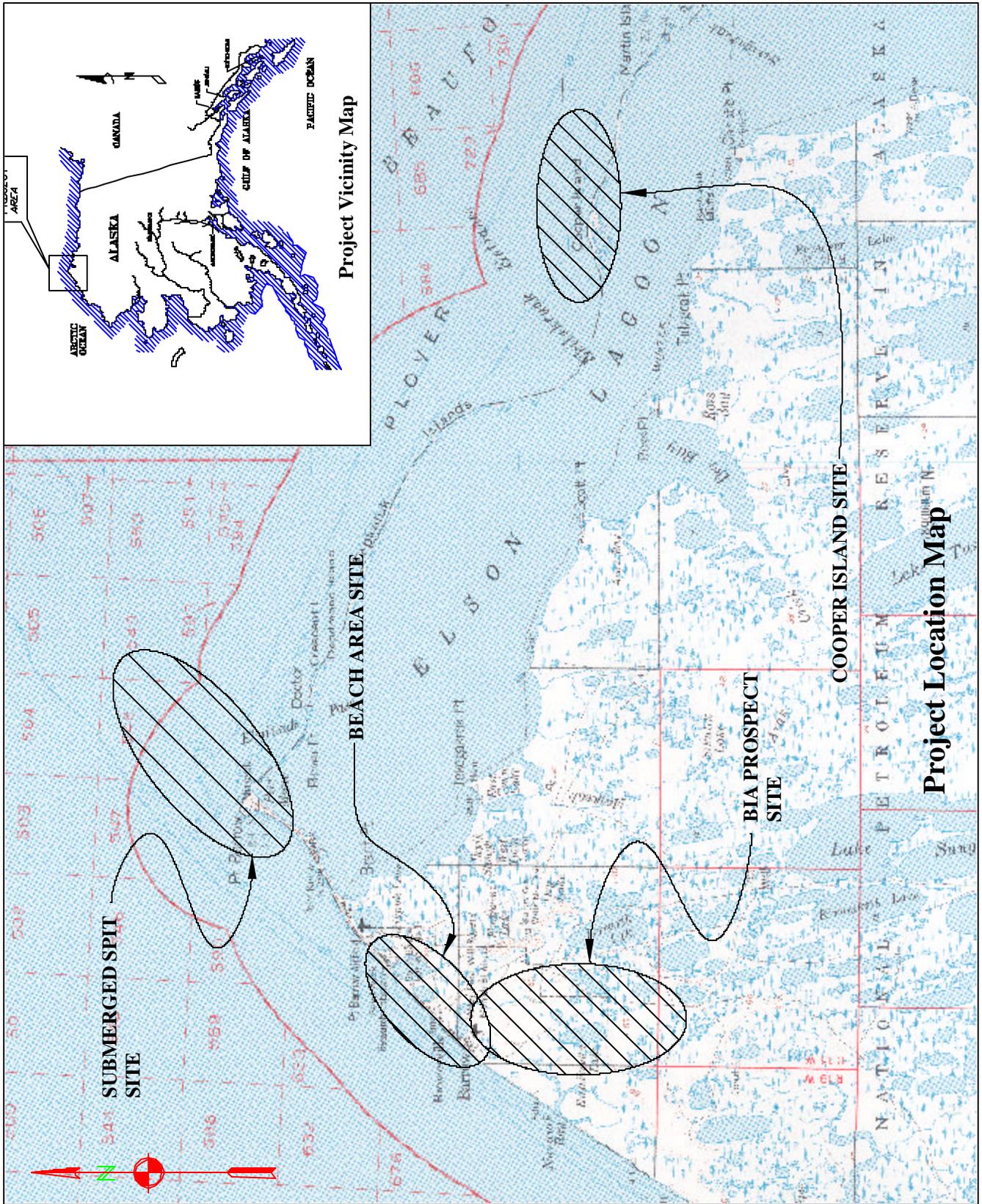
BIA Prospect—The BIA prospect has about two million cubic yards of granular soil that could be extracted and used for this project. The granular soils generally consist of sands with variable percentages of gravel and on the order of ten percent silt. The granular soils are covered with a mantle of frozen silt, organics and ice that generally is only slightly less in thickness than the granular deposit. The extraction of the granular material will require removal of

overburden in volumes approximately equal to the volume of extracted granular material.

Submerged Spit—The exploration in the offshore area north of Point Barrow did not identify any significant volume of usable granular soils. The soils encountered generally consisted of fine silty sands or sandy silts. These materials are deemed unsuitable for use as material for beach nourishment.

Enclosures:

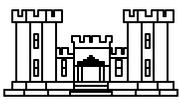
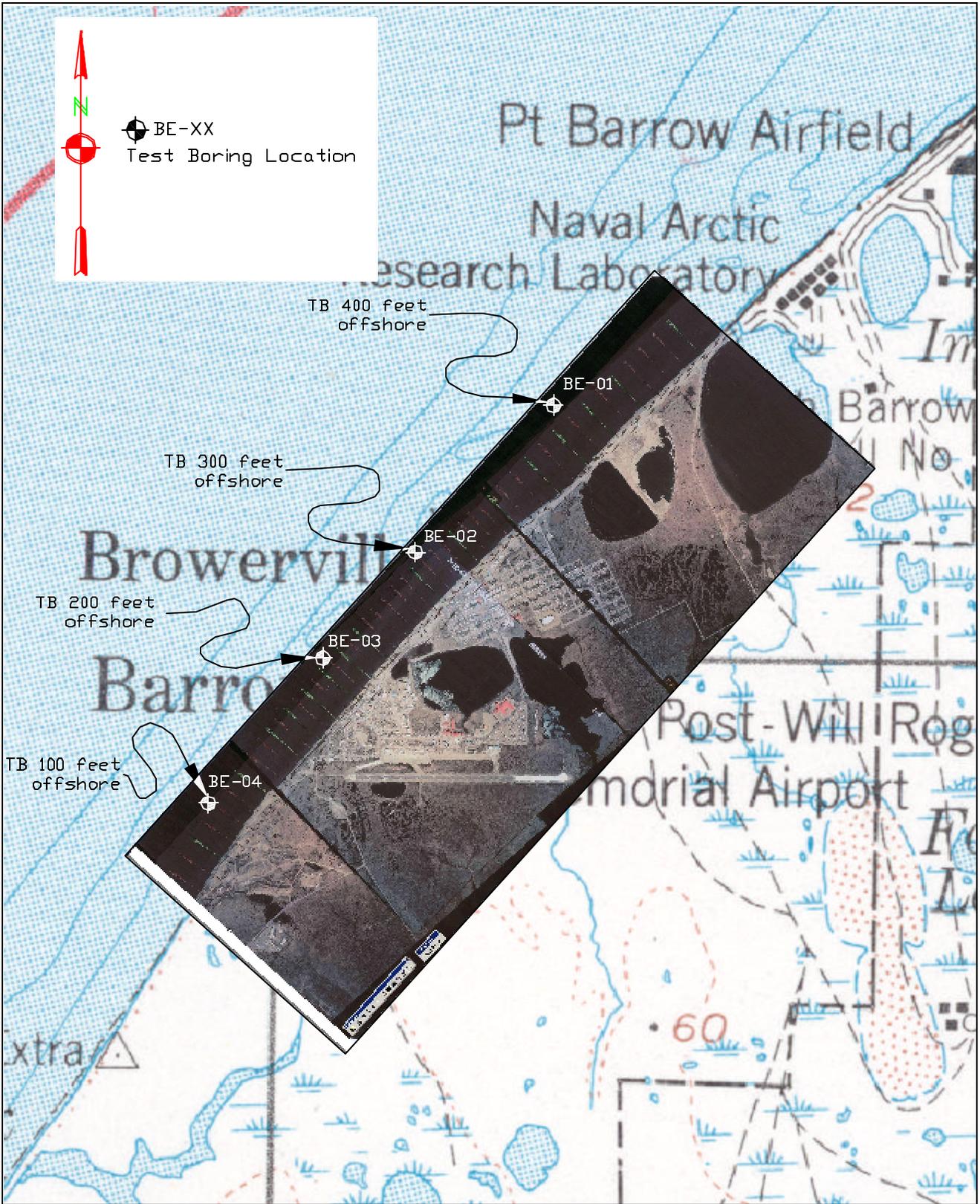
1. Figure 1 - Project Location and Vicinity Map
2. Figure 2 - Test Boring Location Map - Beach Area Site
3. Figure 3 - Test Boring Location Map - Cooper Island Site
4. Figure 4 - Test Boring Location Map - BIA Prospect Site
5. Figure 5 - Test Boring Location Map - Submerged Spit Site
6. Appendix A - Test Boring Logs and Laboratory Data - Beach Area
7. Appendix B - Test Boring Logs and Laboratory Data - Cooper Island
8. Appendix C - Test Boring Logs and Laboratory Data - BIA Prospect
9. Appendix D - Test Boring Logs and Laboratory Data - Submerged Spit



ALASKA DISTRICT  
CORPS OF ENGINEERS  
SOILS AND GEOLOGY

PROJECT LOCATION AND VICINITY MAP  
Barrow SDR (CWIS 013656)  
BARROW, ALASKA

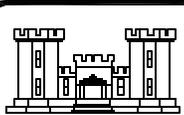
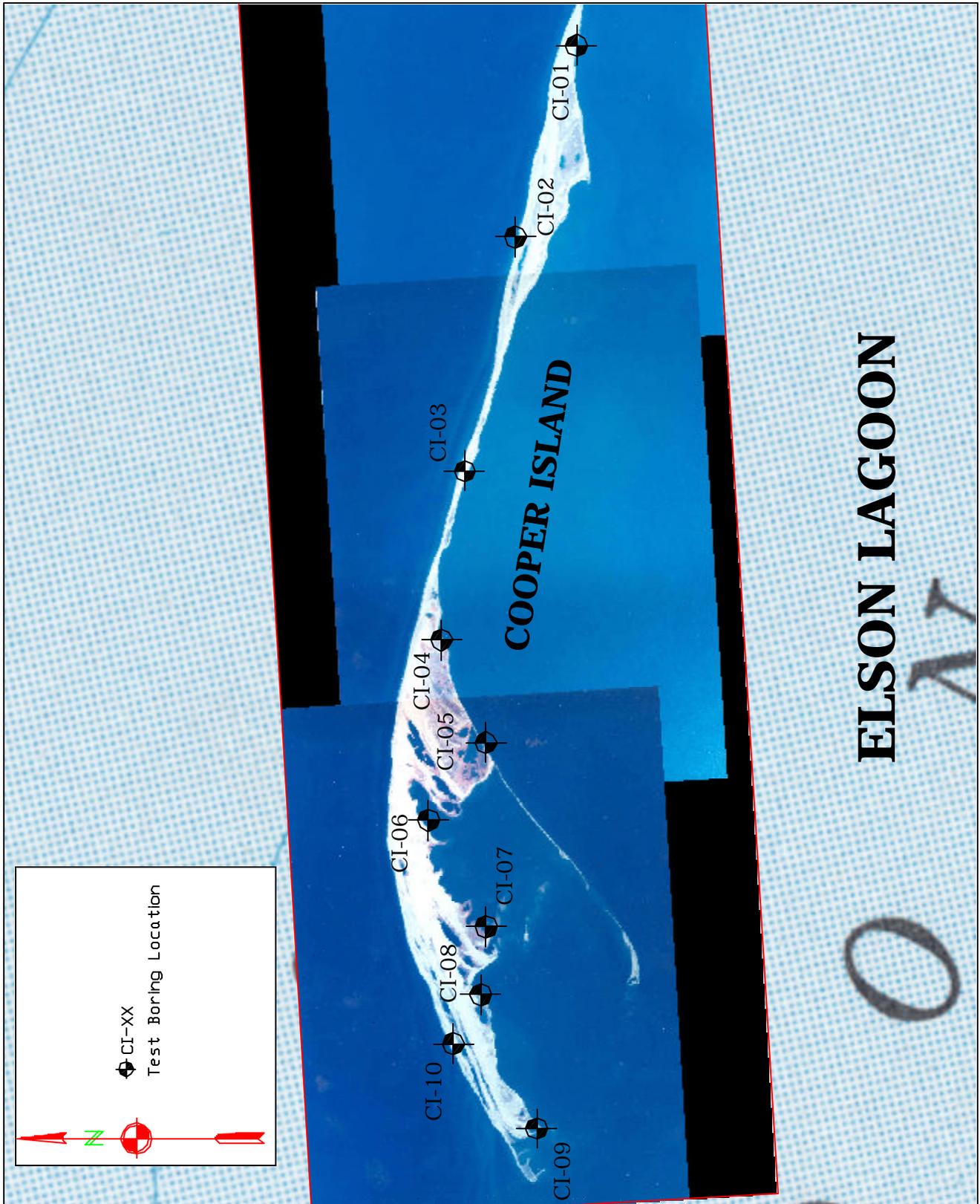
SCALE: NTS  
DATE: FEBRUARY 2005  
DRAWN/RW: RTW/CRW  
**FIGURE 1**



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TEST BORING LOCATION MAP  
Barrow SDR (CWIS 013656)  
Beach Area Site  
BARROW, ALASKA

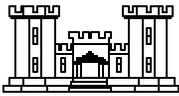
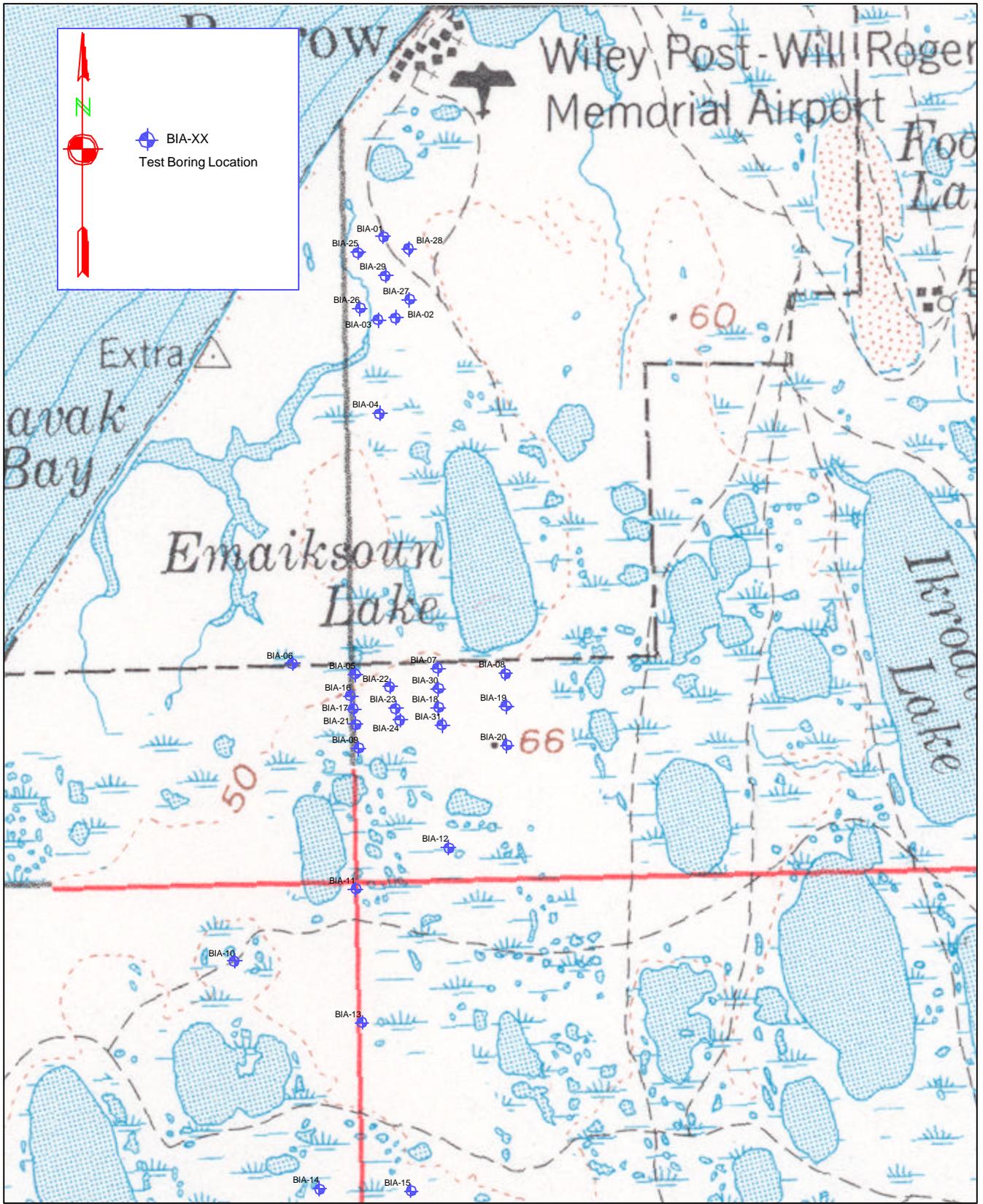
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DATE: FEBRUARY 2005  
DRAWN/RWV: RTW/CEA  
FIGURE 2



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TEST BORING LOCATION MAP  
BARROW SDR (CWIS 01656)  
COOPER ISLAND SITE  
BARROW, ALASKA

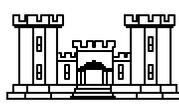
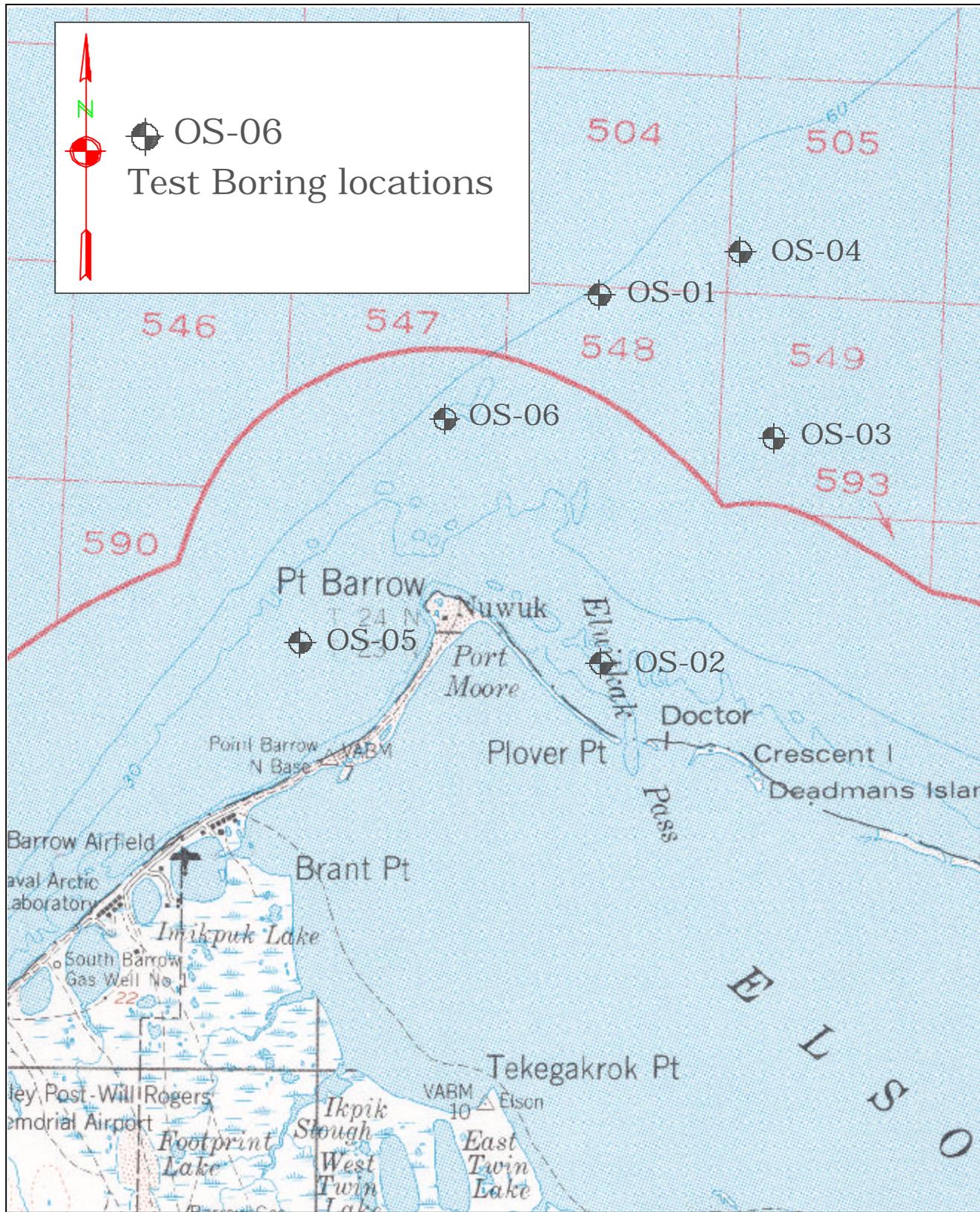
SCALE: NTS  
DATE: February 2005  
DRWN/RVW: KDM/CRW  
FIGURE 3



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TEST BORING LOCATION MAP  
Barrow SDR (CWIS 013656)  
BIA PROSPECT SITE  
BARROW, ALASKA

SCALE: NTS  
DATE: February 2005  
DRAWN/RVV: CEA/RTW  
FIGURE 4



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SOILS AND GEOLOGY

TEST BORING LOCATION MAP  
Barrow SDR (CWIS 013656)  
Submerged Spit Site  
BARROW, ALASKA

SCALE: NTS  
DATE: February 2005  
DRAWN/RW: RTW/GEA  
FIGURE 5

## **Appendix A**

### **Test Boring Logs and Laboratory Data Beach Area**



**ALASKA DISTRICT  
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ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **30 Mar 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,323,672 ft. ±**  
Easting: **638,870 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **BE-01** Permanent: **BE-01**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**9.5 ft. WD**

Depth Drilled:  
**25.0 ft.**

Total Depth:  
**25.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0 - 10						Ice	Ice						Sea ice, seasonal	
10 - 12		1	Nbn	NFS	5 5 5	SP	Poorly graded SAND	0	97	3			Dark gray, frozen, fine to medium sand	
12 - 16		2		NFS	2 1 2	SP	Poorly graded SAND	6	90	4			Dark gray-black, moist, fine to coarse sand	
16 - 20		3		F2	14 32 38	SW	Well-graded SAND with Gravel	23	75	2			Dark gray, moist, subrounded to rounded gravel, fine to coarse sand, 5 feet of heave	
20 - 25													Bottom of Hole 25.0 ft. Groundwater Encountered While Drilling: at an elevation of ft. PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **30 Mar 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,327,698 ft. ±**  
Easting: **645,063 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **BE-02** Permanent: **BE-02**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**9.0 ft. WD**

Depth Drilled:  
**24.0 ft.**

Total Depth:  
**24.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4						ICE	ICE with Sand/Fines Inclusions							Sea ice, seasonal
6														
8														
10														▼ Water
12														
14														
16		1			7 15 37	SP	Poorly graded SAND	2	94	4				Mudline Dark gray, wet, fine to medium sand High blow count due to heave in auger
18														
20														
22														
24		2				NR	No Recovery							
26														Bottom of Hole 24.0 ft. Groundwater Encountered While Drilling: at an elevation of ft. PID = (Cold/Hot) Photo Ionization Detector
28														
30														
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDGT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **31 Mar 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,324,365 ft. ±**  
Easting: **642,258 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **BE-03** Permanent: **BE-03**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**5.0 ft. WD**

Depth Drilled:  
**24.0 ft.**

Total Depth:  
**25.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Froze ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0 - 18						Ice	Ice						Ice	
18 - 19		1		F3	2	SM	Silty SAND with Gravel	30	45	25	0.25		Dark gray, wet, subrounded to subangular gravel, fine to coarse sand, NP fines, strong sewer odor	
19 - 24		2		F3	3	SM	Silty SAND	9	58	33	0.5		Dark gray, wet, subrounded to rounded gravel, fine to coarse sand, NP fines	
24 - 26		3		NFS	2	SP	Poorly graded SAND	12	87	1			Dark gray, black, wet, fine to coarse sand	
26 - 25.5													Bottom of Hole 25.5 ft. Groundwater Encountered While Drilling: at an elevation of ft. PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **1 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,320,008 ft. ±**  
Easting: **638,941 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **BE-04** Permanent: **BE-04**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**6.0 ft. WD**

Depth Drilled:  
**22.0 ft.**

Total Depth:  
**23.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

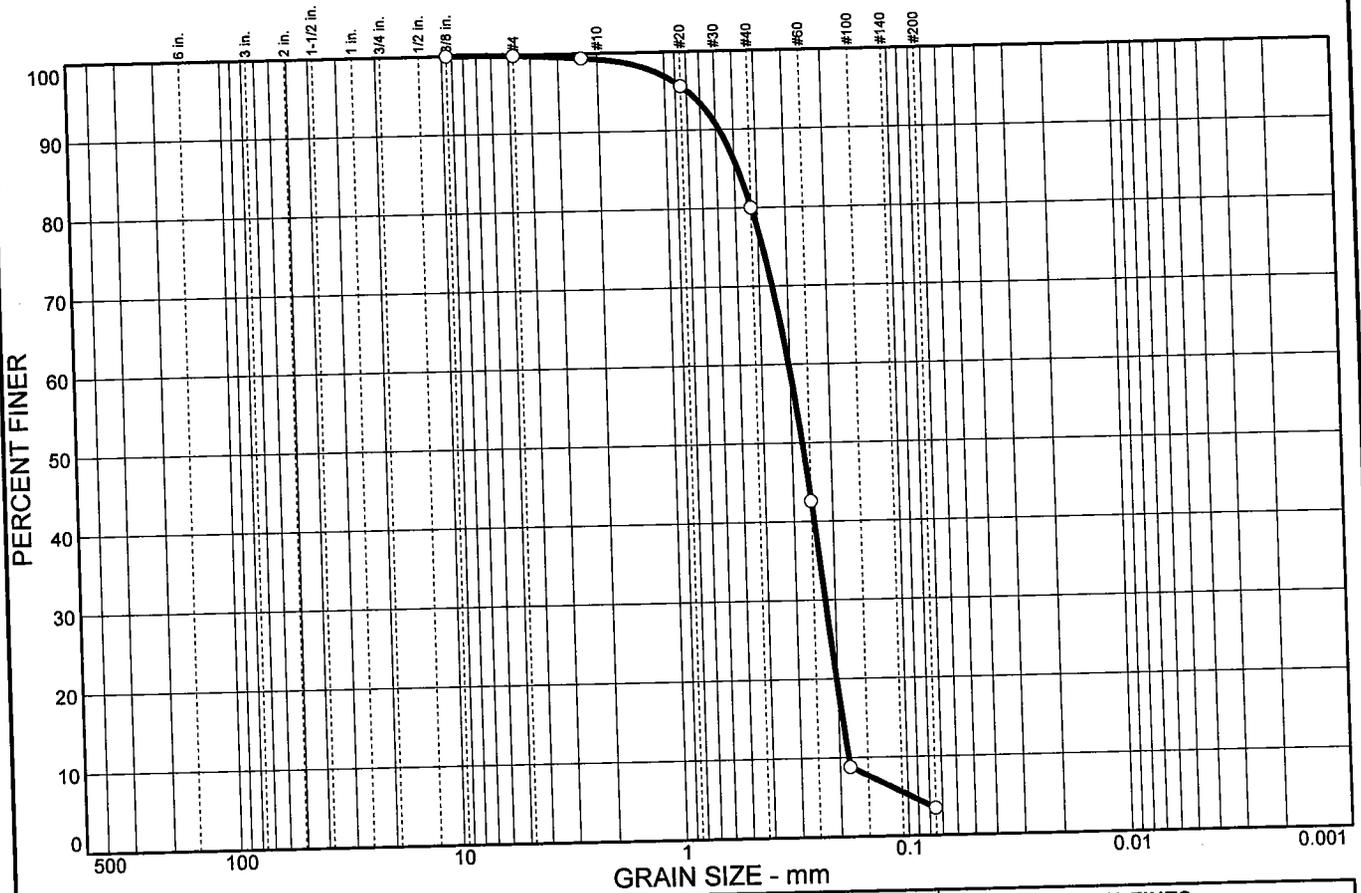
Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2						Ice	Ice						Ice	
4														
6													Water	
8														
10														
12		1	Nbn	F4	2 7 6	ML	SILT with Sand	0	29	71			Brown, frozen, fine sand, nonplastic (NP) to low plasticity fines, trace organic	
14														
16														
18		2		F3	1 2 9	SM	Silty SAND	0	59	41			Brown, wet, fine sand, NP fines	
20														
22		3		F3	5 7 10	SM	Silty SAND	0	58	42			Brown, wet, fine sand, NP fines	
24													Bottom of Hole 23.5 ft. Groundwater Encountered While Drilling: at an elevation of ft. PID = (Cold/Hot) Photo Ionization Detector	
26														
28														
30														
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.7	19.2	76.6	3.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.9		
#8	99.4		
#20	95.6		
#40	80.0		
#60	42.6		
#80	8.8		
#200	3.4		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.484              D<sub>60</sub>= 0.304              D<sub>50</sub>= 0.270  
D<sub>30</sub>= 0.222              D<sub>15</sub>= 0.193              D<sub>10</sub>= 0.183  
C<sub>u</sub>= 1.66                      C<sub>c</sub>= 0.89

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

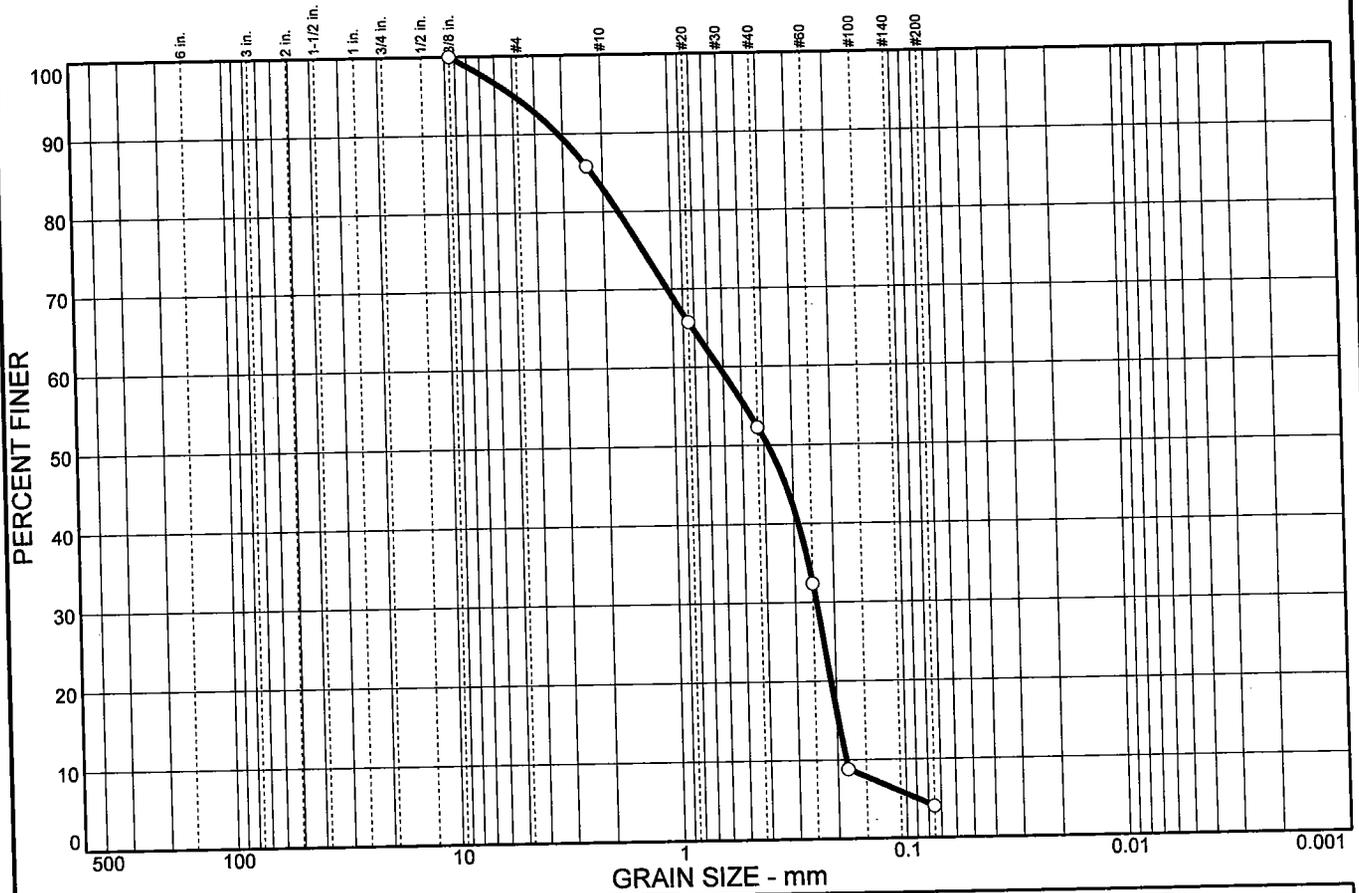
**Sample No.:** 6006  
**Location:** BE-01 #1

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 12 FT 3.6 m

<h2>Mappa TestLab</h2>	<p><b>Client:</b> U.S. Army Corps of Engineers, Alaska District</p> <p><b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska</p> <p><b>Project No.:</b> 2004-148</p>
	<b>Figure</b>

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.5	11.6	30.6	48.3	4.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 8	85.8		
# 20	65.7		
# 40	52.3		
# 60	32.4		
# 80	8.8		
# 200	4.0		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 2.25              D<sub>60</sub>= 0.628              D<sub>50</sub>= 0.384  
D<sub>30</sub>= 0.241              D<sub>15</sub>= 0.197              D<sub>10</sub>= 0.184  
C<sub>u</sub>= 3.42                      C<sub>c</sub>= 0.51

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6007  
 Location: BE-01 # 2

Source of Sample: Client Samples

Date:  
 Elev./Depth: 15 FT 4.5 m

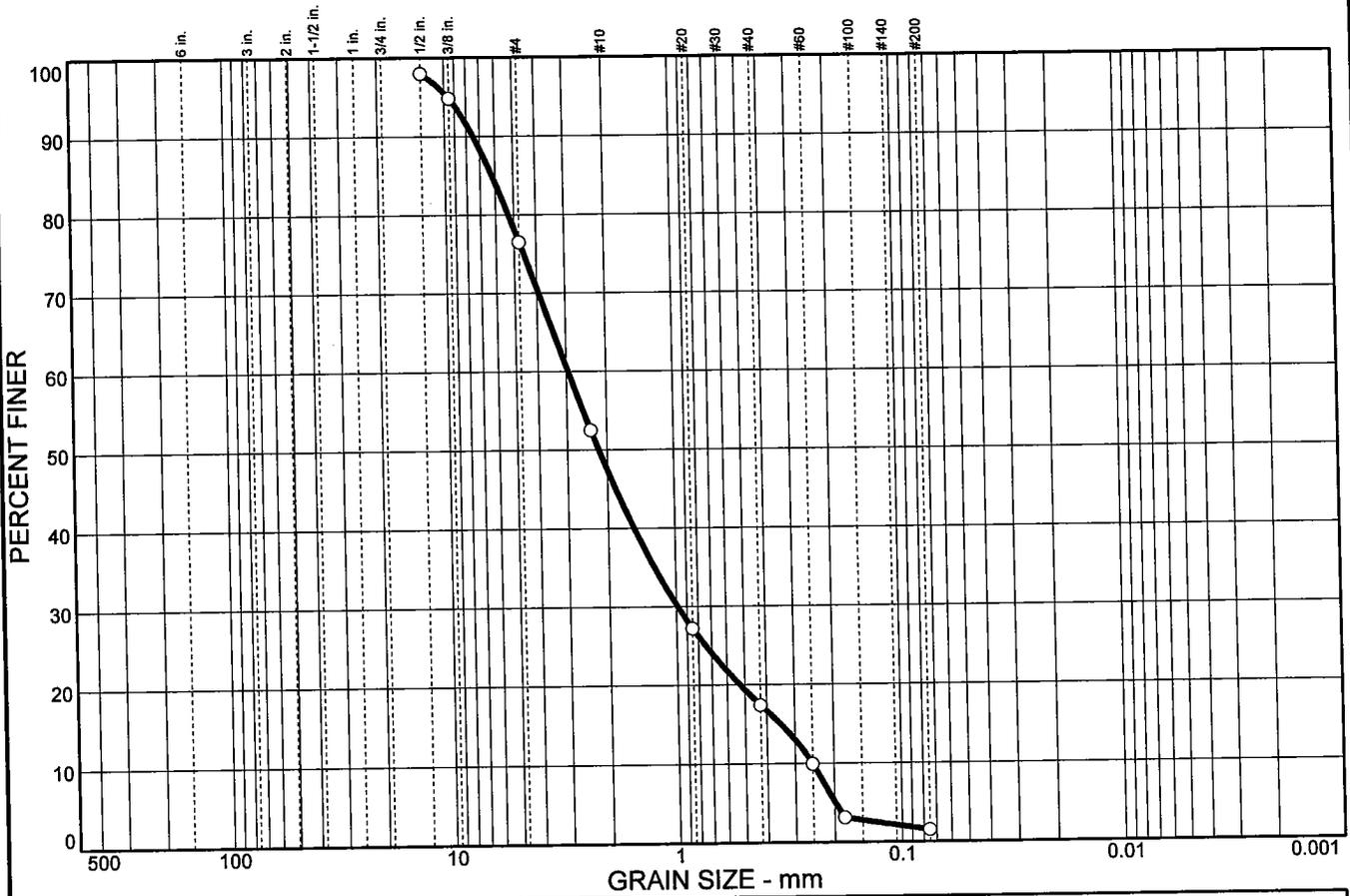
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			29.1	30.0	15.9	1.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	98.0		
3/8 in.	94.8		
# 4	76.5		
# 8	52.5		
# 20	27.2		
# 40	17.4		
# 60	9.9		
# 80	3.1		
# 200	1.5		

**Soil Description**

Well-graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.21              D<sub>60</sub>= 2.95              D<sub>50</sub>= 2.18  
D<sub>30</sub>= 0.987            D<sub>15</sub>= 0.347            D<sub>10</sub>= 0.251  
C<sub>u</sub>= 11.75              C<sub>c</sub>= 1.31

**Classification**

USCS= SW                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

**Sample No.:** 6008  
**Location:** BE-01 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 20 FT 6 m

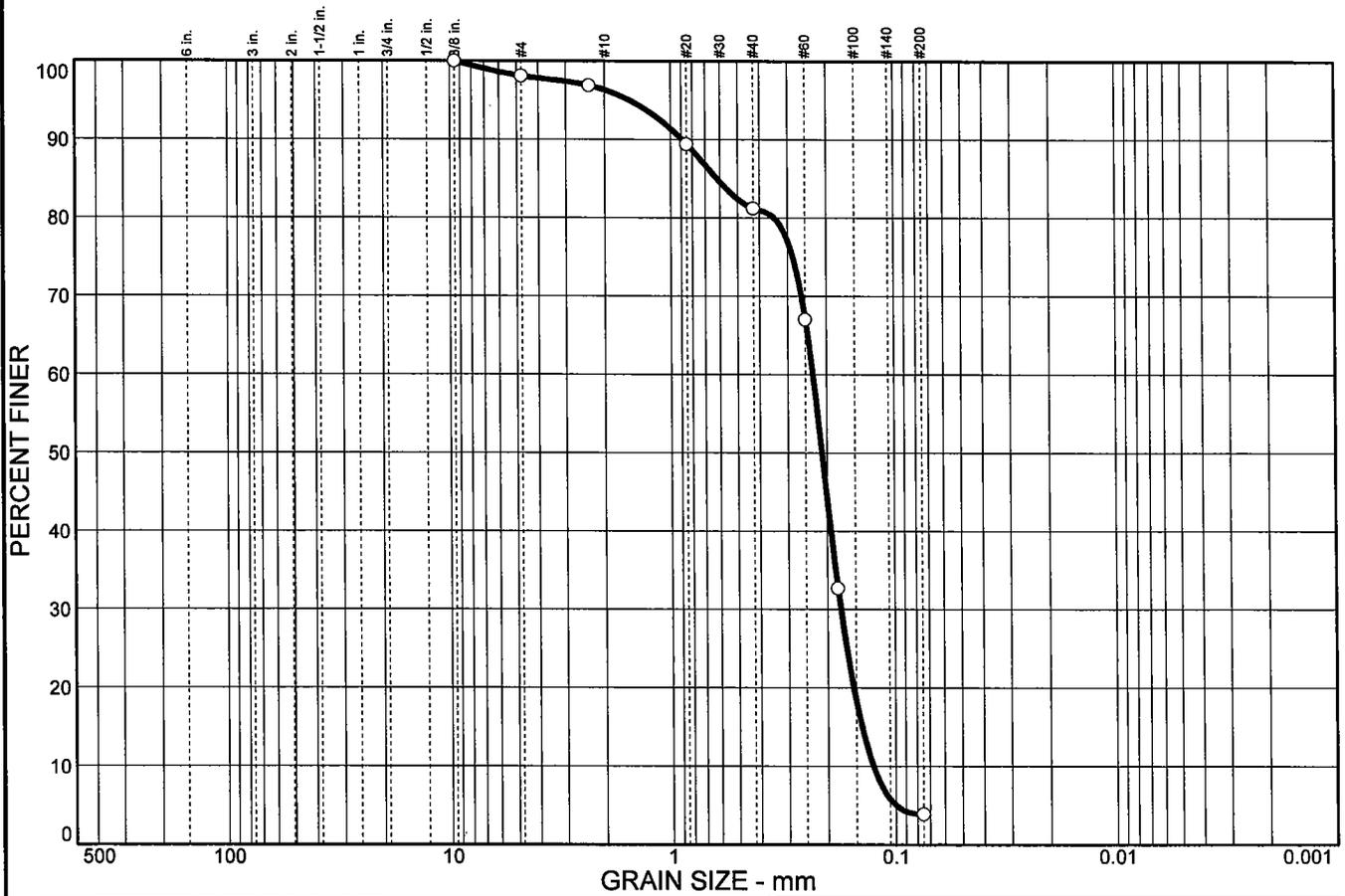
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.9	1.7	15.2	77.3	3.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	98.1		
# 8	96.9		
# 20	89.4		
# 40	81.2		
# 60	67.0		
# 80	32.7		
# 200	3.9		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.621      D<sub>60</sub>= 0.232      D<sub>50</sub>= 0.211  
D<sub>30</sub>= 0.175      D<sub>15</sub>= 0.141      D<sub>10</sub>= 0.126  
C<sub>u</sub>= 1.84              C<sub>c</sub>= 1.05

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

**Sample No.:** 6009  
**Location:** BE-02 # 1

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 18 FT 5.4 m

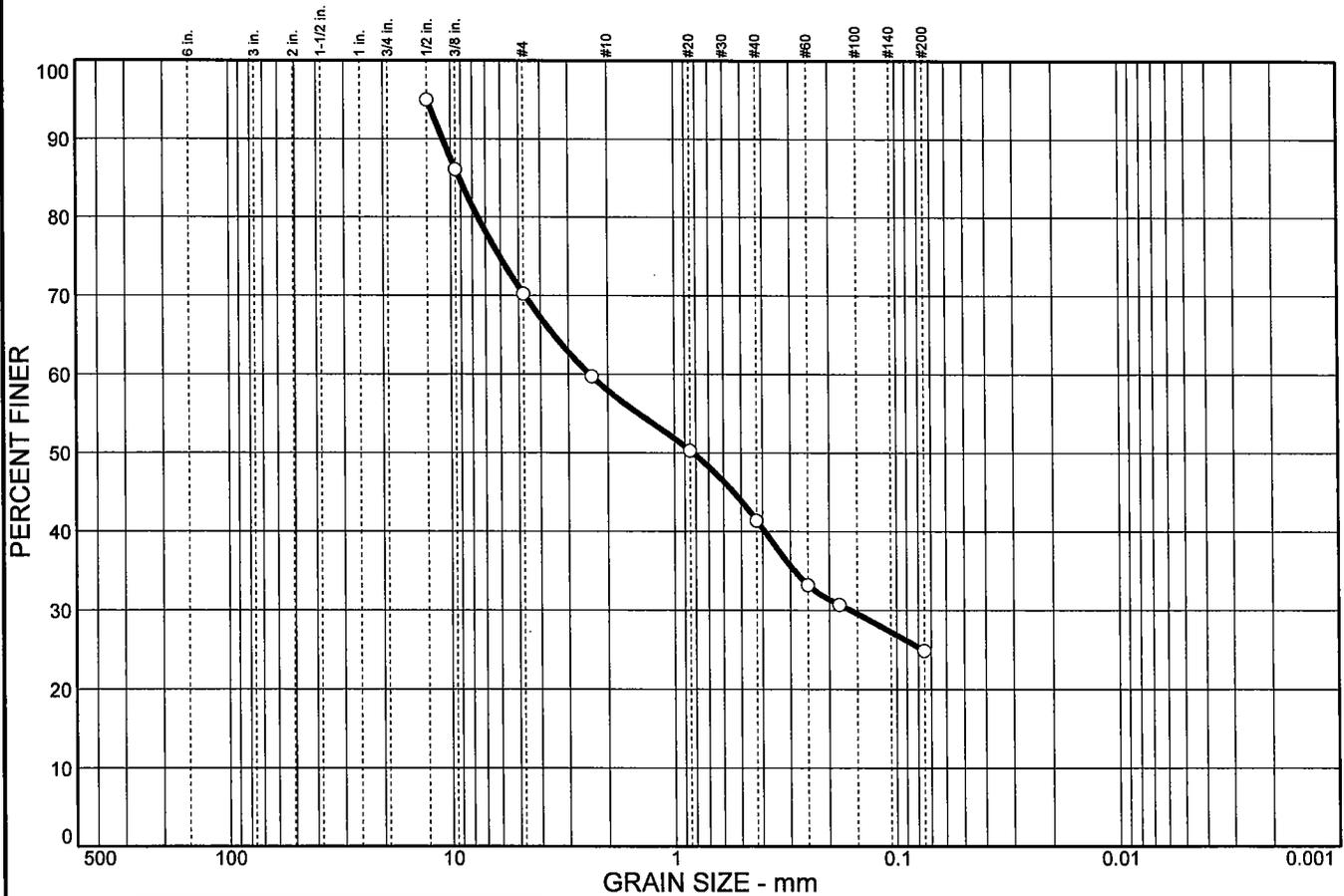
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			12.3	16.5	16.5	24.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	95.0		
3/8 in.	86.1		
# 4	70.2		
# 8	59.7		
# 20	50.3		
# 40	41.4		
# 60	33.2		
# 80	30.7		
# 200	24.9		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 9.16              D<sub>60</sub>= 2.42              D<sub>50</sub>= 0.825

D<sub>30</sub>= 0.161              D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6010  
**Location:** BE-03 #1

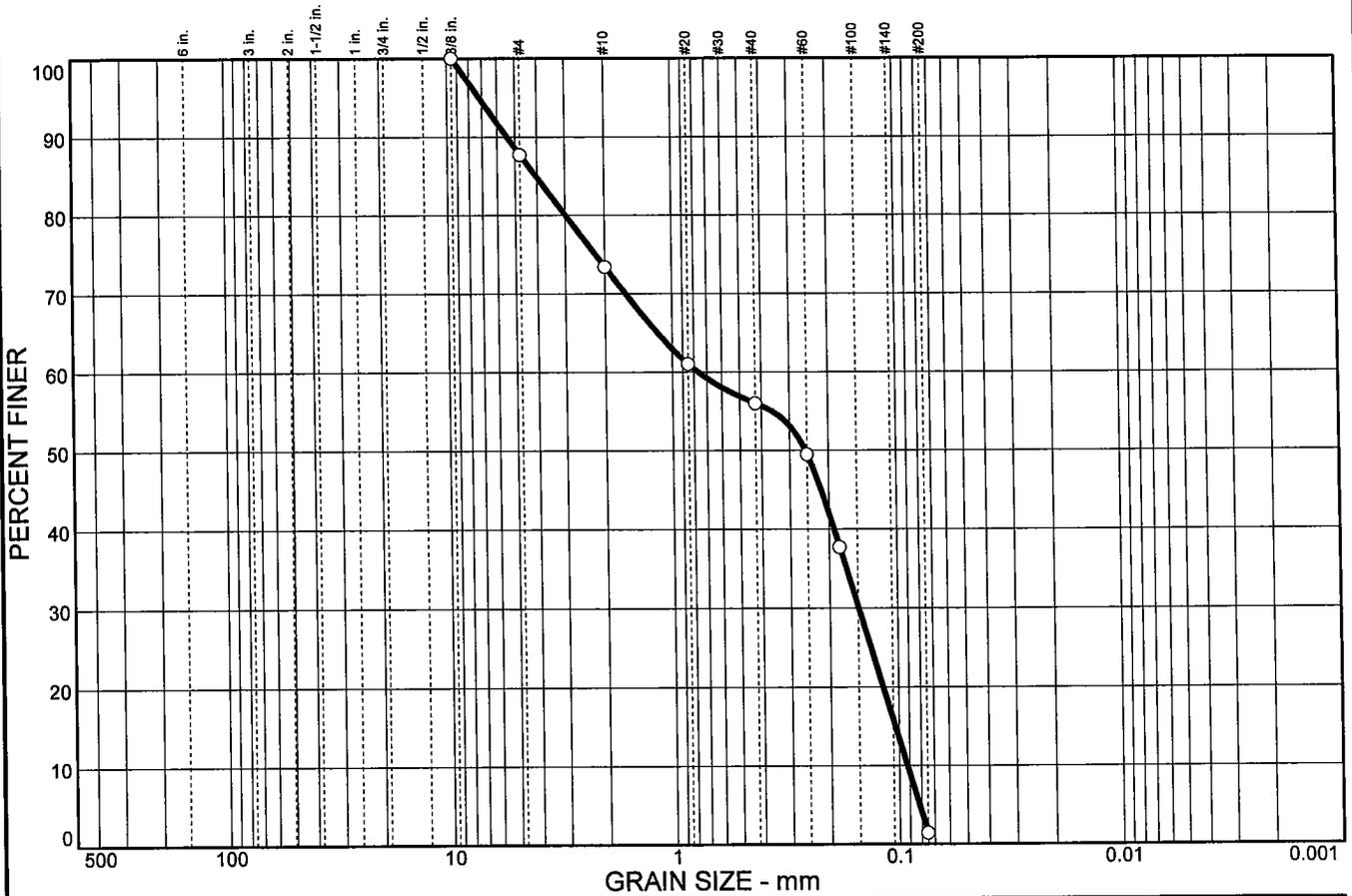
**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 17 FT 5.1 m

<h2>Mappa TestLab</h2>	<p><b>Client:</b> U.S. Army Corps of Engineers, Alaska District</p> <p><b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska</p> <p><b>Project No.:</b> 2004-148</p>	<b>Figure</b>
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# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.3	14.3	17.4	54.6	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	87.7		
# 10	73.4		
# 20	61.0		
# 40	56.0		
# 60	49.5		
# 80	37.7		
# 200	1.4		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 4.05              D<sub>60</sub>= 0.769              D<sub>50</sub>= 0.255  
D<sub>30</sub>= 0.149              D<sub>15</sub>= 0.104              D<sub>10</sub>= 0.0921  
C<sub>u</sub>= 8.34                      C<sub>c</sub>= 0.31

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

**Sample No.:** 6012  
**Location:** BE-03 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 24 FT 7.2 m

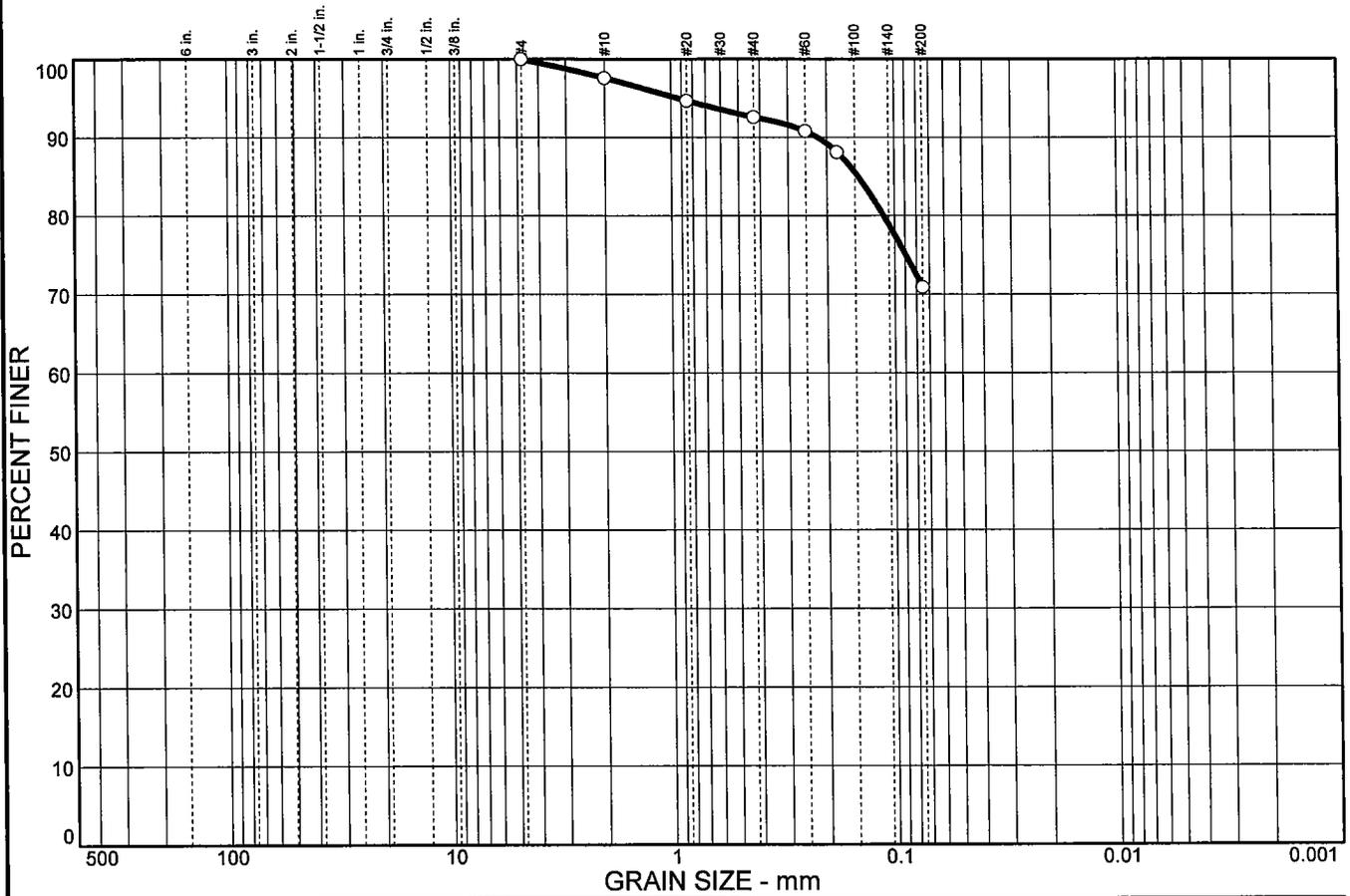
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.4	5.0	21.7	70.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	97.6		
# 20	94.7		
# 40	92.6		
# 60	90.8		
# 80	88.1		
# 200	70.9		

**Soil Description**  
Silt with sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.145              D<sub>60</sub>=                      D<sub>50</sub>=  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6013  
Location: BE-04 #1

Source of Sample: Client Samples

Date:  
Elev./Depth: 12 FT 3.6 m

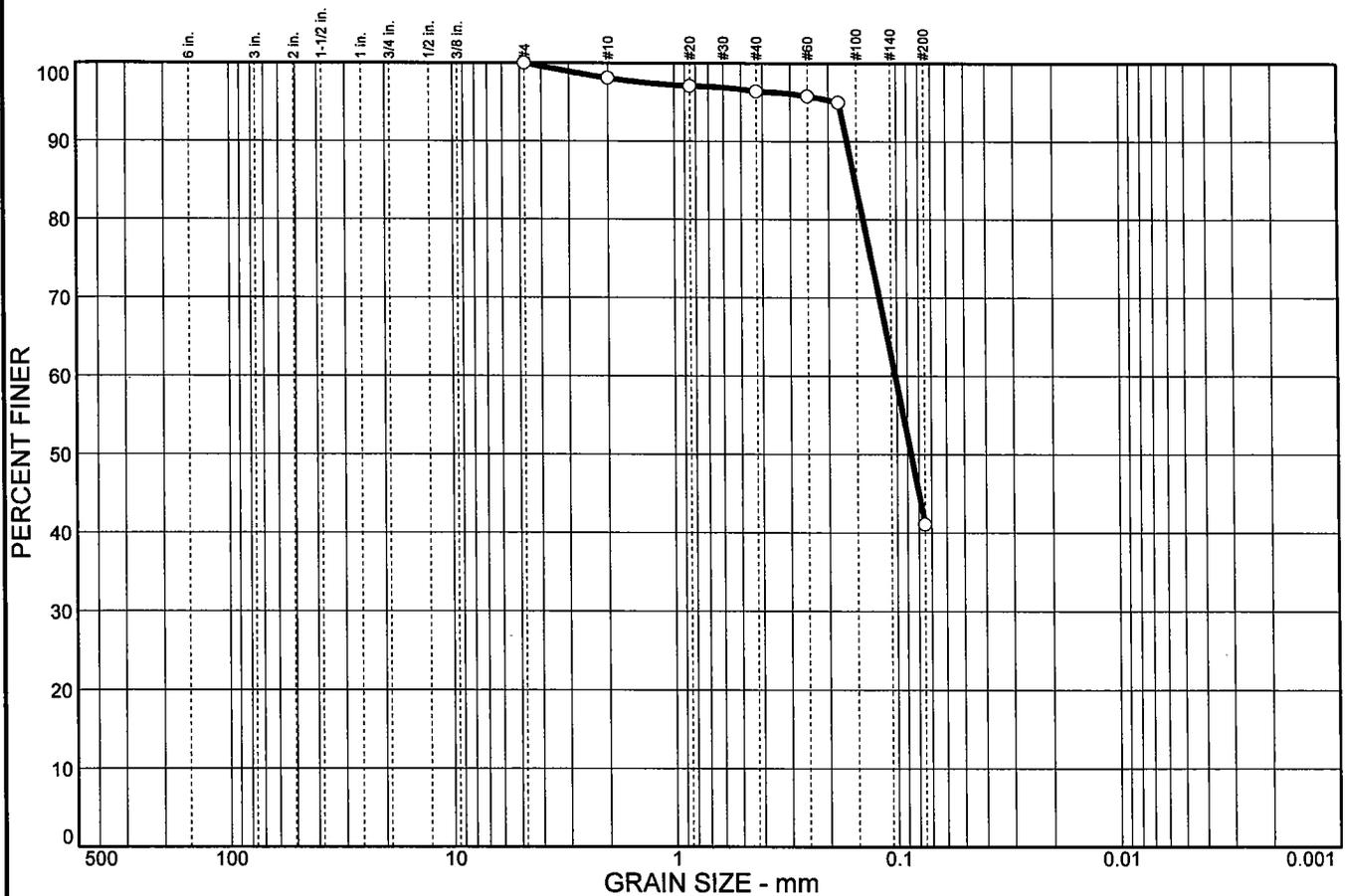
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	1.9	1.7	55.3	41.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	98.1		
# 20	97.1		
# 40	96.4		
# 60	95.8		
# 80	95.0		
# 200	41.1		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.153              D<sub>60</sub>= 0.102              D<sub>50</sub>= 0.0866  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6014  
Location: BE-04 #2

Source of Sample: Client Samples

Date:  
Elev./Depth: 17 FT 5.1 m

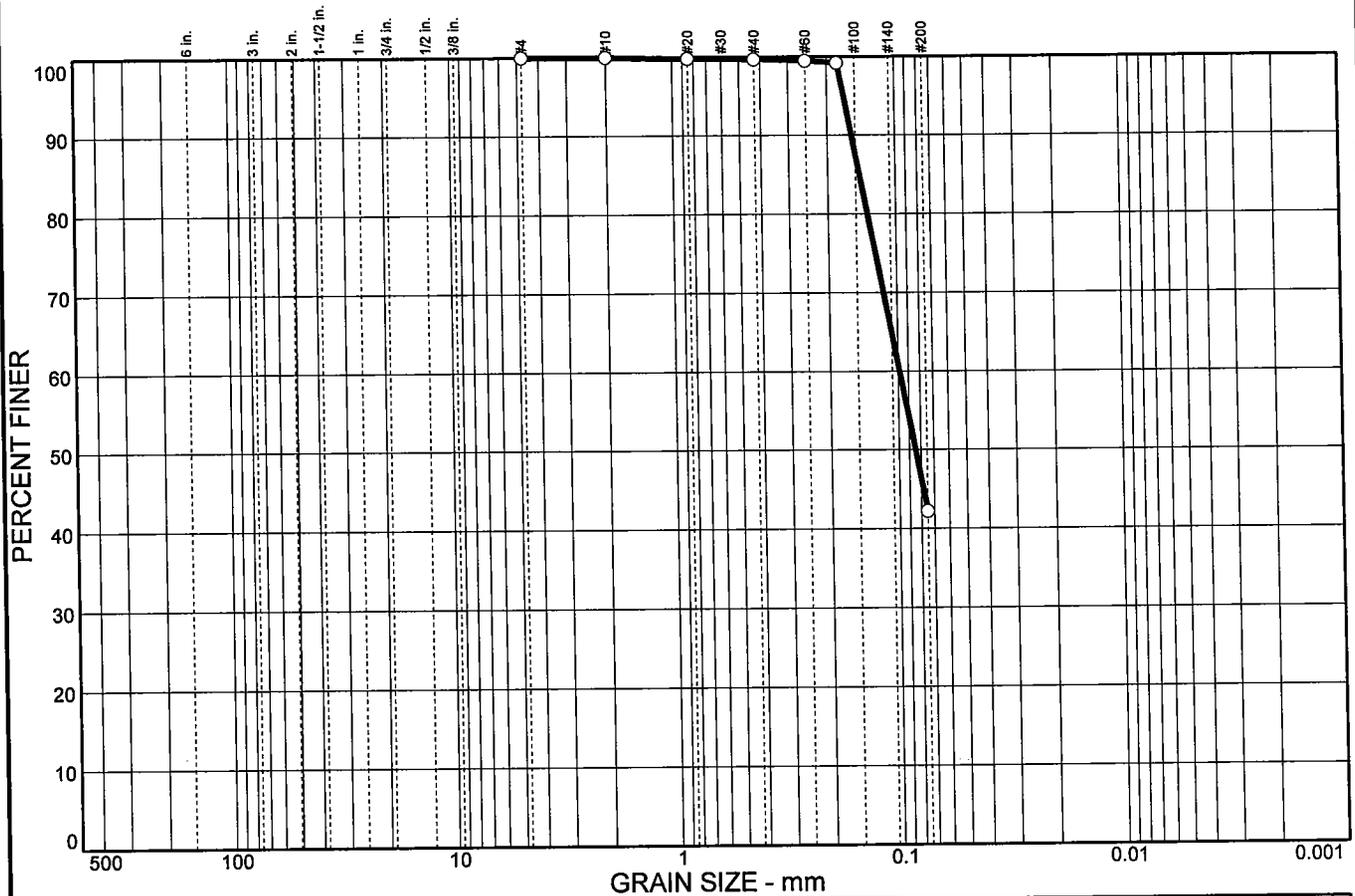
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	57.5	42.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	100.0		
# 20	99.8		
# 40	99.7		
# 60	99.5		
# 80	99.2		
# 200	42.2		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.145              D<sub>60</sub>= 0.0985              D<sub>50</sub>= 0.0845  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6015  
**Location:** BE-04 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 22 FT 6.6 m

## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

**Appendix B**

**Test Boring Logs and Laboratory Data  
Cooper Island**



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

Page 1 of 2

Date: 4 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 6,303,576 ft. ±  
Easting: 786,907 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
CI-01 CI-01

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Gregory Carpenter

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
39.0 ft.

Total Depth:  
40.5 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1		NFS	Grab	SP	Poorly graded SAND with Gravel	27	73		0.75			Brown, frozen, dry, rounded gravel, fine to coarse sand
2														
4		2	Nf	PFS	17 61/4in.	SP	Poorly graded SAND with Gravel	20	78	2	0.75			Brown, frozen, dry, rounded gravel, fine to coarse sand
6														
8														
10		3	Nbn	S2	7 33 34	SP	Poorly graded SAND		96	4				Brown and gray, frozen, moist, fine sand
12														
14		4		F4	2 6	ML	SILT							Gray, moist, fine sand, nonplastic (NP) to low plasticity fines
16														
18														
20		5		F4	2 6	ML	SILT							Gray to black, moist, fine sand, NP to low plasticity fines
22														
24		6		F4	2 7	ML	SILT							Black, wet, NP to low-plasticity fines
26														
28														
30		7	Vx	F4	4 6 7	ML	SILT							Black, frozen, NP to low plasticity fines, ice crystals to 1/8"
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 2 of 2

Date: **4 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,303,576 ft. ±**  
Easting: **786,907 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-01 CI-01**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		8	Vx	F4	4 10 14	ML	SILT							Gray, frozen, NP fines, ice crystals to 1/8"
36														
38														
40		9	Vx	F4	3 7 11	CL	Lean CLAY							Gray, frozen, low plasticity fines, ice crystals to 1/8"
42														Bottom of Hole 40.5 ft. PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

Page 1 of 2

Date: 5 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 6,304,872 ft. ±  
Easting: 782,948 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
CI-02 CI-02

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Gregory Carpenter

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
13.0 ft. WD

Depth Drilled:  
39.0 ft.

Total Depth:  
40.5 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1		NFS	Grab	GP	Poorly graded GRAVEL with Sand	60	40		0.5		Brown, frozen, dry, rounded gravel, medium to coarse sand	
2														
4		2	Nf	S2	5 60	SP	Poorly graded SAND	15	80	5	0.25		Brown, frozen, rounded gravel, fine to coarse sand	
6														
8		3	Nf	F2	26 65/3in.	SP-SM	Poorly graded SAND with Silt	1	92	7			Brown, frozen, fine to medium sand	
10														
12														
14		4		F4	5 4 5	ML	Sandy SILT						Gray to black, wet, fine sand, nonplastic (NP) fines, water table at 13 feet	
16														
18														
20		5		F4	4 7 8	ML	SILT						Gray to black, wet, low plasticity fines	
22														
24		6		F4	2 5 7	ML	SILT						Black, wet, low plasticity fines	
26														
28														
30		7		F4	3 7 7	ML	SILT						Black, wet, low plasticity fines	
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 2 of 2

Date: **5 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,304,872 ft. ±**  
Easting: **782,948 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **CI-02** Permanent: **CI-02**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**13.0 ft. WD**

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class: TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		8		F4	3 5 3	ML	SILT							Black and gray mottled, wet, low plasticity fines
36														
38														
40		9		F4	3 4 8	ML	SILT							Gray and black mottled, wet, low plasticity fines
42														Bottom of Hole 40.5 ft. Groundwater Encountered While Drilling: at an elevation of ft. PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2

Date: **6 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,004 ft. ±**  
Easting: **778,095 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **CI-03** Permanent: **CI-03**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**8.0 ft. WD**

Depth Drilled:  
**34.0 ft.**

Total Depth:  
**35.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frost Class. ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Nf	NFS	Grab	SP	Poorly graded SAND with Gravel	40	60		1		Brown, frozen, dry, rounded gravel, fine to coarse sand	
2														
4														
6		2	Nf	NFS	26 60/3in.	SP	Poorly graded SAND with Gravel	16	83	1	0.5		Brown, frozen, rounded gravel, fine to medium sand	
8													Water table at 11'	
10		3a	Nbn	F3	6 14	SM	Silty SAND	9	75	16			Brown to gray, frozen, fine sand	
10		3b	Nbn	F4	21	ML	SILT						Gray and black mottled, frozen, nonplastic (NP) to low plasticity fines	
12														
14														
16		4	NFS	NFS	7 16 20	SP	Poorly graded SAND						Brown, wet, fine sand, pieces of shell and organics	
18														
20		5a	NFS	NFS	2	SP	Poorly graded SAND						Brown, wet, fine sand	
20		5b	NFS	NFS	3	ML	SILT						Gray, wet, NP fines	
22														
24		6	F4	F4	1 3	CL-ML	Silty CLAY						Dark gray, wet, low plasticity fines	
26														
28														
30		7	F4	F4	2 3	ML	Sandy SILT						Gray, wet, fine sand, low plasticity fines	
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 2 of 2

Date: **6 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,004 ft. ±**  
Easting: **778,095 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-03 CI-03**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**8.0 ft. WD**

Depth Drilled:  
**34.0 ft.**

Total Depth:  
**35.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		8		F4	257	ML	SILT							Dark gray, wet, low plasticity fines
36														Bottom of Hole 35.5 ft. Groundwater Encountered While Drilling: at an elevation of ft. PID = (Cold/Hot) Photo Ionization Detector
38														
40														
42														
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2  
Date: **8 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,595 ft. ±**  
Easting: **775,776 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-04 CI-04**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Nf	NFS	Grab	SP	Poorly graded SAND with Gravel	23	77		1		Brown, frozen to dry, rounded gravel, fine to medium sand, color change to gray at 2.5' - water table in summer?	
2-6		2	Nf	NFS	70	SP	Poorly graded SAND with Gravel	37	62	1	2.5		Gray, frozen to dry, rounded gravel, medium to coarse sand	
10		3	Nbn	F2	20 61	SP-SM	Poorly graded SAND with Silt		93	7			Gray, frozen, fine sand, nonplastic (NP) to low plasticity fines	
14-16		4	Vx	F4	6 8 9	ML	SILT						Gray and black, low plasticity fines, ice crystals to 1/8"	
20-22		5	Vx & Vr	F4	3 6 8	ML	SILT						Gray and black, low plasticity fines, ice crystals to 1/8"	
24-26		6	Vx & Vr	F4	2 8 12	CL-ML	Silty CLAY						Black, frozen, low plasticity fines, ice crystals to 1/8"	
30-32		7	Vx	F4	3 13 20	CL-ML	Silty CLAY						Black, frozen, low plasticity fines, ice crystals to 1/8"	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 2 of 2

Date: **8 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,595 ft. ±**  
Easting: **775,776 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-04 CI-04**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														
36		8	Nbn	F4	2 22	ML	SILT							Dark gray, frozen, low plasticity fines
38														
40		g	Nbn	F4	36 45	ML	Sandy SILT							Gray, frozen, fine sand, low plasticity fines
42														Bottom of Hole 41.0 ft. PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **9 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,305,661 ft. ±**  
Easting: **772,439 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-05 CI-05**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**40.8 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2		1	Nf	NFS	Grab	SP	Poorly graded SAND with Gravel	20	79	1	0.5			Brown, frozen/ dry, rounded gravel, fine to coarse sand
2-4														
4-6		2	Nbn	F2	27 60/3in.	SP-SM	Poorly graded SAND with Silt and Gravel	8	83	9	0.375			Gray, frozen, rounded gravel, fine to medium sand
6-8														
8-10		3	Vx	F4	8 19 20	ML	SILT							Dark gray and black, frozen, nonplastic fines, ice crystals to 1/8 inch
10-12														
12-14														
14-16		4		F4	1 3 4	ML	SILT							Dark gray, wet, low plasticity fines
16-18														
18-20		5		F4	3 4 7	ML	SILT							Dark gray, wet, low plasticity fines
20-22														
22-24														
24-26		6	Vx	F4	8 8 10	CL-ML	Silty CLAY							Black, frozen, low plasticity fines, ice crystals to 1/8 inch
26-28														
28-30														
30-32		7	Vx	F4	7 11 12	CL-ML	Silty CLAY							Black, frozen, low plasticity fines, ice crystals to 1/8 inch

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **9 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,305,661 ft. ±**  
Easting: **772,439 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-05 CI-05**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**40.8 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														
36		8	Vx	F4	39 26 48	CL- ML	Silty CLAY							Gray and black, frozen, low plasticity fines, ice crystals to 1/8 inch
40		9	Vx	F4	40 50/3in	CL- ML	Silty CLAY							Gray and black, frozen, low plasticity fines, ice crystals to 1/8 inch
42														Bottom of Hole 40.8 ft. PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
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# Soils and Geology Section EXPLORATION LOG

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 2

Date: **10 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,882 ft. ±**  
Easting: **770,851 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **CI-06** Permanent: **CI-06**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**40.4 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Nf	NFS	Grab	SP	Poorly graded SAND with Gravel	20	80		0.75		Brown, frozen/ dry, rounded gravel, fine to coarse sand	
2-5														
6		2	Nbn	PFS	37 50/ 2in.	SP	Poorly graded SAND	10	88	2			Brown, frozen, rounded gravel, fine to medium sand	
10		3a	Nbn	NFS	17	SP	Poorly graded SAND with Gravel						Brown, frozen, rounded gravel, fine sand	
11		3b	Nbn	F4	15 14	ML	SILT						Gray, frozen, low plasticity fines	
15-16														
16		4	Nbn	F4	3 3 4	ML	SILT						Black, frozen, low plasticity fines	
20														
20		5			2 3 4	NR	No Recovery						No recovery, same as sample four by cuttings	
24														
25		6	Vx	F4	4 5 9	CL- ML	Silty CLAY						Dark gray, frozen, low plasticity fines, 35% ice by volume, ice crystals to 1/4 inch	
28														
30		7	Vx	F4	6 14 17	CL- ML	Silty CLAY						Dark gray, frozen, low plasticity fines, ice crystals to 1/8 inch	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 2 of 2

Date: **10 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,882 ft. ±**  
Easting: **770,851 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **CI-06** Permanent: **CI-06**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**40.4 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														
36		8	Vx & Vr	F4	5 13 16	CL-ML	Silty CLAY							Dark gray, frozen, low plasticity fines, ice crystals to 1/8 inch
38														
40		9	Nbn	F2	54/ 5in	SM	Silty SAND							Brown, frozen, fine sand, nonplastic fines Bottom of Hole 40.4 ft. PID = (Cold/Hot) Photo Ionization Detector
42														
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **12 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,305,721 ft. ±**  
Easting: **768,612 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-07 CI-07**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4983	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2		1	Nf	NFS	Grab	SW	Well-graded SAND	14	83	3	0.375		Brown, frozen to dry, rounded gravel, fine to coarse sand	
2-6		2	Nbn	F4	10 17 17	ML	SILT						Gray, frozen, fine sand as lenses to two inches, nonplastic fines	
6-10		3	Nbn	F4	4 7 6	CL- ML	Silty CLAY						Gray, frozen, low plasticity fines	
10-16		4		F4	2 3 4	ML	SILT						Gray and black, wet, low plasticity fines, trace organics	
16-22		5		F4	2 3 4	ML	SILT						Gray and black, wet, low plasticity fines, trace organics	
22-26		6		F4	3 4 7	CL- ML	Silty CLAY						Gray, wet, low plasticity fines	
26-32		7	Vx	F4	8 12 16	CL- ML	Silty CLAY						Gray, frozen, low plasticity fines, ice crystals to 1/8 inch	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
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**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **12 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,305,721 ft. ±**  
Easting: **768,612 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-07 CI-07**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														Clear, 0 degrees, windy
36		8	Vx	F4	5 20 17	CL- ML	Silty CLAY							Gray, frozen, low plasticity fines, ice crystals to 1/8 inch
40		9	Vx	F4	28 19 19	CL- ML	Silty CLAY with sand							Gray, frozen, low plasticity fines, ice crystals to 1/8 inch
42														Bottom of Hole 41.5 ft. PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

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EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

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Date: 14 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 6,305,847 ft. ±  
Easting: 767,203 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
CI-08 CI-08

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Gregory Carpenter

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
NE

Depth Drilled:  
40.0 ft.

Total Depth:  
40.4 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Nf	NFS	Grab	SP	Poorly graded SAND with Gravel	15	85		1			Brown, frozen to dry, rounded gravel, fine to coarse sand
2														
4		2	Nbn	NFS	20 50/4in.	SP	Poorly graded SAND	1	97	2				Brown, frozen, fine sand, nonplastic (NP) fines
6														
8														
10		3	Nbn	NFS	24 50/3in.	SP	Poorly graded SAND		97	3				Brown, frozen, fine sand, NP fines
12														
14														
16		4	Vx	F4	5 6 10	ML	SILT							Gray, frozen, low plasticity fines, ice crystals to 1/16 inch thick
18														
20		5		F4	3 3 4	CL- ML	Silty CLAY							Gray, wet, low plasticity fines
22														
24														
26		6		F4	4 5 5	CL- ML	Silty CLAY							Black and gray, wet, low plasticity fines
28														
30		7		F4	4 7 10	CL- ML	Silty CLAY							Dark gray, wet, low plasticity fines
32														

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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **14 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,305,847 ft. ±**  
Easting: **767,203 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **CI-08** Permanent: **CI-08**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**40.4 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														Clear, 0 degrees
36		8	Vx	F4	5 11 43	CL- ML	Silty CLAY							Dark gray and black, frozen, low plasticity fines, ice crystals to 1/8 inch
38														
40		9			60/5"	NR	No Recovery							No recovery Bottom of Hole 40.4 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector
42														
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE AN.C.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

Page 1 of 2

Date: 15 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 7,906,214 ft. ±  
Easting: 616,440 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
CI-09 CI-09

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Gregory Carpenter

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
NE

Depth Drilled:  
40.0 ft.

Total Depth:  
41.5 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Nf	NFS	Grab	SP	Poorly graded SAND	13	86	1	1		Brown, frozen/ dry, rounded gravel, fine to medium sand	
2														
4														
5		2	Nbn	NFS	39 59	SP	Poorly graded SAND	7	91	2	0.375		Brown, frozen, rounded gravel, fine to coarse sand	
6														
8														
10		3	Nbn & Vx	F2	13 18 28	SM	Silty SAND	2	64	34			Gray, frozen, fine sand, low plasticity fines, ice crystals to 1/8 inch	
12														
14														
16		4	Nbn & Vx	F4	9 17 23	CL- ML	Silty CLAY						Gray and black, frozen, low plasticity fines, ice crystals to 1/8 inch	
18														
20		5	Vx & Vr	F4	9 14 15	CL- ML	Silty CLAY						Black, frozen, low plasticity fines, ice crystals to 1/8 inch, 25% ice by volume	
22														
24														
26		6	Vx & Vr	F4	3 12 17	CL- ML	Silty CLAY						Black, frozen, low plasticity fines, ice crystals to 1/8 inch	
28														
30		7	Vx	F4	9 17 20	CL- ML	Silty CLAY						Dark gray, frozen, low plasticity fines, ice crystals to 1/8 inch	
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 2 of 2

Date: 15 Apr 2004

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **7,906,214 ft. ±**  
Easting: **616,440 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **CI-09** Permanent: **CI-09**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														
36		8	Vx	F4	5 13 17	CL- ML	Silty CLAY							Dark gray, frozen, low plasticity fines, ice crystals to 1/8 inch
40		9	Vx	F4	7 9 13	CL- ML	Silty CLAY							Dark gray, frozen, low plasticity fines, ice crystals to 1/4 inch
42														Bottom of Hole 41.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2

Date: **15 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,443 ft. ±**  
Easting: **766,192 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-10 CI-10**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Nf	NFS	3	SP	Poorly graded SAND with Gravel	23	77		1			Brown, frozen to dry, rounded gravel, fine to coarse sand
2														
4														
6		2	Nf	NFS	3 8 50/4in.	SW	Well-graded SAND with Gravel	48	51	1	0.5			Brown, frozen, dry, rounded gravel, fine to coarse sand
8														
10		3	Nbn	NFS	24 50/2in.	SP	Poorly graded SAND		98	2				Brown, frozen, fine sand
12														
14														
16		4		F2	11 13 12	SP- SM	Poorly graded SAND with Silt	1	93	6				Brown, wet, fine sand
18														
20		5		F4	3 5 4	CL- ML	Silty CLAY							Gray, wet, low plasticity fines
22														
24														
26		6		F4	2 3 4	CL- ML	Silty CLAY							Dark gray, wet, low plasticity fines
28														
30		7		F4	3 3 3	CL- ML	Silty CLAY							Dark gray, wet, low plasticity fines
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 2 of 2

Date: 15 Apr 2004

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,306,443 ft. ±**  
Easting: **766,192 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**CI-10 CI-10**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

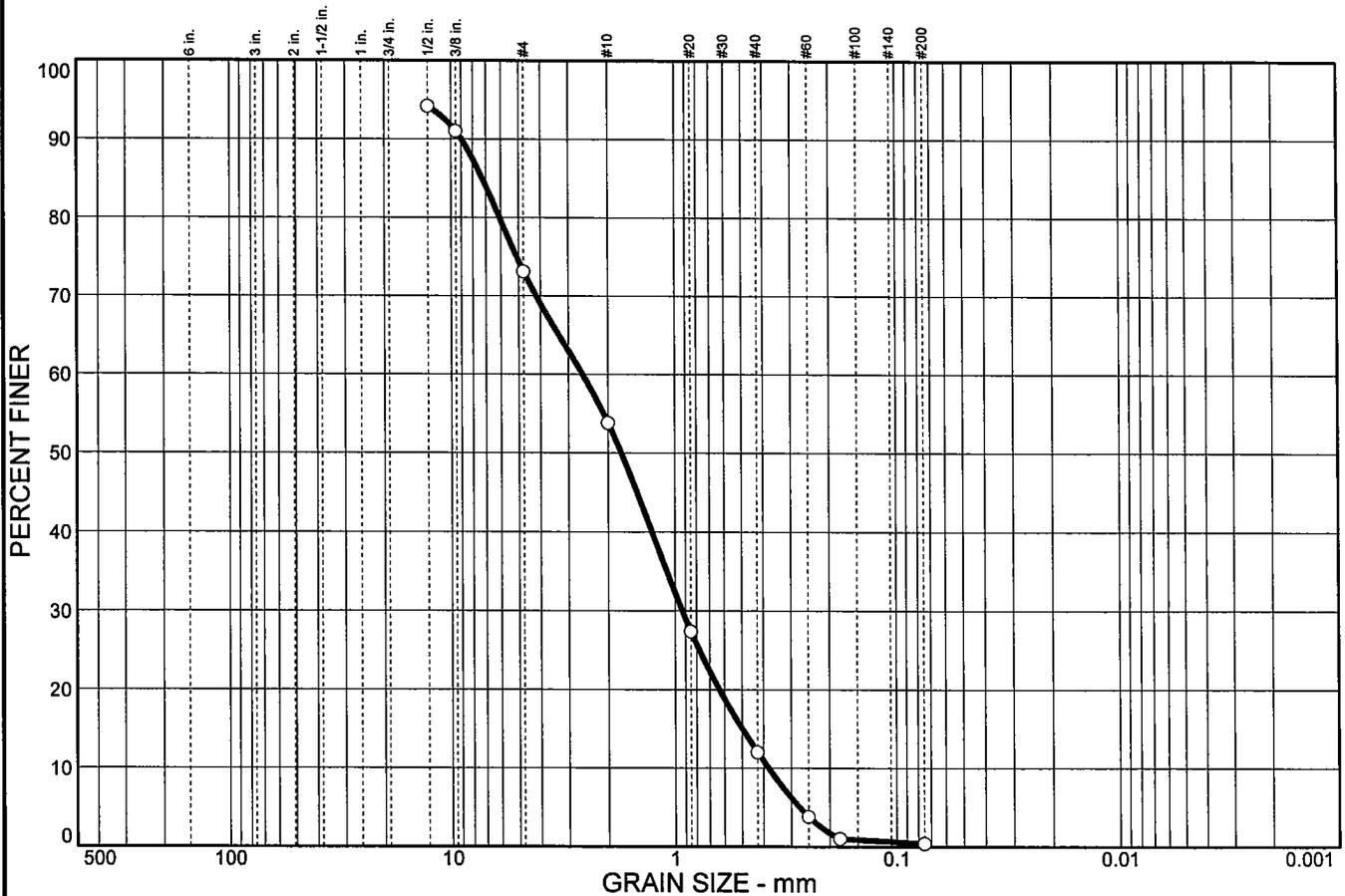
Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-922-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														
36		8			4 5 4	SM	Silty SAND							Gray, wet, fine sand, non plastic fines
38														
40		9			5 5 5	SP	Poorly graded SAND							Gray, wet, fine sand
42														Bottom of Hole 41.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			19.3	41.8	11.6	0.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	94.2		
3/8 in.	91.0		
# 4	73.1		
# 10	53.8		
# 20	27.4		
# 40	12.0		
# 60	3.8		
# 80	1.0		
# 200	0.4		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.27              D<sub>60</sub>= 2.60              D<sub>50</sub>= 1.75  
D<sub>30</sub>= 0.929              D<sub>15</sub>= 0.499              D<sub>10</sub>= 0.380  
C<sub>u</sub>= 6.85                      C<sub>c</sub>= 0.87

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6016  
**Location:** CI-01 #1

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 0 FT 0 m

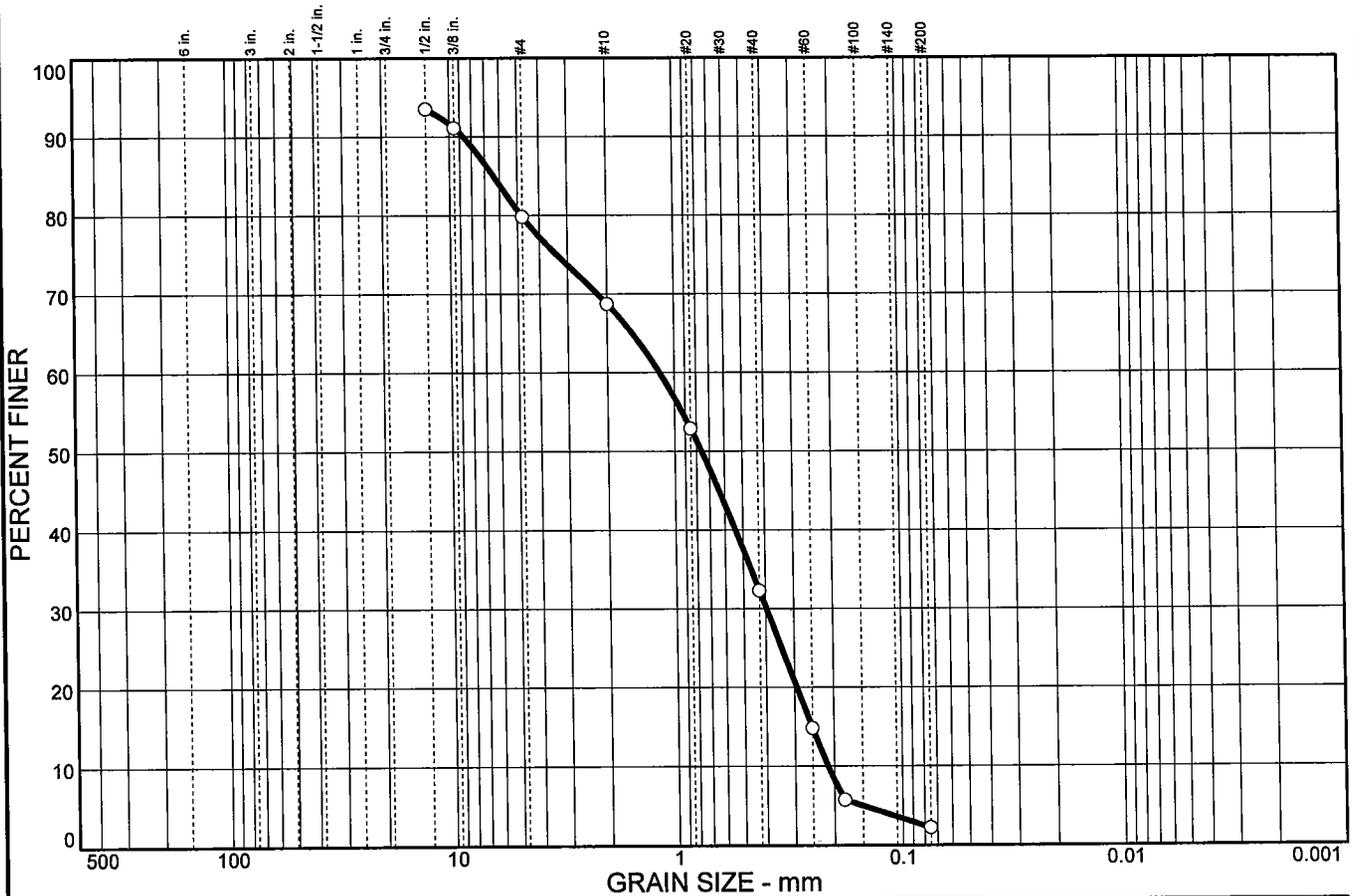
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			11.1	36.4	30.1	2.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	93.5		
3/8 in.	91.1		
# 4	79.8		
# 10	68.7		
# 20	52.9		
# 40	32.3		
# 60	14.8		
# 80	5.7		
# 200	2.2		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.40              D<sub>60</sub>= 1.17              D<sub>50</sub>= 0.760  
 D<sub>30</sub>= 0.396            D<sub>15</sub>= 0.252            D<sub>10</sub>= 0.214  
 C<sub>u</sub>= 5.47                C<sub>c</sub>= 0.63

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6017  
**Location:** CI-01 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 4 FT 1.2 m

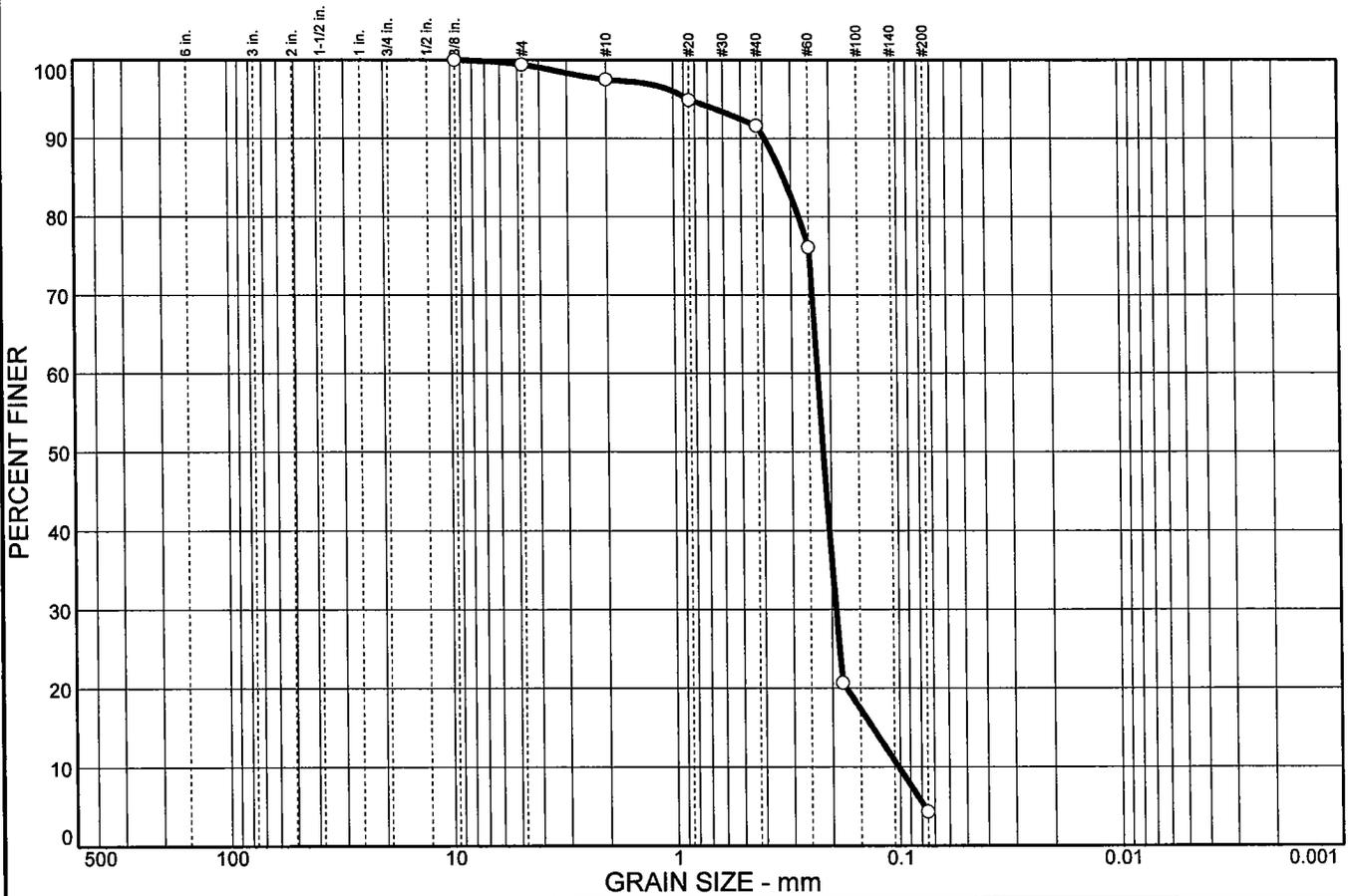
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.6	1.9	5.9	87.3	4.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	99.4		
# 10	97.5		
# 20	94.9		
# 40	91.6		
# 60	76.1		
# 80	20.7		
# 200	4.3		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.323      D<sub>60</sub>= 0.229      D<sub>50</sub>= 0.217  
 D<sub>30</sub>= 0.192      D<sub>15</sub>= 0.133      D<sub>10</sub>= 0.102  
 C<sub>u</sub>= 2.25              C<sub>c</sub>= 1.59

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6018  
 Location: CI-01 #3

Source of Sample: Client Samples

Date:  
 Elev./Depth: 9 FT 2.7 m

## Mappa TestLab

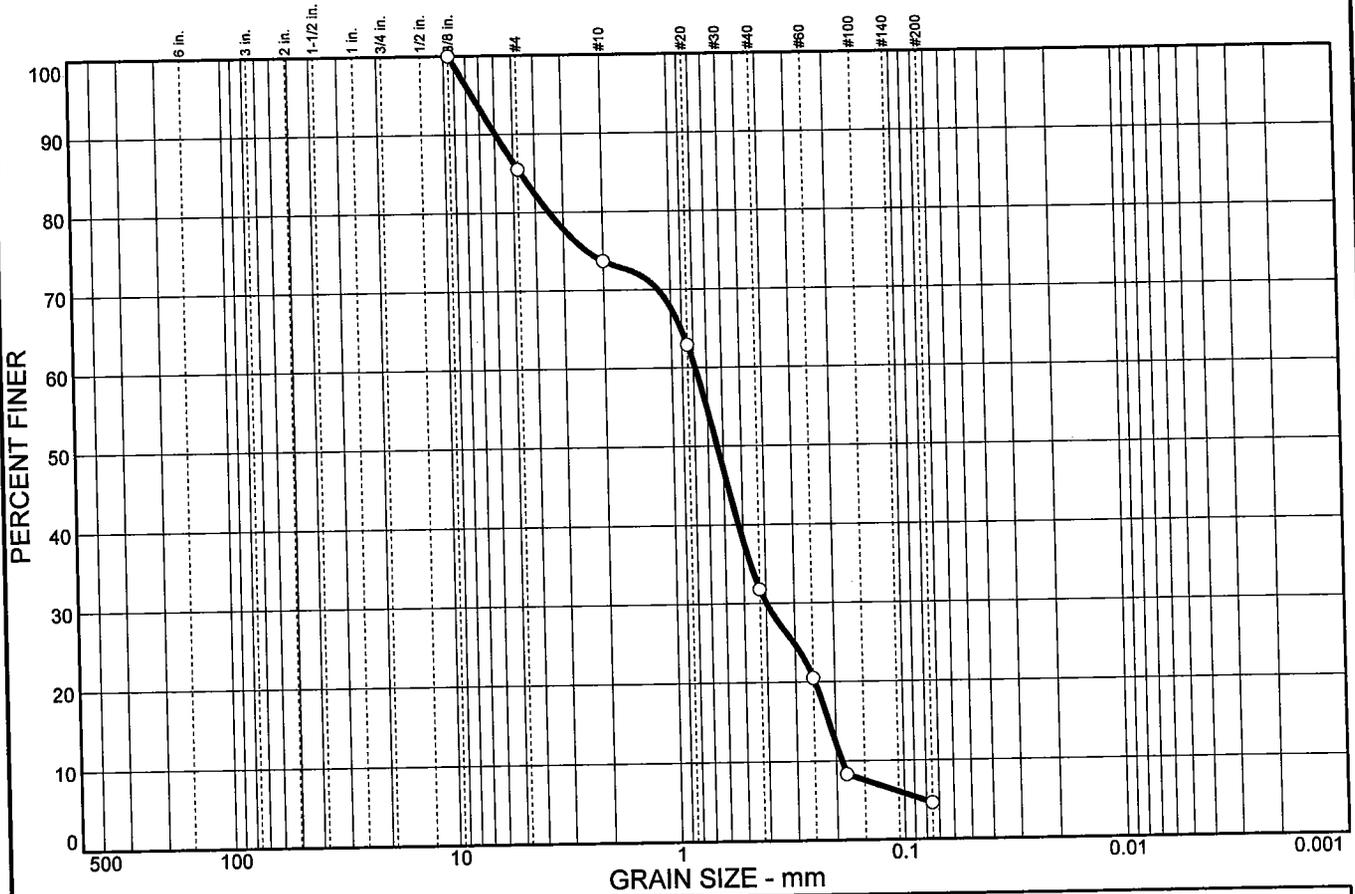
**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	14.5	11.8	41.9	27.2	4.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	85.5		
# 10	73.7		
# 20	62.9		
# 40	31.8		
# 60	20.5		
# 80	8.3		
# 200	4.6		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 4.63              D<sub>60</sub>= 0.789              D<sub>50</sub>= 0.639  
D<sub>30</sub>= 0.398              D<sub>15</sub>= 0.215              D<sub>10</sub>= 0.189  
C<sub>u</sub>= 4.17                      C<sub>c</sub>= 1.06

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6020  
Location: CI-02 #2

Source of Sample: Client Samples

Date:  
Elev./Depth: 4 FT 1.2 m

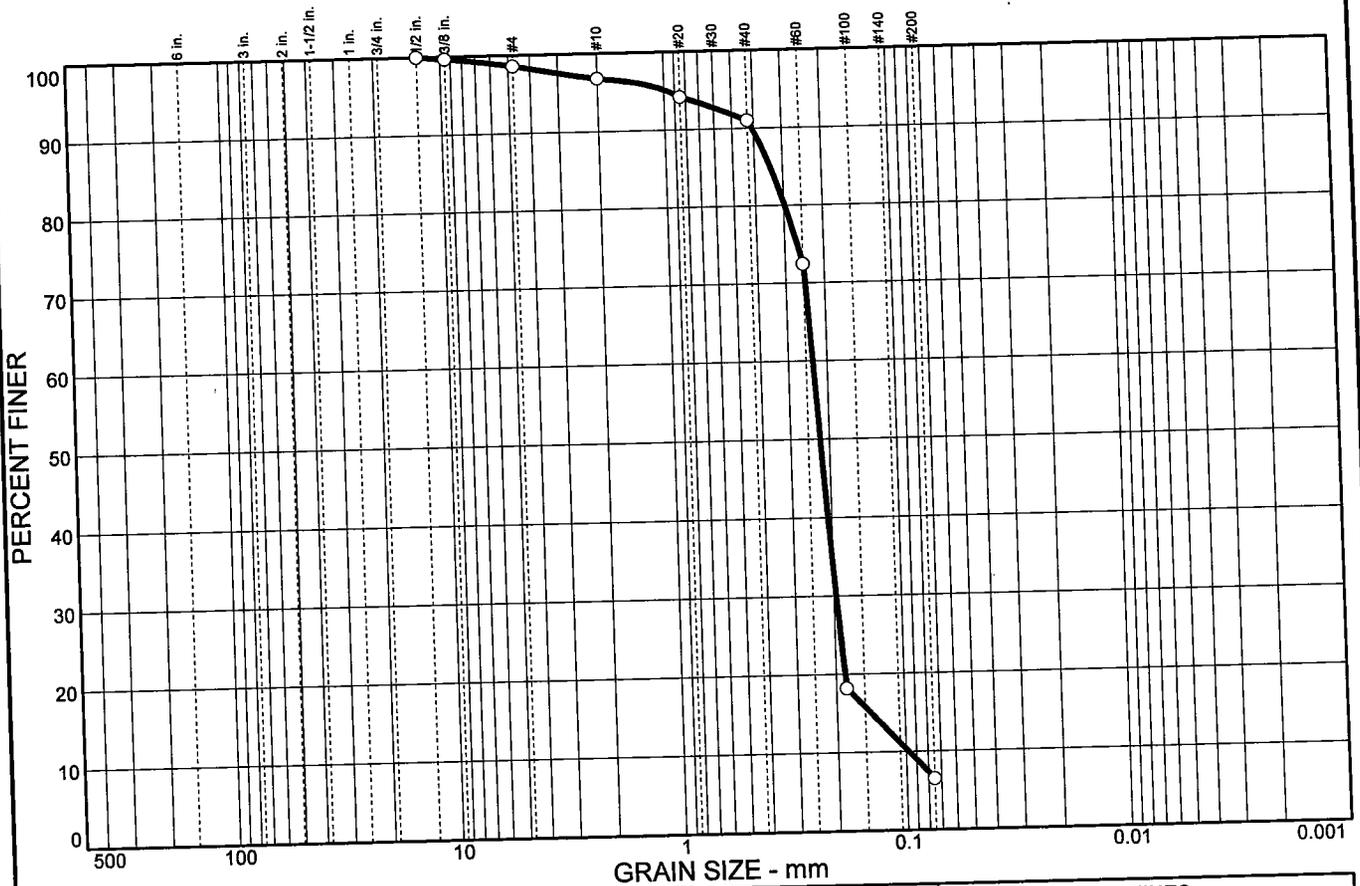
## Mappa TestLab

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.4	1.8	5.8	84.5	6.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.7		
# 4	98.6		
# 10	96.8		
# 20	94.2		
# 40	91.0		
# 60	72.4		
# 80	18.2		
# 200	6.5		

**Soil Description**  
Poorly graded sand with silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.341                      D<sub>60</sub>= 0.233                      D<sub>50</sub>= 0.221  
 D<sub>30</sub>= 0.196                      D<sub>15</sub>= 0.142                      D<sub>10</sub>= 0.0975  
 C<sub>u</sub>= 2.40                      C<sub>c</sub>= 1.69

**Classification**  
 USCS= SP-SM                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6021  
 Location: CI-02 #3

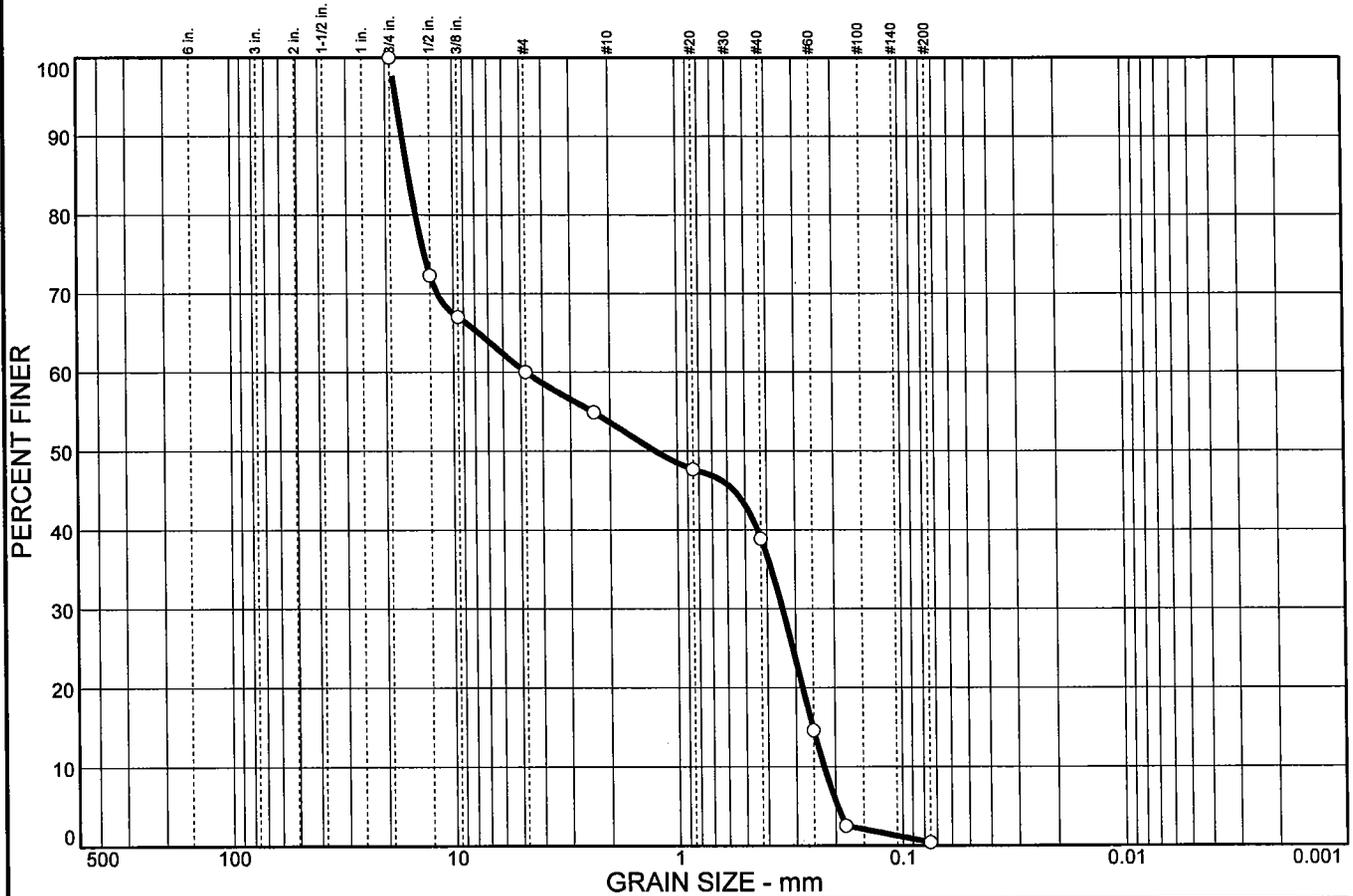
Source of Sample: Client Samples

Date:  
 Elev./Depth: 9 FT 2.7 m

Mappa TestLab

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska  
 Project No: 2004-148                      Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	40.0	6.4	14.7	38.5	0.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	72.3		
3/8 in.	67.0		
# 4	60.0		
# 8	54.9		
# 20	47.7		
# 40	38.9		
# 60	14.6		
# 80	2.5		
# 200	0.4		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 15.8              D<sub>60</sub>= 4.75              D<sub>50</sub>= 1.25  
D<sub>30</sub>= 0.343              D<sub>15</sub>= 0.252              D<sub>10</sub>= 0.225  
C<sub>u</sub>= 21.12              C<sub>c</sub>= 0.11

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6022  
 Location: CI-03 #1

Source of Sample: Client Samples

Date:  
 Elev./Depth: 0 FT 0 m

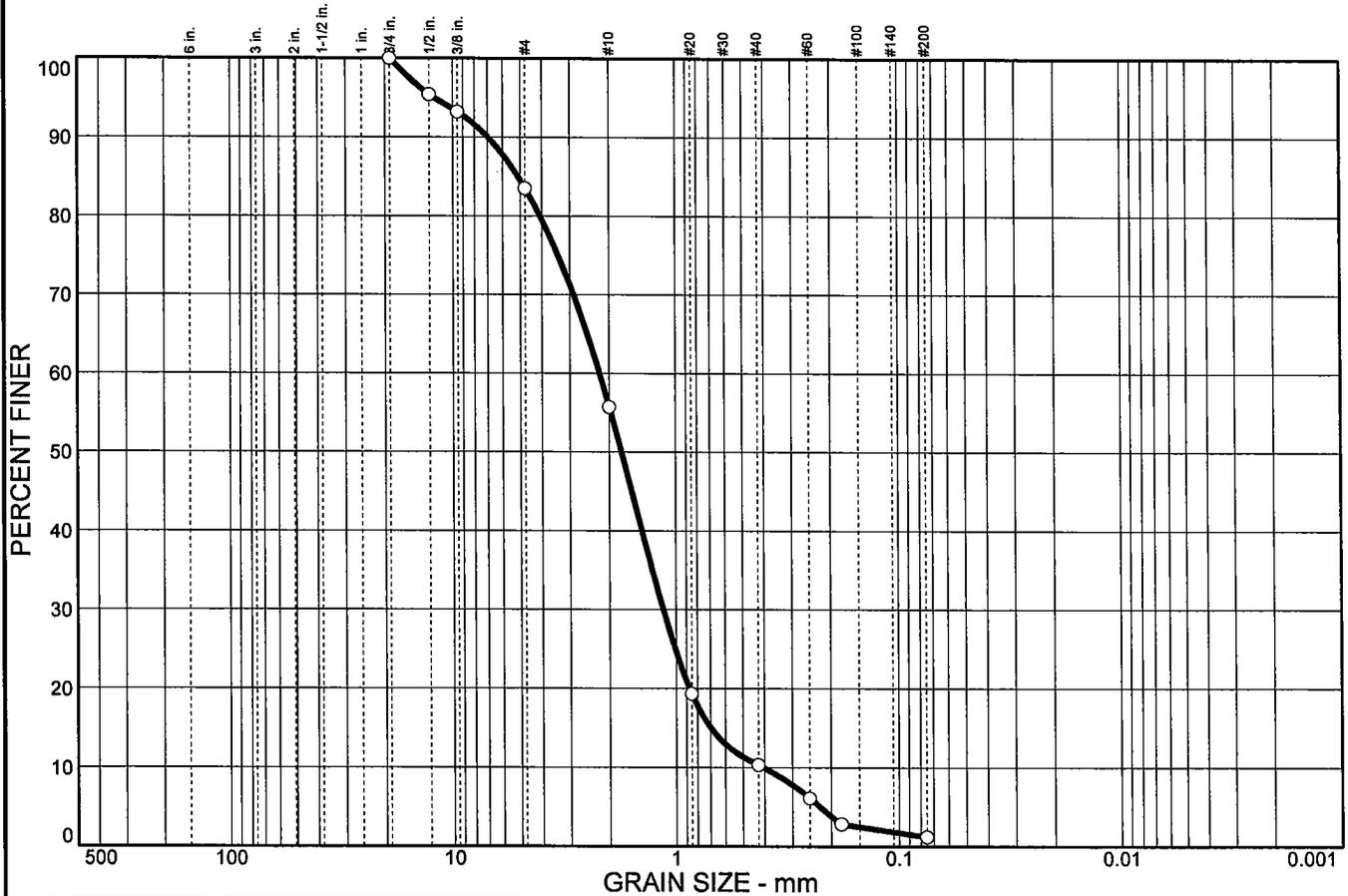
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	16.5	27.8	45.4	9.1	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	95.4		
3/8 in.	93.2		
# 4	83.5		
# 10	55.7		
# 20	19.3		
# 40	10.3		
# 60	6.1		
# 80	2.8		
# 200	1.2		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.12                      D<sub>60</sub>= 2.21                      D<sub>50</sub>= 1.76  
D<sub>30</sub>= 1.14                      D<sub>15</sub>= 0.699                      D<sub>10</sub>= 0.405  
C<sub>u</sub>= 5.46                      C<sub>c</sub>= 1.46

**Classification**

USCS= SP                      AASHTO= A-1-b

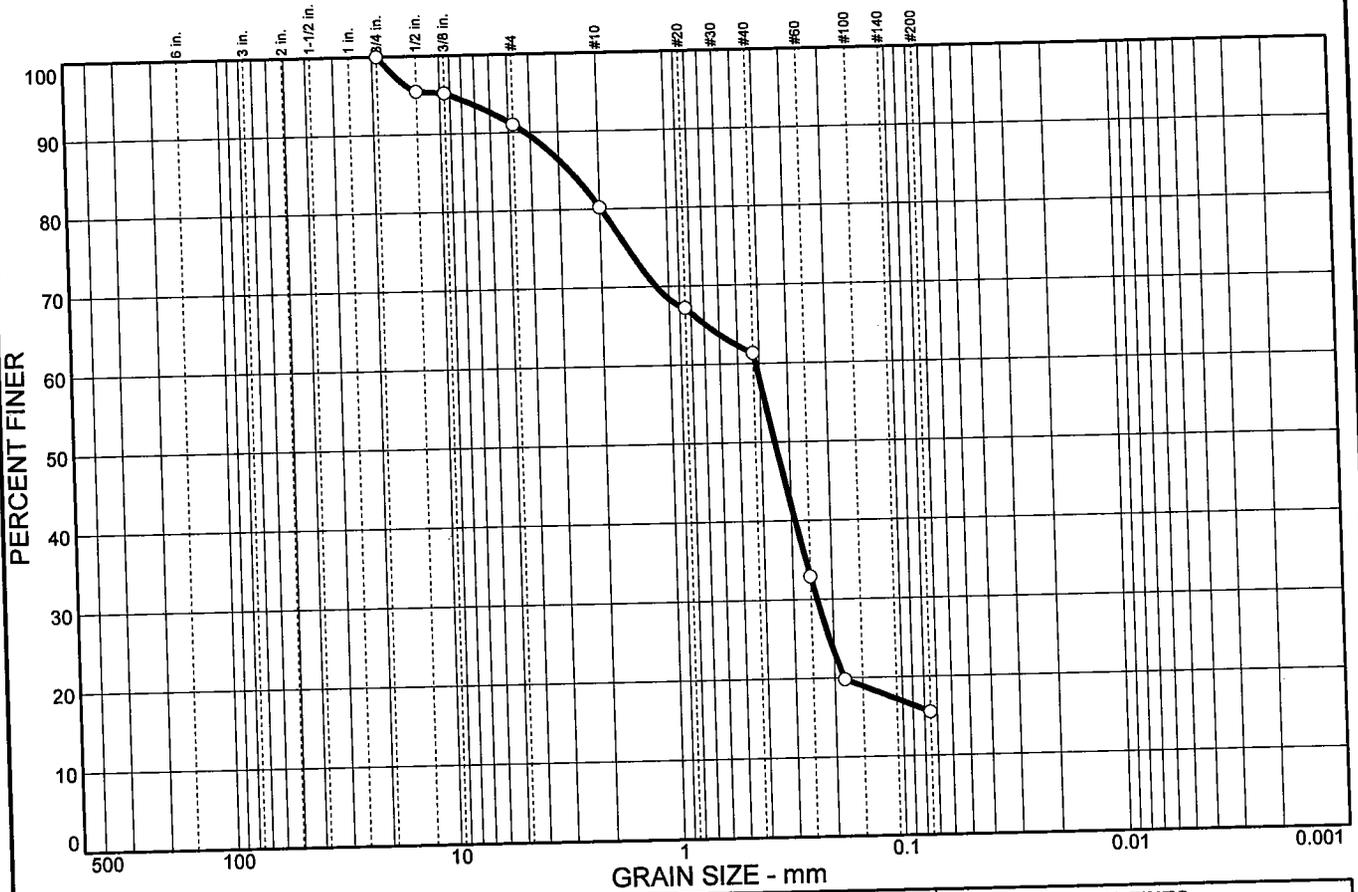
**Remarks**

\* (no specification provided)

Sample No.: 6023                      Source of Sample: Client Samples                      Date:  
Location: CI-03 #2                      Elev./Depth: 4 FT 1.2 m

<h2>Mappa TestLab</h2>	<b>Client:</b> U.S. Army Corps of Engineers, Alaska District <b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska <b>Project No:</b> 2004-148	<b>Figure</b>
------------------------	--	---------------

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.0	10.8	18.9	45.8	15.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	95.5		
3/8 in.	95.2		
# 4	91.0		
# 10	80.2		
# 20	67.2		
# 40	61.3		
# 60	32.9		
# 80	19.8		
# 200	15.5		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 2.71              D<sub>60</sub>= 0.416              D<sub>50</sub>= 0.348  
 D<sub>30</sub>= 0.235              D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

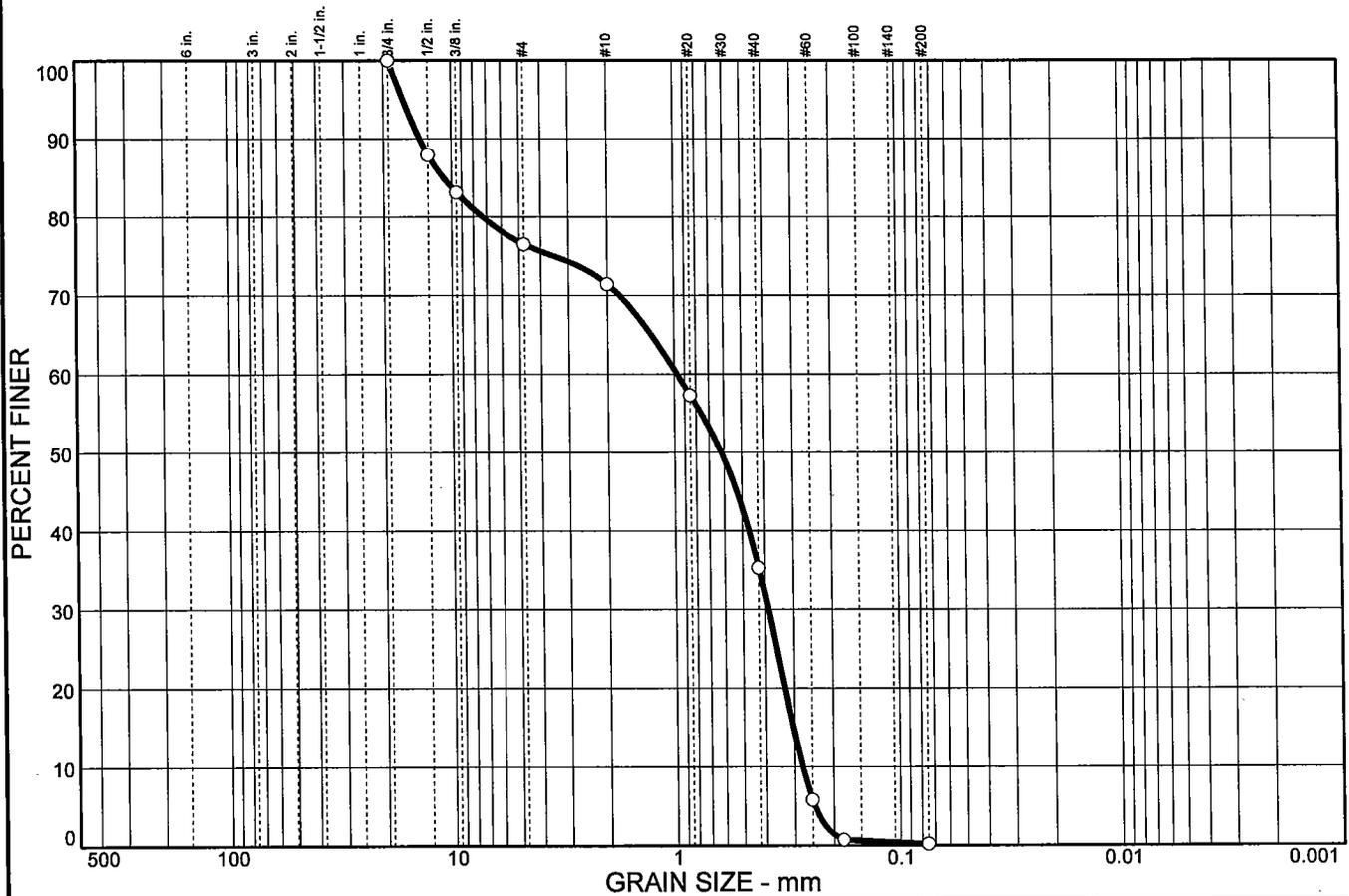
Sample No.: 6024  
 Location: CI-03 # 3

Source of Sample: Client Samples

Date:  
 Elev./Depth: 9 FT 2.7 m

<b>Mappa TestLab</b>	<p><b>Client:</b> U.S. Army Corps of Engineers, Alaska District</p> <p><b>Project:</b> Barrow Coastal Storm Damage Reduction Study                  Barrow, Alaska</p> <p><b>Project No:</b> 2004-148</p>
	<b>Figure</b>

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	23.5	5.1	36.1	35.1	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	87.9		
3/8 in.	83.1		
# 4	76.5		
# 10	71.4		
# 20	57.3		
# 40	35.3		
# 60	5.8		
# 80	0.7		
# 200	0.2		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 10.9              D<sub>60</sub>= 0.973              D<sub>50</sub>= 0.618  
 D<sub>30</sub>= 0.387              D<sub>15</sub>= 0.303              D<sub>10</sub>= 0.276  
 C<sub>u</sub>= 3.52                      C<sub>c</sub>= 0.56

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6025  
 Location: CI-04 #1

Source of Sample: Client Samples

Date:  
 Elev./Depth: 0 FT 0 m

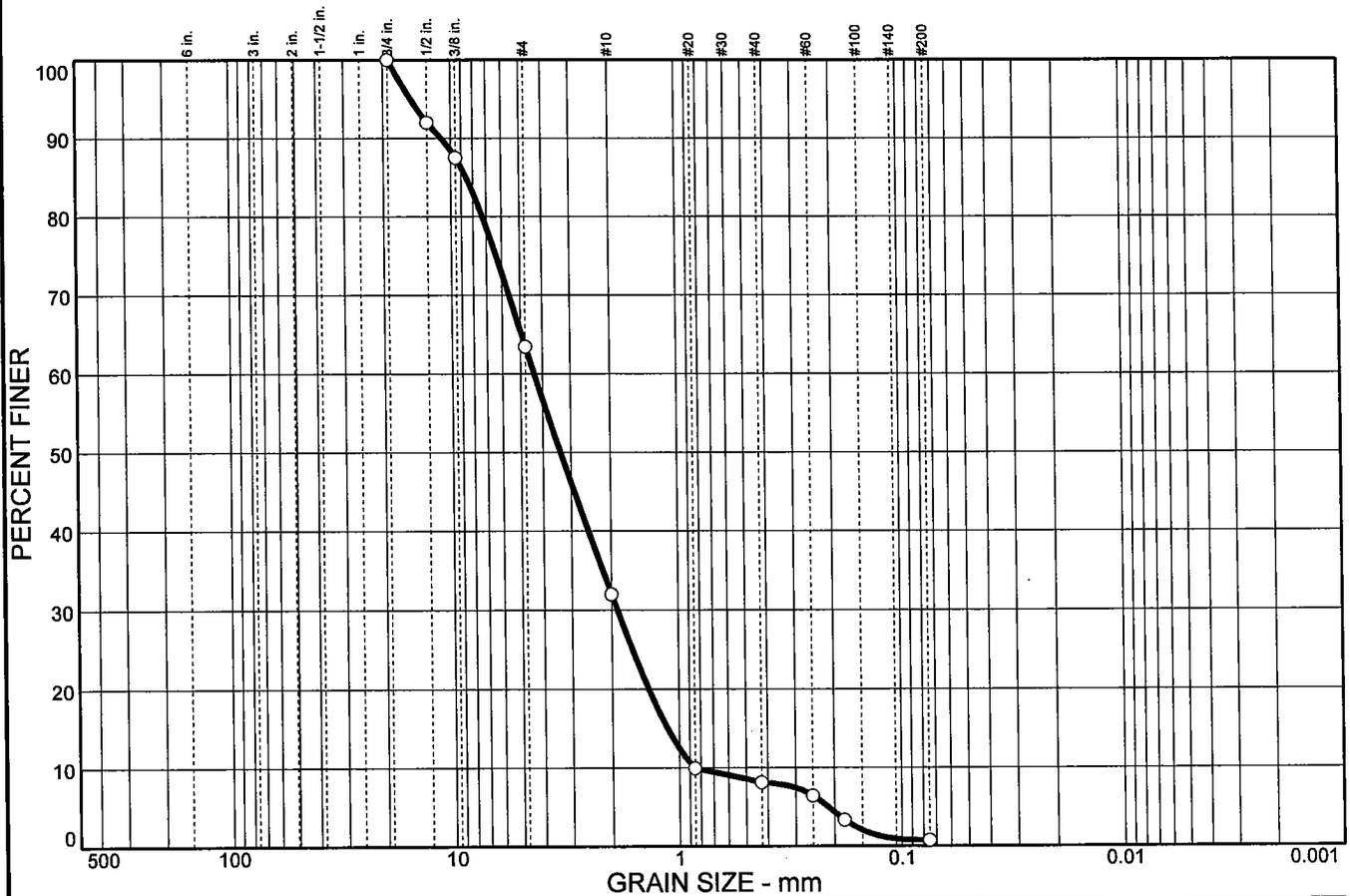
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	36.6	31.4	23.9	7.4	0.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	92.0		
3/8 in.	87.5		
# 4	63.4		
# 10	32.0		
# 20	9.9		
# 40	8.1		
# 60	6.4		
# 80	3.3		
# 200	0.7		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 8.57              D<sub>60</sub>= 4.36              D<sub>50</sub>= 3.35  
D<sub>30</sub>= 1.88              D<sub>15</sub>= 1.13              D<sub>10</sub>= 0.857  
C<sub>u</sub>= 5.09                C<sub>c</sub>= 0.95

**Classification**

USCS= SP                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6026  
 Location: CI-04 #2

Source of Sample: Client Samples

Date:  
 Elev./Depth: 5 FT 1.5 m

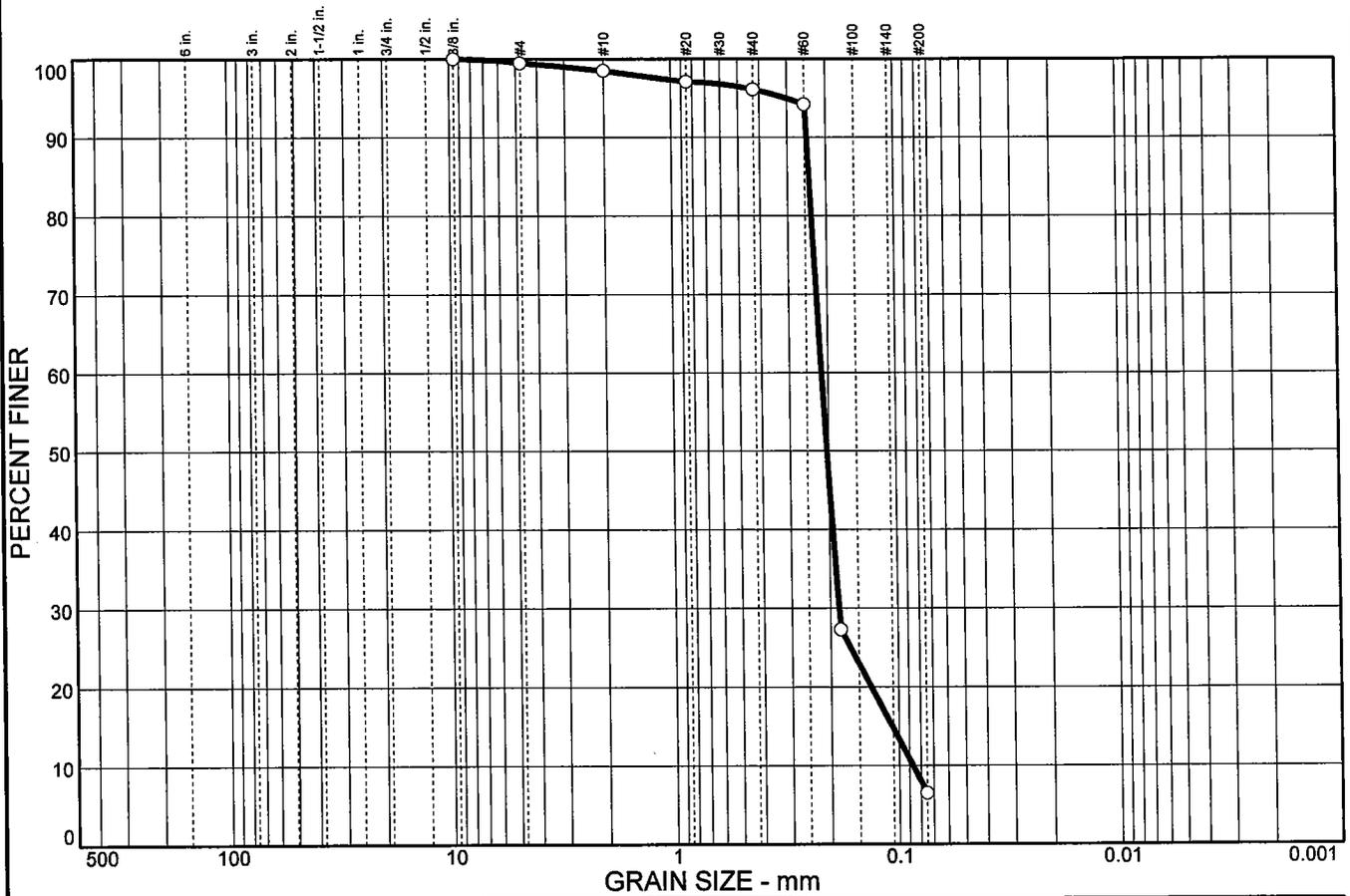
Mappa TestLab

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.5	1.0	2.4	89.6	6.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	99.5		
# 10	98.5		
# 20	97.1		
# 40	96.1		
# 60	94.2		
# 80	27.3		
# 200	6.5		

**Soil Description**

Poorly graded sand with silt

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.240              D<sub>60</sub>= 0.214              D<sub>50</sub>= 0.204  
D<sub>30</sub>= 0.183              D<sub>15</sub>= 0.107              D<sub>10</sub>= 0.0868  
C<sub>u</sub>= 2.47                      C<sub>c</sub>= 1.80

**Classification**

USCS= SP-SM                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6027  
 Location: CI-04 #3

Source of Sample: Client Samples

Date:  
 Elev./Depth: 10 FT 3 m

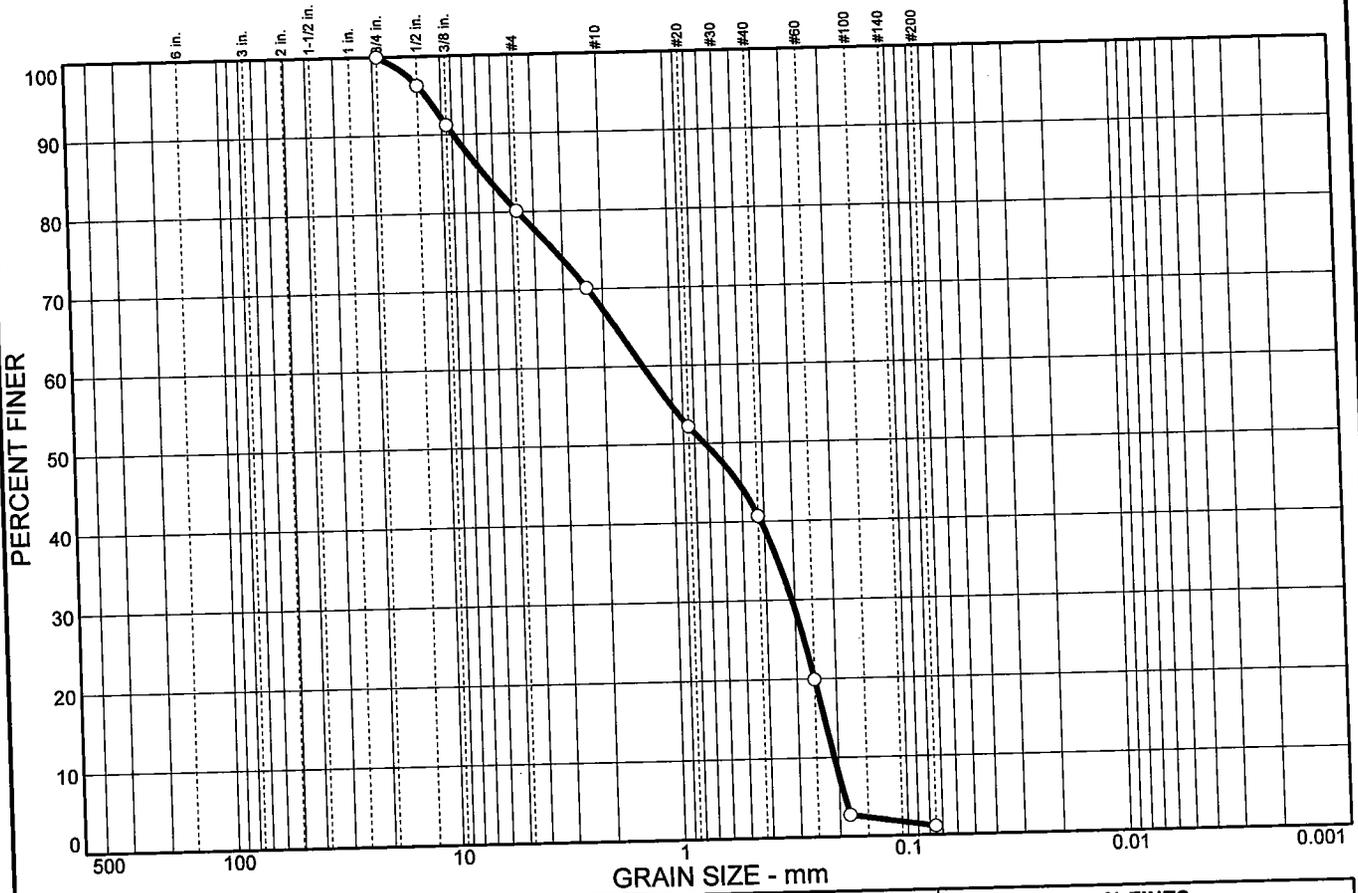
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	19.9	12.8	26.6	39.6	1.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.3		
3/8 in.	91.2		
# 4	80.1		
# 8	70.1		
# 20	52.2		
# 40	40.7		
# 60	19.9		
# 80	2.7		
# 200	1.1		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.63              D<sub>60</sub>= 1.35              D<sub>50</sub>= 0.724  
D<sub>30</sub>= 0.309              D<sub>15</sub>= 0.229              D<sub>10</sub>= 0.209  
C<sub>u</sub>= 6.45                      C<sub>c</sub>= 0.34

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6028  
 Location: CI-05 #1

Source of Sample: Client Samples

Date:  
 Elev./Depth: 0 FT 0 m

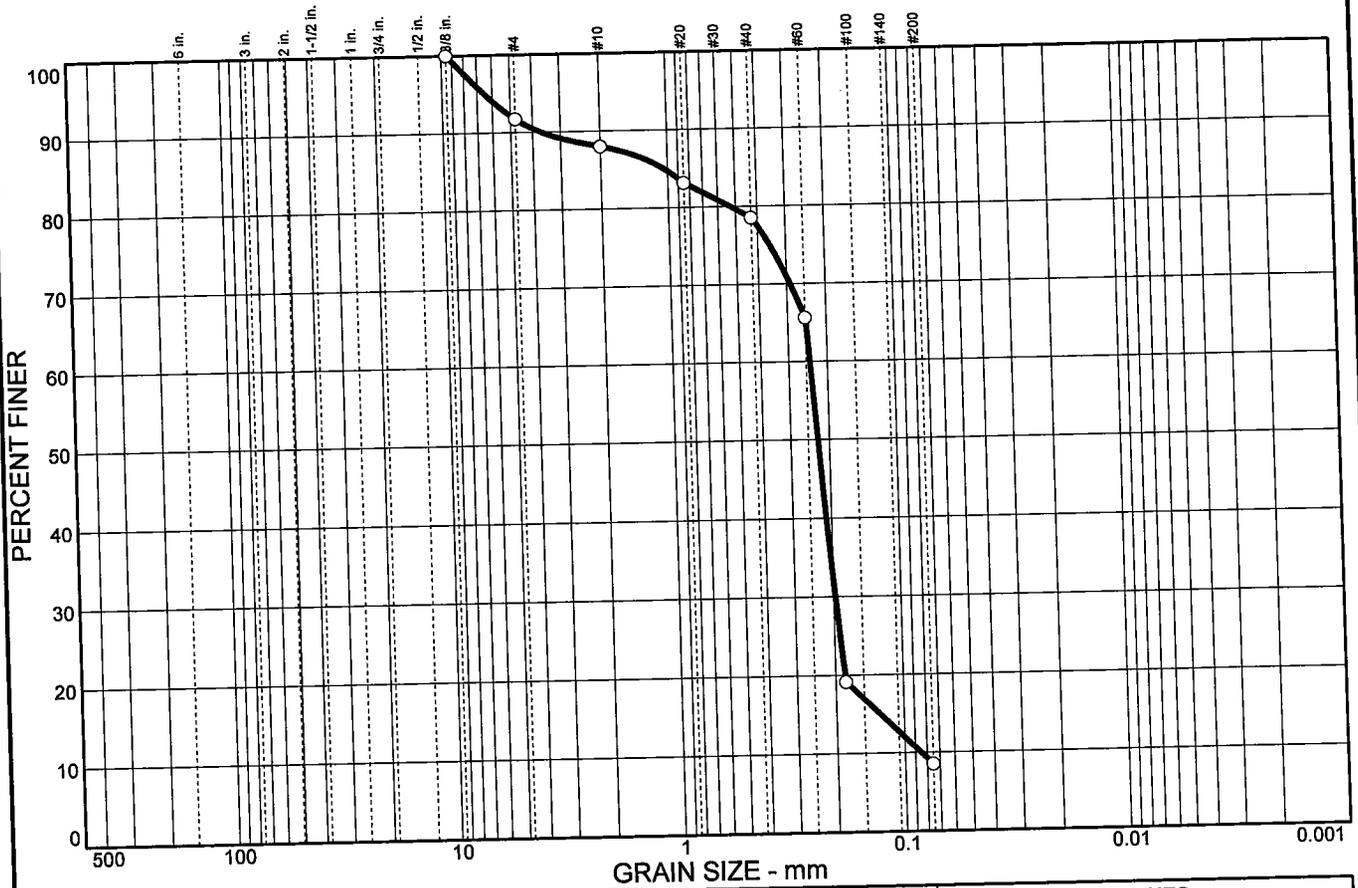
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.3	3.7	9.5	70.0	8.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	91.7		
#10	88.0		
#20	83.1		
#40	78.5		
#60	65.6		
#80	19.1		
#200	8.5		

**Soil Description**  
Poorly graded sand with silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 1.04              D<sub>60</sub>= 0.241              D<sub>50</sub>= 0.226  
 D<sub>30</sub>= 0.197              D<sub>15</sub>= 0.128              D<sub>10</sub>= 0.0849  
 C<sub>u</sub>= 2.84                      C<sub>c</sub>= 1.90

**Classification**  
 USCS= SP-SM                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6029  
Location: CI-05 #2

Source of Sample: Client Samples

Date:  
Elev./Depth: 5 FT 1.5 m

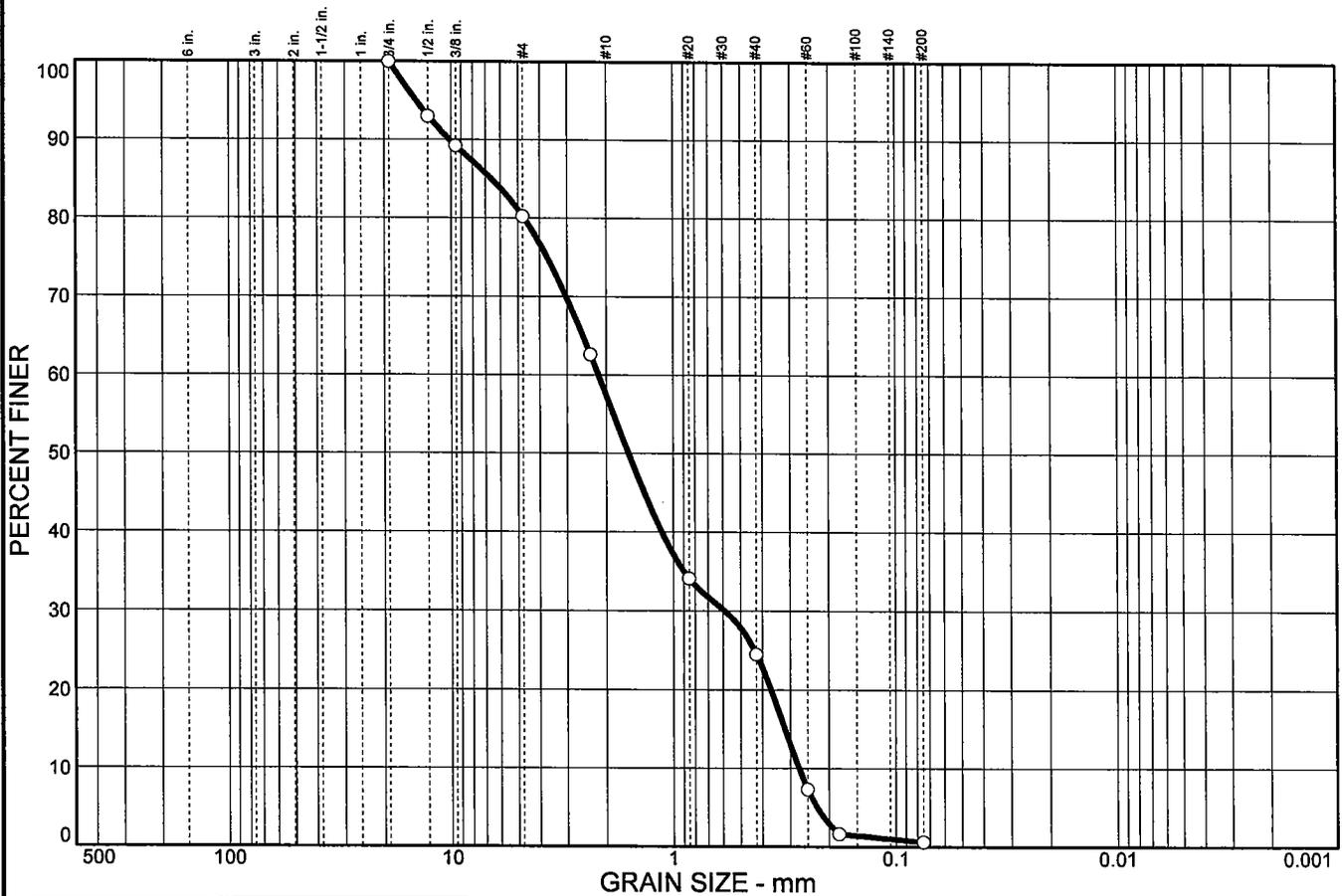
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	19.8	22.9	32.8	23.9	0.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	93.0		
3/8 in.	89.2		
# 4	80.2		
# 8	62.6		
# 20	34.1		
# 40	24.5		
# 60	7.3		
# 80	1.6		
# 200	0.6		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.60              D<sub>60</sub>= 2.17              D<sub>50</sub>= 1.59  
D<sub>30</sub>= 0.590              D<sub>15</sub>= 0.317              D<sub>10</sub>= 0.274  
C<sub>u</sub>= 7.93                      C<sub>c</sub>= 0.59

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6030  
 Location: CI-06 #1

Source of Sample: Client Samples

Date:  
 Elev./Depth: 0 FT 0 m

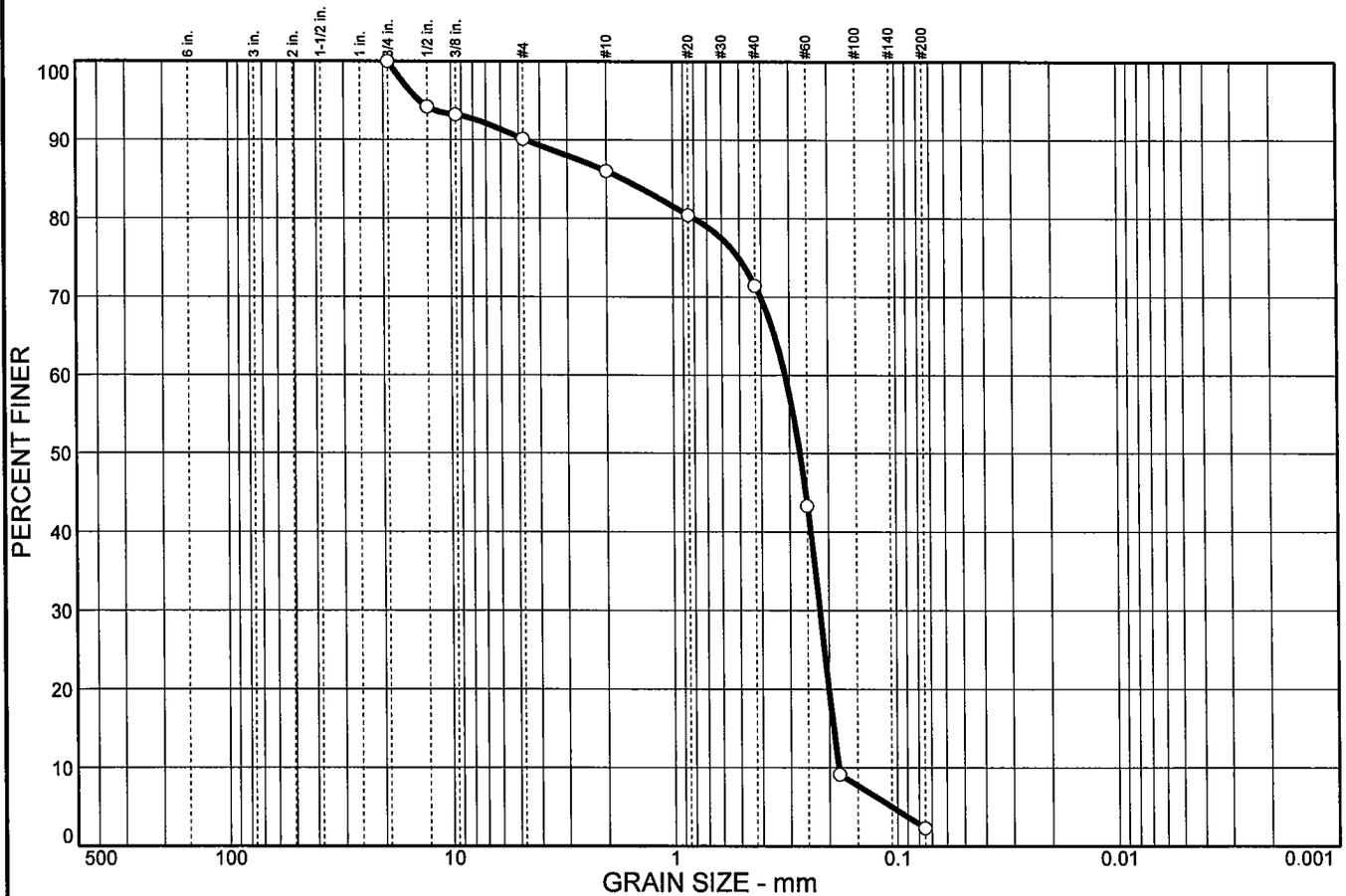
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.9	4.1	14.6	69.1	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	94.2		
3/8 in.	93.2		
# 4	90.1		
# 10	86.0		
# 20	80.4		
# 40	71.4		
# 60	43.3		
# 80	9.1		
# 200	2.3		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 1.68              D<sub>60</sub>= 0.314              D<sub>50</sub>= 0.270  
D<sub>30</sub>= 0.220              D<sub>15</sub>= 0.192              D<sub>10</sub>= 0.182  
C<sub>u</sub>= 1.72                      C<sub>c</sub>= 0.85

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6031  
 Location: CI-06 #2

Source of Sample: Client Samples

Date:  
 Elev./Depth: 5 FT 1.5 m

## Mappa TestLab

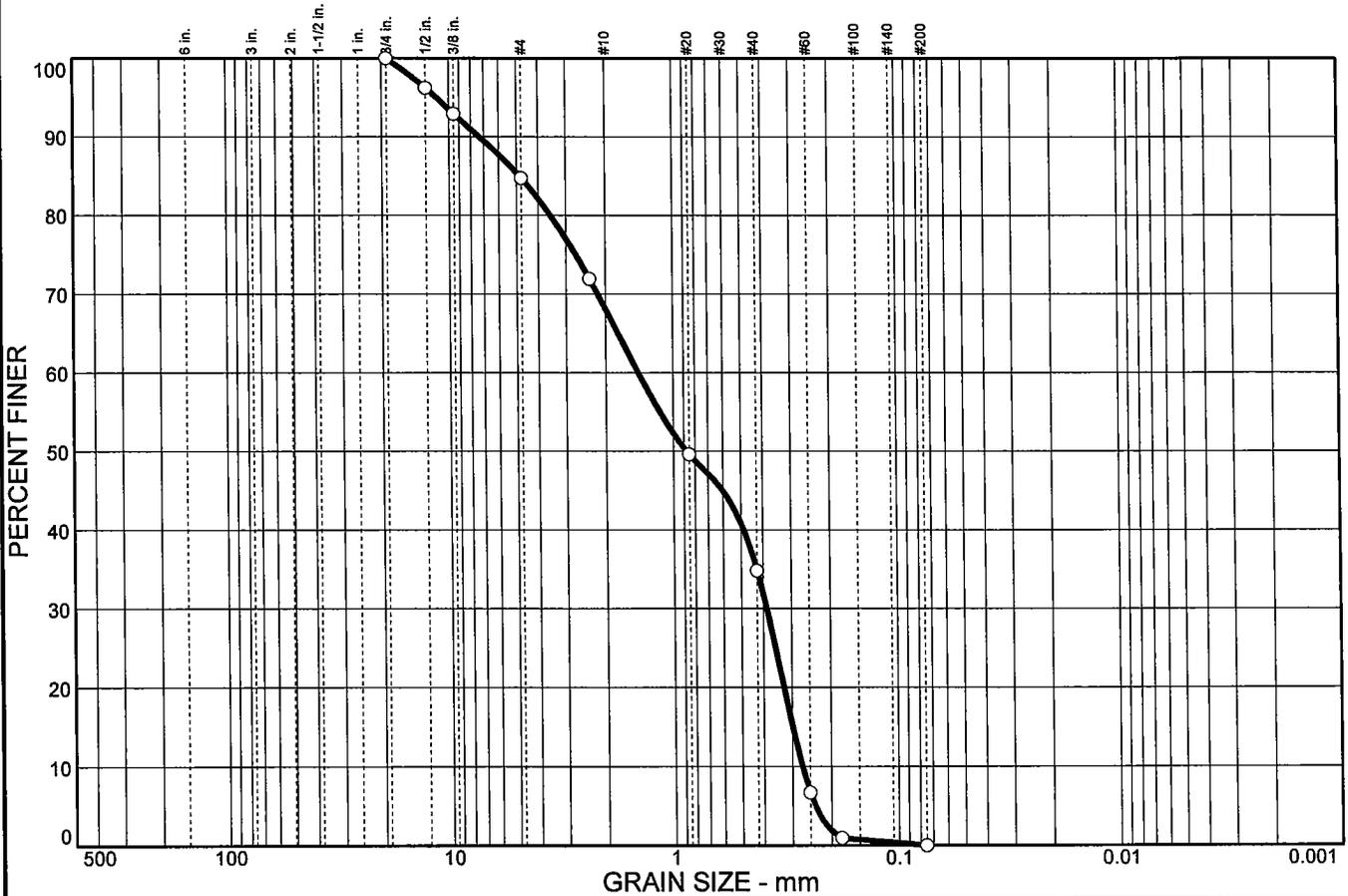
**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	15.3	16.7	33.2	34.8	0.0	0.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.2		
3/8 in.	92.9		
# 4	84.7		
# 8	71.9		
# 20	49.6		
# 40	34.8		
# 60	6.7		
# 80	0.9		
# 200	0.0		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 4.85              D<sub>60</sub>= 1.44              D<sub>50</sub>= 0.874  
D<sub>30</sub>= 0.386              D<sub>15</sub>= 0.298              D<sub>10</sub>= 0.271  
C<sub>u</sub>= 5.30                      C<sub>c</sub>= 0.38

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6033  
**Location:** CI-08 #1

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 0 FT 0 m

Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.5	2.1	27.3	67.2	1.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 10	96.4		
# 20	94.0		
# 40	69.1		
# 60	63.3		
# 80	12.2		
# 200	1.9		

**Soil Description**

Poorly graded sand with silt ad

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.699              D<sub>60</sub>= 0.245              D<sub>50</sub>= 0.232  
 D<sub>30</sub>= 0.205              D<sub>15</sub>= 0.184              D<sub>10</sub>= 0.149  
 C<sub>u</sub>= 1.64                      C<sub>c</sub>= 1.15

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

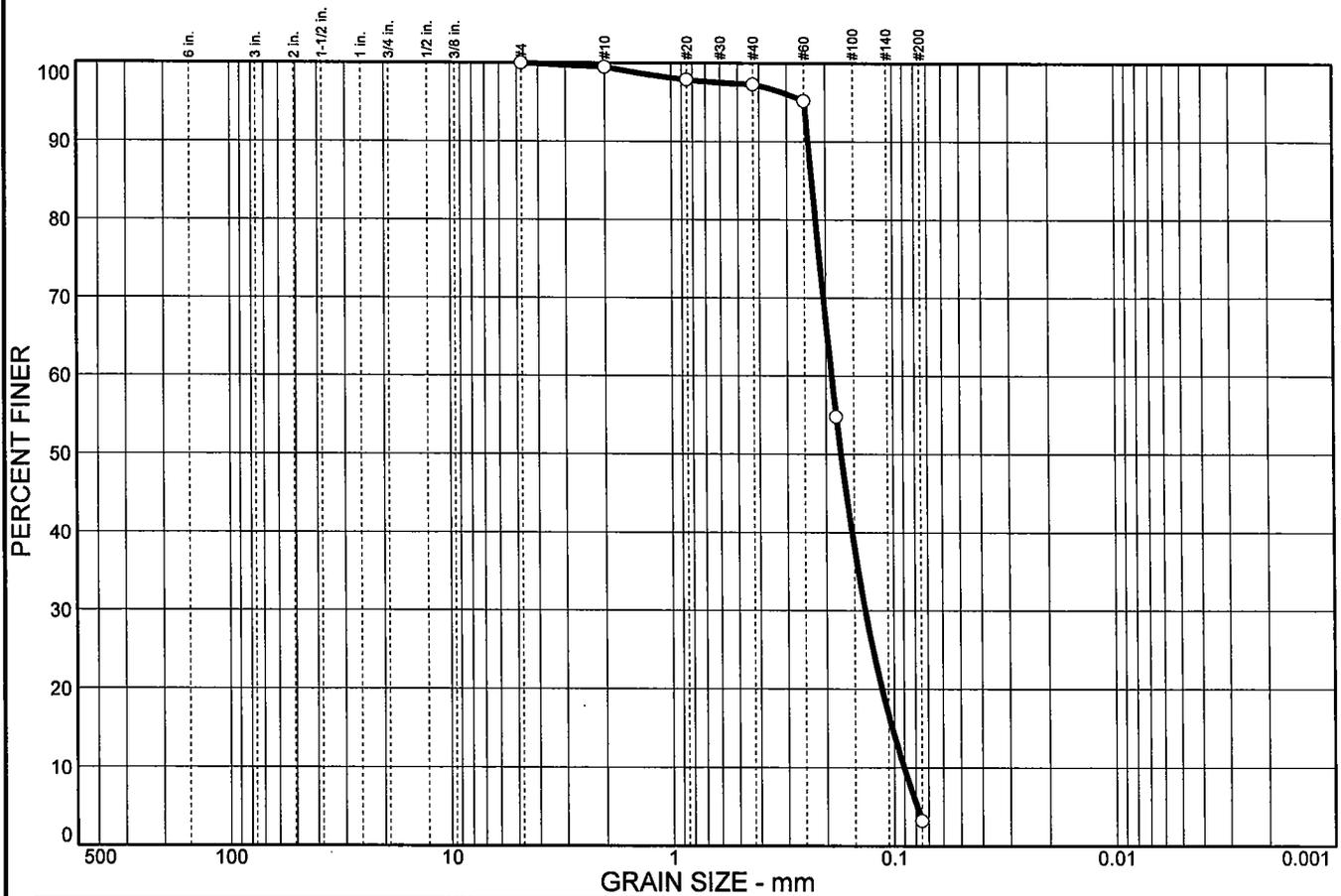
\* (no specification provided)

Sample No.: 6034                      Source of Sample: Client Samples                      Date:

Location: CI-08 #2                      Elev./Depth: 5 FT 1.5 m

<h2>Mappa TestLab</h2>	<p><b>Client:</b> U.S. Army Corps of Engineers, Alaska District</p> <p><b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska</p> <p><b>Project No:</b> 2004-148</p> <p style="text-align: right;"><b>Figure</b></p>
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# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.5	2.2	94.1	3.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	99.5		
# 20	97.9		
# 40	97.3		
# 60	95.2		
# 80	54.8		
# 200	3.2		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.231              D<sub>60</sub>= 0.189              D<sub>50</sub>= 0.172  
D<sub>30</sub>= 0.134              D<sub>15</sub>= 0.102              D<sub>10</sub>= 0.0903  
C<sub>u</sub>= 2.09                      C<sub>c</sub>= 1.06

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6035  
 Location: CI-08 #3

Source of Sample: Client Samples

Date:  
 Elev./Depth: 10 FT 3 m

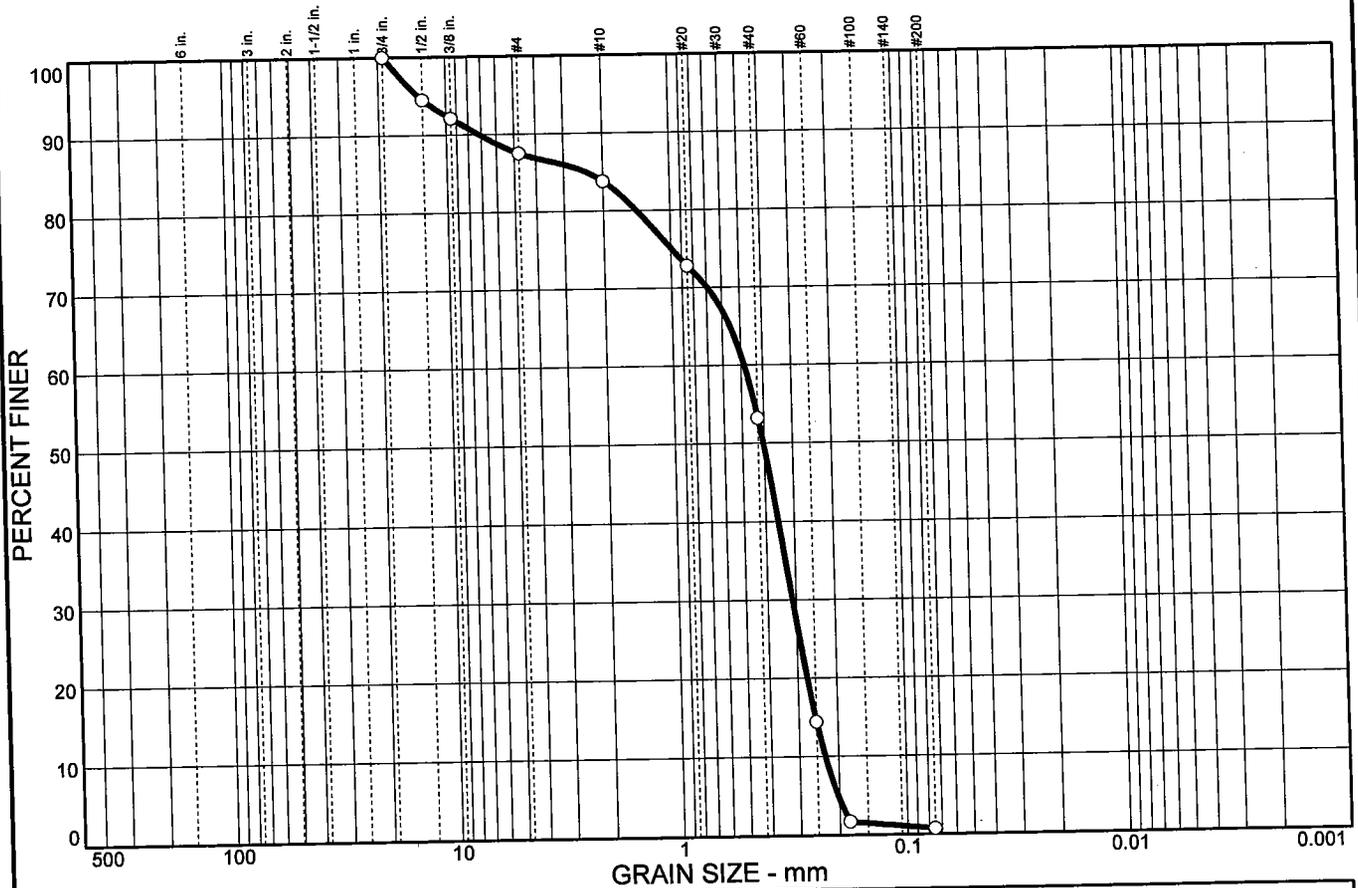
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.5	3.7	30.6	52.5	0.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	94.5		
3/8 in.	92.1		
# 4	87.5		
# 10	83.8		
# 20	72.8		
# 40	53.2		
# 60	14.4		
# 80	1.7		
# 200	0.7		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 2.38                      D<sub>60</sub>= 0.484                      D<sub>50</sub>= 0.404  
D<sub>30</sub>= 0.311                      D<sub>15</sub>= 0.253                      D<sub>10</sub>= 0.230  
C<sub>u</sub>= 2.10                      C<sub>c</sub>= 0.87

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6036  
 Location: CI-09 #1

Source of Sample: Client Samples

Date:  
 Elev./Depth: 0 FT 0 m

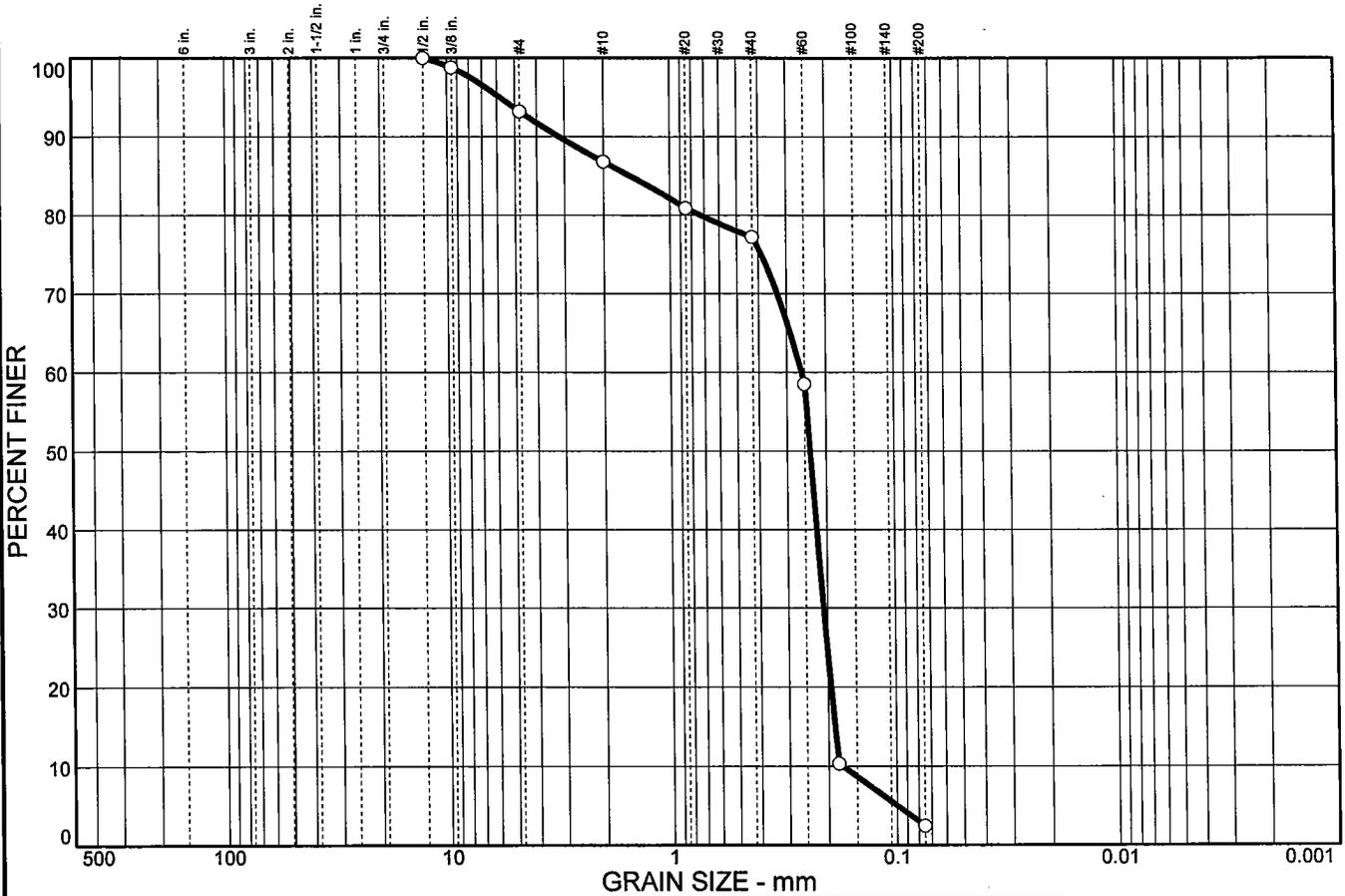
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.8	6.4	9.6	74.8	2.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	98.8		
# 4	93.2		
# 10	86.8		
# 20	80.9		
# 40	77.2		
# 60	58.5		
# 80	10.3		
# 200	2.4		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 1.52              D<sub>60</sub>= 0.258              D<sub>50</sub>= 0.237  
D<sub>30</sub>= 0.209              D<sub>15</sub>= 0.187              D<sub>10</sub>= 0.174  
C<sub>u</sub>= 1.48                      C<sub>c</sub>= 0.97

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6037  
Location: CI-09 #2

Source of Sample: Client Samples

Date:  
Elev./Depth: 5 FT 1.5 m

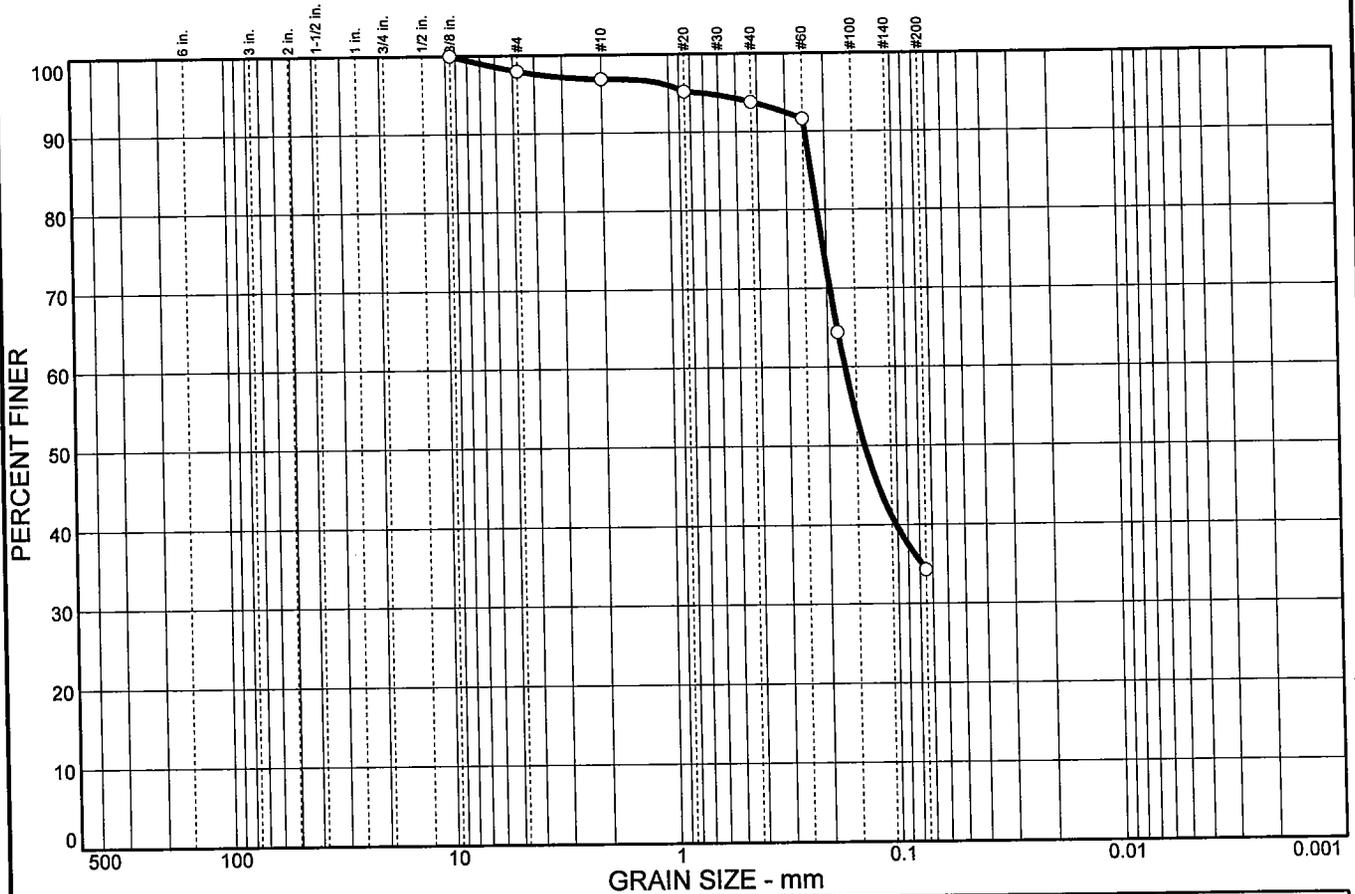
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.0	1.1	3.1	59.5	34.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	98.0		
# 10	96.9		
# 20	95.2		
# 40	93.8		
# 60	91.6		
# 80	64.4		
# 200	34.3		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.232              D<sub>60</sub>= 0.168              D<sub>50</sub>= 0.139  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6038  
Location: CI-09 #3

Source of Sample: Client Samples

Date:  
Elev./Depth: 10 FT 3 m

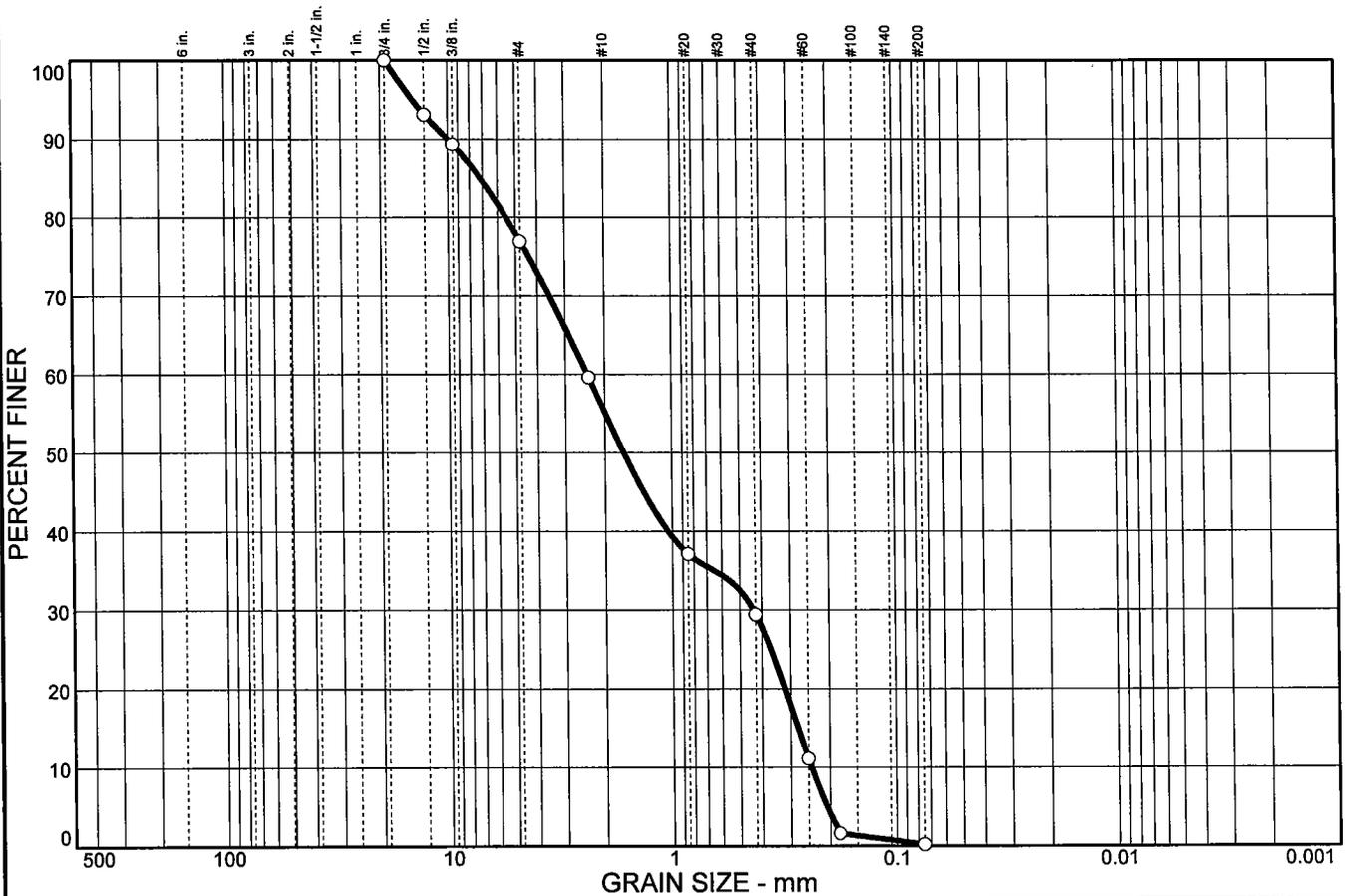
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	23.1	21.8	25.7	29.2	0.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	93.1		
3/8 in.	89.3		
# 4	76.9		
# 8	59.6		
# 20	37.1		
# 40	29.4		
# 60	11.1		
# 80	1.6		
# 200	0.2		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.20              D<sub>60</sub>= 2.40              D<sub>50</sub>= 1.65  
D<sub>30</sub>= 0.436              D<sub>15</sub>= 0.278              D<sub>10</sub>= 0.242  
C<sub>u</sub>= 9.89                      C<sub>c</sub>= 0.33

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6039  
Location: CI-10 #1

Source of Sample: Client Samples

Date:  
Elev./Depth: 0 FT 0 m

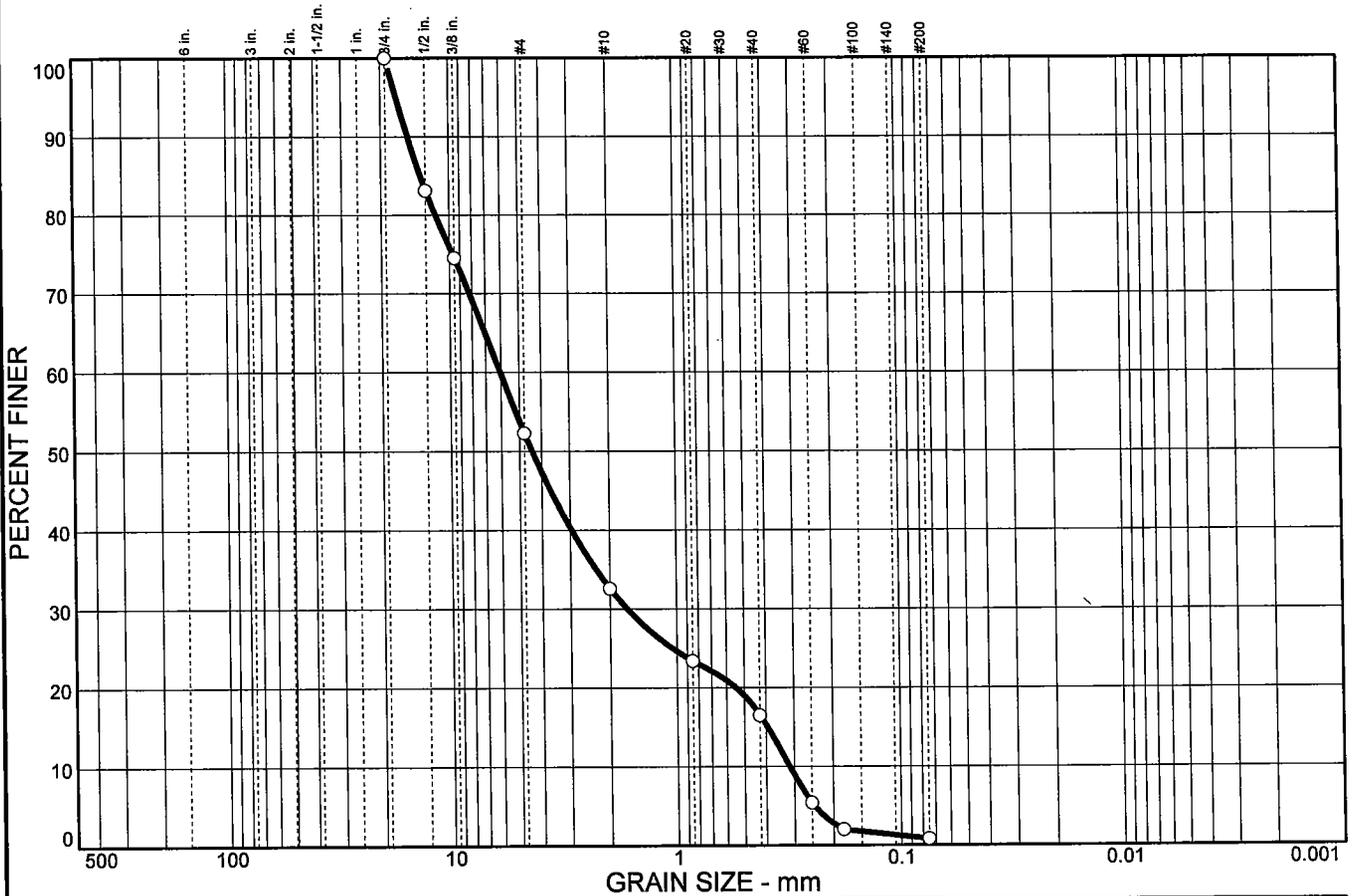
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	47.7	19.7	16.1	15.7	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	83.1		
3/8 in.	74.5		
# 4	52.3		
# 10	32.6		
# 20	23.4		
# 40	16.5		
# 60	5.4		
# 80	2.0		
# 200	0.8		

**Soil Description**

Well-graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 13.4              D<sub>60</sub>= 6.05              D<sub>50</sub>= 4.39  
D<sub>30</sub>= 1.67              D<sub>15</sub>= 0.393              D<sub>10</sub>= 0.314  
C<sub>u</sub>= 19.26              C<sub>c</sub>= 1.47

**Classification**

USCS= SW                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

**Sample No.:** 6040  
**Location:** CI-10 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 5 FT 1.5 m

## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**





## **Appendix C**

### **Test Boring Logs and Laboratory Data BIA Prospect**



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: 1 Apr 2004

# Soils and Geology Section

## EXPLORATION LOG

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,316,855 ft. ±**  
Easting: **641,136 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-01** Permanent: **BIA-01**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

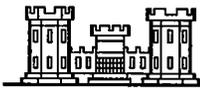
Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Ice		5 13 21	ICE	ICE with Sand/Fines Inclusions							Foggy, -15 degrees, 5 mph winds
2														No sample collected, clear, ice, planar ice crystals larger than 2 inches with white interstitial ice
6		2	Vr	F4	5 15 28	SM	Silty SAND				0.25			Gray/ brown, frozen, subrounded gravel, fine to coarse sand, nonplastic (NP) fines, estimated 45% clear ice crystals less than .5 inch with interstitial ice.
10		3	Nbe	S2	19 44 50/ 4in.	SP-SM	Poorly graded SAND with Silt and Gravel	23	70	7	0.5			gravel present in cuttings Brown, frozen, subrounded gravel, fine to coarse sand
16		4	Vr	S1	29 33 54	SP-SM	Poorly graded SAND with Silt and Gravel				0.25			Light brown, frozen, subrounded gravel, fine to coarse sand, Estimated 30% clear and cloudy ice crystals randomly distributed
22		5	Vx	F4	30 40 52	SM	Silty SAND	1	74	25				Brown and gray, frozen, fine to coarse sand, NP fines, estimated 5% ice, 0.5-inch clusters of small cloudy ice crystals
26		6	Vr	F1	18 26 26	ML	SILT							Gray, frozen, NP fines, randomly oriented-clusters and veins of small white crystals, estimated 15% ice
30		7	Vs	F4	11 17 24	ML	SILT							Gray, frozen, NP fines, estimated 10% ice, horizontally stratified 1/16 inch veins of small cloudy ice crystals
32														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05

NPA Form 19-E  
May 94 Prev. Ed. Obsolete

Project: Coastal Storm Damage Reduction

Hole Number:  
**BIA-01**



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

Page 1 of 1

Date: 4 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 6,313,928 ft. ±  
Easting: 641,593 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
TB-02 BIA-02

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Aaron Banks

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
30.0 ft.

Total Depth:  
31.5 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
1		1	Ice	F4	6 11 17	ICE	ICE with Sand/Fines Inclusions							No sample collected, ice (large planer clear ice crystals with white interstitial ice)
2														
4														
6		2	Vx	F4	7 15 50/5in.	ML	SILT							1st foot of sample is ice as above, last 6 inches is gray, frozen, fine sand, non plastic (NP) fines, estimated 10% ice, sampler was overstuffed 50 blows is not accurate
8														
10		3	Vr	F4	48 41 45	SM	Silty SAND with Gravel				0.25			Gray and brown, subrounded gravel, fine to coarse sand, Estimated 10% visible small white ice crystals in random formations greater than .5 inch thick
12														
14														
16		4	Nbe	F3	35 50/5in.	SM	Silty SAND	3	74	23	0.375			Gray, frozen, fine to medium sand, cuttings from 16 feet down are black and slightly plastic when thawed
18														
20		5	Vx	F4	12 23 36	CL- ML	Silty CLAY							Dark gray, very fine to fine sand, fines are slightly plastic when thawed, Estimated 20% visible ice (uniformly distributed small cloudy-clear granuler ice crystals)
22														
24														
26		6	Vx	F4	15 29 34	CL- ML	Silty CLAY							Dark gray, frozen, fines are slightly to low plasticity when thatwed, small clear-white granular ice crystals throughout, estimated 30% visible ice
28														
30		7	Vx	F4	10 15 20	CL- ML	Silty CLAY							Dark gray, frozen, fines are slightly to low plasticity when thawed, small clear-white granular ice crystals throughout, estimated 30% visible ice
32														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE, ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **5 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,313,857 ft. ±**  
Easting: **640,961 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-03** Permanent: **BIA-03**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2		1	Vr	F3	8 48 50/ 5in.	SM	Silty SAND		54	46	0.125			Gray and brown, frozen, subrounded gravel, fine to coarse sand, estimated 20% visible ice, uniformly distributed small white crystals
4		2	Vr	F3	20 50/ 4in.	SM	Silty SAND	3	67	30				Gray and brown, frozen, fine to medium sand, estimated 20% visible ice, less than 1 inch clusters of small granular white ice
10		3	Nbe	F3	45 50/ 2in.	SM	Silty SAND							Brown, frozen, subrounded gravel, fine to medium sand  Gravel in cuttings at 12'
16		4	Vr	F4	14 28 38	ML	Sandy SILT				0.25			Gray, frozen, subrounded gravel, fine to coarse sand, estimated 10% visible ice, less than 0.5 inch random orientated veins and clusters of white small granular ice crystals
20		5	Vx	F4	15 21 27	ML	SILT with Sand				0.125			Dark gray, frozen, subrounded gravel, fine sand, estimated 5% visible ice, small white individual ice crystals
26		6	Vx	F4	12 22 20	ML	SILT							Dark gray, frozen, thawed cuttings have low plasticity fines, estimated 20% visible ice, small cloudy flat ice crystals
30		7	Vx	F4	12 12 11	ML	SILT							Dark gray, frozen, thawed cuttings have low plasticity fines, estimated 20% visible ice, small cloudy flat ice crystals
32														Bottom of Hole 31.5 ft PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

Page 1 of 1

Date: 7 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 6,310,478 ft. ±  
Easting: 641,008 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
TB-04 BIA-04

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Aaron Banks

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
30.0 ft.

Total Depth:  
31.5 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2		1	Ice		5 28 40	ICE + silt	SILT							Partly cloudy, 0 degrees, 20 mph winds
4		2	Ice		17 27 48	ICE + silt	Ice with silt inclusions							80% ice with 20% silt, silt is gray, ice is large clear crystals with white interstitial ice
6		3			22 41 50/5in.	SM	Silty SAND	4	77	19	0.25			Brown and gray, frozen, subrounded gravel, fine sand, small white ice crystals throughout, estimated 20% visible ice
8		4			29 49 50/5in.	ML	SILT				0.25			Gray, frozen, subrounded gravel, fine to coarse sand, estimated 5% visible ice, less than 1/8 inch thick bands of cloudy flakey ice crystals
10		5			18 25 32	ML	SILT							Dark gray, frozen, estimated 3% visible ice, 1/8 inch horizontally stratified white ice veins
12		6			14 18 19	ML	SILT							Dark gray, frozen, estimated 20% small, clear-cloudy, flakey ice crystals throughout, cuttings have low plasticity fines
14		7			14 37 27	ML	SILT							Dark gray, frozen, estimated 20% small, clear-cloudy, flakey ice crystals throughout
16														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **9 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,301,067 ft. ±**  
Easting: **640,133 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-05** Permanent: **BIA-05**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
6		1	Vr	F3	25 45 50/4in.	SM	Silty SAND	1	66	33	0.25			Brown and gray, frozen, subrounded gravel, fine to medium sand, nonplastic (NP) fines, 20% ice by volume, small white ice crystals throughout
10		2	Vx	F3	30 50 54	SM	Silty SAND	1	55	44	0.25			Gray and brown, frozen, subrounded gravel, fine sand, NP fines, 5% ice by volume, individual inclusions to 0.5 inch of small white ice crystals
16		3	Vx	F2	19 42 42	SM	Silty SAND							Gray, frozen, fine sand, NP fines, 10% ice by volume, 0.5 inch inclusions and veins of small white to clear ice crystals
20		4	Vx	F3	21 47 44	SM	Silty SAND							Gray and brown, frozen, fine sand, NP fines, 3% ice by volume, 1/16-inch horizontal veins of small white ice crystals
26		5	Vx	F3	22 38 41	SM	Silty SAND				0.25			Gray and brown, frozen, subrounded gravel, fine to coarse sand, NP fines, 3% ice by volume
28		6	Vr	F3	30	SM	Silty SAND							Dark gray, frozen, fine sand, NP fines, 2% ice by volume, 1/8 inch randomly oriented veins of white ice
30		7	Nbe	F3	27 45 30	SM	Silty SAND				0.25			Dark gray, frozen, subrounded gravel, fine to coarse sand, NP fines
32														Bottom of Hole 31.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **9 Apr 2004**

# Soils and Geology Section EXPLORATION LOG

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,301,447 ft. ±**  
Easting: **637,886 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-06** Permanent: **BIA-06**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						ML	SILT						Brown silt cuttings	
2-6		1	Ice		9 16 18	ICE	ICE with Sand/Fines Inclusions						Clear ice, large flat clear ice crystals with white interstitial ice	
6-10		2	Vx	F3	50 50/3in.	SM	Silty SAND	80	20	0.25			Gray and brown, frozen, subrounded gravel, fine sand, nonplastic (NP) fines, estimate 3% ice, small .5-inch white ice crystals	
10-16		3	Nbe	NFS	50 50/3in.	SP	Poorly graded SAND	5	93	2	0.5		Gray and brown, frozen, subrounded gravel, fine sand	
16-20		4	Nbn	F3	43 50 46	SM	Silty SAND	7	76	17			Gray and brown, frozen, fine to coarse sand, NP fines	
20-26		5	Nbe	F4	45 50/2in.	ML	Sandy SILT						Dark gray, frozen, fine sand, low plasticity fines	
26-30		6	Nbe	F4	30 38 44	ML	Sandy SILT						Dark gray, frozen, fine sand, NP fines	
30-32													Bottom of Hole 31.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: Coastal Storm Damage Reduction  
Barrow, Alaska

Page 1 of 1

Date: 10 Apr 2004

Drilling Agency:  Alaska District  
 Other Denali Drilling

Elevation Datum:  
 MSL  other

Location: Northing: 6,301,276 ft. ±  
Easting: 643,097 ft. ±

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
TB-07 BIA-07

Operator:  
Lyle Cain & Travis Coghill

Inspector:  
Aaron Banks

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
NE

Depth Drilled:  
30.0 ft.

Total Depth:  
30.4 ft.

Hammer Weight:  
340 lbs

Split Spoon I.D.:  
3 in.

Size and Type of Bit:  
7 in. Hollow Stem Auger

Type of Equipment:  
CME-45

Type of Samples:  
Grab and Drive

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1	Vr	F4	21 40 50/5in.	SM	Silty SAND with Gravel				0.5			Olive gray, frozen, subrounded gravel, fine to coarse sand, nonplastic (NP) fines, estimate 30% ice, .5 inch clusters of hard white ice crystals
10		2	Vr	F3	22 34 40	SM	Silty SAND with Gravel	18	52	30	0.5			Olive gray, frozen, subrounded gravel, fine to coarse sand, NP fines, uniform large cloudy ice crystals throughout, estimate 40% ice
14														Switched to auger core at 14.5'
16		3	Vr	F4	GRAB	SM	Silty SAND				0.5			Gray, frozen, subrounded gravel, fine sand, NP fines, estimate 5% ice, 1/16-inch viens of clear ice
18		4	Vs	PFS	GRAB	SP	Poorly graded SAND with Gravel	30	68	2	1.25			Gray and brown, frozen, subrounded gravel, fine sand, NP fines, estimate 10% ice, 1-inch thick layers of clear hard ice
20		5	Nbe	S2	GRAB	SP	Poorly graded SAND				2			Gray, frozen, rounded gravel, fine sand
22														
24														
26		6	Nbe	S2	50/1in.	SP	Poorly graded SAND							Gray, frozen, fine sand, NP fines
28														
30		7	Nbe	F3	50/5in.	SM	Silty SAND							Dark gray, frozen, fine sand, NP fines
32														Bottom of Hole 30.4 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **12 Apr 2004**

**Soils and Geology Section**  
**EXPLORATION LOG**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,301,091 ft. ±**  
Easting: **645,540 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-08** Permanent: **BIA-08**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.4 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class: TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1			38 50/4in.	SP-SM	Poorly graded SAND with Silt							Gray, frozen, fine sand, nonplastic (NP) fines
8														
10		2			32 44 52	SM	Silty SAND with Gravel	18	58	24	0.25			Gray, frozen, subrounded to rounded gravel, fine sand, NP fines, .5 inch thick clusters of small white ice crystals
12														
14														
16		3	Ice +		53 44 35	SM	Silty SAND		51	49				Gray and brown, frozen, fine sand, NP fines, one 4-inch thick band of flat clear large ice crystals with silt and white interstitial ice
18			Vx											
20		4			24 35 45	SM	Silty SAND	2	54	44	0.5			Dark gray, frozen, subrounded gravel, fine sand, NP fines, individual clusters of white ice crystals less than 0.5 inch thick
22														
24														
26		5			50/4in.	SP	Poorly graded SAND							Gray, frozen, fine sand
28														
30		6			50/4in.	SP	Poorly graded SAND							Not enough sample to collect data
32														Bottom of Hole 30.4 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **13 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,298,400 ft. ±**  
Easting: **640,254 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-09** Permanent: **BIA-09**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1	Ice	F4	22 28 43	SM	Silty SAND with Gravel				0.5			Gray and brown, frozen, angular to subrounded gravel, fine to coarse sand, NP fines, estimate 30% organics by volume, estimate 60% ice by volume, clear ice crystals less than .5 inch thick with white interstitial ice
8														
10		2	Ice	F4	17 28 41	ML	Sandy SILT							Gray, frozen, fine sand, NP fines, estimate 65% ice by volume, large clear planar ice crystals with white interstitial ice
12														
14														
16		3	Vx	F3	21 32 35	SM	Silty SAND	4	58	38	0.25			Gray and brown, frozen, subrounded to rounded gravel, fine sand, NP fines, small white ice crystals less than .25 inch thick, 10% ice by volume
18														gravel in cuttings at 18 feet
20		4	Nbe	F3	23 29 26	SM	Silty SAND with Gravel	13	56	31	0.5			Gray and brown, frozen, subrounded to rounded gravel, fine and coarse sand (mostly fine), NP fines
22														gravel in cuttings to 25 feet, no more than 30% gravel, lots of fines
24														Gray, frozen, subrounded to rounded gravel, fine sand, NP fines, randomly oriented veins of small white ice crystals less than .125 inch thick
26		5	Vr	F3	23 23 27	SM	Silty SAND				0.25			
28														
30		6	Nbe	S2	24 25 53	SP-SM	Poorly graded SAND with Silt and Gravel	37	52	11	0.5			Dark gray, frozen, subrounded to rounded gravel, fine and coarse sand, NP fines
32														Bottom of Hole 31.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1  
Date: **14 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,290,706 ft. ±**  
Easting: **635,797 ft. ±**

Top of Hole Elevation:

Hole Number, Field: **TB-10** Permanent: **BIA-10**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.3 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						PT	PEAT						Brown, frozen, silty peat	
2-6		1	Vr	F4	23 23 53	OL	Organic SILT						Brown and gray, frozen, organic fines, estimate 60% organics by volume, estimate 40% ice by volume	
6-10		2	Vr	F4	20 30 35	OL	Organic SILT						Brown and gray, frozen, organic fines, estimate 60% organics by volume, estimate 40% ice by volume	
10-16		3	Nbe	F4	21 34 34	ML	Sandy SILT	2	47	51	0.25		Brown, frozen, subrounded to rounded gravel, fine sand, NP fines	
16-20		4	Nbn	S2	40 50/5in.	SP-SM	Poorly graded SAND with Silt						Gray and brown, frozen, fine sand, nonplastic (NP) fines	
20-26		5	Vx	F2	30 30 50/3in.	SM	Silty SAND		83	17	0.5		Gray and brown, frozen, subrounded gravel, fine and coarse sand, individual clusters of clear ice crystals less than .5 inch thick with white interstitial ice	
26-30		6	Nbe	F2	50/3in.	SM	Silty SAND						Gray and brown, frozen, fine sand, NP fines, low recovery	
30-32													Bottom of Hole 30.3 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **14 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,293,316 ft. ±**  
Easting: **640,159 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-11** Permanent: **BIA-11**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class: TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1	Vr	F4	22 30 25	ML	Sandy SILT							Gray, frozen, fine sand, nonplastic (NP) fines, estimate 30% ice by volume, small white and clear ice crystals throughout
8														
10		2	Vr	F3	9 14	SM	Silty SAND with Gravel	10	66	24	0.25			Light brown, frozen, subrounded gravel, fine sand, NP fines, estimate 30% ice by volume, small white and clear ice crystals throughout
12														
14														
16		3	Vr	F4	33 45 50/4in.	ML	Sandy SILT							Gray, frozen, fine sand, NP fines, estimate 40% ice by volume, small clear ice crystals throughout with white interstitial ice
18														
20		4	Vx	F3	50/5in.	SM	Silty SAND							Gray and brown, frozen, fine sand, NP fines, estimate 10% ice by volume, individual small white ice crystals less than .5 inch thick
22														
24														
26		5	Nbe	F2	50/4in.	SM	Silty SAND							Gray, frozen, fine sand, NP fines
28														
30		6	Nbe	F2	85	SM	Silty SAND							Dark gray, frozen, fine sand, NP fines
32														Bottom of Hole 30.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **18 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,294,807 ft. ±**  
Easting: **643,484 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-12** Permanent: **BIA-12**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.3 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
6		1	Ice		7 20 20	Ice	Ice							No sample collected, large clear ice crystals with white interstitial ice
10		2	Ice		10 13 15	Ice	Ice							No sample collected, large clear ice crystals with white interstitial ice
16		3	Ice		10 18 34	Ice	Ice							No sample collected, large clear ice crystals with white interstitial ice
20		4	Ice	F2	31 50/ 5in.	SM	Silty SAND							Light brown, frozen, fine sand, nonplastic (NP) fines, estimate 40% ice by volume, large cloudy ice crystals with white interstitial ice, the ice soil interface is approximately 20.7 feet below the surface
26		5	Nbe	F2	50/ 4in.	SM	Silty SAND							Gray and brown, frozen, fine sand, NP fines
30		6	Nbe	F2	50/ 3in.	SM	Silty SAND							Gray and frozen, fine sand, NP fines
30.3														Bottom of Hole 30.3 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



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**Soils and Geology Section  
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Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **18 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,288,499 ft. ±**  
Easting: **640,373 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-13** Permanent: **BIA-13**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (m.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2	Peat					PT	PEAT						Brown, frozen	
2-4	Ice	1			11 14 20	Ice	Ice						Large clear ice crystals with white interstitial ice, no soil color	
4-10	Silty SAND	2		F2	11 26 34/3in.	SM	Silty SAND						Gray and brown, frozen, trace of gravel less than .25 inch, fine sand, nonplastic (NP) fines	
10-16	Silty SAND	3		F3	50 50 50/3in.	SM	Silty SAND	1	61	38	0.5	1	Gray and brown, frozen, subrounded to rounded gravel, fine sand, NP fines, estimate 5% ice by volume, individual clusters of small white ice crystals less than 1/2 inch wide	
16-20	Poorly graded SAND	4		NFS	50/3in.	SP	Poorly graded SAND	4	93	3	0.25	0	Light brown, frozen, rounded gravel, fine to medium sand, NP fines	
20-26	Poorly graded SAND Sandy SILT	5		F4	52 42 50/3in.	SP ML	Poorly graded SAND Sandy SILT						Dark gray and brown, fine sand, NP fines, estimate 2% ice by volume, small individual white ice crystals, first 3 inches of sample not retained (same as sample 4)	
26-30	Sandy SILT	6		F4	30 42 54	ML	Sandy SILT						Dark gray, frozen, fine sand, estimated 2% visible ice, individual, .125 inch thick veins of small white ice crystals	
30-32													Bottom of Hole 31.5 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **19 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,282,490 ft. ±**  
Easting: **638,855 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-14** Permanent: **BIA-14**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						ICE	ICE with Sand/Fines Inclusions						Ground ice and snow	
2-4						PT	PEAT						Brown, frozen	
4-6		1	Vx & Nbe	F3	48 50/5in.	SM	Silty SAND						Gray and brown, frozen, fine sand, nonplastic (NP) fines	
6-8		2	Vx	F4	30 40 34	ML	Sandy SILT						Dark gray, frozen, fine sand, NP fines, 5% ice by volume, small ice crystals	
8-16		3	Nbe	F4	26 50/5in.	ML	Sandy SILT						Dark gray, frozen, fine sand, NP fines	
16-20		4	Nbe	F2	50/5in.	SP-SM	Poorly graded SAND with Silt	1	92	7			Light brown and gray, frozen, fine sand, NP fines	
20-26		5	Nbn	F4	33 48 50	ML	Sandy SILT						Dark gray, frozen, fine sand, NP fines	
26-30		6	Nbn	F4	12 16 22	ML	SILT						Dark gray, frozen, NP fines	
30-32													Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT**  
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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

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Date: **20 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,282,420 ft. ±**  
Easting: **642,146 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-15** Permanent: **BIA-15**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1	Vr	F4	24 33 50	ML- OL	Sandy SILT-Organic SILT mix							Gray and brown, frozen, fine sand, nonplastic (NP) fines, small white ice crystals on fresh surfaces, estimated 10% visible ice, estimated 10% organics by volume
10		2	Nbn	F3	14 50 50/5in.	SM	Silty SAND	4	65	31	0.75			Gray and brown, frozen, subrounded to rounded gravel, fine to medium sand, NP fines
16		3	Vx	F3	16 30 30	SM	Silty SAND							Gray and brown, frozen, fine to coarse sand, NP fines, estimated 2% visible ice, individual inclusions of small white to clear ice crystals less than .5 inch thick
20		4	Nbe	F4	33 50/5in.	ML	Sandy SILT	49	51	0.5				Gray and brown, frozen, subrounded to rounded gravel, fine to coarse sand, NP fines
26		5	Nbn	F4	10 10 14	ML	SILT							Dark gray, frozen, NP fines
30		6	Nbn	F4	17 17 16	ML	SILT							Dark gray, frozen, NP fines
32														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
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Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **20 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,300,276 ft. ±**  
Easting: **639,972 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-16** Permanent: **BIA-16**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Dark brown, frozen	
2-6		1	Nbe	F4	14 50/ 5in.	ML	SILT						Brown, frozen, nonplastic (NP) to low plasticity fines, 25% ice by volume	
6-10		2	Vr	F4	21 55	ML	Sandy SILT			0.25			Brown, frozen, rounded gravel, fine sand, NP fines, 30% ice by volume	
10-16		3	Vx	NFS	22 50/ 3in.	SP	Poorly graded SAND	8	90	2	0.25		Brown, frozen, rounded gravel, fine to coarse sand, 20% ice by volume	
16-20		4	Vx	NFS	50	SP	Poorly graded SAND with Gravel	49	50	1	0.375		Brown, frozen, rounded gravel, fine to coarse sand	
20-26		5		NFS	GRAB	GP	Poorly graded GRAVEL with Sand	67	31	2	0.75		Brown, frozen, rounded gravel, fine to coarse sand	
26-32		6		NFS	GRAB	GP	Poorly graded GRAVEL with Sand	72	26	2	0.75		Brown, frozen, rounded gravel, fine to coarse sand	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
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Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **20 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,300,276 ft. ±**  
Easting: **639,972 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-16** Permanent: **BIA-16**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**41.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		7		NFS	GRAB	GP	Poorly graded GRAVEL with Sand	63	35	2	0.5			Sunny, 5 degrees
36														
38		8		F2	GRAB	SM	Silty SAND							Brown, frozen, rounded gravel, fine to coarse sand
40														
42														Gray, frozen, fine sand, NP fines
44														Bottom of Hole 41.0 ft. PID = (Cold/Hot) Photo Ionization Detector
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
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Project: **Coastal Storm Damage Reduction  
Barrow, Alaska** Page 1 of 2  
Date: **20 Apr 2004**

Drilling Agency:  Alaska District  Other **Denali Drilling** Elevation Datum:  
 MSL  other

Location: Northing: **6,299,806 ft. ±**  
Easting: **640,062 ft. ±** Top of Hole  
Elevation:

Hole Number, Field: **TB-17** Permanent: **BIA-17** Operator: **Lyle Cain & Travis Coghill** Inspector: **Gregory Carpenter**

Type of Hole:  other **Auger**  Test Pit  Auger Hole  Monitoring Well  Piezometer  
Depth to Groundwater: \_\_\_\_\_ Depth Drilled: **40.0 ft.** Total Depth: **40.5 ft.**

Hammer Weight: **340 lbs** Split Spoon I.D.: **3 in.** Size and Type of Bit: **7 in. Hollow Stem Auger** Type of Equipment: **CME-45** Type of Samples: **Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Dark brown, frozen, nonplastic (NP) fines	
2-6		1	Vx & Vr	F4	7 14 35	ML	SILT						Brown, frozen, NP fines, 40% ice by volume	
6-10		2	Vx	F4	29 60	ML	SILT			0.375			Brown, frozen, rounded gravel, fine sand, NP fines, 25% ice by volume	
10-16		3	Nbe	F3	30 50/3in.	SM	Silty SAND with Gravel	20	59	21	0.375		Brown, frozen, rounded gravel, fine to coarse sand, NP to low plasticity fines	
16-20		4	Nbe	F3	12 39 55	SM	Silty SAND with Gravel				0.375		Brown, frozen, rounded gravel, fine sand, NP fines	
20-26		5		F4		ML	Sandy SILT	12	33	55	0.375		Brown, frozen, rounded gravel, fine to coarse sand, NP fines	
26-32		6		S2		SP	Poorly graded SAND with Gravel	42	53	5	0.375		Brown, frozen, rounded gravel, fine to coarse sand, NP fines, pieces of coal	

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Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **20 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,806 ft. ±**  
Easting: **640,062 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-17** Permanent: **BIA-17**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**40.0 ft.**

Total Depth:  
**40.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														
36		7				SP	Poorly graded SAND with Gravel	30	65	5	0.25			Brown and gray, frozen, rounded gravel, fine to coarse sand, NP fines
38														
40		8	Nbe	S2		SP-SM	Poorly graded SAND with Silt		94	6				Brown and gray, frozen, fine sand Bottom of Hole 40.5 ft. PID = (Cold/Hot) Photo Ionization Detector
42														
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2

Date: **19 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,867 ft. ±**  
Easting: **643,126 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**TB-18 BIA-18**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other Auger  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**38.5 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT							Light snow, 0 degrees
2-4														
4-6		1	Ice		9 40 48	ICE	ICE with Sand/Fines Inclusions				0.5			90% ice by volume, few rounded gravel, NP fines
6-8														
8-10		2	Vx & Vr	F4	3 22 45	ML	SILT							Brown, frozen, fine sand, NP fines, 40% ice by volume
10-12														
12-14		3	Vx & Vr	F2	7 34 50/5in.	SM	Silty SAND				0.375			Brown, frozen, rounded gravel, fine sand, NP fines, ice 30% by volume
14-16														
16-18		4	Vx & Vr	F3	14 58	SM	Silty SAND	8	76	16	0.25			Brown, frozen, rounded gravel, fine to coarse sand, NP fines, 20% ice by volume
18-20														
20-22		5		F4	60/3in.	ML	Sandy SILT	9	37	54	0.5			Brown, frozen, rounded gravel, fine to coarse sand, NP fines
22-24														
24-26		6	Nbn	S2	60/6in.	SP	Poorly graded SAND with Gravel	18	77	5	0.5			Brown, frozen, rounded gravel, fine to coarse sand
26-28														
28-30														
30-32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 2 of 2

Date: **19 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,867 ft. ±**  
Easting: **643,126 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-18** Permanent: **BIA-18**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**38.5 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34														Light snow, 0 degrees
36		7				ML	Sandy SILT	5	40	55	0.5			Brown, frozen, rounded gravel, fine sand
38		8	Nbn	F2	GRAB	SP-SM	Poorly graded SAND with Silt and Gravel	38	52	10	0.5			Brown, frozen, rounded gravel, fine to coarse sand
40														Bottom of Hole 40.0 ft. PID = (Cold/Hot) Photo Ionization Detector
42														
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1  
Date: **18 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,916 ft. ±**  
Easting: **645,564 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-19**  
Permanent: **BIA-19**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.8 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Brown, frozen, 50% ice by volume	
2-6		1	Ice	F4	11 29 35	ICE + silt- OL	Ice with silt inclusions to Organic SILT						White ice with organics and nonplastic (NP) fines, 95% ice by volume	
6-10		2	Nbe & Vx	F4	22 60	ML	Sandy SILT						Brown, frozen, fine sand, NP fines, 30% ice by volume	
10-16		3	Vr & Vx	F4	15 44	ML	Sandy SILT						Brown, frozen, rounded gravel, fine sand, NP fines, 40% ice by volume	
16-20		4	Vr & Vx	F3	29 60	SM	Silty SAND	4	78	18	0.5		Brown, frozen, rounded gravel, fine sand, NP fines, 35% ice by volume	
20-26		5	Vx & Vr	F4	21 51	SM	Silty SAND						Brown, frozen, fine sand, NP fines, 25% ice by volume	
26-30		6a 6b	Vr Vr	NFS F4	27 52/3in	SP PT	Poorly graded SAND PEAT						Gray, frozen, fine sand Dark brown peat, frozen Bottom of Hole 30.8 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE AN.C.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: 17 Apr 2004

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,298,507 ft. ±**  
Easting: **645,593 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-20**  
Permanent: **BIA-20**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.8 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1	Vx & Ice	F4	3 15 57	OL-ICE	Organic SILT to ICE with Sand/Fines Inclusions							Dark brown, frozen, nonplastic (NP) fines, 90% ice by volume
8														
10		2	Nbe	F4	20 55	ML	SILT							Brown, frozen, NP to lowplasticity fines
12														
14														
16		3	Nbe & Vx	F4	10 36 47	ML	SILT							Brown, frozen, NP to low plasticity fines
18														
20		4	Vr	F4	14 41 54	ML	SILT							Brown, frozen, NP fines, 60% ice by volume
22														
24														
26		5	Nbe	NFS	30 50/ 2in.	SP	Poorly graded SAND	97	3					Brown, frozen, fine sand
28														10% gravel to 0.75 inch from 27.5 to 28.5 feet, no sample collected
30		6	Nbe	NFS	37 50/ 3in.	SP	Poorly graded SAND							Brown, frozen, fine sand
32														Bottom of Hole 30.8 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2

Date: **20 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,266 ft. ±**  
Easting: **640,157 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-21** Permanent: **BIA-21**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Dark brown, frozen	
2-6		1	Ice	F4	8 30 27	ML	SILT						Brown, frozen, nonplastic (NP) fines, 75% ice by volume	
6-10		2	Vx & Vr	F4	4 34 48	ML	Sandy SILT						Brown, frozen, NP fines, 50% ice by volume	
10-16		3	Vx & Nbe	F4	24 50	SM	Silty SAND						Brown, frozen, NP fines	
16-20		4	Nbe	F4	8 40 33	ML	SILT				0.5		Brown, frozen, NP fines	
20-22				F2		SM	Silty SAND with Gravel				0.5		Brown, frozen, rounded gravel, fine to medium sand, NP fines	
22-26		5	Nbn	F2	100	SP-SM	Poorly graded SAND with Silt and Gravel	39	50	11	0.75		Brown, frozen, rounded gravel, fine to coarse sand	
26-30		6	Nbn	F1	Grab	GP-GM	Poorly graded GRAVEL with Silt and Sand	46	45	9	0.5		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 2 of 2

Date: **20 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,266 ft. ±**  
Easting: **640,157 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-21** Permanent: **BIA-21**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		7	Nbn	S1	Grab	GW	Well-graded GRAVEL with Sand	56	40	4	1		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	
36														
38		8	Nbn	S2	Grab	SP	Poorly graded SAND with Gravel	47	49	4	1		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	
40													Bottom of Hole 40.0 ft. PID = (Cold/Hot) Photo Ionization Detector	
42														
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE AN.C.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **24 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,300,612 ft. ±**  
Easting: **641,374 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-22** Permanent: **BIA-22**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**29.0 ft.**

Total Depth:  
**30.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Clear, 5 degrees	Dark brown, frozen
2-6		1	Vx & Vr	F4	9 33 53	ML	SILT							Brown, frozen, nonplastic (NP) fines, 60% ice by volume
6-10		2	Vx	F4	20 50/5in.	ML	Sandy SILT							Brown, frozen, fine sand, NP fines
10-16		3	Nbe	F2	10 50/4in.	SM	Silty SAND with Gravel				0.375			Brown, frozen, rounded gravel, fine sand, NP fines
16-20		4	Nf	F4	Grab	ML	SILT with Sand	6	42	52	0.5			Dark brown, frozen, rounded gravel, fine to coarse sand
20-24		5	Nf	NFS	Grab	GW	Well-graded GRAVEL with Sand	52	46	2	1			Brown, frozen, rounded gravel, fine to coarse sand
24-30		6	Nbe	F3	Grab	SM	Silty SAND	6	74	20	0.375			Brown, frozen, rounded gravel, fine to coarse sand
30-32														Bottom of Hole 30.0 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2

Date: **23 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,836 ft. ±**  
Easting: **641,594 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-23**  
Permanent: **BIA-23**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Dark brown, frozen	
2-6		1	Ice		9 34 30	ICE	ICE with Sand/Fines Inclusions						White ice with 5% silt	
6-10		2	Nbe	F4	10 42 54	ML	Sandy SILT						Brown, frozen, fine sand, nonplastic (NP) fines	
10-16		3	Nbe	F4	33 57	ML	Sandy SILT						Brown, frozen, fine sand, NP fines	
16-20		4	Nf	F4	Grab	ML	Sandy SILT with Gravel	13	30	57	0.75		Brown, frozen, rounded gravel, medium to coarse sand, NP fines	
20-24		5	Nf	F4	Grab	ML	Sandy SILT with Gravel	15	31	54	0.375		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	
24-30		6	Nf	S1	Grab	GP-GM	Poorly graded GRAVEL with Silt and Sand	55	39	6	0.75		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	

EXPLORATION LOG BARROW/STORM/DAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 2 of 2

Date: **23 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,836 ft. ±**  
Easting: **641,594 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-23**  
Permanent: **BIA-23**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		7	Nf	NFS	Grab	GP	Poorly graded GRAVEL with Sand	73	27		1		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	
36						SP	Poorly graded SAND						Fine frozen sand (by drill action)	
38						GP	Poorly graded GRAVEL with Sand						By drill action	
40		8	Nbe	F3	Grab	SM	Silty SAND with Gravel	21	65	14	0.25		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines	
42													Bottom of Hole 40.0 ft.	
44													PID = (Cold/Hot) Photo Ionization Detector	
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 2  
Date: **23 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,403 ft. ±**  
Easting: **641,735 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-24**  
Permanent: **BIA-24**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-2						OL	Organic SILT						Dark brown, frozen	
2-6		1	Ice		9 16 33	ICE	ICE with Sand/Fines Inclusions						Clear-white ice	
6-10		2	Vx & Ice	F4	10 32 41	ML	SILT						Brown, frozen, nonplastic (NP) fines, 75% ice by volume	
10-14						ICE	ICE with Sand/Fines Inclusions						Ice	
14-16		3	Vx	F4	6 26 35	ML	SILT			0.5			Brown, frozen, rounded gravel, fine sand, NP fines, 30% ice by volume	
16-20		4	Nf	F1	41 50/4in.	SP-SM	Poorly graded SAND with Silt and Gravel	32	61	7	0.5		Brown, frozen, rounded gravel, fine and coarse sand, NP fines	
20-24		5	Nf	F2	Grab	SP-SM	Poorly graded SAND with Silt and Gravel	41	49	10	0.5		Dark brown, frozen, rounded gravel, fine and coarse sand, NP fines, pieces of coal	
24-30		6	Nf	NFS	Grab	SW	Well-graded SAND with Gravel	35	62	3	0.5		Dark brown, frozen, rounded gravel, fine to coarse sand, NP fines, pieces of coal	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 2 of 2

Date: **23 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,403 ft. ±**  
Easting: **641,735 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-24** Permanent: **BIA-24**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
							%Gravel	%Sand	%Fines				
34		7	Nbe	F3	Grab	SM	Silty SAND	3	78	19	0.5		Dark brown, frozen, rounded gravel, fine sand, NP fines
36													
38													
40		8	Nbe	F2	Grab	SM	Silty SAND						Dark brown, frozen, fine sand, NP fines
42													Bottom of Hole 40.0 ft. PID = (Cold/Hot) Photo Ionization Detector
44													
46													
48													
50													
52													
54													
56													
58													
60													
62													
64													
66													

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **21 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,316,285 ft. ±**  
Easting: **640,238 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-25** Permanent: **BIA-25**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1	Nbe	F3	46 50/3in.	SM	Silty SAND	4	49	47	0.375			Gray, frozen, subrounded to rounded gravel, fine sand, non plastic (NP) fines
8														
10		2	Vr	F4	36 46 48	ML	Sandy SILT	3	30	67	0.25			Light brown, frozen, subrounded to rounded gravel, fine sand, NP fines, estimate 5% visible ice, randomly orientated veins of small white ice crystals
12														
14														
16		3	Vr	F4	20 49 33	ML	SILT							Dark gray, frozen, very fine sand, NP fines, estimate 40% visible ice, small white ice crystals throughout
18														
20		4	Vx	F4	28 40 52	ML	SILT				0.375			Dark gray, frozen, subrounded to rounded gravel, fine sand, NP fines, estimate 5% visible ice, small white crystals, on fresh surfaces
22														
24														
26		5	Vx	F4	19 23 21	ML	SILT							Dark gray, frozen, very fine sand, NP fines, estimate 40% visible ice, small cloudy ice crystals on fresh surfaces
28														
30		6	Vx	F4	14 16 18	ML	SILT							Dark gray, frozen, very fine sand, NP fines, estimate 40% visible ice, small cloudy ice crystals on fresh surfaces
32														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
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**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **21 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,314,280 ft. ±**  
Easting: **640,304 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-26** Permanent: **BIA-26**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														Cloudy, 0 degrees, 10 mph winds
6		1	Vr	F4	36 50 50	ML	Sandy SILT	1	37	62	0.25			Light brown, frozen, subrounded to rounded gravel, fine sand, non plastic (NP) fines, small white ice crystals throughout on fresh surfaces, estimate 25% visible ice
10		2	Nbe	F3	22 44 50/ 4in.	SM	Silty SAND		65	35				Light brown and gray, frozen, fine sand, NP fines
16		3	Vr	F4	18 32 40	ML	SILT							Dark gray, frozen, very fine sand, NP fines, estimate 45% visible ice, small cloudy white ice crystals throughout
22		4	Nbe	F4	29 50 45	ML	Sandy SILT							Dark gray, frozen, fine sand, NP fines
26		5	Vr	F4	20 29 34	ML	SILT							Dark gray, frozen, NP fines, estimate 40% visible ice, small white ice crystals throughout
30		6	Vr	F4	22 30 36	ML	Sandy SILT							Dark gray, frozen, subrounded to rounded gravel, fine sand, NP fines, estimate 15% visible ice, small white crystals throughout on fresh surfaces
32														Bottom of Hole 31.5 ft.

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGD.T 3/11/05

PID - (Gold/Hot) Photo-Ionization Detector



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **22 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,314,590 ft. ±**  
Easting: **642,087 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**TB-27 BIA-27**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
0-5						ICE	ICE with Sand/Fines Inclusions							Ice and silt cuttings to 5 feet
5-6		1	Nbe	F3	25 50/3in.	SM	Silty SAND with Gravel				0.375			Light brown (2nd 5" of sample), frozen, subangular to subrounded gravel, fine to coarse sand, non plastic (NP) fines, first 4" of sample is ICE and Silt (this portion was not collected)
6-10		2	Vx	F4	50/5in.	ML	Sandy SILT with Gravel	6	42	52	0.5			Dark gray, frozen, subrounded to rounded gravel, fine to coarse sand, NP fines, estimate 30% visible ice, clear ice crystals with white interstitial ice inclusions <1" thick
10-16		3	Vx	F4	36 50/5in.	ML	Sandy SILT							Dark gray, frozen, fine sand, NP fines, estimated 10% visible ice, small clear and white flat ice crystals on fresh surface
16-22		4	Vx	F4	19 36 27	ML	Sandy SILT							Dark gray, frozen, fine sand, NP fines, estimate 10% visible ice, small clear and white flat ice crystals on fresh surface
22-26		5	Vr	F4	15 20 24	ML	SILT							Dark gray, frozen, very fine sand, NP fines, estimate 30% visible ice, small granular white ice crystals on fresh surfaces throughout
26-32		6	Vr	F4	11 14 19	ML	Sandy SILT							Dark gray, frozen, very fine sand, NP fines, estimate 30% visible ice, small granular white ice crystals on fresh surfaces throughout
32-31.5														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **23 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,316,412 ft. ±**  
Easting: **642,048 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-28** Permanent: **BIA-28**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**30.9 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
6		1	Ice		13 24 50	ICE	ICE with Sand/Fines Inclusions							Ice, large flat clear ice crystals with white interstitial ice and some trace of gray silt
10		2	Vx	F3	36 46 50/5in.	SM	Silty SAND with Gravel	10	58	32	0.375			Light brown, frozen, subrounded to rounded gravel, fine sand, non plastic (NP) fines, estimate 5% visible ice, small white ice crystals inclusions <.25" thick
16		3	Vx	F3	41 39 48	SM	Silty SAND with Gravel	12	44	29	0.5			Light brown, frozen, subangular to subrounded gravel, fine and coarse sand, NP fines, estimate 5% visible ice, small white ice crystals inclusions <.25 in. thick
20		4	Nbe	S2	80	SP	Poorly graded SAND with Gravel	46	49	5	1			Brown, frozen, subangular to subrounded gravel, fine and coarse sand
26		5	Nbe	F2	61	SM	Silty SAND							Gray and brown, frozen, fine sand, NP fines
30		6	Vx	F2	50 50/5in.	SM	Silty SAND							Gray and brown, frozen, fine sand, NP fines, estimate 2% visible ice, clear ice crystals with white interstitial ice vien, < 0.25 in.
32														Bottom of Hole 30.9 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **24 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,315,455 ft. ±**  
Easting: **641,225 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: Permanent:  
**TB-29 BIA-29**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
5.5		1	Vx	F3	50/ 4in.	SM	Silty SAND with Gravel	37	45	18	0.5			Gray and brown, frozen, subangular to subrounded gravel, fine to coarse sand, non plastic (NP) fines, inclusions of small white ice crystals clusters less than .75 inches thick, estimated 10% visible ice, 50 blows for 4"
10		2	Vr	F4	36 37 45	ML	SILT with Sand							Gray, frozen, fine sand, NP fines, estimated 20% visible ice, small white ice crystals throughout
15.5		3	Vr	F4	26 32 30	ML	SILT with Sand							Gray, frozen, fine sand, NP fines, estimated 20% visible ice, small white ice crystals throughout
20.5		4	Vr	F4	21 23 25	ML	SILT							Dark gray, frozen, very fine sand, NP fines, estimated 3% visible ice, small white ice crystals throughout on fresh surfaces, some muscle shell fragments are present in in sample
25.5		5	Vr	F4	16 21 22	ML	SILT							Dark gray, frozen, NP fines, estimated 5% visible ice, small white ice crystals on fresh surfaces throughout
30.5		6	Vr	F4	18 21 19	ML	Sandy SILT							Dark gray, frozen, very fine sand, NP fines, estimated 20% visible ice, small white ice crystals on fresh surfaces throughout
31.5														Bottom of Hole 31.5 ft. PID = (Cold/Hot) Photo Ionization Detector

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05



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**Soils and Geology Section  
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Project: **Coastal Storm Damage Reduction  
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Date: **25 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,300,540 ft. ±**  
Easting: **643,116 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-30** Permanent: **BIA-30**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4088	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2						OL	Organic SILT						Dark brown, frozen, nonplastic (NP) fines	
4						ML	SILT						Brown, frozen, NP fines, 50% ice by volume	
6		Vx & Vr		F4	14 38									
10		2	Nbe	F4	15 52	ML	SILT with Sand			0.25			Brown, frozen, rounded gravel, fine sand, NP fines	
16		3	Nbe	F4	16 51	ML	Sandy SILT			0.25			Brown, frozen, rounded gravel, fine sand, NP fines	
20		4	Nf	F2	56	GM	Silty GRAVEL with Sand	43	41	16	0.5		Brown, frozen, rounded gravel, fine and coarse sand	
24		5	Nf	F2	Grab	SM	Silty SAND with Gravel	37	50	13	0.75		Brown, frozen, rounded gravel, fine and coarse sand	
30		6	Nf	F2	Grab	GP-GM	Poorly graded GRAVEL with Silt and Sand	47	41	12	1		Brown, frozen, rounded gravel, fine and coarse sand	
32						SM	Silty SAND						Fine sand, frozen, by drill action	
						GP	Poorly graded GRAVEL with Sand						By drill action	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDGT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
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Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **25 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,300,540 ft. ±**  
Easting: **643,116 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-30** Permanent: **BIA-30**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		7	Nbe	F3	Grab	SM	Silty SAND with Gravel	6	78	16			Brown, frozen, fine sand	
40		8	Nbe	F2	Grab	SM	Silty SAND						Dark brown, frozen, fine sand, NP fines	
40													Bottom of Hole 40.0 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector	

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
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**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

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Date: **26 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,225 ft. ±**  
Easting: **643,246 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-31** Permanent: **BIA-31**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2					Grab	OL	Organic SILT						Dark brown, frozen	
4														
6		1	Vx & Vr	F4	12 34 40	ML	SILT						Brown, frozen, nonplastic (NP) fines, 60% ice by volume	
8														
10		2	Nbe	F4	12 47	ML	SILT with Sand			0.5			Brown, frozen, rounded gravel, fine sand, NP fines	
12														
14														
16		3	Nf	F3	19 50/3in.	SM	Silty SAND with Gravel	27	56	17	0.5		Brown, frozen, rounded gravel, fine to coarse sand, NP fines	
18														
20		4	Nf	F3	Grab	SM	Silty SAND with Gravel	18	56	26	0.5		Brown, frozen, rounded gravel, fine and coarse sand, NP fines	
22														
24		5	Nf	F3	Grab	SM	Silty SAND with Gravel	22	60	18	1		Brown, frozen, rounded gravel, fine to coarse sand, NP fines	
26														
28														
30		6	Nf	F2	Grab	SP-SM	Poorly graded SAND with Silt and Gravel	35	54	11	1		Brown, frozen, rounded gravel, fine to coarse sand, NP fines	
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT  
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Project: **Coastal Storm Damage Reduction  
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Date: **26 Apr 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,299,225 ft. ±**  
Easting: **643,246 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-31** Permanent: **BIA-31**

Operator:  
**Lyle Cain & Travis Coghill**

Inspector:  
**Gregory Carpenter**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NE**

Depth Drilled:  
**39.0 ft.**

Total Depth:  
**40.0 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**3 in.**

Size and Type of Bit:  
**7 in. Hollow Stem Auger**

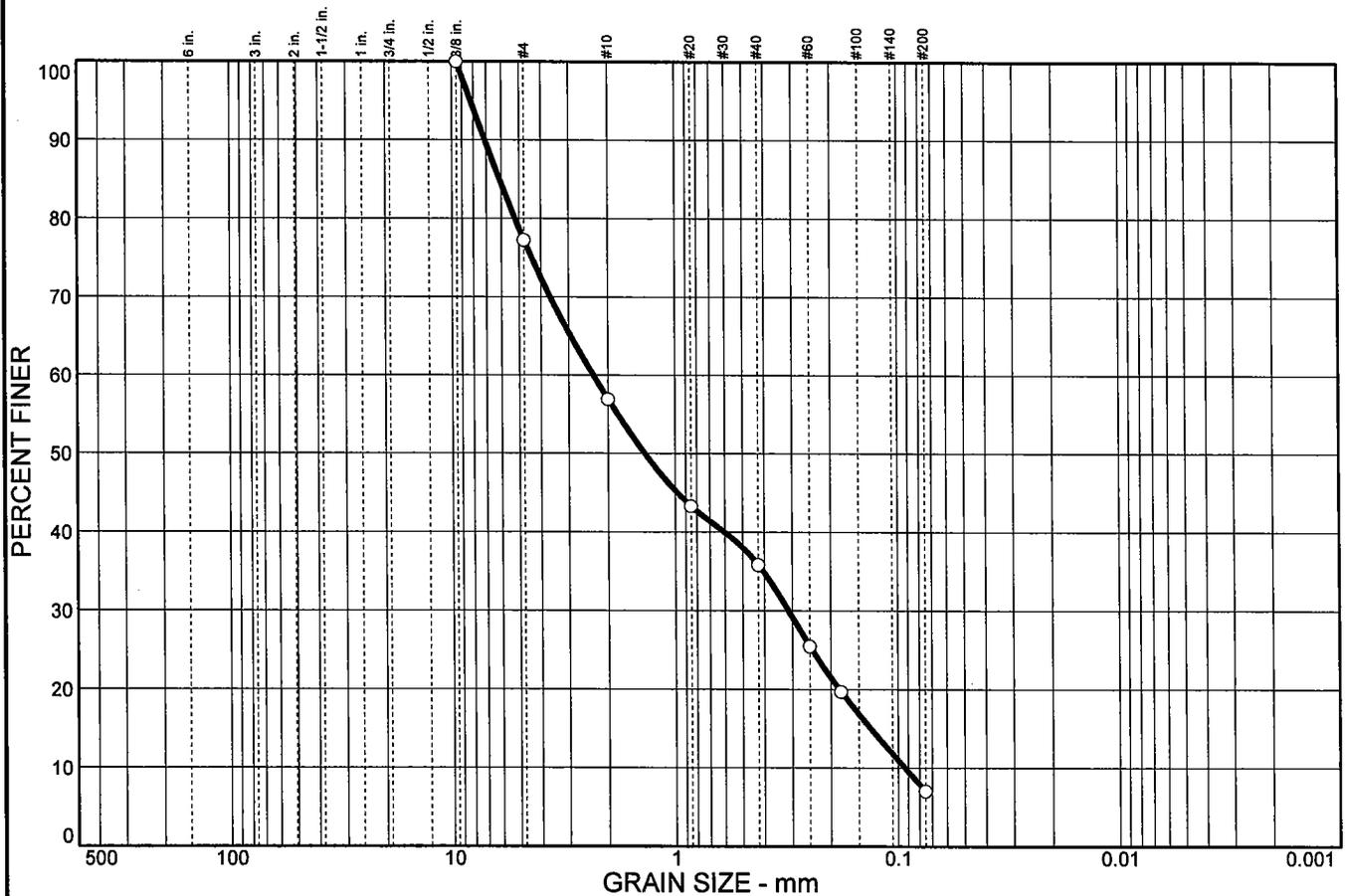
Type of Equipment:  
**CME-45**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
34		7	Nf	S1	Grab	GP	Poorly graded GRAVEL with Sand	78	17	5	1.5			Windy, 5 degrees
36														
38														
40		8	Nbe	NFS	Grab	SP	Poorly graded SAND							Brown, frozen, fine sand
42														Bottom of Hole 40.0 ft. Groundwater Not Encountered PID = (Cold/Hot) Photo Ionization Detector
44														
46														
48														
50														
52														
54														
56														
58														
60														
62														
64														
66														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	22.8	20.3	21.1	28.8	7.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	77.2		
# 10	56.9		
# 20	43.3		
# 40	35.8		
# 60	25.5		
# 80	19.7		
# 200	7.0		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.12              D<sub>60</sub>= 2.34              D<sub>50</sub>= 1.37  
D<sub>30</sub>= 0.312            D<sub>15</sub>= 0.133            D<sub>10</sub>= 0.0934  
C<sub>u</sub>= 25.01              C<sub>c</sub>= 0.45

**Classification**

USCS= SP-SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6043  
**Location:** BIA-01 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 10 FT 3 m

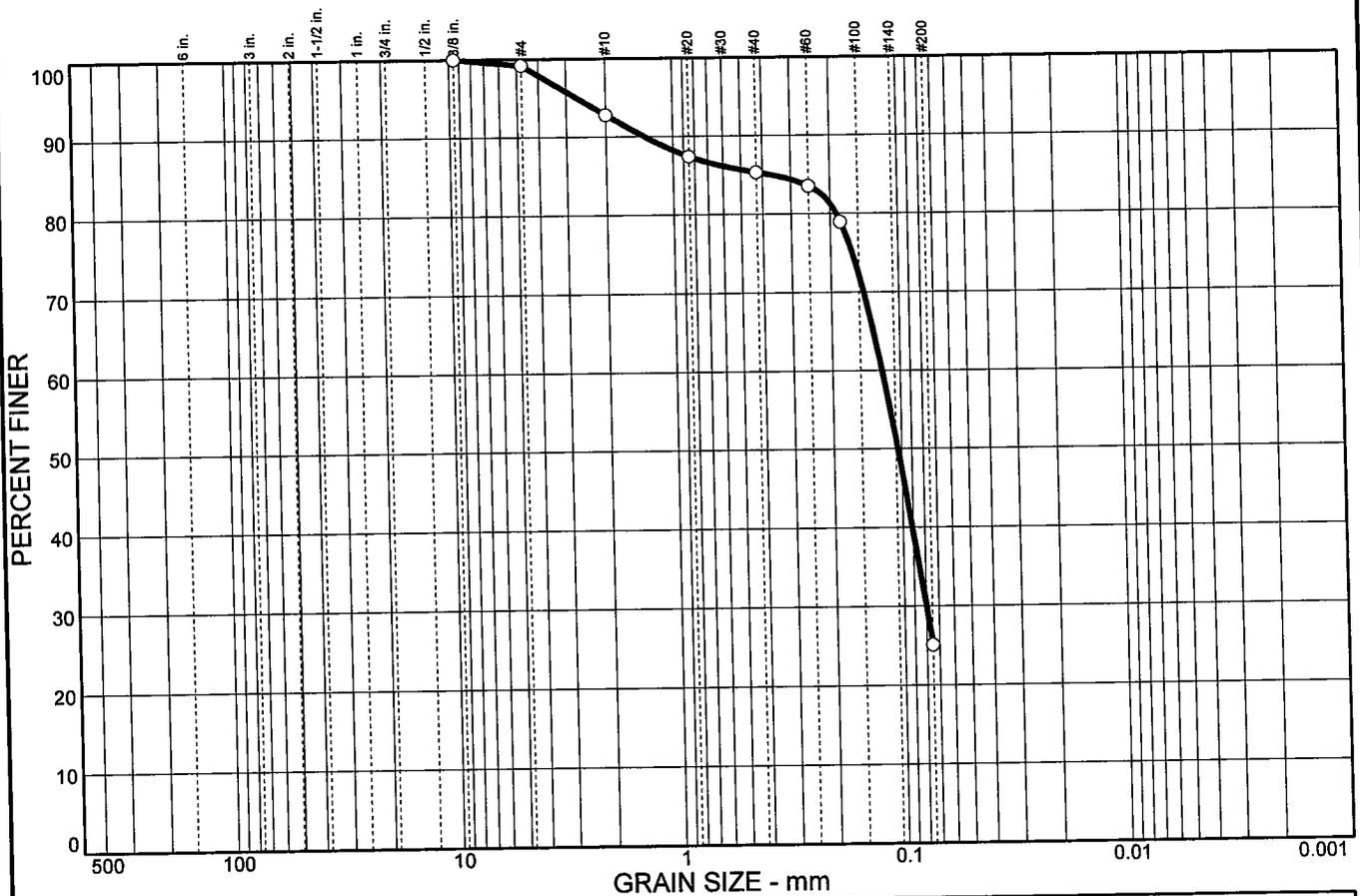
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.8	6.4	7.5	60.2	25.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	99.2		
# 10	92.8		
# 20	87.4		
# 40	85.3		
# 60	83.5		
# 80	78.9		
# 200	25.1		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.371                      D<sub>60</sub>= 0.121                      D<sub>50</sub>= 0.104  
D<sub>30</sub>= 0.0798                      D<sub>15</sub>=                      D<sub>10</sub>=  
C<sub>u</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6045

Location: BIA-01 #5

Source of Sample: Client Samples

Date:  
Elev./Depth: 20 FT 6 m

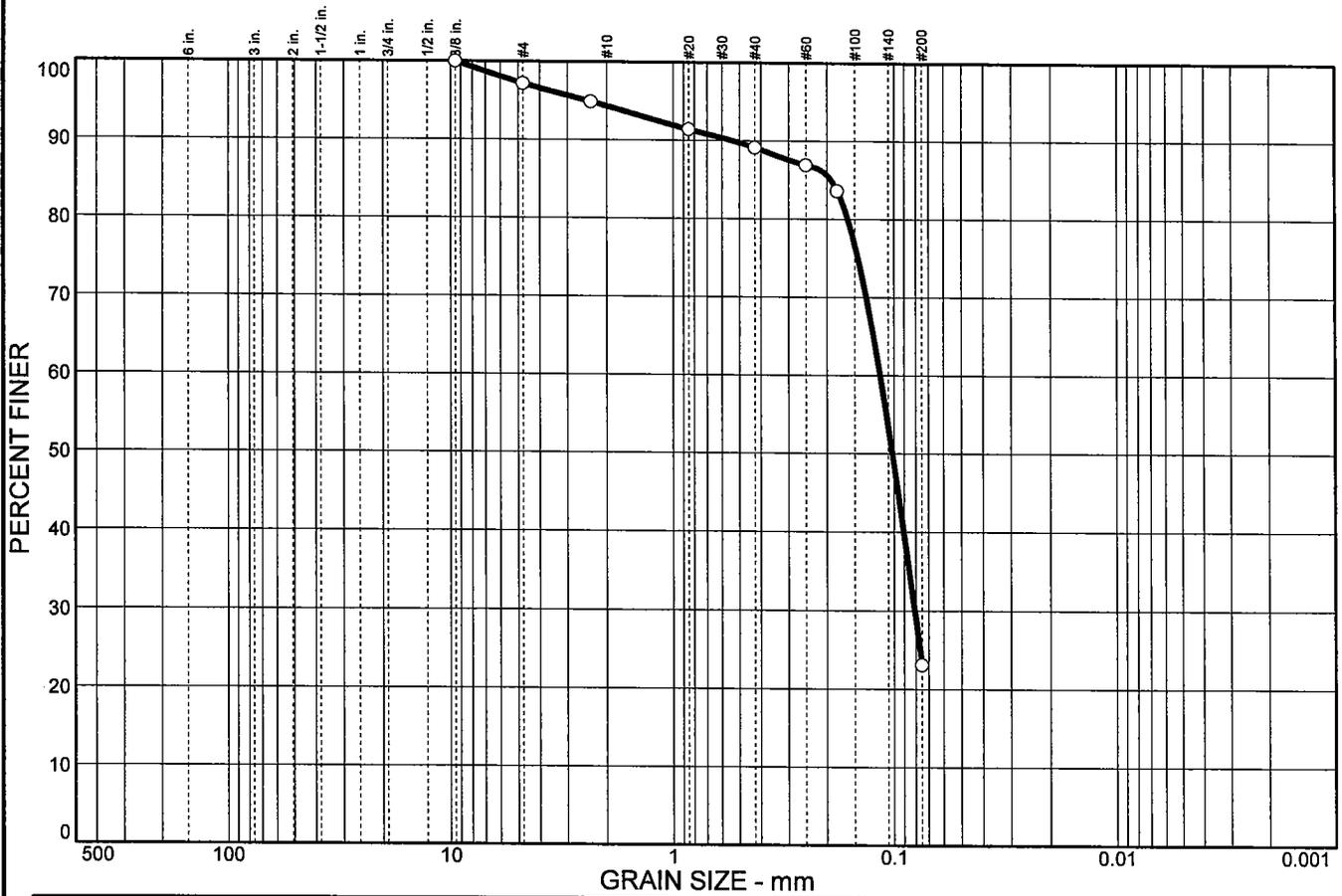
Mappa TestLab

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.8	2.9	5.2	66.0	23.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	97.2		
# 8	94.9		
# 20	91.4		
# 40	89.1		
# 60	86.9		
# 80	83.6		
# 200	23.1		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.192              D<sub>60</sub>= 0.115              D<sub>50</sub>= 0.102

D<sub>30</sub>= 0.0809            D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

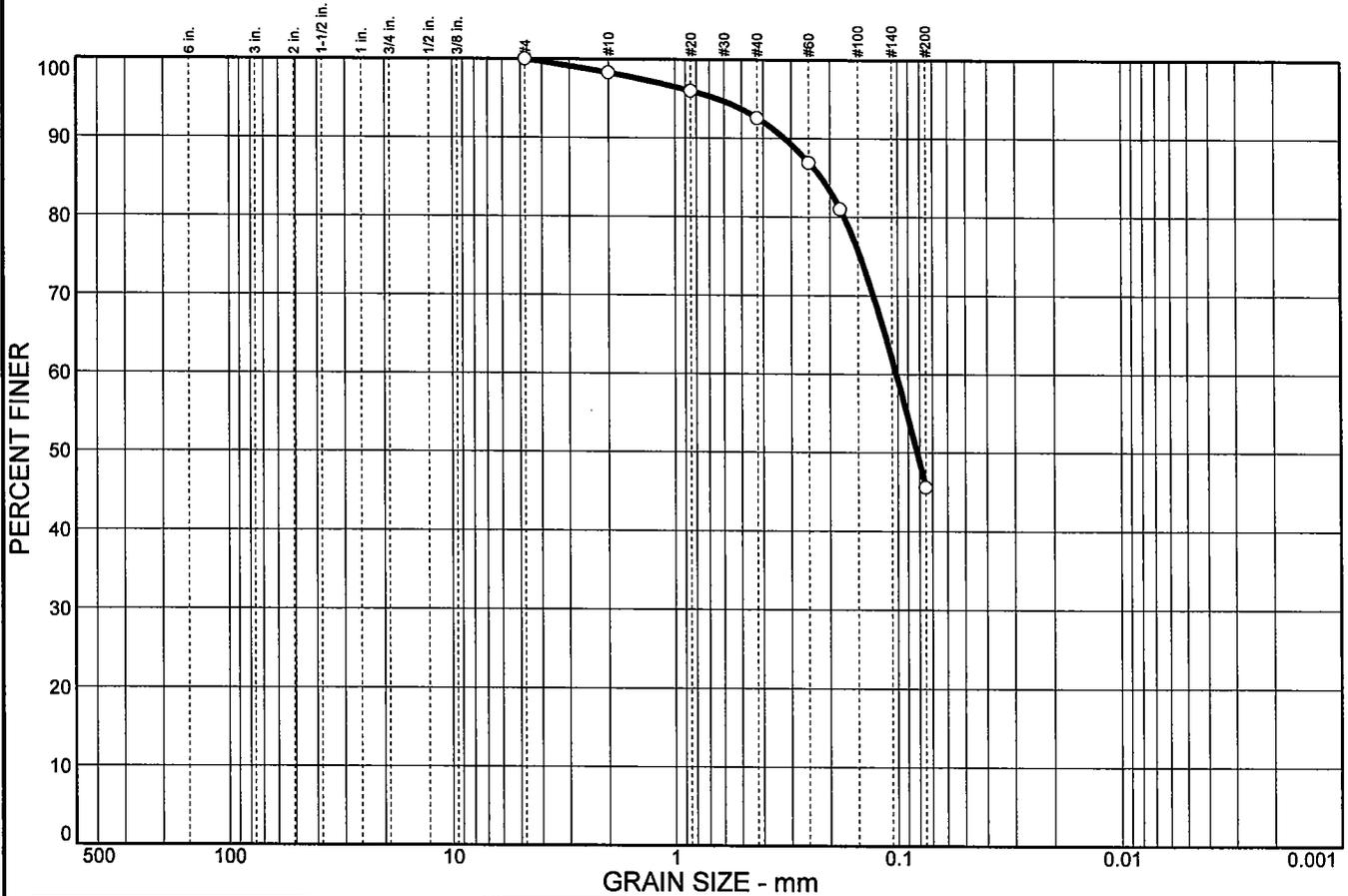
Sample No.: 6046                      Source of Sample: Client Samples                      Date:

Location: BIA-02 #4                      Elev./Depth: 15 FT 4.5 m

**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska  
**Project No:** 2004-148                      **Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	1.7	5.7	47.0	45.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	98.3		
# 20	96.0		
# 40	92.6		
# 60	86.9		
# 80	81.0		
# 200	45.6		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.220              D<sub>60</sub>= 0.102              D<sub>50</sub>= 0.0822

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6047  
Location: BIA-03 #1

Source of Sample: Client Samples

Date:  
Elev./Depth: 2.5 FT 0.75

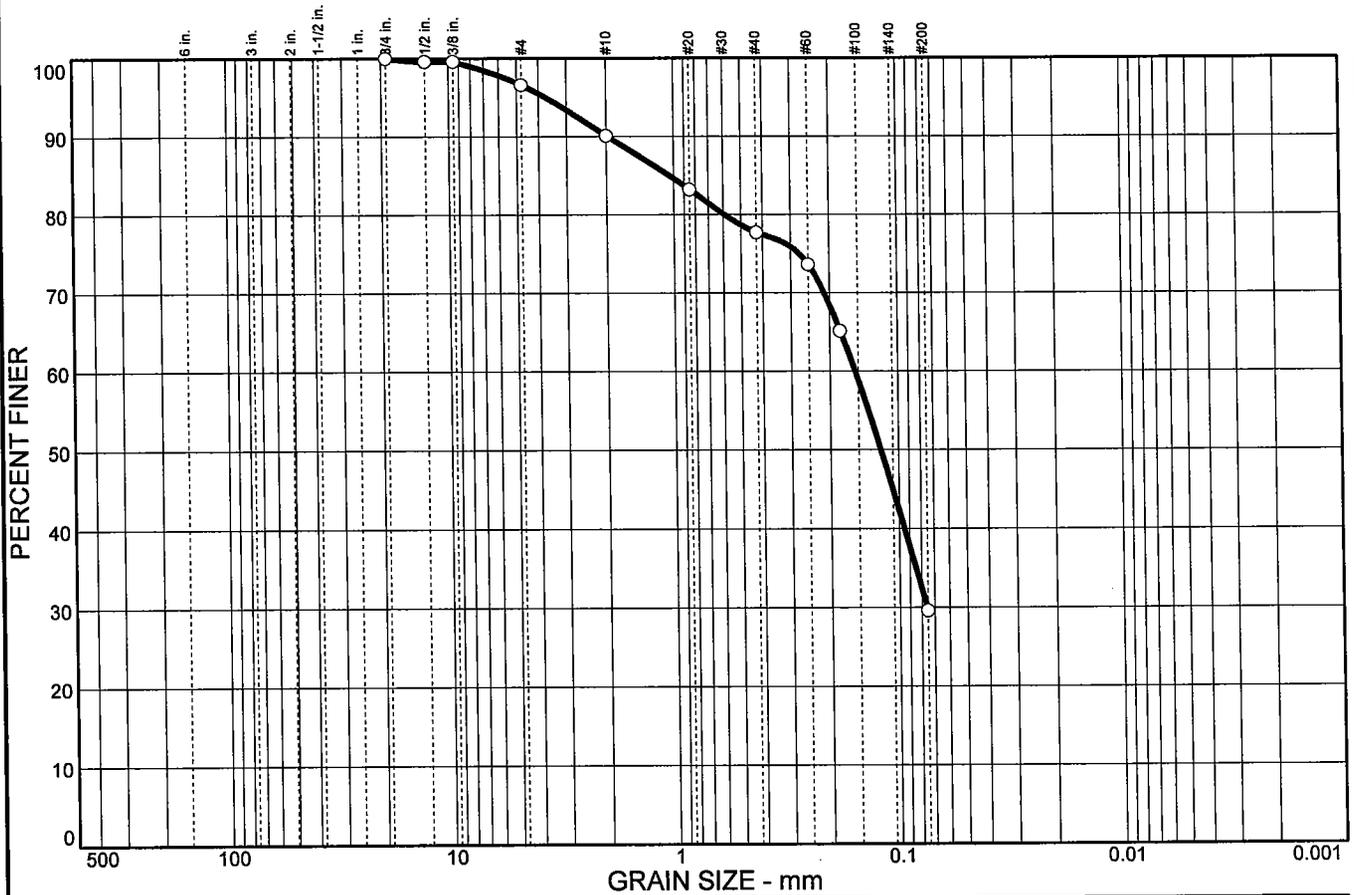
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.4	6.5	12.4	48.1	29.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.6		
3/8 in.	99.6		
# 4	96.6		
# 10	90.1		
# 20	83.2		
# 40	77.7		
# 60	73.6		
# 80	65.1		
# 200	29.6		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 1.05              D<sub>60</sub>= 0.155              D<sub>50</sub>= 0.120

D<sub>30</sub>= 0.0757              D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6048  
**Location:** BIA-03 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 5 FT 1.5 m

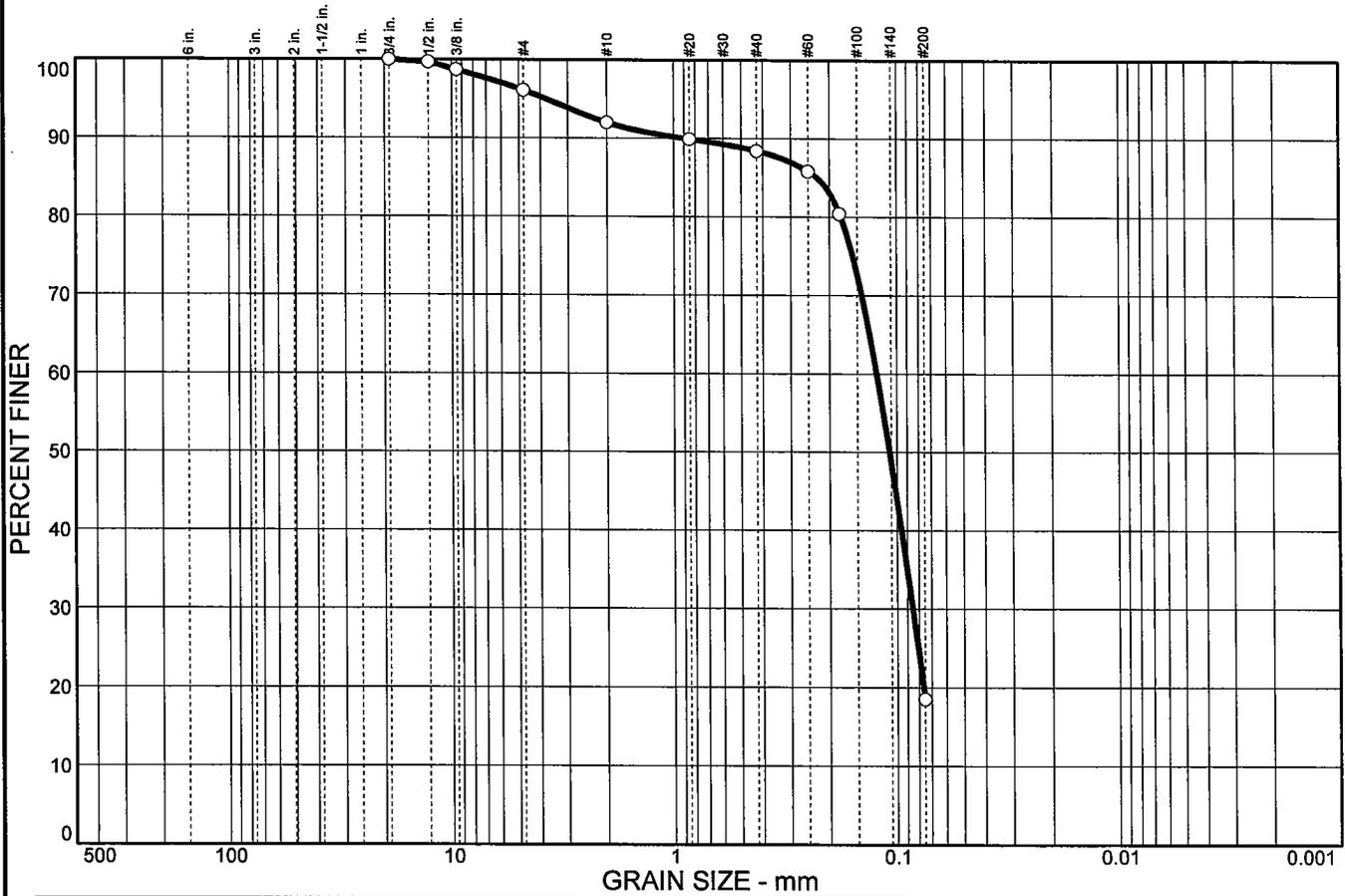
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.9	4.1	3.6	69.9	18.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.7		
3/8 in.	98.7		
# 4	96.1		
# 10	92.0		
# 20	89.9		
# 40	88.4		
# 60	85.8		
# 80	80.4		
# 200	18.5		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.228              D<sub>60</sub>= 0.123              D<sub>50</sub>= 0.108

D<sub>30</sub>= 0.0853              D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6049  
Location: BIA-04 #3

Source of Sample: Client Samples

Date:  
Elev./Depth: 10 FT 3 m

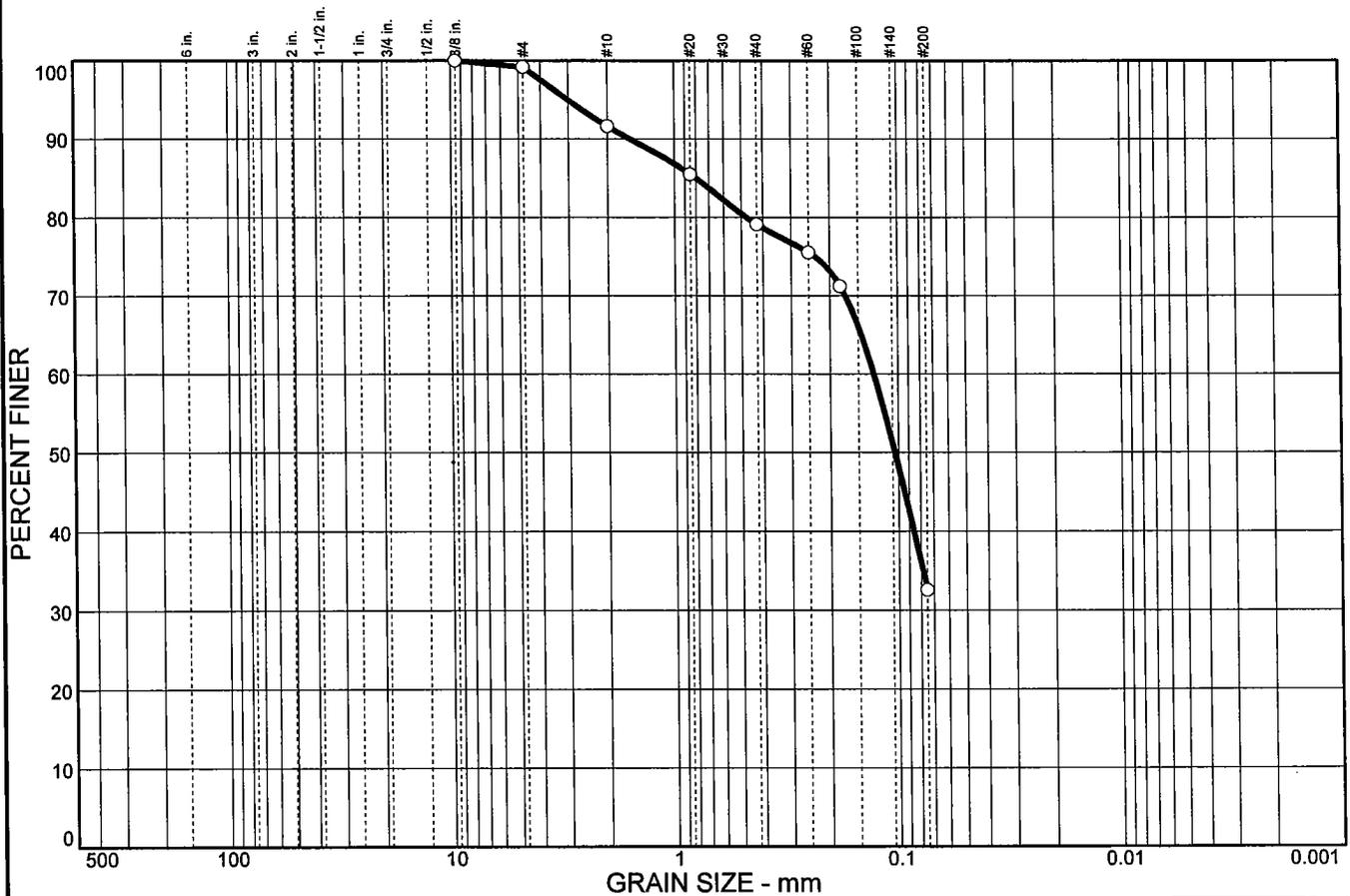
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.8	7.6	12.5	46.5	32.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	99.2		
# 10	91.6		
# 20	85.5		
# 40	79.1		
# 60	75.5		
# 80	71.2		
# 200	32.6		

**Soil Description**

Silty sand

---

**Atterberg Limits**

PL=                      LL=                      PI=

---

**Coefficients**

D<sub>85</sub>= 0.803              D<sub>60</sub>= 0.128              D<sub>50</sub>= 0.104  
D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

---

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

---

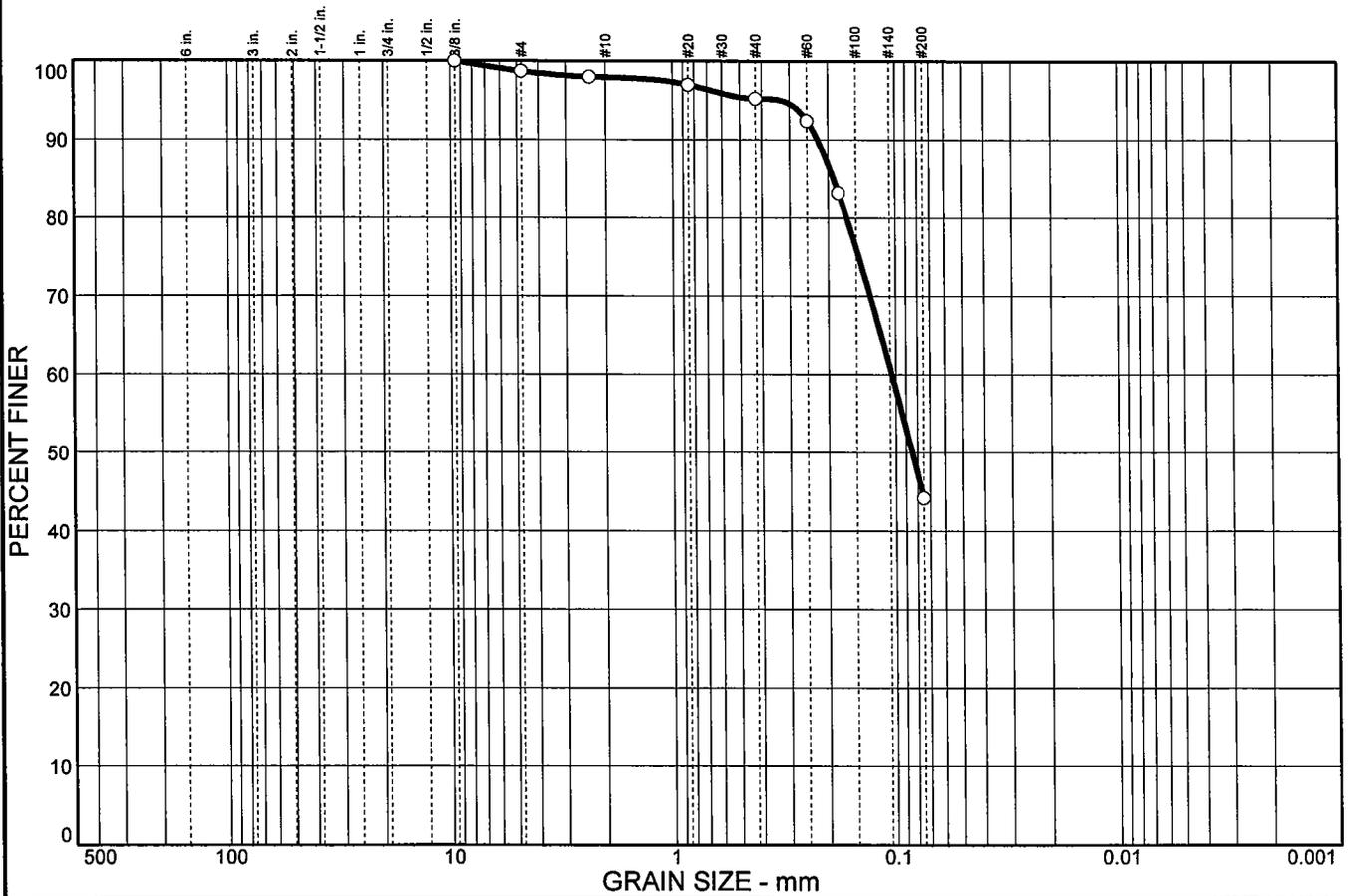
**Remarks**

\* (no specification provided)

**Sample No.:** 6050                      **Source of Sample:** Client Samples                      **Date:**  
**Location:** BIA-05 #1                      **Elev./Depth:** 5 FT 1.5 m

<h2>Mappa TestLab</h2>	<b>Client:</b> U.S. Army Corps of Engineers, Alaska District <b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska <b>Project No.:</b> 2004-148 <b>Figure</b>
------------------------	---

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.3	0.8	2.7	51.0	44.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	98.7		
# 8	98.0		
# 20	97.0		
# 40	95.2		
# 60	92.4		
# 80	83.1		
# 200	44.2		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.190              D<sub>60</sub>= 0.104              D<sub>50</sub>= 0.0844

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6051  
**Location:** BIA-05 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 10 FT 3 m

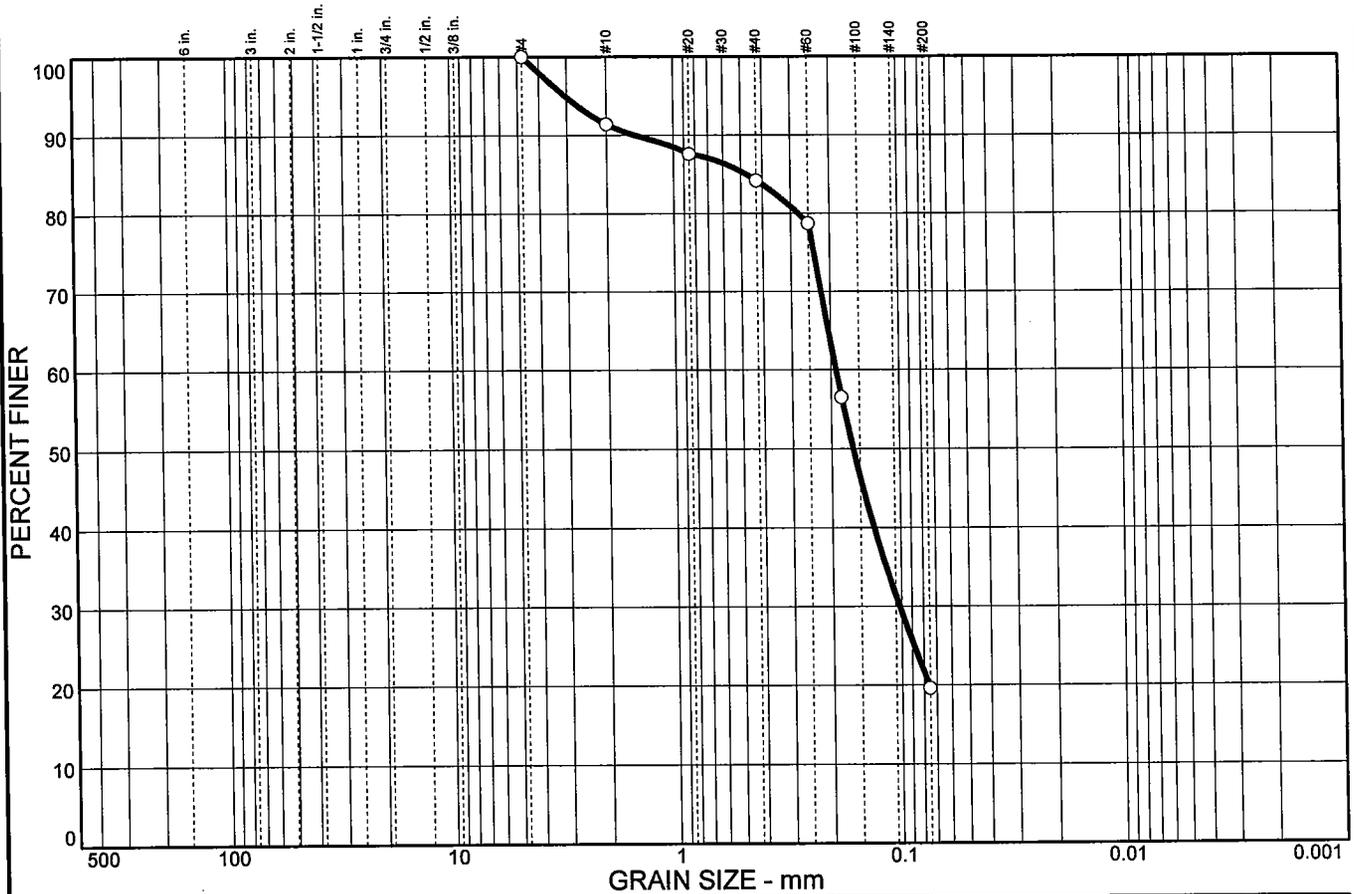
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	8.6	7.2	64.6	19.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	91.4		
# 20	87.6		
# 40	84.2		
# 60	78.7		
# 80	56.5		
# 200	19.6		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.473              D<sub>60</sub>= 0.190              D<sub>50</sub>= 0.160  
 D<sub>30</sub>= 0.102              D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6052  
 Location: BIA-06 #2

Source of Sample: Client Samples

Date:  
 Elev./Depth: 10 FT 3 m

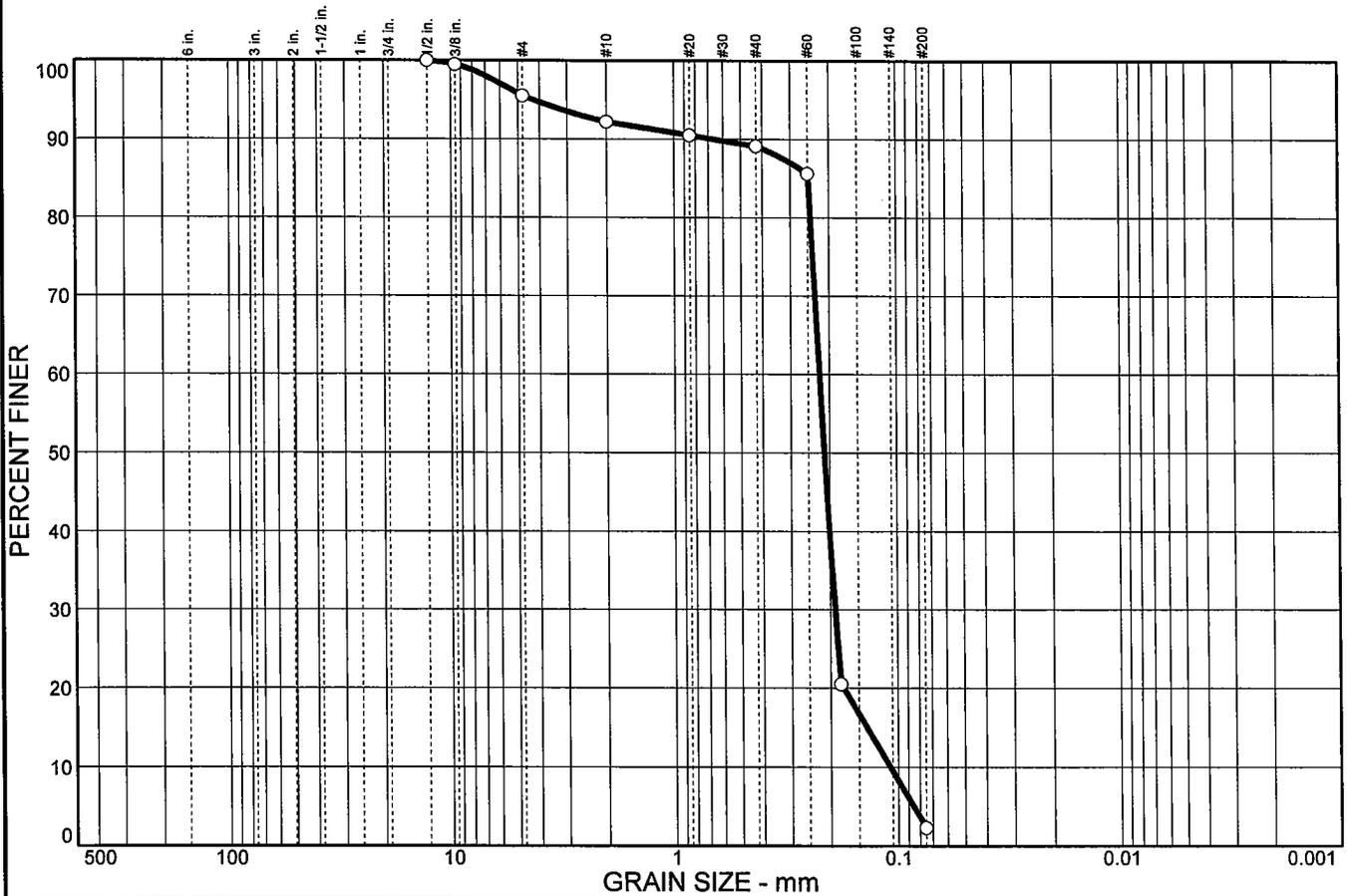
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.5	3.3	3.1	86.8	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.5		
# 4	95.5		
# 10	92.2		
# 20	90.5		
# 40	89.1		
# 60	85.6		
# 80	20.5		
# 200	2.3		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.249              D<sub>60</sub>= 0.222              D<sub>50</sub>= 0.212  
D<sub>30</sub>= 0.191              D<sub>15</sub>= 0.138              D<sub>10</sub>= 0.109  
C<sub>u</sub>= 2.05                      C<sub>c</sub>= 1.51

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

**Sample No.:** 6053  
**Location:** BIA-06 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 15 FT 4.5 m

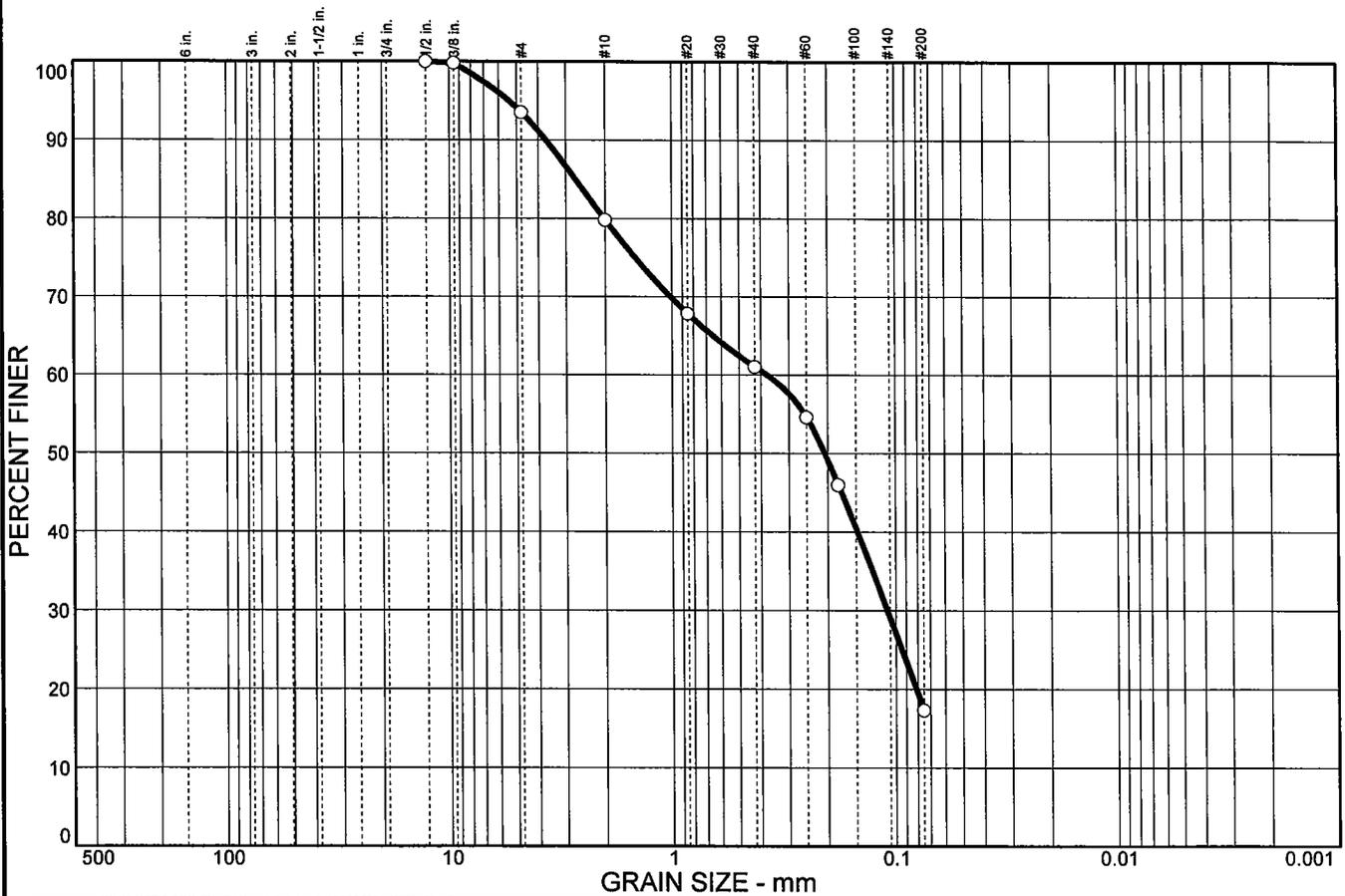
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.5	13.7	18.8	43.7	17.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.8		
# 4	93.5		
# 10	79.8		
# 20	67.8		
# 40	61.0		
# 60	54.6		
# 80	46.0		
# 200	17.3		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 2.72              D<sub>60</sub>= 0.377              D<sub>50</sub>= 0.207

D<sub>30</sub>= 0.109              D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6054  
 Location: BIA-06 #4

Source of Sample: Client Samples

Date:  
 Elev./Depth: 20 FT 6 m

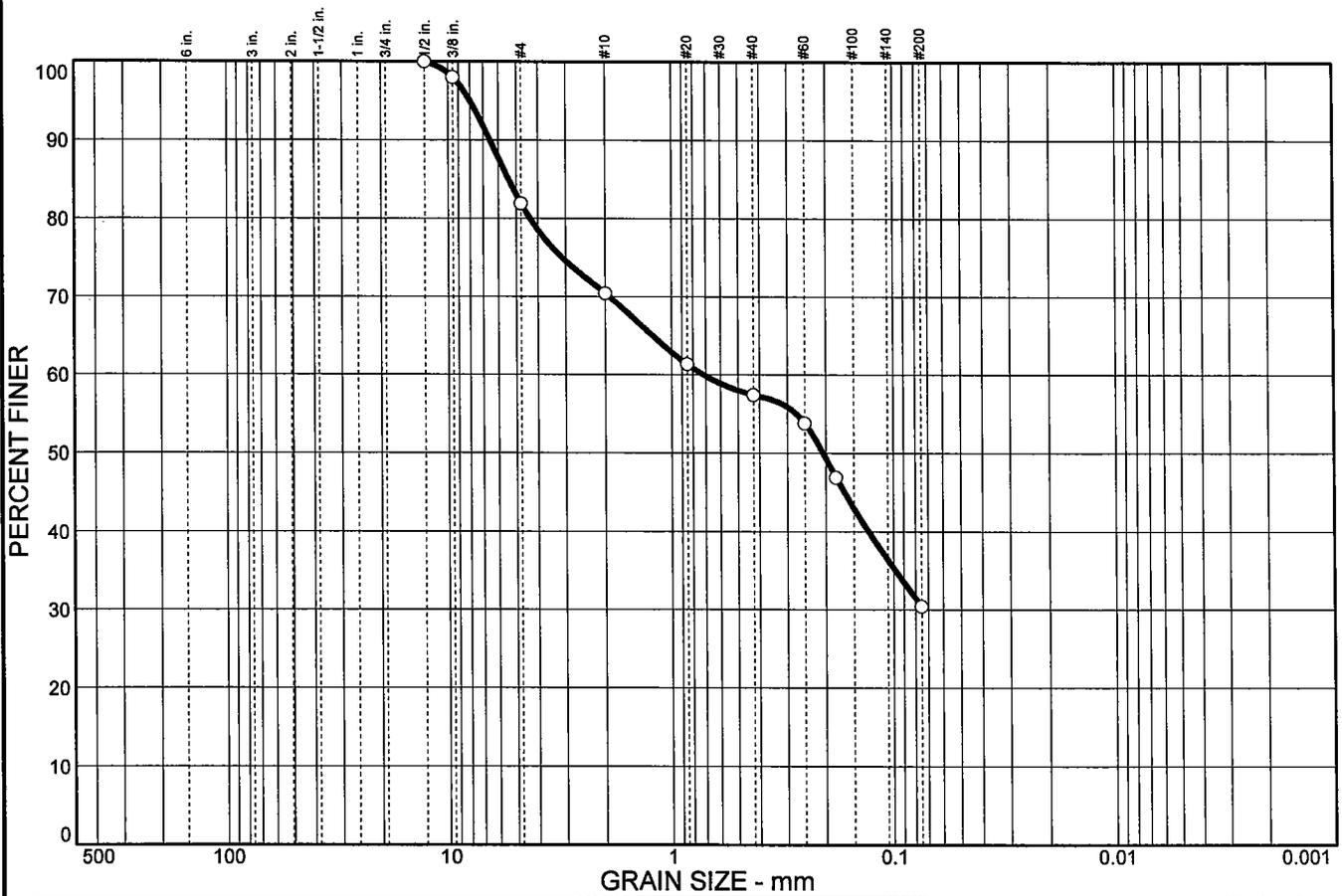
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.0	11.6	13.0	27.0	30.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	98.0		
# 4	81.9		
# 10	70.4		
# 20	61.3		
# 40	57.4		
# 60	53.8		
# 80	46.9		
# 200	30.4		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.38              D<sub>60</sub>= 0.720              D<sub>50</sub>= 0.206

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6055  
Location: BIA-07 #2

Source of Sample: Client Samples

Date:  
Elev./Depth: 10 FT 3 m

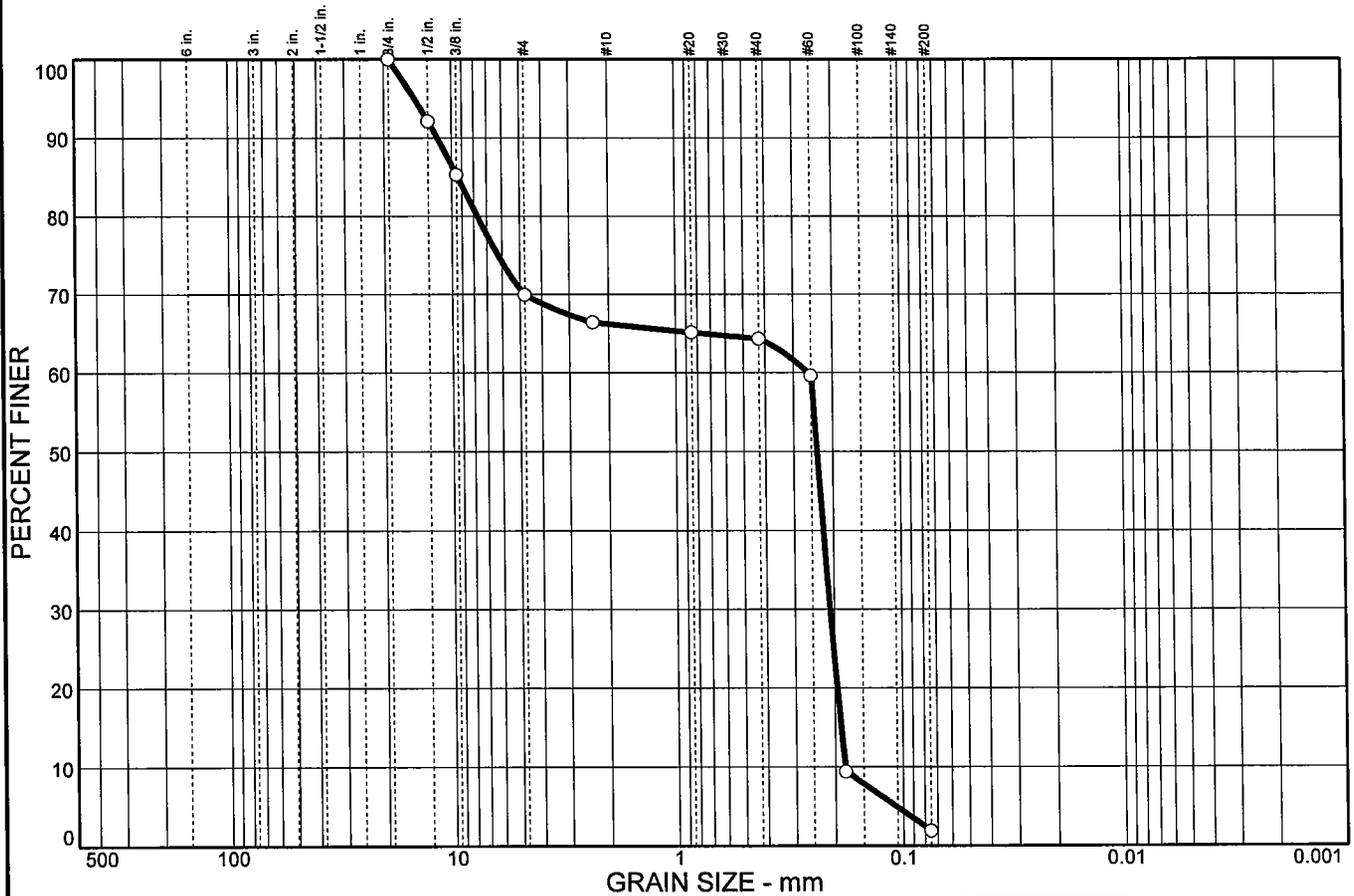
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	30.1	3.7	1.9	62.4	1.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	92.1		
3/8 in.	85.3		
# 4	69.9		
# 8	66.4		
# 20	65.1		
# 40	64.3		
# 60	59.6		
# 80	9.4		
# 200	1.9		

**Soil Description**  
Poorly graded sand with gravel

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 9.41              D<sub>60</sub>= 0.258              D<sub>50</sub>= 0.236  
 D<sub>30</sub>= 0.209              D<sub>15</sub>= 0.188              D<sub>10</sub>= 0.181  
 C<sub>u</sub>= 1.43                      C<sub>c</sub>= 0.94

**Classification**  
 USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6056  
 Location: BIA-07 #4

Source of Sample: Client Samples

Date:  
 Elev./Depth: 17 FT 5.1 m

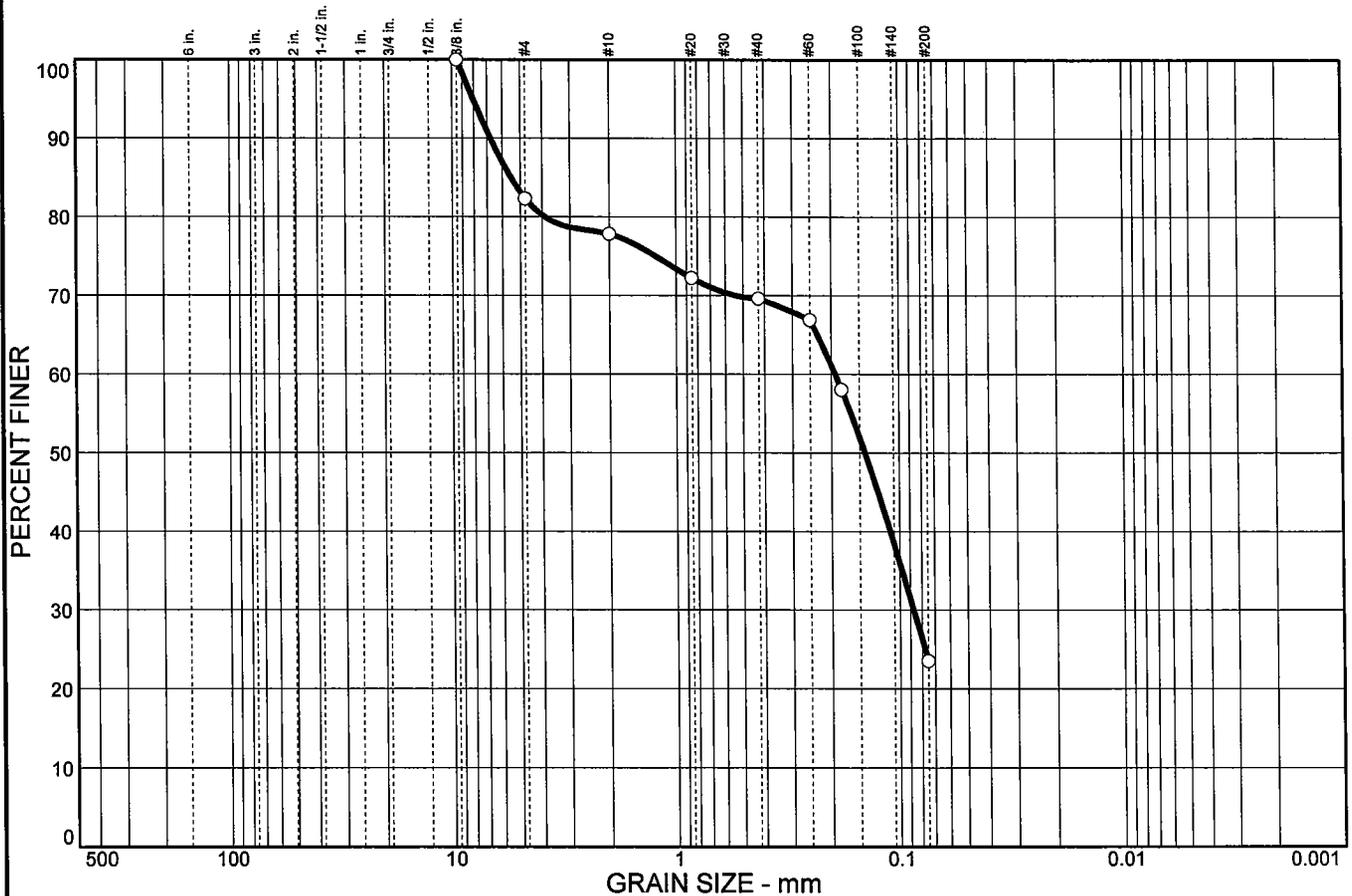
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	17.7	4.5	8.2	46.1	23.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	82.3		
# 10	77.8		
# 20	72.2		
# 40	69.6		
# 60	66.9		
# 80	58.0		
# 200	23.5		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.50                      D<sub>60</sub>= 0.193                      D<sub>50</sub>= 0.142

D<sub>30</sub>= 0.0870                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6057  
Location: BIA-08 #2

Source of Sample: Client Samples

Date:  
Elev./Depth: 10 FT 3.0 m

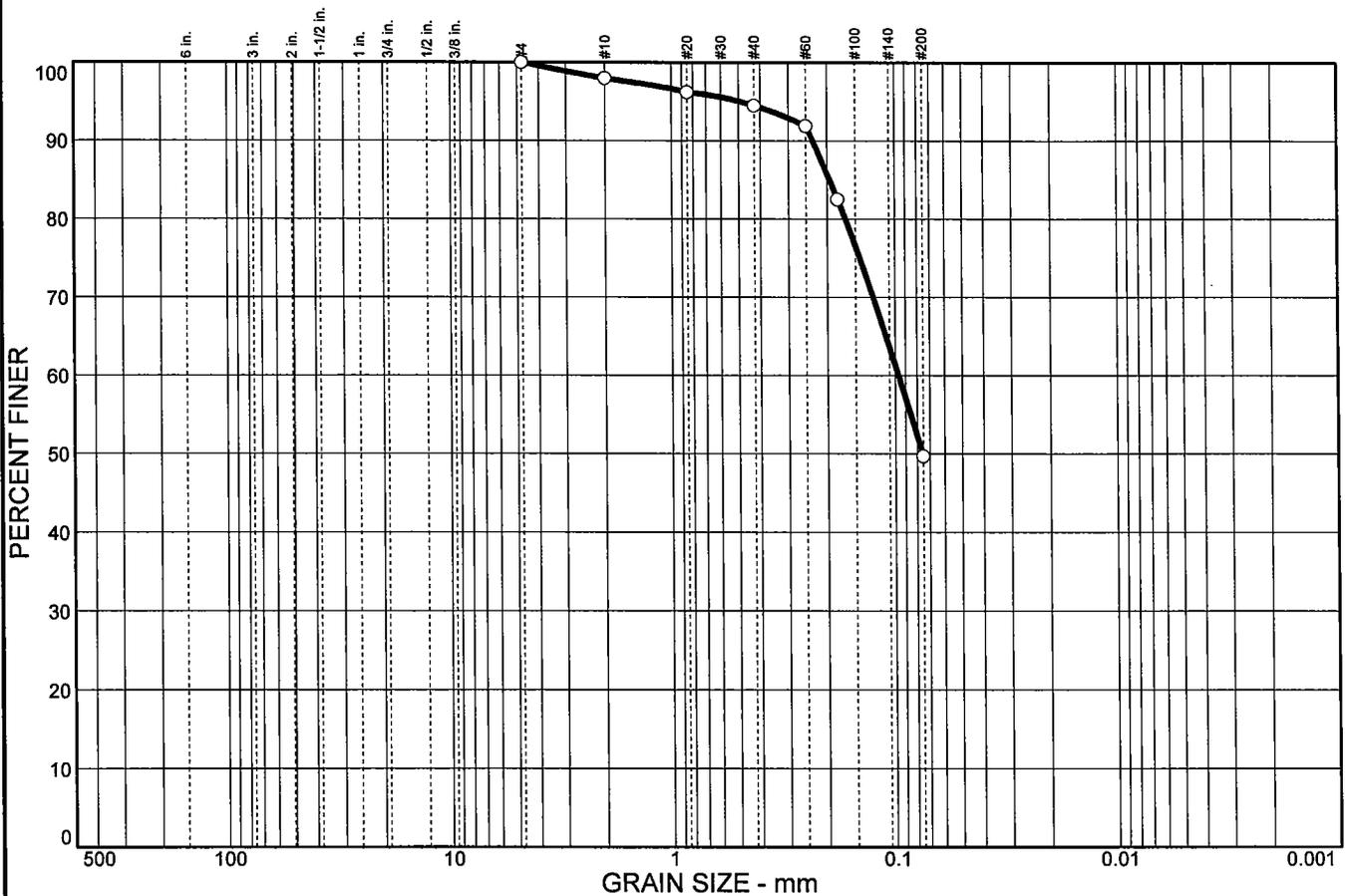
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.0	3.5	44.8	49.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 10	98.0		
# 20	96.2		
# 40	94.5		
# 60	91.9		
# 80	82.5		
# 200	49.7		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.195              D<sub>60</sub>= 0.0968              D<sub>50</sub>= 0.0756

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6058  
**Location:** BIA-08 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 15 FT 4.5 m

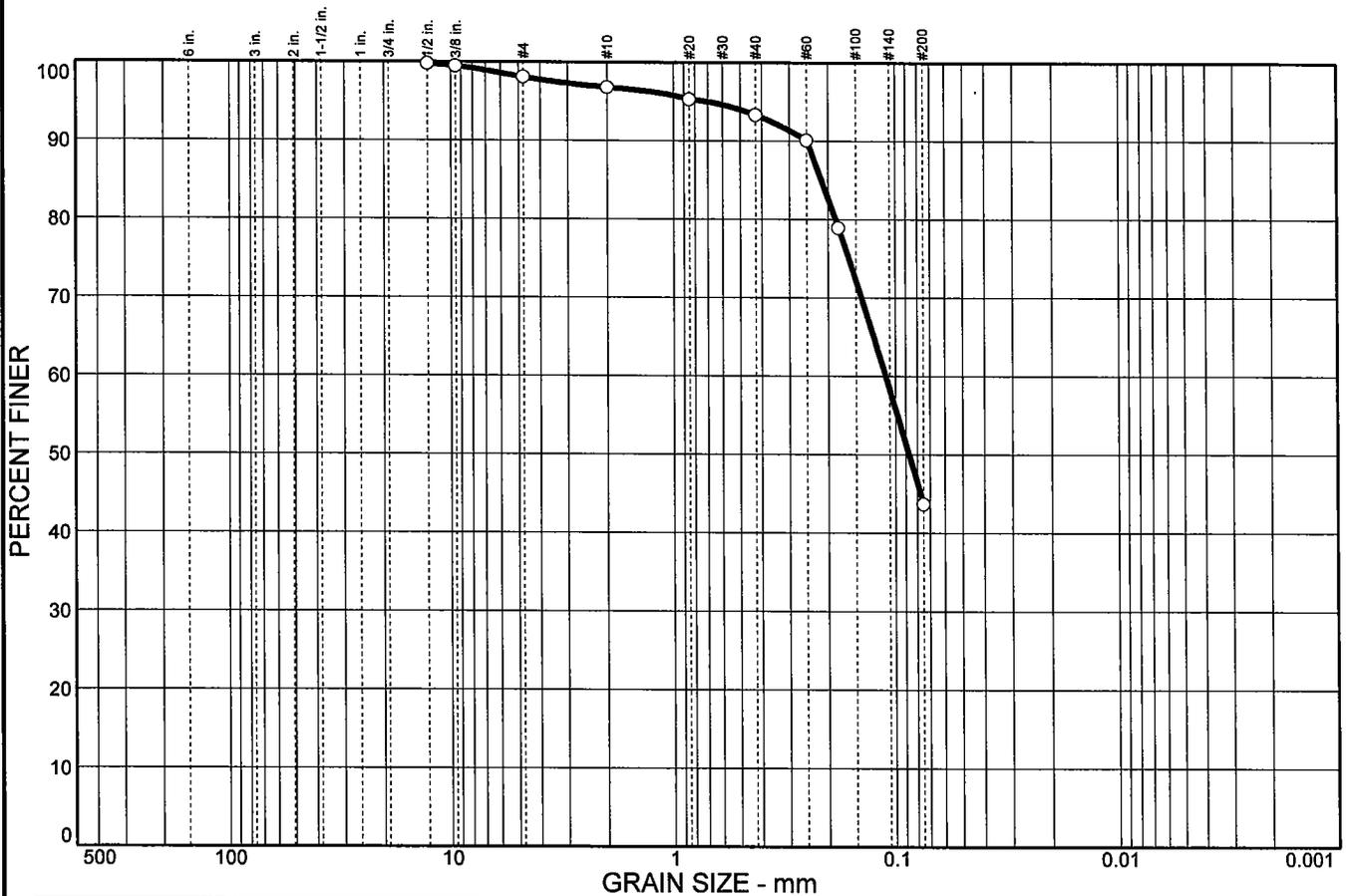
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			1.3	3.5	49.6		43.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	99.8		
3/8 in.	99.5		
# 4	98.1		
# 10	96.8		
# 20	95.3		
# 40	93.3		
# 60	90.1		
# 80	78.9		
# 200	43.7		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.214              D<sub>60</sub>= 0.111              D<sub>50</sub>= 0.0871  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6059  
 Location: BIA-08 # 4

Source of Sample: Client Samples

Date:  
 Elev./Depth: 20 FT 6 m

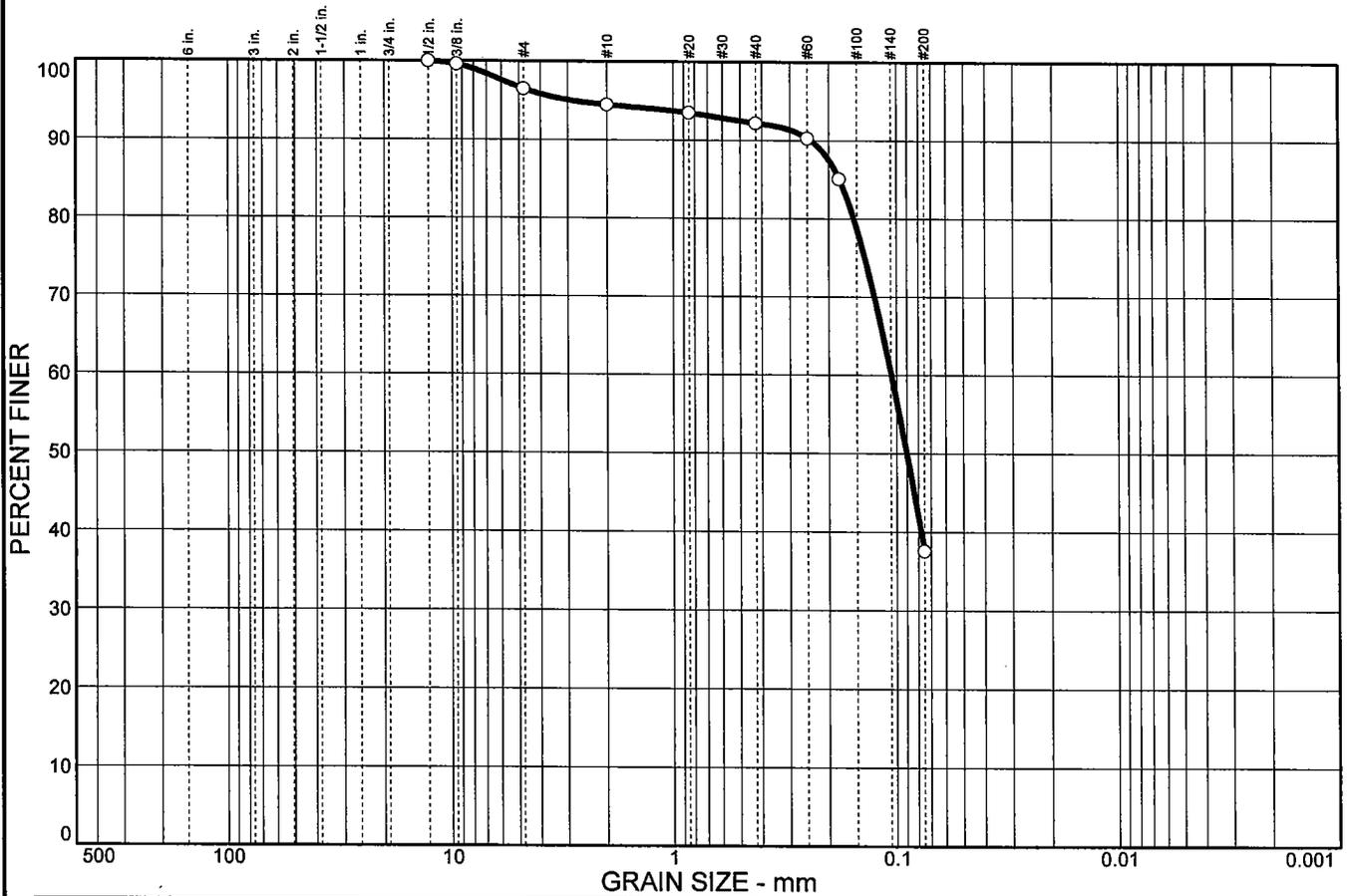
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.5	2.0	2.3	54.6	37.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.6		
# 4	96.5		
# 10	94.5		
# 20	93.5		
# 40	92.2		
# 60	90.3		
# 80	85.1		
# 200	37.6		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.179              D<sub>60</sub>= 0.105              D<sub>50</sub>= 0.0902  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6060  
**Location:** BIA-09 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 15 FT 4.5 m

**Mappa TestLab**

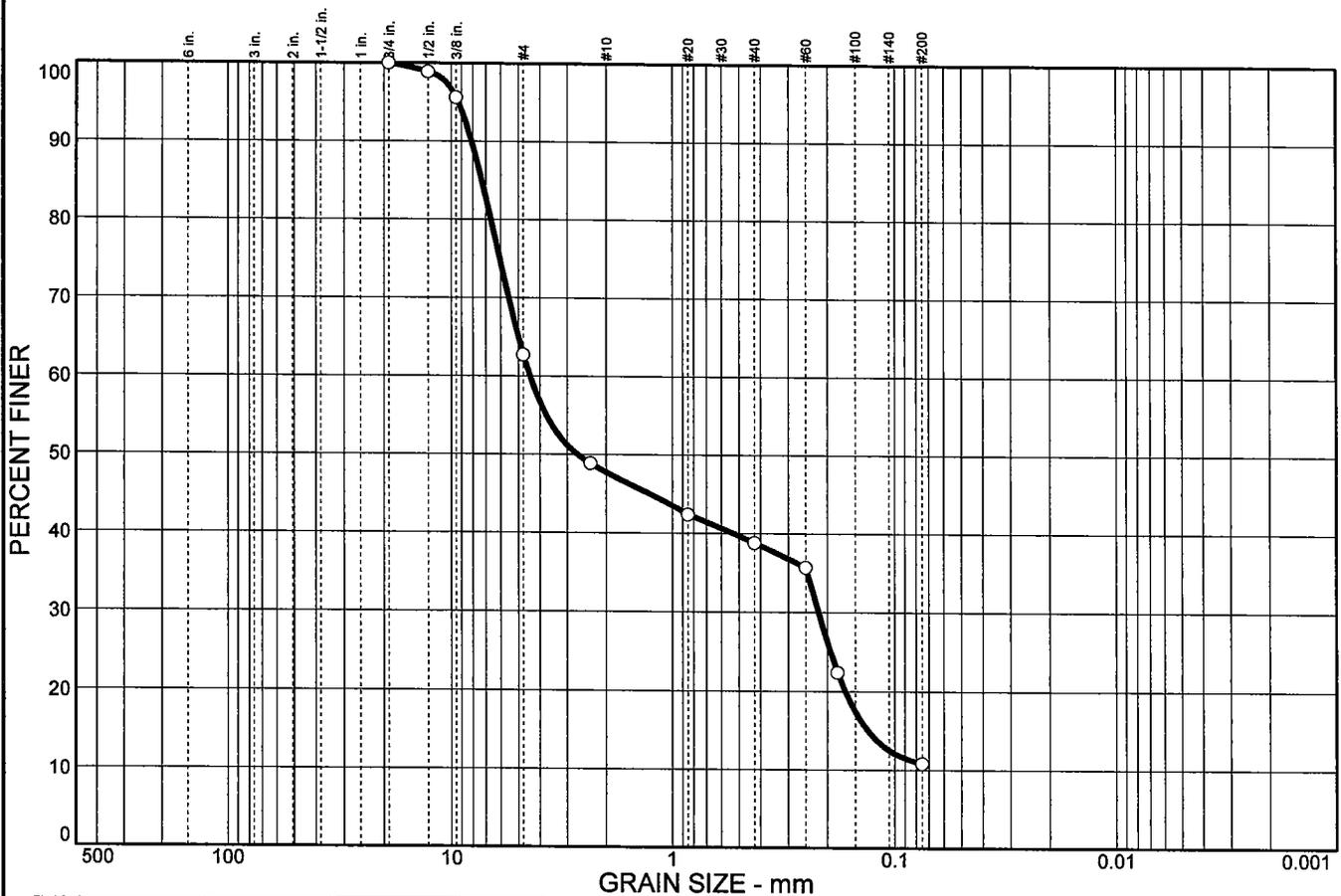
**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	37.3	15.0	8.9	28.0	10.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	98.9		
3/8 in.	95.6		
# 4	62.7		
# 8	48.9		
# 20	42.4		
# 40	38.8		
# 60	35.7		
# 80	22.4		
# 200	10.8		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.31              D<sub>60</sub>= 4.43              D<sub>50</sub>= 2.70  
D<sub>30</sub>= 0.219            D<sub>15</sub>= 0.132            D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SP-SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6062  
Location: BIA-09 #6

Source of Sample: Client Samples

Date:  
Elev./Depth: 30 FT 9 m

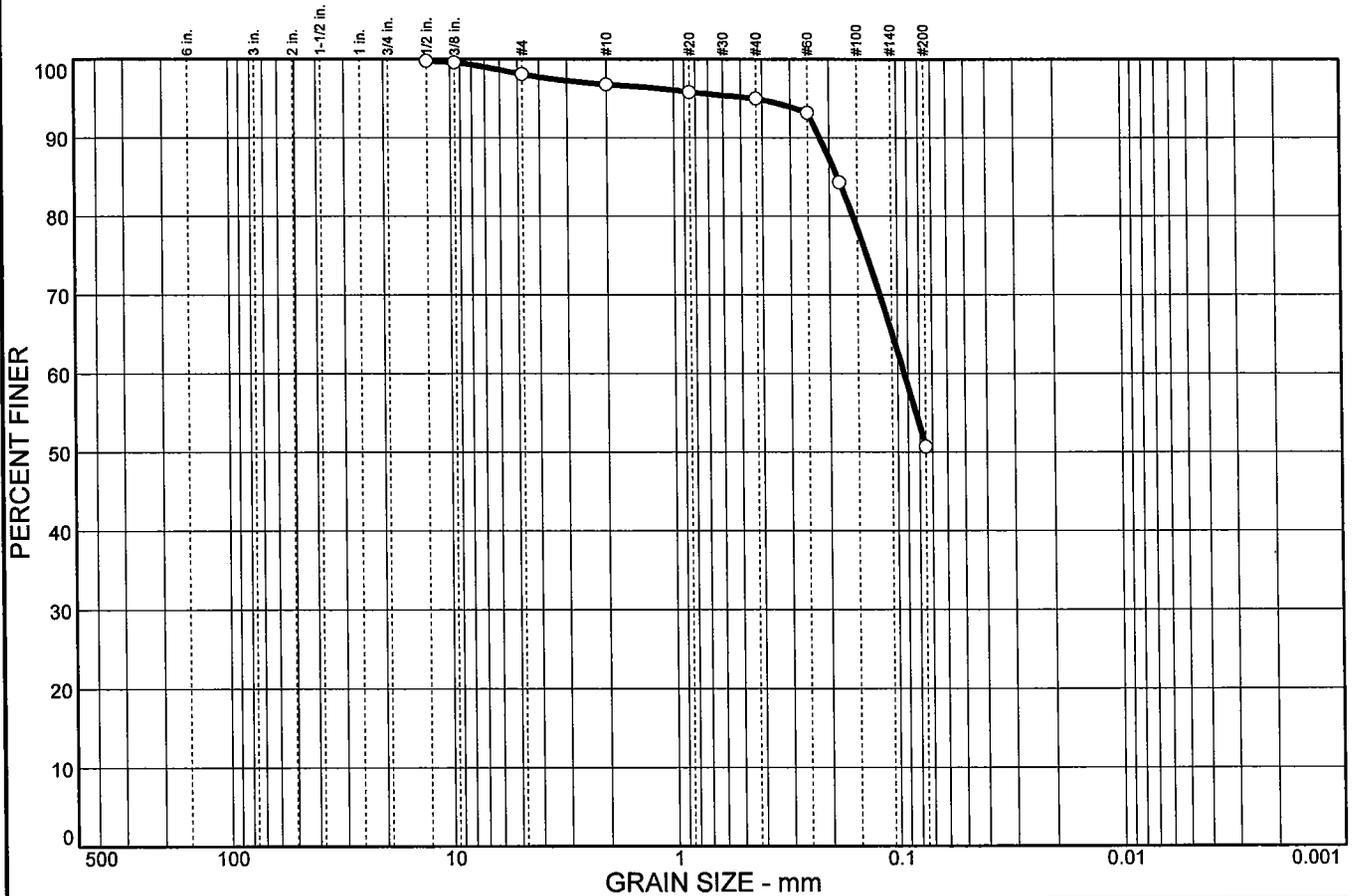
## Mappa TestLab

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			1.3	1.8	44.3	50.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	99.8		
3/8 in.	99.6		
# 4	98.1		
# 10	96.8		
# 20	95.8		
# 40	95.0		
# 60	93.2		
# 80	84.3		
# 200	50.7		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.184              D<sub>60</sub>= 0.0935              D<sub>50</sub>=  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6063  
**Location:** BIA-10 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 15 FT 4.5 m

**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

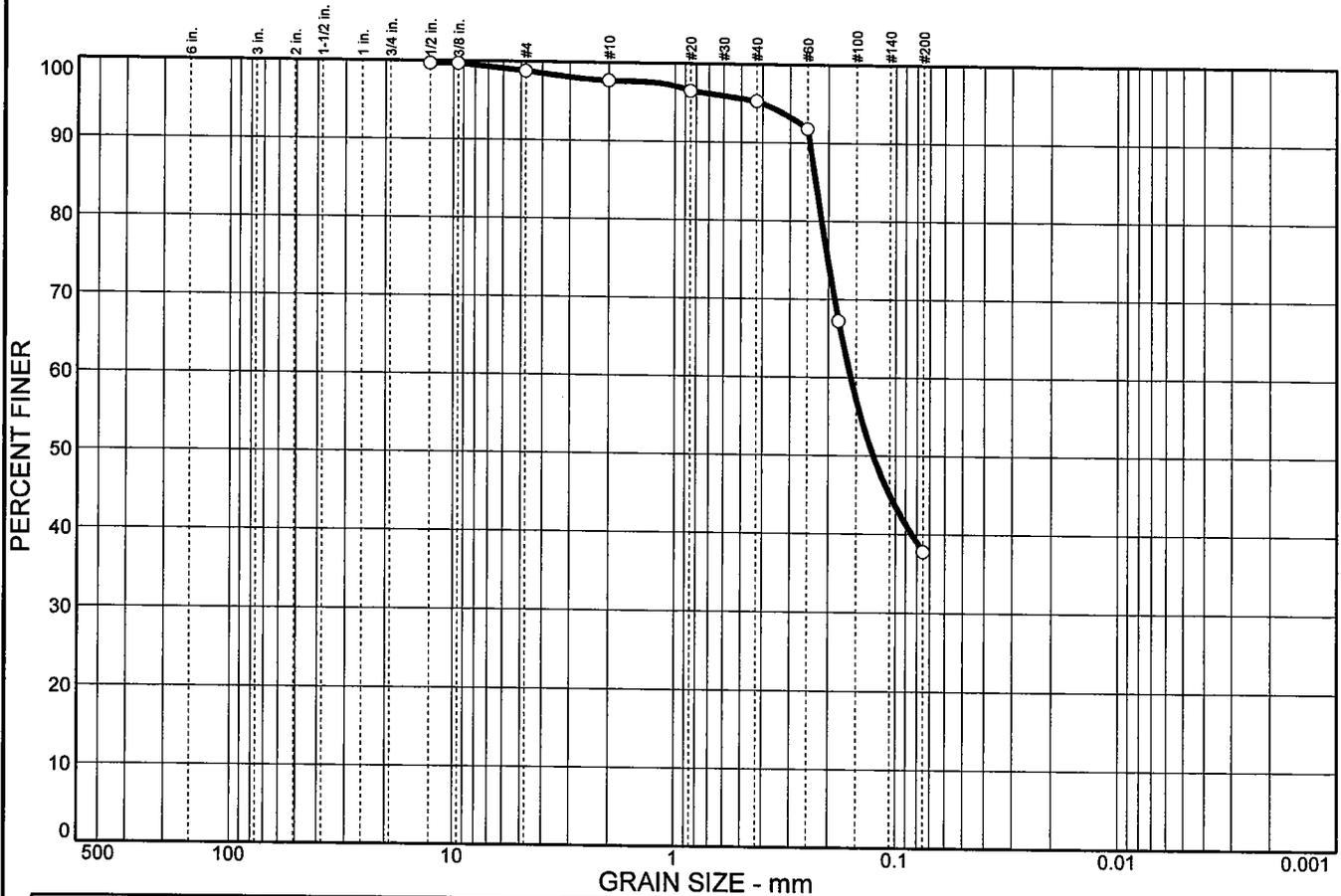
**Figure**



# Particle Size Distribution Report



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			1.1	2.4	57.5		37.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	99.7		
3/8 in.	99.7		
# 4	98.8		
# 10	97.7		
# 20	96.5		
# 40	95.3		
# 60	91.8		
# 80	67.2		
# 200	37.8		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.230              D<sub>60</sub>= 0.159              D<sub>50</sub>= 0.126

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6066  
**Location:** BIA-13 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 15 FT 4.5 m

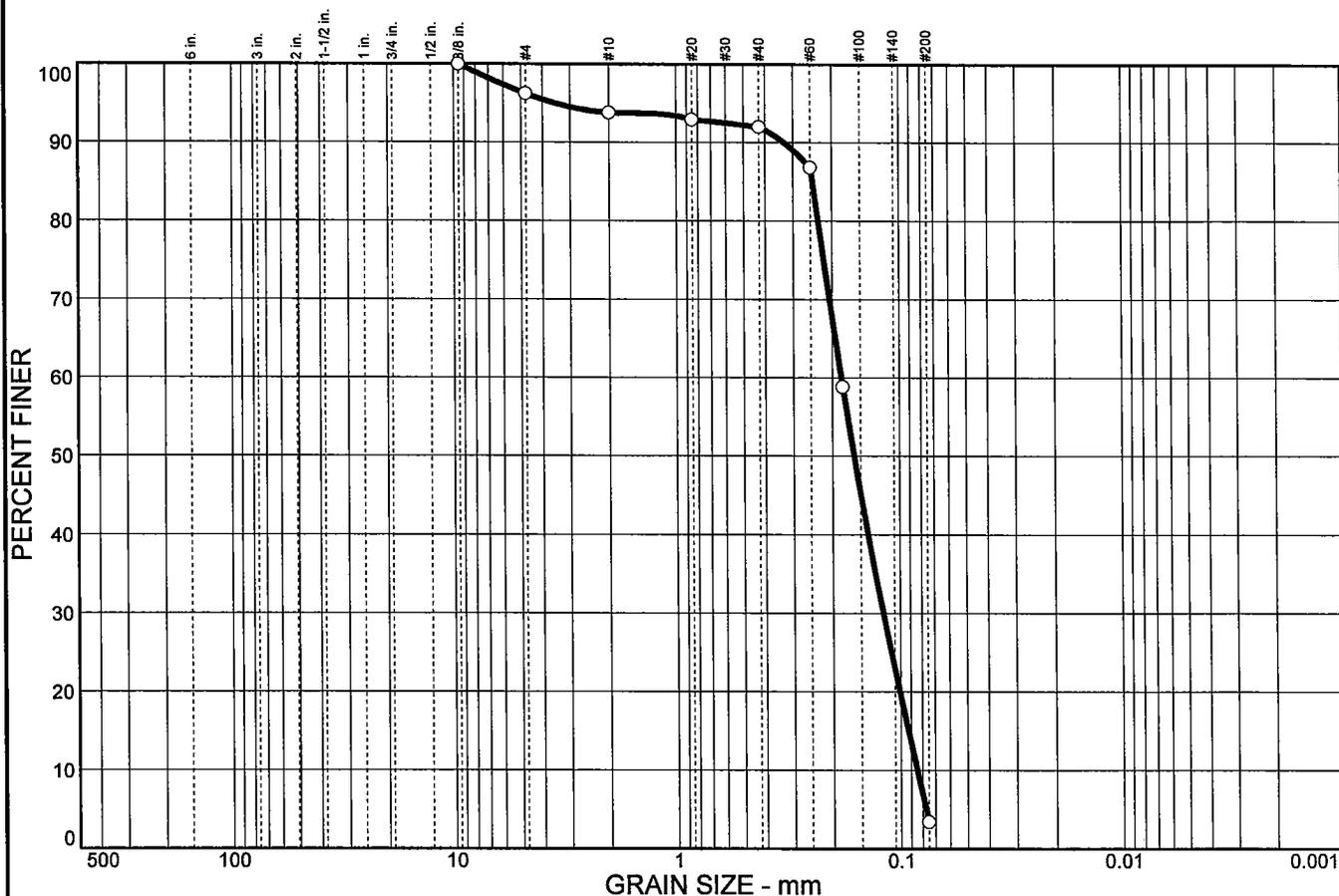
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.8	2.4	1.8	88.6	3.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	96.2		
# 10	93.8		
# 20	92.9		
# 40	92.0		
# 60	86.8		
# 80	58.8		
# 200	3.4		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.245              D<sub>60</sub>= 0.183              D<sub>50</sub>= 0.160  
D<sub>30</sub>= 0.119              D<sub>15</sub>= 0.0924              D<sub>10</sub>= 0.0845  
C<sub>u</sub>= 2.16                      C<sub>c</sub>= 0.92

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6067  
Location: BIA-13 #4

Source of Sample: Client Samples

Date:  
Elev./Depth: 20 FT 6 m

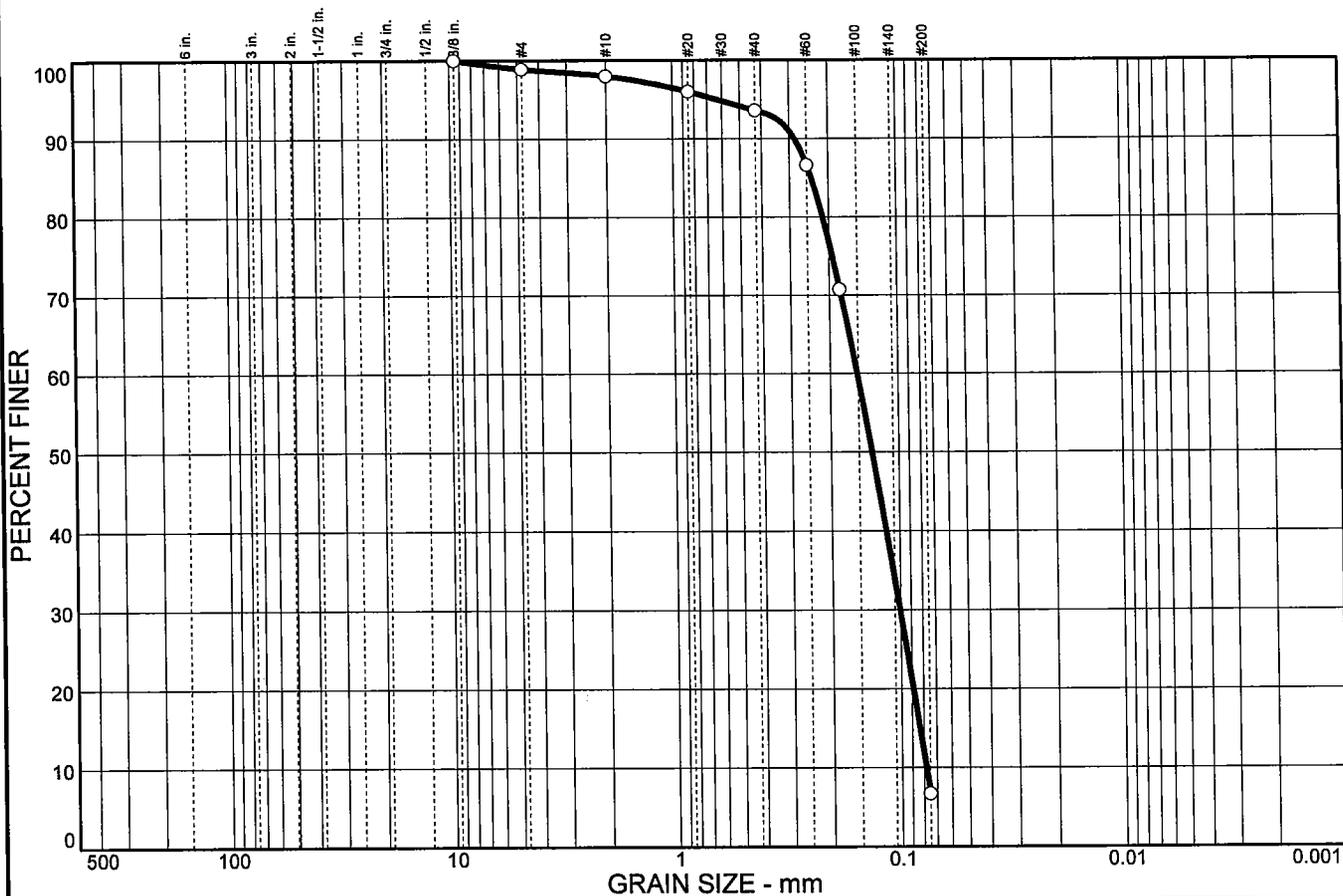
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.1	0.9	4.4	86.9	6.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	98.9		
# 10	98.0		
# 20	96.0		
# 40	93.6		
# 60	86.6		
# 80	70.7		
# 200	6.7		

**Soil Description**

Poorly graded sand with silt

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.239              D<sub>60</sub>= 0.152              D<sub>50</sub>= 0.132

D<sub>30</sub>= 0.101              D<sub>15</sub>= 0.0832              D<sub>10</sub>= 0.0782

C<sub>u</sub>= 1.94                      C<sub>c</sub>= 0.85

**Classification**

USCS= SP-SM                      AASHTO= A-3

**Remarks**

\* (no specification provided)

Sample No.: 6068

Source of Sample: Client Samples

Date:

Location: BIA-14 #4

Elev./Depth: 20 FT 6 m

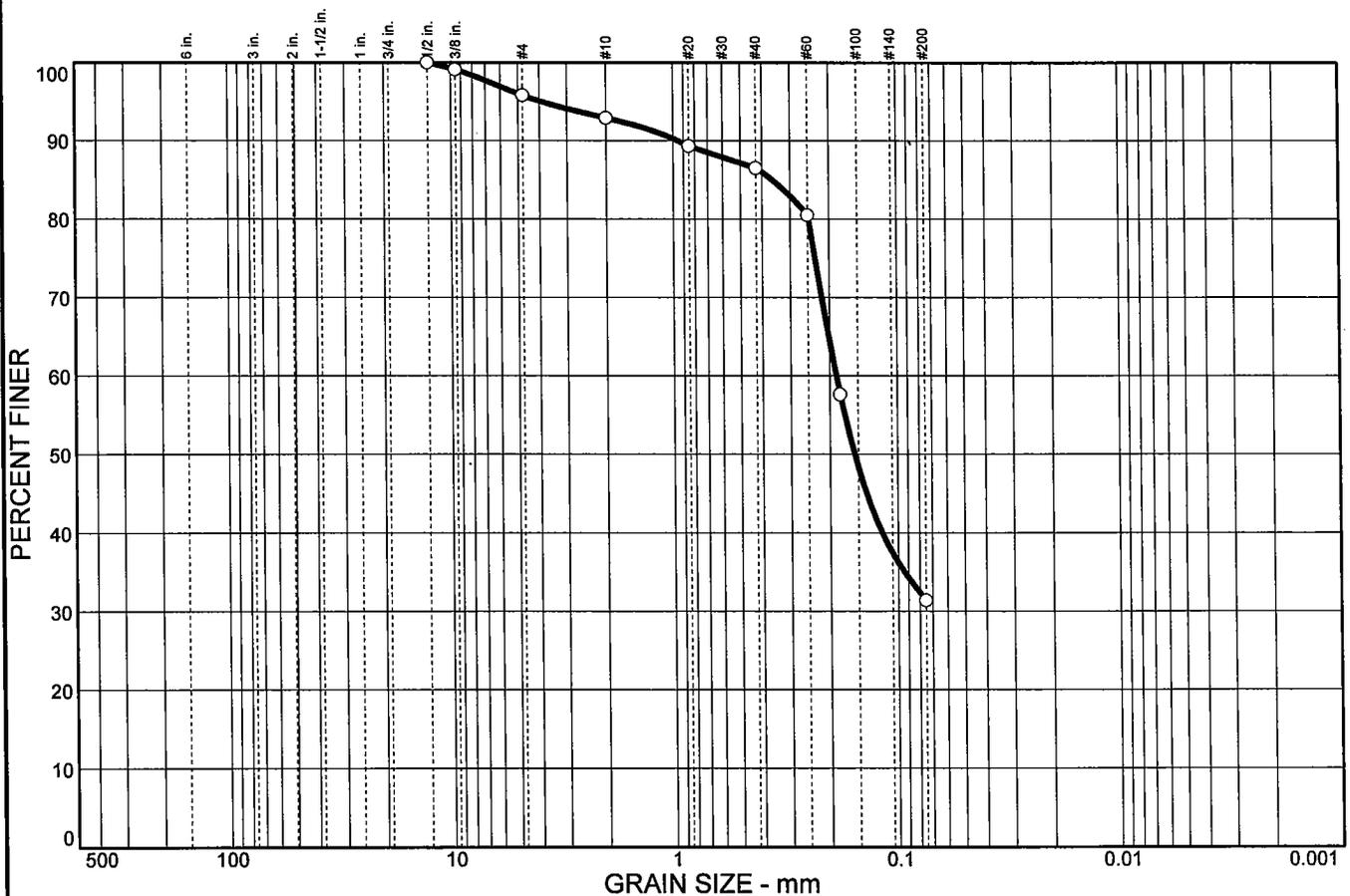
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.2	2.9	6.4	55.1	31.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.1		
# 4	95.8		
# 10	92.9		
# 20	89.3		
# 40	86.5		
# 60	80.5		
# 80	57.6		
# 200	31.4		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.361              D<sub>60</sub>= 0.187              D<sub>50</sub>= 0.156  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6069  
 Location: BIA-15 #2

Source of Sample: Client Samples

Date:  
 Elev./Depth: 10 FT 3 m

## Mappa TestLab

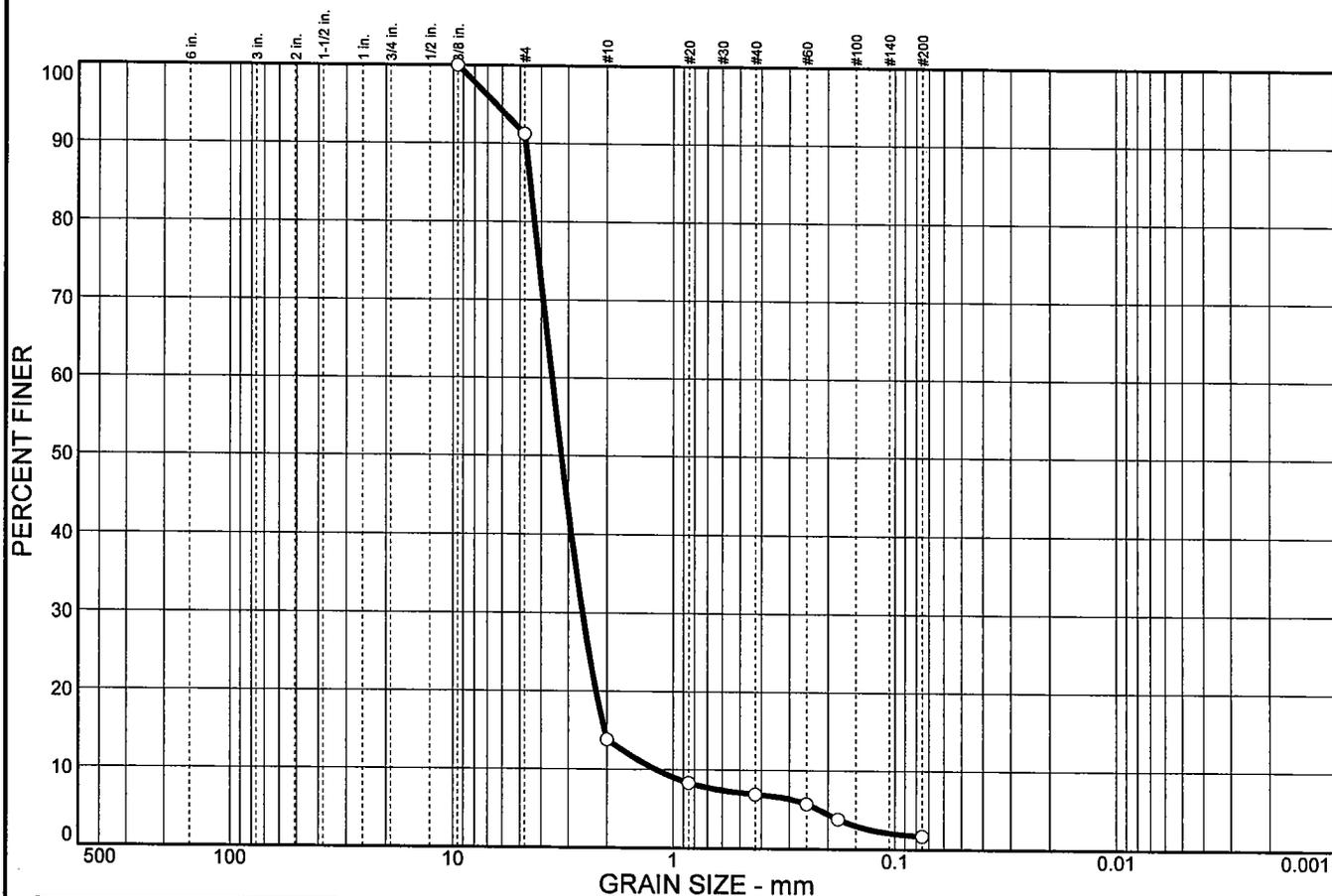
**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.8	77.4	6.9	5.2	1.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	91.2		
# 10	13.8		
# 20	8.3		
# 40	6.9		
# 60	5.7		
# 80	3.8		
# 200	1.7		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 4.49              D<sub>60</sub>= 3.57              D<sub>50</sub>= 3.24  
D<sub>30</sub>= 2.59              D<sub>15</sub>= 2.05              D<sub>10</sub>= 1.20  
C<sub>u</sub>= 2.98                C<sub>c</sub>= 1.57

**Classification**

USCS= SP                      AASHTO= A-1-a

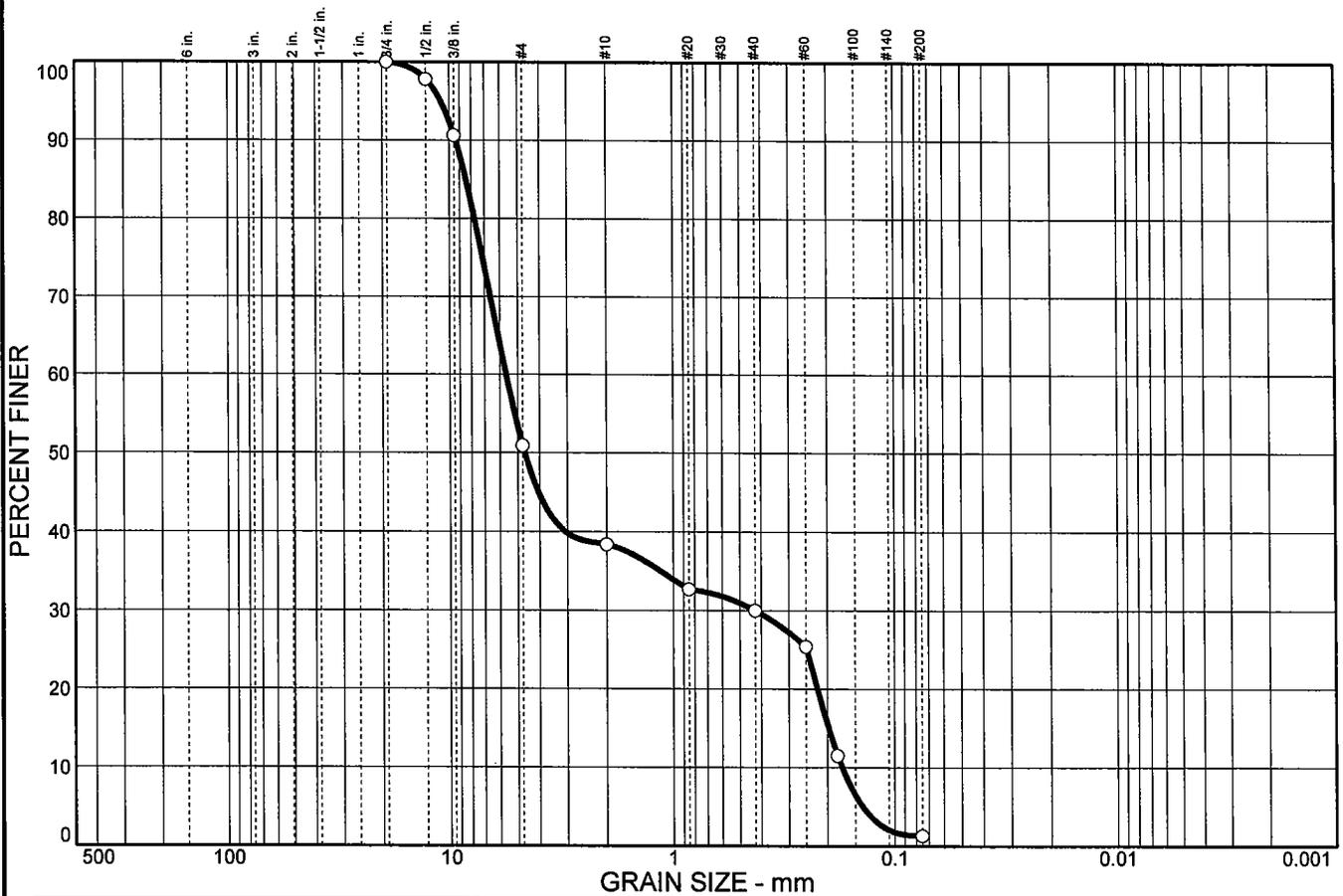
  

**Remarks**

\* (no specification provided)

Sample No.: 6071                      Source of Sample: Client Samples                      Date:                      Elev./Depth: 15 FT 4.5 m  
Location: BIA-16 #3

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	49.1	12.5	8.4	28.7	1.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.8		
3/8 in.	90.6		
# 4	50.9		
# 10	38.4		
# 20	32.7		
# 40	30.0		
# 60	25.4		
# 80	11.5		
# 200	1.3		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 8.46              D<sub>60</sub>= 5.63              D<sub>50</sub>= 4.65  
D<sub>30</sub>= 0.425              D<sub>15</sub>= 0.198              D<sub>10</sub>= 0.172  
C<sub>u</sub>= 32.76              C<sub>c</sub>= 0.19

**Classification**

USCS= SP                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6072

Source of Sample: Client Samples

Date:

Location: BIA-16 #4

Elev./Depth: 20 FT 6 m

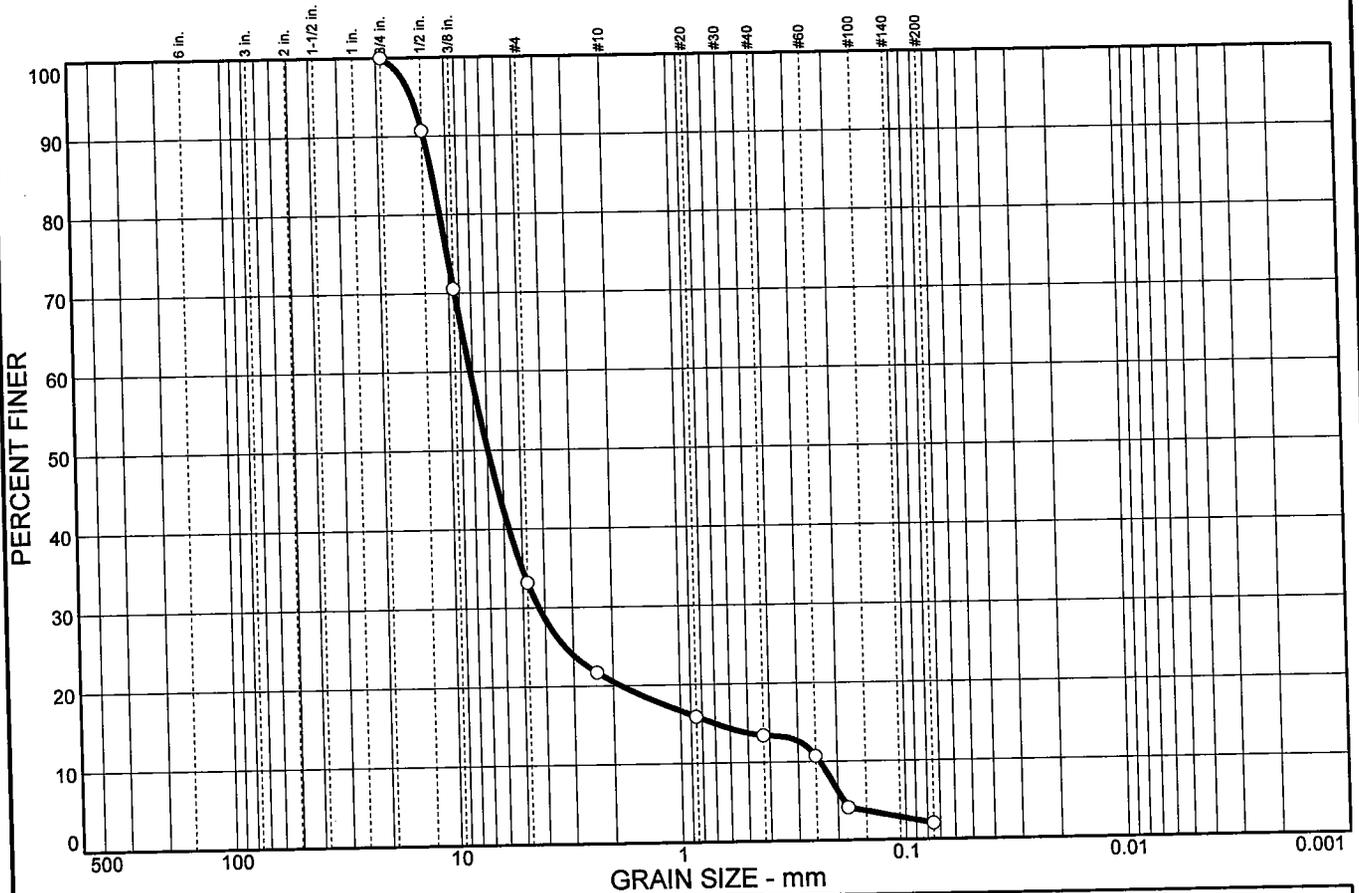
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	66.8	12.7	7.1	11.4	2.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	90.7		
3/8 in.	70.5		
# 4	33.2		
# 8	21.7		
# 20	15.9		
# 40	13.4		
# 60	10.7		
# 80	4.1		
# 200	2.0		

**Soil Description**

Poorly graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 11.6              D<sub>60</sub>= 8.20              D<sub>50</sub>= 6.96  
D<sub>30</sub>= 4.25              D<sub>15</sub>= 0.702              D<sub>10</sub>= 0.240  
C<sub>u</sub>= 34.20              C<sub>c</sub>= 9.16

**Classification**

USCS= GP                      AASHTO= A-1-a

**Remarks**

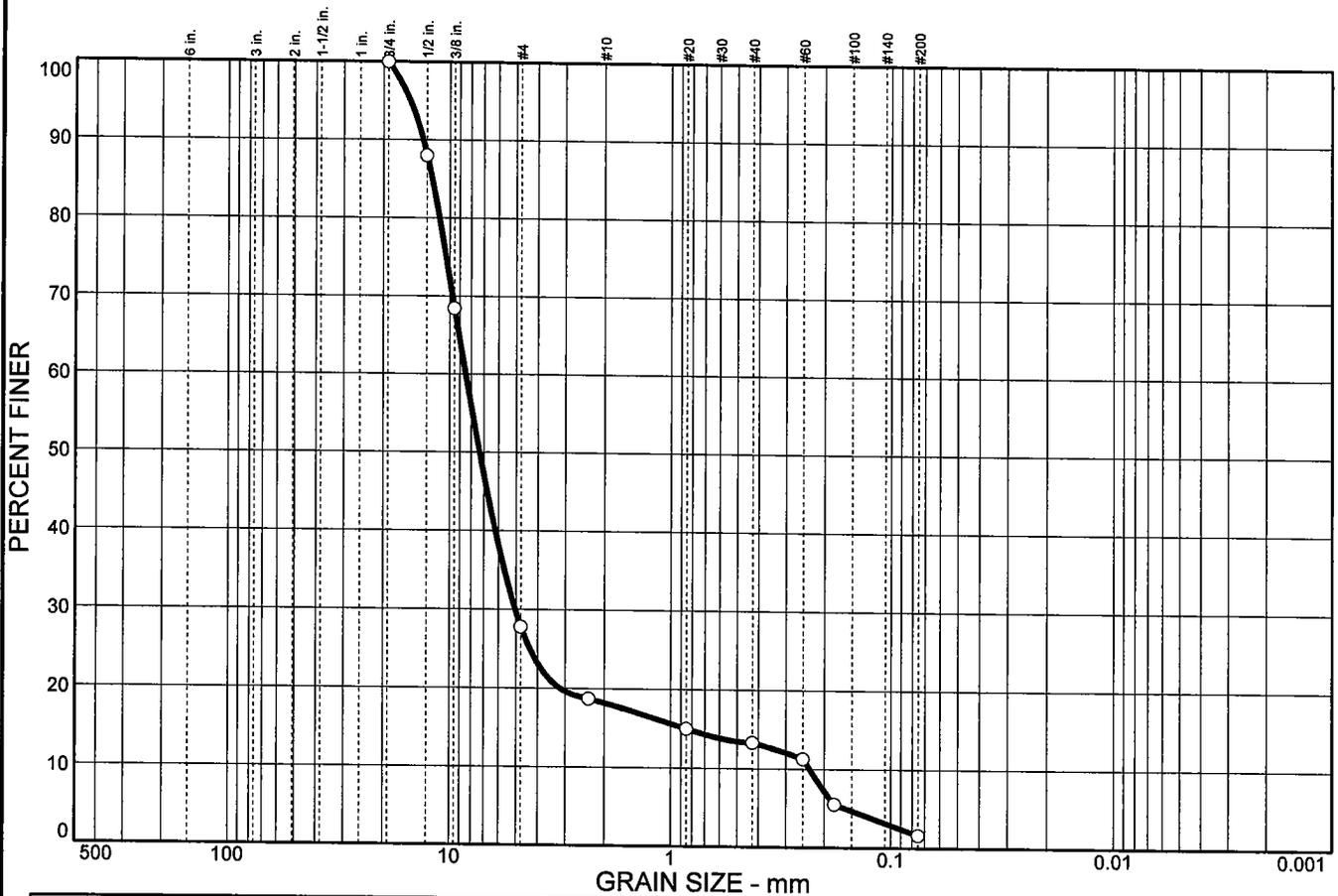
\* (no specification provided)

Sample No.: 6073                      Source of Sample: Client Samples                      Date:                      Elev./Depth: 25 FT 7.5 m  
Location: BIA-16 #5

**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska  
Project No: 2004-148                      Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	72.2	9.6	4.9	11.7	1.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	88.0		
3/8 in.	68.4		
#4	27.8		
#8	18.7		
#20	15.0		
#40	13.3		
#60	11.3		
#80	5.5		
#200	1.6		

**Soil Description**

Poorly graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 12.0                      D<sub>60</sub>= 8.49                      D<sub>50</sub>= 7.33  
 D<sub>30</sub>= 5.04                      D<sub>15</sub>= 0.850                      D<sub>10</sub>= 0.234  
 C<sub>u</sub>= 36.32                      C<sub>c</sub>= 12.82

**Classification**

USCS= GP                      AASHTO= A-1-a

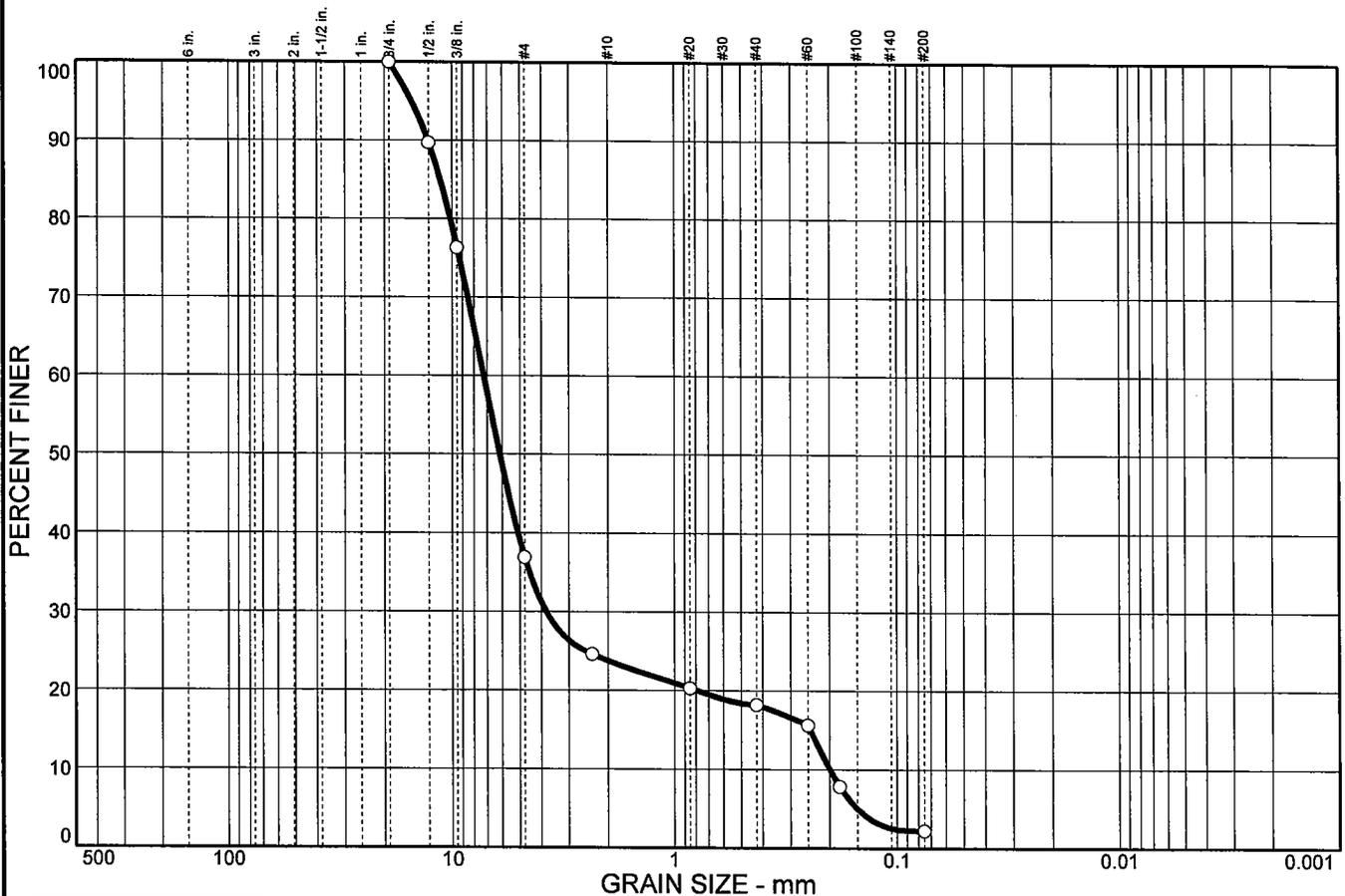
**Remarks**

\* (no specification provided)

**Sample No.:** 6074                      **Source of Sample:** Client Samples                      **Date:**  
**Location:** BIA-16 #6                      **Elev./Depth:** 30 FT 9 m

<h2>Mappa TestLab</h2>	<b>Client:</b> U.S. Army Corps of Engineers, Alaska District <b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska <b>Project No.:</b> 2004-148	<b>Figure</b>
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# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	63.1	13.1	5.6	16.0	2.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	89.7		
3/8 in.	76.3		
# 4	36.9		
# 8	24.6		
# 20	20.3		
# 40	18.2		
# 60	15.6		
# 80	7.8		
# 200	2.2		

**Soil Description**

Poorly graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 11.3              D<sub>60</sub>= 7.26              D<sub>50</sub>= 6.16  
D<sub>30</sub>= 3.80              D<sub>15</sub>= 0.244              D<sub>10</sub>= 0.200  
C<sub>u</sub>= 36.35              C<sub>c</sub>= 9.94

**Classification**

USCS= GP                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6075  
 Location: BIA-16 #7

Source of Sample: Client Samples

Date:  
 Elev./Depth: 35 FT 10.5

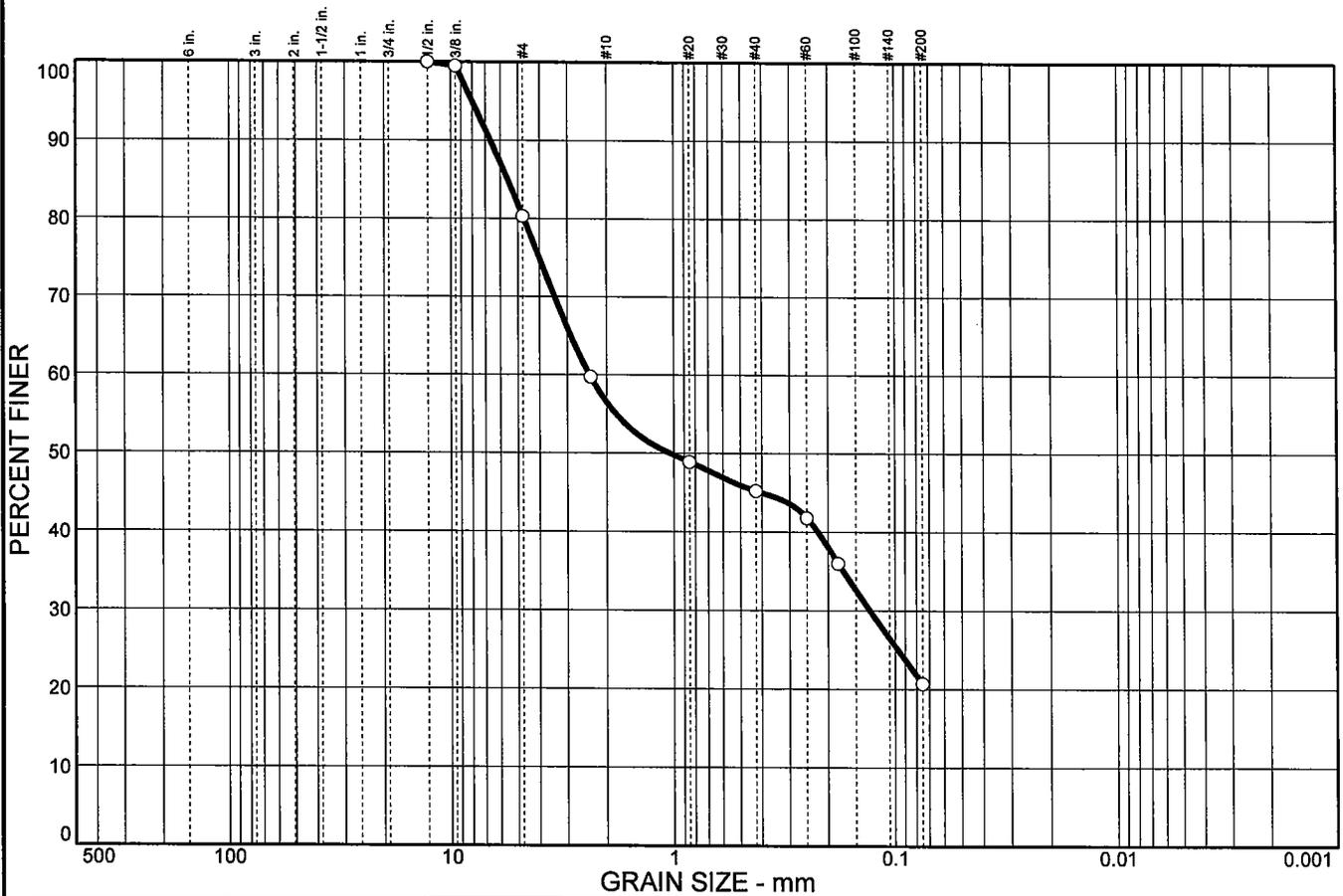
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	19.7	23.8	11.3	24.5	20.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.5		
# 4	80.3		
# 8	59.7		
# 20	48.9		
# 40	45.2		
# 60	41.8		
# 80	36.0		
# 200	20.7		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.56                      D<sub>60</sub>= 2.39                      D<sub>50</sub>= 1.04  
D<sub>30</sub>= 0.130                      D<sub>15</sub>=                      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6076

Location: BIA-17 #3

Source of Sample: Client Samples

Date:

Elev./Depth: 15 FT 4.5 m

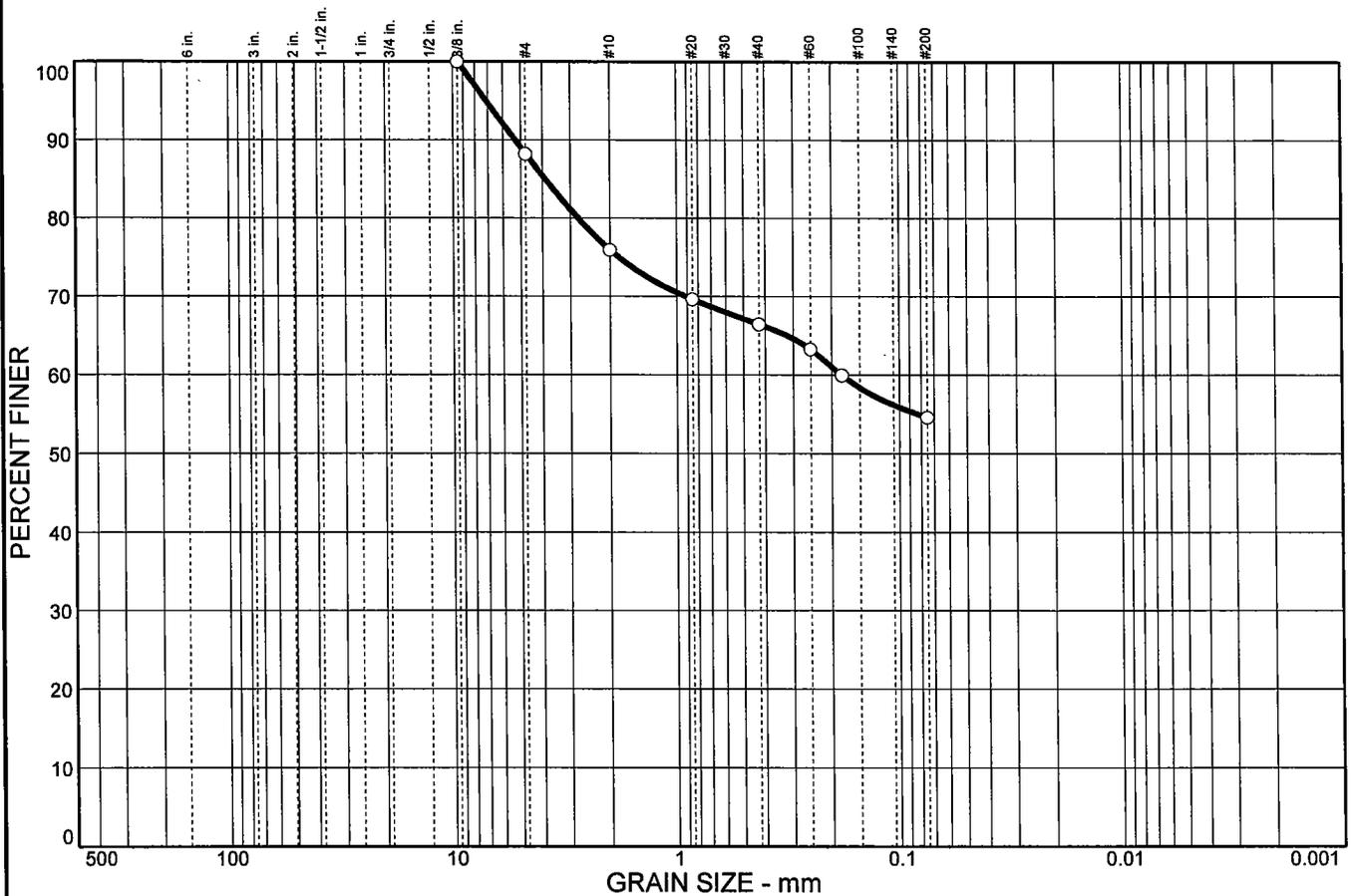
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.8	12.3	9.5	11.8	54.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	88.2		
# 10	75.9		
# 20	69.6		
# 40	66.4		
# 60	63.2		
# 80	59.9		
# 200	54.6		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 3.90                      D<sub>60</sub>= 0.182                      D<sub>50</sub>=  
 D<sub>30</sub>=                                      D<sub>15</sub>=                                      D<sub>10</sub>=  
 C<sub>u</sub>=                                      C<sub>c</sub>=

**Classification**  
 USCS= ML                                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6077  
 Location: BIA-17 #5

Source of Sample: Client Samples

Date:  
 Elev./Depth: 25 FT 7.5 m

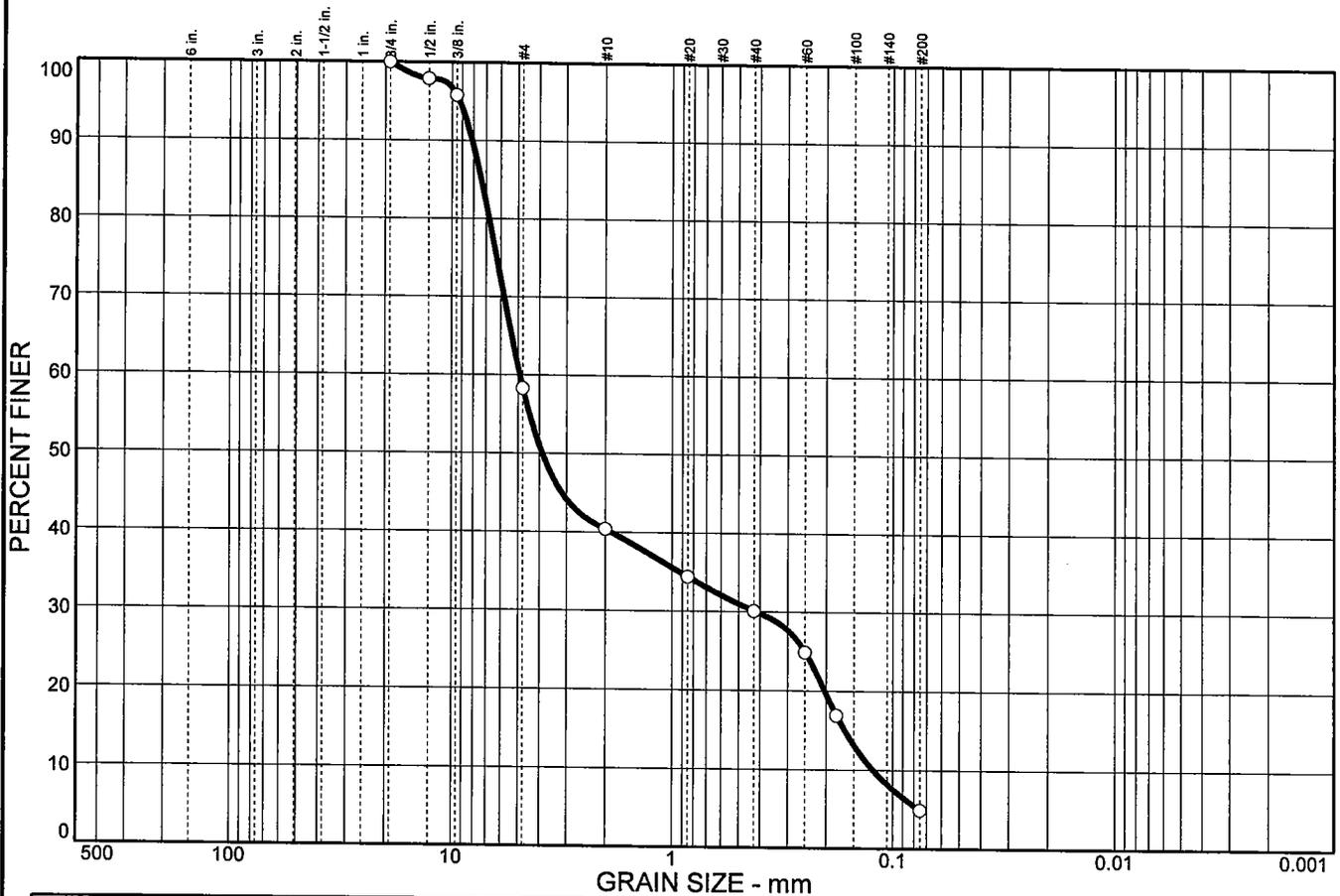
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	41.7	17.9	10.3	25.2	4.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.9		
3/8 in.	95.8		
# 4	58.3		
# 10	40.4		
# 20	34.4		
# 40	30.1		
# 60	24.9		
# 80	16.9		
# 200	4.9		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.38                      D<sub>60</sub>= 4.91                      D<sub>50</sub>= 3.88  
D<sub>30</sub>= 0.417                      D<sub>15</sub>= 0.165                      D<sub>10</sub>= 0.123  
C<sub>u</sub>= 39.85                      C<sub>c</sub>= 0.29

**Classification**

USCS= SP                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6078  
 Location: BIA-17 #6

Source of Sample: Client Samples

Date:  
 Elev./Depth: 30 FT 9 m

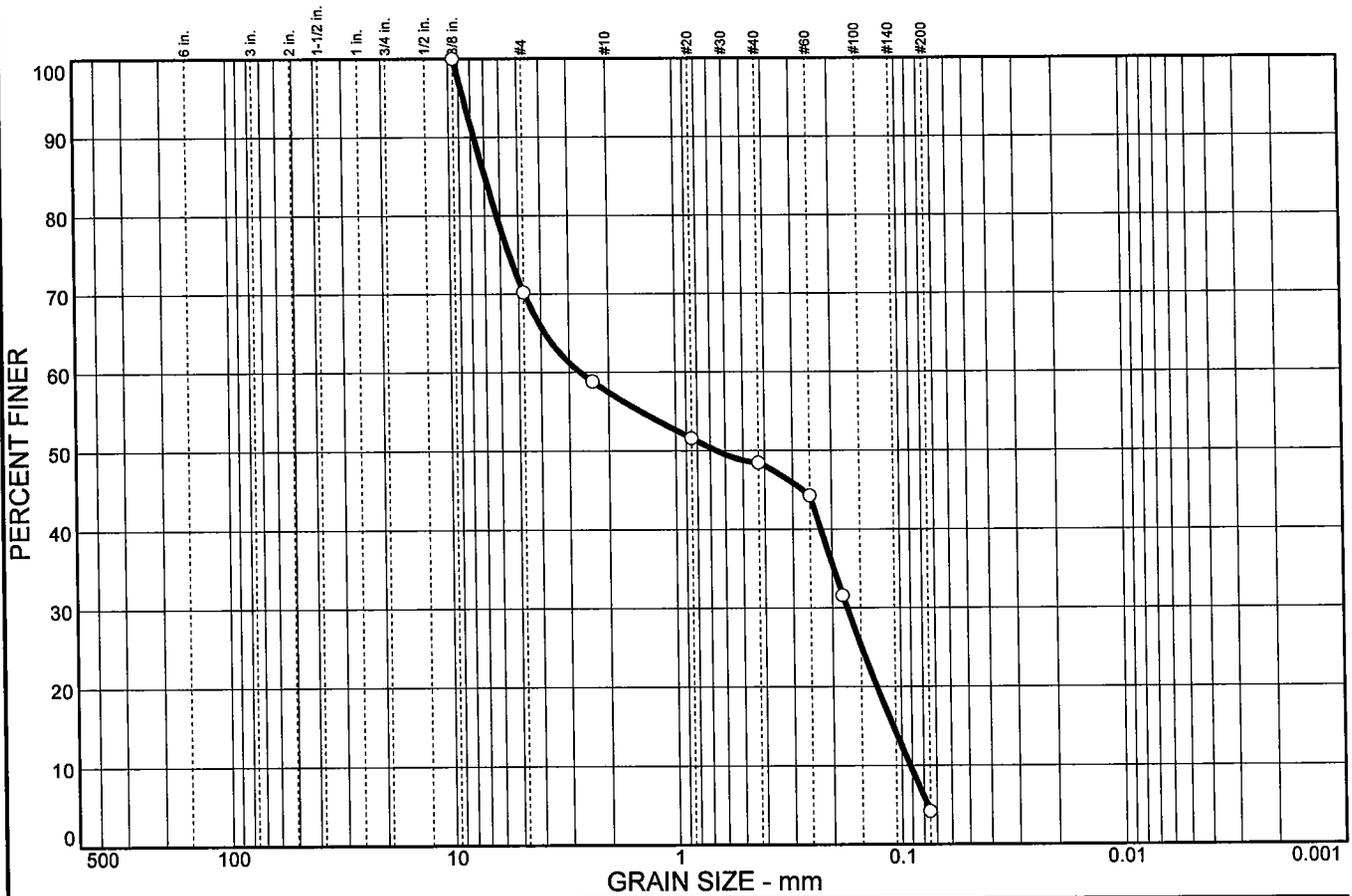
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	29.8	12.8	8.9	44.3	4.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	70.2		
# 8	58.8		
# 20	51.6		
# 40	48.5		
# 60	44.3		
# 80	31.6		
# 200	4.2		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.97                      D<sub>60</sub>= 2.69                      D<sub>50</sub>= 0.656

D<sub>30</sub>= 0.172                      D<sub>15</sub>= 0.109                      D<sub>10</sub>= 0.0918

C<sub>u</sub>= 29.29                      C<sub>c</sub>= 0.12

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6079                      Source of Sample: Client Samples                      Date:

Location: BIA-17 #7                      Elev./Depth: 35 FT 10.5

**Mappa TestLab**

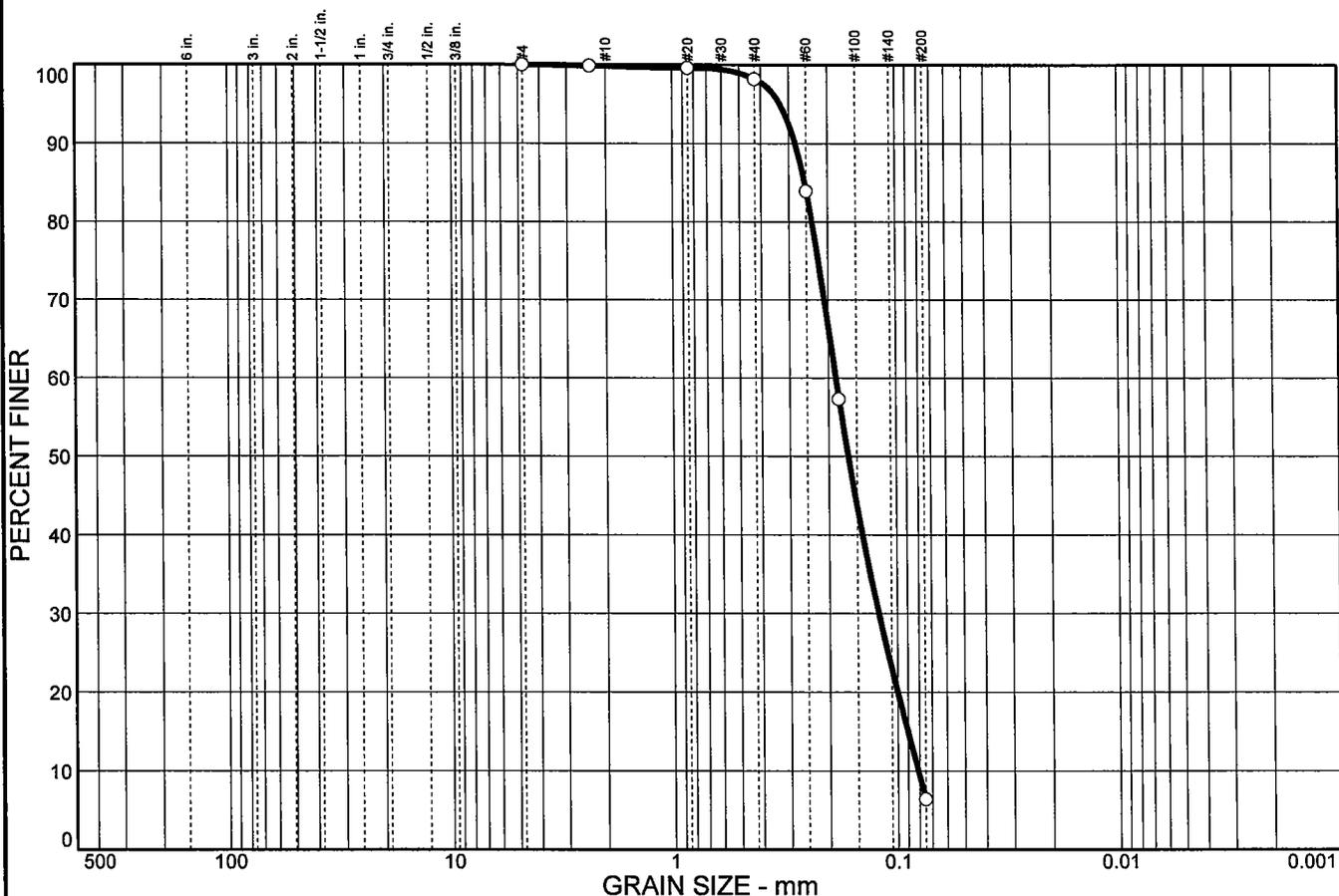
**Client:** U.S. Army Corps of Engineers, Alaska District

**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	1.7	91.8	6.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
# 4	100.0		
# 8	99.9		
# 20	99.6		
# 40	98.2		
# 60	83.9		
# 80	57.3		
# 200	6.4		

**Soil Description**

Poorly graded sand with silt

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.254              D<sub>60</sub>= 0.186              D<sub>50</sub>= 0.164  
D<sub>30</sub>= 0.121              D<sub>15</sub>= 0.0903              D<sub>10</sub>= 0.0811  
C<sub>u</sub>= 2.29                      C<sub>c</sub>= 0.97

**Classification**

USCS= SP-SM                      AASHTO= A-3

**Remarks**

\* (no specification provided)

**Sample No.:** 6080  
**Location:** BIA-17 #8

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 40 FT 12 m

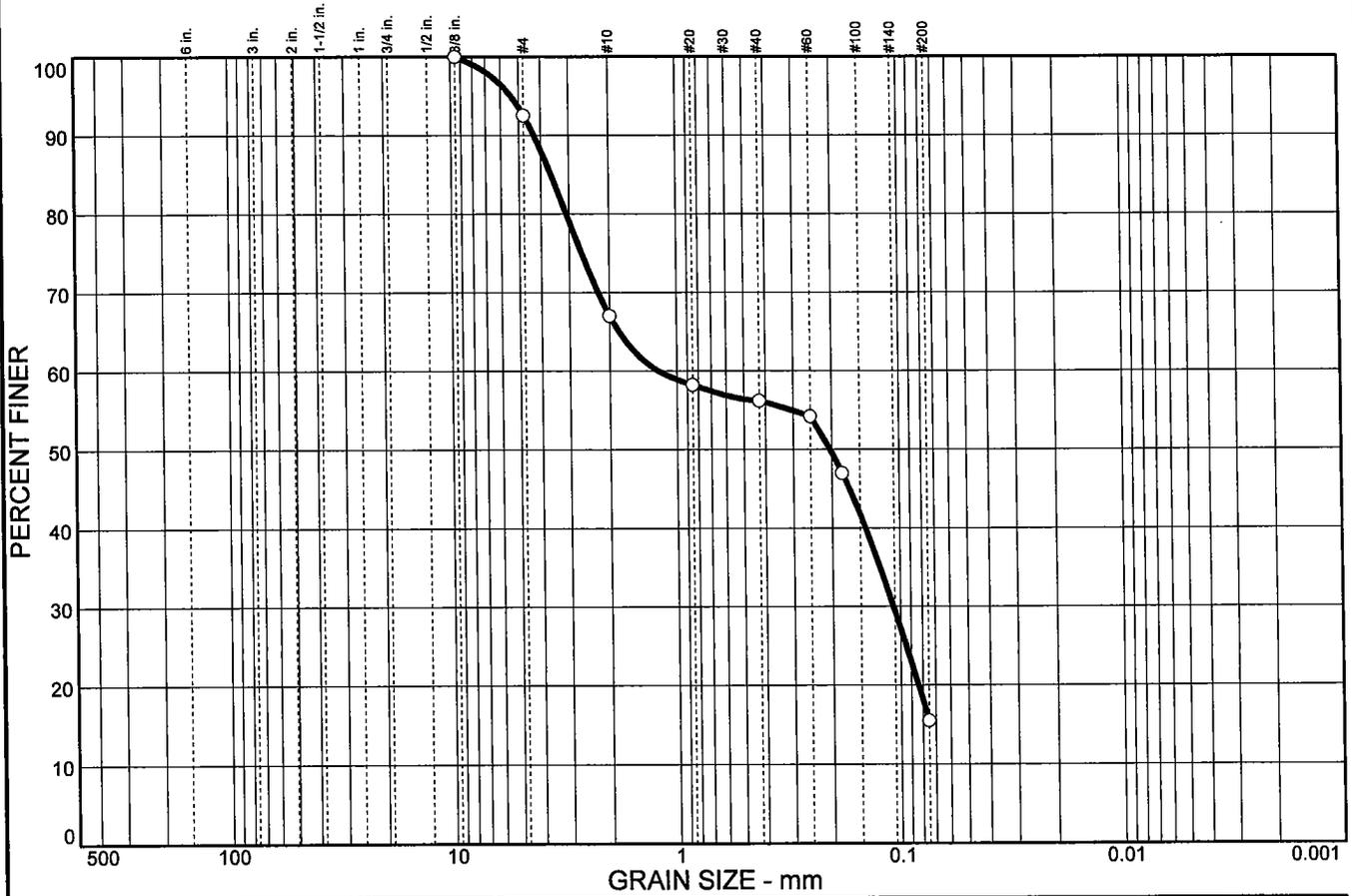
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.5	25.5	10.8	40.7	15.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	92.5		
# 10	67.0		
# 20	58.2		
# 40	56.2		
# 60	54.2		
# 80	47.0		
# 200	15.5		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 3.61                      D<sub>60</sub>= 1.22                      D<sub>50</sub>= 0.204  
 D<sub>30</sub>= 0.108                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6081                      Source of Sample: Client Samples                      Date:  
 Location: BIA-18 #4                      Elev./Depth: 20 FT 6 m

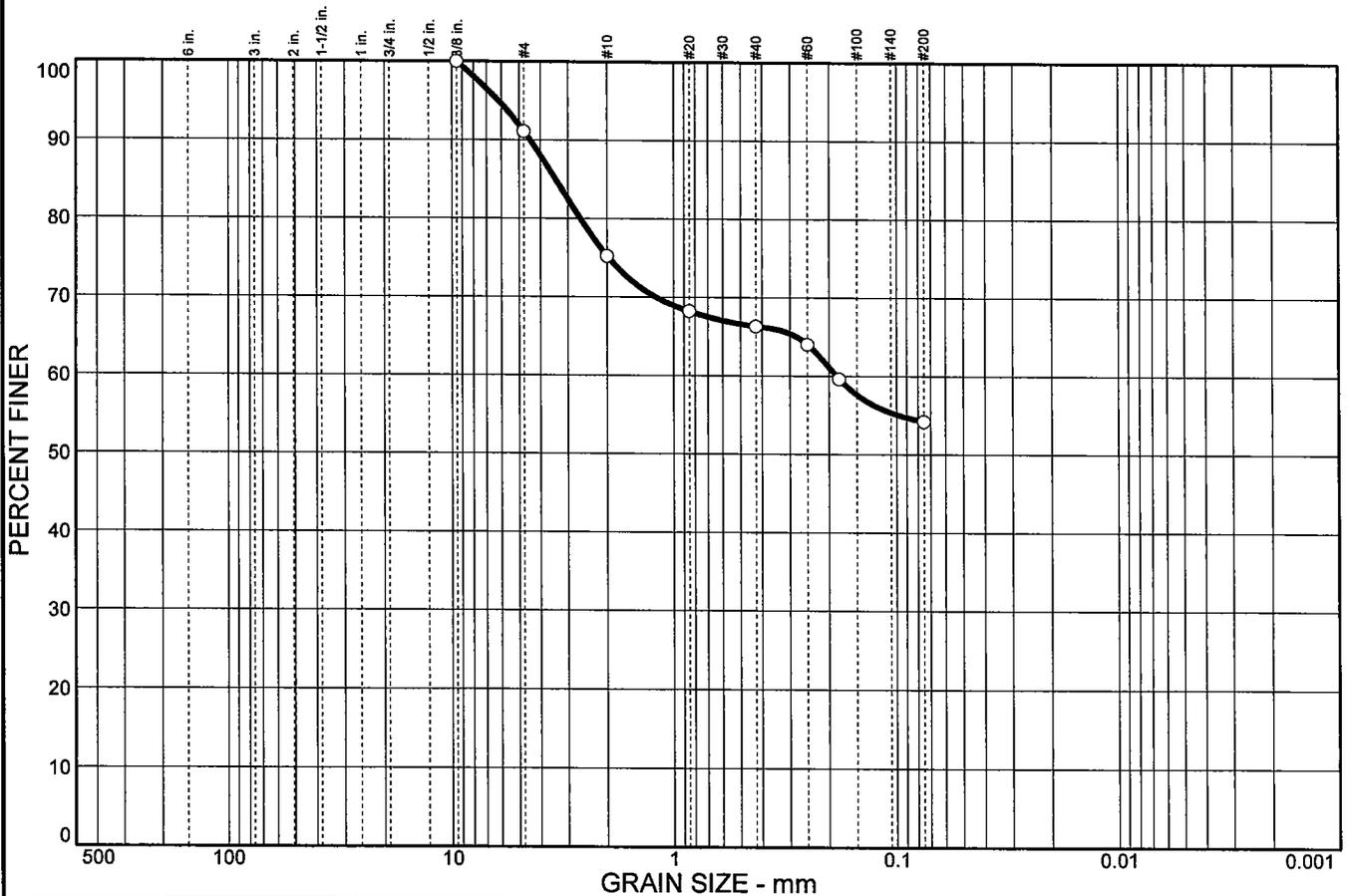
**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.9	15.9	8.9	12.1	54.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	91.1		
#10	75.2		
#20	68.2		
#40	66.3		
#60	64.0		
#80	59.6		
#200	54.2		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 3.42                      D<sub>60</sub>= 0.186                      D<sub>50</sub>=  
 D<sub>30</sub>=                                      D<sub>15</sub>=                                      D<sub>10</sub>=  
 C<sub>u</sub>=                                      C<sub>c</sub>=

**Classification**  
 USCS= ML                                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6082  
 Location: BIA-18 #5

Source of Sample: Client Samples

Date:  
 Elev./Depth: 25 FT 7.5 m

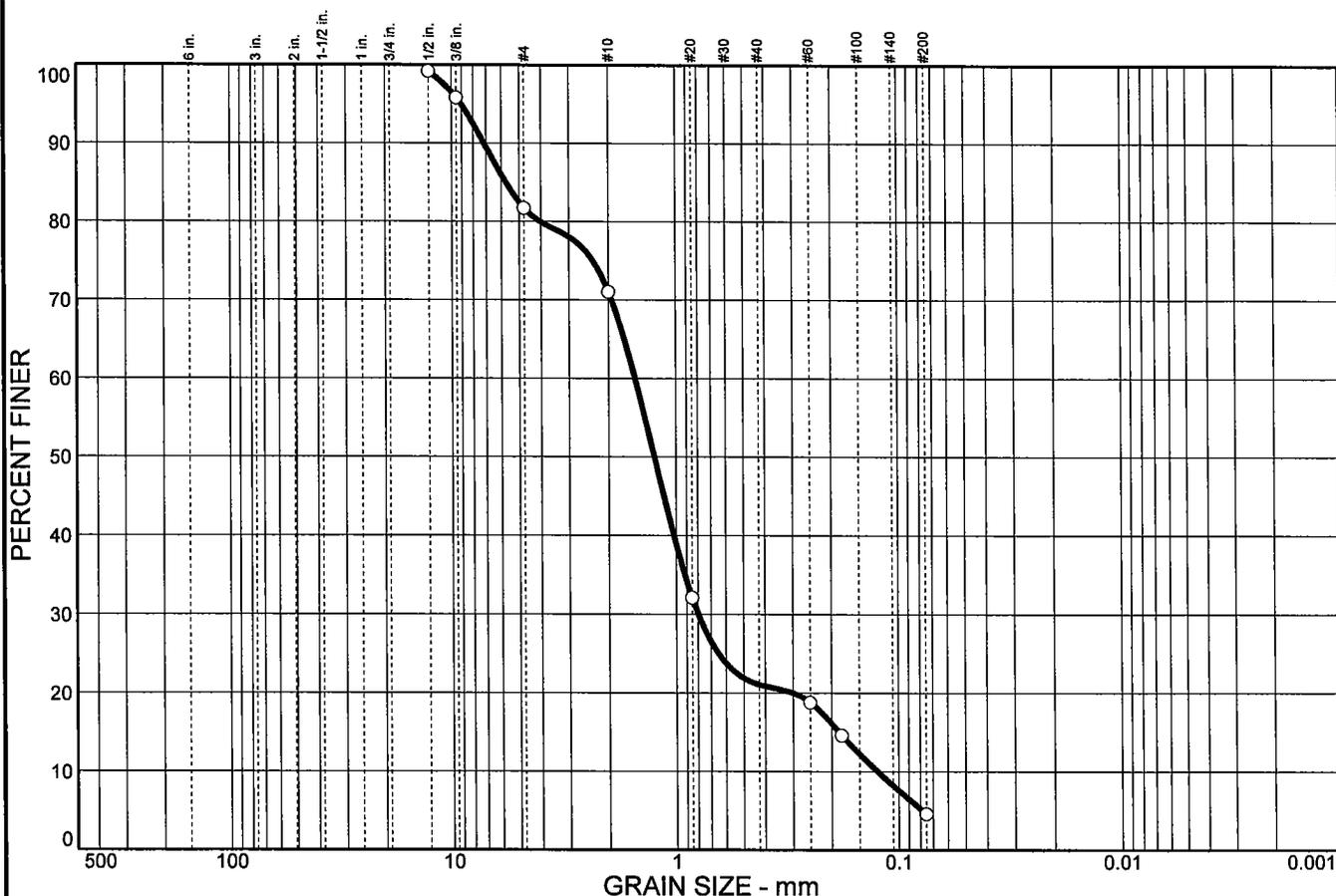
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			10.7	49.9	16.5		4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	99.2		
3/8 in.	95.8		
# 4	81.7		
# 10	71.0		
# 20	32.1		
# 60	18.8		
# 80	14.6		
# 200	4.6		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.73                      D<sub>60</sub>= 1.53                      D<sub>50</sub>= 1.25  
 D<sub>30</sub>= 0.798                      D<sub>15</sub>= 0.185                      D<sub>10</sub>= 0.125  
 C<sub>u</sub>= 12.25                      C<sub>c</sub>= 3.34

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6083

Source of Sample: Client Samples

Date:

Location: BIA-18 #6

Elev./Depth: 30 FT 9 m

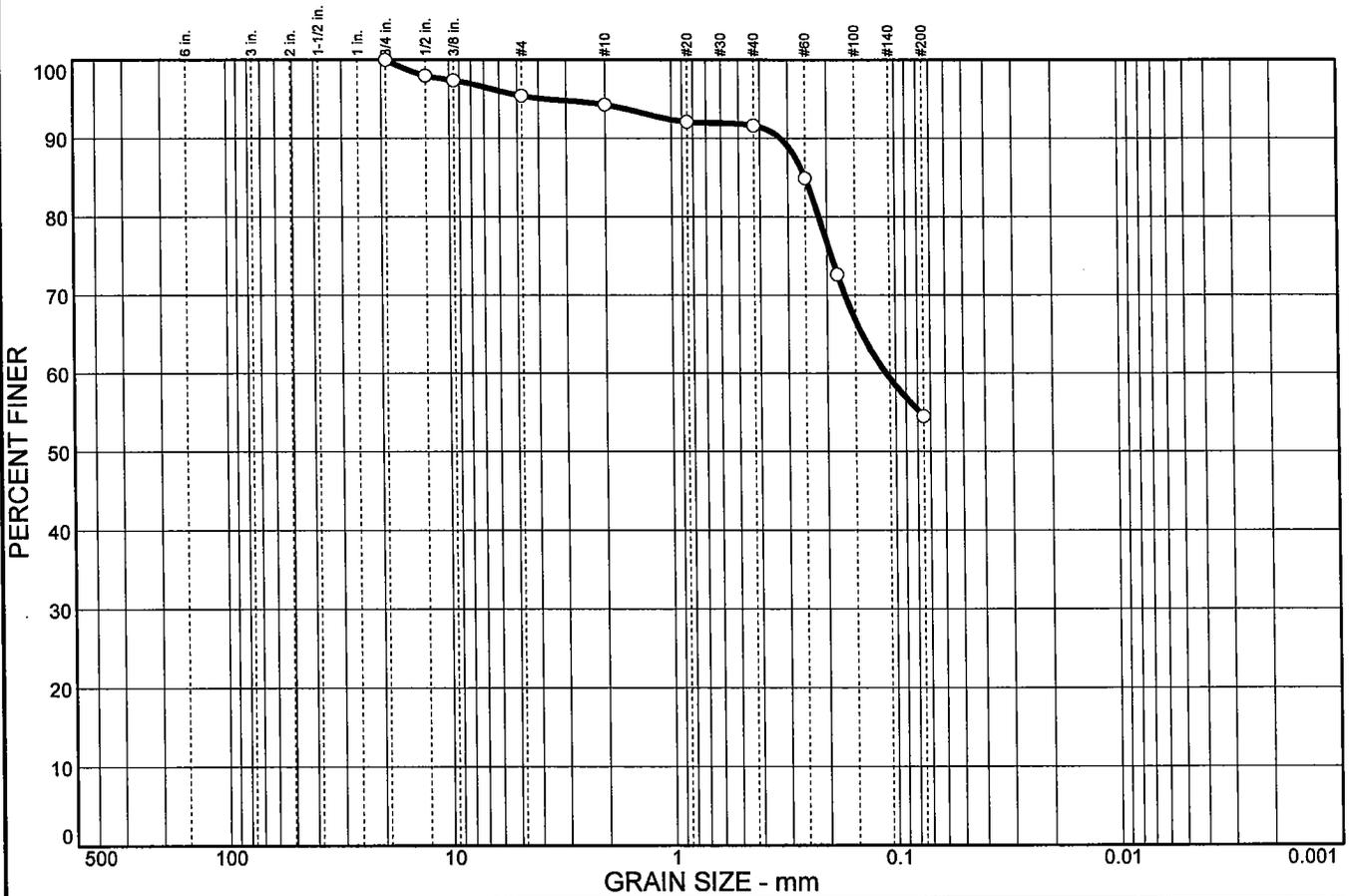
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.6	1.1	2.7	37.1	54.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	98.0		
3/8 in.	97.4		
# 4	95.4		
# 10	94.3		
# 20	92.1		
# 40	91.6		
# 60	84.9		
# 80	72.6		
# 200	54.5		

**Soil Description**

Sandy silt

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.251              D<sub>60</sub>= 0.110              D<sub>50</sub>=

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6084  
Location: BIA-18 #7

Source of Sample: Client Samples

Date:  
Elev./Depth: 35 FT 10.5 m

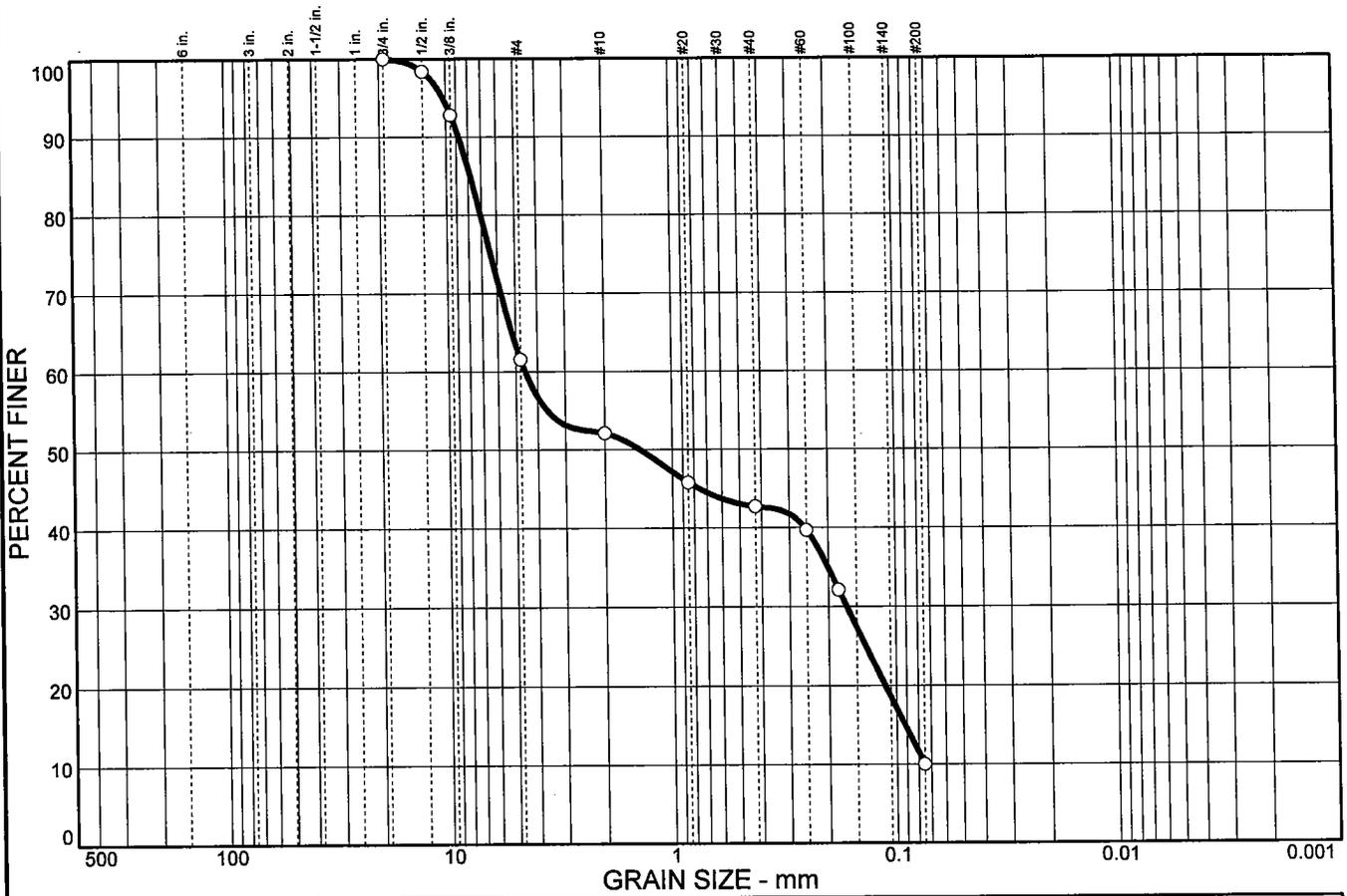
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	38.5	9.4	9.4	32.7	10.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	98.4		
3/8 in.	92.8		
# 4	61.5		
# 10	52.1		
# 20	45.8		
# 40	42.7		
# 60	39.7		
# 80	32.1		
# 200	10.0		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.84                      D<sub>60</sub>= 4.54                      D<sub>50</sub>= 1.40  
D<sub>30</sub>= 0.166                      D<sub>15</sub>= 0.0918                      D<sub>10</sub>= 0.0750  
C<sub>u</sub>= 60.53                      C<sub>c</sub>= 0.08

**Classification**

USCS= SP-SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6085  
**Location:** BIA-18 #8

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 37 FT 11.1

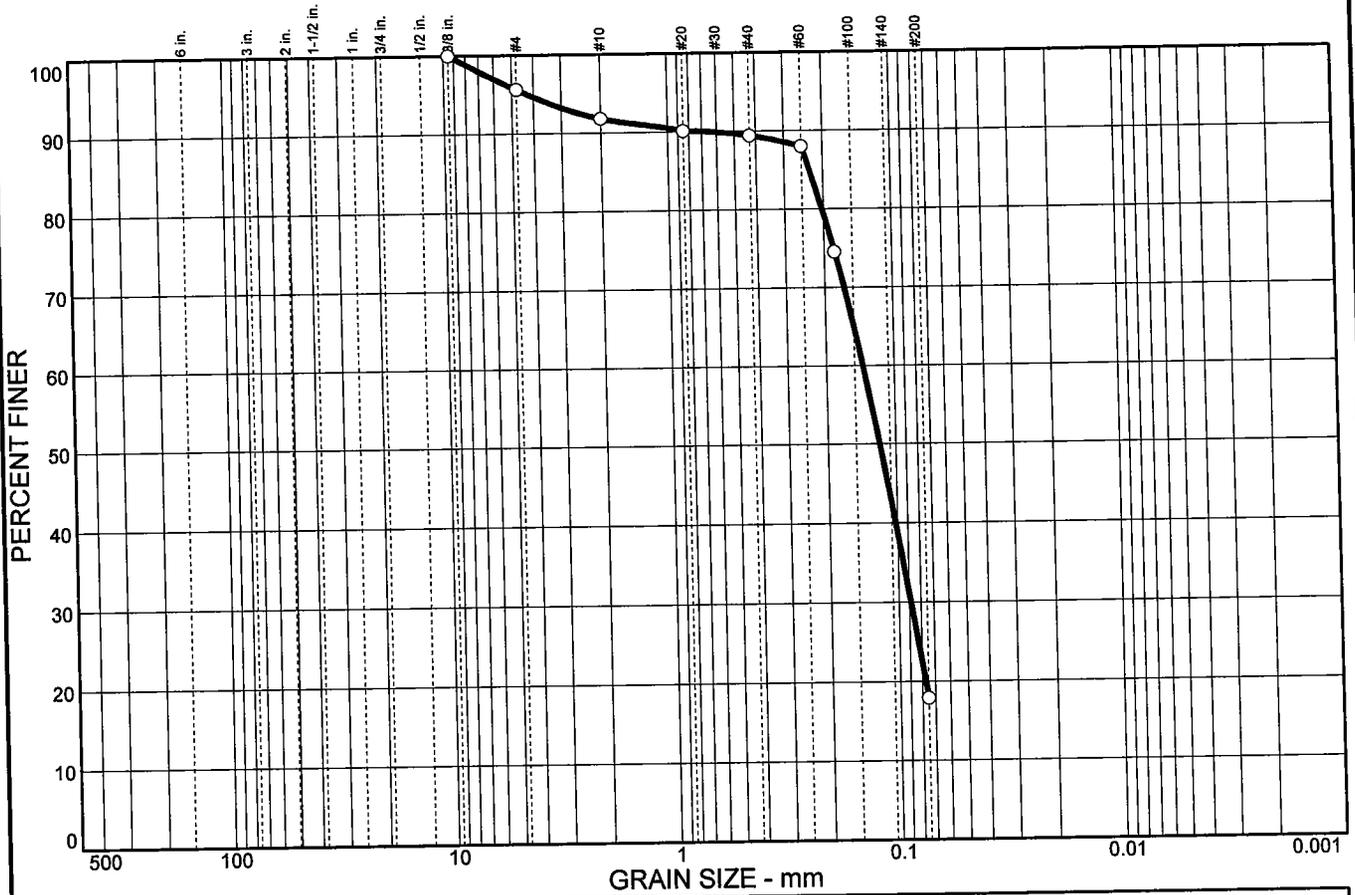
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.4	3.8	2.4	71.5	17.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	95.6		
# 10	91.8		
# 20	90.1		
# 40	89.4		
# 60	88.0		
# 80	74.5		
# 200	17.9		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.231                      D<sub>60</sub>= 0.138                      D<sub>50</sub>= 0.118  
 D<sub>30</sub>= 0.0886                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6086  
 Location: BIA-19 #4

Source of Sample: Client Samples

Date:  
 Elev./Depth: 20 FT 6 m

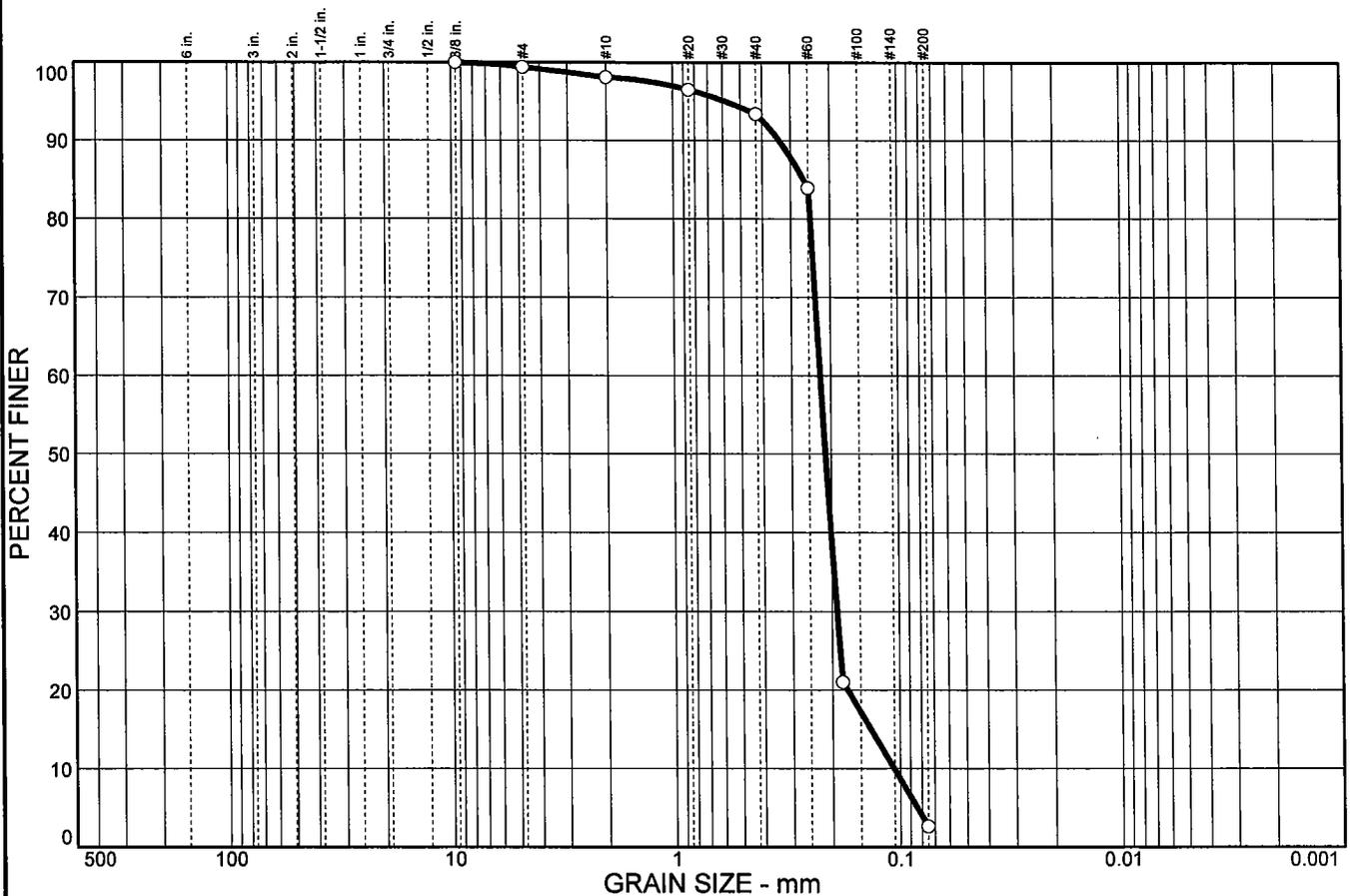
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.6	1.3	4.7	90.8	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	99.4		
# 10	98.1		
# 20	96.5		
# 40	93.4		
# 60	83.9		
# 80	21.0		
# 200	2.6		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.262      D<sub>60</sub>= 0.223      D<sub>50</sub>= 0.212  
 D<sub>30</sub>= 0.191      D<sub>15</sub>= 0.135      D<sub>10</sub>= 0.107  
 C<sub>u</sub>= 2.09              C<sub>c</sub>= 1.53

**Classification**

USCS= SP                      AASHTO= A-3

**Remarks**

\* (no specification provided)

**Sample No.:** 6087  
**Location:** BIA-20 #5

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 25 FT 7.5 m

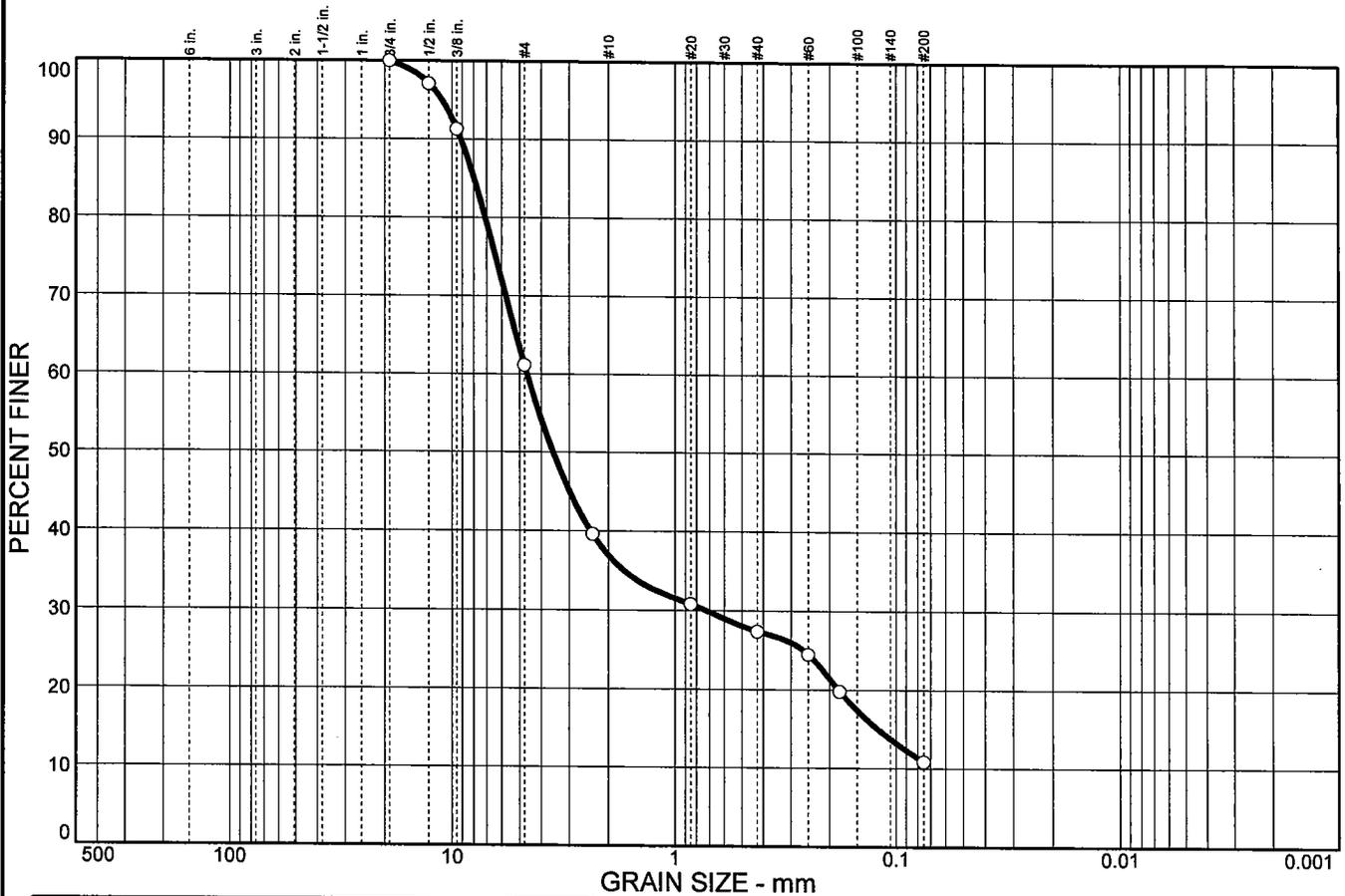
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	38.9	24.2	9.5	16.6	10.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.1		
3/8 in.	91.3		
# 4	61.1		
# 8	39.6		
# 20	30.8		
# 40	27.4		
# 60	24.5		
# 80	19.8		
# 200	10.8		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.98              D<sub>60</sub>= 4.63              D<sub>50</sub>= 3.55  
D<sub>30</sub>= 0.725              D<sub>15</sub>= 0.121              D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SP-SM                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

**Sample No.:** 6088  
**Location:** BIA-21 #5

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 25 FT 7.5

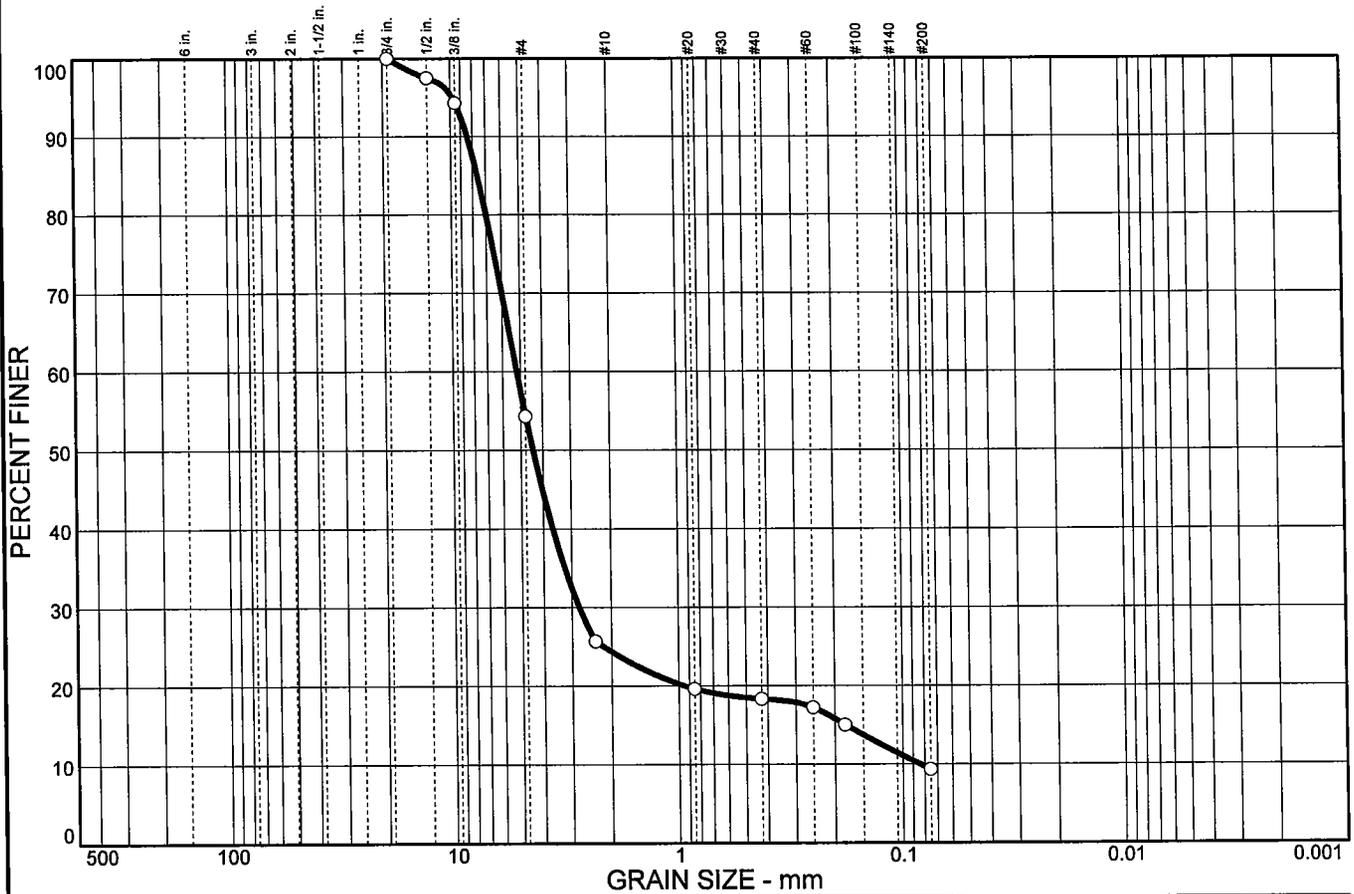
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	45.7	29.9	6.1	9.0	9.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.5		
3/8 in.	94.3		
# 4	54.3		
# 8	25.7		
# 20	19.6		
# 40	18.3		
# 60	17.2		
# 80	15.0		
# 200	9.3		

**Soil Description**  
Poorly graded gravel with silt and sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 7.64              D<sub>60</sub>= 5.19              D<sub>50</sub>= 4.42  
 D<sub>30</sub>= 2.79              D<sub>15</sub>= 0.180              D<sub>10</sub>= 0.0841  
 C<sub>u</sub>= 61.71              C<sub>c</sub>= 17.78

**Classification**  
 USCS= GP-GM              AASHTO= A-1-a

**Remarks**

\* (no specification provided)

**Sample No.:** 6089  
**Location:** BIA-21 #6

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 29 FT 8.7 m

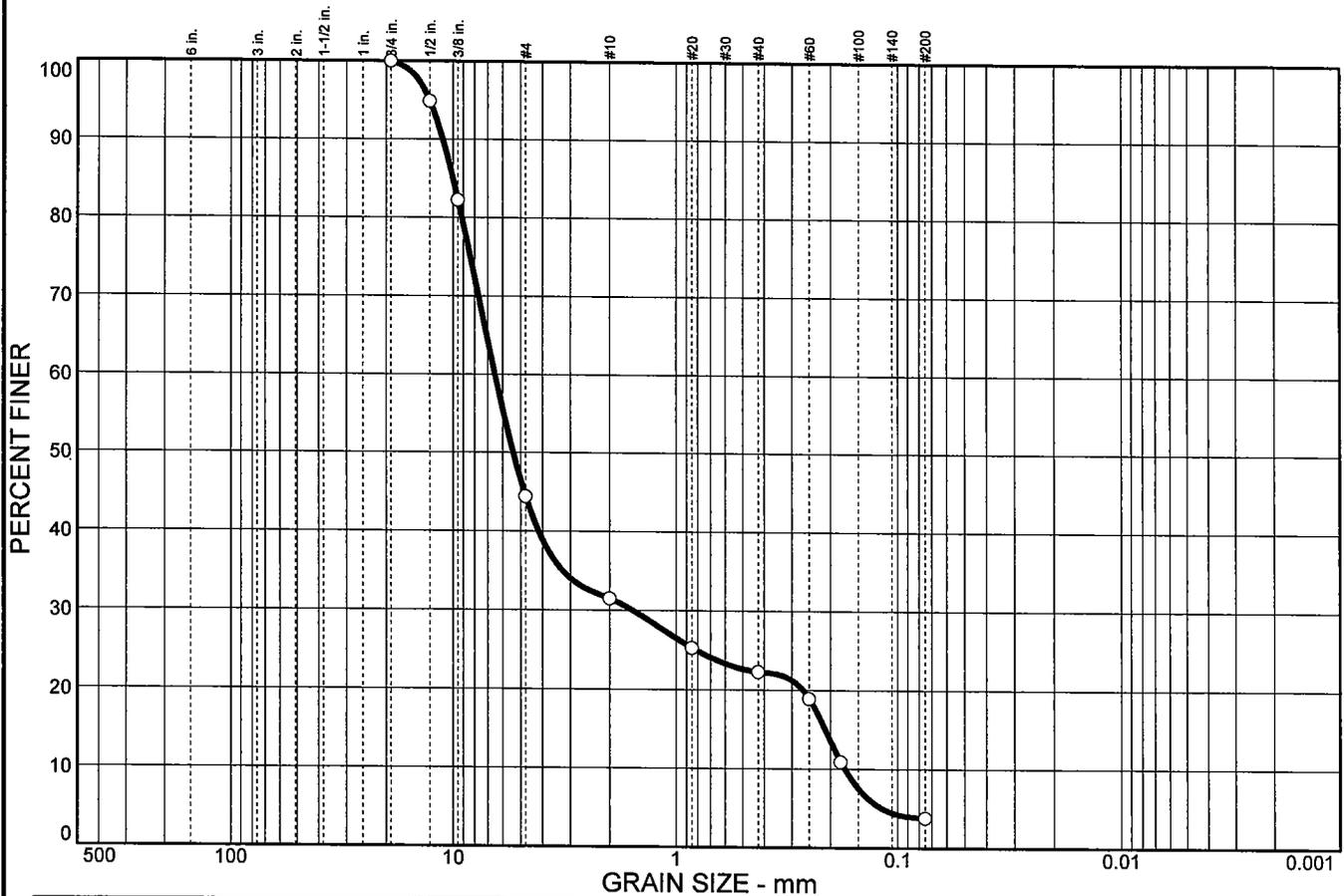
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	55.6	12.9	9.2	18.5	3.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	94.9		
3/8 in.	82.2		
# 4	44.4		
# 10	31.5		
# 20	25.3		
# 40	22.3		
# 60	18.9		
# 80	10.9		
# 200	3.8		

**Soil Description**

Well-graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 10.0              D<sub>60</sub>= 6.50              D<sub>50</sub>= 5.39  
D<sub>30</sub>= 1.57              D<sub>15</sub>= 0.212              D<sub>10</sub>= 0.173  
C<sub>u</sub>= 37.65              C<sub>c</sub>= 2.20

**Classification**

USCS= GW                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6090  
 Location: BIA-21 #7

Source of Sample: Client Samples

Date:  
 Elev./Depth: 34 FT 10.2

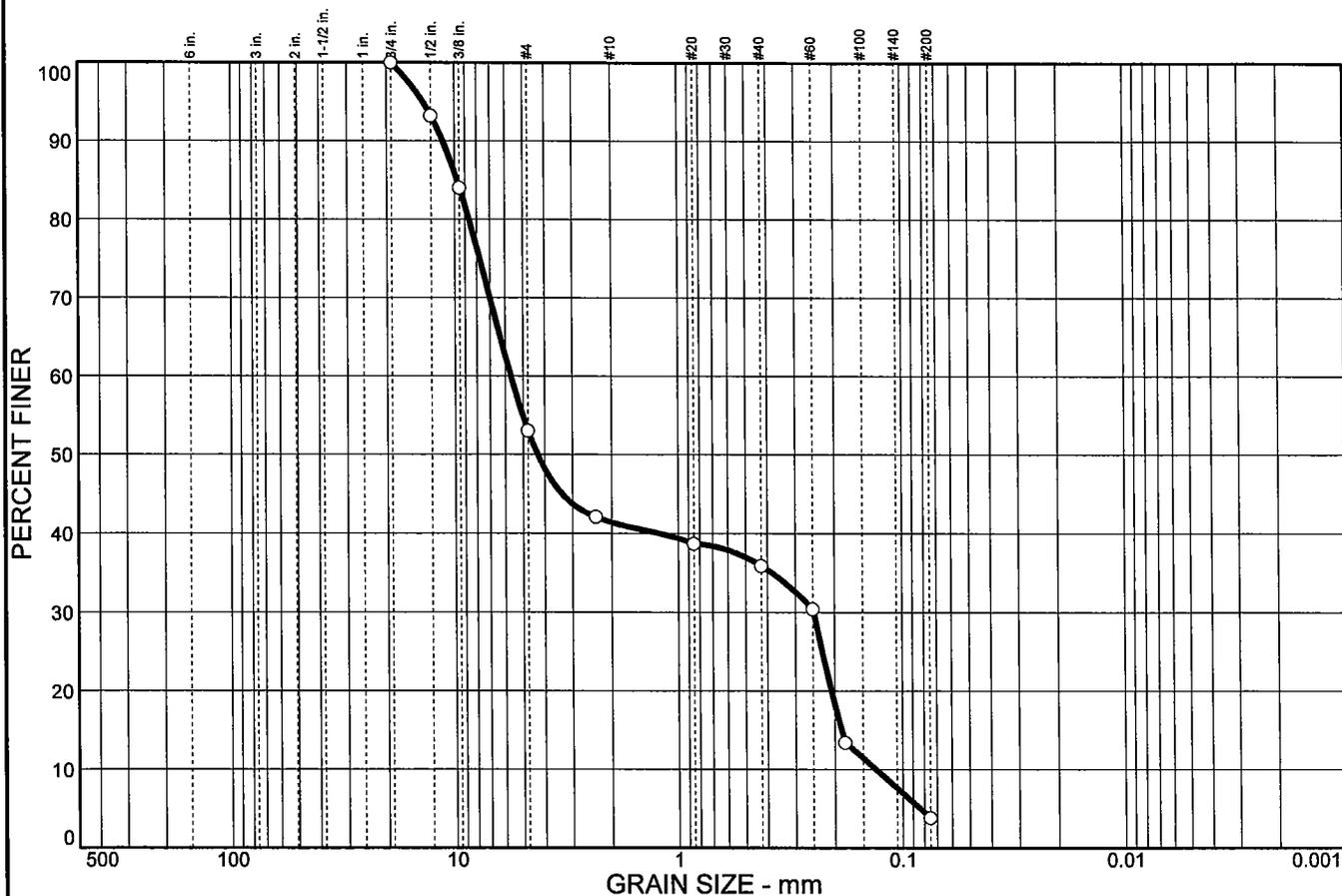
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	47.0	11.6	5.5	32.1	3.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	93.2		
3/8 in.	84.0		
# 4	53.0		
# 8	42.1		
# 20	38.7		
# 40	35.9		
# 60	30.4		
# 80	13.4		
# 200	3.8		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 9.77              D<sub>60</sub>= 5.67              D<sub>50</sub>= 4.30  
D<sub>30</sub>= 0.248            D<sub>15</sub>= 0.187            D<sub>10</sub>= 0.132  
C<sub>u</sub>= 42.96              C<sub>c</sub>= 0.08

**Classification**

USCS= SP                      AASHTO= A-1-b

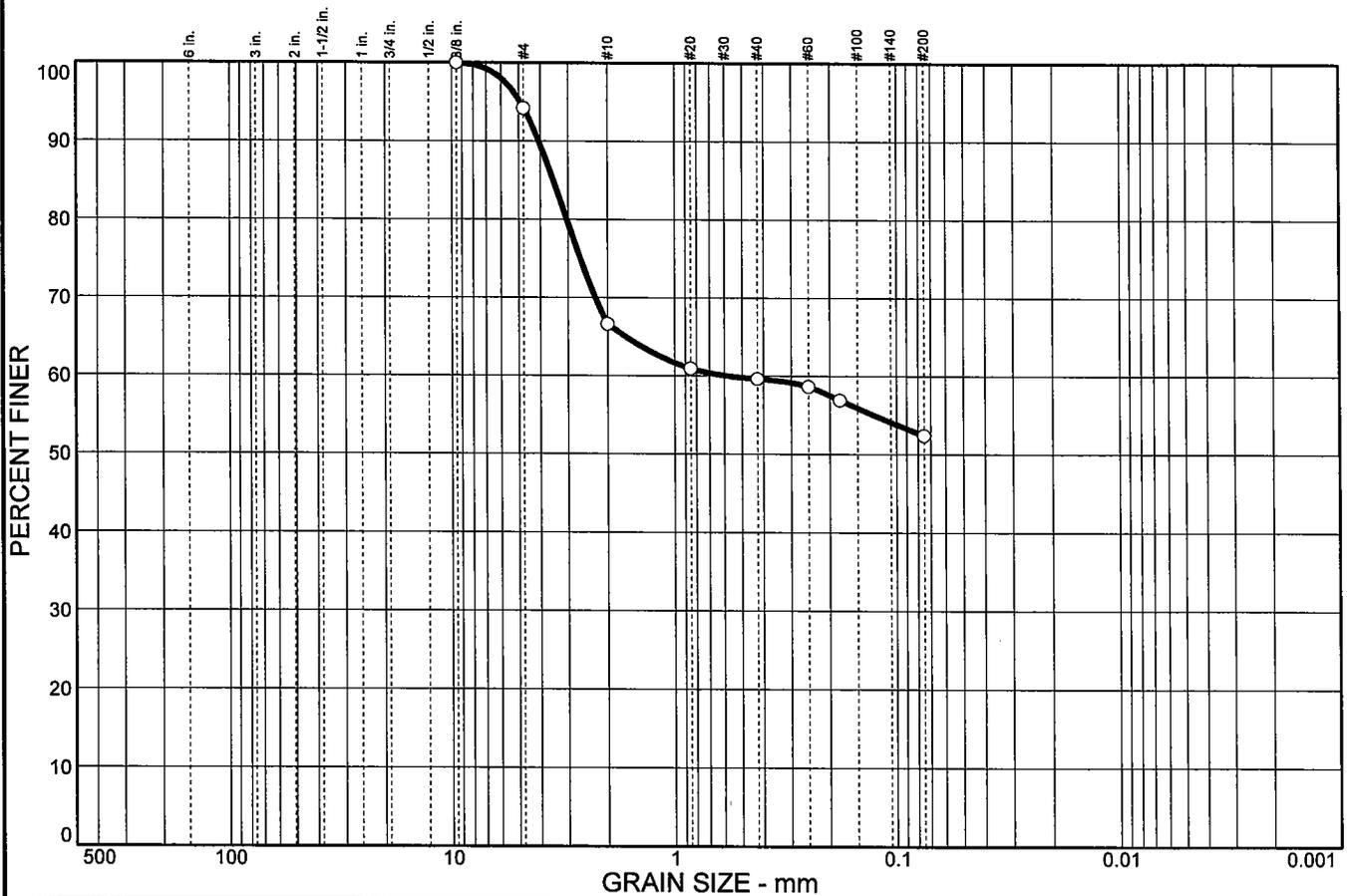
**Remarks**

\* (no specification provided)

**Sample No.:** 6091                      **Source of Sample:** Client Samples                      **Date:**  
**Location:** BIA-21 #8                      **Elev./Depth:** 39 FT 11.7

<h2>Mappa TestLab</h2>	<b>Client:</b> U.S. Army Corps of Engineers, Alaska District <b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska <b>Project No.:</b> 2004-148	<b>Figure</b>
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# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.8	27.6	7.0	7.2	52.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	94.2		
# 10	66.6		
# 20	60.9		
# 40	59.6		
# 60	58.6		
# 80	56.9		
# 200	52.4		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 3.50              D<sub>60</sub>= 0.587              D<sub>50</sub>=  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6092

Location: BIA-22 #4

Source of Sample: Client Samples

Date:

Elev./Depth: 19 FT 5.7 m

## Mappa TestLab

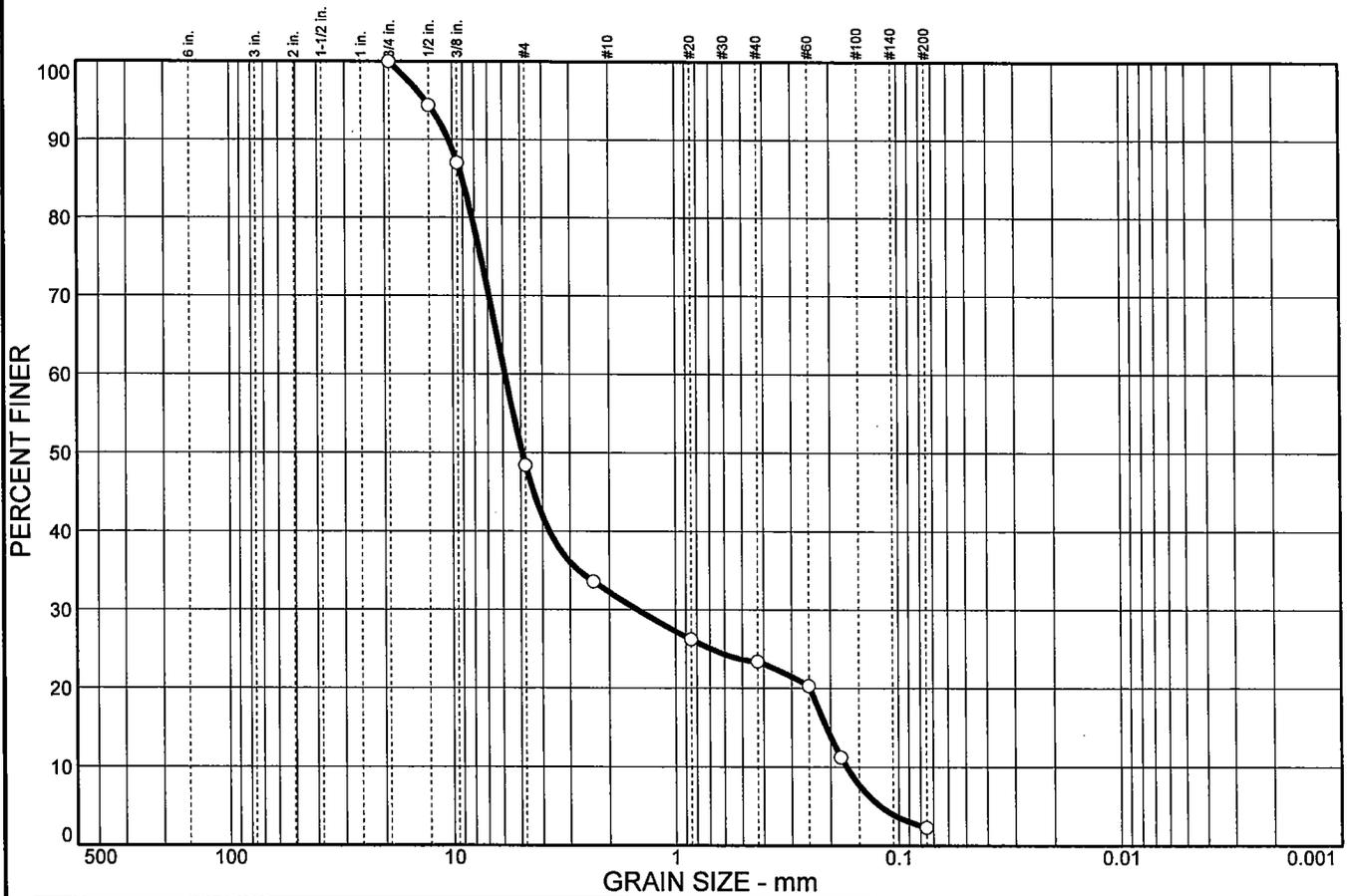
**Client:** U.S. Army Corps of Engineers, Alaska District

**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	51.6	16.2	8.8	21.1	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	94.4		
3/8 in.	87.0		
# 4	48.4		
# 8	33.6		
# 20	26.2		
# 40	23.4		
# 60	20.3		
# 80	11.2		
# 200	2.3		

**Soil Description**

Well-graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 9.08              D<sub>60</sub>= 5.88              D<sub>50</sub>= 4.91  
D<sub>30</sub>= 1.49              D<sub>15</sub>= 0.209              D<sub>10</sub>= 0.170  
C<sub>u</sub>= 34.52              C<sub>c</sub>= 2.23

**Classification**

USCS= GW                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6093

Source of Sample: Client Samples

Date:

Location: BIA-22 #5

Elev./Depth: 24 FT 7.2 m

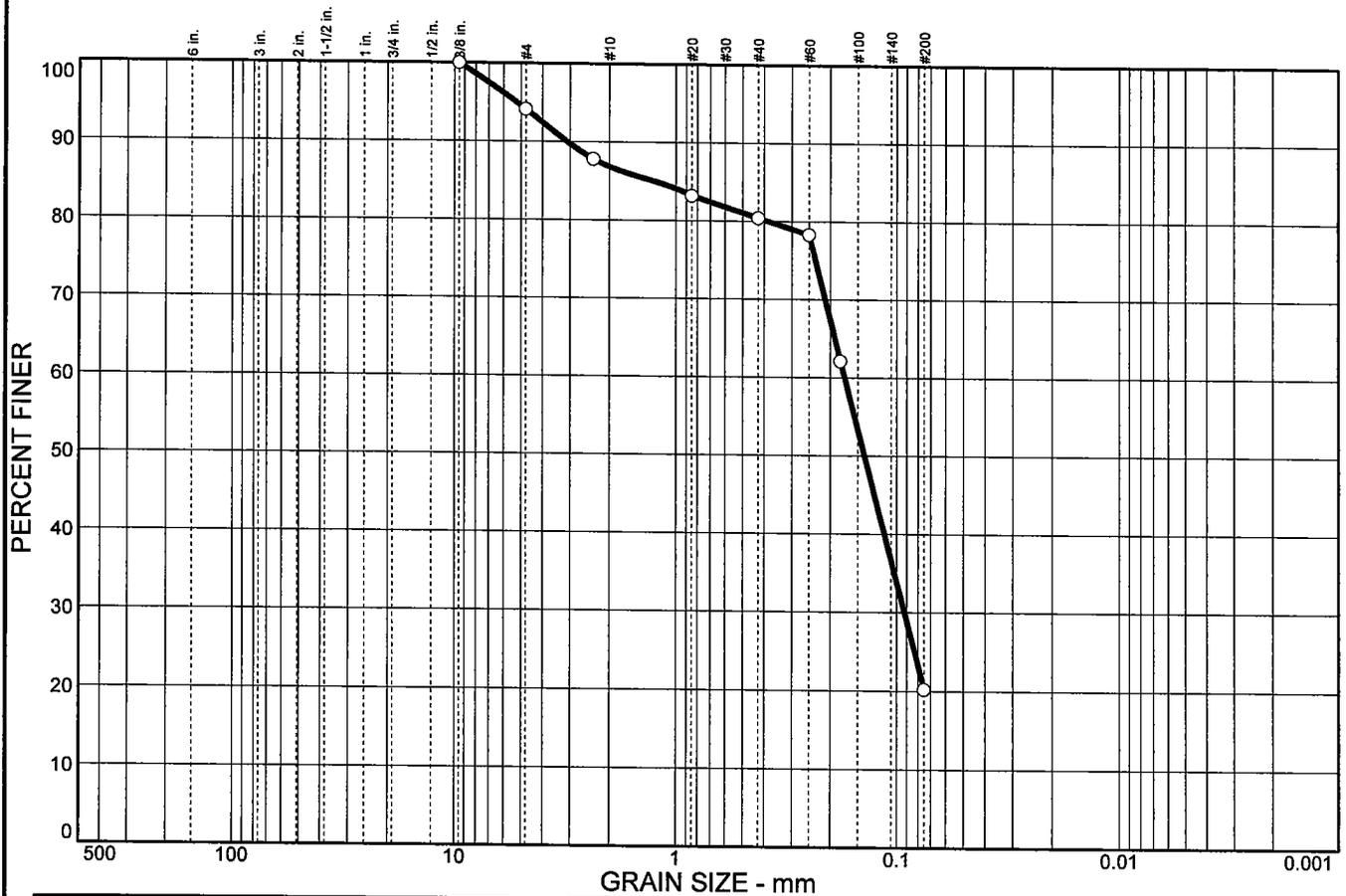
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.9	7.3	6.4	60.2	20.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	94.1		
# 8	87.8		
# 20	83.2		
# 40	80.4		
# 60	78.3		
# 80	62.1		
# 200	20.2		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 1.25              D<sub>60</sub>= 0.172              D<sub>50</sub>= 0.140  
 D<sub>30</sub>= 0.0922            D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6094  
 Location: BIA-22 #6

Source of Sample: Client Samples

Date:  
 Elev./Depth: 29 FT 8.7 m

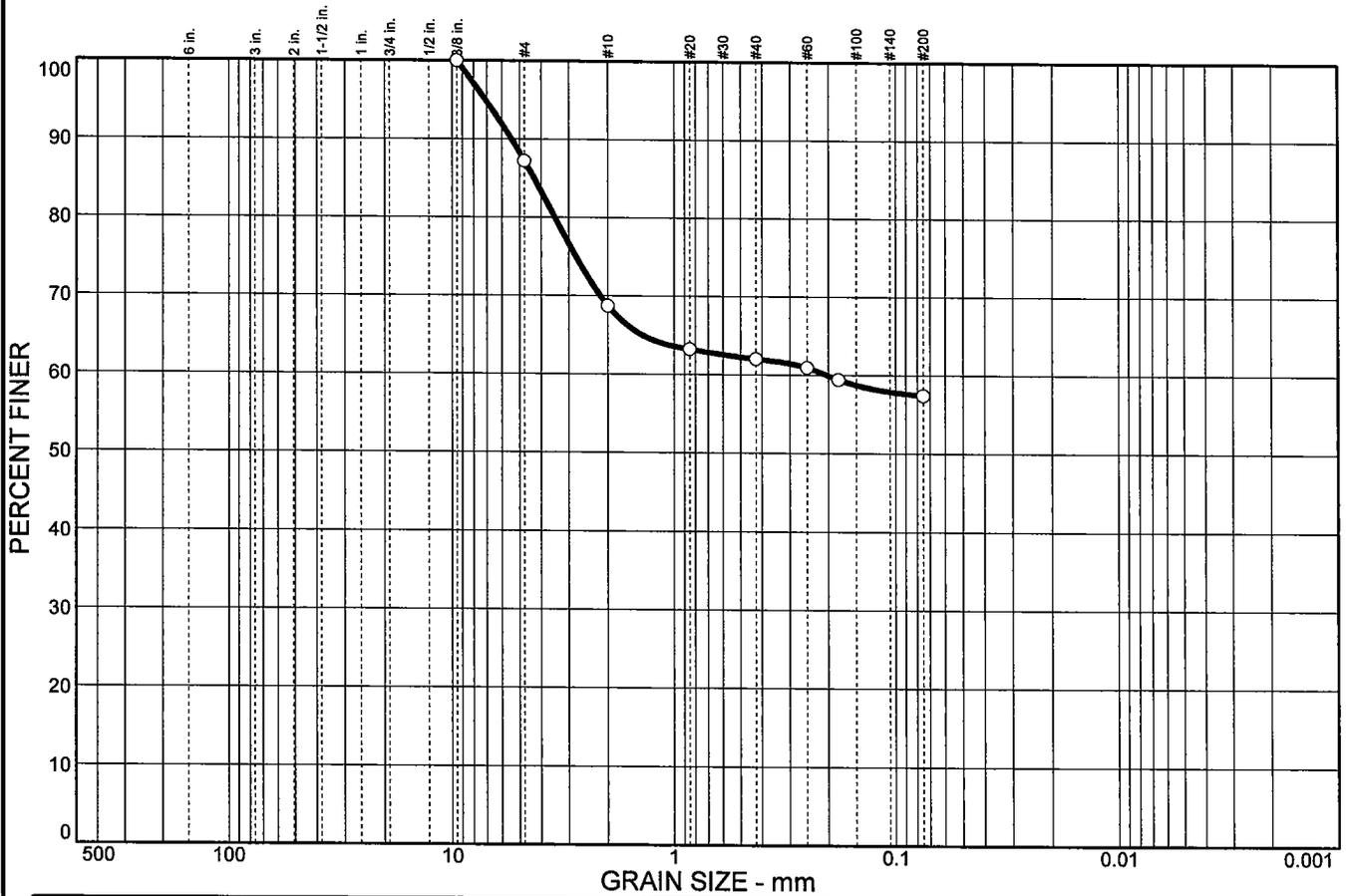
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.8	18.5	6.7	4.6	57.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	87.2		
# 10	68.7		
# 20	63.2		
# 40	62.0		
# 60	60.9		
# 80	59.4		
# 200	57.4		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 4.30              D<sub>60</sub>= 0.205              D<sub>50</sub>=  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6095  
**Location:** BIA-23 #4

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 19 FT 5.7 m

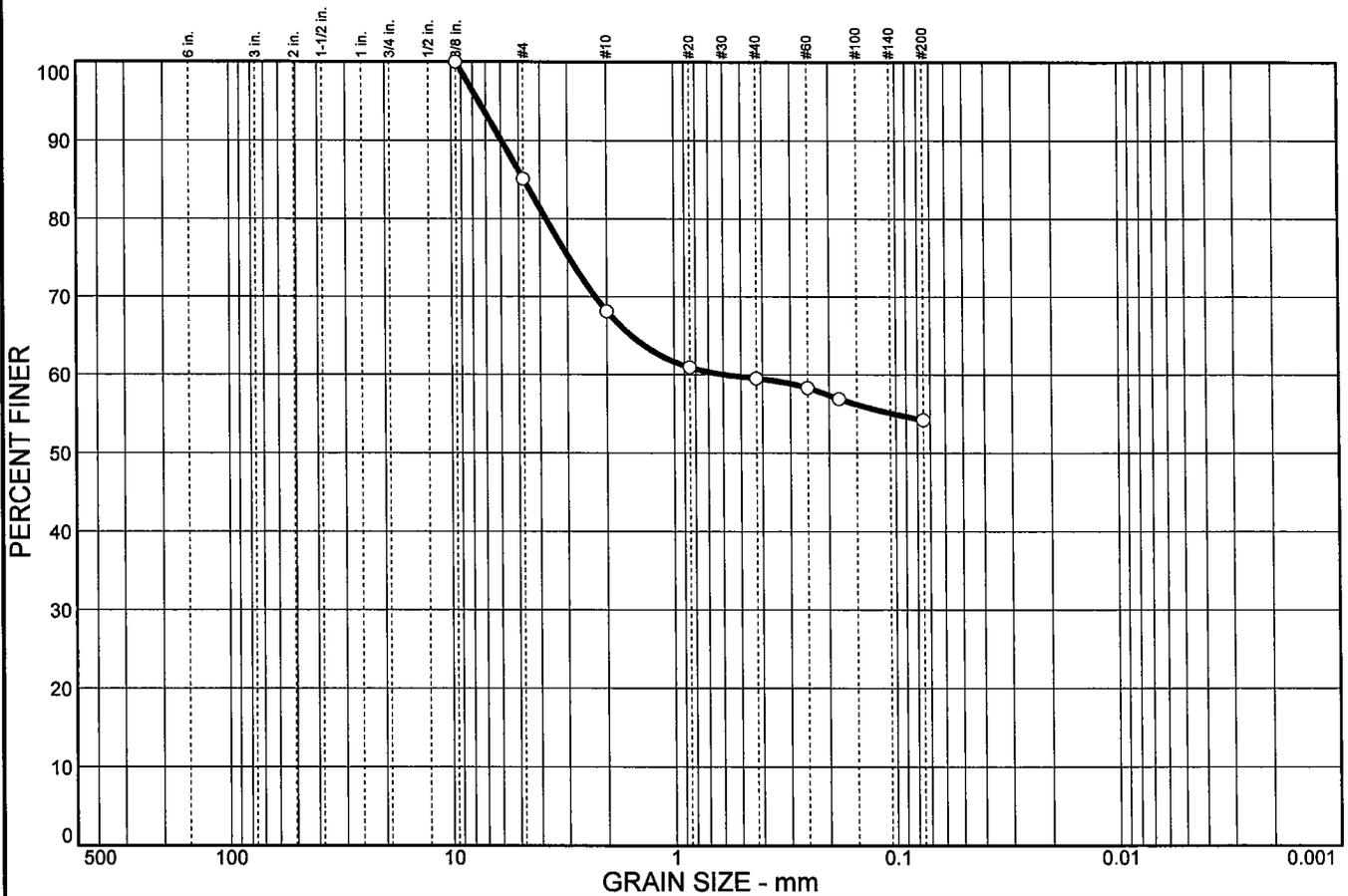
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	14.9	17.0	8.6	5.3	54.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	85.1		
# 10	68.1		
# 20	60.9		
# 40	59.5		
# 60	58.3		
# 80	56.9		
# 200	54.2		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 4.73              D<sub>60</sub>= 0.599              D<sub>50</sub>=  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6096  
**Location:** BIA-23 #5

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 24 FT 7.2 m

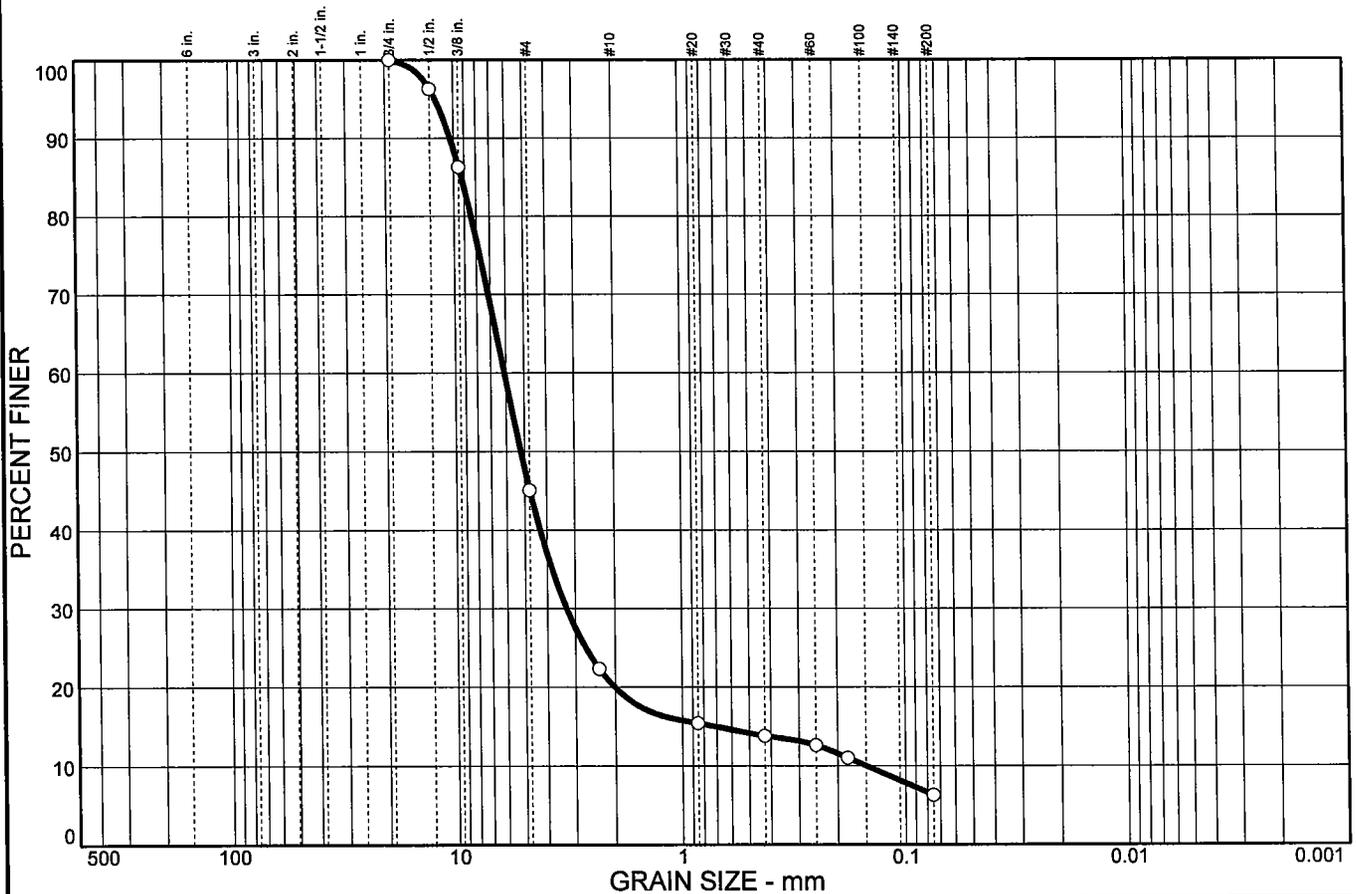
**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	54.9	25.2	6.1	7.5	6.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.3		
3/8 in.	86.3		
# 4	45.1		
# 8	22.3		
# 20	15.4		
# 40	13.8		
# 60	12.6		
# 80	11.0		
# 200	6.3		

**Soil Description**

Poorly graded gravel with silt and sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 9.27              D<sub>60</sub>= 6.11              D<sub>50</sub>= 5.19  
D<sub>30</sub>= 3.29              D<sub>15</sub>= 0.714              D<sub>10</sub>= 0.150  
C<sub>u</sub>= 40.84              C<sub>c</sub>= 11.83

**Classification**

USCS= GP-GM                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6097

Source of Sample: Client Samples

Date:

Location: BIA-23 #6

Elev./Depth: 29 FT 8.7 m

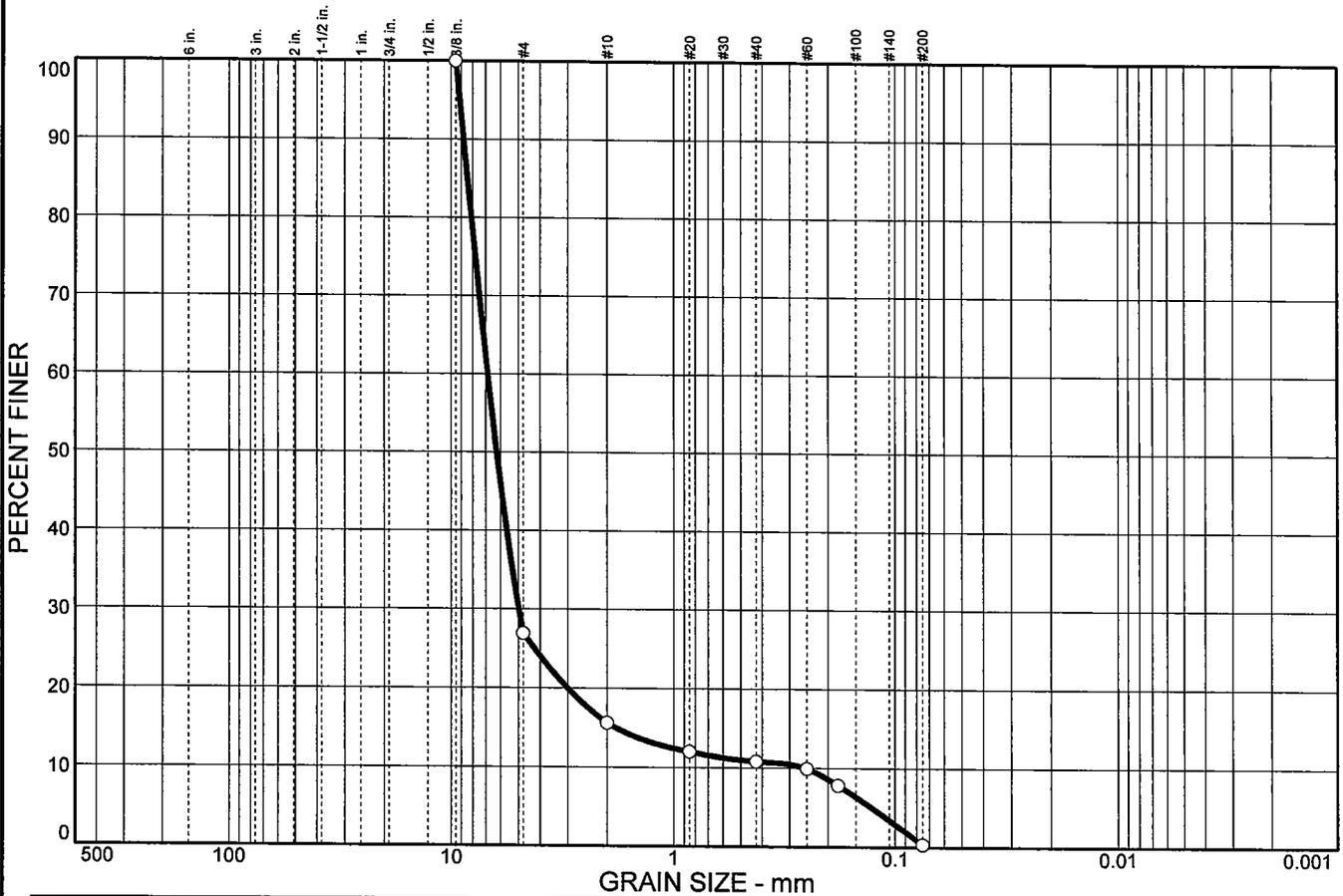
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	73.1	11.2	4.9	10.5	0.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	26.9		
# 10	15.6		
# 20	12.0		
# 40	10.8		
# 60	9.9		
# 80	7.8		
# 200	0.3		

**Soil Description**

Poorly graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 8.46              D<sub>60</sub>= 6.86              D<sub>50</sub>= 6.25  
D<sub>30</sub>= 4.98              D<sub>15</sub>= 1.81              D<sub>10</sub>= 0.256  
C<sub>u</sub>= 26.80              C<sub>c</sub>= 14.11

**Classification**

USCS= GP                      AASHTO= A-1-a

**Remarks**

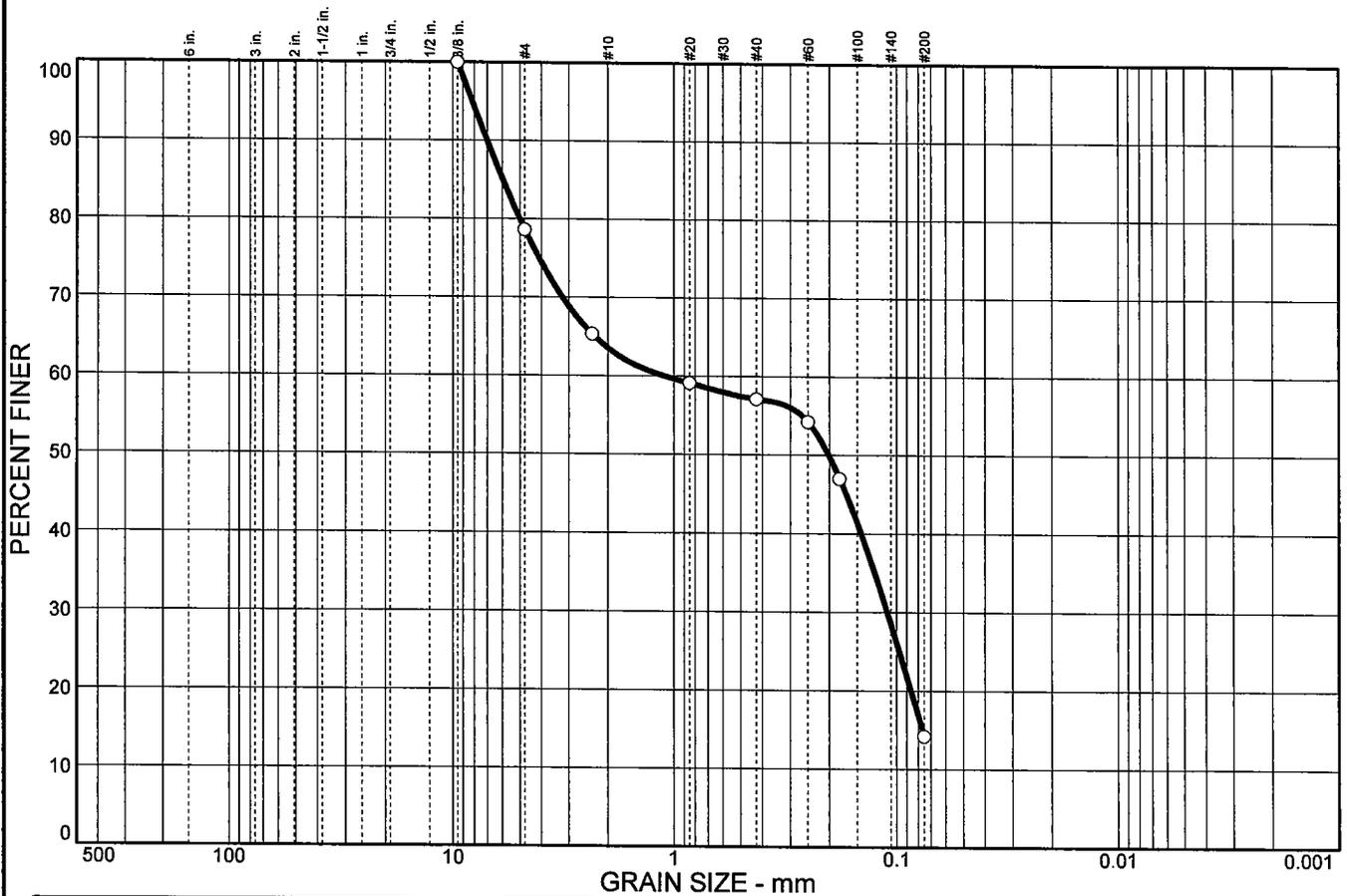
\* (no specification provided)

Sample No.: 6098                      Source of Sample: Client Samples                      Date:                      Elev./Depth: 34 FT 10.2

Location: BIA-23 #7

<h2>Mappa TestLab</h2>	<p><b>Client:</b> U.S. Army Corps of Engineers, Alaska District</p> <p><b>Project:</b> Barrow Coastal Storm Damage Reduction Study Barrow, Alaska</p> <p><b>Project No:</b> 2004-148                      <b>Figure</b></p>
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# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	21.4	15.1	6.4	42.9	14.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	78.6		
# 8	65.3		
# 20	59.1		
# 40	57.1		
# 60	54.2		
# 80	47.0		
# 200	14.2		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.97              D<sub>60</sub>= 1.11              D<sub>50</sub>= 0.202  
D<sub>30</sub>= 0.110              D<sub>15</sub>= 0.0764              D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6099  
**Location:** BIA-23 #8

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 39 FT 11.7

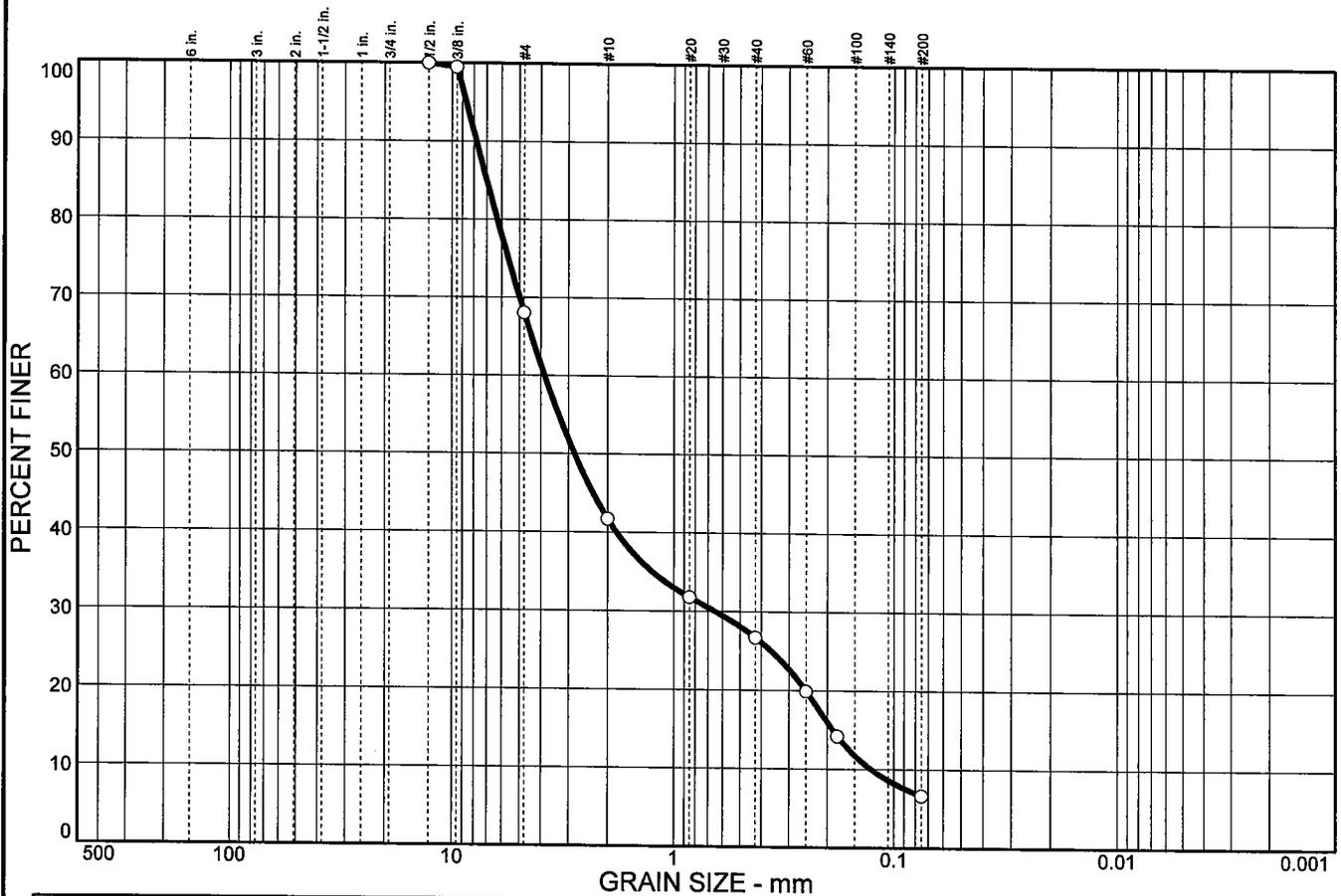
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	32.0	26.3	15.0	20.1	6.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.5		
# 4	68.0		
# 10	41.7		
# 20	31.8		
# 40	26.7		
# 60	19.9		
# 80	14.2		
# 200	6.6		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.01              D<sub>60</sub>= 3.85              D<sub>50</sub>= 2.82  
D<sub>30</sub>= 0.649            D<sub>15</sub>= 0.189            D<sub>10</sub>= 0.127  
C<sub>u</sub>= 30.31              C<sub>c</sub>= 0.86

**Classification**

USCS= SP-SM                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6100  
 Location: BIA-24 #4

Source of Sample: Client Samples

Date:  
 Elev./Depth: 20 FT 6 m

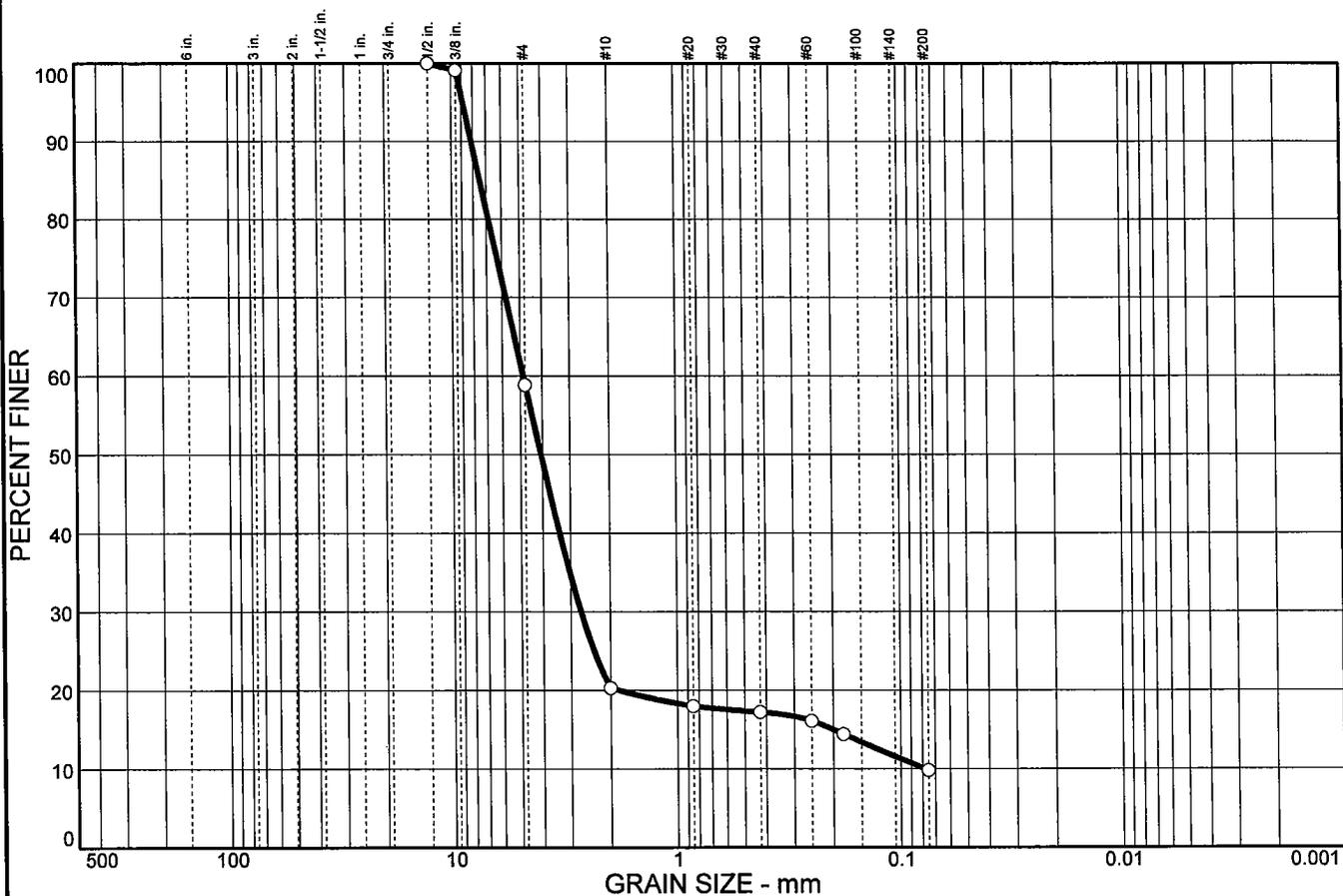
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	41.2	38.5	3.1	7.4	9.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.1		
# 4	58.8		
# 10	20.3		
# 20	18.0		
# 40	17.2		
# 60	16.1		
# 80	14.4		
# 200	9.8		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.48              D<sub>60</sub>= 4.85              D<sub>50</sub>= 4.06  
D<sub>30</sub>= 2.71              D<sub>15</sub>= 0.200              D<sub>10</sub>= 0.0780  
C<sub>u</sub>= 62.18              C<sub>c</sub>= 19.35

**Classification**

USCS= SP-SM                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

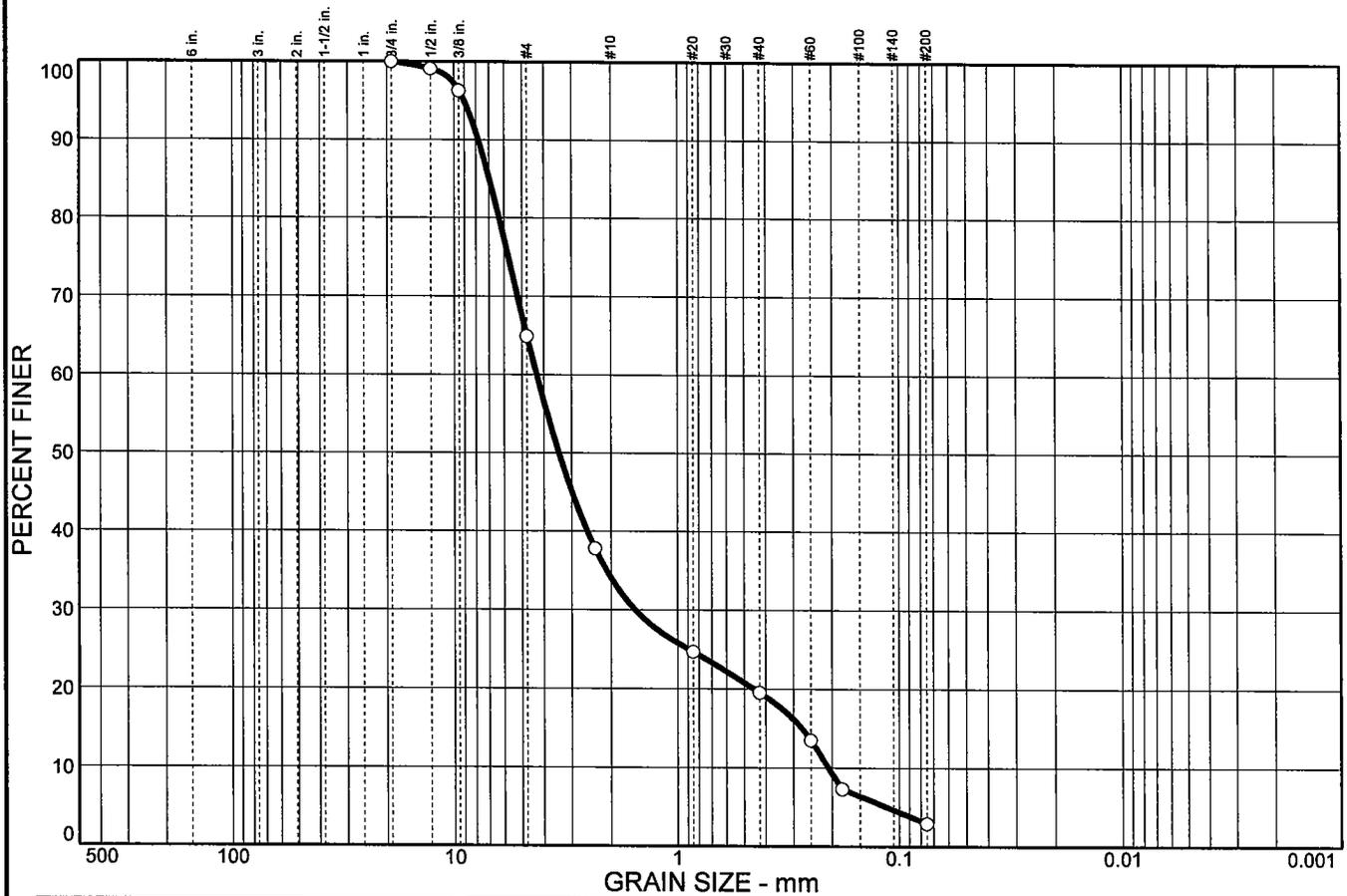
**Sample No.:** 6101                      **Source of Sample:** Client Samples                      **Date:**  
**Location:** BIA-24 #5                      **Elev./Depth:** 24 FT 7.2 m

Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148                      **Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	35.1	30.9	14.5	16.6	2.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.1		
3/8 in.	96.3		
# 4	64.9		
# 8	37.8		
# 20	24.7		
# 40	19.5		
# 60	13.5		
# 80	7.3		
# 200	2.9		

**Soil Description**

Well-graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.98              D<sub>60</sub>= 4.30              D<sub>50</sub>= 3.42  
D<sub>30</sub>= 1.56              D<sub>15</sub>= 0.275              D<sub>10</sub>= 0.208  
C<sub>u</sub>= 20.65              C<sub>c</sub>= 2.71

**Classification**

USCS= SW                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

**Sample No.:** 6102  
**Location:** BIA-24 #6

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 29 FT 8.7 m

Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			3.2	2.6	43.9	46.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	99.6		
3/8 in.	99.6		
# 4	96.4		
# 8	93.6		
# 20	91.7		
# 40	90.6		
# 60	85.9		
# 80	66.5		
# 200	46.7		

**Soil Description**

Silty sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.246              D<sub>60</sub>= 0.155              D<sub>50</sub>= 0.102

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6104  
Location: BIA-25 #1

Source of Sample: Client Samples

Date:  
Elev./Depth: 5 FT 1.5 m

## Mappa TestLab

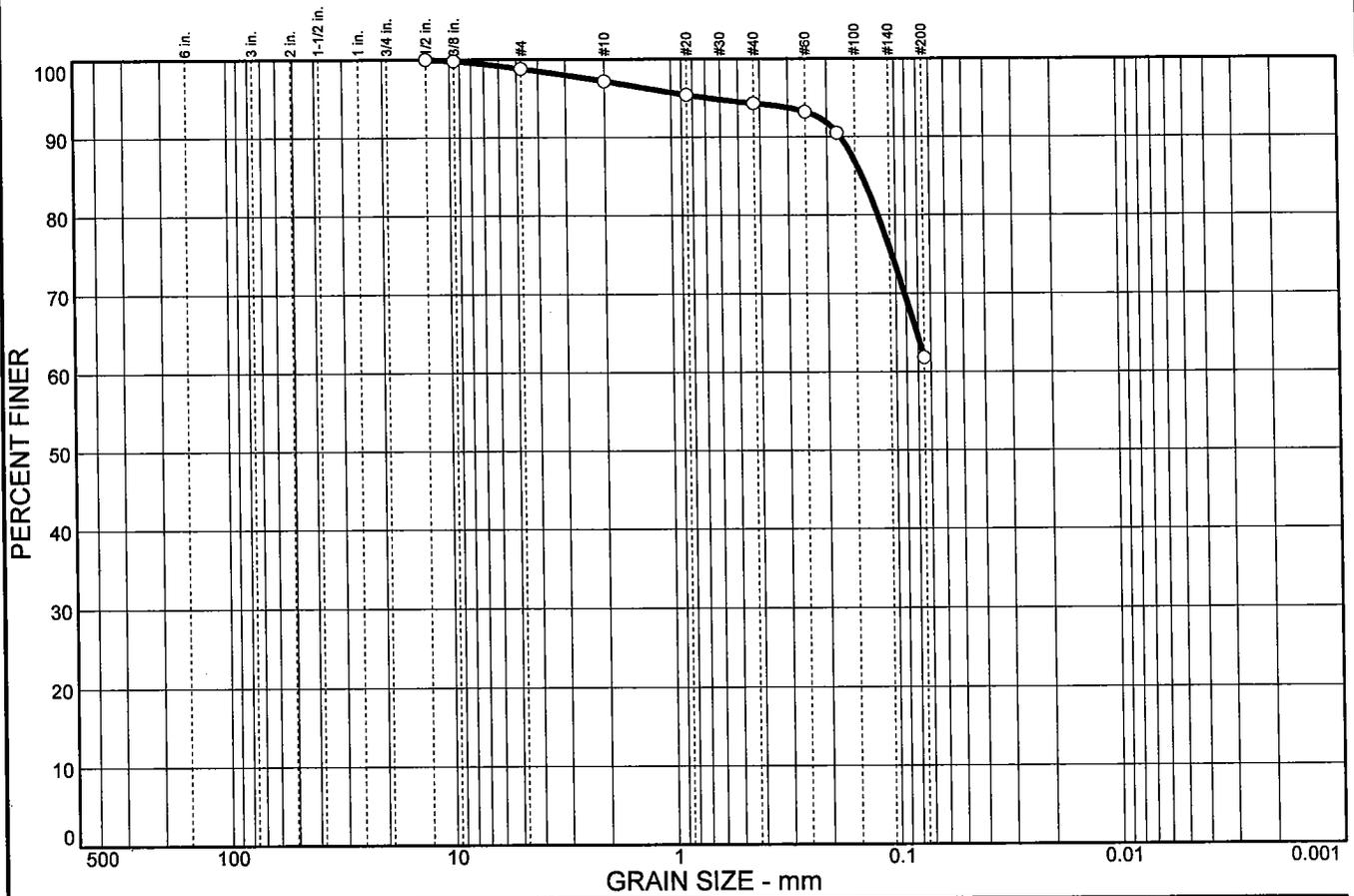
**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**



# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.2	1.6	2.9	32.5	61.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.8		
# 4	98.8		
# 10	97.2		
# 20	95.4		
# 40	94.3		
# 60	93.2		
# 80	90.5		
# 200	61.8		

**Soil Description**  
Sandy silt

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.140              D<sub>60</sub>=                      D<sub>50</sub>=  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6106  
**Location:** BIA-26 #1

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 5 FT 1.5 m

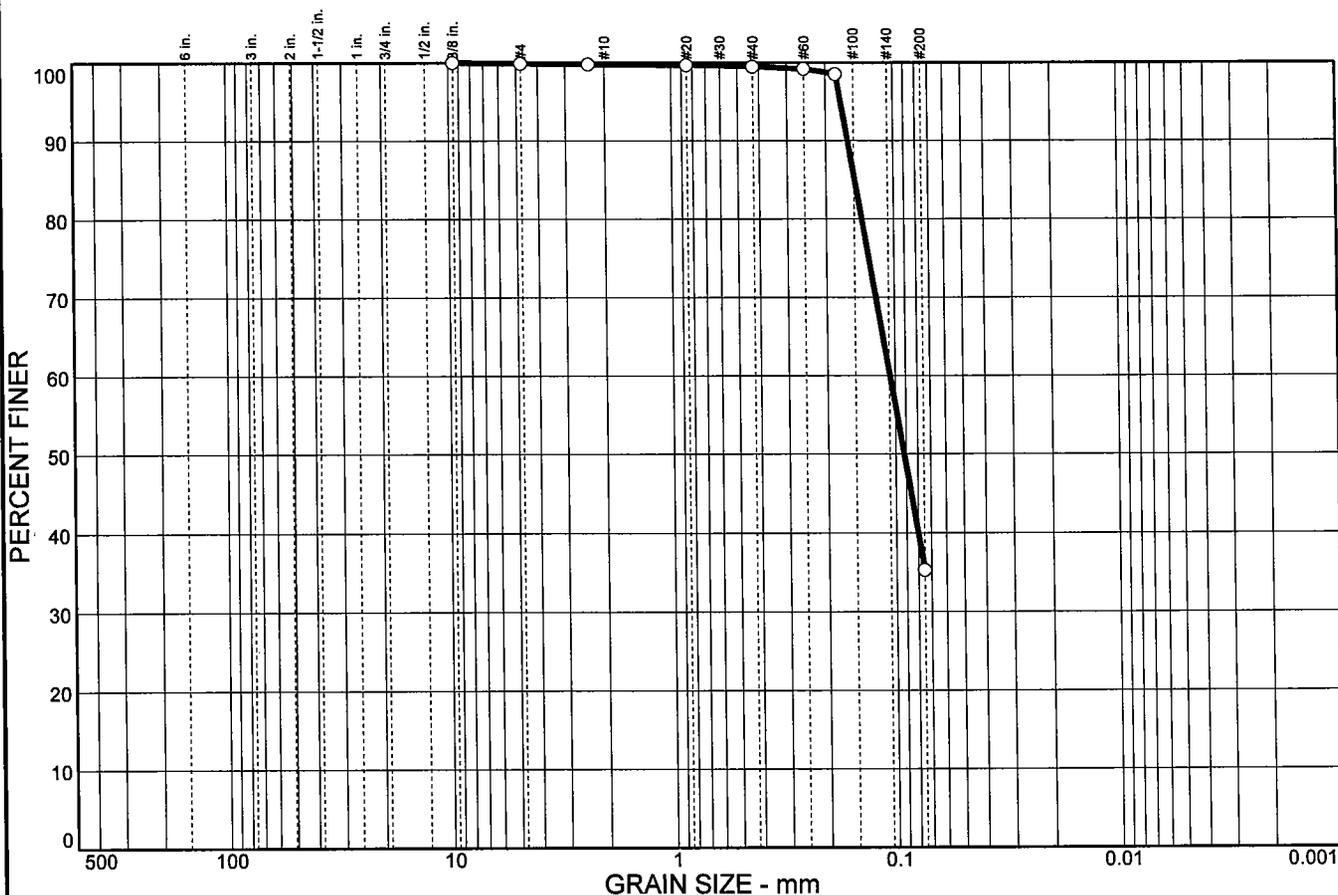
**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.1	0.3	64.2	35.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	99.9		
# 8	99.8		
# 20	99.7		
# 40	99.5		
# 60	99.2		
# 80	98.5		
# 200	35.3		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.149              D<sub>60</sub>= 0.105              D<sub>50</sub>= 0.0918  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6107  
**Location:** BIA-26 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 10 FT 3m

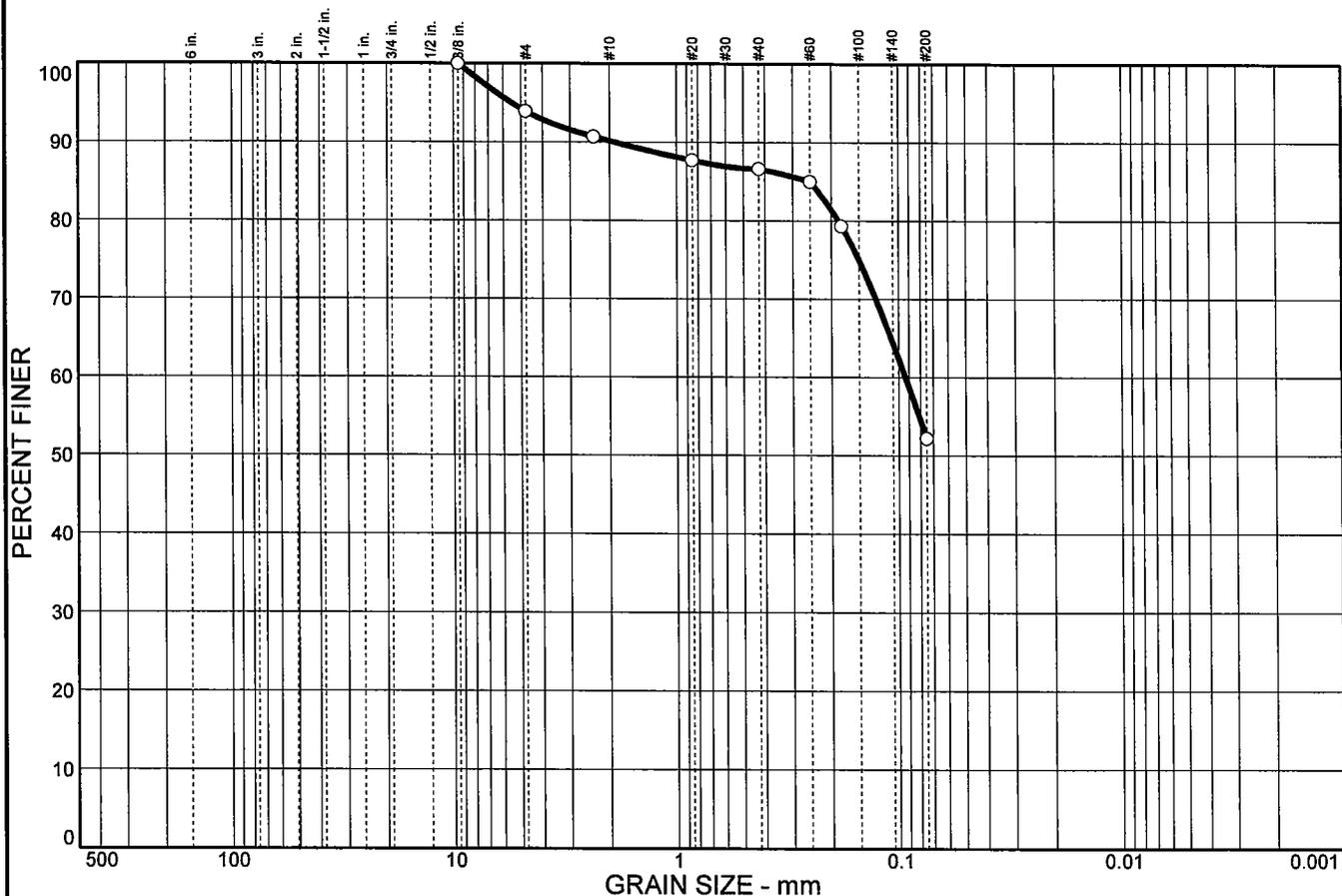
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.1	3.7	3.6	34.4	52.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	93.9		
# 8	90.7		
# 20	87.7		
# 40	86.6		
# 60	85.0		
# 80	79.3		
# 200	52.2		

**Soil Description**

Sandy silt

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 0.250              D<sub>60</sub>= 0.0934              D<sub>50</sub>=

D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= ML                      AASHTO= A-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6108  
**Location:** BIA-27 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 10 FT 3m

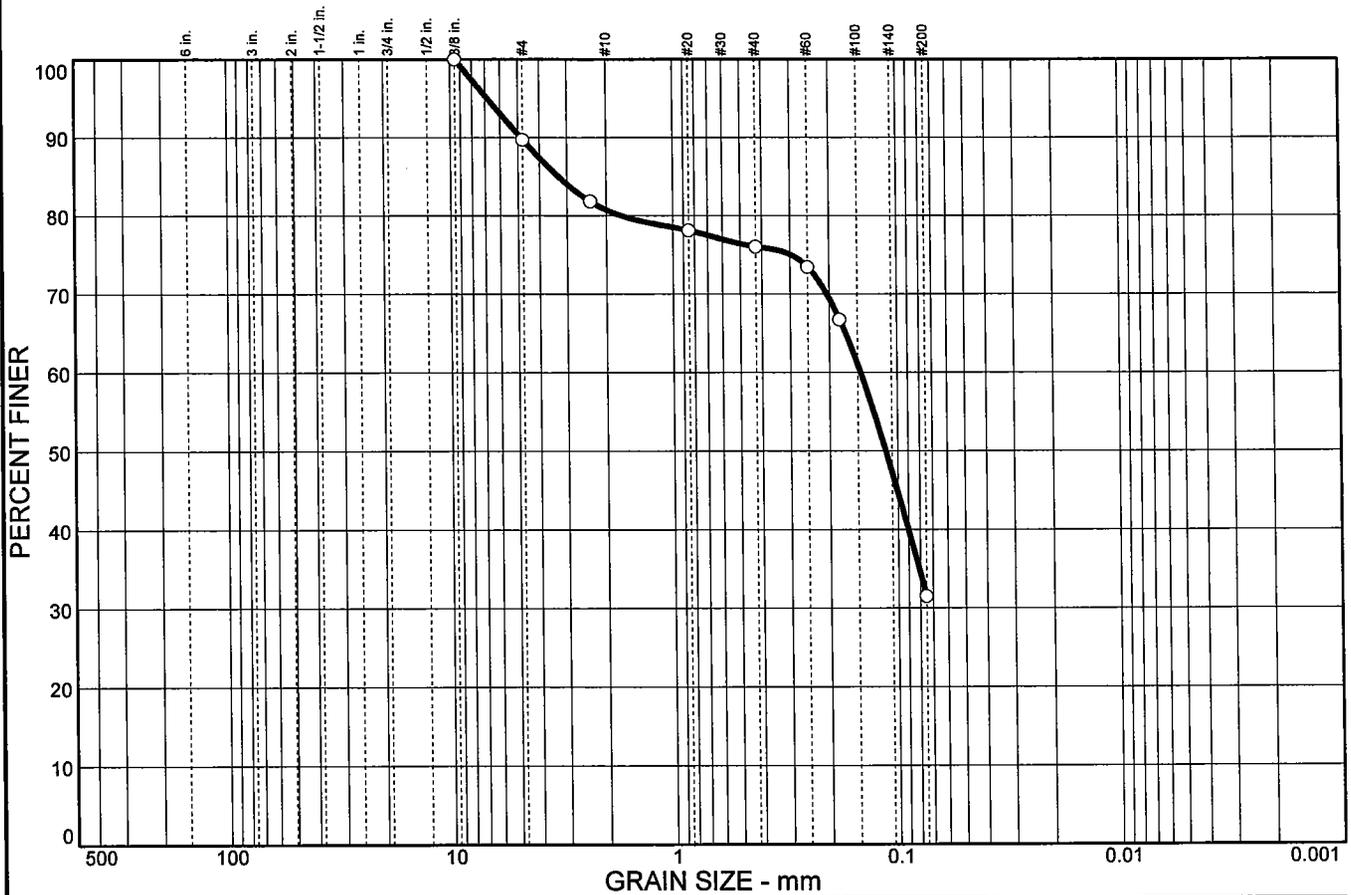
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.3	9.0	4.7	44.5	31.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
# 4	89.7		
# 8	81.8		
# 20	78.1		
# 40	76.0		
# 60	73.4		
# 80	66.7		
# 200	31.5		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 3.29              D<sub>60</sub>= 0.146              D<sub>50</sub>= 0.113  
 D<sub>30</sub>=                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6109  
**Location:** BIA-28 #2

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 10 FT 3 m

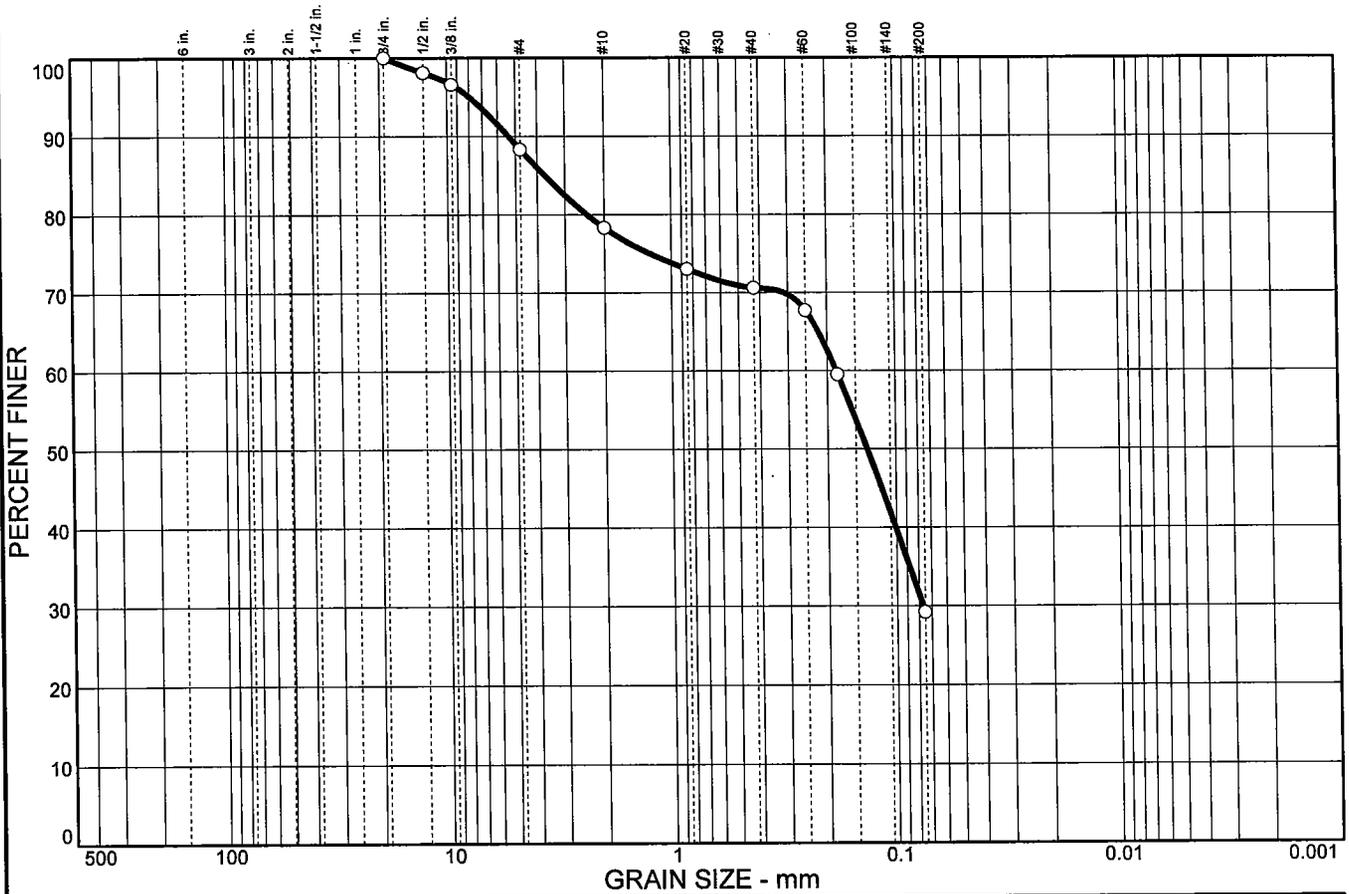
**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.7	10.0	7.7	41.4	29.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	98.1		
3/8 in.	96.6		
# 4	88.3		
# 10	78.3		
# 20	73.0		
# 40	70.6		
# 60	67.7		
# 80	59.5		
# 200	29.2		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 3.70                      D<sub>60</sub>= 0.183                      D<sub>50</sub>= 0.134  
 D<sub>30</sub>= 0.0767                      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6110  
**Location:** BIA-28 #3

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 15 FT 4.5 m

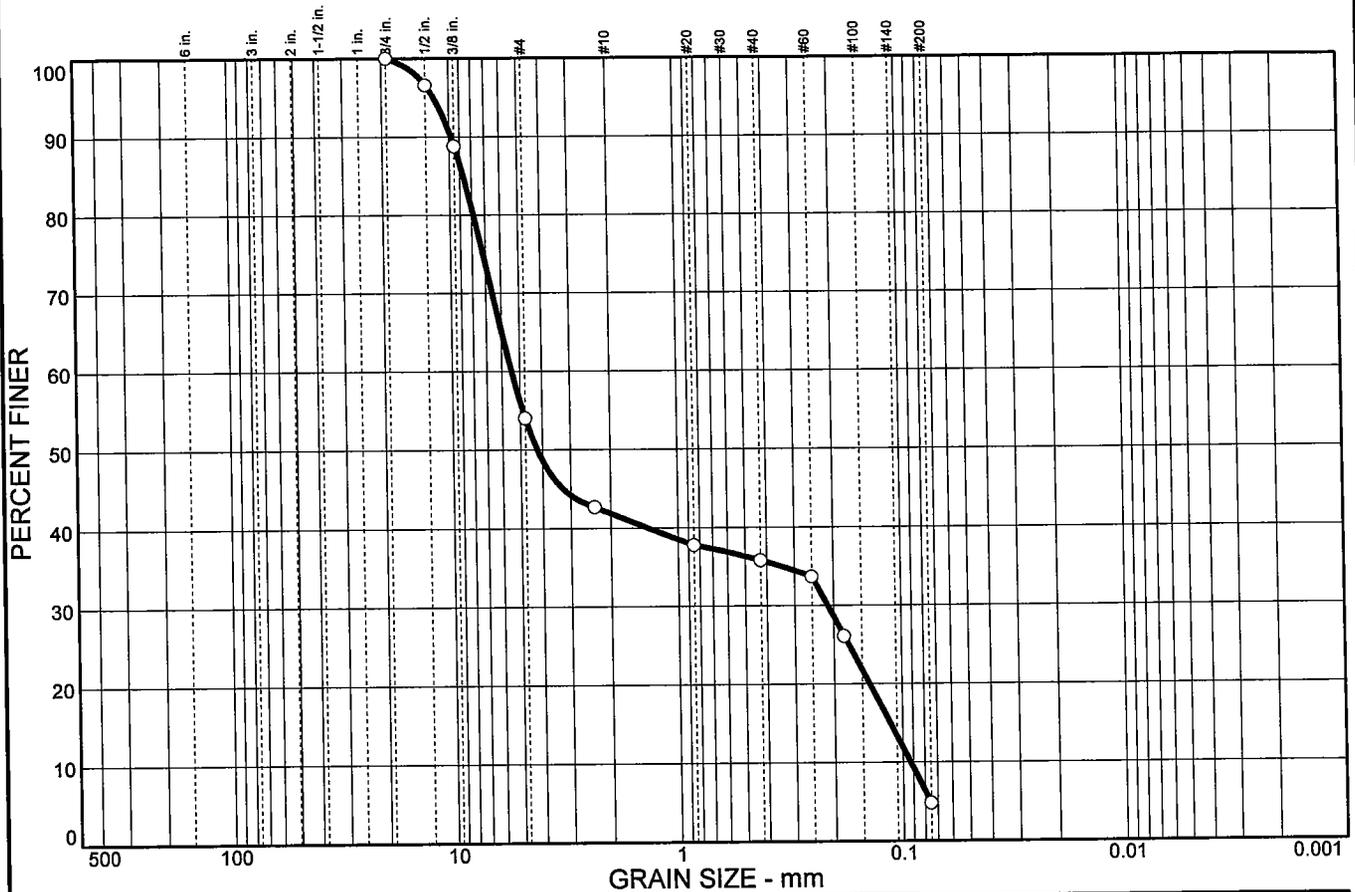
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	46.0	12.1	6.1	31.0	4.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.6		
3/8 in.	88.8		
# 4	54.0		
# 8	42.7		
# 20	37.8		
# 40	35.8		
# 60	33.7		
# 80	26.1		
# 200	4.8		

**Soil Description**

Poorly graded sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 8.72              D<sub>60</sub>= 5.44              D<sub>50</sub>= 4.21  
D<sub>30</sub>= 0.213              D<sub>15</sub>= 0.113              D<sub>10</sub>= 0.0926  
C<sub>u</sub>= 58.75              C<sub>c</sub>= 0.09

**Classification**

USCS= SP                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6111

Source of Sample: Client Samples

Date:

Location: BIA-28 #4

Elev./Depth: 20 FT 6 m

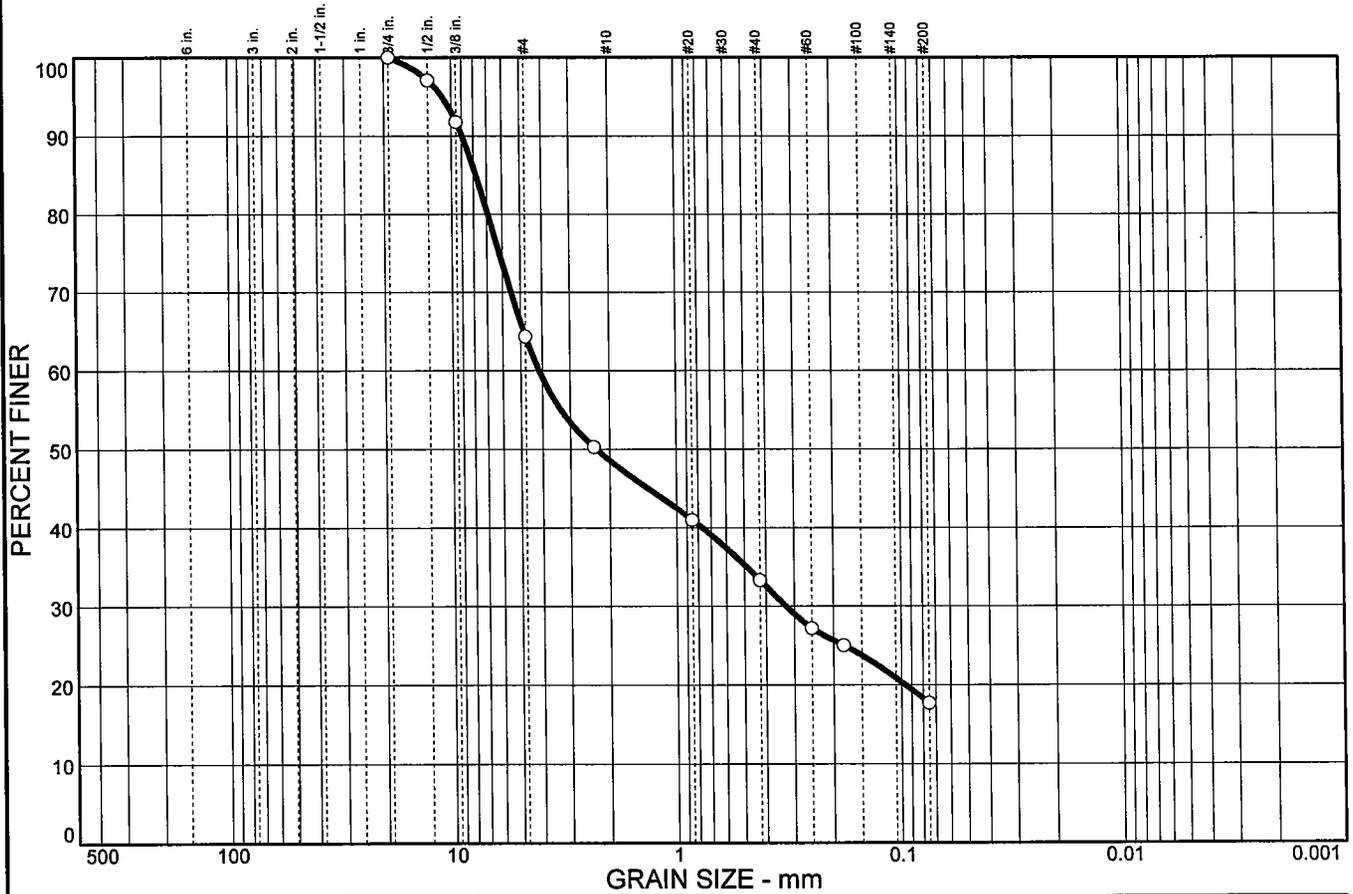
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	35.7	15.7	15.3	15.6	17.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.1		
3/8 in.	91.8		
# 4	64.3		
# 8	50.3		
# 20	41.0		
# 40	33.3		
# 60	27.2		
# 80	25.0		
# 200	17.7		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.82              D<sub>60</sub>= 4.14              D<sub>50</sub>= 2.30

D<sub>30</sub>= 0.327            D<sub>15</sub>=                      D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6112

Source of Sample: Client Samples

Date:

Location: BIA-29 #1

Elev./Depth: 5 FT 1.5 m

## Mappa TestLab

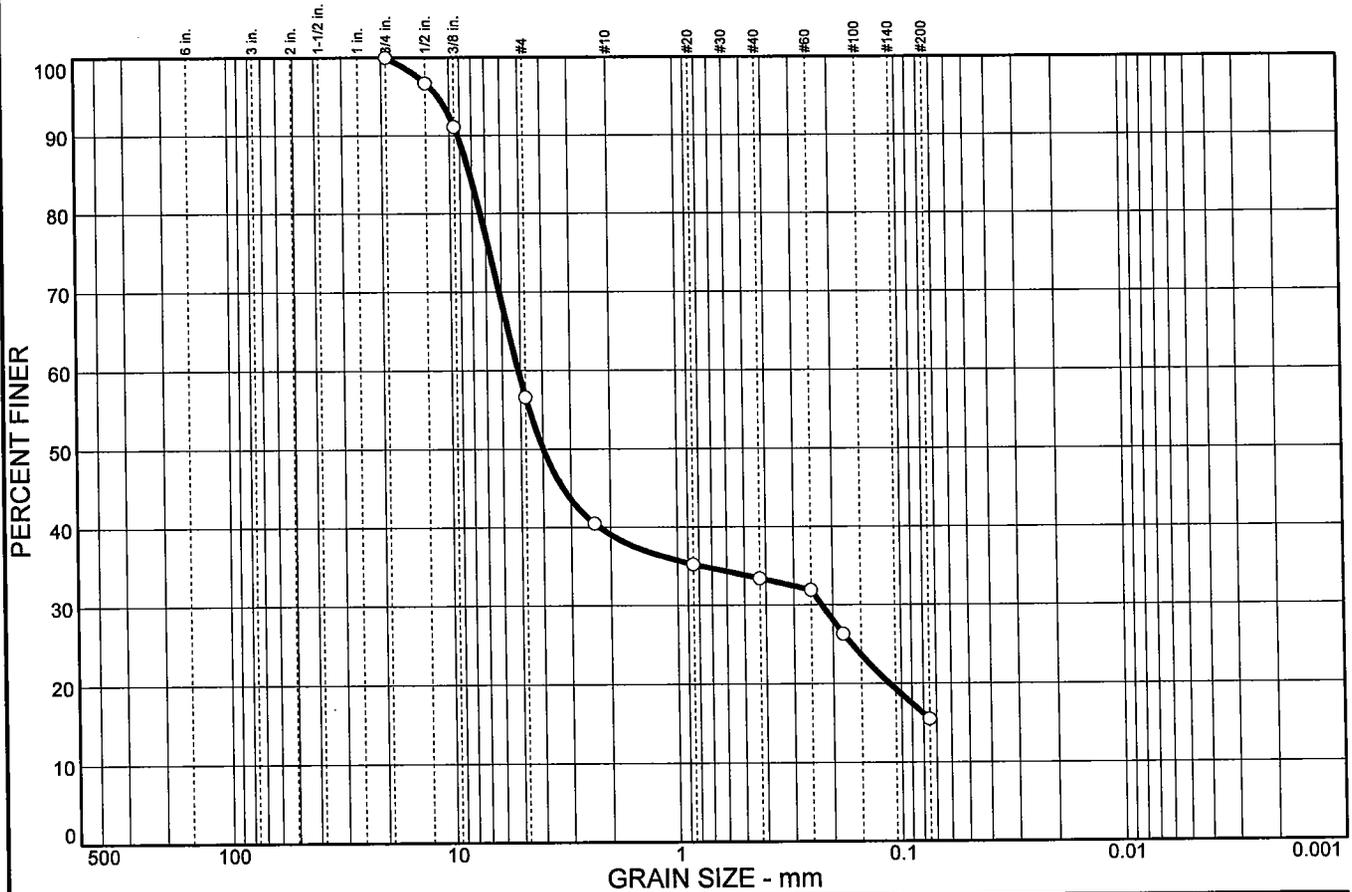
Client: U.S. Army Corps of Engineers, Alaska District

Project: Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	43.4	17.5	5.7	17.9	15.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.7		
3/8 in.	91.1		
# 4	56.6		
# 8	40.5		
# 20	35.2		
# 40	33.4		
# 60	31.9		
# 80	26.3		
# 200	15.5		

**Soil Description**

Silty gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 8.17              D<sub>60</sub>= 5.11              D<sub>50</sub>= 3.98  
D<sub>30</sub>= 0.224              D<sub>15</sub>=                      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= GM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

**Sample No.:** 6113  
**Location:** BIA-30 #4

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 20 FT 6 m

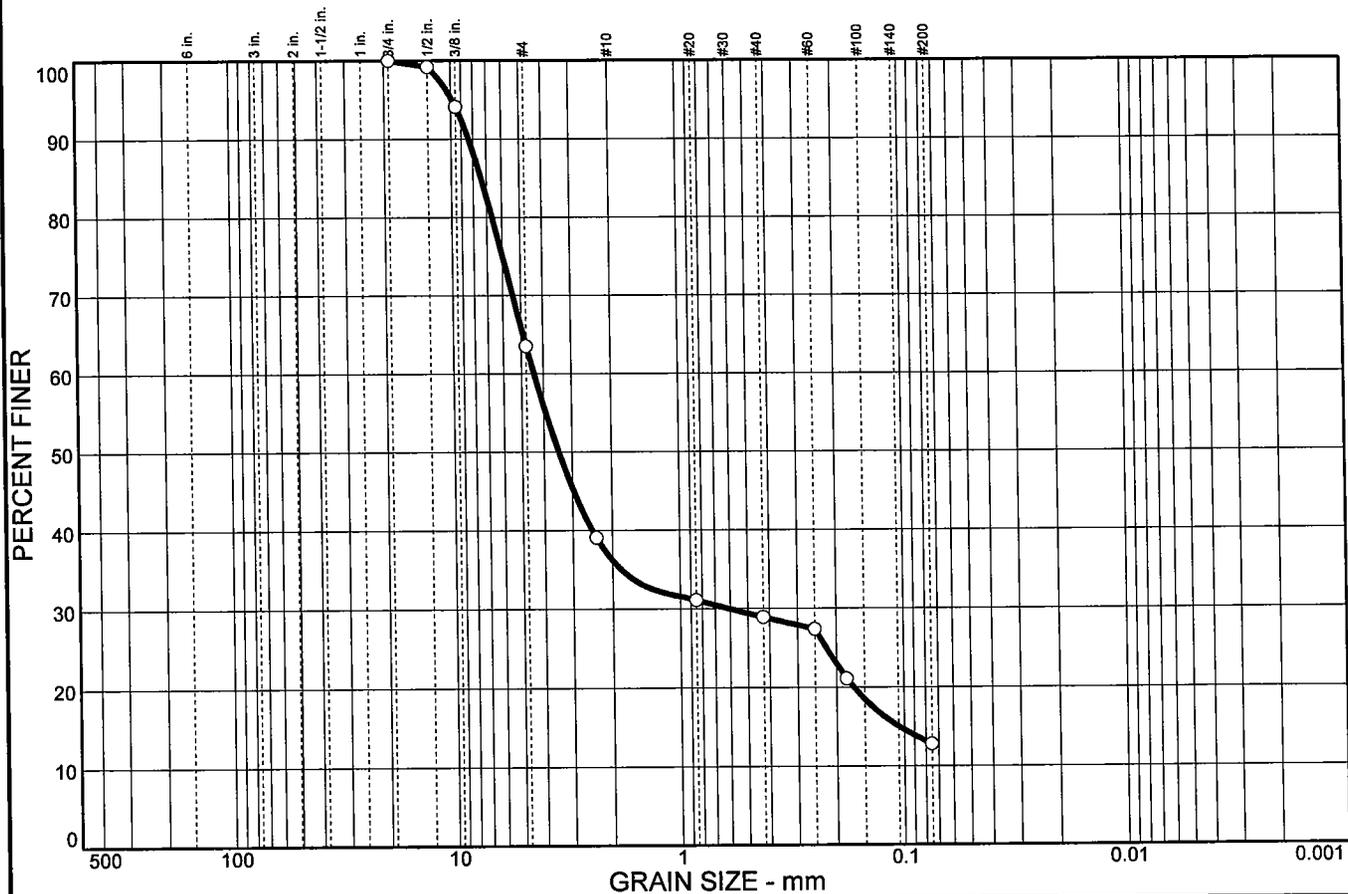
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	36.5	27.3	7.3	16.1	12.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.2		
3/8 in.	94.1		
# 4	63.5		
# 8	39.1		
# 20	31.1		
# 40	28.9		
# 60	27.4		
# 80	21.1		
# 200	12.8		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.40              D<sub>60</sub>= 4.40              D<sub>50</sub>= 3.44

D<sub>30</sub>= 0.608            D<sub>15</sub>= 0.105            D<sub>10</sub>=

C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6114  
 Location: BIA-30 #5

Source of Sample: Client Samples

Date:  
 Elev./Depth: 24 FT 7.2 m

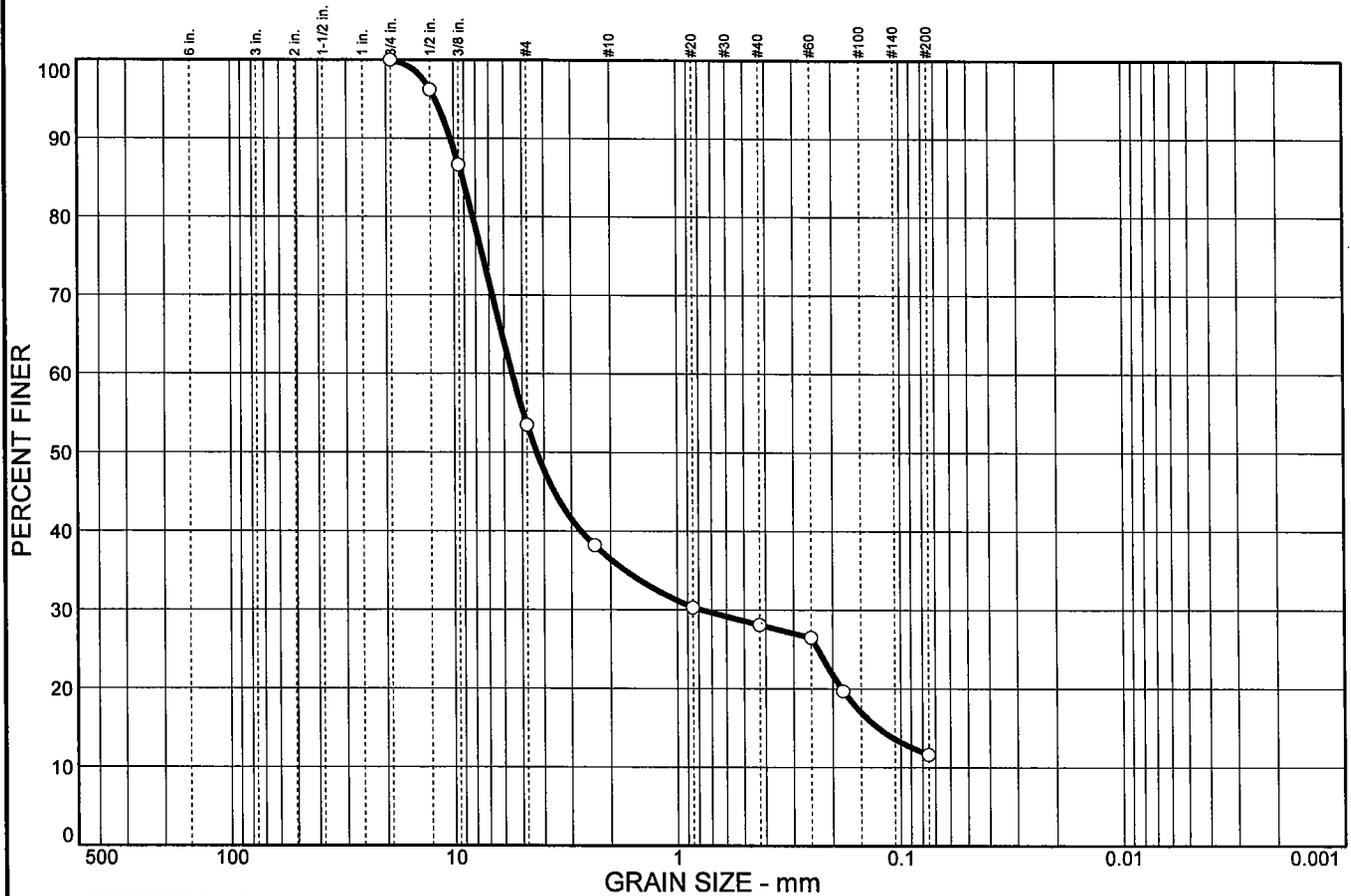
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	46.5	17.1	8.3	16.5	11.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.2		
3/8 in.	86.6		
# 4	53.5		
# 8	38.2		
# 20	30.3		
# 40	28.1		
# 60	26.5		
# 80	19.7		
# 200	11.6		

**Soil Description**

Poorly graded gravel with silt and sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 9.18              D<sub>60</sub>= 5.53              D<sub>50</sub>= 4.30  
D<sub>30</sub>= 0.775              D<sub>15</sub>= 0.126              D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= GP-GM                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

**Sample No.:** 6115  
**Location:** BIA-30 #6

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 29 FT 8.7 m

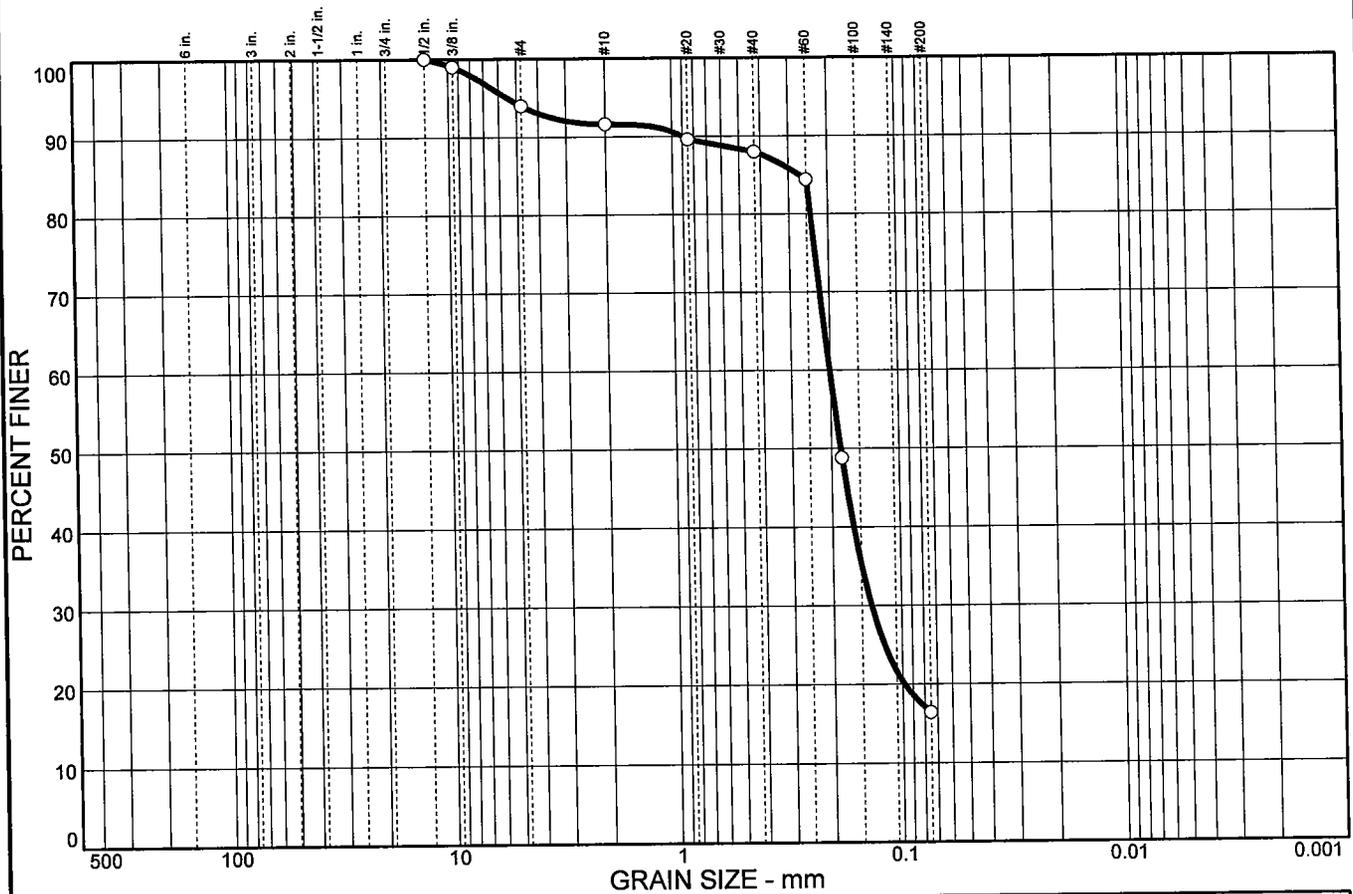
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.0	2.4	3.6	71.6	16.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.0		
# 4	94.0		
# 10	91.6		
# 20	89.6		
# 40	88.0		
# 60	84.4		
# 80	48.8		
# 200	16.4		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL=                      LL=                      PI=

**Coefficients**  
 D<sub>85</sub>= 0.268      D<sub>60</sub>= 0.202      D<sub>50</sub>= 0.182  
 D<sub>30</sub>= 0.136      D<sub>15</sub>=                      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6116  
**Location:** BIA-30 #7

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 34 FT 10.2 m

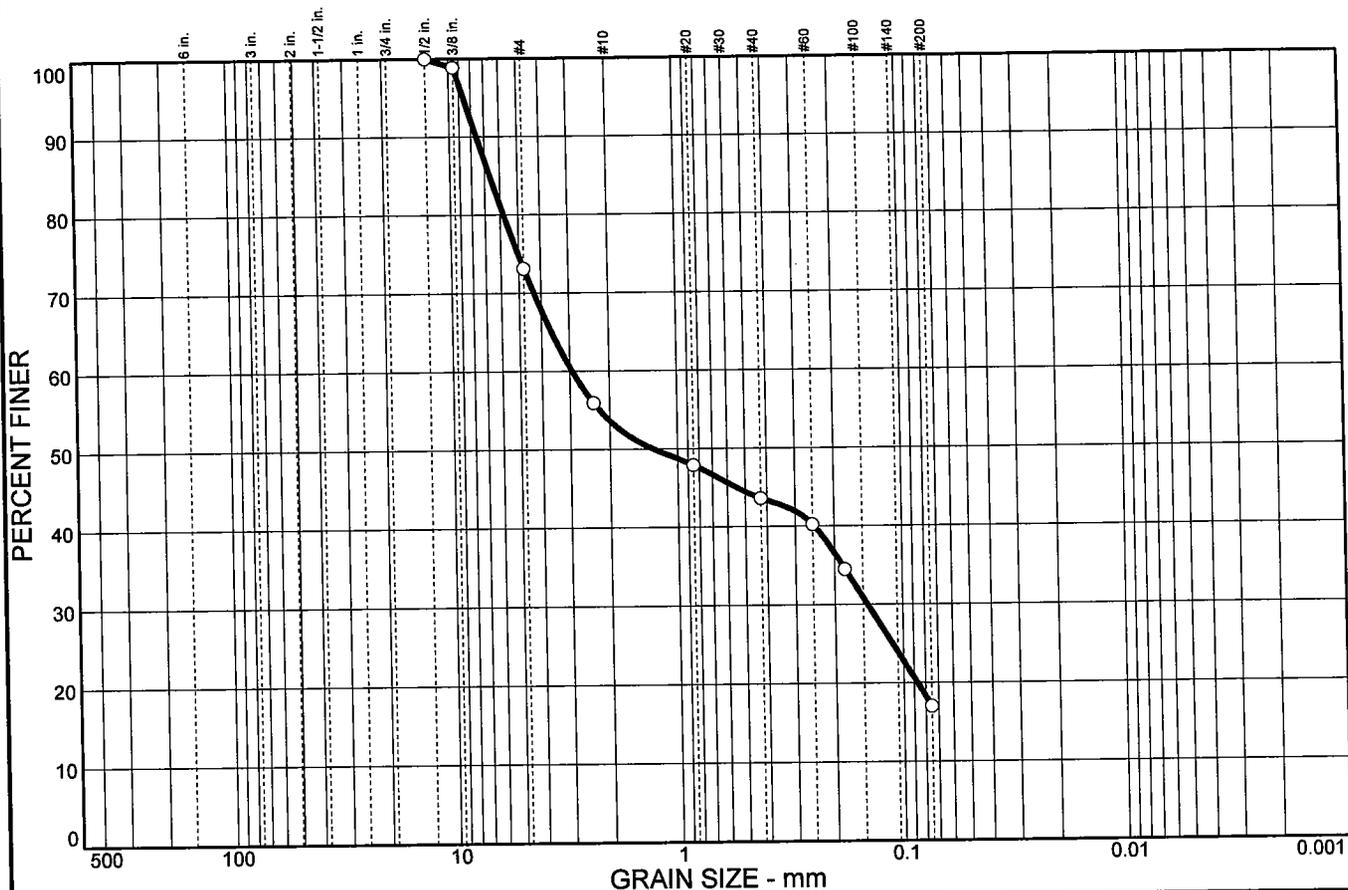
**Mappa TestLab**

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No.:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	26.9	19.4	10.1	26.6	17.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	98.9		
# 4	73.1		
# 8	55.9		
# 20	47.9		
# 40	43.6		
# 60	40.2		
# 80	34.5		
# 200	17.0		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 6.66              D<sub>60</sub>= 2.93              D<sub>50</sub>= 1.27  
D<sub>30</sub>= 0.143              D<sub>15</sub>=                      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6117

Source of Sample: Client Samples

Date:

Location: BIA-31 #3

Elev./Depth: 15 FT 4.5 m

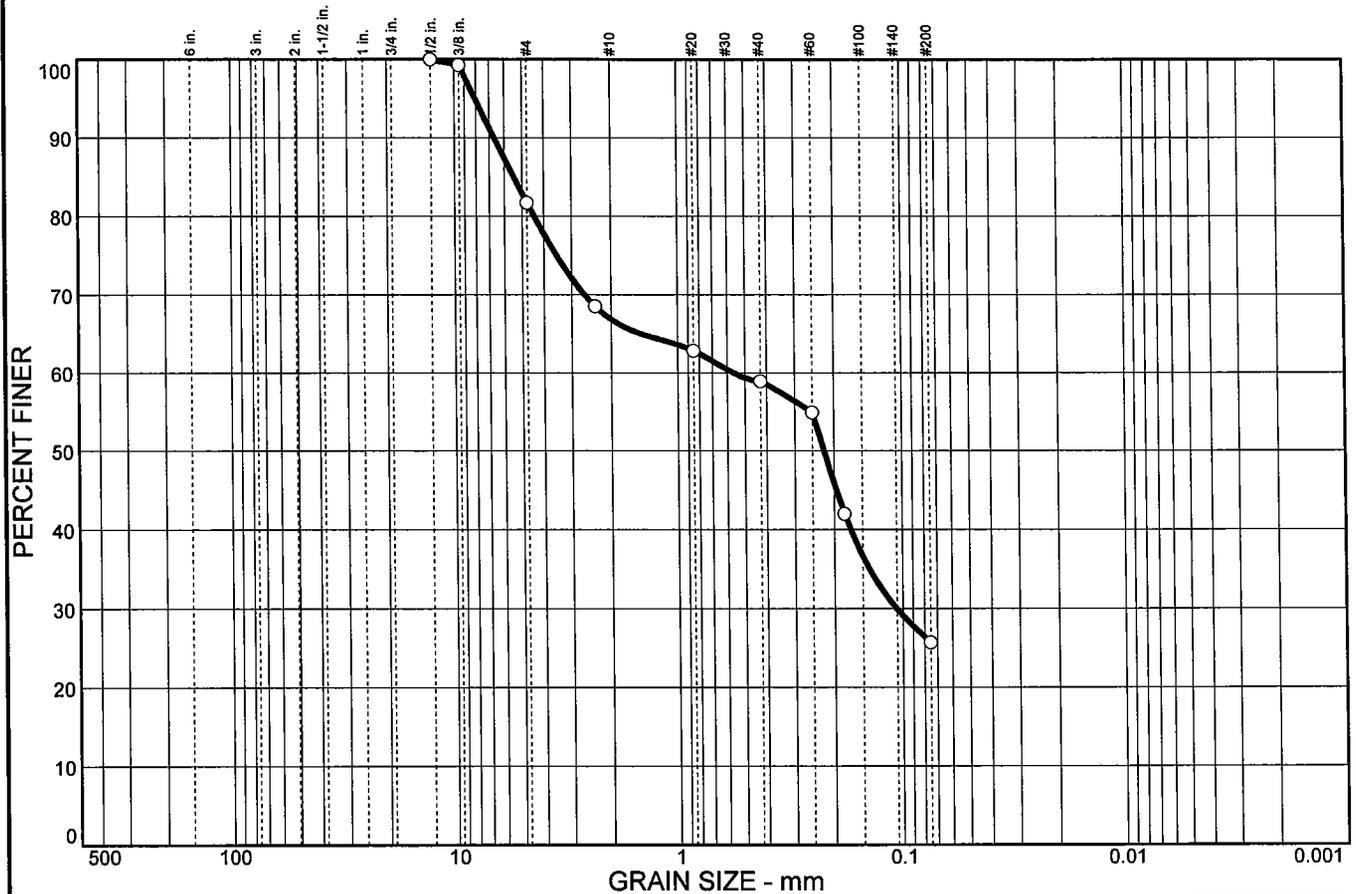
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.3	14.9	7.9	33.2	25.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.3		
# 4	81.7		
# 8	68.5		
# 20	62.8		
# 40	58.9		
# 60	54.9		
# 80	42.0		
# 200	25.7		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.45                      D<sub>60</sub>= 0.564                      D<sub>50</sub>= 0.222  
D<sub>30</sub>= 0.106                      D<sub>15</sub>=                                      D<sub>10</sub>=  
C<sub>u</sub>=                                      C<sub>c</sub>=

**Classification**

USCS= SM                                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

Sample No.: 6118

Source of Sample: Client Samples

Date:

Location: BIA-31 #4

Elev./Depth: 19 FT 5.7 m

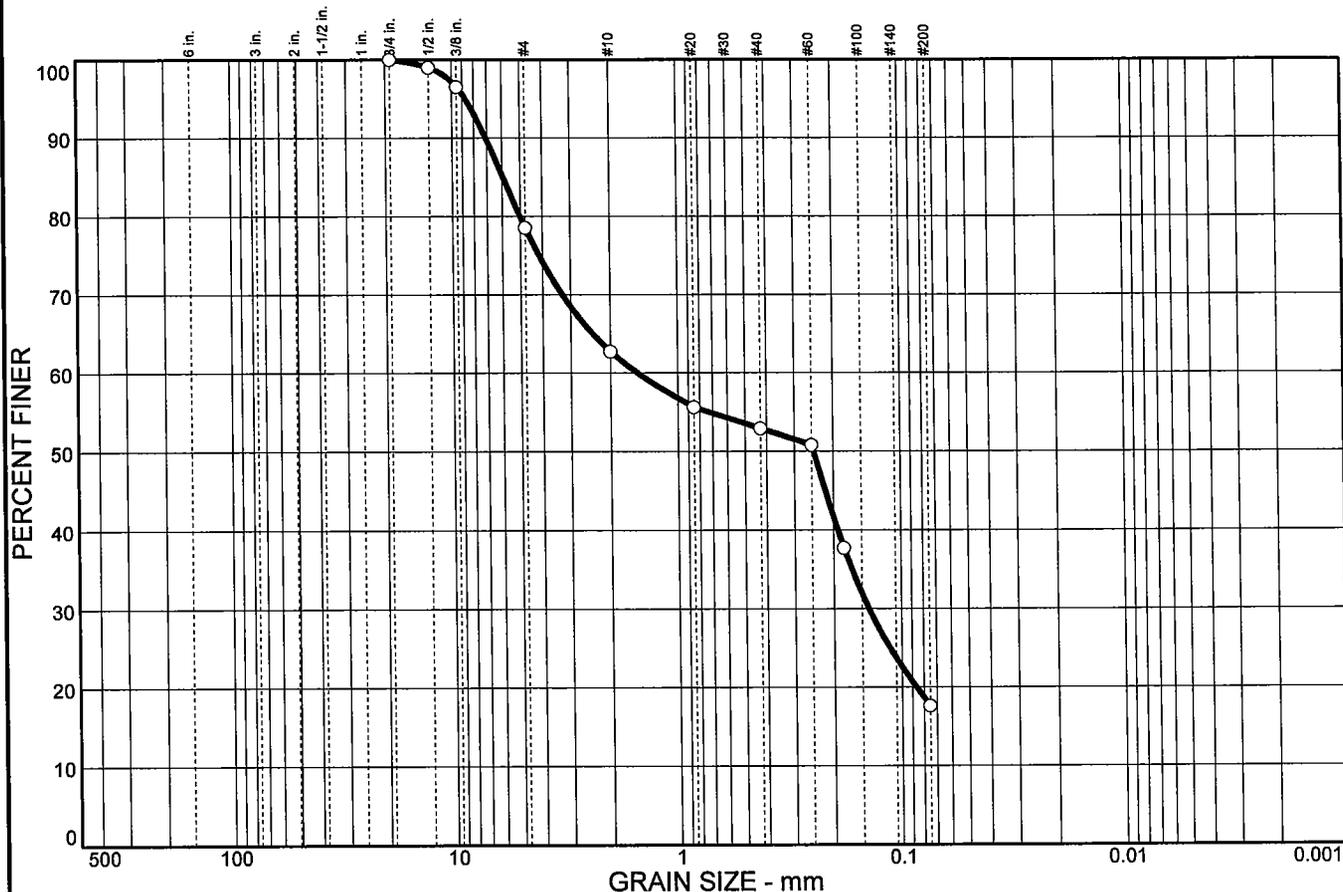
## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	21.5	15.8	9.8	35.3	17.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.0		
3/8 in.	96.5		
# 4	78.5		
# 10	62.7		
# 20	55.6		
# 40	52.9		
# 60	50.8		
# 80	37.7		
# 200	17.6		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 5.95              D<sub>60</sub>= 1.53              D<sub>50</sub>= 0.245  
D<sub>30</sub>= 0.140              D<sub>15</sub>=                      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

\* (no specification provided)

**Sample No.:** 6119  
**Location:** BIA-31 # 5

**Source of Sample:** Client Samples

**Date:**  
**Elev./Depth:** 24 FT 7.2 m

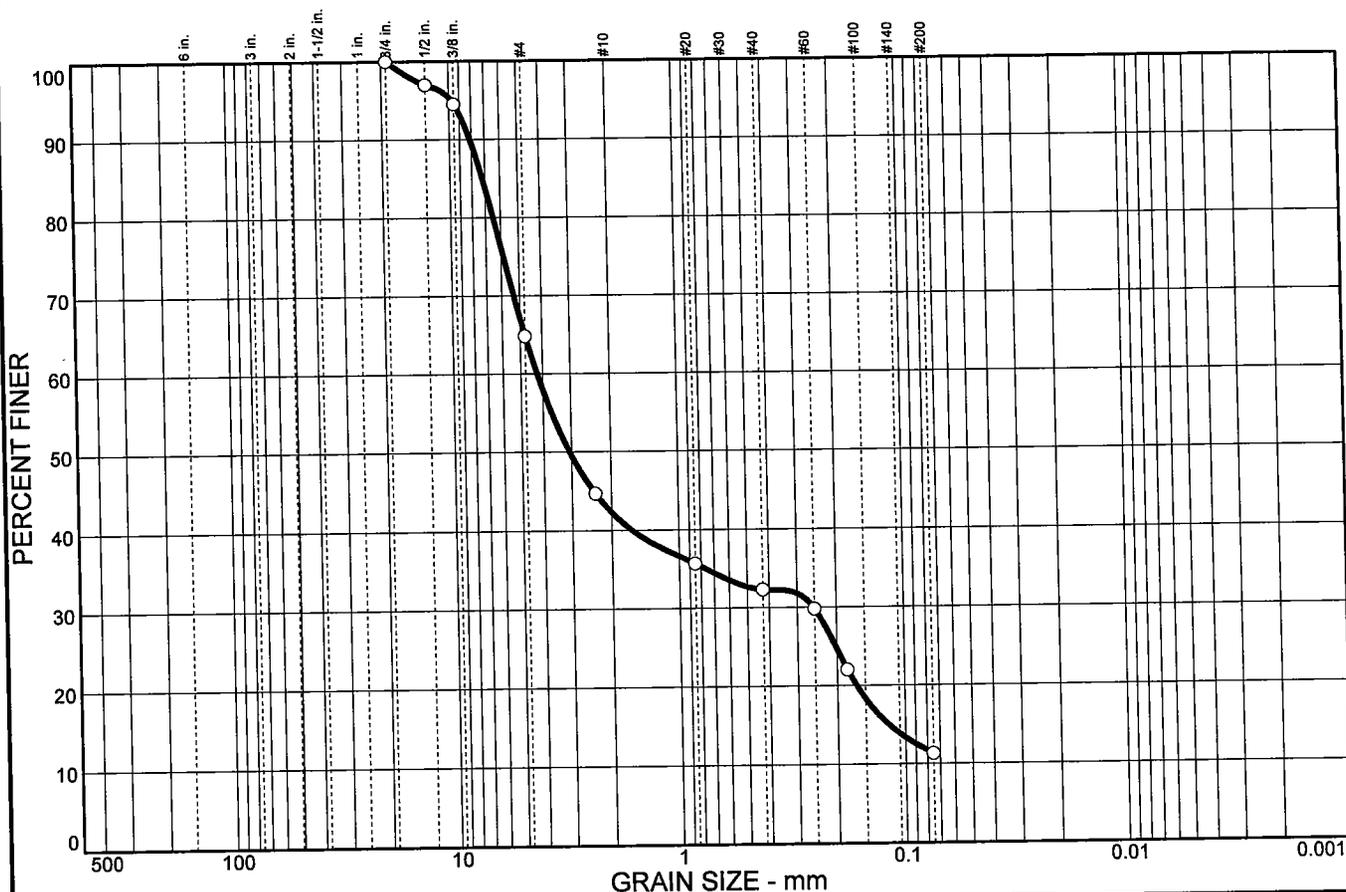
Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	35.2	22.5	10.0	21.0	11.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.0		
3/8 in.	94.5		
# 4	64.8		
# 8	44.7		
# 20	35.7		
# 40	32.3		
# 60	29.8		
# 80	22.0		
# 200	11.3		

**Soil Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 7.21              D<sub>60</sub>= 4.23              D<sub>50</sub>= 3.07  
D<sub>30</sub>= 0.253              D<sub>15</sub>= 0.119              D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SP-SM                      AASHTO= A-1-b

**Remarks**

\* (no specification provided)

Sample No.: 6120  
 Location: BIA-31 # 6

Source of Sample: Client Samples

Date:  
 Elev./Depth: 29 FT 8.7 m

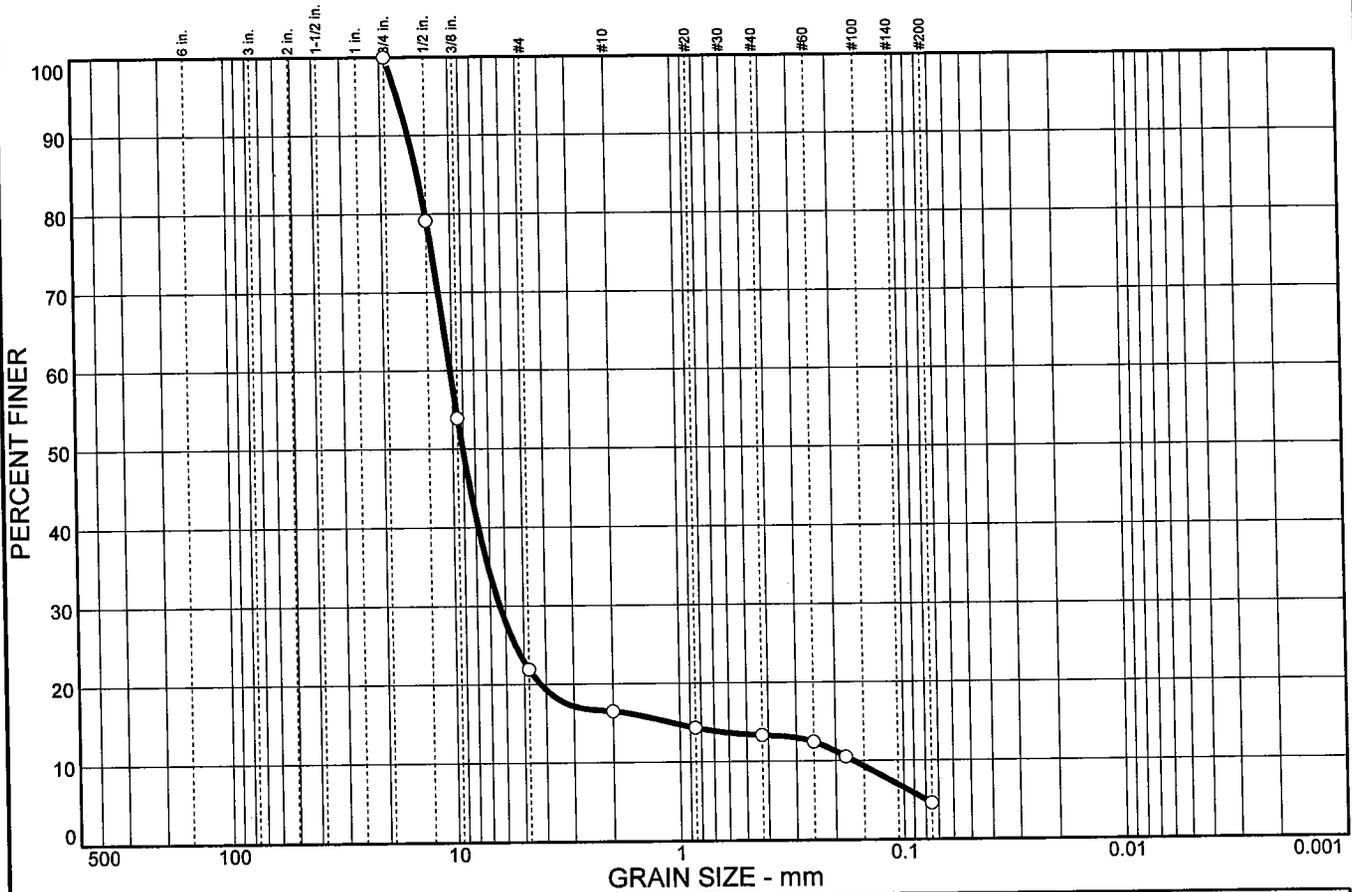
**Mappa TestLab**

Client: U.S. Army Corps of Engineers, Alaska District  
 Project: Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

Project No: 2004-148

Figure

# Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	78.1	5.4	3.2	8.7	4.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	79.1		
3/8 in.	53.9		
# 4	21.9		
# 10	16.5		
# 20	14.3		
# 40	13.3		
# 60	12.4		
# 80	10.5		
# 200	4.6		

**Soil Description**

Poorly graded gravel with sand

**Atterberg Limits**

PL=                      LL=                      PI=

**Coefficients**

D<sub>85</sub>= 13.8              D<sub>60</sub>= 10.2              D<sub>50</sub>= 9.07  
D<sub>30</sub>= 6.36              D<sub>15</sub>= 1.09              D<sub>10</sub>= 0.167  
C<sub>u</sub>= 61.19              C<sub>c</sub>= 23.69

**Classification**

USCS= GP                      AASHTO= A-1-a

**Remarks**

\* (no specification provided)

Sample No.: 6121

Source of Sample: Client Samples

Date:

Location: BIA-31 #7

Elev./Depth: 34 FT 10 m

## Mappa TestLab

**Client:** U.S. Army Corps of Engineers, Alaska District  
**Project:** Barrow Coastal Storm Damage Reduction Study  
 Barrow, Alaska

**Project No:** 2004-148

**Figure**

**Appendix D**

**Test Boring Logs and Laboratory Data  
Submerged Spit**



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction  
Barrow, Alaska**

Page 1 of 1

Date: **8 Aug 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,379,800 ft. ±**  
Easting: **687,029 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-1** Permanent: **OS-01**

Operator:  
**Travis Coghill & Ryan Ralston**

Inspector:  
**Inocencio Roman/ Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NA**

Depth Drilled:  
**15.0 ft.**

Total Depth:  
**16.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**2.5 in.**

Size and Type of Bit:  
**3.875 in. Tri-Cone Bit**

Type of Equipment:  
**Nodwell B61 w/ autohammer**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1		F2	6 9 13	SP- SM	Poorly graded SAND with Silt	1	88	11	0.5		22	Dark gray, brown, and black, wet, fine sand, nonplastic (NP) fines
8														
10		2		F2	19 30 48	SP- SM	Poorly graded SAND with Silt		88	12			20	Dark gray and black, wet, fine sand, NP fines
12														
14														
16		3		F4	6 19 21	SM	Silty SAND		60	40			28	Dark gray to black, wet, fine sand, NP fines
18														Bottom of Hole 16.5 ft. Groundwater Measurement Not Applicable PID = (Cold/Hot) Photo Ionization Detector Depth to mudline - 50 feet
20														
22														
24														
26														
28														
30														
32														

EXPLORATION LOG BARROW/STORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **11 Aug 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,353,974 ft. ±**  
Easting: **689,280 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **A-8** Permanent: **OS-02**

Operator:  
**Travis Coghill & Ryan Ralston**

Inspector:  
**Inocencio Roman/ Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NA**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**2.5 in.**

Size and Type of Bit:  
**3.875 in. Tri-Cone Bit**

Type of Equipment:  
**Nodwell B61 w/ autohammer**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1			2 3	SM	Silty SAND	5	64	31	0.75	29	Black and gray, wet, fine sand, non plastic (NP) fines, trace of subangular gravel	
8														
10		2			5 7 12	SM	Silty SAND		87	13		21	Gray to brown, wet, fine sand, NP fines	
12														
14														
16		3			10 17 24	SP-SM	Poorly graded SAND with Silt		91	9		21	Gray, wet, fine sand, NP fines	
18														
20		4			8 13 20	SP-SM	Poorly graded SAND with Silt		88	12		21	Gray, wet, fine sand, NP fines, trace of shell fragments	
22														
24														
26		5			7 7 7	SM	Silty SAND	5	21	74	0.5	18	Gray, wet, fine sand, slightly plastic fines, some gravel and shells in sample that were washed down the hole and were not retrieved	
28														
30		6			2 5	ML	SILT		5	95		27	Dark gray, wet, fine sand, NP fines	
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05

Bottom of Hole 31.5 ft.  
Groundwater Measurement Not Applicable  
PID = (Cold/Hot) Photo Ionization Detector



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **12 Aug 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,365,516 ft. ±**  
Easting: **689,013 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **A-5** Permanent: **OS-03**

Operator:  
**Travis Coghill & Ryan Ralston**

Inspector:  
**Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NA**

Depth Drilled:  
**30.0 ft.**

Total Depth:  
**31.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**2.5 in.**

Size and Type of Bit:  
**3.875 in. Tri-Cone Bit**

Type of Equipment:  
**Nodwell B61 w/ autohammer**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
5		1		F4	3 7 8	ML	Sandy SILT		47	53			25	Dark gray, wet, fine sand
10		2		F4	7 14 11	ML	Sandy SILT		50	50			24	Dark gray, wet, fine sand
15		3		F4	5 5 8	SM	Silty SAND		55	45	0.25		28	Dark gray, wet, subrounded gravel, fine sand, some shell fragments in sample
20		4		F4	9 13 16	ML	Sandy SILT	1	30	69	0.375		29	Dark gray, wet, very fine sand, NP fines
25		5		F4	7 4 7	ML	Sandy SILT	1	25	74	0.2		30	Dark gray, wet, fine sand, NP fines
30		6		F4	4 13 15	ML	SILT		14	86			28	Dark gray, wet, very fine sand, NP fines
31.5	Bottom of Hole 31.5 ft. Groundwater Measurement Not Applicable PID = (Cold/Hot) Photo Ionization Detector													

EXPLORATION LOG BARROW STORM DAMAGE REDUCTION.GPJ ACE AN.C.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **12 Aug 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,384,905 ft. ±**  
Easting: **699,822 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **TB-5** Permanent: **OS-04**

Operator:  
**Travis Coghill & Ryan Ralston**

Inspector:  
**Inocencio Roman**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NA**

Depth Drilled:  
**9.0 ft.**

Total Depth:  
**9.8 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**2.5 in.**

Size and Type of Bit:  
**3.875 in. Tri-Cone Bit**

Type of Equipment:  
**Nodwell B61 w/ autohammer**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
4														
6		1			16 19 21	SM	Silty SAND		70	30			13	Dark gray to black, wet, very fine sand, nonplastic (NP) fines
8														
10		2			20 5 1/4"	SP-SM	Poorly graded SAND with Silt		89	11			20	Dark gray to black, wet, very fine sand, NP fines
12														Bottom of Hole 9.8 ft. Groundwater Measurement Not Applicable PID = (Cold/Hot) Photo Ionization Detector Depth to mudline - 40 feet
14														
16														
18														
20														
22														
24														
26														
28														
30														
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE\_ANC.GDT 3/11/05



**ALASKA DISTRICT  
CORPS OF ENGINEERS  
ENGINEERING SERVICES**

**Soils and Geology Section  
EXPLORATION LOG**

Project: <b>Coastal Storm Damage Reduction Barrow, Alaska</b>		Page 1 of 1
Date: <b>12 Aug 2004</b>		
Drilling Agency: <input type="checkbox"/> Alaska District <input checked="" type="checkbox"/> Other <b>Denali Drilling</b>		Elevation Datum: <input type="checkbox"/> MSL <input type="checkbox"/> other
Location: Northing: <b>6,353,696 ft. ±</b> Easting: <b>668,124 ft. ±</b>		Top of Hole Elevation:

Hole Number, Field: <b>A-11</b>	Permanent: <b>OS-05</b>	Operator: <b>Travis Coghill &amp; Ryan Ralston</b>	Inspector: <b>Inocencio Roman/ Aaron Banks</b>
---------------------------------	-------------------------	--	--

Type of Hole: <input checked="" type="checkbox"/> other <b>Auger</b> <input type="checkbox"/> Test Pit <input checked="" type="checkbox"/> Auger Hole <input type="checkbox"/> Monitoring Well <input type="checkbox"/> Piezometer	Depth to Groundwater: <b>NA</b>	Depth Drilled: <b>30.0 ft.</b>	Total Depth: <b>33.0 ft.</b>
---	---------------------------------	--------------------------------	------------------------------

Hammer Weight: <b>340 lbs</b>	Split Spoon I.D.: <b>2.5 in.</b>	Size and Type of Bit: <b>3.875 in. Tri-Cone Bit</b>	Type of Equipment: <b>Nodwell B61 w/ autohammer</b>	Type of Samples: <b>Grab and Drive</b>
-------------------------------	----------------------------------	---	---	--

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks Rain, 45 degrees
								%Gravel	%Sand	%Fines				
2														
4														
6		1		F4	33 33	ML	SILT with Sand	25	75			29	Dark gray, wet, very fine sand, NP fines	
8														
10		2		F4	33 33	ML	SILT	14	86			37	Dark gray, wet, very fine sand, slightly plastic fines	
12														
14														
16		3		F4	22 22	ML	Sandy SILT	31	69			27	Dark gray, wet, fine sand, slightly plastic fines	
18														
20		4		F4	22 22	ML	SILT	8	92			33	Dark gray, wet, very fine sand, slightly to NP fines	
22														
24														
26		5		F4	4 12 12	ML	Sandy SILT	38	62			20	Dark gray, wet, fine sand, trace shell fragments in sample	
28														
30		6		F2	11 25 29	ML	Sandy SILT	42	58			19	Dark gray, wet, fine sand	
32		7		F4	12 13 40	SP-SM	Poorly graded SAND with Silt	92	8			25	Dark gray, wet, fine sand	
34													Bottom of Hole 33.0 ft. Groundwater Measurement Not Applicable PID = (Cold/Hot) Photo Ionization Detector Depth to mudline - 28 feet	
36														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANC.GDT 3/11/05



**ALASKA DISTRICT**  
CORPS OF ENGINEERS  
ENGINEERING SERVICES

**Soils and Geology Section**  
**EXPLORATION LOG**

Project: **Coastal Storm Damage Reduction**  
**Barrow, Alaska**

Page 1 of 1

Date: **14 Aug 2004**

Drilling Agency:  Alaska District  
 Other **Denali Drilling**

Elevation Datum:  
 MSL  other

Location: Northing: **6,370,184 ft. ±**  
Easting: **676,954 ft. ±**

Top of Hole  
Elevation:

Hole Number, Field: **A-1** Permanent: **OS-06**

Operator:  
**Travis Coghill & Ryan Ralston**

Inspector:  
**Inocencio Roman/ Aaron Banks**

Type of Hole:  other **Auger**  
 Test Pit  Auger Hole  Monitoring Well  Piezometer

Depth to Groundwater:  
**NA**

Depth Drilled:  
**22.0 ft.**

Total Depth:  
**23.5 ft.**

Hammer Weight:  
**340 lbs**

Split Spoon I.D.:  
**2.5 in.**

Size and Type of Bit:  
**3.875 in. Tri-Cone Bit**

Type of Equipment:  
**Nodwell B61 w/ autohammer**

Type of Samples:  
**Grab and Drive**

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class: TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size			Max Size (in.)	PID (ppm)	% Water	Description and Remarks
								%Gravel	%Sand	%Fines				
2														
8		1			13 20 22	SM	Silty SAND	78	22			21	Black to gray, wet, very fine sand, nonplastic (NP) fines	
12		2			4 9 16	ML	Sandy SILT	35	65			20	Black to gray, wet, very fine sand, NP fines	
18		3			6 8 8	ML	Sandy SILT	27	73			21	Black to gray, wet, very fine sand, NP fines	
22		4			7 11 15	ML	Sandy SILT	42	58			18	Black to gray, wet, very fine sand, NP fines	
24													Bottom of Hole 23.5 ft. Groundwater Measurement Not Applicable PID = (Cold/Hot) Photo Ionization Detector Depth to mudline - 40 feet	
26														
28														
30														
32														

EXPLORATION LOG BARROWSTORMDAMAGEREDUCTION.GPJ ACE ANCGDT 3/11/05

801 East 82nd Avenue, #A-9  
Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

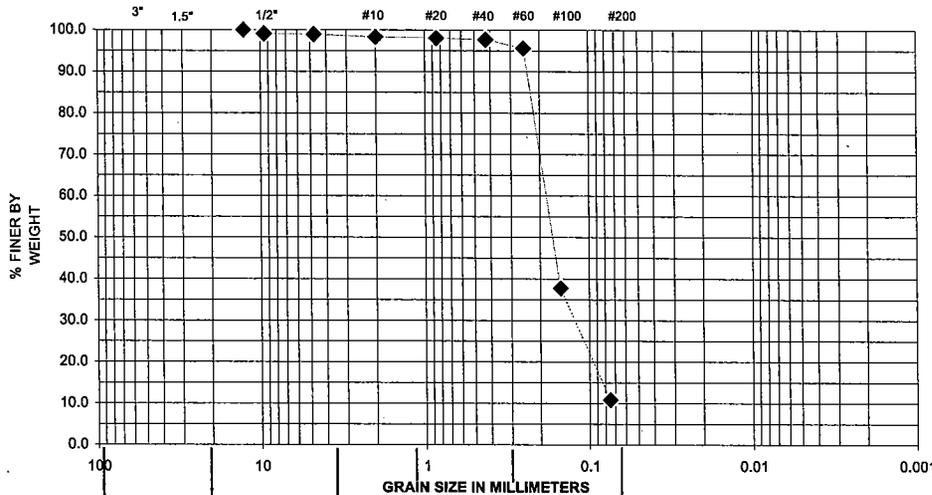
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	TB1
SAMPLE NO/ DEPTH	TB1-1 (5.0' - 6.5' Depth)
DESCRIPTION:	Poorly grd. sand w/ silt.
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T.

% GRAVEL:	1.1	USC:	SP-SM
% SAND:	88.1	FC:	
% SILT/CLAY:	10.8	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		21.5	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



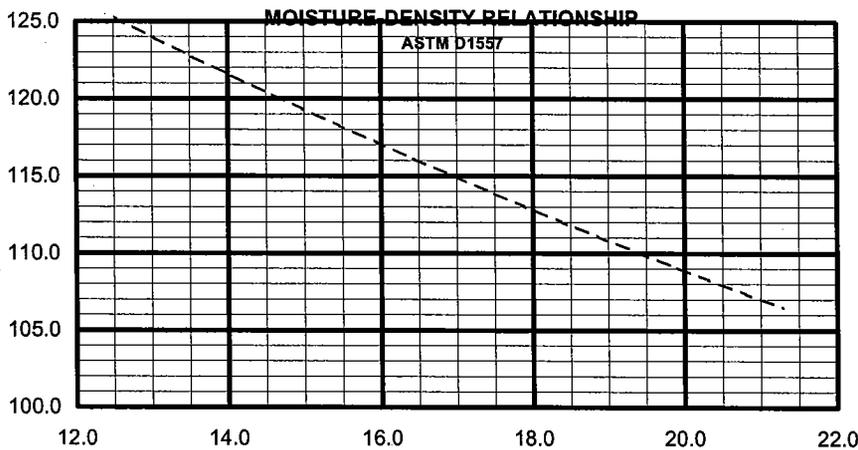
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"	100	
9.5	3/8"	99	
4.75	# 4	99	
2	#10	98	
0.85	#20	98	
0.425	#40	98	
0.25	# 60	96	
0.015	#100	38	
0.075	#200	10.8	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required, TFI will provide upon written request.

801 East 82nd Avenue, #A-9  
Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

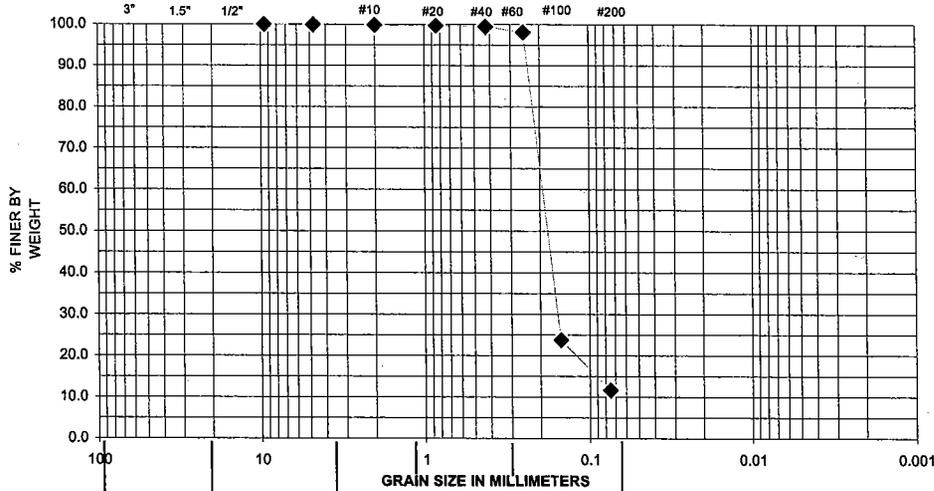
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	TB1
SAMPLE NO/ DEPTH	TB1-2 (-10.0' Depth)
DESCRIPTION:	Poorly grd. sand w/ silt.
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T.

% GRAVEL:	0.0	USC:	SP-SM
% SAND:	88.3	FC:	
% SILT/CLAY:	11.7	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		20.2	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



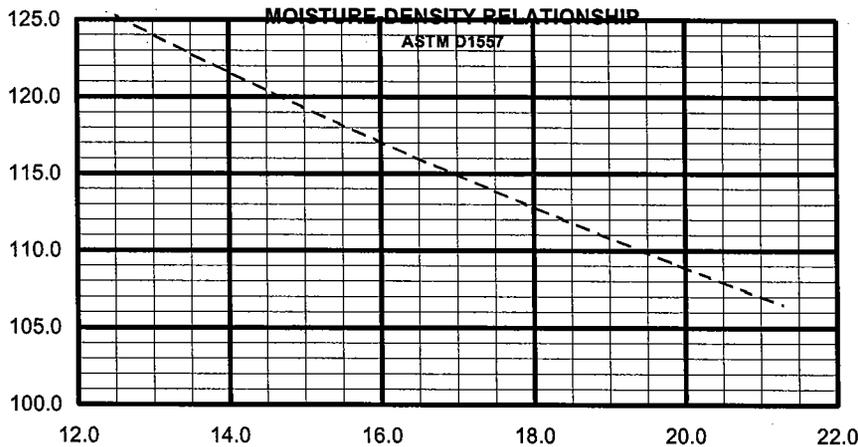
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	99	
0.25	# 60	98	
0.015	#100	24	
0.075	#200	11.7	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit (ASTM 4318)	

The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required, TFI will provide upon written request.

801 East 82nd Avenue, #A-9  
Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

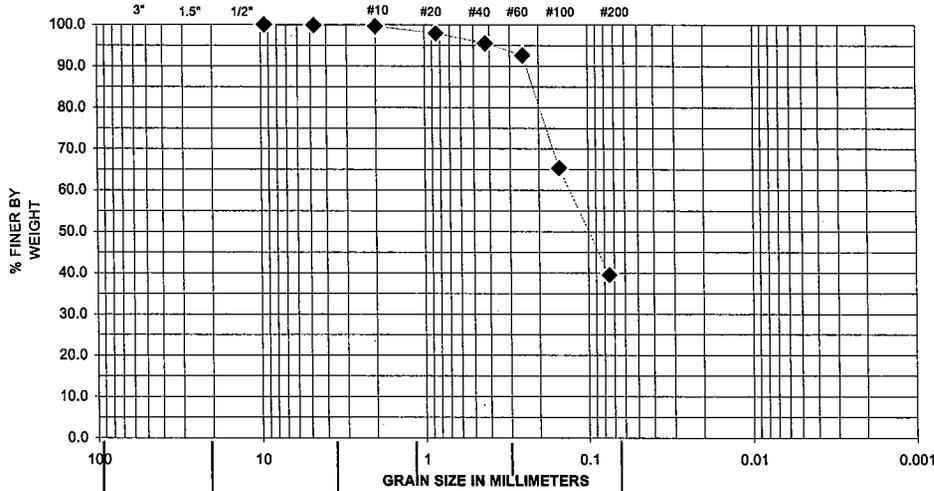
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	TB1
SAMPLE NO/ DEPTH:	TB1-3 (-15.0' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.1	USC:	SM
% SAND:	60.4	FC:	
% SILT/CLAY:	39.5	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		27.7	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



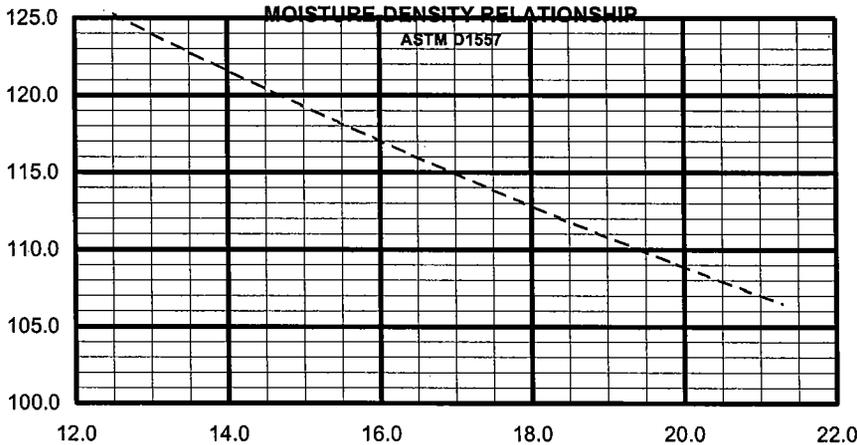
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	98	
0.425	#40	96	
0.25	# 60	93	
0.015	#100	65	
0.075	#200	39.5	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required, TFI will provide upon written request.

801 East 82nd Avenue, #A-9  
Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

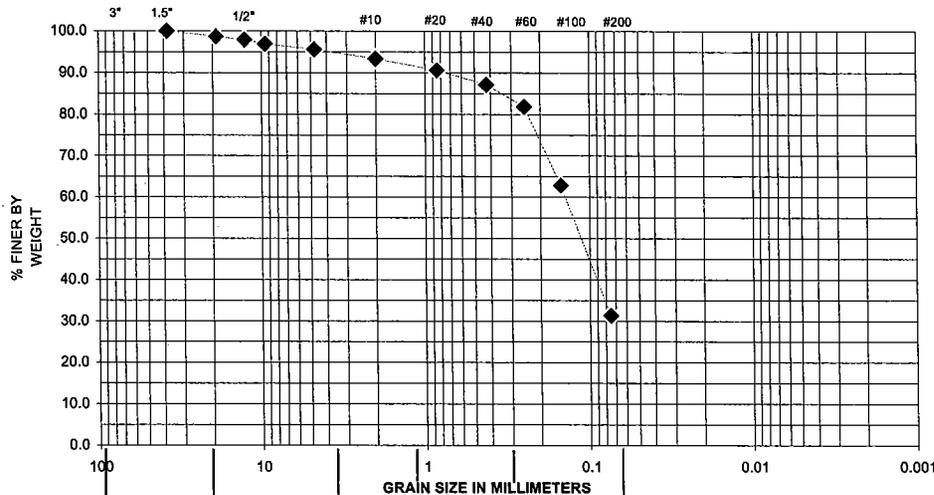
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A8
SAMPLE NO/ DEPTH	A8-1 (-5.0' - 6.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	4.4	USC:	SM
% SAND:	64.3	FC:	
% SILT/CLAY:	31.3	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		28.9	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



### SIEVE ANALYSIS RESULT

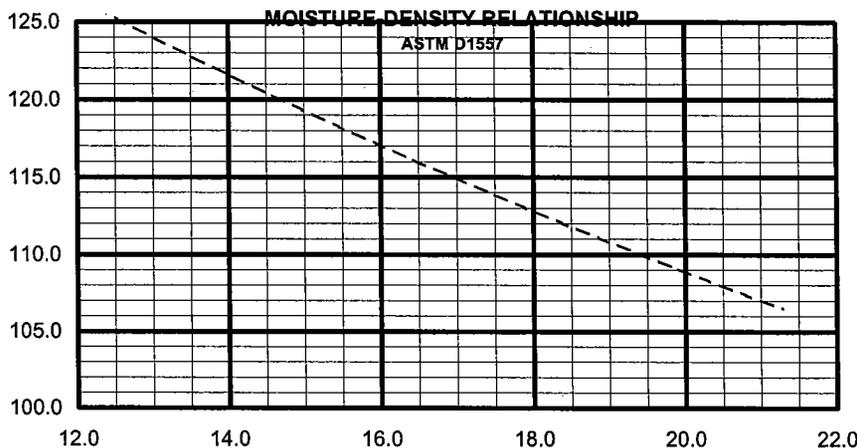
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"	100	
19.05	3/4"	99	
12.7	1/2"	98	
9.5	3/8"	97	
4.75	# 4	96	
2	#10	93	
0.85	#20	91	
0.425	#40	87	
0.25	# 60	82	
0.015	#100	63	
0.075	#200	31.3	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	



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# TERRA FIRMA INC.

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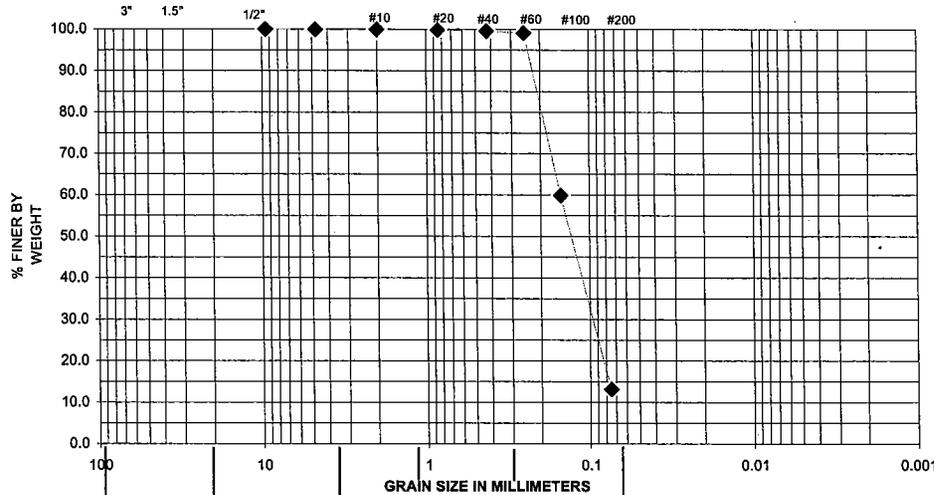
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A8
SAMPLE NO/ DEPTH	A8-2 (-10.0' - 11.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	SM
% SAND:	86.8	FC:	
% SILT/CLAY:	13.2	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		21.3	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



### SIEVE ANALYSIS RESULT

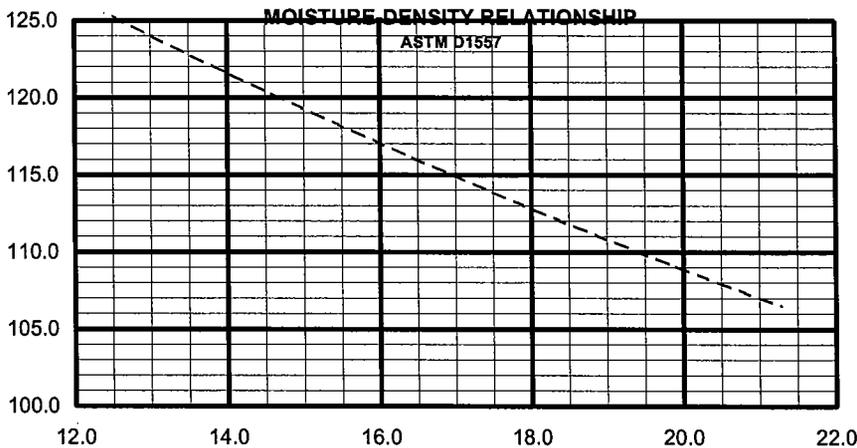
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	100	
0.25	# 60	99	
0.015	#100	60	
0.075	#200	13.2	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	



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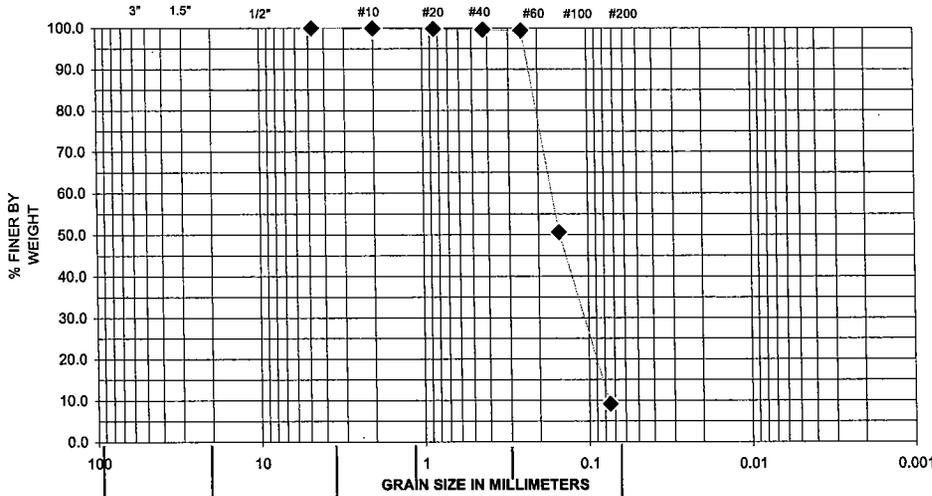
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A8
SAMPLE NO/ DEPTH	A8-3 (-15.0' - 16.5' Depth)
DESCRIPTION:	Poorly grd. sand w/ silt.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	SP-SM
% SAND:	90.9	FC:	
% SILT/CLAY:	9.1	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		21.2	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



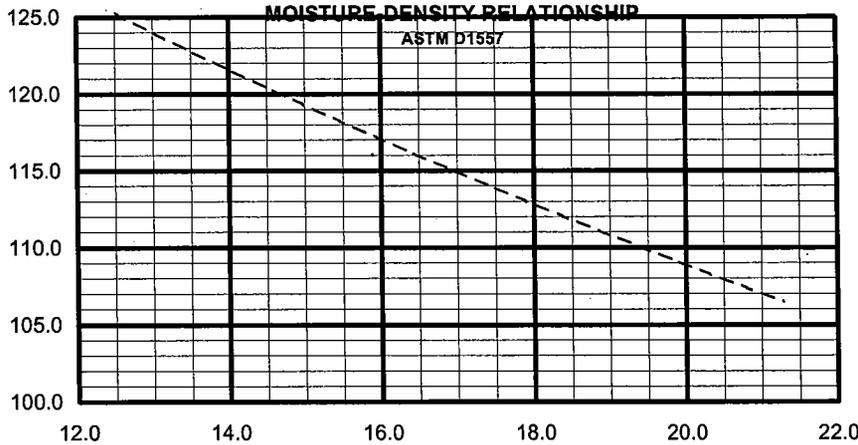
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	100	
0.25	# 60	99	
0.015	#100	51	
0.075	#200	9.1	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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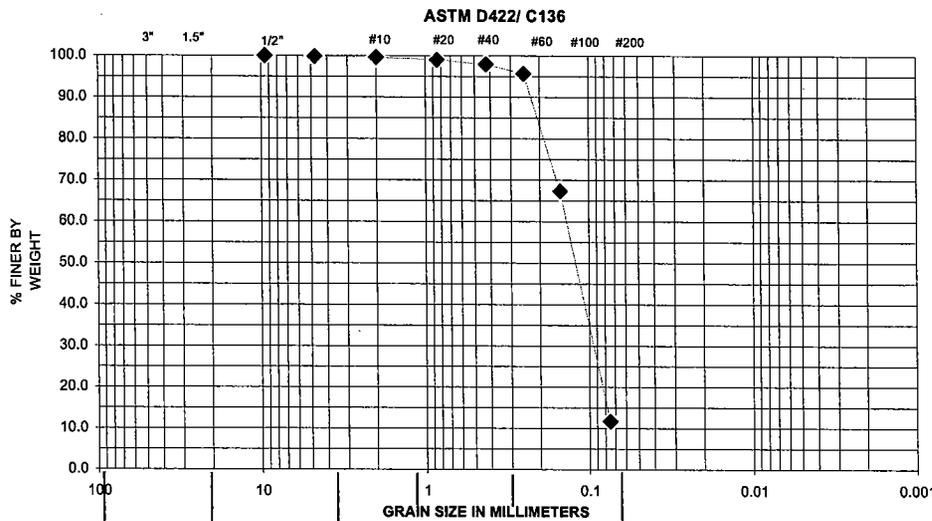
Laboratory Testing | Construction Monitoring

Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A8
SAMPLE NO/ DEPTH	A8-4 (-20.0' - 21.5' Depth)
DESCRIPTION:	Poorly grd. sand w/ silt.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.1	USC:	SP-SM
% SAND:	88.2	FC:	
% SILT/CLAY:	11.7	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		21.2	

### PARTICLE SIZE ANALYSIS



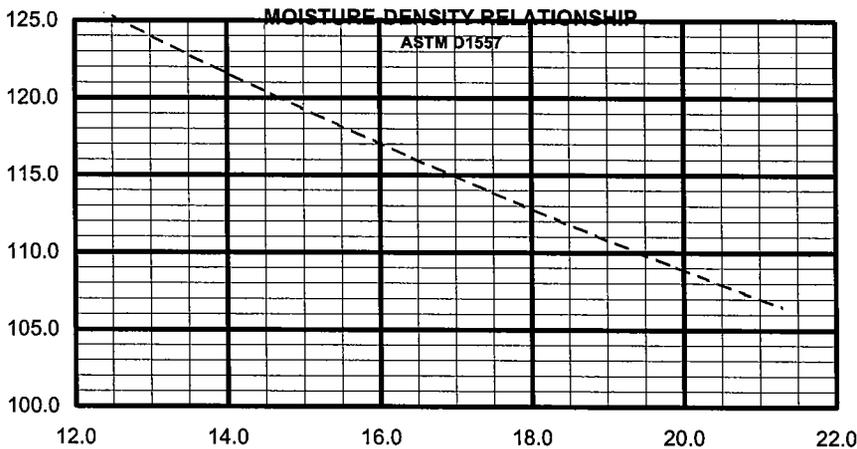
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	98	
0.25	# 60	96	
0.075	#100	67	
0.075	#200	11.7	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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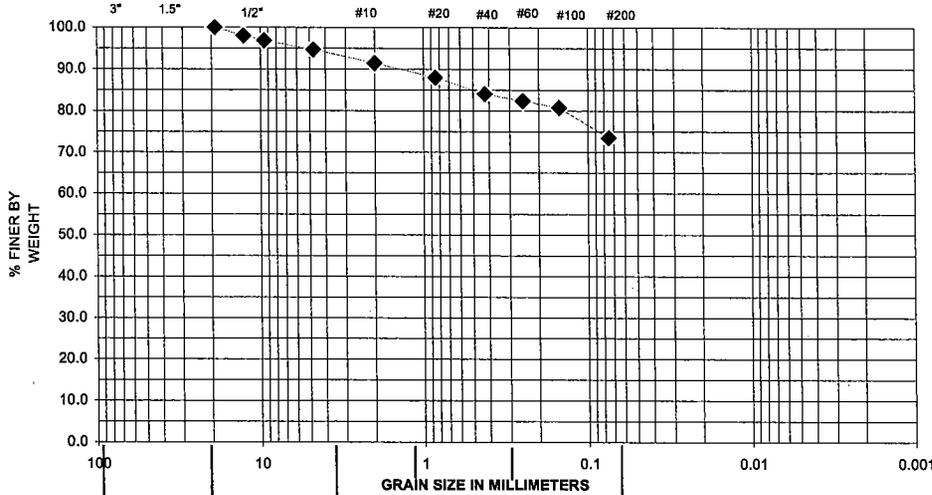
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A8
SAMPLE NO/ DEPTH	A8-5 (-25.0' - 26.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	5.3	USC:	SM
% SAND:	21.2	FC:	
% SILT/CLAY:	73.5	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		18.2	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



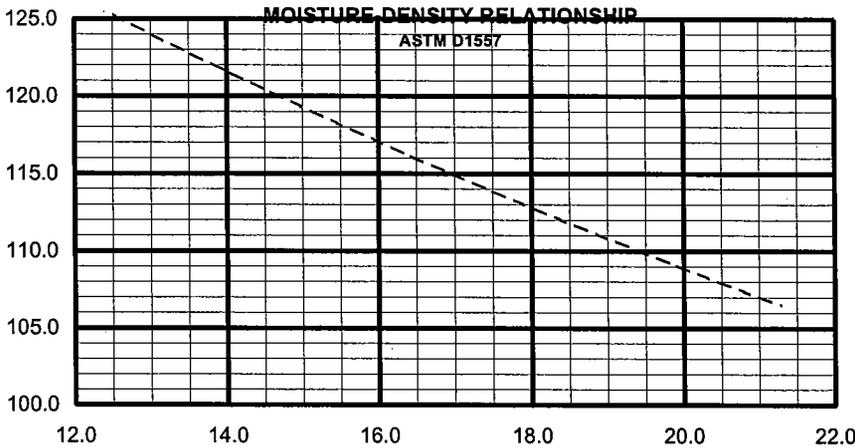
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"	100	
12.7	1/2"	98	
9.5	3/8"	97	
4.75	# 4	95	
2	#10	91	
0.85	#20	88	
0.425	#40	84	
0.25	# 60	82	
0.015	#100	81	
0.075	#200	73.5	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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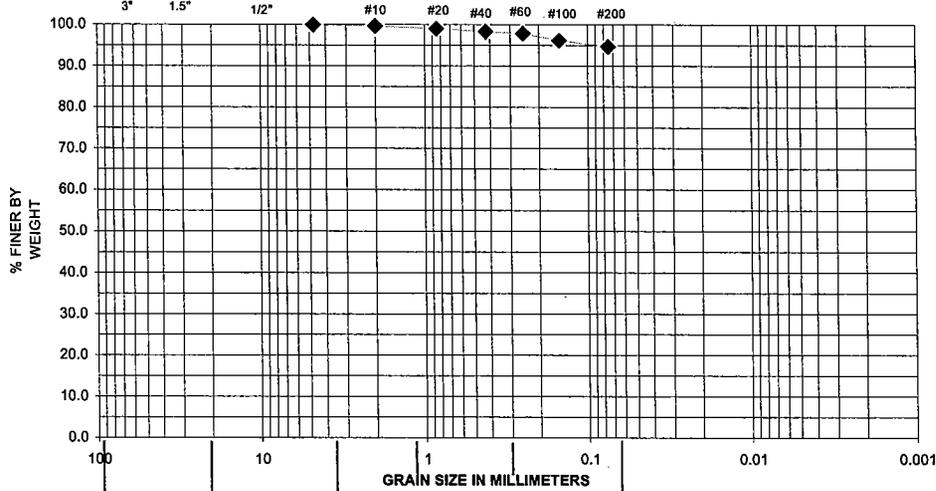
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	<b>COE - Alaska District</b>
PROJECT NAME:	<b>Barrow Storm Damage Reduction</b>
PROJECT NO.:	<b>COE 1594</b>
SAMPLE LOCATION:	<b>A8</b>
SAMPLE NO/ DEPTH	<b>A8-6 (-30.0' - 31.5' Depth)</b>
DESCRIPTION:	<b>Silt</b>
DATE TESTED:	<b>08/28/04</b>
TESTED BY:	<b>D.P.</b>
REVIEWED BY:	<b>Ron Caron C.E.T. / T. Selmer</b>

% GRAVEL:	<b>0.0</b>	USC:	<b>ML</b>
% SAND:	<b>5.3</b>	FC:	
% SILT/CLAY:	<b>94.7</b>	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		<b>26.7</b>	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



### SIEVE ANALYSIS RESULT

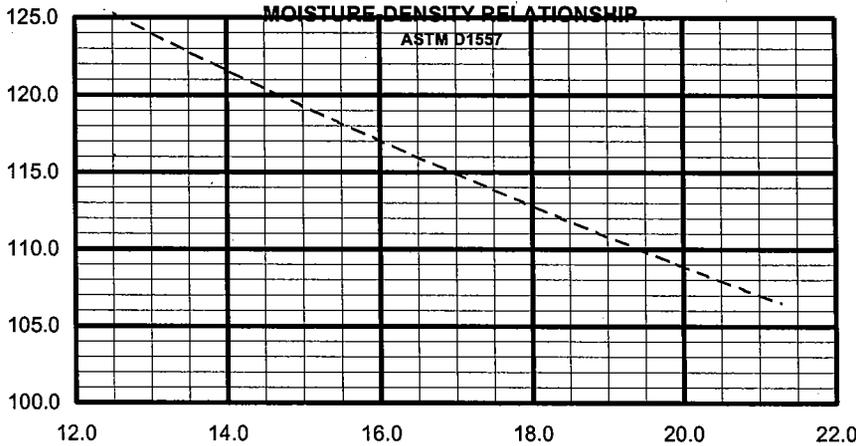
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	<b>100</b>	
2	#10	<b>100</b>	
0.85	#20	<b>99</b>	
0.425	#40	<b>98</b>	
0.25	# 60	<b>98</b>	
0.015	#100	<b>96</b>	
0.075	#200	<b>94.7</b>	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	



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Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

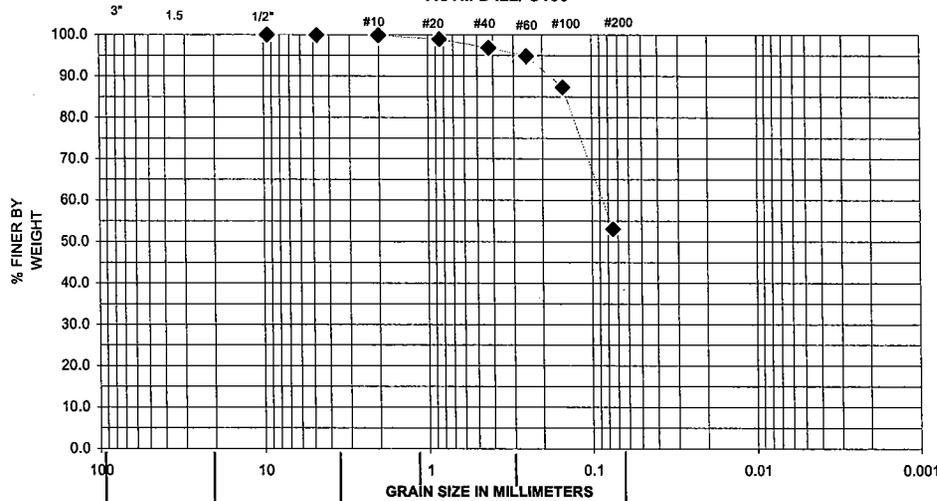
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A5
SAMPLE NO/ DEPTH	A5-1 (-5.0' - 6.5' Depth)
DESCRIPTION:	Sandy Silt
DATE TESTED:	08/24/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	46.9	FC:	
% SILT/CLAY:	53.1	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		24.7	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



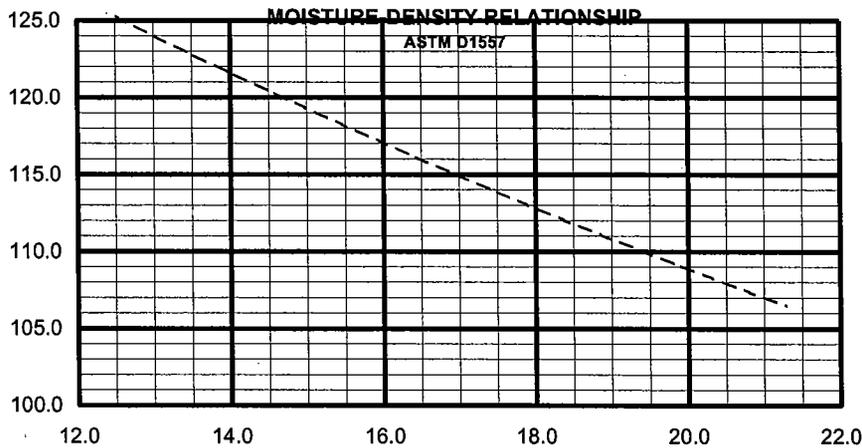
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	97	
0.25	# 60	95	
0.015	#100	87	
0.075	#200	53.1	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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801 East 82nd Avenue, #A-9  
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Laboratory Testing / Construction Monitoring

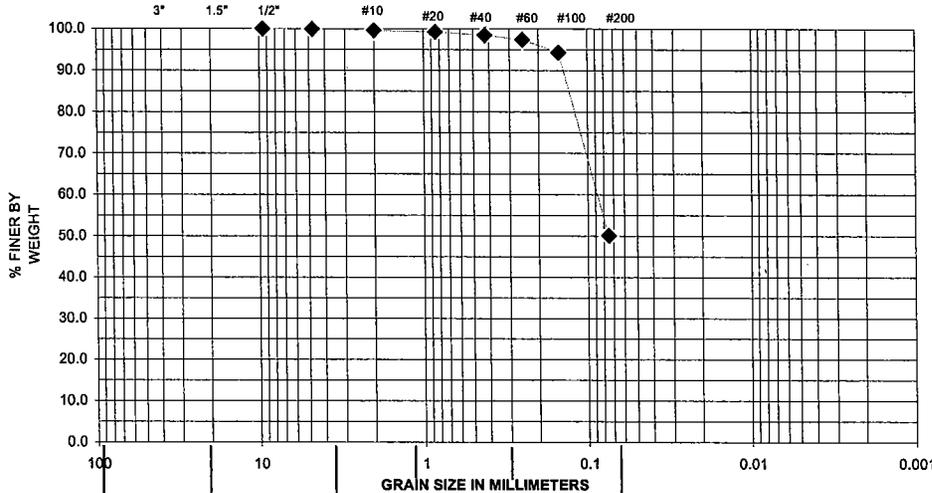
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A5
SAMPLE NO/ DEPTH	A5-2 (-10.0' - 11.5' Depth)
DESCRIPTION:	Sandy Silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.1	USC:	ML
% SAND:	49.8	FC:	
% SILT/CLAY:	50.1	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		24.3	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	98	
0.25	# 60	97	
0.075	#100	94	
0.075	#200	50.1	

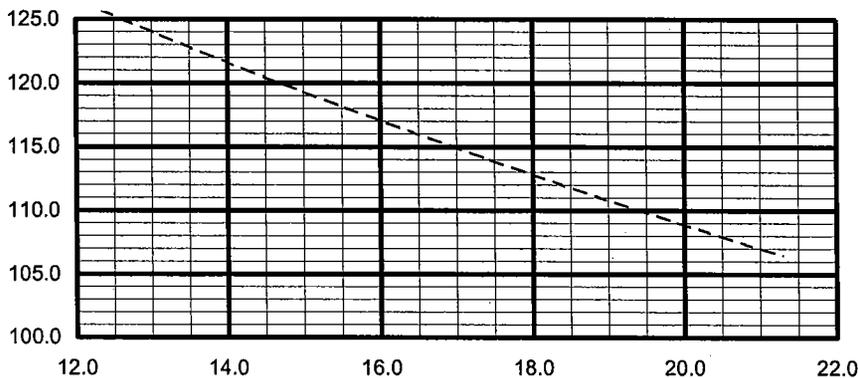
COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

### MOISTURE-DENSITY RELATIONSHIP

ASTM D1557



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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801 East 82nd Avenue, #A-9  
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Laboratory Testing / Construction Monitoring

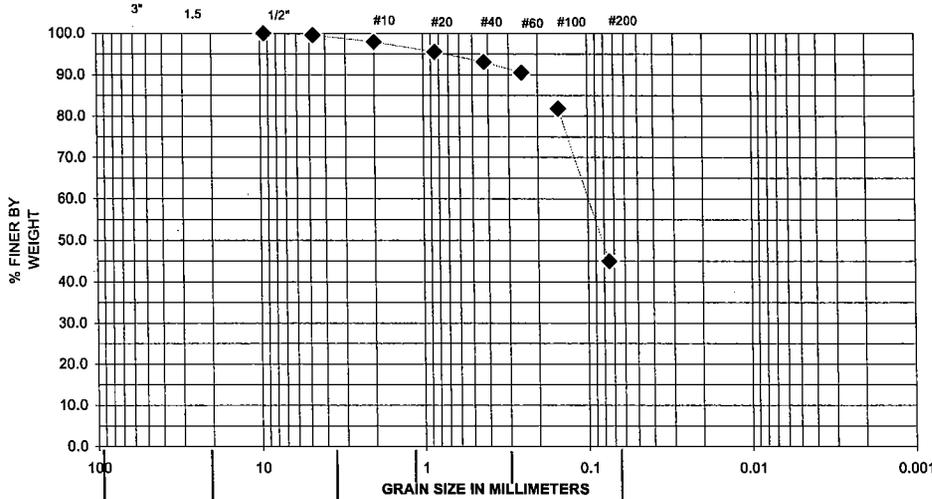
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A5
SAMPLE NO/ DEPTH	A5-3 (-15.0' - 16.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	08/24/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.5	USC:	SM
% SAND:	54.5	FC:	
% SILT/CLAY:	45.0	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		27.8	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



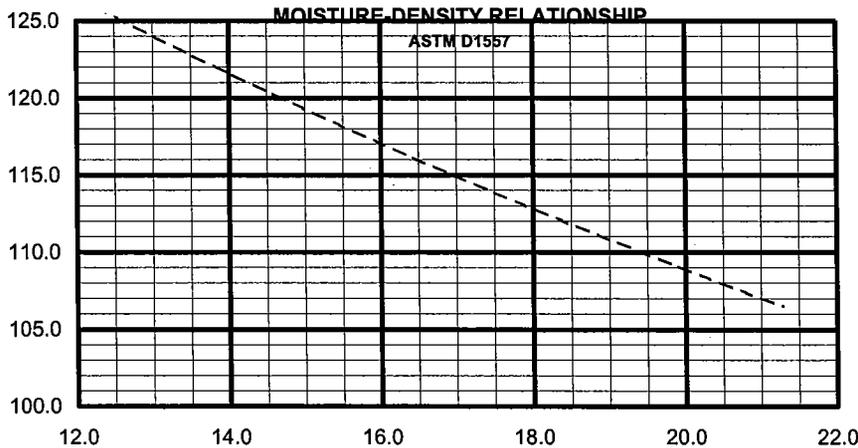
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	98	
0.85	#20	96	
0.425	#40	93	
0.25	# 60	91	
0.075	#100	82	
0.075	#200	45.0	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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Laboratory Testing / Construction Monitoring

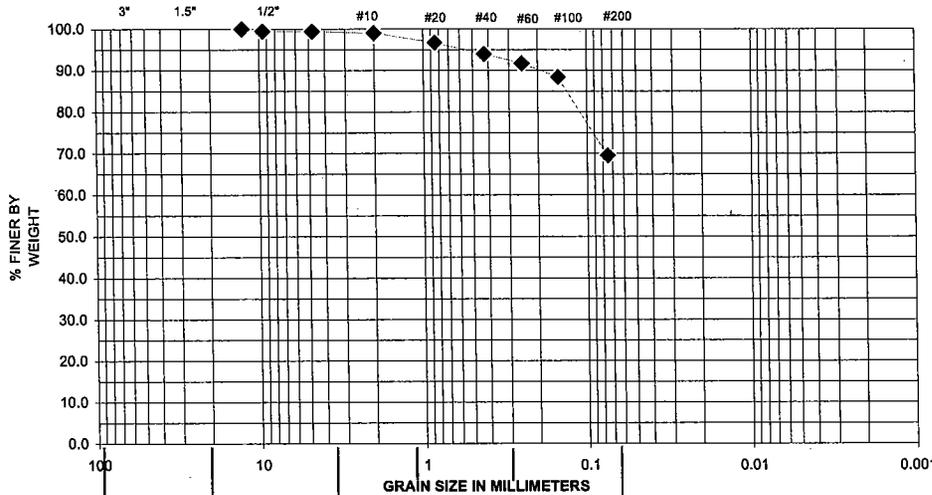
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A5
SAMPLE NO/ DEPTH	A5-4 (-20.0' - 21.5' Depth)
DESCRIPTION:	Sandy silt
DATE TESTED:	08/24/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.6	USC:	ML
% SAND:	29.9	FC:	
% SILT/CLAY:	69.5	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		29.3	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



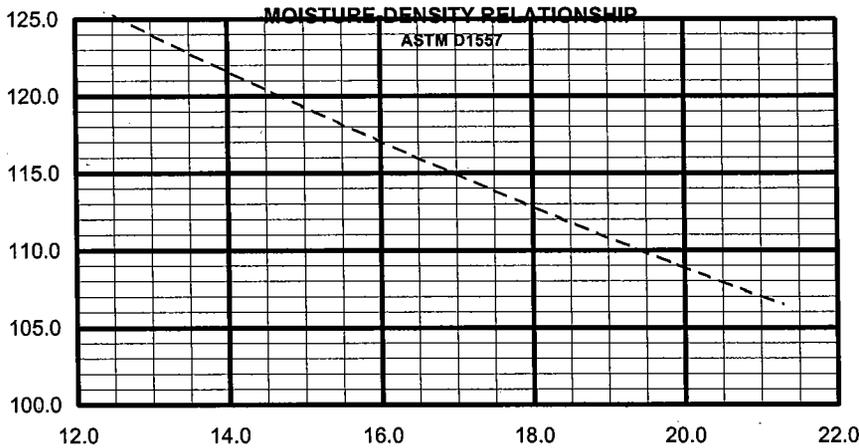
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"	100	
9.5	3/8"	99	
4.75	# 4	99	
2	#10	99	
0.85	#20	97	
0.425	#40	94	
0.25	# 60	92	
0.015	#100	88	
0.075	#200	69.5	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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801 East 82nd Avenue, #A-9  
Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

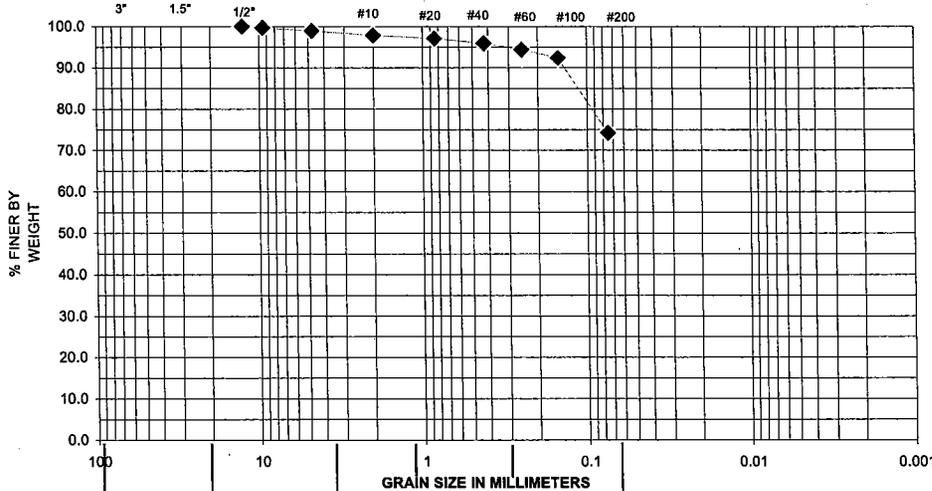
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A5
SAMPLE NO/ DEPTH	A5-5 (-25.0' - 26.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	1.0	USC:	SM
% SAND:	24.8	FC:	
% SILT/CLAY:	74.2	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		29.9	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



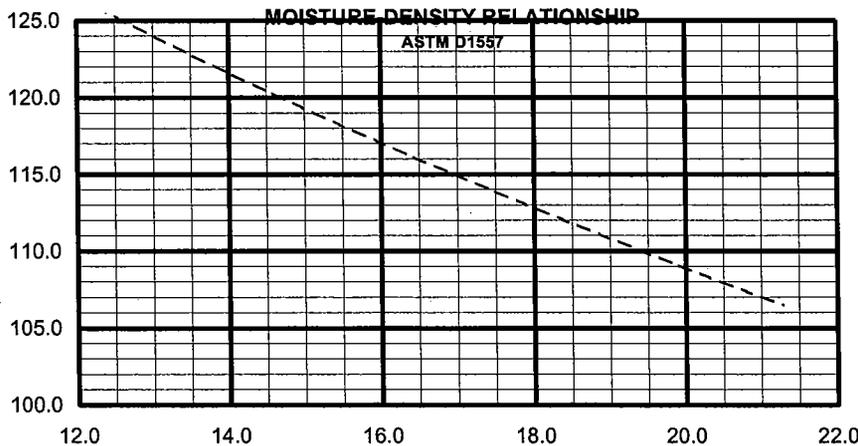
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"	100	
9.5	3/8"	100	
4.75	# 4	99	
2	#10	98	
0.85	#20	97	
0.425	#40	96	
0.25	# 60	94	
0.015	#100	92	
0.075	#200	74.2	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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Laboratory Testing / Construction Monitoring

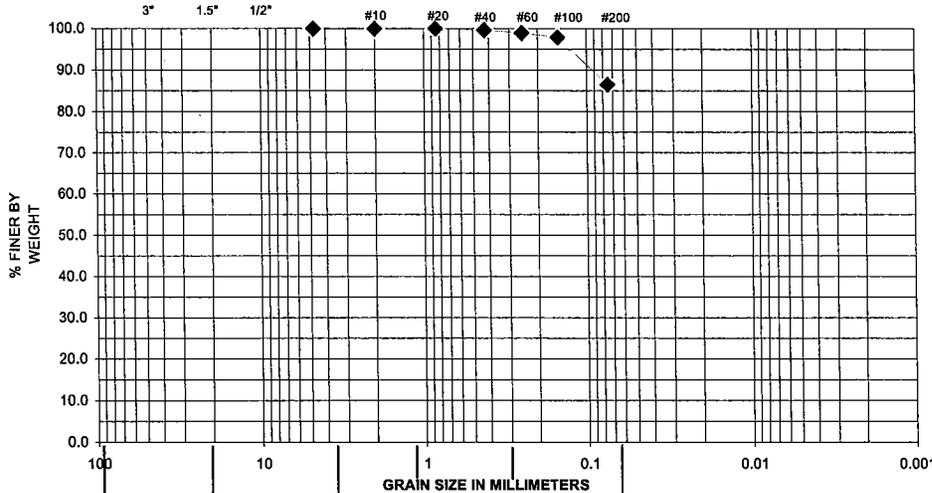
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A5
SAMPLE NO/ DEPTH	A5-6 (-30.0' - 31.5' Depth)
DESCRIPTION:	Silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	13.5	FC:	
% SILT/CLAY:	86.5	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		27.6	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



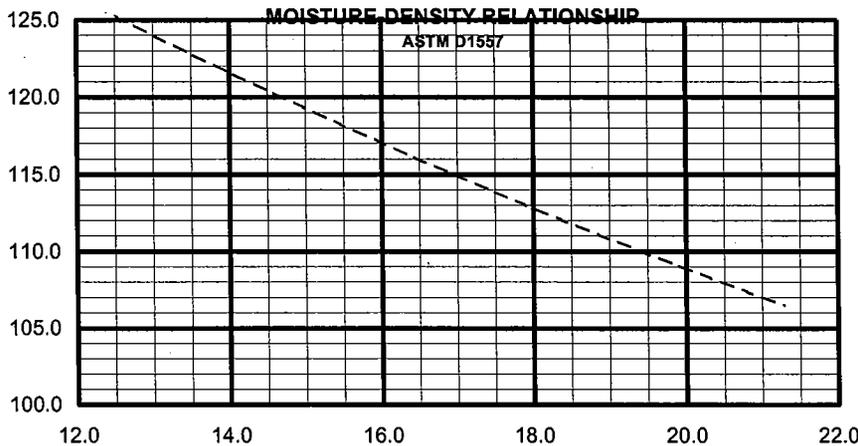
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	100	
0.25	# 60	99	
0.015	#100	98	
0.075	#200	86.5	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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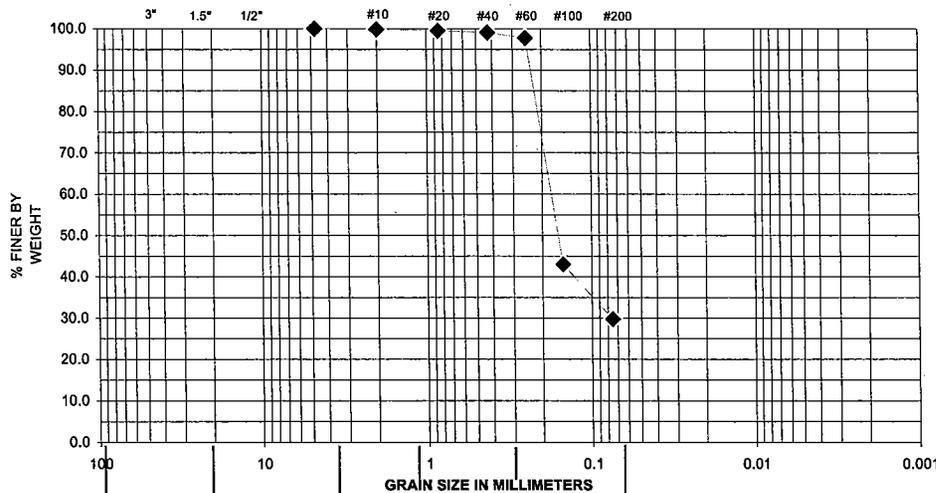
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Valdez Harbor Lab Testing
PROJECT NO.:	COE 1583
SAMPLE LOCATION:	TB5
SAMPLE NO/ DEPTH	TB5-5a (-5.0' - 6.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	SM
% SAND:	70.3	FC:	
% SILT/CLAY:	29.7	.02 mm:	
ASTM D1557 (uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		13.3	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



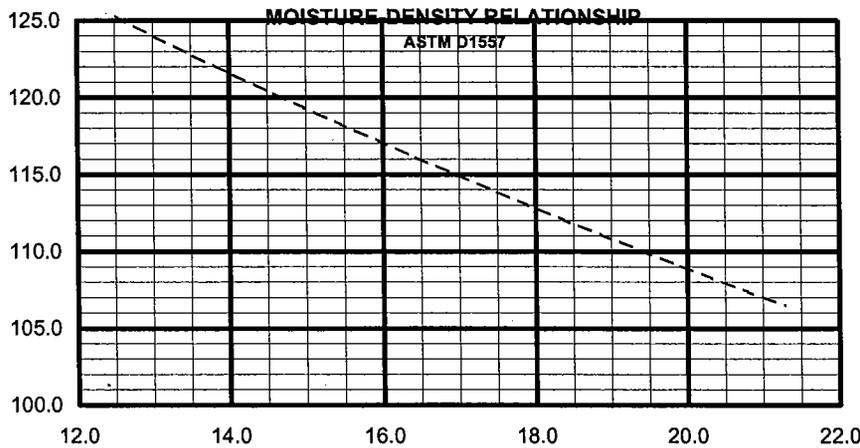
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	99	
0.25	# 60	98	
0.015	#100	43	
0.075	#200	29.7	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit (ASTM 4318)	

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Laboratory Testing / Construction Monitoring

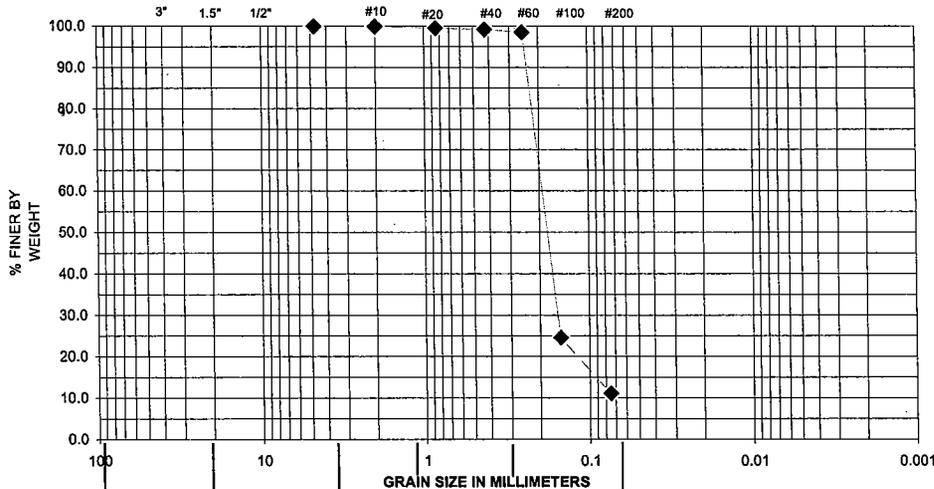
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Valdez Harbor Lab Testing
PROJECT NO.:	COE 1583
SAMPLE LOCATION:	TB5
SAMPLE NO/ DEPTH	TB5-S2 (-10.0' - 11.5' Depth)
DESCRIPTION:	Poorly grd. sand w/ silt.
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	SP-SM
% SAND:	88.9	FC:	
% SILT/CLAY:	11.1	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		20.3	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



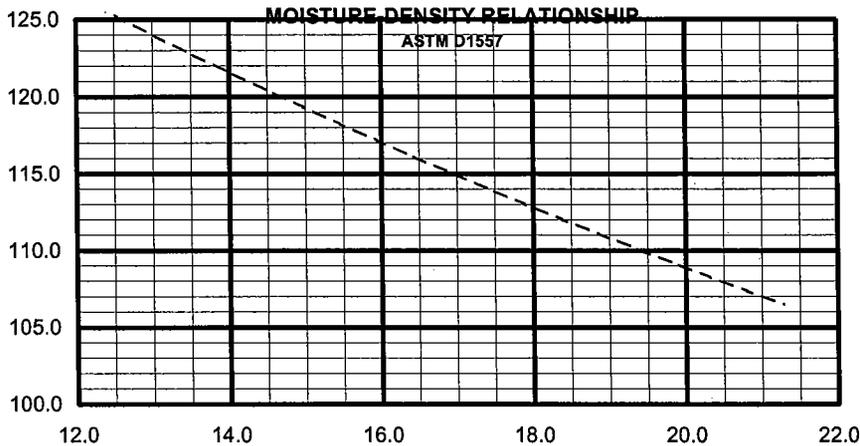
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	99	
0.25	# 60	99	
0.015	#100	25	
0.075	#200	11.1	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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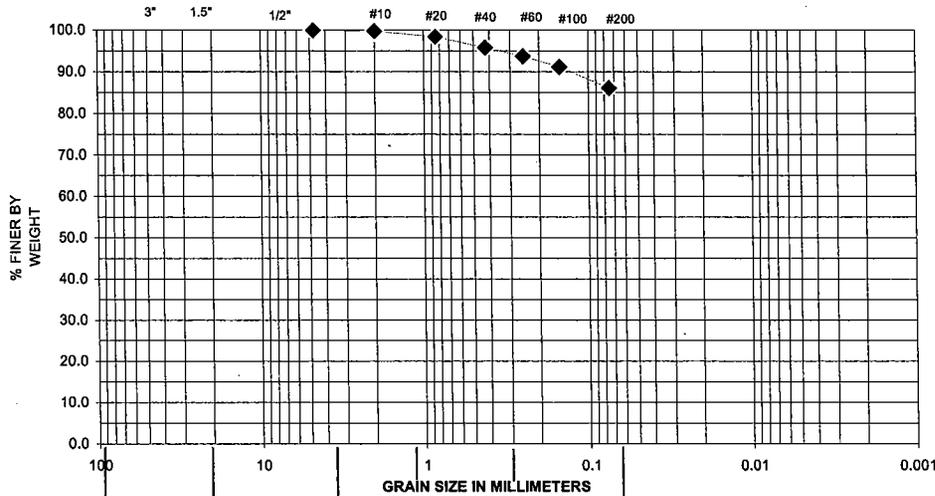
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A11
SAMPLE NO/ DEPTH	A11-2 (-10.0' - 11.5' Depth)
DESCRIPTION:	Silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	13.9	FC:	
% SILT/CLAY:	86.1	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C.%(corrected)			
NATURAL M.C. %		36.5	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



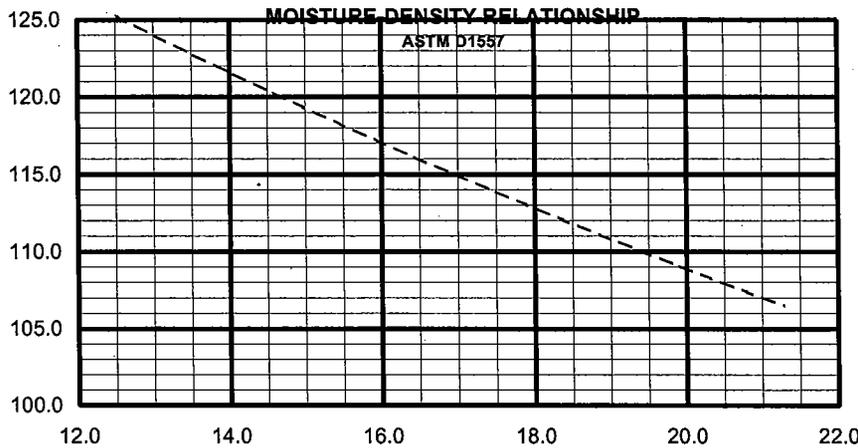
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	98	
0.425	#40	96	
0.25	# 60	94	
0.015	#100	91	
0.075	#200	86.1	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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Laboratory Testing / Construction Monitoring

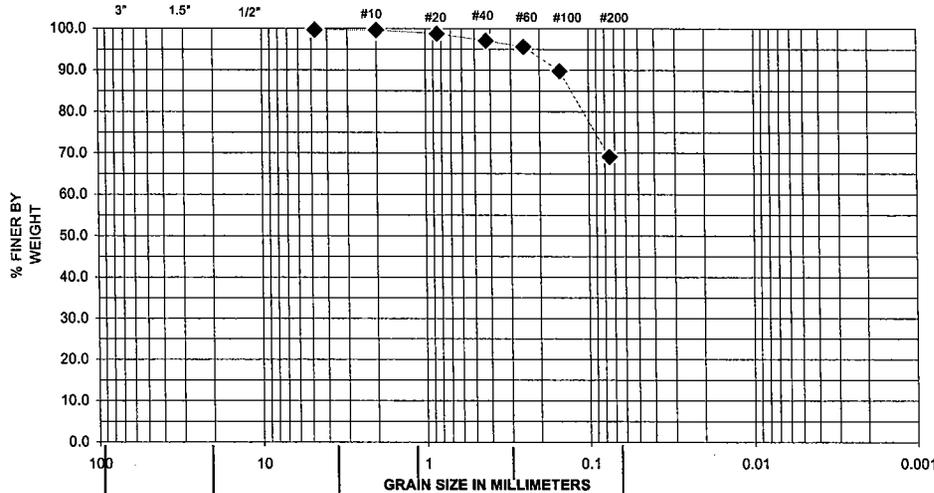
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A11
SAMPLE NO/ DEPTH	A11-3 (-15.0.0' -16.5' Depth)
DESCRIPTION:	Sandy silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.3	USC:	ML
% SAND:	30.6	FC:	
% SILT/CLAY:	69.1	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		26.5	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



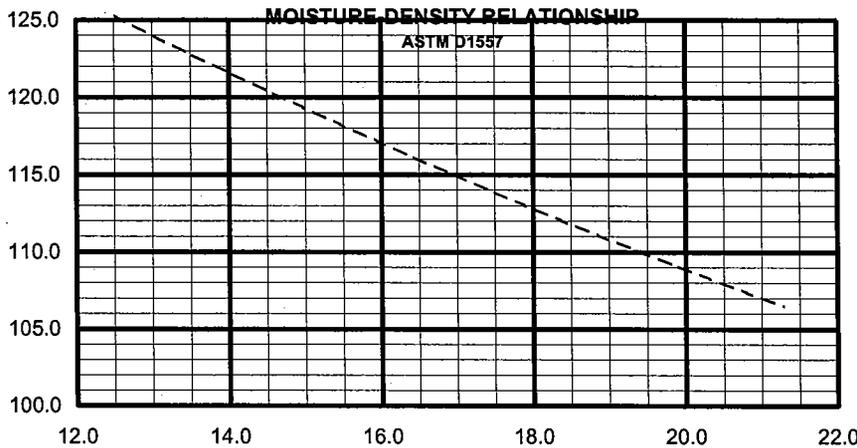
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	97	
0.25	# 60	96	
0.015	#100	90	
0.075	#200	69.1	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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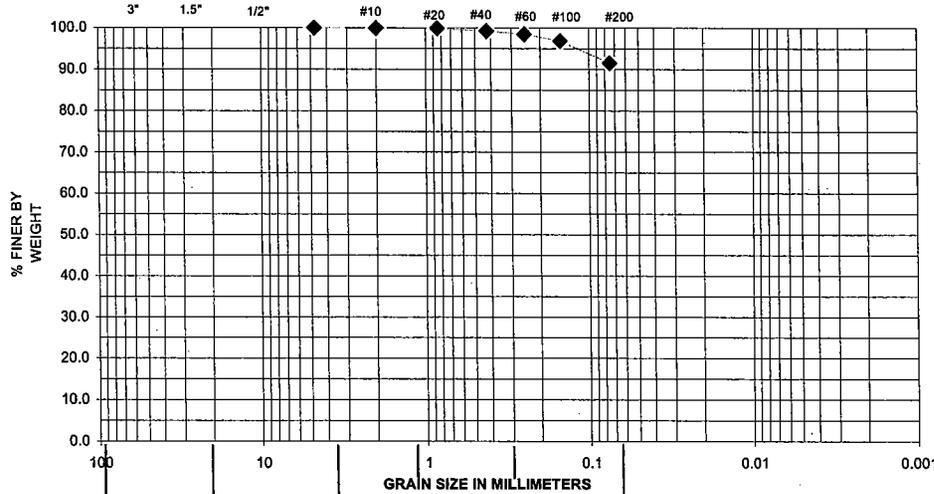
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A11
SAMPLE NO/ DEPTH	A11-4 (-20.0.0' -21.5' Depth)
DESCRIPTION:	Silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	8.5	FC:	
% SILT/CLAY:	91.5	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C.%(corrected)			
NATURAL M.C. %		32.5	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



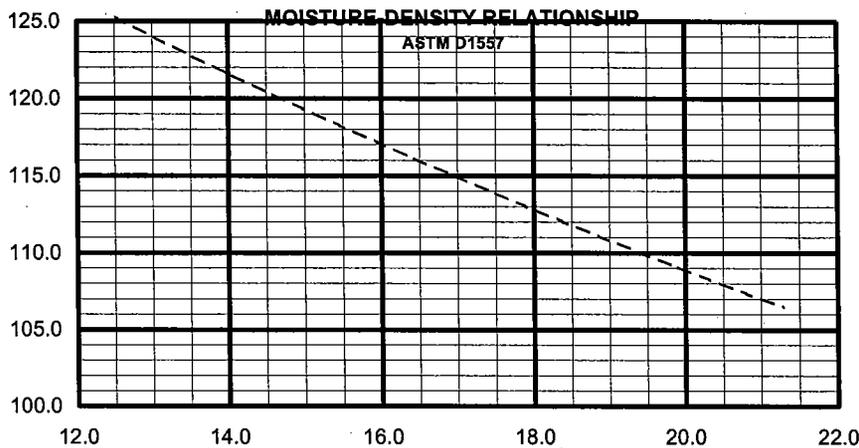
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	99	
0.25	# 60	99	
0.015	#100	97	
0.075	#200	91.5	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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Laboratory Testing / Construction Monitoring

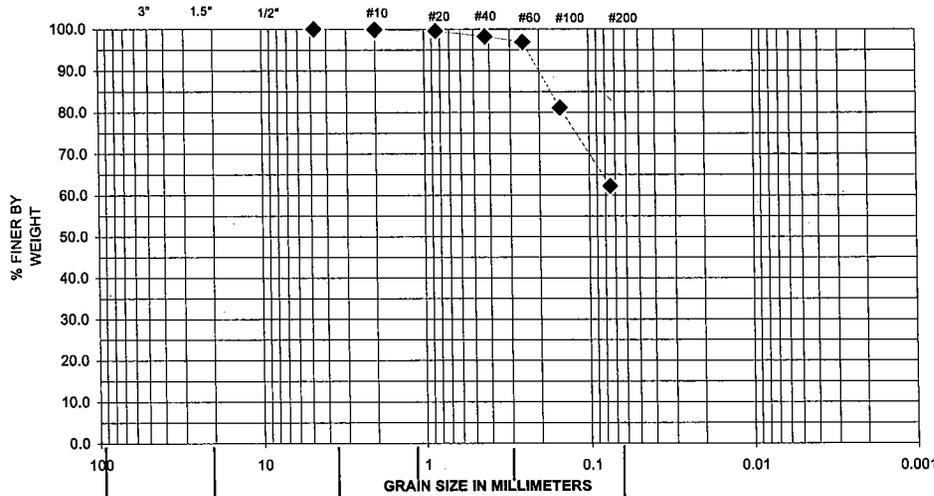
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A11
SAMPLE NO/ DEPTH	A11-5 (-25.0.0' -26.5' Depth)
DESCRIPTION:	Sandy silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	37.7	FC:	
% SILT/CLAY:	62.3	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C.%(corrected)			
NATURAL M.C. %		19.7	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



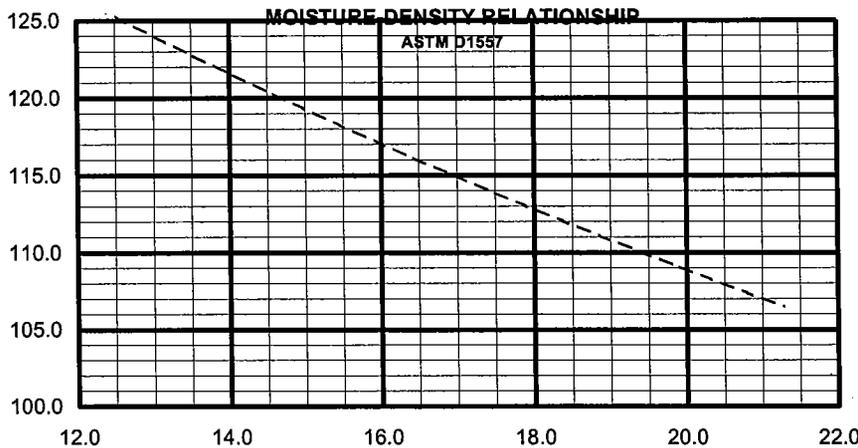
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	98	
0.25	# 60	97	
0.075	#100	81	
0.075	#200	62.3	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

The testing services reported herein have been performed to recognized industry standards, unless otherwise noted. No other warranty is made. Should engineering interpretation or opinion be required, TFI will provide upon written request.

801 East 82nd Avenue, #A-9  
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# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

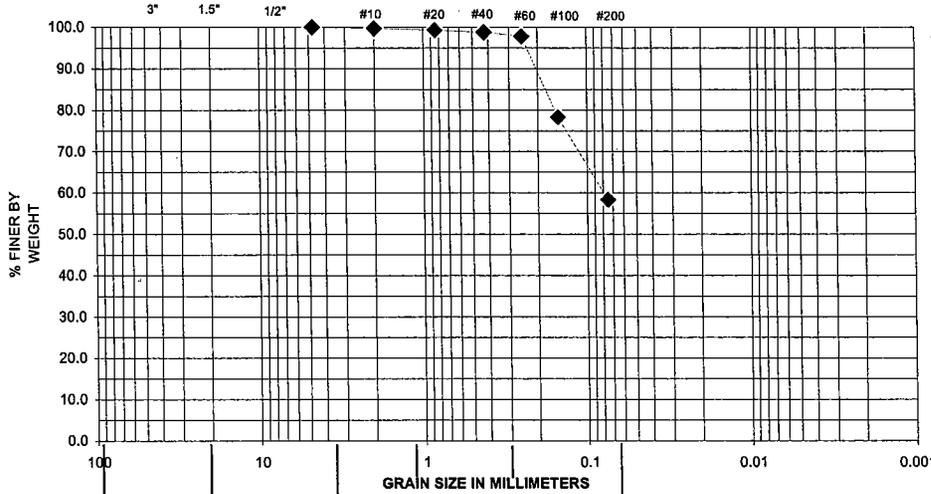
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A11
SAMPLE NO/ DEPTH	A11-6 (-30.0' -31.5' Depth)
DESCRIPTION:	Sandy silt
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	41.7	FC:	
% SILT/CLAY:	58.3	.02 mm:	
ASTM D1557 (uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		25.3	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



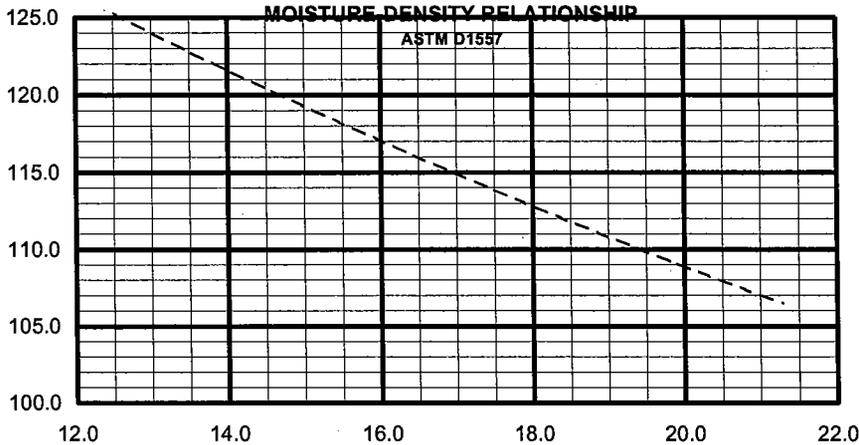
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	99	
0.25	# 60	98	
0.075	#100	78	
0.075	#200	58.3	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit (ASTM 4318)	

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801 East 82nd Avenue, #A-9  
Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

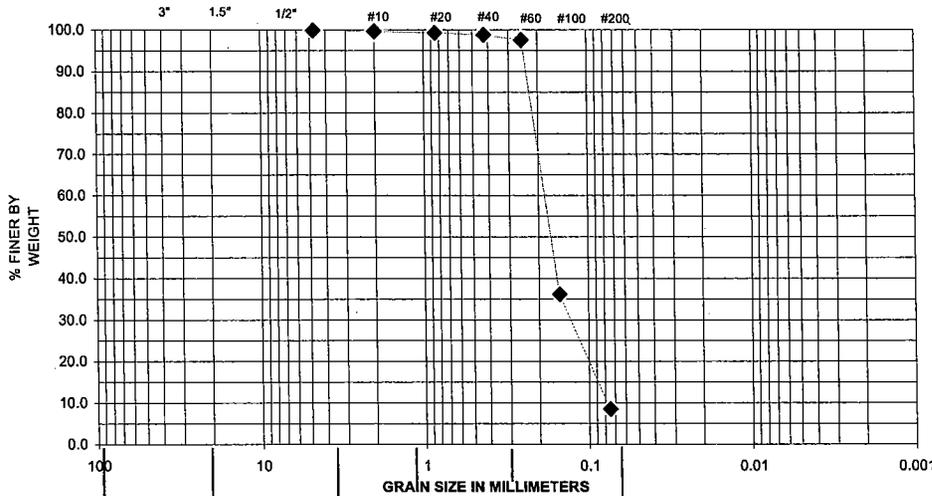
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1549
SAMPLE LOCATION:	A11
SAMPLE NO/ DEPTH	A11-7 (-31.5' -33.0' Depth)
DESCRIPTION:	Poorly grd. sand w/ silt.
DATE TESTED:	08/28/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.1	USC:	SP-SM
% SAND:	91.5	FC:	
% SILT/CLAY:	8.4	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		19.2	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



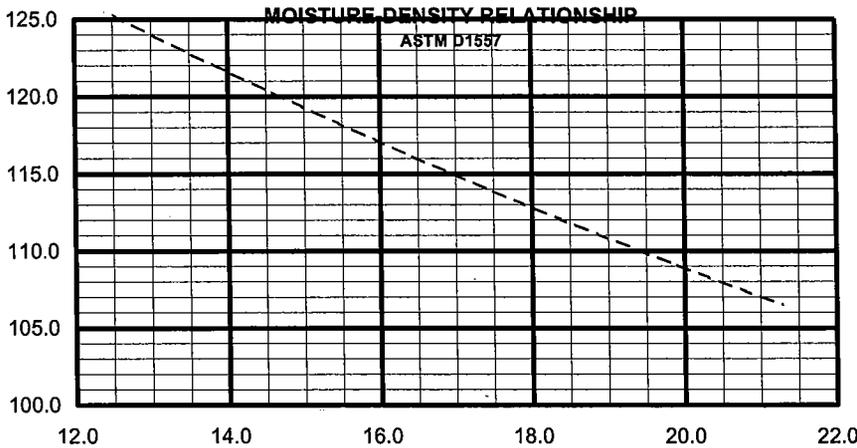
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	99	
0.25	# 60	98	
0.015	#100	36	
0.075	#200	8.4	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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Laboratory Testing / Construction Monitoring

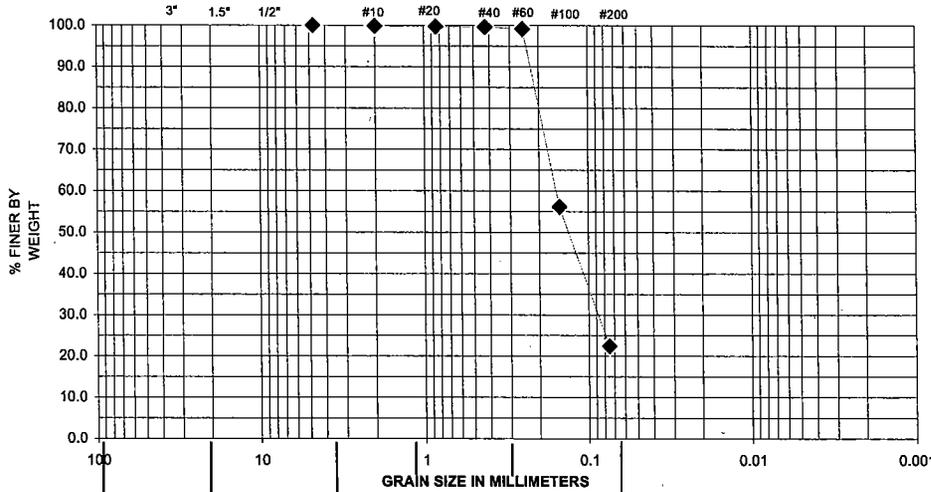
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A1
SAMPLE NO/ DEPTH	A1-1 (-7.0' - 8.5' Depth)
DESCRIPTION:	Silty sand.
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	SM
% SAND:	77.6	FC:	
% SILT/CLAY:	22.4	.02 mm:	
ASTM D1557 (uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		20.9	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



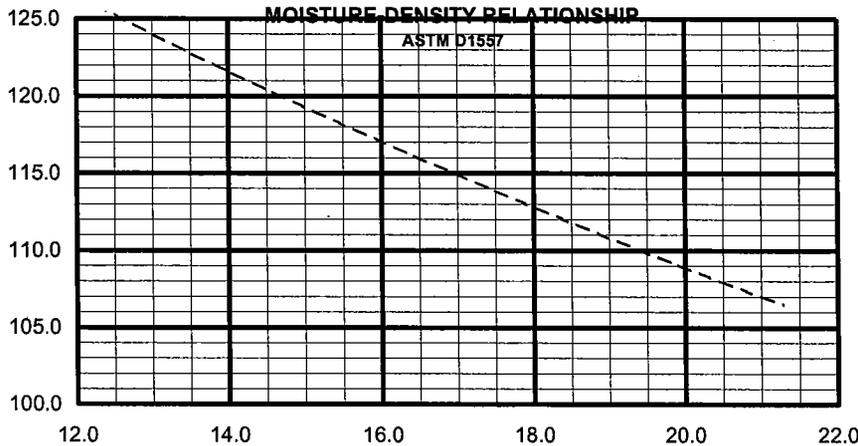
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	100	
0.25	# 60	99	
0.015	#100	56	
0.075	#200	22.4	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit (ASTM 4318)	

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Anchorage, AK 99518

# TERRA FIRMA INC.

Laboratory Testing / Construction Monitoring

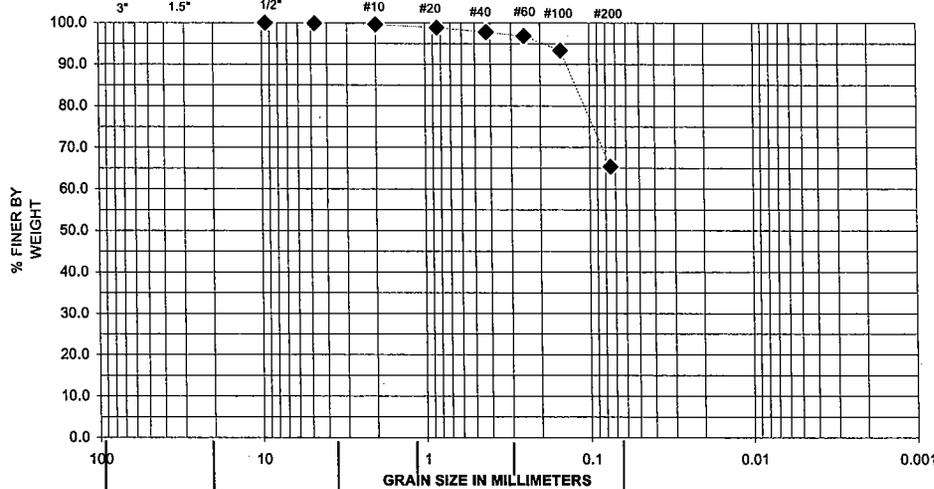
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	CPE 1594
SAMPLE LOCATION:	A1
SAMPLE NO/ DEPTH	A1-2 (-12.0' - 13.5' Depth)
DESCRIPTION:	Sandy Silt
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.1	USC:	M:
% SAND:	34.5	FC:	
% SILT/CLAY:	65.4	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		19.6	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



### SIEVE ANALYSIS RESULT

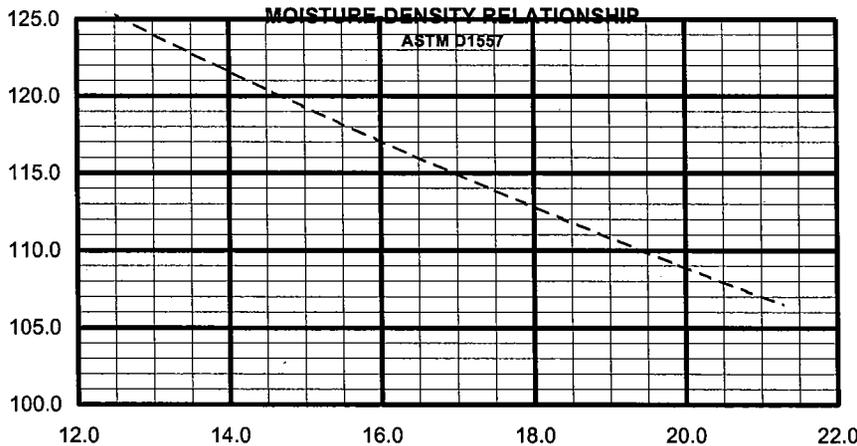
SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	98	
0.25	# 60	97	
0.015	#100	93	
0.075	#200	65.4	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		

Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	



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Laboratory Testing / Construction Monitoring

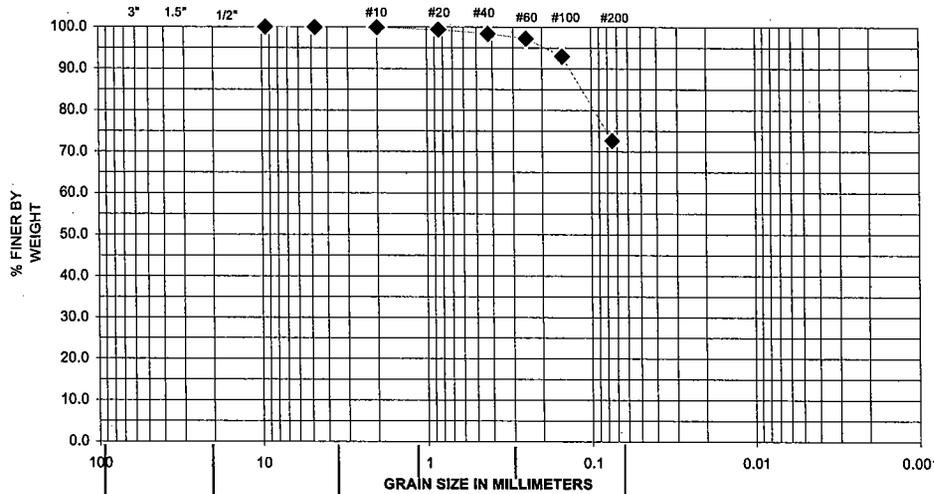
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A1
SAMPLE NO/ DEPTH	A1-3 (-17.0' - 18.5' Depth)
DESCRIPTION:	Silt w/ sand
DATE TESTED:	8/24/2004
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	27.3	FC:	
% SILT/CLAY:	72.7	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		20.5	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



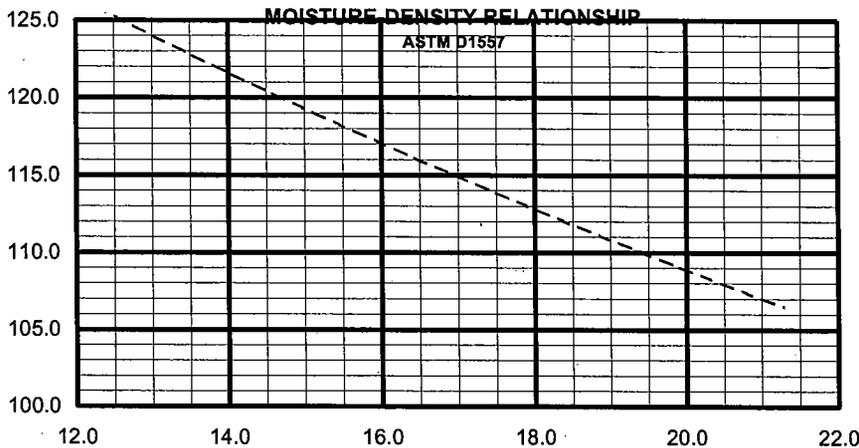
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"	100	
4.75	# 4	100	
2	#10	100	
0.85	#20	99	
0.425	#40	98	
0.25	# 60	97	
0.015	#100	93	
0.075	#200	72.7	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit (ASTM 4318)	

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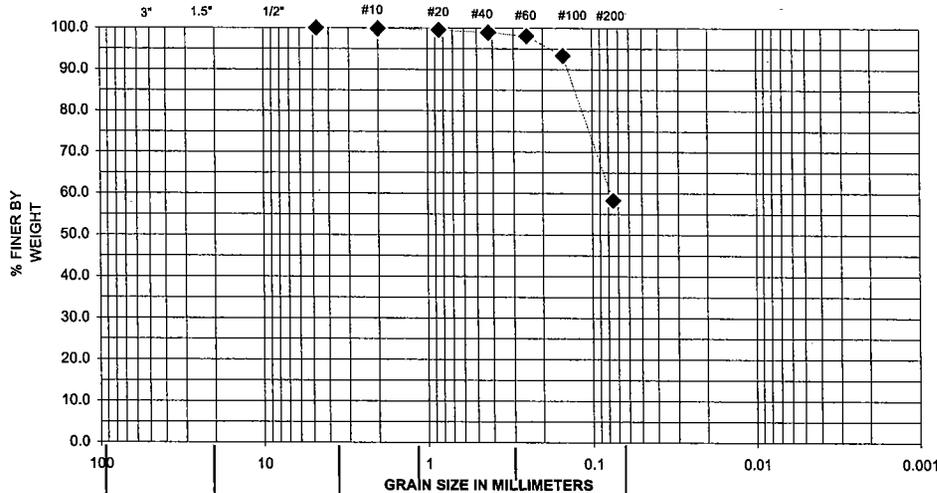
Telephone: (907) 344-5934  
Fax: (907) 344-5993  
terrafirma@alaska.com

PROJECT CLIENT:	COE - Alaska District
PROJECT NAME:	Barrow Storm Damage Reduction
PROJECT NO.:	COE 1594
SAMPLE LOCATION:	A1
SAMPLE NO/ DEPTH	A1-4 (-22.0' - 23.5' Depth)
DESCRIPTION:	Sandy Silt
DATE TESTED:	08/24/04
TESTED BY:	D.P.
REVIEWED BY:	Ron Caron C.E.T. / T. Selmer

% GRAVEL:	0.0	USC:	ML
% SAND:	41.7	FC:	
% SILT/CLAY:	58.3	.02 mm:	
ASTM D1557(uncorrected)		pcf	
ASTM D4718 (corrected)		pcf	
OPTIMUM M.C. % (corrected)			
NATURAL M.C. %		17.9	

### PARTICLE SIZE ANALYSIS

ASTM D422/ C136



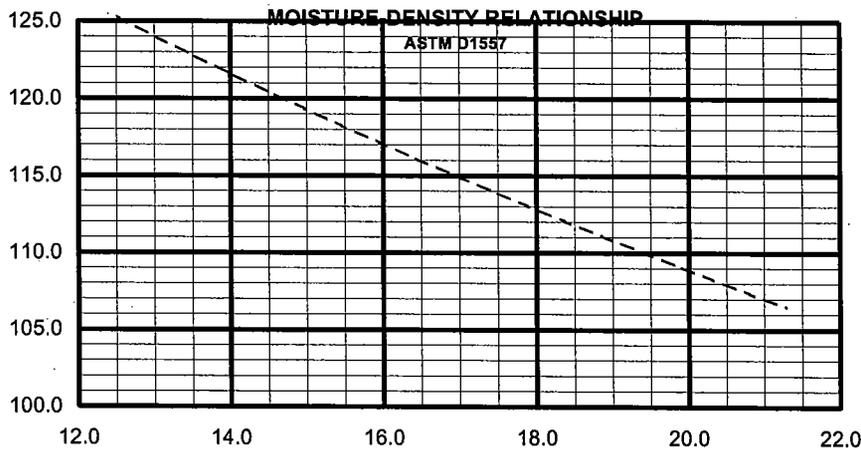
### SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (in.)	TOTAL % PASSING	SPEC
152.4	6"		
76.2	3"		
38.1	1.5"		
19.05	3/4"		
12.7	1/2"		
9.5	3/8"		
4.75	# 4	100	
2	#10	100	
0.85	#20	100	
0.425	#40	99	
0.25	# 60	98	
0.015	#100	93	
0.075	#200	58.3	

COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

### HYDROMETER RESULT

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
1440		



Perm. (ASTM D2438)	
Degradation (ATM T-13)	
Atterberg Limit ASTM 4318	

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