APPENDIX H

REPORT OF OFFSHORE SAMPLING DREDGE AREA IR SITE 7, NORTH SLIP FILL AT PIER G, BERTHS G230-G236, PORT OF LONG BEACH, CA, DATED DECEMBER 17, 2007 BY KLEINFELDER

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December 17, 2007
Revised May 22, 2008
File No. 72500

Mr. Nicholas C. Kozma, P.E.
Senior Program Manager
Port of Long Beach
925 Harbor Plaza
Long Beach, California 90802

Subject: Report of Offshore Sampling
Dredge Area IR Site 7
North Slip Fill at Pier G, Berths G230-G236
Port of Long Beach, California

Dear Mr. Kozma:

Kleinfelder is pleased to present this report summarizing our offshore sampling performed at the Area IR Site 7, generally located within West Basin and Middle Harbor, south of Pier T and west of Pier D within Long Beach Harbor.

We appreciate the opportunity to be of service on this project. If you have any questions, comments, or require additional information, please do not hesitate to contact the undersigned.

Respectfully submitted,

KLEINFELDER

Mariusz P. Sieradzki, Ph.D., P.E.
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
MARIUSZ P. SIERADZKI
No. C 56925
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Senior Principal Engineer

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1 INTRODUCTION

1.1. GENERAL

Kleinfelder was retained by the Port of Long Beach to conduct an offshore sampling at the Area IR Site 7, located within Long Beach Harbor, south of Pier T and west of Pier D. The location of the site is presented on Plate 1, Borings and Vibrocores Location Map. The scope of our services for this project was presented in our proposal entitled, "Proposal and Cost Estimate to Perform Geotechnical Investigation, Dredge Area IR Site 7, North Slip Fill, Port of Long Beach, California", dated March 19, 2007.

1.2. PURPOSE AND SCOPE OF SERVICES

The purpose of our services was to obtain and test sediments samples at selected locations and evaluate the soils for the proposed hydraulic fill planned to be used for the future North Slip Fill at Pier G, Berths G230-G236 Terminal Redevelopment site. Target locations of our exploratory points were selected by the Port's civil engineering consultant, Moffatt & Nichol. A description of the scope of services is presented below.

1.2.1. Offshore Sampling

Six borings identified as 1 through 6 were advanced on April 25 through April 27, 2007 in the Middle Harbor Area to a maximum depth of approximately 21 feet below mudline. Drilling was performed utilizing a rotary wash drill rig and vessel with four-point anchoring provided by our subcontractor Gregg Drilling. Soil samples were collected every five (5) feet using Standard Penetrometer Test (SPT) sampler. Bentonite mud was used to maintain stability of borehole during drilling. In addition, ten (10) borings identified as 7 through 16 were conducted on April 30 and May 1, 2007 within the Area AOEC C to depths ranging from approximately 10 to 14 feet below mudline using an Alpine vibracore system equipped with a 20-foot core barrel and provided by MEC Weston Solutions. The core barrel was lined with a continuous, 3-inch diameter, clear plastic sleeve. A continuous soil sample was collected within this liner. The liner was placed in a holding box and split to allow for logging and sample collection.

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The rotary wash and vibracore samples were logged by a Kleinfelder engineer, using the Unified Soil Classification system. Samples of representative earth materials were obtained from the borings and cores and submitted to the laboratory for testing. Following completion of our offshore sampling, each borehole was surveyed by The Port of Long Beach survey crew.

The locations of the rotary wash and vibracore sampling are shown on Plate 1, Borings and Vibrocores Location Map. The borings and vibracore logs are presented in Appendix A.

1.2.2. Laboratory Testing

Laboratory testing was performed on representative soil samples to substantiate offshore visual classification. Testing consisted grain size distribution and plasticity index. The results of laboratory tests are presented in Appendix B.

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2 FINDINGS

The soils encountered during our offshore sampling within the Middle Harbor area generally consisted of silty sand, sandy silt, sand with silt and occasionally sandy clay within the upper 15 feet below the sea floor and underlain by sandy clay, clay with sand and occasionally by silt with sand and silty sand to the maximum explored depth of approximately 21 feet. Generalized cross section A-A' within the Middle Harbor area is shown on Plate 2. Surficial layer approximately 2 to 4 feet thick of soft sandy clay and silt was encountered below mudline in majority of vibrocores advanced within the area AOEC C (West Basin site) and generally underline by silty sand, sand with silt and sand to the maximum explored depths of 10 to 14 feet below the sea floor. Cross sections B-B' and C-C' showing general soil conditions founded within area AOEC C are presented on Plates 3 and 4. For more details and information pertaining to the soils encountered please refer to Logs of Borings included in Appendix A and laboratory test results presented in Appendix B.

Locations of each exploratory boring/vibrocore along with the depths of penetration are summarized in the Table 1.

TABLE 1

DESCRIPTION OF BORINGS/VIBRACORES

Exploratory Point	Sampling Technique	Northing (feet)	Easting (feet)	Sea Floor Elevation (approx. feet, MLLW)	Penetration (feet)
1	Rotary Wash	4020893.0	4221607.1	-70	21.5
2	Rotary Wash	4021220.8	42216371	-73	21.5
3	Rotary Wash	4021496.9	4221122.5	-67	21.5
4	Rotary Wash	4021599.1	4221446.8	-69	21.5
5	Rotary Wash	4022117.7	4221789.9	-74	21.5
6	Rotary Wash	4022456.0	4222006.4	-77	21.5
7	Vibrocore	4019407.3	4219157.2	-49	14.0
8	Vibrocore	4019148.4	4219017.0	-46	13.5
9	Vibrocore	4018995.6	4218624.9	-47	10.0
10	Vibrocore	4019235.1	4218135.5	-50	12.5
11	Vibrocore	4018896.9	4218105.7	-48	13.7
12	Vibrocore	4019153.4	4217300.0	-44	11.0
13	Vibrocore	4019416.6	4217273.1	-50	12.0
14	Vibrocore	4019508.3	4216974.0	-47	13.3
15	Vibrocore	4019450.5	4216436.5	-47	13.3
16	Vibrocore	4019202.9	4216353.8	-46	11.0

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3 LIMITATIONS

Our services were accomplished in accordance with generally accepted geotechnical engineering practice common to the local area. No other warranty, express or implied, is made.

The scope of our geotechnical services did not include any environmental soils assessment for the presence or absence of hazardous/toxic materials.

The contents of this report are based on the data obtained from the referenced subsurface explorations. The offshore samples indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between exploration locations. Subsurface conditions at other locations may differ from conditions occurring at the indicated locations. The passage of time may result in changes in conditions at these locations due to active erosional, depositional, seismic, or human factors.

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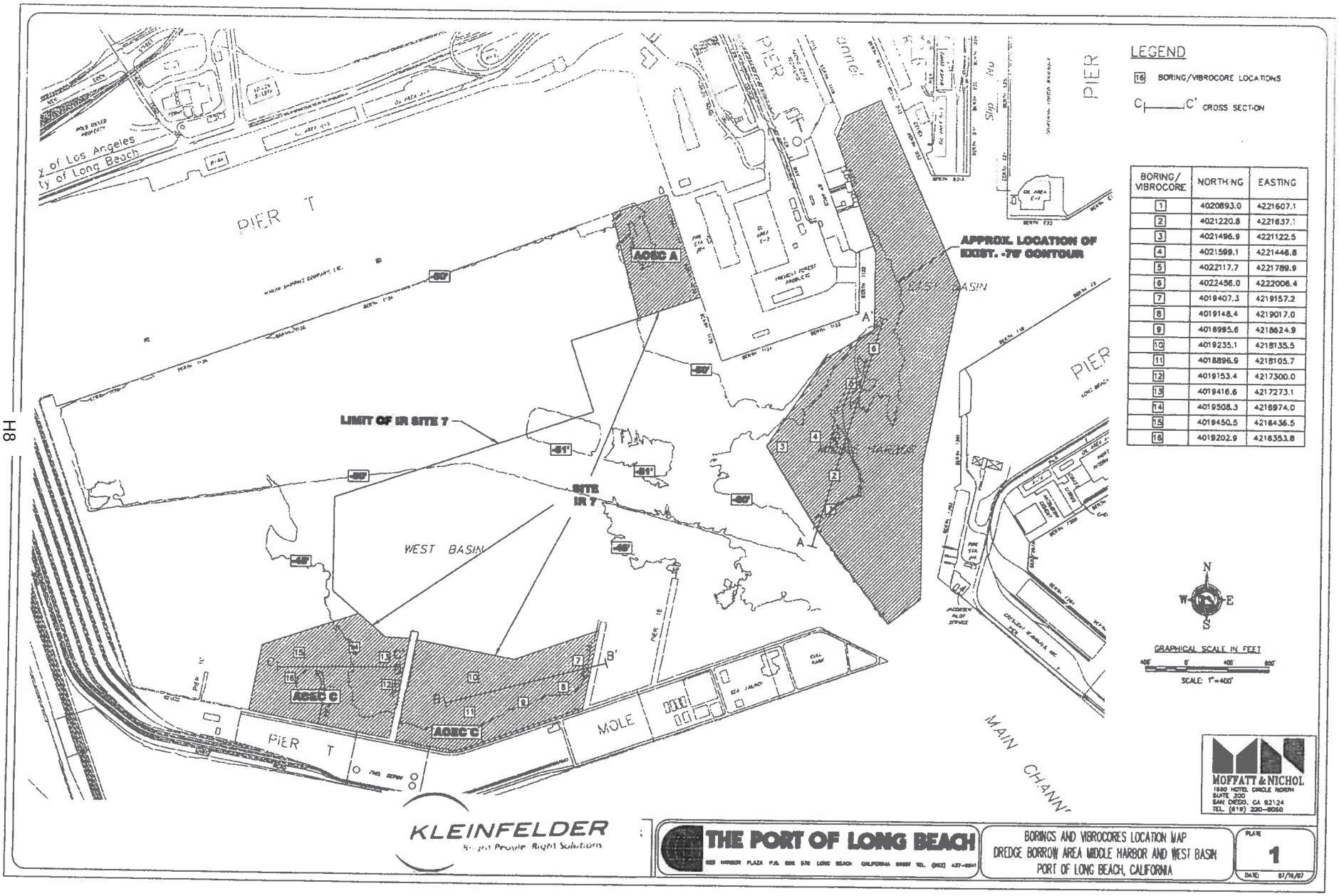
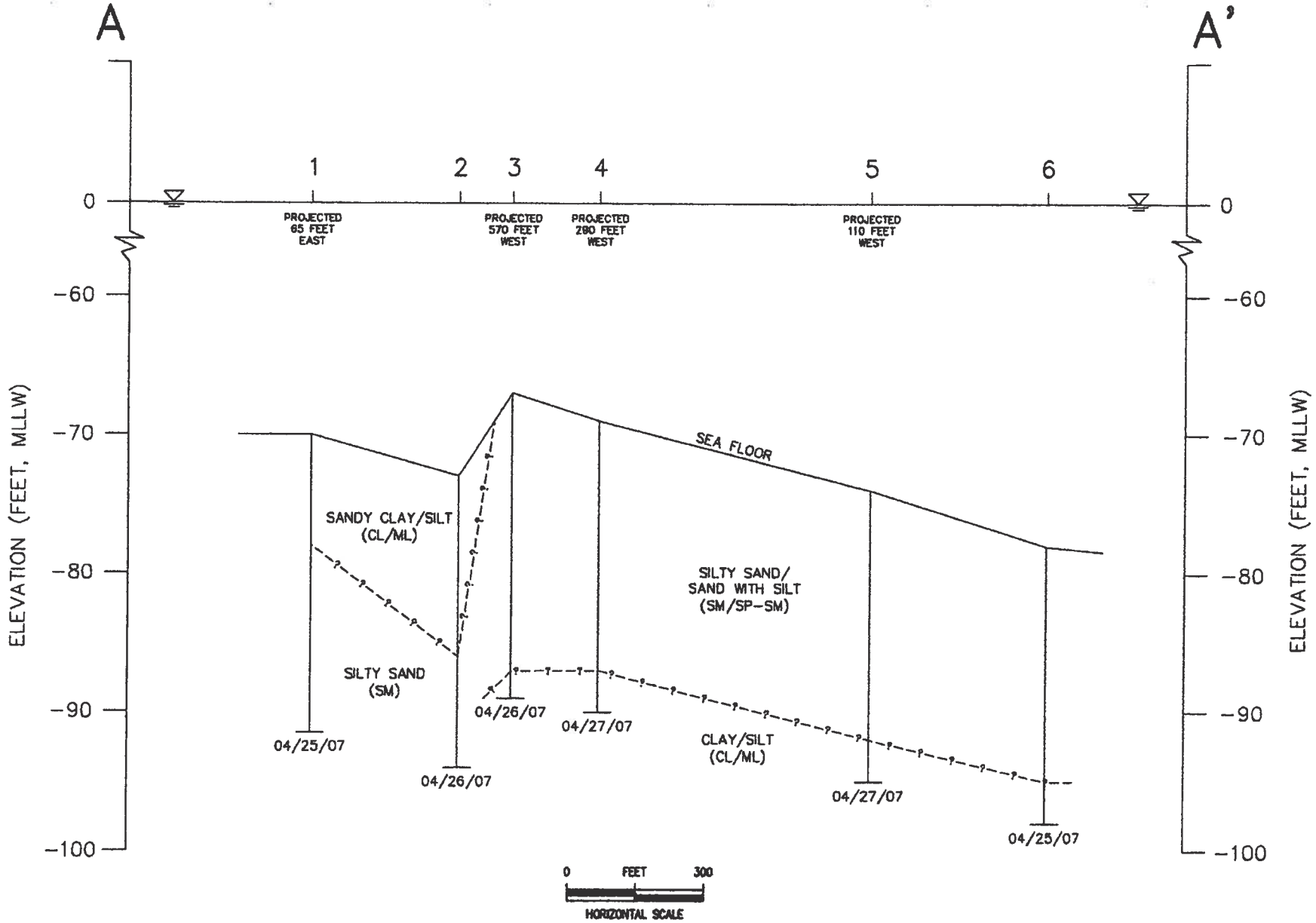
PLATES



BORING/ VIBROCORE	NORTHING	EASTING
1	4020893.0	4221607.1
2	4021220.8	4221637.1
3	4021496.9	4221122.5
4	4021589.1	4221446.8
5	4022117.7	4221789.9
6	4022456.0	4222006.4
7	4019407.3	4219157.2
8	4019148.4	4219017.0
9	4018995.6	4218624.9
10	4019235.1	4218135.5
11	4018896.9	4218105.7
12	4019153.4	4217300.0
13	4019416.6	4217273.1
14	4019508.3	4216974.0
15	4019450.5	4216436.5
16	4019202.9	4216353.8



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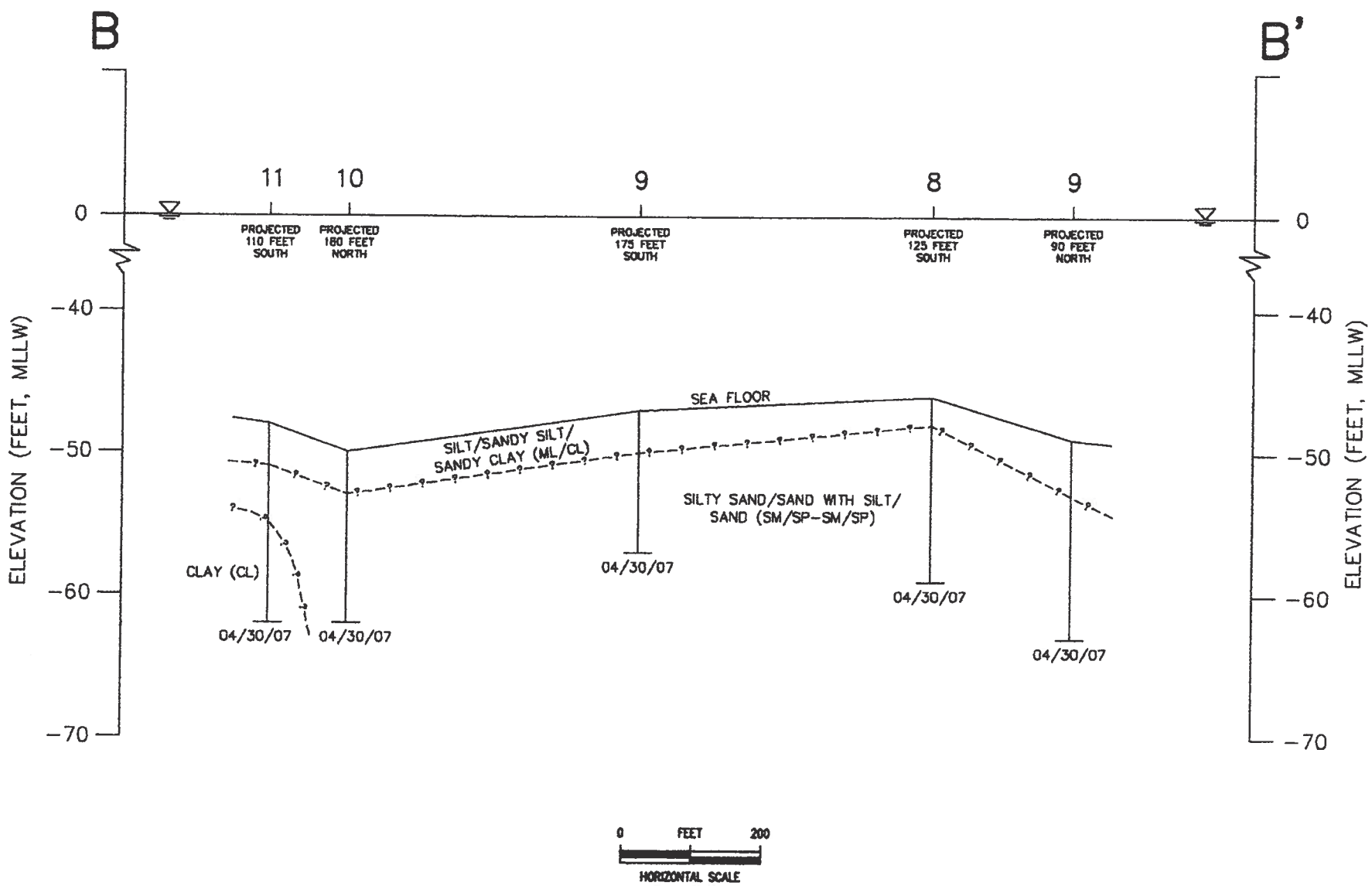
CROSS SECTION A-A'

PLATE 2

DATE: 07/16/07

6H



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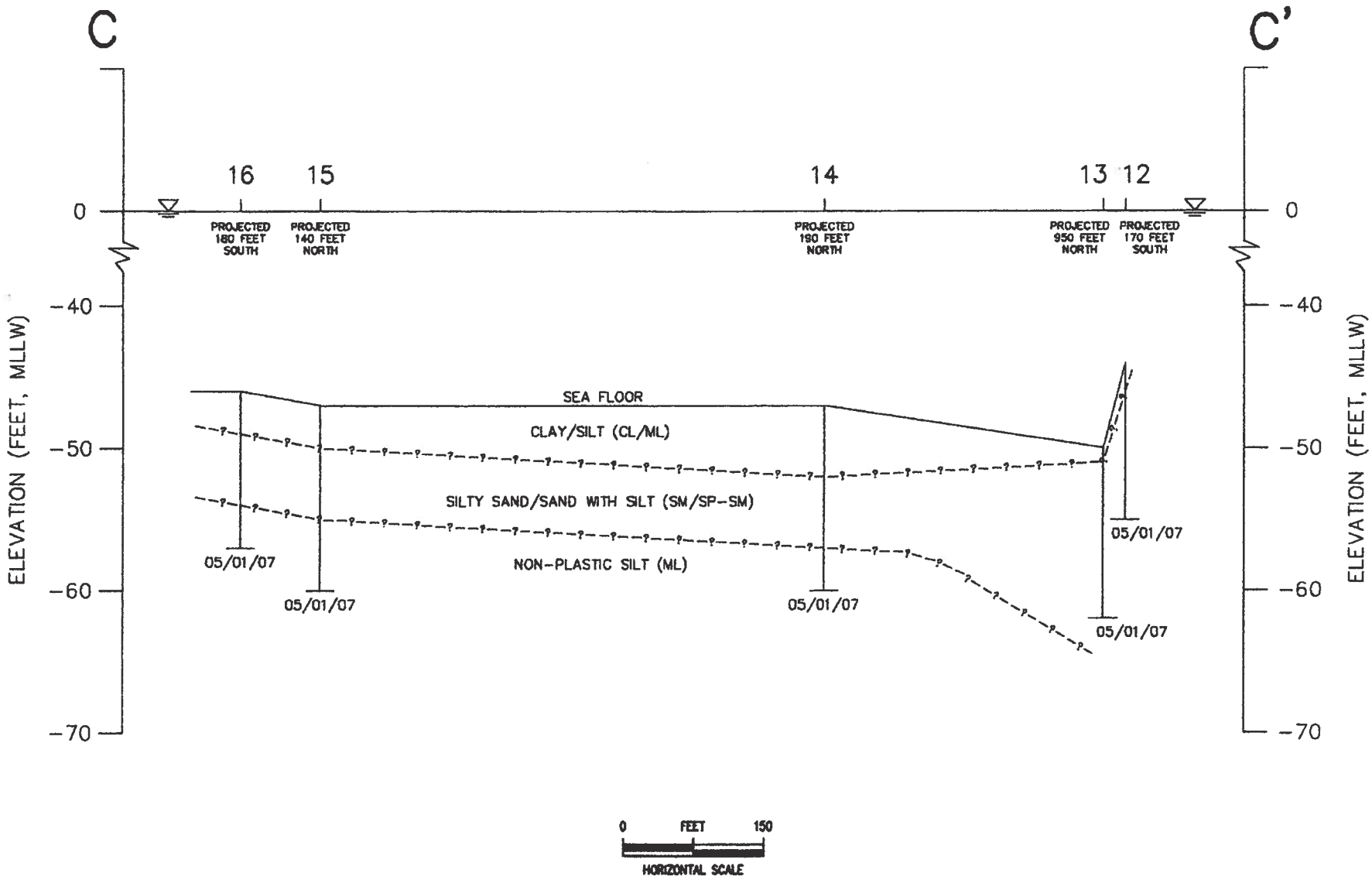
CROSS SECTION B–B'

PLATE 3

DATE: 07/16/07

H10



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CROSS SECTION C-C'

PLATE 4

DATE: 07/16/07

APPENDIX A

LOGS OF BORINGS/VIBRACORES

Date Drilled:	Water Depth:
Drilled By:	Date Measured:
Drilling Method:	Reference Elevation:
Logged By:	Datum:

Elevation (feet) Depth	Sample	Sample No.	Blow Count (Blows/ft.)	Graphic Log	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1	6			108	10	DS, SE
		2	12					GS
5								
	(1)	(2)	(3)	(4)	(5)	(6)	(6)	(7)
10								

NOTES ON FIELD INVESTIGATION

1. SAMPLE – Graphical representation of sample type as shown below.
   - Split Spoon – Standard Penetration Test Sample (SPT)
   - Drive Sample – California Sample (Cal)
   - Bulk Sample – Obtained by collecting cuttings in a plastic bag
   - Tube Sample – Shelby/Pitcher Tube Sample
2. SAMPLE NO. – Sample Number
3. BLOWS/FT – Number of blows required to advance sampler 1 foot (unless a lesser distance is specified). Samplers in general were driven into the soil at the bottom of the hole with a standard (140 lb) hammer dropping a standard 30 inches. Drive samples collected in bucket auger borings may be obtained by dropping non-standard weight from variable heights. When a SPT sampler is used the blow count conforms to ASTM D-1586.

   SCR/RQD – Sample Core Recovery (SCR) in percent (%) and Rock Quality Designation (RQD) in percent (%). RQD is defined as the percentage of core in each run which the spacing between natural fractures is greater than 4 inches. Mechanical breaks of the core are not considered.
4. GRAPHIC LOG – Standard symbols for soil and rock types, as shown on plate A-1b.
5. GEOTECHNICAL DESCRIPTION

   Soil – Soil classifications are based on the Unified Soil Classification System per ASTM D-2487, and designations include consistency, moisture, color and other modifiers. Field descriptions have been modified to reflect results of laboratory analyses where deemed appropriate.

   Rock – Rock classifications generally include a rock type, color, moisture, mineral constituents, degree of weathering, alteration, and the mechanical properties of the rock. Fabric, lineations, bedding spacing, foliations, and degree of cementation are also presented where appropriate.

   Description of soil origin or rock formation is placed in brackets at the beginning of the description where applicable, for example, Residual Soil.
6. DRY DENSITY, MOISTURE CONTENT: As estimated by laboratory or field testing.
7. ADDITIONAL TESTS – (Indicates sample tested for properties other than the above):
   - MAX – Maximum Dry Density
   - GS – Grain Size Distribution
   - SE – Sand Equivalent
   - EI – Expansion Index
   - CHEM – Sulfate and Chloride Content, pH, Resistivity
   - PM – Permeability
   - UU – Unconsolidated Undrained Triaxial
   - SG – Specific Gravity
   - HA – Hydrometer Analysis
   - AL – Atterberg Limits
   - RV – R-Value
   - CN – Consolidation
   - CU – Consolidation Undrained Triaxial
   - CD – Consolidated Drained Triaxial
   - PP – Pocket Penetrometer
   - WA – Wash Analysis
   - DS – Direct Shear
   - CP – Collapse Potential
   - UC – Unconfined Compression
   - T – Torvane
8. ATTITUDES – Orientation of rock discontinuity observed in bucket auger boring or rock core, expressed in strike/dip and dip angle, respectively, preceded by a one-letter symbol denoting nature of discontinuity as shown below.

   B: Bedding Plane J: Jointing C: Contact F: Fault S: Shear

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EXPLANATION OF LOGS

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PLATE A-1a

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

PRIMARY DIVISIONS			GROUP SYMBOLS	SECONDARY DIVISIONS
COURSE GRAINED SOILS MORE THAN HALF OF MATERIALS IS LARGER THAN #200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COURSE FRACTION IS LARGER THAN #4 SIEVE	CLEAN GRAVELS (LESS THAN) 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVEL WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF OF COURSE FRACTION IS SMALLER THAN #4 SIEVE	CLEAN SANDS (LESS THAN) 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF OF MATERIALS IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
	HIGHLY ORGANIC SOILS		PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS
TYPICAL FORMATIONAL MATERIALS	SANDSTONES		SS	
	SILTSTONES		SH	
	CLAYSTONES		CS	
	LIMESTONES		LS	
	SHALE		SL	

CONSISTENCY CRITERIA BASED ON FIELD TESTS

RELATIVE DENSITY – COARSE – GRAIN SOIL

RELATIVE DENSITY	SPT * (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	0 – 15
Loose	4 – 10	15 – 35
Medium Dense	10 – 30	35 – 65
Dense	30 – 50	65 – 85
Very Dense	>50	85 – 100

CONSISTENCY– FINE–GRAIN SOIL

CONSISTENCY	SPT (# blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET ** PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)
Very Soft	<2	<0.13	<0.25
Soft	2 – 4	0.13 – 0.25	0.25 – 0.5
Medium Stiff	4 – 8	0.25 – 0.5	0.5 – 1.0
Stiff	8 – 15	0.5 – 1.0	1.0 – 2.0
Very Stiff	15 – 30	1.0 – 2.0	2.0 – 4.0
Hard	>30	>2.0	>4.0

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1 3/8 INCH I.D.) SPLIT BARREL SAMPLER (ASTM-1586 STANDARD PENETRATION TEST)

** UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ.FT. READ FROM POCKET PENETROMETER

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

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EXPLANATION OF LOGS

H14

PLATE
A-1b

Date Drilled:	4/25/07	Water Depth:	
Drilled By:	Gregg Drilling	Date Measured:	4/25/07
Drilling Method:	6-Inch Mud Rotary	Elevation:	-70 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet)	Depth	Sample Type	Sample Number	Blows per Foot	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
						Sandy Clay (CL): gray, wet, fine sand.			
-75	5		1	9		-- sand catcher installed. -- medium stiff to stiff.			SIEVE, PI
						Silty Sand (SM): greenish gray, wet, loose, fine sand, some medium sand, trace of clay.			
-80	10		2	9					SIEVE
-85	15		3	19		-- medium dense, decrease clay.			SIEVE
-90	20		4	24					SIEVE
						Total depth: 21.5 feet			

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Dredge [illegible] **Area Middle Harbor**
Port of Long Beach
Long Beach, California

PLATE
A-2

PROJECT NO. 72500-1

LOG OF BORING 1

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA MIDDLE HARBOR.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/26/07	Water Depth:	
Drilled By:	Gregg Drilling	Date Measured:	4/26/07
Drilling Method:	6-Inch Mud Rotary	Elevation:	-73 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Blows per Foot	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
					Sandy Silt (ML): brown, wet, fine sand, non-plastic.			
-75								
5		1	10		-- stiff.			SIEVE
-80								
10		2	17		-- very stiff, 3-inch silty sand layer in sample.			SIEVE
-85								
					Sand with Silt (SP-SM): gray, wet, medium dense, fine to medium grained.			
15		3	13					SIEVE
-90								
20		4	25					SIEVE
					Total depth: 21.5 feet			

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Dredge [illegible] Area Middle Harbor
Port of Long Beach
Long Beach, California

PLATE A-3

PROJECT NO. 72500-1

LOG OF BORING 2

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA MIDDLE HARBOR.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/26/07	Water Depth:	
Drilled By:	Gregg Drilling	Date Measured:	4/26/07
Drilling Method:	6-Inch Mud Rotary	Elevation:	-67 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Blows per Foot	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
					Silty Sand (SM): gray, wet, fine to coarse grained, trace clay.			
-70								
5		1	12		-- medium dense.			SIEVE
-75					**Sand with Silt (SP-SM):** gray brown, wet, medium dense, fine to coarse grained.			
10		2	22		-- trace coarse sand.			SIEVE
-80					**Silty Sand (SM):** gray, wet, medium dense, fine to coarse grained.			
15		3	24					SIEVE
-85								
20		4	21		**Clay with Sand (CL):** brown, wet, very stiff.			PI, SIEVE
					Total depth: 21.5 feet			

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Dredge [illegible] Area Middle Harbor
Port of Long Beach
Long Beach, California

PLATE A-4

PROJECT NO. 72500-1

LOG OF BORING 3

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA MIDDLE HARBOR.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/27/07	Water Depth:	
Drilled By:	Gregg Drilling	Date Measured:	4/27/07
Drilling Method:	6-Inch Mud Rotary	Elevation:	-69 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) / Depth	Sample Type	Sample Number	Blows per Foot	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
-70					**Silty Sand (SM):** gray, wet, fine to coarse grained.			
5 / -75		1	5		-- loose.			SIEVE
10 / -80		2	13		**Sandy Silt (ML):** brown, wet, medium dense, non-plastic.			SIEVE
15 / -85		3	14		**Silty Sand (SM):** gray brown, wet, medium dense, fine grained.			SIEVE
20 / -90		4	9		**Silt with Sand (ML):** gray, wet, loose, fine sand, trace clay.			SIEVE
					Total depth: 21.5 feet			

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Dredge [illegible] Area Middle Harbor
Port of Long Beach
Long Beach, California

PLATE A-5

PROJECT NO. 72500-1

LOG OF BORING 4

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA MIDDLE HARBOR.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/27/07	Water Depth:	
Drilled By:	Gregg Drilling	Date Measured:	4/27/07
Drilling Method:	6-Inch Mud Rotary	Elevation:	-74 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) / Depth	Sample Type	Sample Number	Blows per Foot	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
-75					**Silty Sand SM):** gray, wet, fine to coarse grained, trace fine gravel.			
5 / -80		1	15		-- medium dense.			SIEVE
10 / -85		2	17		-- 1/4 to 1/2 inch silt lens.			SIEVE
15 / -90		3	28					SIEVE
					Clay (CL): olive brown, wet, fine sand.			
20 / -95		4	25					SIEVE, PI
					Total depth: 21.5 feet			

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Dredge [illegible] ea Middle Harbor
Port of Long Beach
Long Beach, California

PLATE A-6

PROJECT NO. 72500-1

LOG OF BORING 5

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA MIDDLE HARBOR.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/25/07	Water Depth:	
Drilled By:	Gregg Drilling	Date Measured:	4/25/07
Drilling Method:	6-Inch Mud Rotary	Elevation:	-77 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) / Depth	Sample Type	Sample Number	Blows per Foot	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
					Silty Sand (SM): gray, wet, fine to coarse grained.			
-80								
5		1	PUSH		-- very loose.			SIEVE
-85								
10		2	31		-- dense, fine grained, fine sand.			SIEVE
-90								
15		3	34		-- olive brown.			SIEVE
-95					**Sandy Clay (CL):** brown, wet, stiff to very stiff, fine grained sand.			
20		4	30					SIEVE, PI
					Total depth: 21.5 feet.			

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Dredge Area Middle Harbor
Port of Long Beach
Long Beach, California

PLATE A-7

PROJECT NO. 72500-1

LOG OF BORING 6

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA MIDDLE HARBOR.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/30/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	4/30/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-49 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
-50				**Sandy Silt (ML):** olive gray, wet, soft.			
		1		**Clay (CH):** olive gray, wet, medium stiff.			SIEVE, PI
5 -55				**Silty Sand (SM):** gray brown, wet, fine to medium grained.			
10 -60		1		**Sand with Silt (SP-SM)** brown, wet. -- with shells from 9-10 feet.			SIEVE
				Total depth: 14 feet.			

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Dredge Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-8

PROJECT NO. 72500-1

LOG OF BORING 7

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/30/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	4/30/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-46 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
	X	1		**Sandy Clay (CL):** olive gray, wet, soft.			SIEVE, PI
-50 / 5	X	2		**Silty Sand (SM):** gray, very moist to wet, medium dense, fine to medium grained.			SIEVE
-55 / 10	X	3					SIEVE
				Total depth: 13.5 feet.			

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Dredge Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-9

PROJECT NO. 72500-1

LOG OF BORING 8

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	4/30/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	4/30/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-47 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
				Silt (ML): olive gray, wet, very soft, trace shell.			
-50	X	1		**Sand with Silt (SP-SM):** gray, wet, medium dense.			SIEVE
5				-- trace shell.			
-55	X	2		**Sand (SP):** gray, wet, medium dense, fine to medium grained.			SIEVE
10				Total depth: 10 feet.			

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Dredge Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-10

PROJECT NO. 72500-1

LOG OF BORING 9

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-50 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet)	Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
			1		**Sandy Silt (ML):** olive gray, wet, soft, non-plastic.			SIEVE
			2		**Sand with Silt (SP-SM):** gray, wet, medium dense, fine to medium grained.			SIEVE
-55	5							
			3					SIEVE
-60	10							
					Total depth: 12.5 feet.			

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Dredge Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE
A-11

PROJECT NO. 72500-1

LOG OF BORING 10

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-48 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
				Silt (ML): olive gray, wet, very soft.			
-50							
				Sand (SP): gray, very moist to wet, medium dense, fine to medium grained.			
				-- trace shells.			
5	X	1					SIEVE
-55				**Clay (CL):** olive gray, wet, medium stiff to stiff.			
	X	2					SIEVE, PI
10							
-60				-- trace of sand.			
				Total depth: 13.7 feet.			

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Dredge Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-12

PROJECT NO. 72500-1

LOG OF BORING 11

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-44 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) / Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
-45				**Silt (ML):** olive gray, wet, very soft.			
	X	1		**Sand (SP):** gray, wet, medium dense, fine to medium grained.			SIEVE
5 / -50	X	2		**Sand with Silt (SP-SM):** gray, wet, medium dense, fine sand, with shells, some medium sand.			SIEVE
	X	3		**Sand (SP):** gray, wet, medium dense, fine to medium grained.			SIEVE
10 / -55				Total depth: 11 feet.			

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Dredge [illegible] Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-13

PROJECT NO. 72500-1

LOG OF BORING 12

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-50 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet)	Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
					Silt (ML): olive green, wet, very soft.			
					Sand with Silt (SP-SM): gray, very moist to wet, medium dense.			
-55	5	X	1		-- some shells.			SIEVE
					Silty Sand (SM): gray, wet, medium dense, fine to medium grained.			
-60	10	X	2					SIEVE
					Total depth: 12 feet.			

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Dredge Borrow Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-14

PROJECT NO. 72500-1

LOG OF BORING 13

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-47 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) / Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
				Silt (ML): olive gray, wet, very soft, non-plastic.			
-50							
		1					SIEVE
5				**Silty Sand (SM):** gray, very moist to wet, medium dense.			
		2					SIEVE
-55							
10				**Silt (ML):** olive gray, moist, medium stiff, with varying amounts of clay, non-plastic.			
		3					SIEVE
-60							
				Total depth: 13.3 feet.			

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Dredge Borrow Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-15

PROJECT NO. 72500-1

LOG OF BORING 14

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA_RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-47 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1		**Clay (CL):** olive gray, wet, very soft.			SIEVE
-50							
5				**Silty Sand (SM):** olive gray, wet, fine to medium grained, some shells.			
		2					SIEVE
-55				**Silt (ML):** gray, wet, medium stiff, with varying amounts of clay.			
10							
-60							
				Total depth: 13.3 feet.			

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Dredge Disposal Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-16

PROJECT NO. 72500-1

LOG OF BORING 15

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

Date Drilled:	5/1/07	Water Depth:	
Drilled By:	Weston Solutions	Date Measured:	5/1/2007
Drilling Method:	4-Inch Vibracore	Elevation:	-46 feet (approx.)
Logged By:	Jeff Waller	Datum:	M. L. L. W.

Elevation (feet) Depth	Sample Type	Sample Number	Graphic Log	SOIL DESCRIPTION AND CLASSIFICATION	Dry Density (pcf)	Moisture Content (%)	Additional Tests
				Silt (ML): olive gray, wet, very soft.			
-50 / 5		1		**Silty Sand (SM):** gray, wet, medium dense.			SIEVE
-55 / 10		2		**Clay (CL):** gray, wet, medium stiff.			SIEVE, PI
				Total depth: 11 feet.			

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Dredge [illegible] Area AOEC (West Basin)
Port of Long Beach
Long Beach, California

PLATE A-17

PROJECT NO. 72500-1

LOG OF BORING 16

Drafted By: Reviewed By:

Note: The boundaries between soil types shown on the logs are approximate as the transition between different soil layers may be gradual.

GEOTECH DB 72500 DREDGE BORROW AREA AOEC.GPJ KA RDLND.GDT 7/12/07

APPENDIX B

LABORATORY TEST RESULTS

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on representative bulk soil samples to substantiate offshore visual classification. Testing was performed in accordance with one of the following references:

1) Lambe, T. William, Soil Testing for Engineers, Wiley, New York, 1951.

2) ASTM Standards for Soil Testing, latest revisions.

GRAIN SIZE DISTRIBUTION

The grain size distribution of selected soil samples was performed by mechanical and/or wash sieving in general accordance with ASTM Standard Test Method D422-63. The test results are presented on Plates B-1 through B-22.

PLASTICITY INDEX

Plasticity index tests were performed on selected fine-grained soil samples to aid in soil classification and to evaluate the plasticity characteristics of the material. Tests were performed in general accordance with ASTM Test Method D 4318. The test results are presented on Plates B-23, B-24 and B-25.

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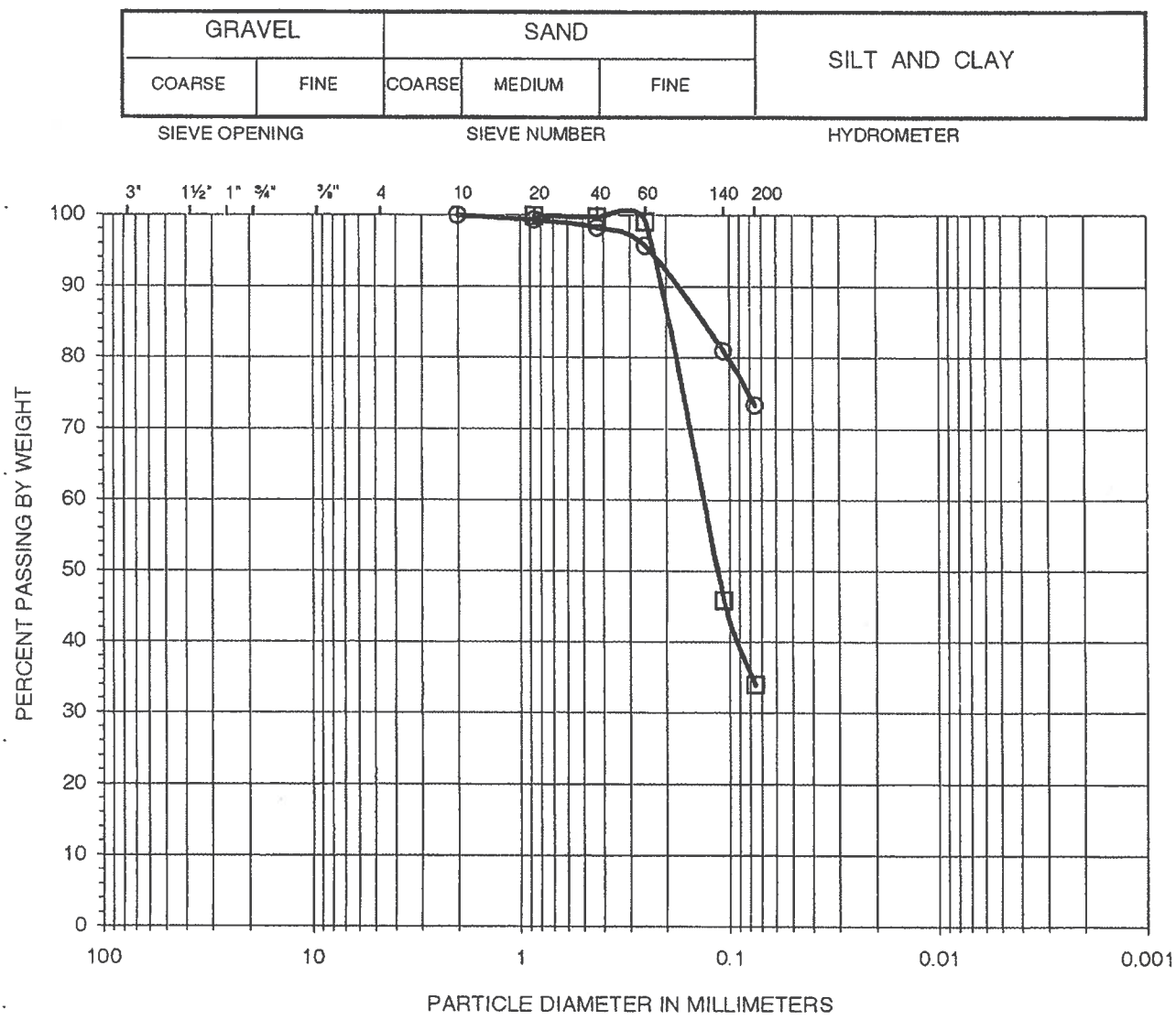


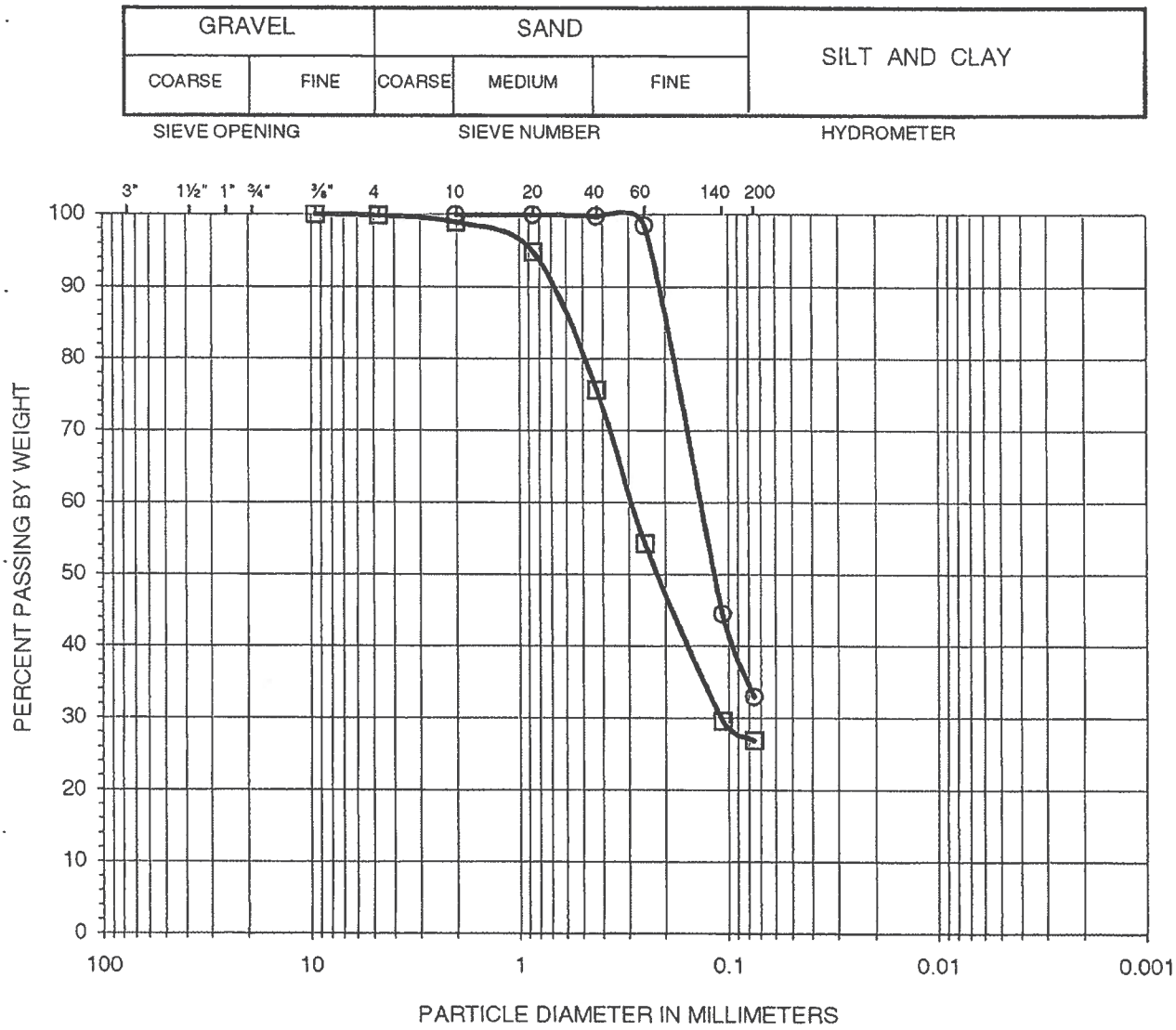
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-1, 1	5	73.25	CL
□	B-1, 2	10	33.97	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-1



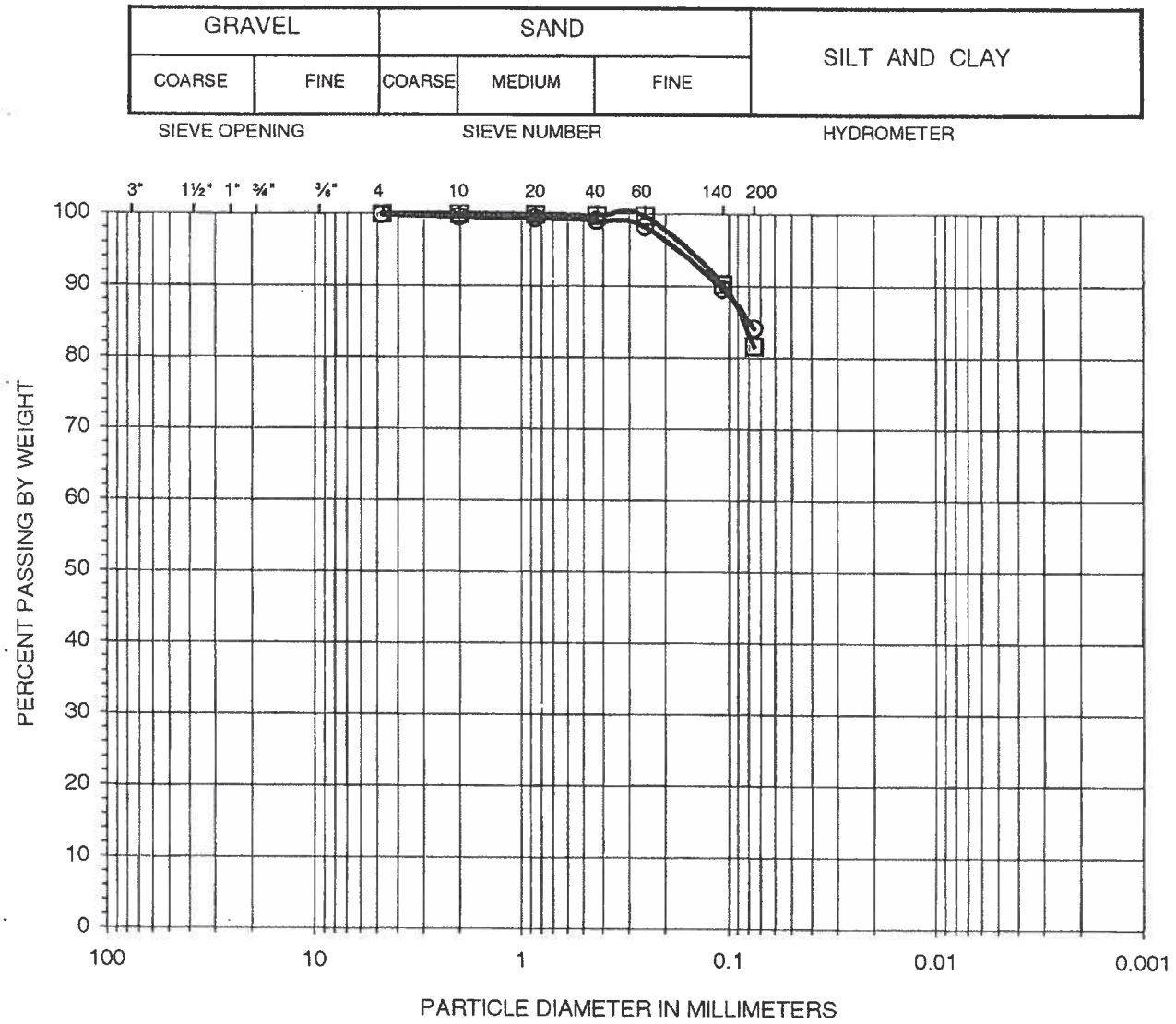
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-1, 3	15	32.92	SM
□	B-1, 4	20	26.85	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-2



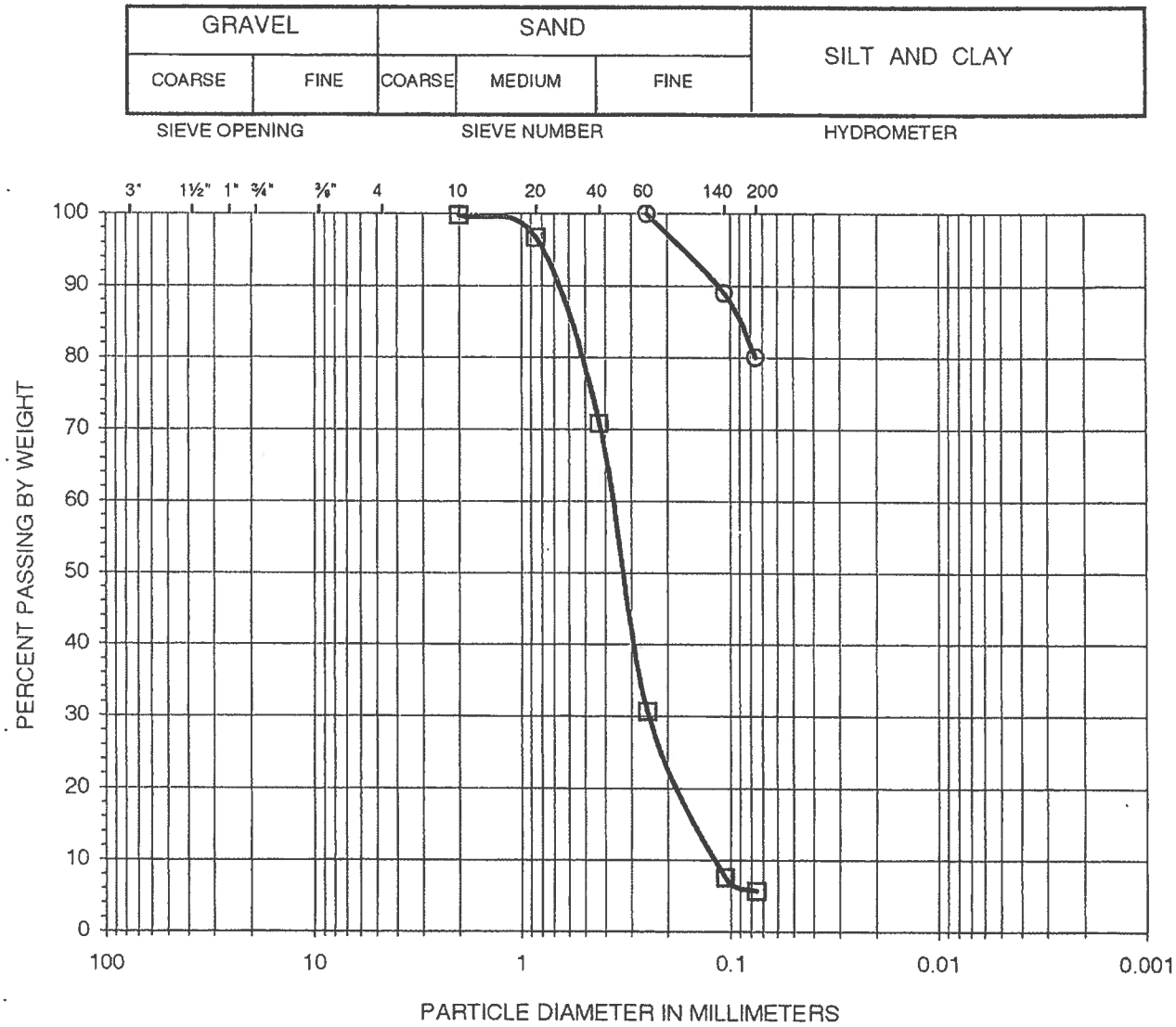
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-2, 1	5	84.05	ML
□	B-2, 2	10	81.51	ML

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-3



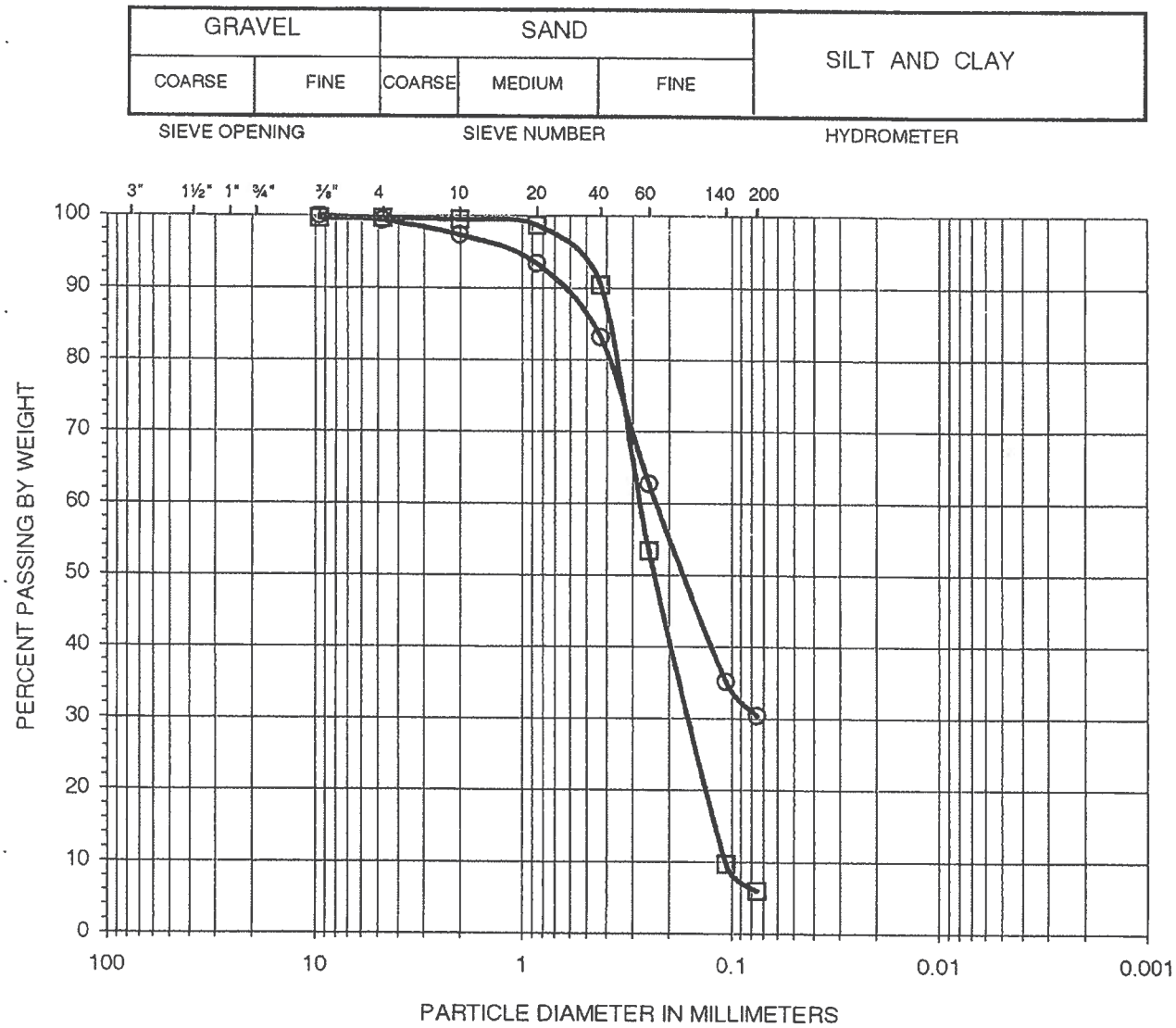
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-2, 3	15	80.04	ML
□	B-2, 4	20	5.65	SP-SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-4



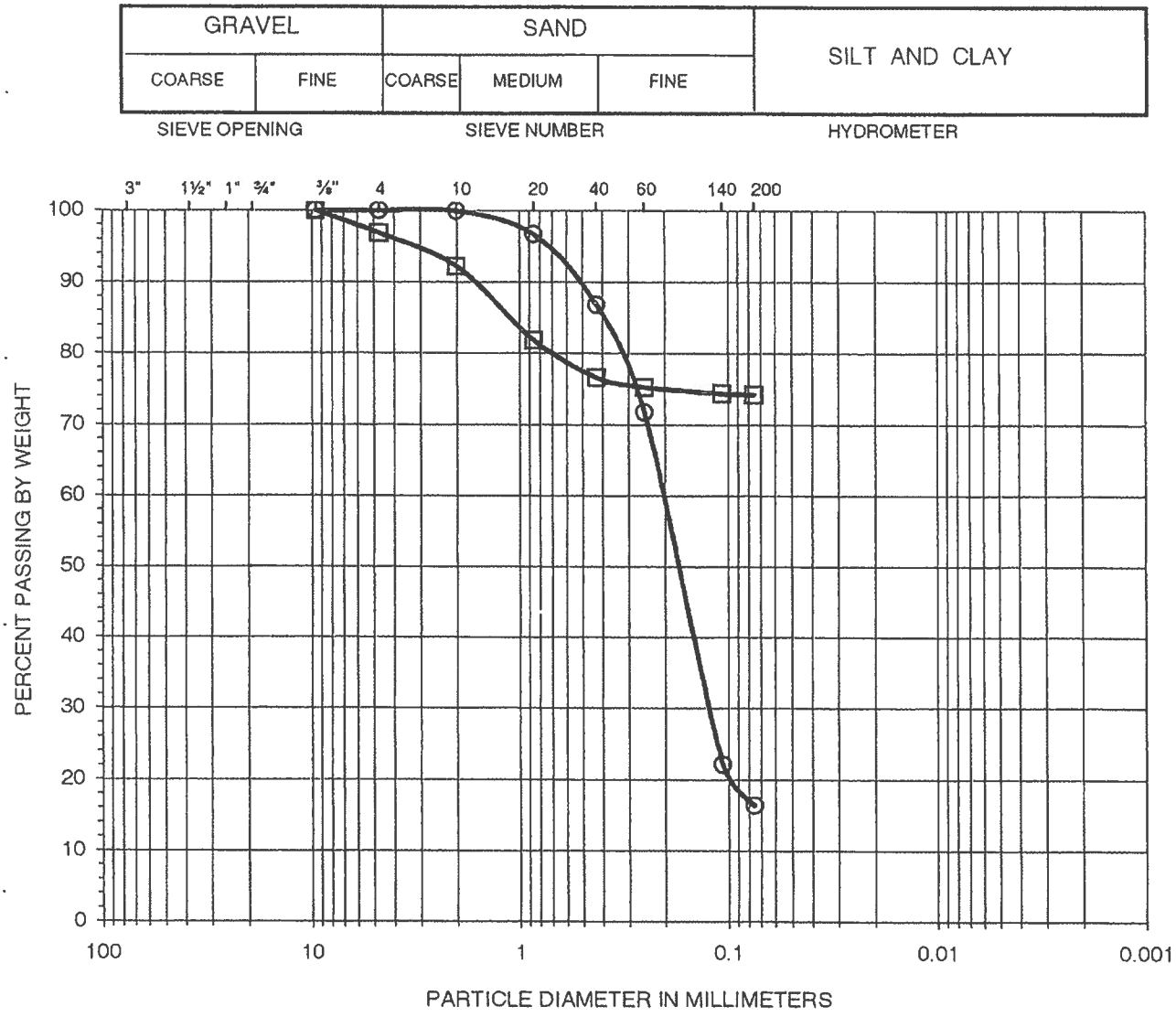
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-3, 1	5	30.38	SM
□	B-3, 2	10	5.98	SP-SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-5



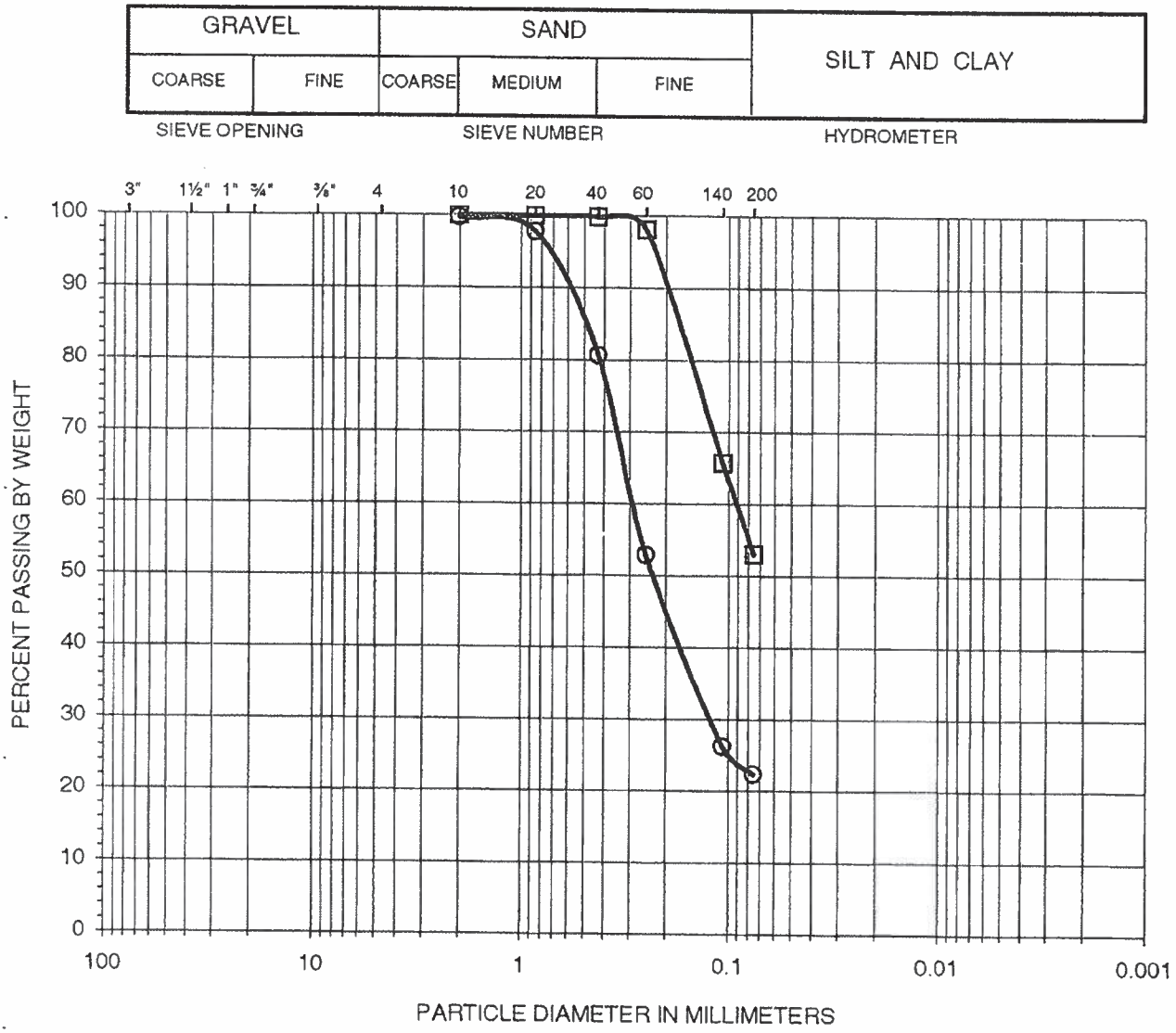
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-3, 3	15	16.32	SM
□	B-3, 4	20	74.22	CL

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-6



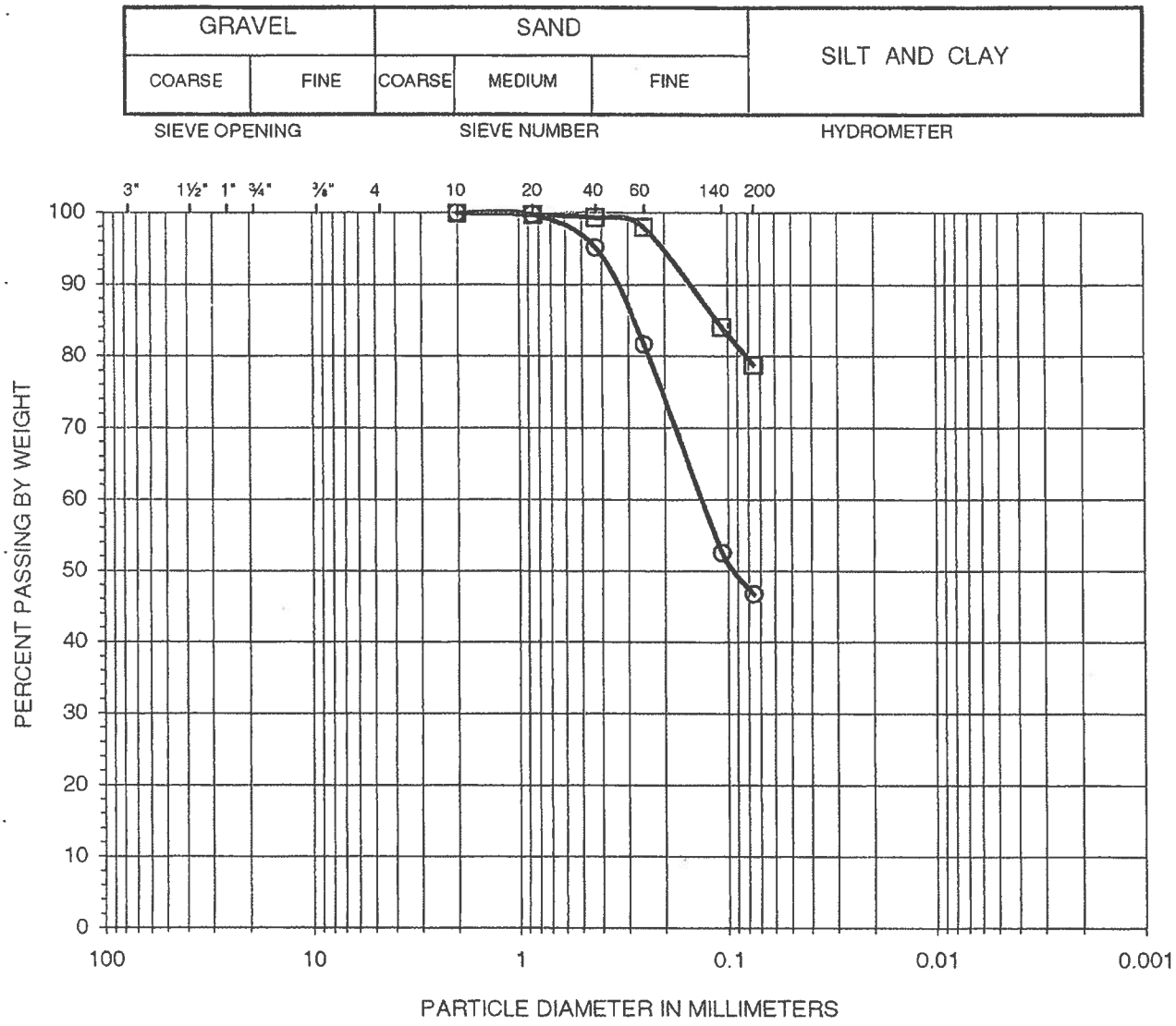
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-4, 1	5	22.32	SM
□	B-4, 2	10	53.03	ML

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-7



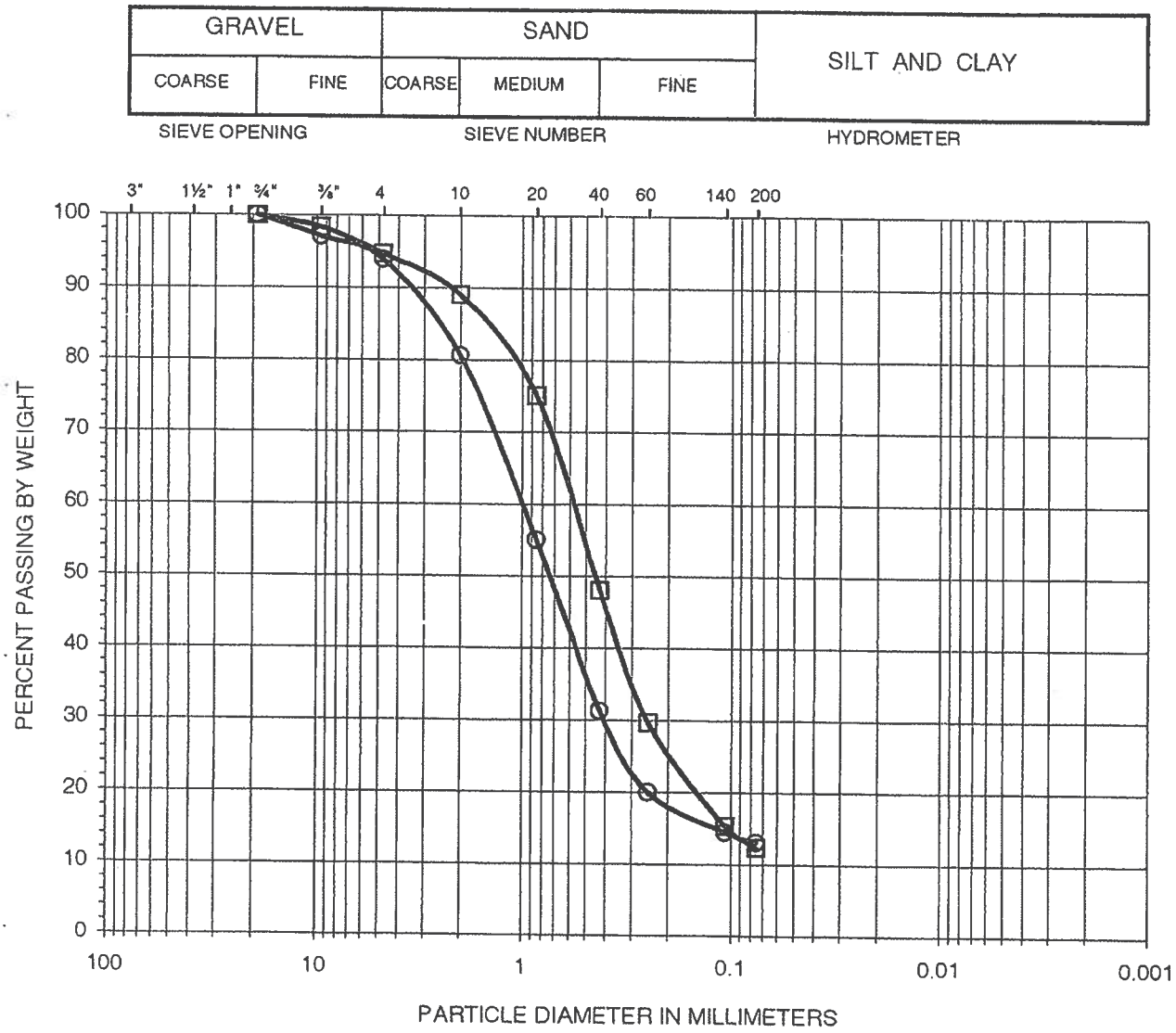
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-4, 3	15	46.73	SM
□	B-4, 4	20	78.77	ML

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-8



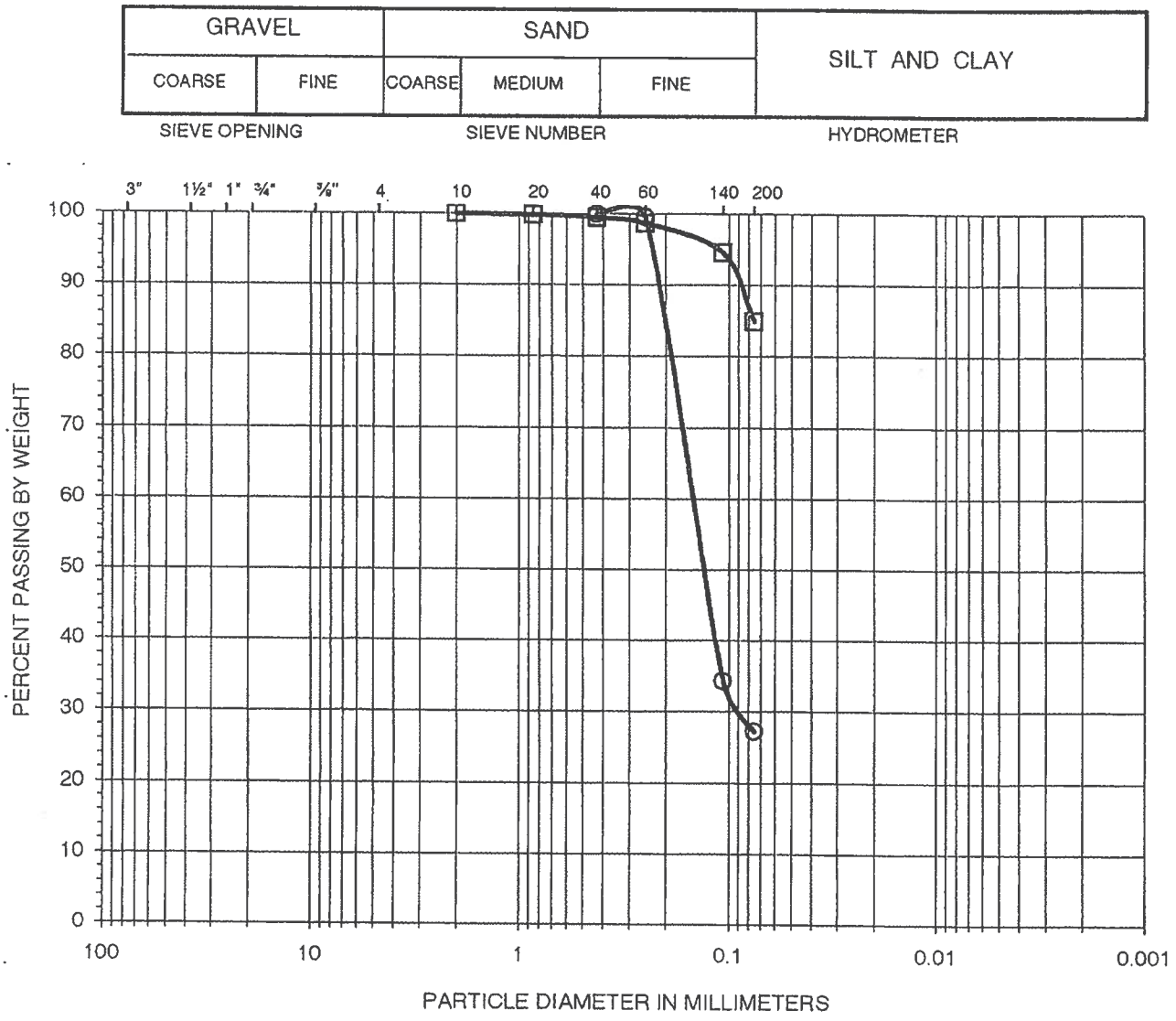
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-5, 1	5	13.11	SM
□	B-5, 2	10	12.36	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-9



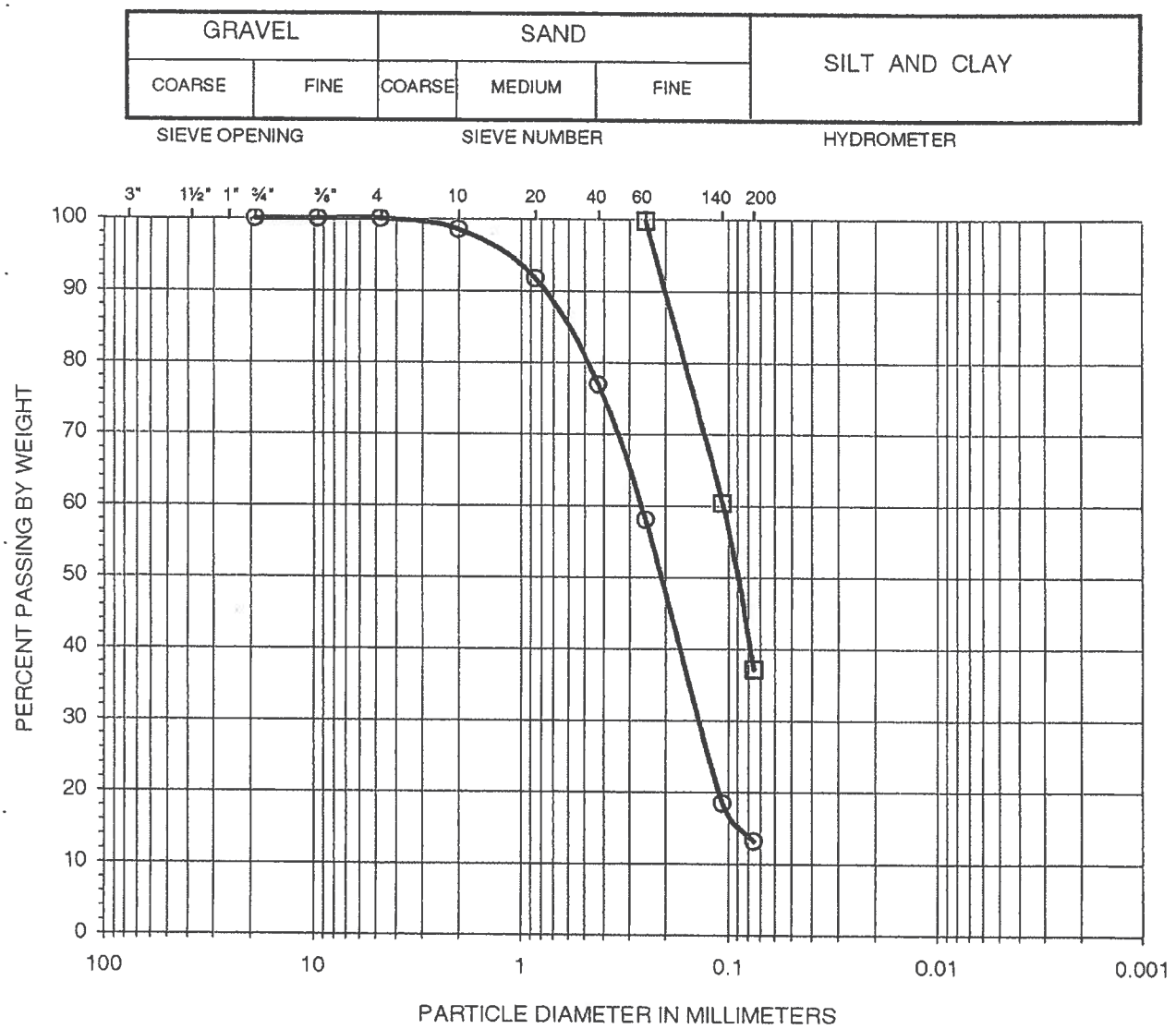
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-5, 3	15	27.21	SM
□	B-5, 4	20	84.87	CL

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-10



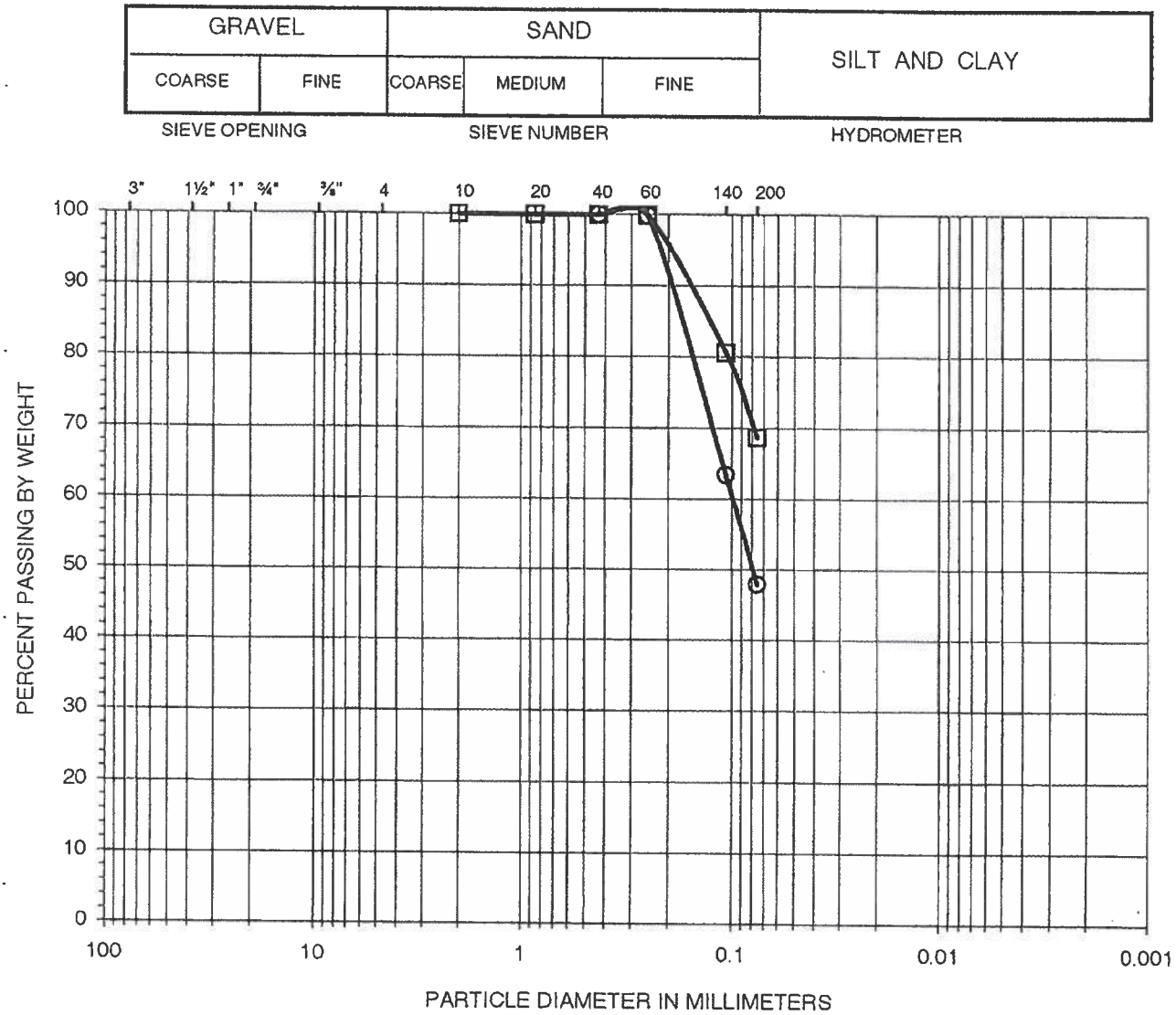
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-6, 1	5	13.20	SM
□	B-6, 2	10	37.17	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-11



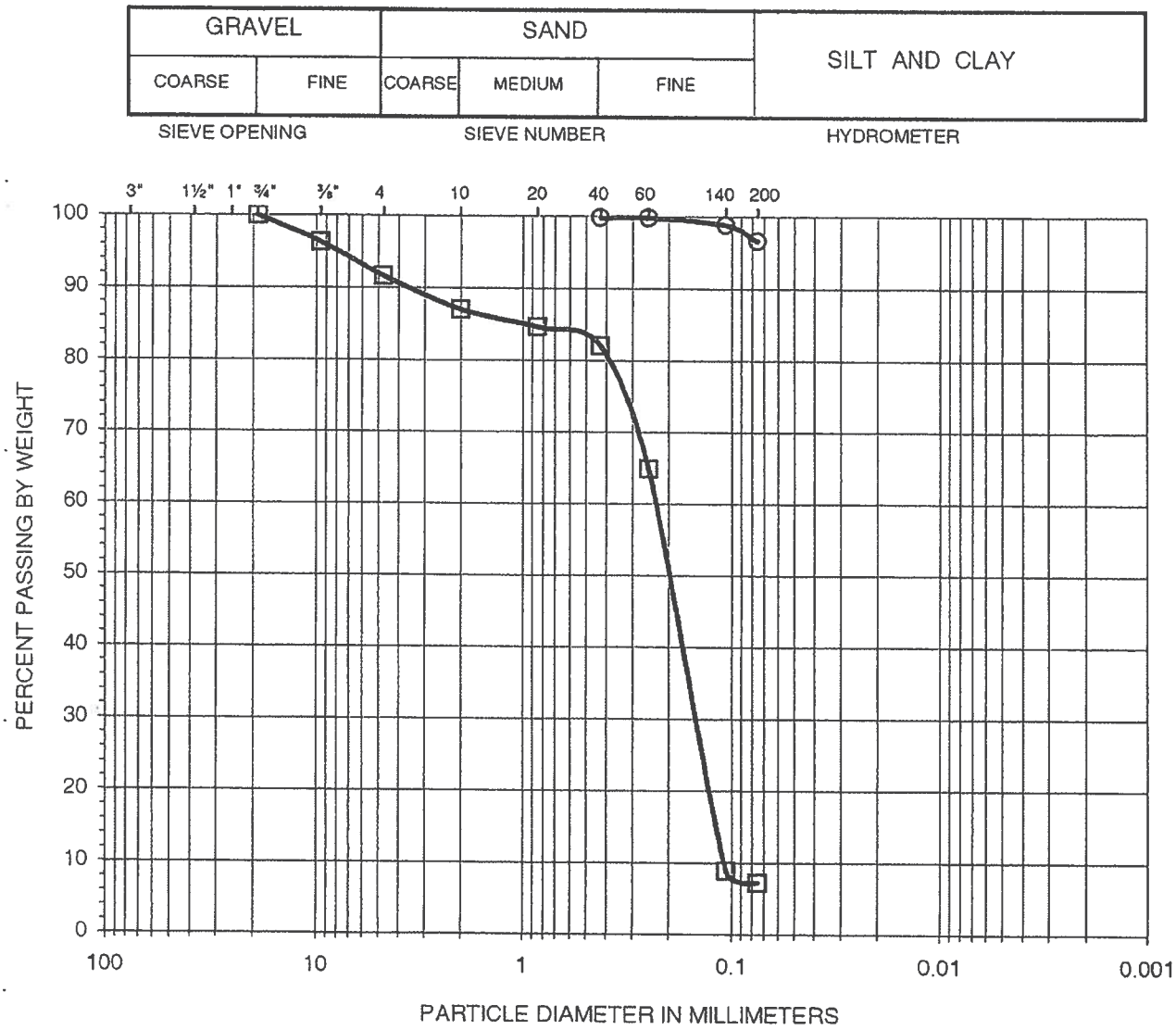
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-6, 3	15	47.89	SM
□	B-6, 4	20	68.62	CL

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-12



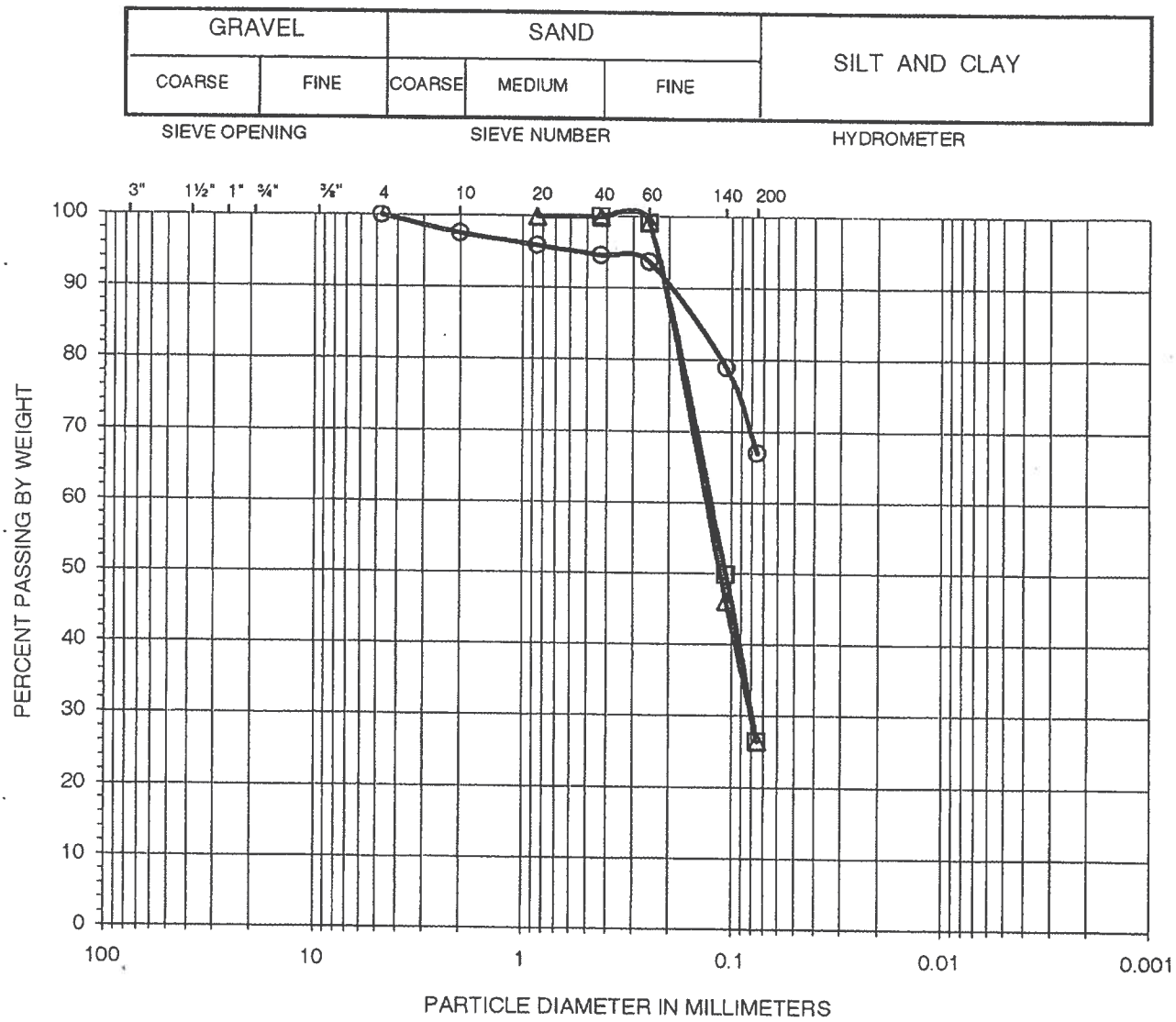
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-7, 1	3	96.57	CH
□	B-7, 2	9	7.24	SP-SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-13



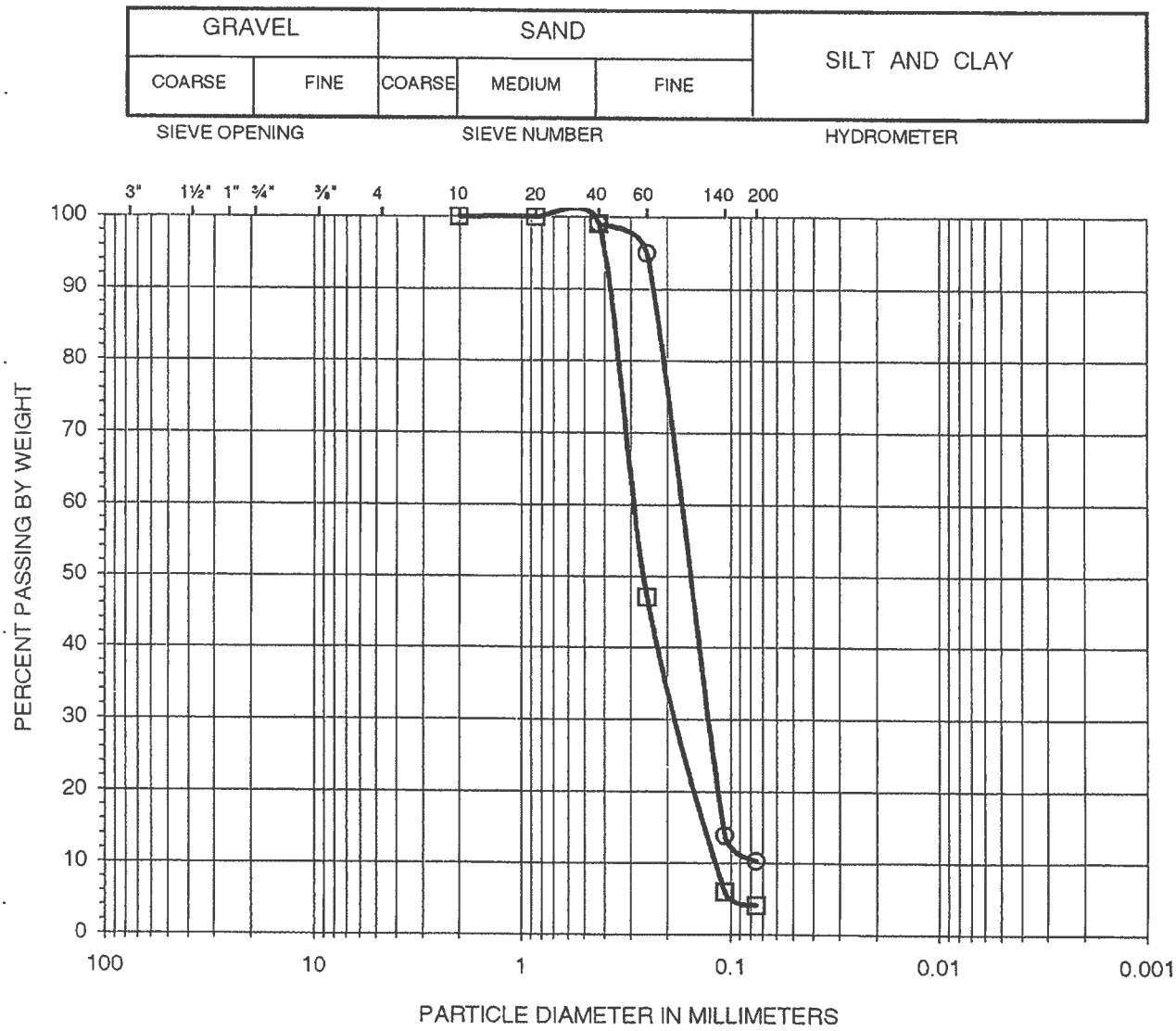
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-8, 1	1	66.96	CL
□	B-8, 2	6	26.38	SM
△	B-8, 3	11	26.44	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-14



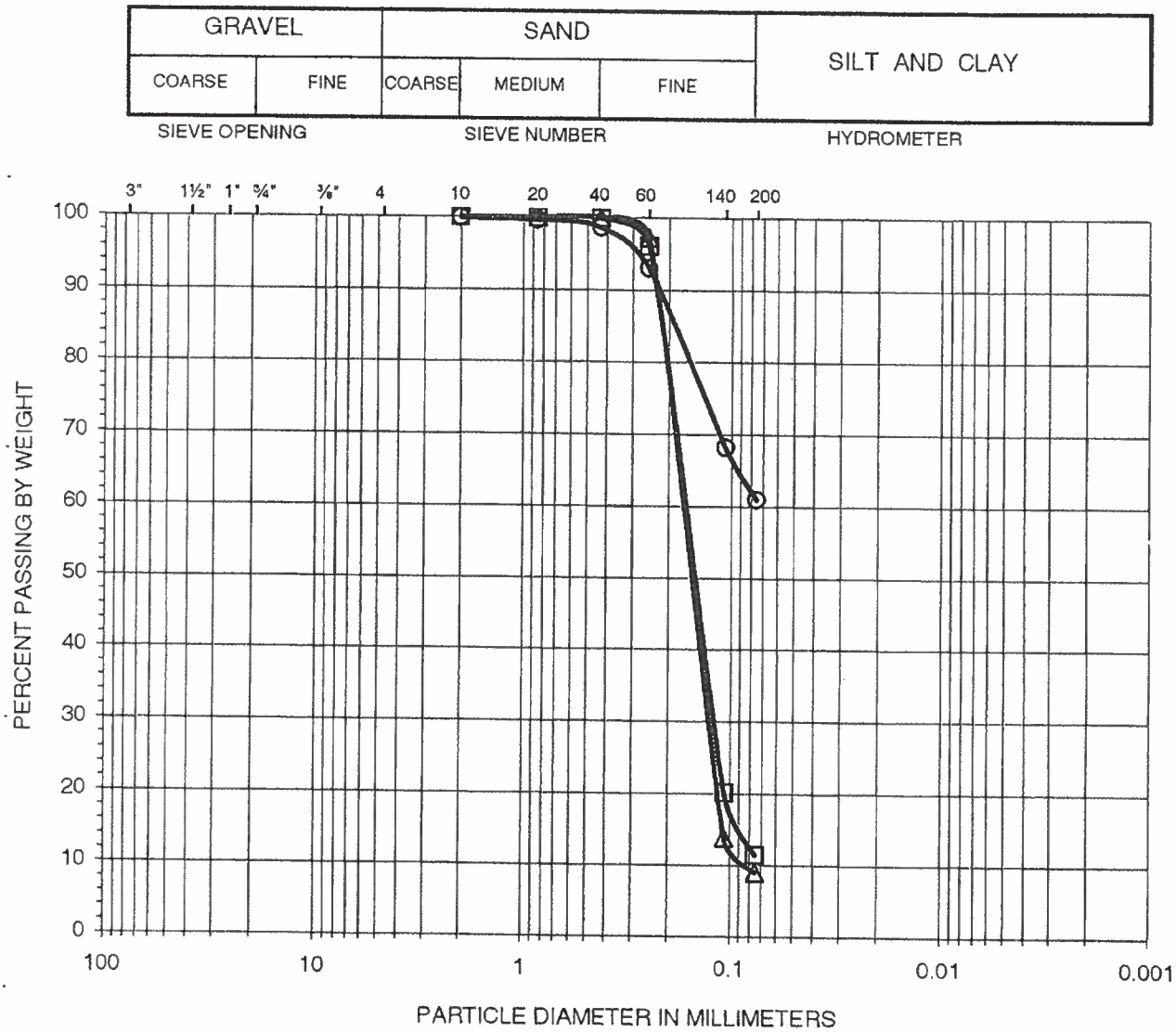
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-9, 1	3	10.27	SP-SM
□	B-9, 2	8	4.14	SP

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-15



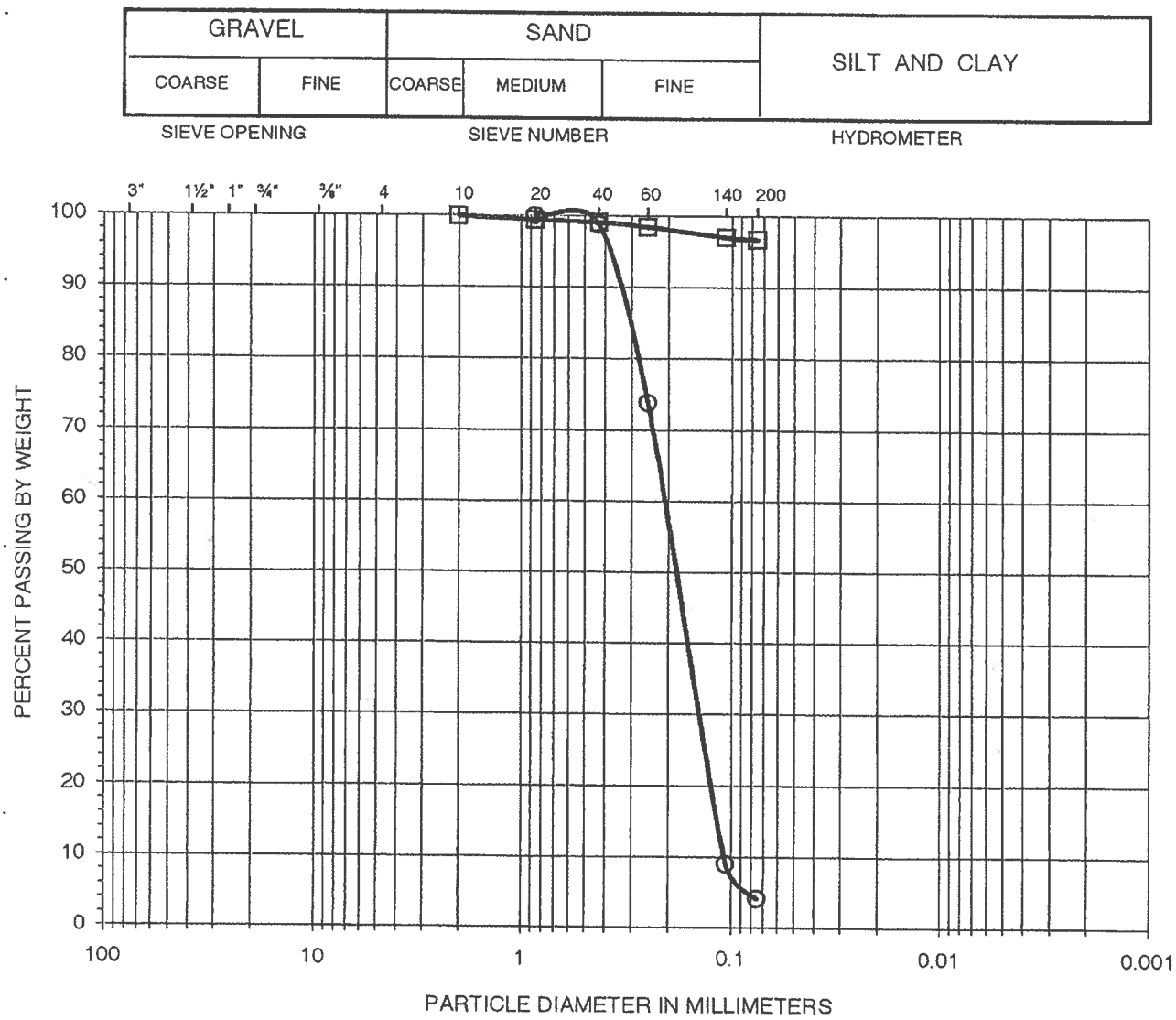
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-10, 1	1.5	60.97	ML
□	B-10, 2	3.5	11.45	SP-SM
△	B-10, 3	6.5	9.01	SP-SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-16



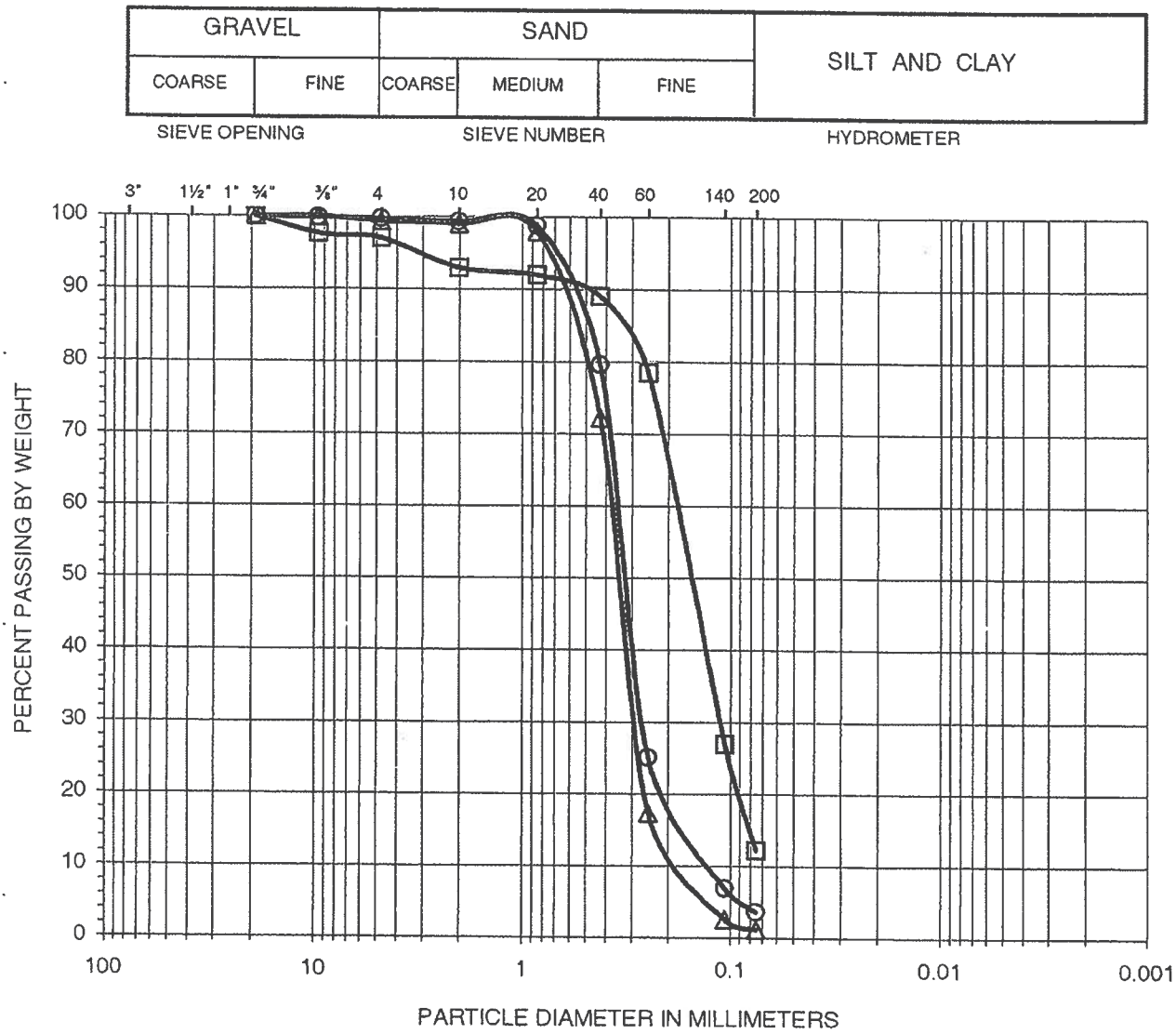
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-11, 1	5	4.05	SP
□	B-11, 2	8	96.72	CL

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-17



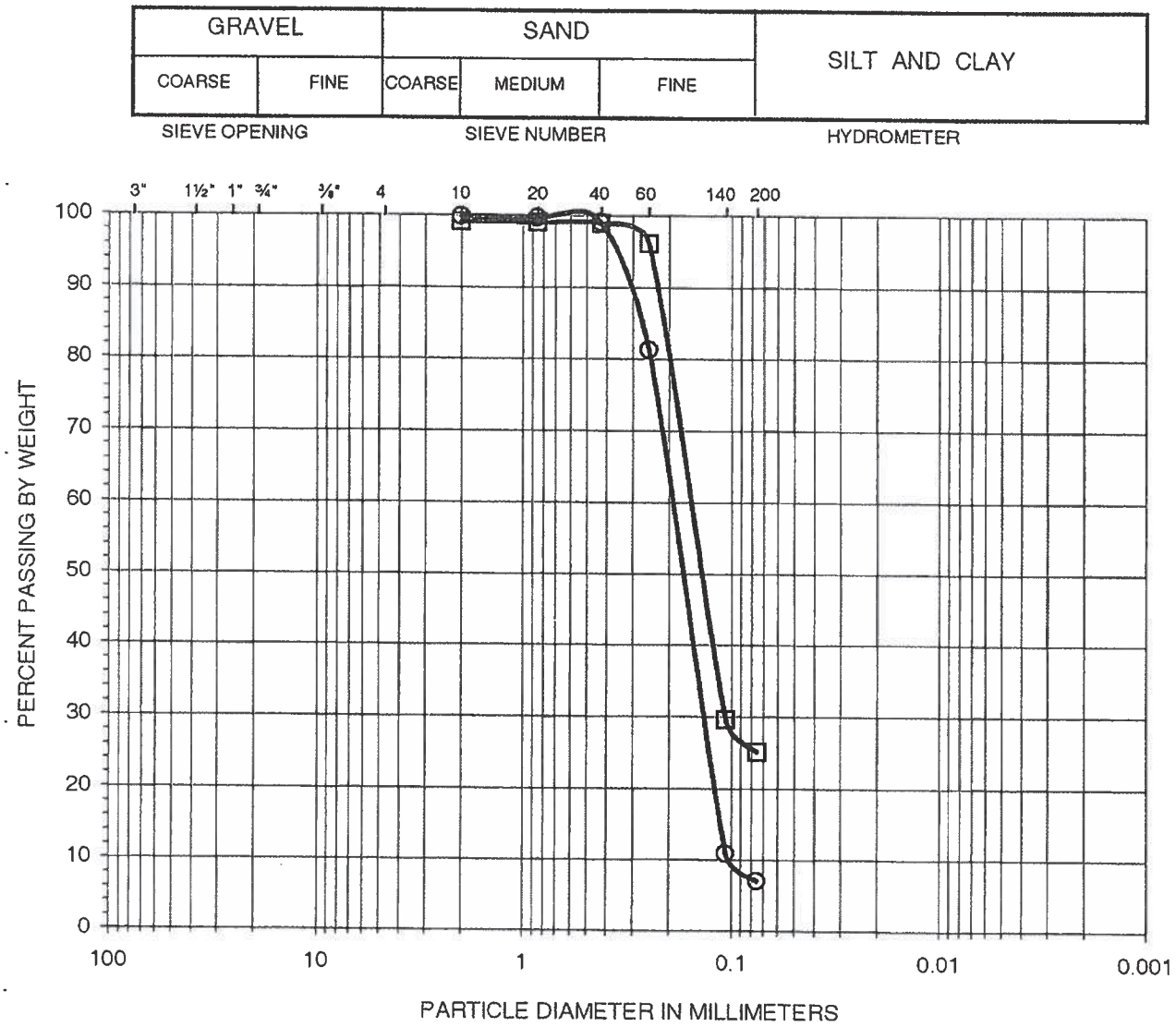
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-12, 1	2.5	3.63	SP
□	B-12, 2	4.5	12.20	SP-SM
△	B-12, 3	8	1.18	SP

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-18



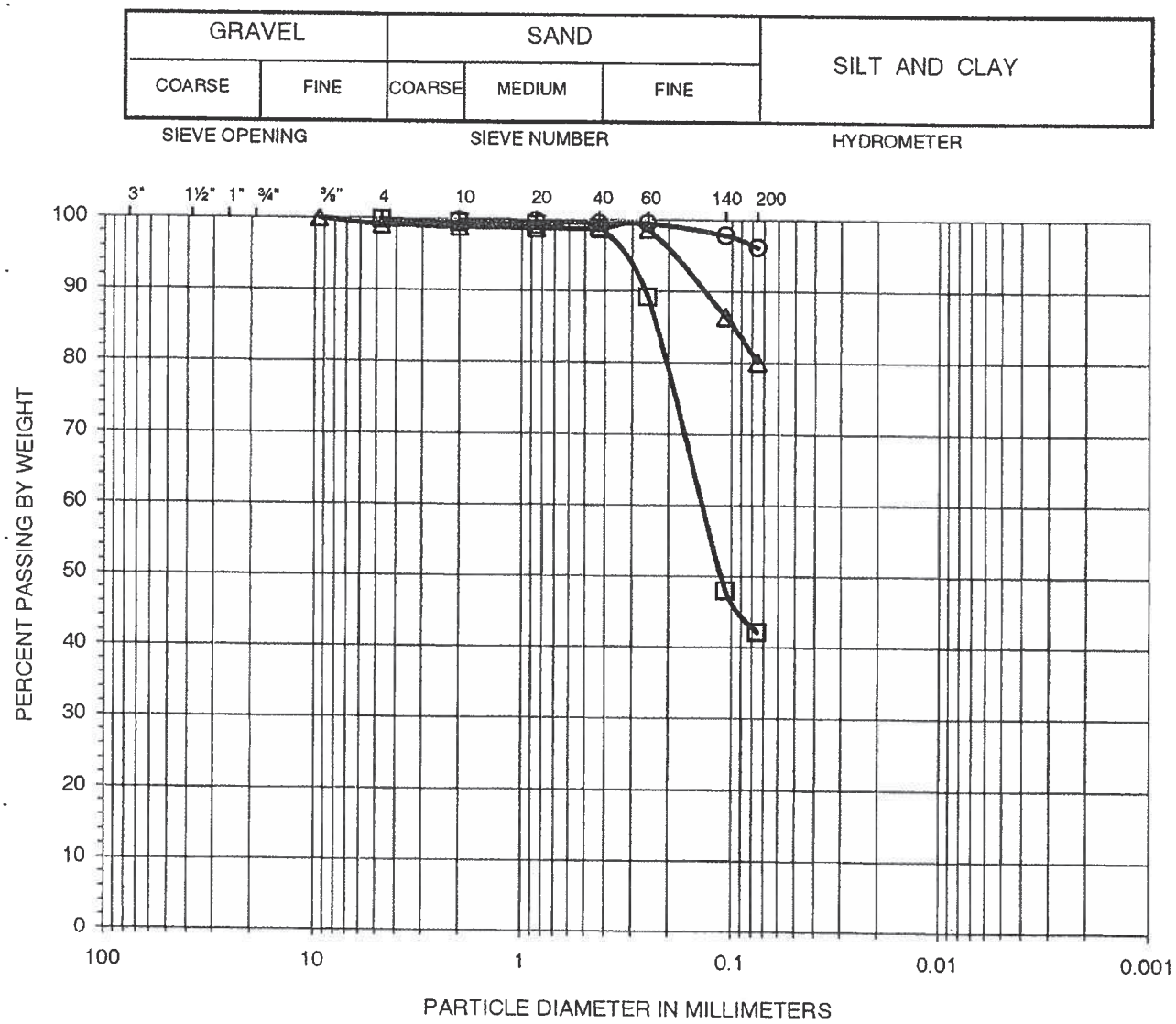
Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-13, 1	4	7.01	SP-SM
□	B-13, 2	9	25.14	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
AP No: 27-0504

B-19



Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-14, 1	3	96.18	ML
□	B-14, 2	6	42.15	SM
△	B-14, 3	10	80.10	ML

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
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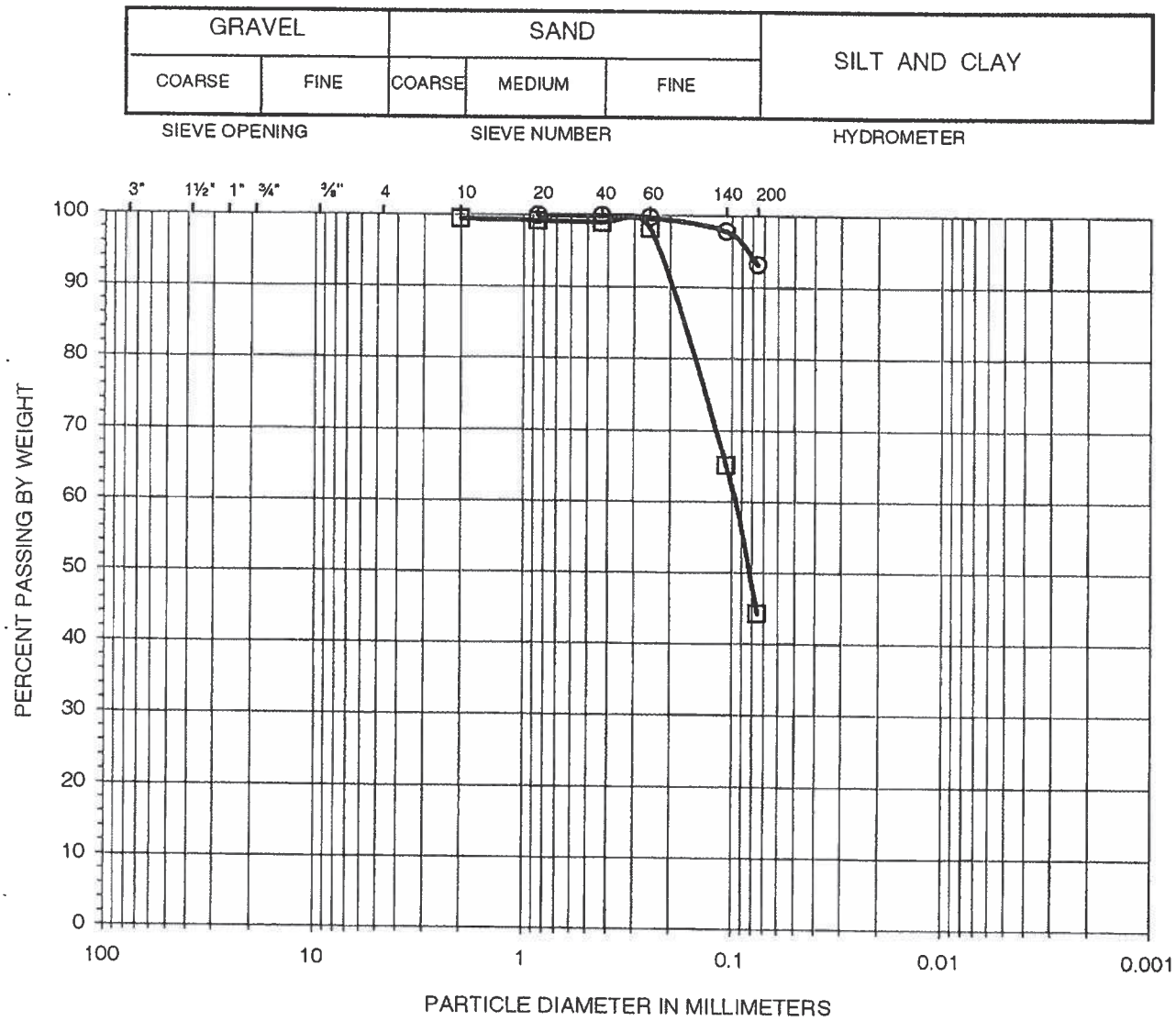
B-20



Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-15, 1	1.5	93.14	CL
□	B-15, 2	6.5	44.28	SM

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
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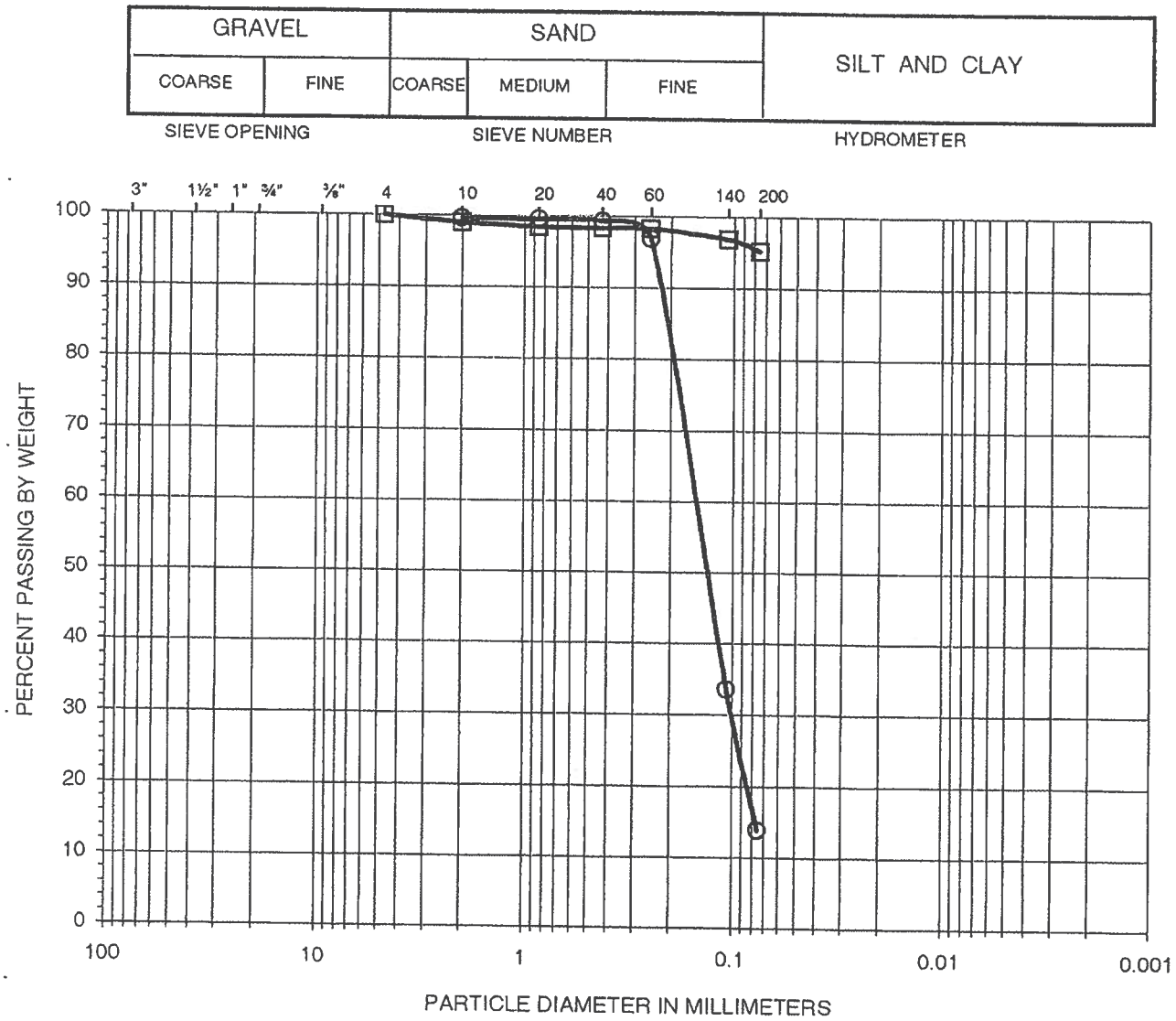

Symbol	Sample Identification	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-16, 1	3.5	13.85	SM
□	B-16, 2	7.5	95.22	CL

GRAIN SIZE DISTRIBUTION CURVE

ASTM D 422

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 5/4/2007
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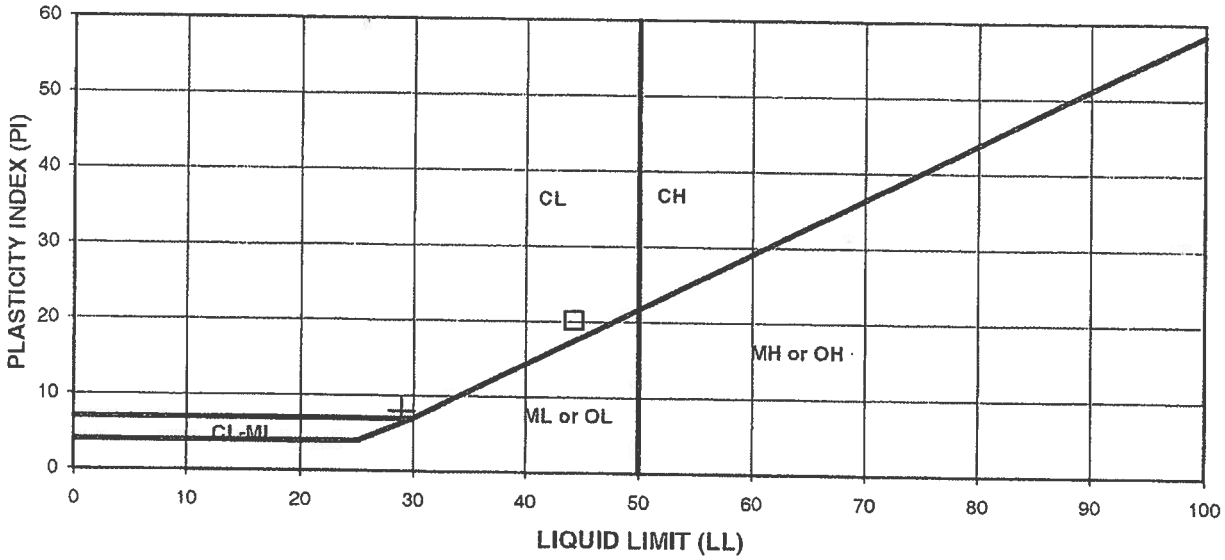

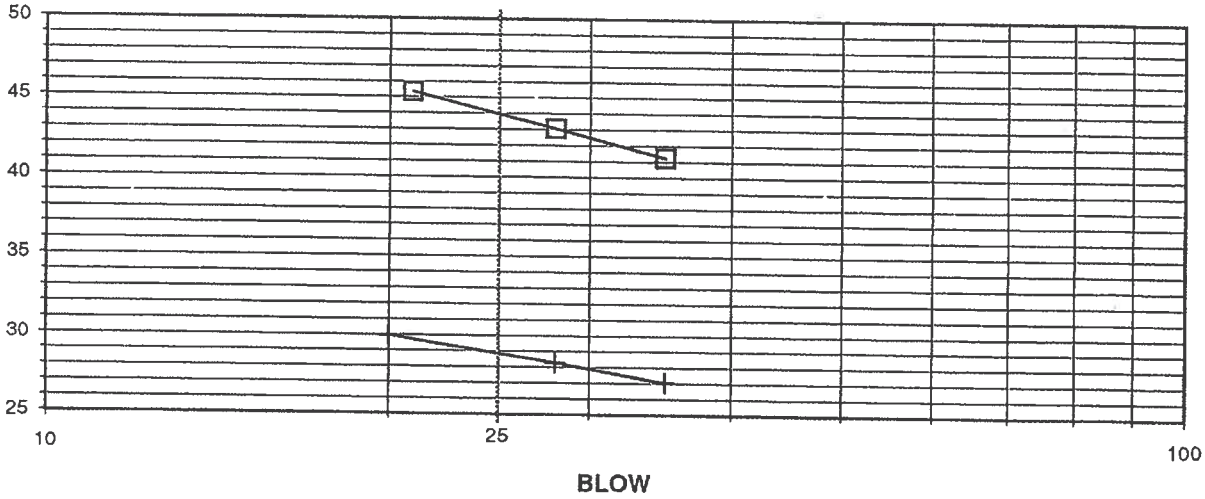

Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	U.S.C.S Symbol
+	B-1	1	5	29	21	8	CL
	B-2	1	5	NP	NP	NP	
	B-2	2	10	NP	NP	NP	
	B-2	3	15	NP	NP	NP	
□	B-3	4	20	44	24	20	CL
	B-4	2	10	NP	NP	NP	
	B-4	4	20	NP	NP	NP	

ATTERBERG LIMITS
ASTM D 4318-93

Project Name: North Slip Fill POLB
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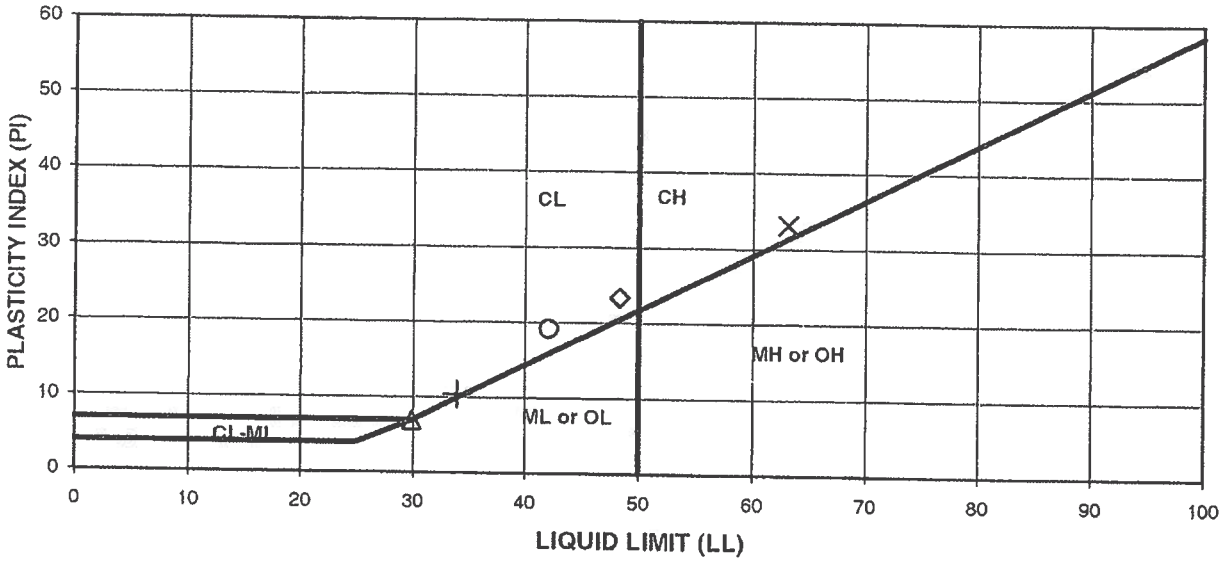

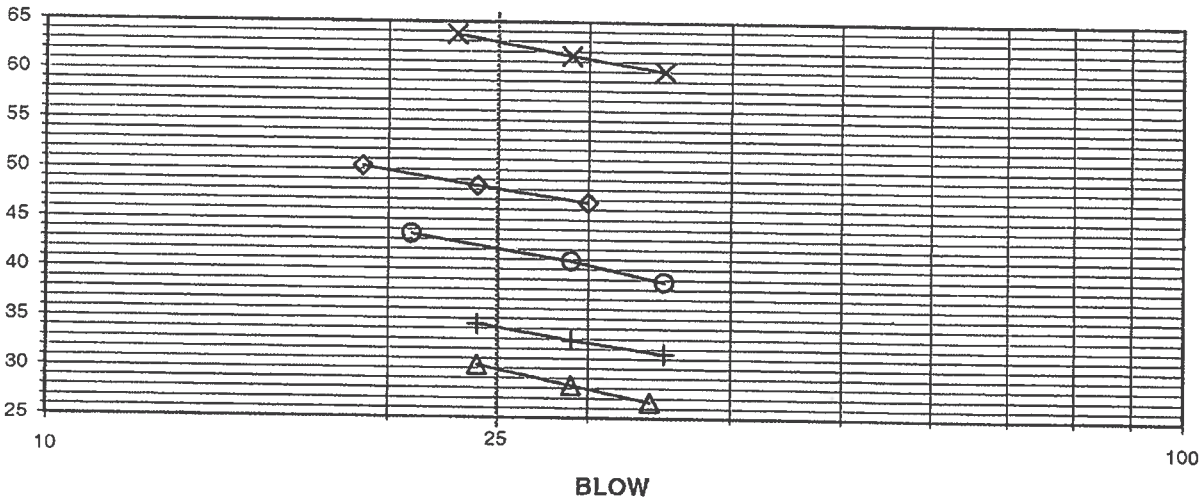

Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	U.S.C.S Symbol
+	B-5	4	20	34	24	10	CL
Δ	B-6	4	20	30	23	7	CL
×	B-7	1	3	63	30	33	CH
○	B-8	1	1	42	23	19	CL
	B-10	1	1.5	NP	NP	NP	
◊	B-11	2	8	48	25	23	CL

ATTERBERG LIMITS
ASTM D 4318-93

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 05/08/07
AP No: 27-0504 Figure No.: **B-24**

AP Engineering and Testing, Inc.
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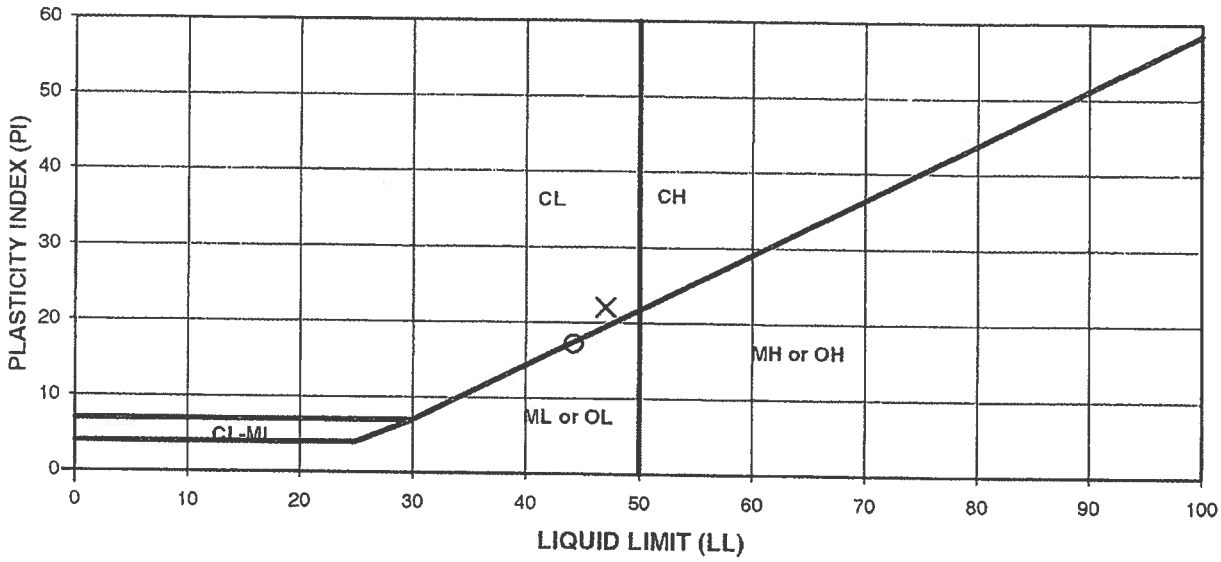

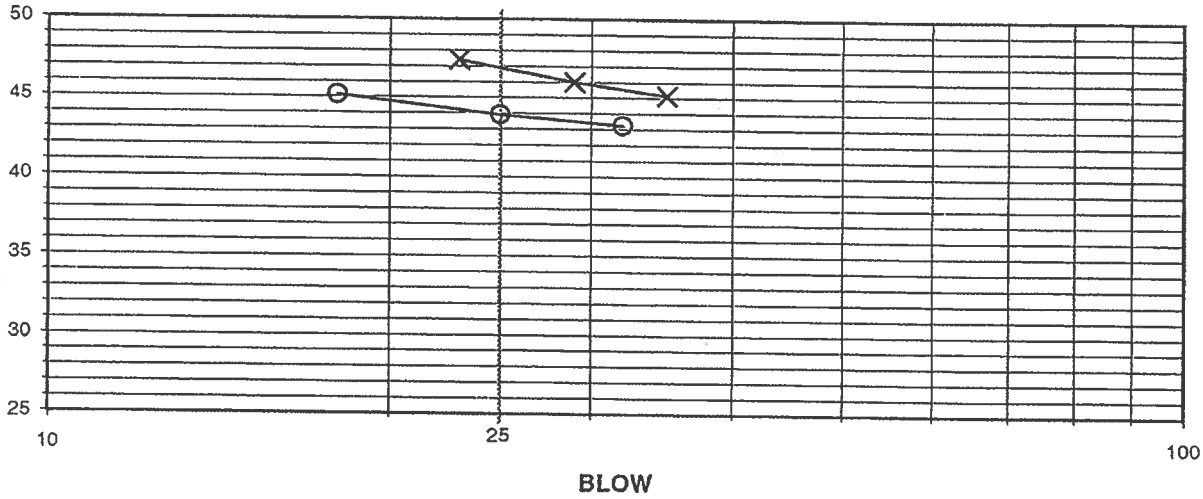

Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	U.S.C.S Symbol
+	B-14	1	3	NP	NP	NP	
	B-14	3	10	NP	NP	NP	
×	B-15	1	1.5	47	25	22	CL
○	B-16	2	7.5	44	27	17	CL

ATTERBERG LIMITS
ASTM D 4318-93

Project Name: North Slip Fill POLB
Project No.: 72500/1
Date: 05/08/07
AP No: 27-0504 Figure No.: **B-25**

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