TRENCH & BORING LOGS BY H.V. LAWNMASTER & CO. IN PSE REPORT (2002)

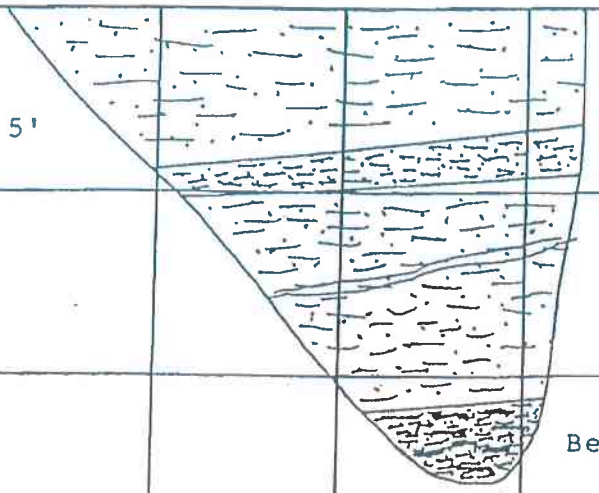
Test Pit 2

File # 88-11342

8-19-88 Surface Elevation 753± Ref. Lot 64 Logged by JD

ogical Classification or Description	Depth	Bag	Core	Density	Bulk	Hazard	Density	Moisture	Engineering Classification or Description	USCS Class
uvium									Alluvium: silty very fine to fine sand, dk. brown, very moist, med. dense	SM
							112	16	Clayey very fine to fine sand with silt, dk. brown, moist, med. dense	SC
	5						112	13	Silty very fine to fine sand, brown, moist, med. dense, some clay	SM
	10						107	15	Silty very fine to fine sand, brown moist, med. dense	SM
lrock istrano Formation Member							107	12	Weathered bedrock, silty very fine to fine sandstone, tan, moist, med. dense	
	15								Total depth - 13' No water, no caving	

st Pit Orientation N30°E → 1":5'



oots to approx. 5'

Layers dip to E approx. 10'

Alluvium - Qal

Bedrock - Tco

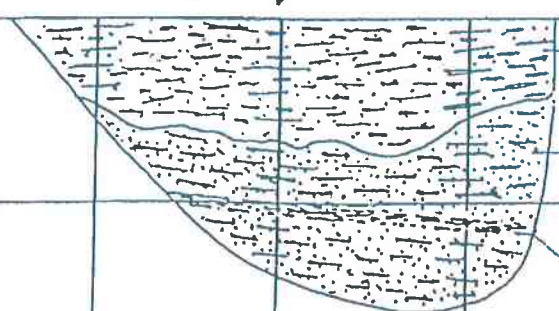
Test Pit 3

File # 88-11342

-19-88 Surface Elevation 750± Ref. Lot 64 Logged by JD

cal Classification Description	Depth	Bag	Core	Density	Bulk	Hazard	Density	Moisture		Engineering Classification or Description	USCS Cls'n.
ium										Silty very fine to fine sand w/clay dk. brown, moist, loose-med. dense	SM
k rano Formation mber	5						110	11		Bedrock: weathered, silty very fine to fine sandstone, lt. tan/greenish tan, med. dense-dense	
	10									Total depth - 7.5' No water, no caving	
	15										

Pit Orientation N50°E → 1":5'



AR SYMBOL T 3R Plate 2

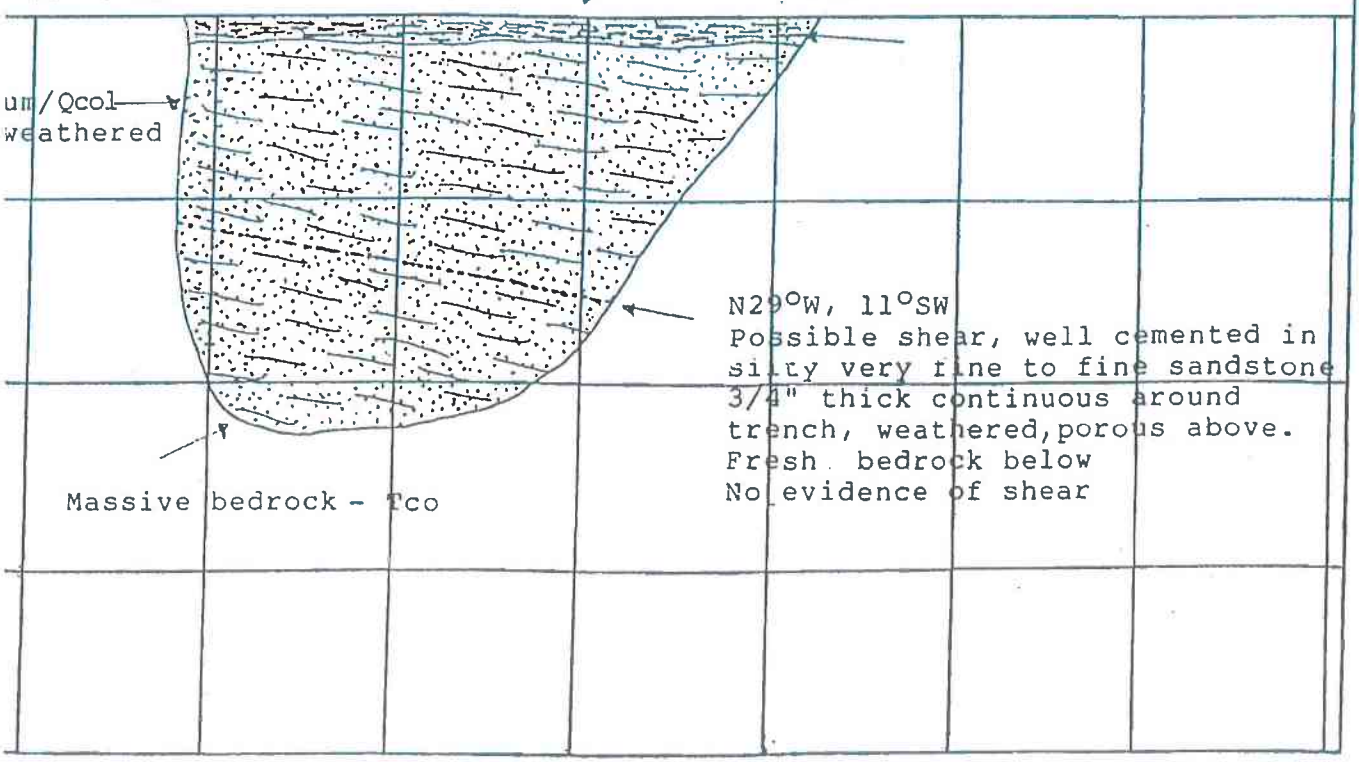
Test Pit 18

File # 88-11342

-23-88 Surface Elevation 785± Ref. Lot 77 Logged by JD

al Classification description	Depth	Bag	Core	Density	Bulk	Hazard	Density	Moisture	Engineering Classification or Description	USCS Cls'n.
									Silty very fine-fine sand sith clay	SM
:um - highly ıered									Silty very fine to fine sand, lt. brown, moist, porous, loose-med. dense	SM
	5						104	6	Silty very fine to fine sand, lt. brown, damp, med. dense	SM
: ·ano Formation ıber									Bedrock: silty very fine to fine sandstone, lt. greenish gray, damp, dense	
	10								Total depth - 12' No water, no caving	
	15									

: Orientation S60°W → 1":5'



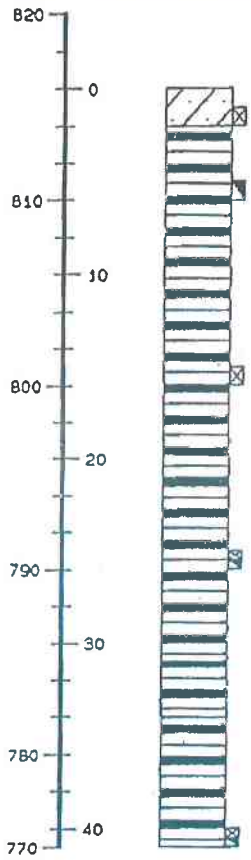
MAP SYMBOL T-18B

Plate 18

LOG OF SOIL BORING

ROJECT: Tentative Tract 13336, Phase I, El Toro
ORING NO.: DH-3
OCATION: See Plate 1
RILL METHOD: 24" bucket-auger
ONTRACTOR: Gallagher Drilling
EPTH TO WATER: n.a.

FILE NO: 88-11342
ELEV.: 816 ft.
START: n.a.
FINISH: n.a.
LOGGER: JE
CAVING: None
DATE DRILLED: 9-15-88



USCS	Description	Density pcf	Moisture %
SC	TOPSOIL: brown clayey sand		
	OSO MEMBER CAPISTRANO FORMATION: light gray silty fine sandstone	105	8
		113	11
		117	11
	- cemented		
	- partly cemented		
		112	11

Plate No. 12

H.V. Lawmaster & Co.

MAP SYMBOL B-DH-3B

GEOLOGIC DOWNHOLE: BORING NO. DH-3

Depth	Description	BY: JRE
0'-2'	Topsoil	
below 2'	Oso Member, Capistrano Formation	
6'	4-inch-thick clayey sand bed, N44°E,9°SE	
Between 10'-11'	Zone of highly micaceous material with cemented zones on south side	
Between 12'-14 1/2'	Material is partially cemented.	
13'	Bedding estimated to be N36°W,8°SW	
20'	2" thick micaceous lense,N52°W,8°SW	
21'	Sheared micaceous bed, N52°W,8°SW. Micaceous zone extends from 20 1/2' to 21 1/2'	
26'	Micaceous bed, N52°W,12°SW	
27'	6" thick cemented zone	
27 1/2'	1/8" thick sheared clay bed, N48°W,9°SW	
31'	1/16" Bentonitic clay bed, N39°W,8°SW. Immediately beneath clay, material becomes cemented.	
32 1/2'	Sandy clay bed, N33°W,7°SW	
Between 32 1/2-33 1/2'	Partially cemented	
33 1/2'	Well cemented	
34 1/2'	Partially cemented	
37'-38'	Well cemented	
Below 38'	Well indurated, partially cemented	

P SYMBOL B-DH-3B

Plate 3

FILE NO. 88-11342
H. V. LAWMASTER & CO., INC.

BORING, CPT, & TRENCH LOGS
BY HUSHMAND, 2010

SOIL CLASSIFICATION SYSTEM - ASTM D2487

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SAMPLERS

- AU Auger Cuttings
- GB Grab Sample
- MC Modified California Sampler
- RC Rock Core
- SPT Standard Penetration Test Sampler
- ST Shelby Tube

LABORATORY TESTS

RV	: R Value
CONS	: Consolidation
SA	: Sieve Analysis
COMP	: Compaction
EI	: Expansion Index
SE	: Sand Equivalent
UC	: Unconfined Compression
DS	: Direct Shear
HA	: Hydrometer Analysis
%200	: Percentage Passing No. 200 Sieve
AL	: Atterberg Limits
CORR	: Corrosion Potential
SW	: Swell Potential

WEATHERING DESCRIPTORS FOR INTACT ROCK

Description	Diagnostic features: Chemical Weathering-Discoloration and/or oxidation: Body of Rock	Chemical Weathering-Discoloration and/or oxidation: Fracture Surfaces	Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments	Texture and Solutioning: Texture	Texture and Solutioning: Solutioning	General Characteristics
Fresh	No discoloration, not oxidized.	No discoloration or oxidation.	No separation, intact (tight).	No change.	No solutioning.	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull.	Minor to complete discoloration or oxidation of most surfaces.	No visible separation, intact (tight).	Preserved.	Minor leaching of some soluble minerals may be noted.	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy."	All fracture surfaces are discolored or oxidized.	Partial separation of boundaries visible.	Generally preserved.	Soluble minerals may be mostly leached.	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions.	All fracture surfaces are discolored or oxidized, surfaces friable.	Partial separation, rock is friable; in semiarid conditions granitics are disaggregated.	Texture altered by chemical disintegration (hydration, argillation).	Leaching of soluble minerals may be complete.	Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or seamlets. Rock is significantly weakened.
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay.		Complete separation of grain boundaries (disaggregated)	Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete.		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes."

Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic features. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two different descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

ROCK HARDNESS

Description	Criteria
Extremely Hard	Specimen cannot be scratched with a pocket knife; no steel marks left on surface.
Very Hard	Specimen cannot be scratched with a pocket knife; steel marks left on surface.
Hard	Specimen can be scratched with a pocket knife with difficulty (heavy pressure).
Moderately Hard	Specimen can be scratched with pocket knife with light or moderate pressure.
Moderately Soft	Specimen can be grooved 1/6 in. deep with a pocket knife with moderate or heavy pressure.
Soft	Specimen can be grooved or gouged easily by a pocket knife with light pressure, can be scratched with fingernail.
Very Soft	Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife.

SORCE:
SOIL AND ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, SECTION 5, 2007

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXPANSION PROJECT	KEY TO ROCK DESCRIPTION	Figure A0
HAI HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers			

HAI Hushmand Associates, Inc.

BORING NUMBER HB-1

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/25/10 **COMPLETED** 3/25/10
GROUND ELEVATION 578.5 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING 40.5 ft / Elev 538.0 ft
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING 45.5 ft / Elev 533.0 ft
NOTES Station: 207+00 Offset: RT-70
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ARTIFICIAL FILL (Afe): covered with some peagravel and vegetation							
		SILTY SAND (SM): Light Brown, slightly moist, dense, trace gravel, fine to medium grained	X		AU MC 1	18-24-24 (48)	110	10	COMP RV
5			X		MC 2	16-20-20 (40)	104	19	
10		**ALLUVIUM/COLLUVIUM (Qac):** CLAYEY SAND (SC), olive brown to gray, slightly moist, dense, fine grained sand	X		SPT 3	7-9-12 (21)			SA
		color changes to brown							
15		POORLY-GRADED SAND (SP): Light brown, slightly moist, dense, fine to medium grained	X		MC 4	11-20-38 (58)	113	15	
20		- brown with yellowish brown inter layers	X		SPT 5	8-11-12 (23)			
25		SILTY SAND (SM): gray with yellow dots, slightly moist, medium dense	X		MC 6	10-18-20 (38)	107	16	SA HA
30									

(Continued Next Page)

FIGURE A2-1

HAI Hushmand Associates, Inc.

BORING NUMBER HB-1

CLIENT CITY OF LAKE FOREST **PROJECT NAME** ALTON PARKWAY GAP EXTENSION PROJECT

PROJECT NUMBER CLF-10-001 **PROJECT LOCATION** Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SAND (SM): light brown to gray, slightly moist, medium dense	X		SPT 7-1	3-8-7 (15)			
		POORLY-GRADED SAND (SP): light brown, slightly moist, medium dense, medium to coarse grained			SPT 7-2				
35		WELL-GRADED SAND (SW): light brown, slightly moist, dense, fine to medium grained, a piece of gravel 1½" in size in shoe	X		MC 8	23-50/3"	105	5	
40		▽ SILTY SAND WITH CLAY (SM): light brown, slightly moist, medium dense, fine grained sand	X		SPT 9	4-6-12 (18)			
45		▼ SILT WITH CLAY (ML): light brown with gray dots, ironoxides stains, moist, hard, fine grained sand, micacious	X		MC 10	12-26-50 (76)	113	16	
50		SANDY SILT (ML): light brown, moist, very stiff, fine grained sand	X		SPT 11	3-8-8 (16)			
55		**CAPISTRANO FORMATION-OSO MEMBER (Tco):** SILTY CLAYSTONE, light yellowish brown, hard, slightly weathered	X		MC 12	12-18-37 (55)	101	24	
60			X		SPT 13	37-8-50/4"			
		Backfilled with drill cuttings Borehole terminated at 61 feet.							

HAI-AMR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-2

HAI Hushmand Associates, Inc.

BORING NUMBER HB-3

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/25/10 **COMPLETED** 3/25/10
GROUND ELEVATION 570 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING 24.5 ft / Elev 545.5 ft
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING 25.3 ft / Elev 544.7 ft
NOTES Station: 208+85 Offset: RT-40
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ALLUVIUM/COLLUVIUM (Qac): ground surface covered with tall grass. SILTY SAND (SM): dark brown, slightly moist, loose, fine grained sand, low plasticity silt			AU MC 1	4-4-3 (7)	114	10	
5		-brown, moist, dense, fine grained sand, trace silt			MC 2	9-15-26 (41)	125	11	
10		CLAYEY SAND (SC): yellowish brown, slightly moist, dense, some 1" size well rounded gravel, fine to medium grained sand, low plasticity clay			SPT 3	9-14-11 (25)			
15		-transition to poorly graded sand							
		SILTY SAND TO POORLY GRADED SAND (SM): yellowish brown, slightly moist, dense, fine grained sand			MC 4	16-22-25 (47)	108	17	
20		POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM): reddish brown, wet, very dense, coarse grained sand, gravel to 1" size			SPT 5	15-17-18 (35)			SA
25		**TERRACE DEPOSIT (Qt):** POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), reddish brown, wet, very dense, gravel to ¾" size			MC 6	25-50/5"	116	15	

Backfilled with drill cuttings

Borehole terminated at 27 feet.

HAI-AMIR ALTON PKWY.GPJ GINT US GDT 4/23/10

FIGURE A2-3

HAI Hushmand Associates, Inc.

BORING NUMBER HB-4

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/25/10 **COMPLETED** 3/25/10
GROUND ELEVATION 575 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
∇ **AT TIME OF DRILLING** 12.5 ft / Elev 562.5 ft
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING ---
NOTES Station: 211+95 Offset: RT-08
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ALLUVIUM/COLLUVIUM (Qac): ground surface covered with tall grass							
		SILTY SAND (SM) WITH CLAY: dark brown, slightly moist, medium dense, fine grained sand	X		AU MC 1	6-11-16 (27)	122	12	
5		SILTY SAND (SM) WITH TRACE GRAVEL : light brown, slightly moist, very dense, fine grained sand, gravel up to 1½" in size	X		MC 2	28-35-32 (67)	118	7	
10		-gravel lenses							
		SILTY SAND (SM) WITH CLAY: light brown, slightly moist, dense, fine to medium grained sand, some silt	X		SPT 3	7-10-15 (25)			
		∇							
15		-no recovery of sample, 2"×4"×5" size rock in sampler	X		MC 4	19-21-25 (46)			
20		SILTY SAND (SM): olive brown, wet, medium dense, fine grained sand	X		SPT 5	5-7-11 (18)			SA HA
25		-dense	X		MC 6	10-15-50 (65)	107	21	
30									

(Continued Next Page)

FIGURE A2-4

HA-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

HAI Hushmand Associates, Inc.

BORING NUMBER HB-4

CLIENT CITY OF LAKE FOREST **PROJECT NAME** ALTON PARKWAY GAP EXTENSION PROJECT

PROJECT NUMBER CLF-10-001 **PROJECT LOCATION** Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		POORLY GRADED SAND (SP): light brown, wet, dense, fine to medium grained sand, trace silt, fines increase with depth	X		SPT 7	7-10-22 (32)			
35			X		MC 8	13-17-17 (34)	111	17	
		SILTY SAND (SM): gray with yellow lines, wet, very dense, fine grained, trace silt							
40			X		SPT 9	15-24-30 (54)			
45									
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, greenish gray, moist, moderately hard to hard, fine grained sand	X		MC 10-1 MC 10-2	50/5"	102	24	
50			X		MC 11	50/5"			
		Backfilled with drill cuttings Borehole terminated at 50.5 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-5

BORING NUMBER HB-5

HAI Hushmand Associates, Inc.

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 **COMPLETED** 3/24/10
GROUND ELEVATION 595 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
∇ **AT TIME OF DRILLING** 8.5 ft / Elev 586.5 ft
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING ---
NOTES Station: 216+85 Offset: RT-05
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ALLUVIUM/COLLUVIUM (Qac): SILT WITH CLAY (ML), dark brown, slightly moist, ground surface covered with grass							
		SILTY SAND (SM) WITH CLAY: dark brown, moist, medium dense, fine grained sand	X		AU MC 1	5-8-14 (22)	116	13	
5		-light brown, slightly moist	X		MC 2	7-14-19 (33)	115	15	
10		CLAYEY SAND (SC): light yellowish brown, slightly moist, medium dense, fine grained sand, some silt, low plasticity fines	X		SPT 3	4-4-7 (11)			SA
15		**CAPISTRANO FORMATION-OSO MEMBER (Tco):** CLAYEY SANDSTONE, light yellowish brown, moist, moderately hard, fine grained sand	X		MC 4	15-26-50/5"	120	15	
20			X		SPT 5	32-50/5"			
		Backfilled with drill cuttings Borehole terminated at 21 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-6

HAI Hushmand Associates, Inc.

BORING NUMBER HB-7

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 **COMPLETED** 3/24/10
GROUND ELEVATION 616 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING 4.0 ft / Elev 612.0 ft
LOGGED BY Jaq **CHECKED BY** AB
AT END OF DRILLING 3.3 ft / Elev 612.8 ft
NOTES Station: 220+80 Offset: LT-20
AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ARTIFICIAL FILL (Af): SILTY SAND (SM), dark brown, dry to slightly moist, ground surface covered with grass							
		ALLUVIUM/COLLUVIUM (Qac): SILTY SAND (SM), dark brown, moist, medium dense, fine grained sand, low plasticity fines			AU MC 1	3-7-12 (19)	110	19	
5		-wet, very stiff			MC 2	5-12-17 (29)	116	18	HA
10		-caliche in sample, wet on top of sample, bottom moist			SPT 3	2-5-7 (12)			
15		-olive brown, wet, fine grained sand			MC 4	6-10-16 (26)	107	20	HA CONS
20		-dense			SPT 5-1 SPT 5-2	6-11-13 (24)			
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, light gray, soft, intensely weathered, iron oxide stains, moist, micacious							
25		-moderately soft and weathered			MC 6	24-34-50/5"	114	17	
30									

(Continued Next Page)

FIGURE A2-7

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

HAI Hushmand Associates, Inc.

BORING NUMBER HB-7

CLIENT CITY OF LAKE FOREST **PROJECT NAME** ALTON PARKWAY GAP EXTENSION PROJECT

PROJECT NUMBER CLF-10-001 **PROJECT LOCATION** Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, light gray, moist, moderately hard, slightly weathered, iron oxide stains, micacious	X		SPT 7	38-50/3"			
		Backfilled with drill cuttings							
		Borehole terminated at 31 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-8

HAI Hushmand Associates, Inc.

BORING NUMBER HB-9

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 **COMPLETED** 3/24/10
GROUND ELEVATION 639 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING —
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING —
NOTES Station: 226+75 Offset: RT-52
AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ground surface covered with grass and vegetation							
		ALLUVIUM/COLLUVIUM (Qac): CLAYEY SAND (SC), dark brown, slightly moist, medium dense, fine to medium grained sand							
5									
		SILTY SAND (SM): dark brown, slightly moist, medium dense, fine grained sand	X		MC 1	7-15-17 (32)	111	17	
10									
			X		SPT 2	3-4-6 (10)			
		SANDY LEAN CLAY (CL): olive brown, very stiff, fine grained sand, low plastic clay			ST 3		91	28	CONS
15									
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, light gray with yellow strands, slightly moist, soft, intensely weathered, fine grained sand	X		MC 4	7-15-22 (37)	103	21	
20									
		-moderately soft and weathered	X		SPT 5-1 SPT 5-2	22-50/1"			
		Backfilled with drill cuttings Borehole terminated at 21.1 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-9

BORING NUMBER HB-10

Hushmand Associates, Inc.

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 **COMPLETED** 3/24/10
GROUND ELEVATION 654.5 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING ---
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING ---
NOTES Station: 229+15 Offset: LT-50
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ALLUVIUM/COLLUVIUM (Qac): SILT WITH CLAY (ML), dark brown, slightly moist, hard							
		-organic impurities			AU MC 1	12-28-50/5"	120	7	
5		**CAPISTRANO FORMATION-OSO MEMBER (Tco):** SANDY SILTSTONE, dark brown, slightly moist, hard, intensely weathered, fine grained sand			MC 2	11-33-50 (83)	122	8	
10		SILTY SANDSTONE: brown, dry, moderately soft, intensely weathered			SPT 3	6-9-12 (21)			SA
15					MC 4	12-23-33 (56)	119	13	
20					SPT 5	6-10-12 (22)			
25		SILTSTONE: brown, moist, moderately soft, moderately weathered			MC 6	13-22-26 (48)	110	18	
30									

(Continued Next Page)

FIGURE A2-10

HAI **Hushmand Associates, Inc.**

BORING NUMBER HB-10

CLIENT CITY OF LAKE FOREST **PROJECT NAME** ALTON PARKWAY GAP EXTENSION PROJECT

PROJECT NUMBER CLF-10-001 **PROJECT LOCATION** Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, light gray, moist, moderately hard, moderately weathered	X		SPT 7	7-14-19 (33)			
35		-hard, micacious	X		MC 8	30-50/4"	107	19	
40			X		SPT 9	50/4"			
		Backfilled with drill cuttings Borehole terminated at 40.5 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-11

HAI Hushmand Associates, Inc.

BORING NUMBER HB-11

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 COMPLETED 3/24/10
GROUND ELEVATION 645 ft HOLE SIZE 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING ---
LOGGED BY Jag CHECKED BY AB
AT END OF DRILLING ---
NOTES Station: 233+00 Offset: LT-25
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ARTIFICIAL FILL (Af): CLAYEY SAND (SC), olive brown, slightly moist, very dense							
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, light gray, slightly moist, moderately hard, moderately weathered, fine to medium grained sand	X		AU MC 1	30-50/4"			COMP DS
5			X		MC 2	30-50/4"	99	12	
10		-grayish brown	X		SPT 3	20-50			
15									
20		-light gray	X		SPT 5	28-50/5"			
		Backfilled with drill cuttings Borehole terminated at 21.5 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-12

HAI Hushmand Associates, Inc.

BORING NUMBER HB-12

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/23/10 **COMPLETED** 3/23/10
GROUND ELEVATION 634 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING ---
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING ---
NOTES Station: 237+75 Offset: 00
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ALLUVIUM (Qal): CLAYEY SAND (SC), brown, slightly moist, medium dense, fine to medium grained sand							
			X		AU MC 1	9-11-15 (26)	118	14	CORR
5		-light brown, micaceous	X		MC 2	10-14-20 (34)	118	13	
		SILTY SAND (SM): olive brown, slightly moist, loose, fine grained sand, about 20% of fines							
10		-medium dense	X		SPT 3	2-3-3 (6)			SA
15			X		MC 4	5-9-13 (22)	101	8	CONS
20			X		SPT 5	4-4-6 (10)			
25		**CAPISTRANO FORMATION-OSO MEMBER(Tco):** SILTY SANDSTONE: light yellowish brown, slightly moist, hard, fine grained sand, micaceous	X		MC 6	12-30-50/4"	114	11	
30									

(Continued Next Page)

FIGURE A2-13

HAI **Hushmand Associates, Inc.**

BORING NUMBER HB-12

CLIENT CITY OF LAKE FOREST **PROJECT NAME** ALTON PARKWAY GAP EXTENSION PROJECT

PROJECT NUMBER CLF-10-001 **PROJECT LOCATION** Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SANDSTONE: light yellowish brown, slightly moist, hard, fine grained sand, micaceous	X		SPT 7	20-38-50/5"			
35									
40			X		MC 8	28-50			
		Backfilled with drill cuttings Borehole terminated at 41.5 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-14

HAI Hushmand Associates, Inc.

BORING NUMBER HB-13

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/23/10 **COMPLETED** 3/23/10
GROUND ELEVATION 650 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING —
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING —
NOTES Station: 239+55 Offset: RT-160
AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ARTIFICIAL FILL (Afe): CLAYEY SAND (SC), dark brown, slightly moist, medium dense, fine to medium grained sand							
			X		AU MC 1	6-8-20 (28)	112	12	
5		**ALLUVIUM (Qal):** SILTY SAND (SM), light brown, slightly moist, very dense, fine to medium grained sand	X		MC 2	40-50/4"	112	14	
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SILTY SANDSTONE, light gray, slightly moist, hard, fine to medium grained sand							
10			X		SPT 3	16-38-50/3"			
15			X		MC 4	50/5"	103	9	
			X		SPT 5	50/4"			
		Backfilled with drill cuttings Borehole terminated at 17.5 feet.							

HAI-AMR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-15

HAI Hushmand Associates, Inc.

BORING NUMBER HB-14

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 **COMPLETED** 3/24/10
GROUND ELEVATION 658.5 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING ---
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING ---
NOTES Station: 243+80 Offset: 00
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ARTIFICIAL FILL (Afe): SILTY SAND (SM), greenish gray, slightly moist, dense, fine to medium grained sand							
			X		AU MC 1	10-20-32 (52)	118	14	
5			X		MC 2	15-27-36 (63)	119	15	
10		-medium dense -dark brown	X		SPT 3	4-9-10 (19)			SA
15		**TERRACE DEPOSIT (Qt):** SILTY SAND (SM), reddish brown, dry, dense, fine grained sand	X		MC 4	15-23-32 (55)	125	8	
20		SANDY SILT (ML): reddish brown, slightly moist, very stiff, fine to medium grained sand, well rounded pebbles and gravels to 1" in diameter	X		SPT 5	4-4-6 (10)			
25		WELL-GRADED SAND (SW): white to reddish brown, slightly moist, dense	X		MC 6	13-21-27 (48)	106	3	
30									

(Continued Next Page)

FIGURE A2-16

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

HAI **Hushmand Associates, Inc.**

BORING NUMBER HB-14

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		WELL-GRADED SAND (SW): white to reddish brown, slightly moist, dense	X		SPT 7	4-10-12 (22)			
35		POORLY-GRADED SAND WITH GRAVEL (SP): brownish white, slightly moist, very dense, well rounded gavel to 1½" in size	X		MC 8	19-30-45 (75)	113	3	
40		-dense	X		SPT 9	8-12-21 (33)			
		CAPISTRANO FORMATION-OSO MEMBER (Tco): SANDSTONE, whitish brown, dry, moderately soft, slightly weathered, fine grained sand							
45		-½" size cemented sandstone	X		MC 10	30-48	108	3	
50			X		SPT 11	15-12-17 (29)			
		Backfilled with drill cuttings Borehole terminated at 51.5 feet.							

HAI-AMR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-17

BORING NUMBER HB-15

HAI Hushmand Associates, Inc.

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/23/10 **COMPLETED** 3/23/10
GROUND ELEVATION 655 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING 53.5 ft / Elev 601.5 ft
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING 53.0 ft / Elev 602.0 ft
NOTES Station: 245+00 Offset: RT-120
AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ARTIFICIAL FILL (Af): CLAYEY SAND (SC), gray, dry, very dense, fine grained sand, about 25% silt							
			X		AU MC 1	15-28-43 (71)	124	11	
5		-mixture of light gray to brown, about 10% silt	X		MC 2	20-50	120	11	
10		-medium dense	X		SPT 3	4-5-12 (17)			
15		-mixture of light gray to greenish brown, slightly moist, dense	X		MC 4	11-20-28 (48)	117	11	
20		-blackish brown to brown, medium dense	X		SPT 5	4-8-10 (18)			
25		-very dense	X		MC 6	16-38-50 (88)	120	13	
30									

(Continued Next Page)

FIGURE A2-18

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

HAI Hushmand Associates, Inc.

BORING NUMBER HB-15

CLIENT CITY OF LAKE FOREST **PROJECT NAME** ALTON PARKWAY GAP EXTENSION PROJECT

PROJECT NUMBER CLF-10-001 **PROJECT LOCATION** Alton pkwy btwn Commerce ctr dr. & Town ctr dr.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SAND (SM), blackish brown to brown, slightly moist, dense, fine grained sand, about 10% silt	X		SPT 7	9-12-17 (29)			
35		POORLY-GRADED SAND (SP) to SILTY SAND (SM): light brown, slightly moist, very dense, pebbles up to 1½" in size	X		MC 8	24-36-40 (76)	119	9	
40		SILTY SAND (SM): light gray to brown mixture, slightly moist, very dense, fine grained sand	X		SPT 9	22-14-30 (44)			
45			X		MC 10	35-27-45 (72)	125	8	
50		**ALLUVIUM (Qal):** SILT(ML) WITH CLAY, light brown, moist, stiff	X		SPT 11-1 SPT 11-2	6-10-14 (24)			
		POORLY GRADED SAND (SP): light brown, moist, dense, fine to medium grained sand, trace silt							
55		SILT (ML) WITH CLAY: light brown, moist, very stiff, low plastic clay	X		MC 12-2 MC 12-1	6-15-16 (31)	86	35	
60		SILT (ML) WITH CLAY: light brown, moist, very stiff, low plastic clay	X		SPT 13	6-16-24 (40)			
		POORLY GRADED SAND (SP): light gray, moist, very dense, trace silt							
		Backfilled with drill cuttings							
		Borehole terminated at 61.5 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-19

HAI Hushmand Associates, Inc.

BORING NUMBER HB-16

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/24/10 **COMPLETED** 3/24/10
GROUND ELEVATION 686 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING —
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING —
NOTES Station: 247+70 Offset: 00
AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		TERRACE DEPOSIT (Qt): CLAYEY SAND (SC), olive brown, slightly moist, medium dense							
			X		AU MC 1	6-7-9 (16)	114 103	10 7	DS COMP
5		-greenish brown, dense	X		MC 2	15-26-30 (56)	108	10	
10		**CAPISTRANO FORMATION-OSO MEMBER (Tco):** SANDSTONE, light brown, slightly moist, very soft, intensely weathered, fine grained sand	X		SPT 3	4-6-8 (14)	106	1	
15		-whitish gray, moderately soft, moderately weathered	X		MC 4	10-24-36 (60)	101	4	DS
20		-fine to medium grained sand	X		SPT 5	10-15-18 (33)			
		Backfilled with drill cuttings Borehole terminated at 21.5 feet.							

HAI-AMIR ALTON PKWY.GPJ GINT US.GDT 4/23/10

FIGURE A2-20

HAI Hushmand Associates, Inc.

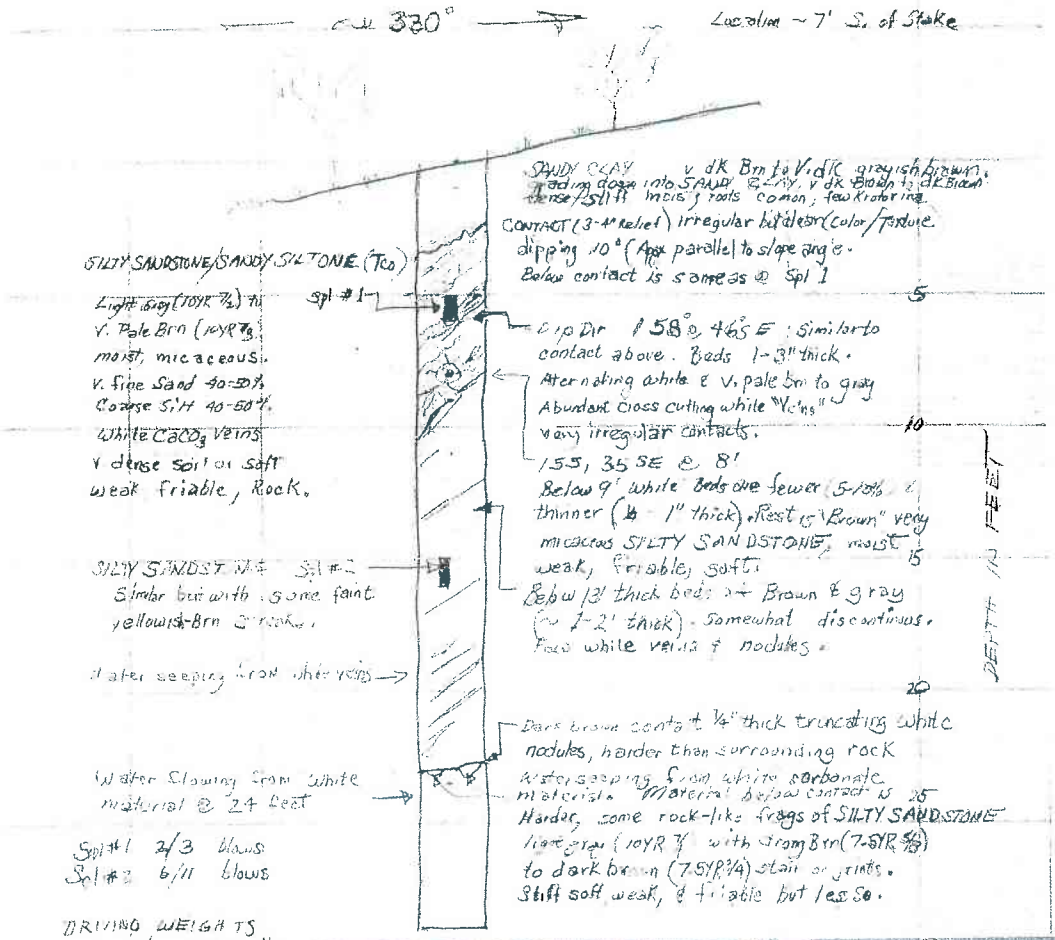
BORING NUMBER HB-17

CLIENT CITY OF LAKE FOREST
PROJECT NAME ALTON PARKWAY GAP EXTENSION PROJECT
PROJECT NUMBER CLF-10-001
PROJECT LOCATION Alton pkwy btwn Commerce ctr dr. & Town ctr dr.
DATE STARTED 3/25/10 **COMPLETED** 3/25/10
GROUND ELEVATION 664.5 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR 2R DRILLING INCORPORATED
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (HSA)
AT TIME OF DRILLING —
LOGGED BY Jag **CHECKED BY** AB
AT END OF DRILLING 19.5 ft / Elev 645.0 ft
NOTES Station: 250+60 Offset: LT-85
0.5hrs AFTER DRILLING 13.0 ft / Elev 651.5 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SAND (SM): ground covered with tall grass							
		ALLUVIUM/COLLUVIUM (Qac): LEAN CLAY WITH SAND (CL), dark brown, slightly moist, medium dense, fine to medium grained sand, some silt			AU				
			X		MC 1	5-10-12 (22)	115	15	
5			X		MC 2	7-10-13 (23)	120	14	CONS
10		SILT WITH CLAY (ML): light brown, slightly moist, hard, low plastic clay	X		SPT 3	5-10-12 (22)			CORR
		CAPISTRANO FORMATION-CSO MEMBER (Tco): SANDY SILTSTONE, light gray, slightly moist, moderately soft, moderately weathered, micaceous							
15			X		MC 4	12-24-30 (54)	109	19	
20		CLAYSTONE: white, moist, soft, highly plastic, intensely weathered	X		SPT 5-2	7-3-17 (20)			
		SANDY SILTSTONE: light gray, slightly moist, moderately soft, moderately weathered			SPT 5-1				
25		CLAYSTONE: light gray, moist, hard	X		MC 6-1	43-50/3"			
		SANDY SILTSTONE: light gray, slightly moist, slightly weathered			6-2		114	17	
30									

(Continued Next Page)

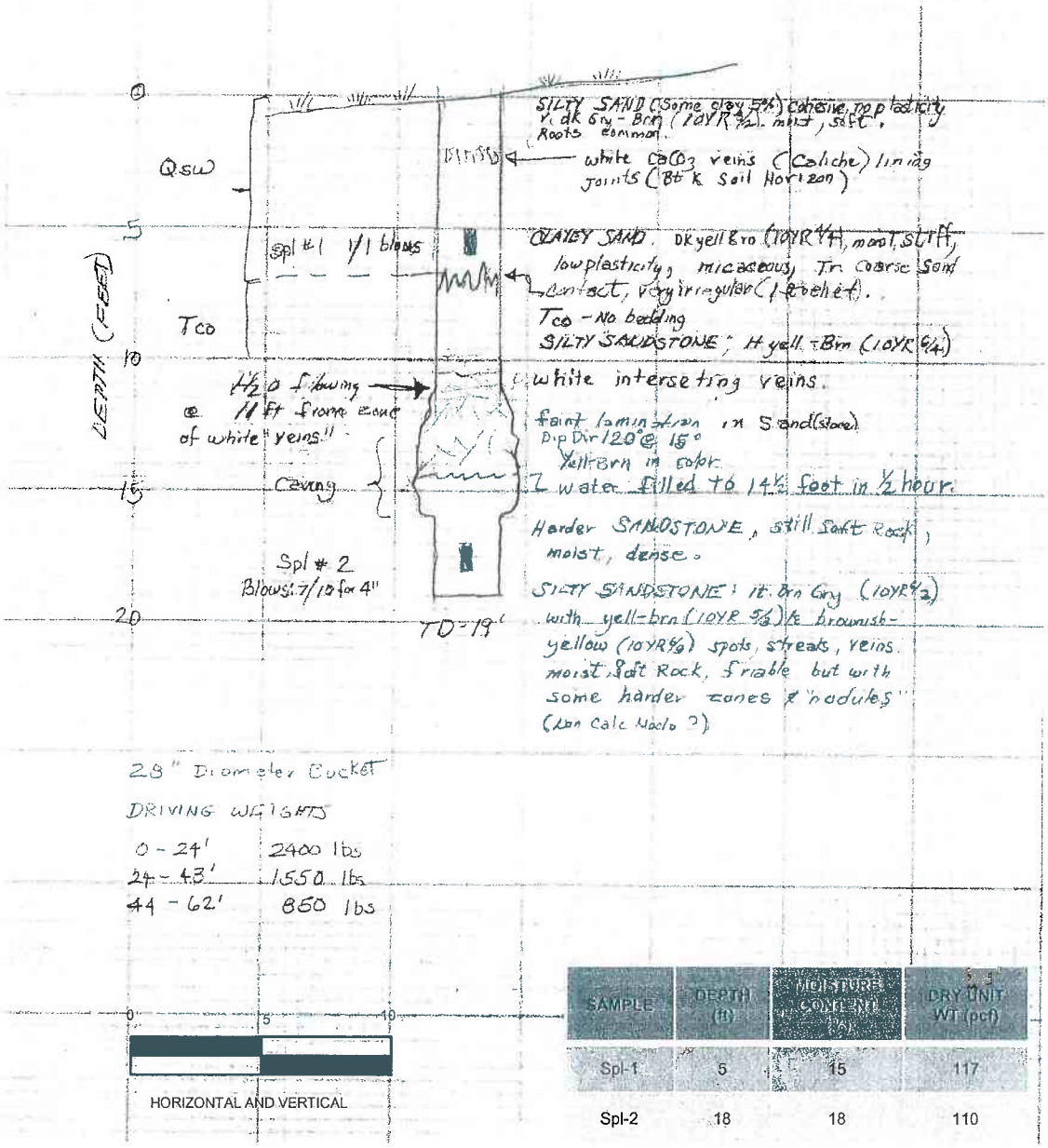
FIGURE A2-21



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)	OTHER TESTS
Spl-1	5	30	90	SA (H), AL, DS
Spl-2	15	13	121	

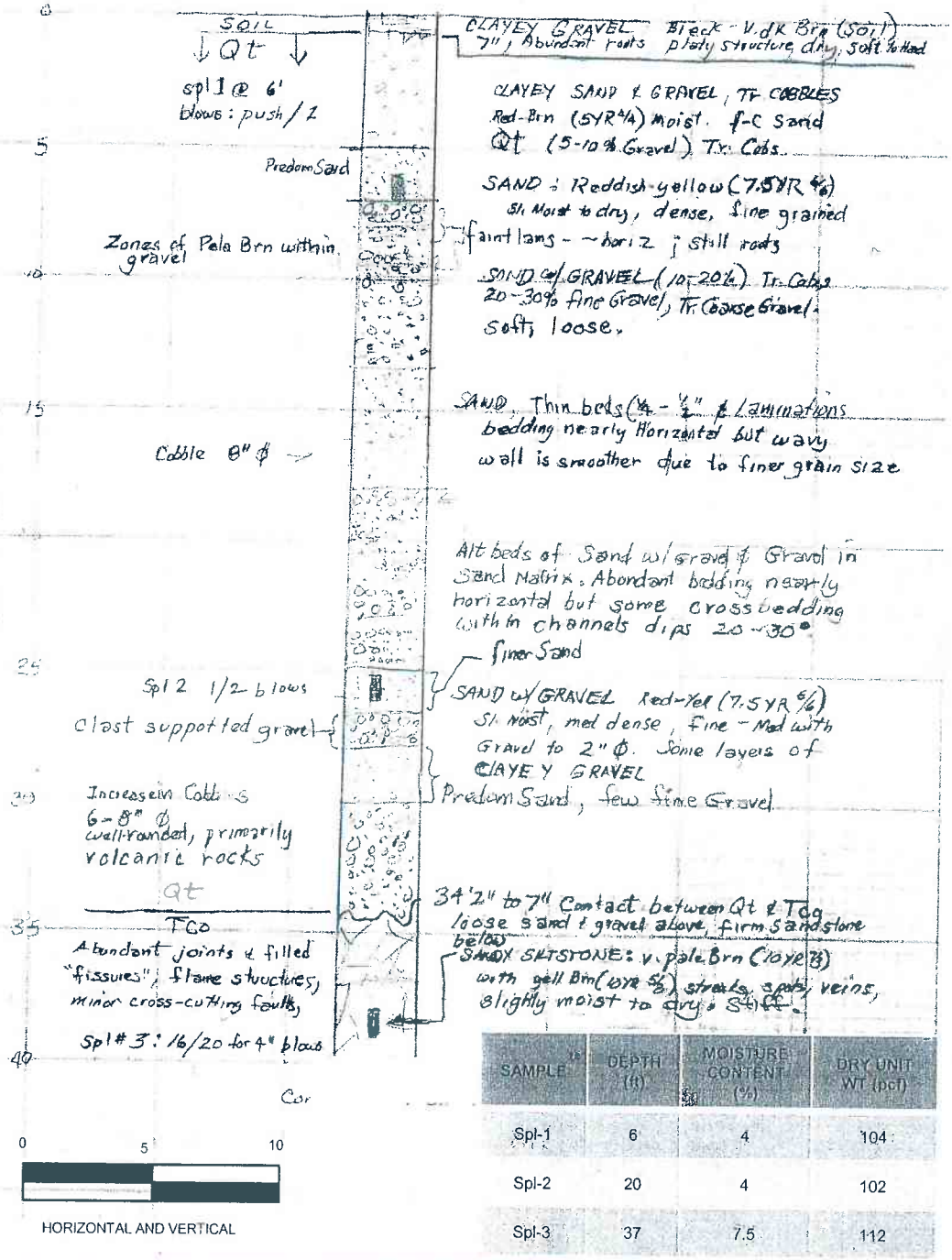
HORIZONTAL AND VERTICAL

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	BUCKET AUGER LOG HBA-1	Figure A1-1
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	5	15	117
Spl-2	18	18	110

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	BUCKET AUGER LOG HBA-2	Figure A1-2
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	6	4	104
Spl-2	20	4	102
Spl-3	37	7.5	112

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	BUCKET AUGER LOG HBA-3 (SHEET 1 OF 2)	Figure A1-3
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		

Continued

40

Dk Brown layer (Bed?) DD / 90 @ 10°

SANDY SILTSTONE & SILTY f-v.f. SANDSTONE: firm material but soft rock (V dense as a Soil), poorly developed bedding

45

50

Spl #4 37/30 for 2" Wet below 51 feet →

SANDY SILT (STONE), light Gray (10YR 7/1) with faint yell-Brn (10YR 6/6) zones. Moist to wet, stiff, friable (Tcs).

Abundant intersecting brn, yell-Brn & Blk veins poorly bedded dipping about 10° to South. Many joints/veins - Several small intraformational faults.

water in bottom of hole ~ 2"

TD 55' 10"

Summary: Qt is lenticular beds of Sand, Sand w/Gravel, & Gravel, Generally Clayey near top where weathered. Generally not clayey at depth.

28" Diameter Bucket
DRIVING WEIGHTS

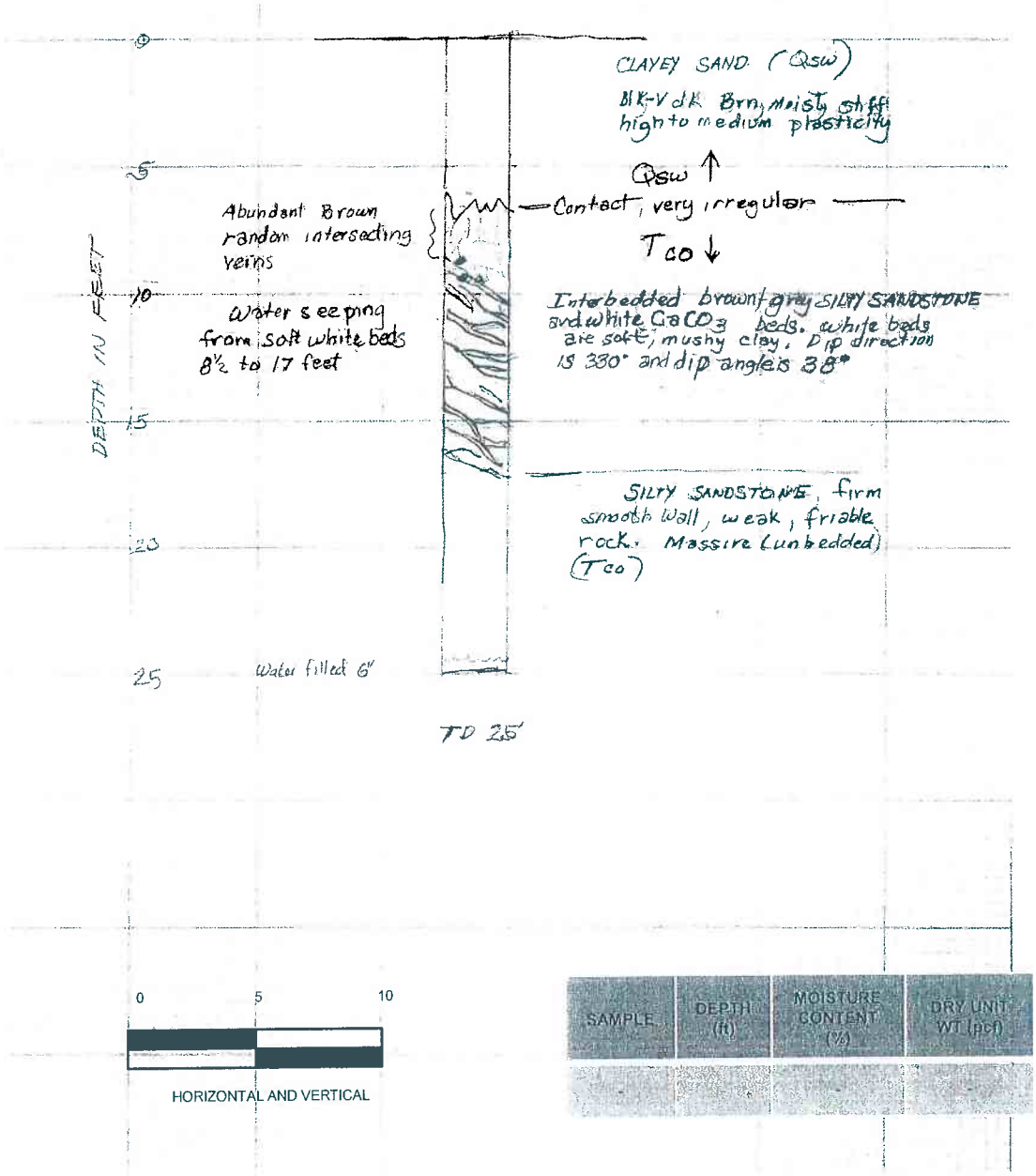
0 - 24' 2400 lbs
24 - 43' 1,555
44 - 62' 850

SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-4	50	21	105

0 5 10

HORIZONTAL AND VERTICAL

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	BUCKET AUGER LOG HBA-3 (SHEET 2 OF 2)	Figure A1-4
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	BUCKET AUGER LOG HBA-4	Figure A1-5
HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers			

SUMMARY

OF

CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the City of Lake Forest project located at Alton Parkway & Commercentre Drive in Lake Forest, California. The work was performed by Kehoe Testing & Engineering (KTE) on March 24, 2010. The scope of work was performed as directed by Hushmand Associates, Inc. personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at three locations to determine the soil lithology. The groundwater measurements were taken in the open CPT hole approximately 10 minutes after completion of CPT. The following **TABLE 2.1** summarizes the CPT soundings performed:

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	42	Refusal, hole open to 14 ft (dry)
CPT-2	21	Refusal, hole open to 5 ft (dry)
CPT-3	41	Refusal, hole open to 41 ft (dry)

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

The above parameters were recorded and viewed in real time using a portable computer and stored on a diskette for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the CPT Classification Chart (Robertson, 1986) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

Output from the interpretation program CPTINT provides averaged CPT data over one-foot intervals. The CPTINT output includes Soil Classification Zones, SPT N Values and Undrained Shear Strength (Su). A summary of the equations used for the tabulated parameters is provided in the CPTINT Correlation Table in the Appendix.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson et al, 1986. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgment and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

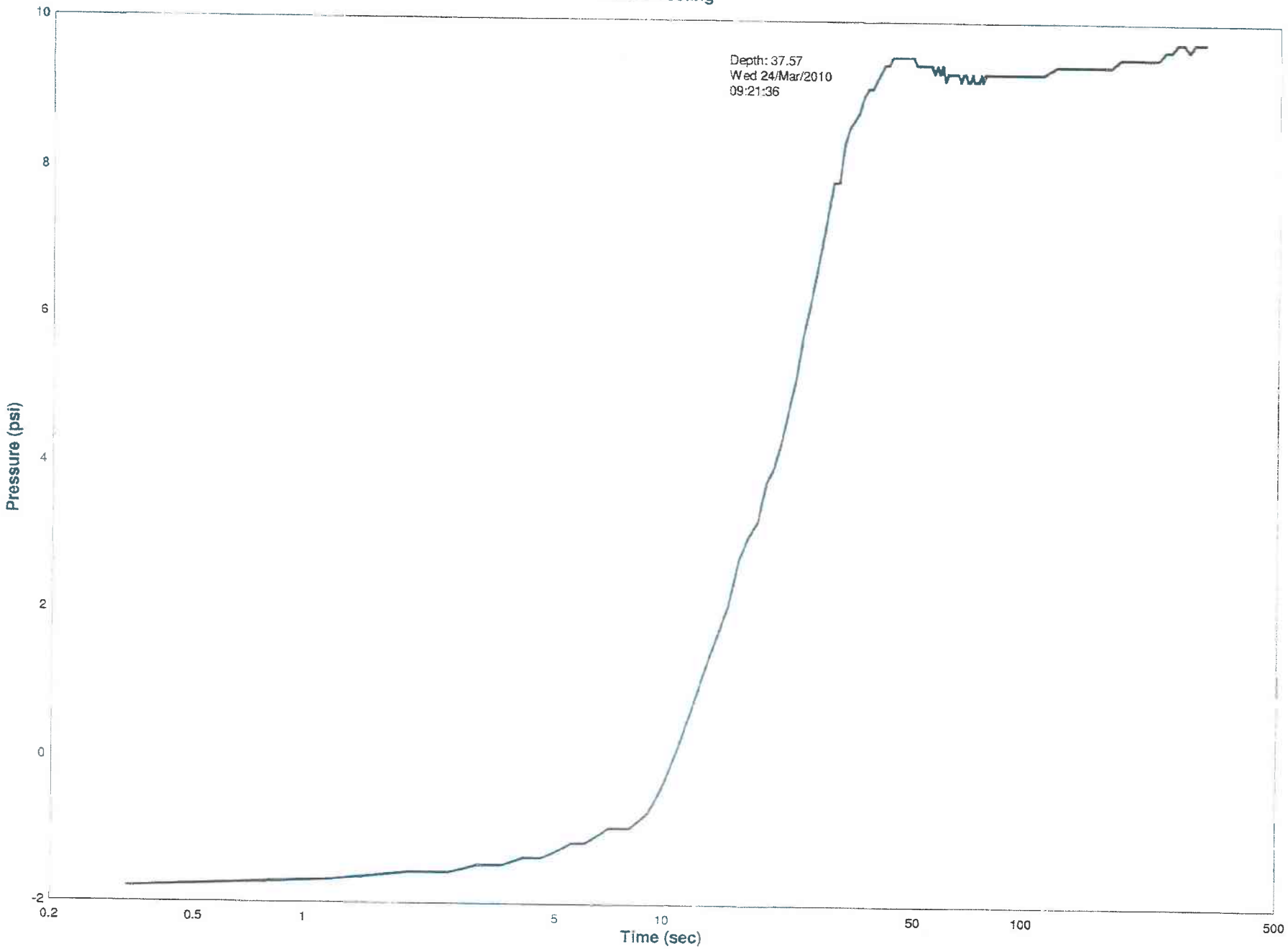
04/05/10-al-6-0353

Hushmand Associates, Inc.

Kehoe Testing

CPT-1

4/21/2010



Kehoe Testing & Engineering
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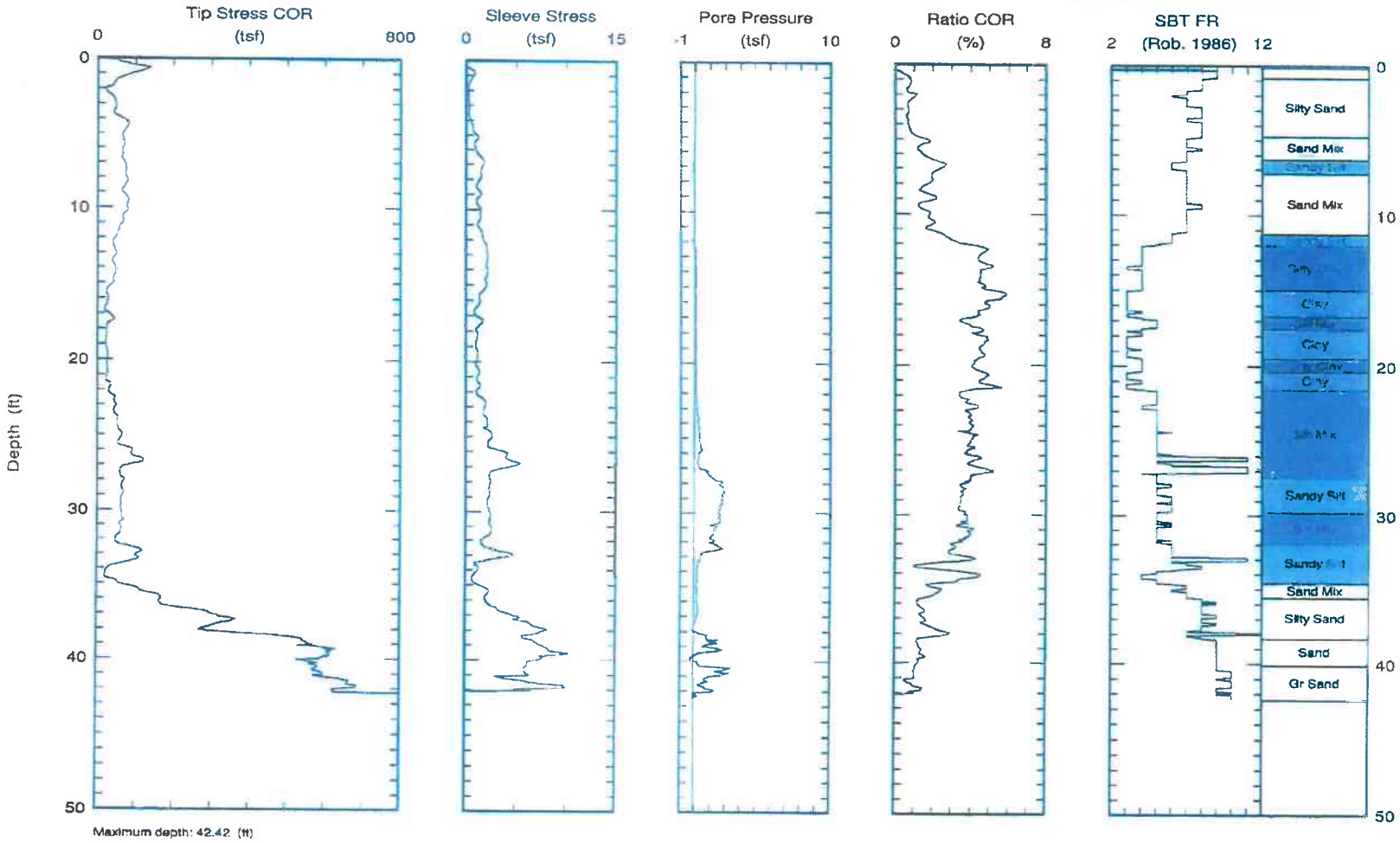
rich@kehoetesting.com
www.kehoetesting.com

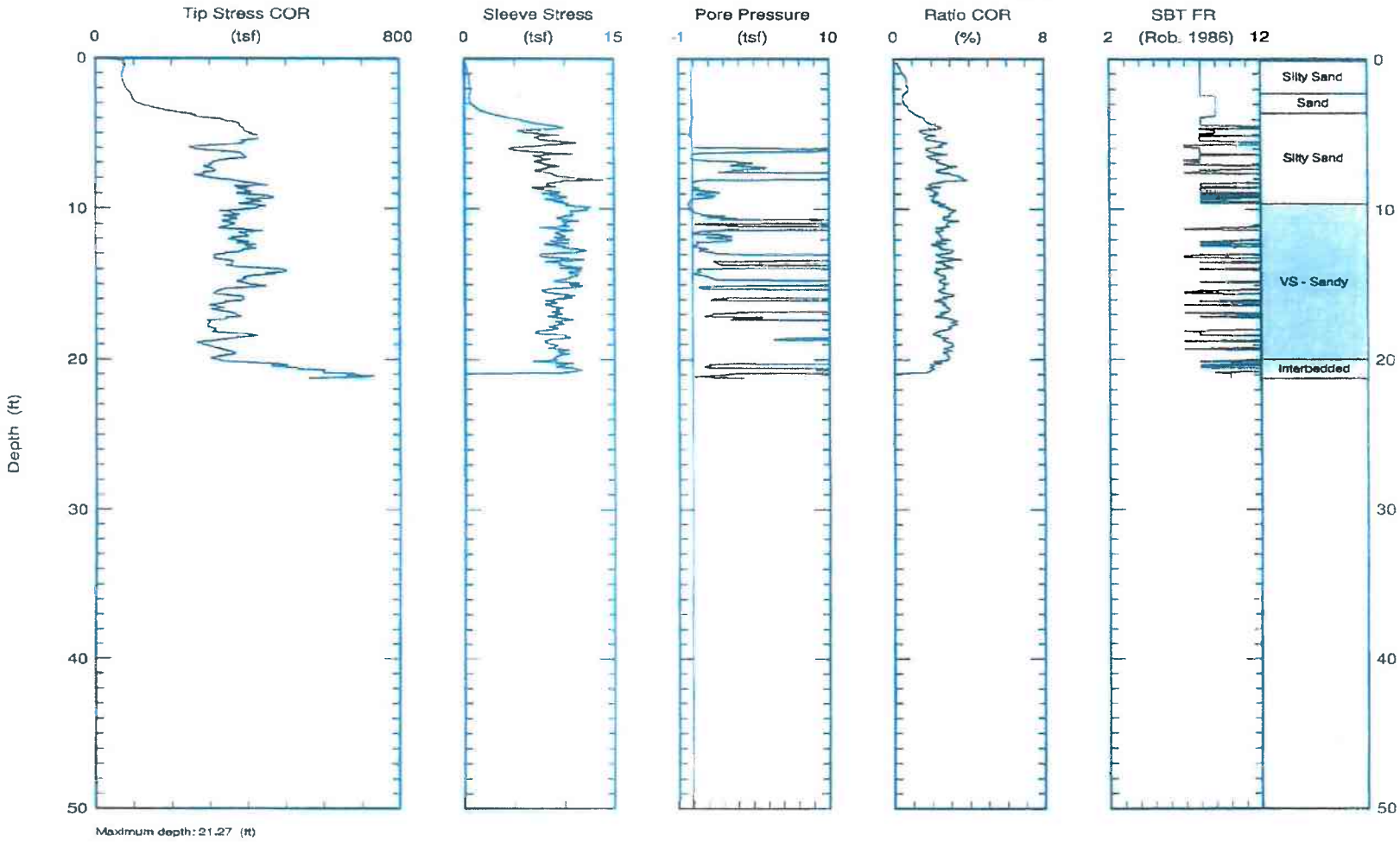
CPT Data
30 ton rig

Date: 24/Mar/2010
Test ID: CPT-1
Project: LakeForest

Customer: Hushmand Associates, Inc.
Job Site: City of Lake Forest-Alton Parkway



Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 24/Mar/2010 Test ID: CPT-2 Project: LakeForest
	Customer: Hushmand Associates, Inc. Job Site: City of Lake Forest-Alton Parkway	



Maximum depth: 21.27 (ft)

Kehoe Testing & Engineering
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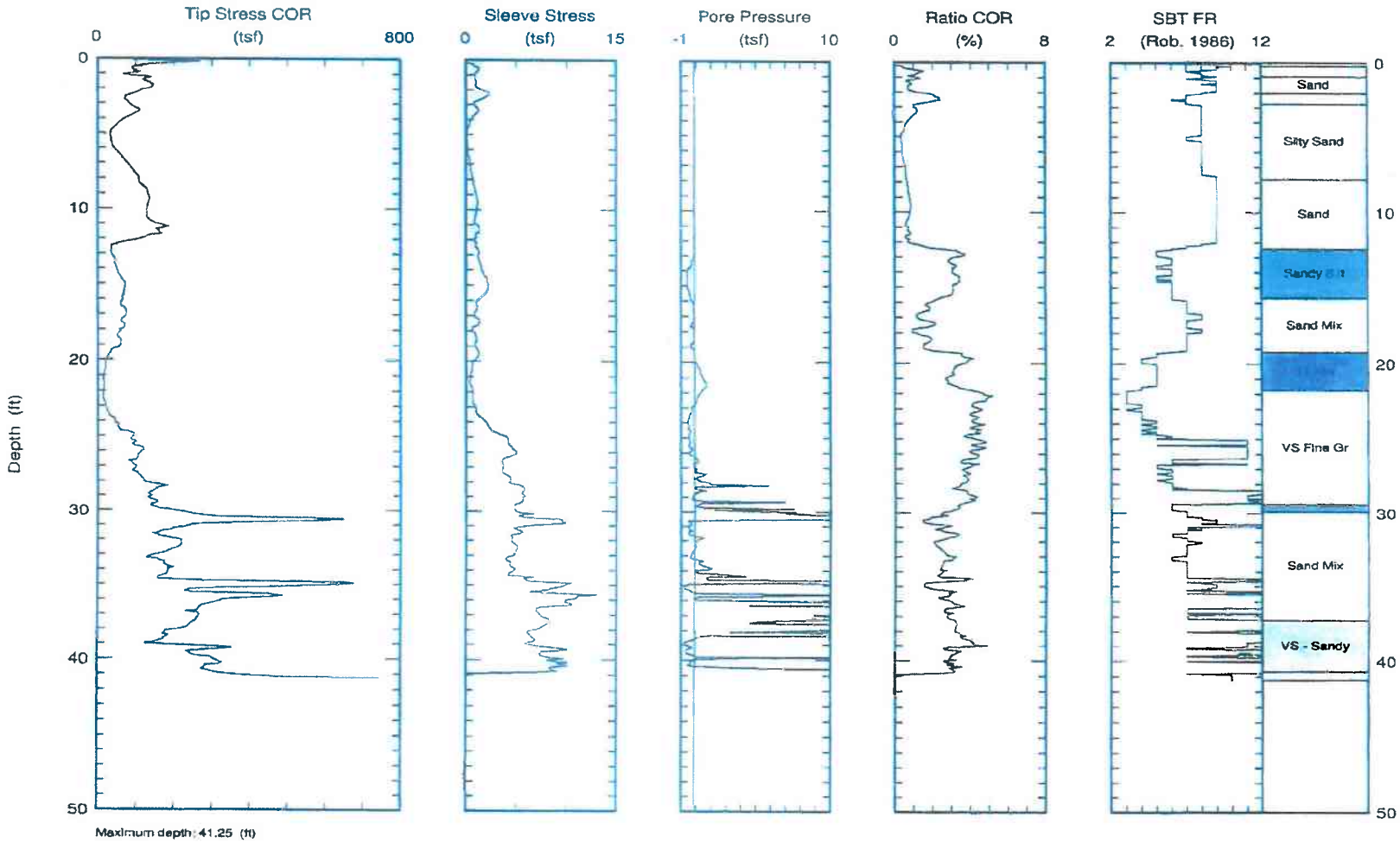
www.kehoetesting.com

CPT Data
30 ton rig

Date: 24/Mar/2010
Test ID: CPT-3
Project: LakeForest

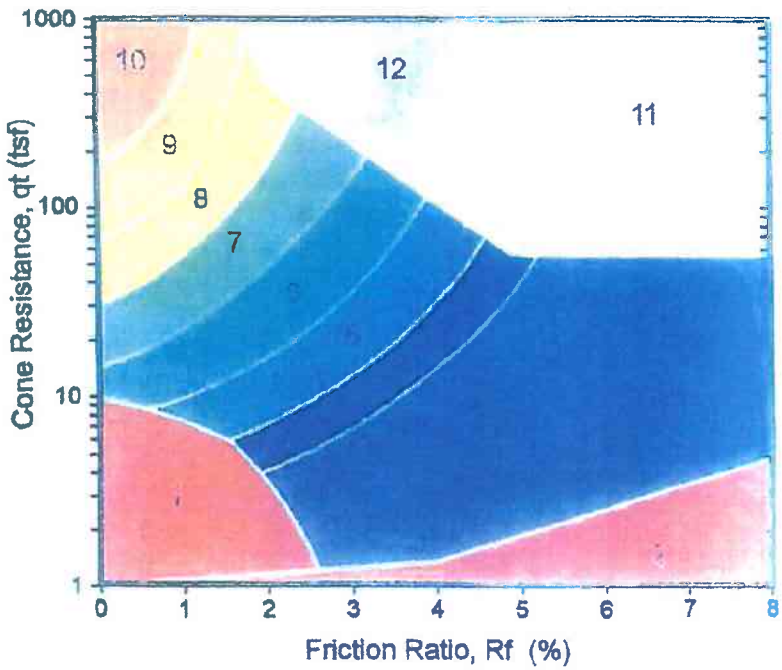
Customer: Hushmand Associates, Inc.
Job Site: City of Lake Forest-Alton Parkway



KEHOE TESTING & ENGINEERING

CPT Classification Chart

(after Robertson and Campanella, 1988)



Zone	q_t / N	Soil Behavior Type	UCSCS
1	2	sensitive fine grained	OL-OH
2	1	organic material	Pt-OH
3	1	clay	CH
4	1.5	silty clay to clay	CL-CH
5	2	clayey silt to silty clay	ML-CL
6	2.5	sandy silt to clayey silt	MH-ML
7	3	silty sand to sandy silt	SM-ML
8	4	sand to silty sand	SP-SM
9	5	sand	SP
10	6	gravelly sand to sand	SW-SP
11	1	very stiff fine grained *	CL-MH
12	2	sand to clayey sand *	SP-SC

* overconsolidated or cemented

NPUT FILE: C:\temp\CPT-1.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	99.498	0.420	0.422	9	19	29	9E9
1.500	49.817	0.392	0.787	7	16	24	9E9
2.500	37.012	0.282	0.761	7	12	18	9E9
3.500	48.742	0.333	0.684	8	12	18	9E9
4.500	76.350	0.720	0.943	8	18	27	9E9
5.500	69.945	1.010	1.444	7	22	33	9E9
6.500	67.350	1.465	2.175	7	22	33	9E9
7.500	75.313	1.549	2.058	7	24	36	9E9
8.500	74.865	1.221	1.631	7	24	36	9E9
9.500	78.040	1.237	1.585	7	25	38	9E9
10.500	73.206	1.365	1.865	7	23	33	9E9
11.500	56.397	1.550	2.749	6	22	29	3.713
12.500	44.897	2.056	4.577	4	29	36	2.943
13.500	45.003	2.121	4.712	4	29	34	2.947
14.500	45.527	2.072	4.549	4	29	32	2.978
15.500	29.953	1.613	5.382	3	29	30	1.935
16.500	24.067	1.096	4.548	3	23	23	1.538
17.500	34.712	1.391	4.005	4	22	21	2.244
18.500	23.957	1.120	4.671	3	23	21	1.523
19.500	25.800	1.152	4.462	4	16	14	1.641
20.500	26.109	1.189	4.550	3	25	21	1.658
21.500	29.923	1.233	4.117	4	19	15	1.909
22.500	43.118	1.715	3.975	5	21	16	2.785
23.500	49.677	1.976	3.974	5	24	18	3.218
24.500	58.858	2.349	3.986	5	28	20	3.828
25.500	66.103	2.582	3.900	5	32	23	4.308
26.500	105.162	4.532	4.307	11	101	69	9E9
27.500	65.748	2.805	4.251	5	32	21	4.285
28.500	67.807	2.424	3.553	5	33	21	4.430
29.500	64.358	2.267	3.502	5	31	19	4.194
30.500	66.172	2.439	3.666	5	32	20	4.308
31.500	60.147	2.257	3.736	5	29	17	3.898
32.500	86.612	2.940	3.385	6	33	19	5.656
33.500	78.970	1.852	2.343	7	25	14	9E9
34.500	33.020	0.926	2.802	6	13	7	2.062
35.500	123.858	2.148	1.734	7	40	22	9E9
36.500	211.238	3.036	1.437	8	51	27	9E9
37.500	327.868	6.247	1.905	8	79	41	9E9
38.500	443.827	6.802	1.532	9	85	43	9E9
39.500	601.917	8.223	1.366	9	115	58	9E9
40.500	568.710	6.238	1.096	9	109	55	9E9
41.499	641.593	6.578	1.025	10	102	51	9E9
42.499	719.395	0.000	0.000	10	9E9	9E9	9E9

NPUT FILE: C:\temp\CPT-2.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	75.708	0.219	0.289	8	18	27	9E9
1.500	74.932	0.506	0.675	8	18	27	9E9
2.500	97.018	0.558	0.575	8	23	35	9E9
3.500	204.505	2.302	1.125	9	39	59	9E9
4.500	378.720	7.130	1.883	8	91	137	9E9
5.500	380.553	8.026	2.109	8	91	137	9E9
6.500	344.627	7.366	2.133	8	83	125	9E9
7.500	293.192	8.689	2.944	12	141	212	9E9
8.500	383.615	8.919	2.322	8	92	138	9E9
9.500	417.782	9.724	2.327	12	200	296	9E9
10.500	360.393	10.406	2.877	12	173	236	9E9
11.500	380.762	9.869	2.582	12	183	232	9E9
12.500	386.715	9.929	2.566	12	185	219	9E9
13.500	354.590	9.603	2.677	12	172	191	9E9
14.500	419.928	10.821	2.565	12	202	212	9E9
15.500	362.253	10.079	2.753	12	175	174	9E9
16.500	334.852	8.877	2.622	12	162	153	9E9
17.500	319.365	9.656	2.999	12	154	139	9E9
18.500	334.593	8.617	2.518	12	164	142	9E9
19.500	318.298	9.365	2.886	12	155	128	9E9
20.500	491.569	8.420	1.696	9	95	76	9E9
21.500	713.230	0.000	0.000	10	9E9	9E9	9E9

NPUT FILE: C:\temp\CPT-3.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	133.252	0.899	0.675	9	26	39	9E9
1.500	132.712	1.139	0.858	9	25	38	9E9
2.500	90.655	1.641	1.810	7	29	44	9E9
3.500	97.840	0.996	1.018	8	23	35	9E9
4.500	51.875	0.268	0.516	8	12	18	9E9
5.500	39.608	0.155	0.392	8	9	14	9E9
6.500	63.903	0.314	0.492	8	15	23	9E9
7.500	95.880	0.581	0.605	8	23	35	9E9
8.500	121.637	0.891	0.732	9	23	35	9E9
9.500	137.650	1.155	0.839	9	26	39	9E9
10.500	138.291	1.003	0.726	9	26	36	9E9
11.500	157.577	1.192	0.757	9	30	39	9E9
12.500	51.582	1.178	2.284	6	20	24	3.387
13.500	46.783	1.416	3.030	6	18	21	3.060
14.500	62.303	2.043	3.284	6	24	26	4.087
15.500	72.157	1.981	2.747	6	28	29	4.742
16.500	69.863	1.100	1.574	7	22	22	9E9
17.500	71.482	1.098	1.536	7	23	22	9E9
18.500	60.563	0.984	1.625	7	19	17	9E9
19.500	41.565	1.171	2.817	6	16	14	2.691
20.500	20.623	0.640	3.089	5	10	8	1.296
21.500	16.313	0.573	3.478	4	11	9	1.009
22.500	17.785	0.772	4.329	3	17	13	1.096
23.500	33.645	1.399	4.163	4	21	16	2.143
24.500	68.587	2.786	4.065	5	33	24	4.467
25.500	104.087	4.518	4.343	11	100	70	9E9
26.500	104.647	4.168	3.982	5	50	34	6.868
27.500	109.372	4.096	3.742	6	42	28	7.183
28.500	150.893	5.484	3.629	6	58	37	9.958
29.500	150.602	5.352	3.548	6	58	36	9.936
30.500	379.918	7.515	1.970	8	91	56	9E9
31.500	198.241	5.242	2.644	7	63	38	9E9
32.500	203.040	5.034	2.479	7	65	38	9E9
33.500	171.573	4.485	2.613	7	55	31	9E9
34.500	294.575	6.478	2.194	8	71	40	9E9
35.500	390.752	9.742	2.491	12	187	102	9E9
36.500	283.470	8.698	3.034	12	137	73	9E9
37.500	253.848	7.942	3.105	12	123	64	9E9
38.500	177.102	6.528	3.669	12	85	43	9E9
39.500	261.603	8.219	3.140	12	125	63	9E9
40.500	300.720	8.888	2.940	12	145	73	9E9
41.499	424.665	0.000	0.000	10	9E9	9E9	9E9

Program: CPTINT - CPT Cone Interpretation Program
Version: 5.2
Table File by: Dr. R. G. (DICK) Campanella, P.Eng.
Rev. Dated: April 3, 2002

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Depth average see NOTE #1	Depth averaged over specified range (see menu)		All	All
Parameter Averaging	Averaged over range specified for depth. If no values exist, your choice is zero's or no value		All	All
Qc, Tip Stress	measured tip force/area	#6,#8	All	All
Qt corrtd for U2 see NOTE #2	Qt = Qc + (1 - a) x U2 and a = tip area ratio Defaults to U2 if given or uses U1 or U3 times Const.	#6,#8	All	All
[Note: Input value from input file is used if defined, not calculated]				
Q (Qt Normalized)	$Q = \frac{Qt - sv}{sv'}$	#9 & 13	All	All
Fs	measured sleeve force/area	#6,#8	All	All
Rf Friction Ratio (if Rf>8, Rf=8)	$Rf = \frac{Fs}{Qt} \times 100\%$	#6,#8	All	All
F (Rf Normalized)	$F = \frac{Fs}{(Qt - sv)} \times 100\%$	#9 & 13	All	All
Gamma Total Unit Weight (Soil + Water) see NOTE #3	Based on Rf or Bq Classif. Zone Zone # Gamma = kN/m^3 1 Qt<4bar 15.70 1 Qt=4bar 17.30 2 Rf<5% 13.36 2 Rf=5% 11.80 2 Bq Zone 12.58 3 Qt<10bar 18.86 3 Qt=10bar 19.65 4, 5 & 6 Qt<20bar 18.86 4, 5 & 6 Qt=20bar 19.65 7 18.86 8 & 9 19.65 10 20.44 11 & 12 21.22		All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
U Penetration Pore Pressure see NOTE #4	U1,measured on Face of tip U2,measured Behind Tip at shoulder (std location) U3,measured Behind Friction Sleeve		All	All
Water Table	Depth below ground surface to where pore pressure = 0 Make negative if water level is above ground		All	All
Uo Hydrostatic Pore Pressure see NOTE #4	Uo = water depth,Hw x unit weight water, Gamma or Uo=Hw=depth-depth to water table if depth<water table,Uo = 0		All	All
dU Excess Pore Pressure	dU = U2 - Uo Defaults to U2 if given or uses U1 or U3 x const.		All	All
DPPR (Differential Pore Pressure Ratio)	$DPPR = \frac{dU}{Qt} = \frac{U - Uo}{Qt}$ Defaults to U2 if given or uses U1 or U3 x const.	#6,#8	All	All
Bq	$Bq = \frac{dU}{Qt - sv}$	# 4 # 8 # 13	All	All
OS (Overburden Stress)	OS = sv = S (Gamma x Depth)		All	All
EOS (Effective Overburden Stress)	EOS = sv' = OS - Uc = sv - Uc		All	All
Rf Zone Soil Behavior Type see NOTE #5	Classification chart for Qc and Rf Zone # = Soil Behavior Type 1=sensitive fine grained 2=organic material 3=clay 4=silty clay 5=clayey silt 6=sandy silt 7=silty sand 8=fine sand 9=sand 10=gravelly sand 11=very stiff fine grained ¥ 12=sand to clayey sand ¥ ¥ overconsolidated or cemented	#6 #8, Fig4.3	All	1<Qt<1000bar 0<Rf<8%

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Bq Zone Soil Behavior Type	Classification chart for Qc and Bq (same zone #'s as Rf above)	#8 Fig 4.3	All	0<Qt<1000bar -0.1<Bq<1.4
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After R&C(1983) see NOTE #6	Qt/N ratio per zone Zone # Qt/N Zone # Qt/N 1 2 7 3 2 1 8 4 3 1 9 5 4 1.5 10 6 5 2 11 1 6 2.5 12 2	# 7 # 8 Fig 4.2	All	All
Spt N1(60) Normalized for Overburden str	Spt N1(60) = Cn x Spt N(60) where Cn = (sv')^(-0.77)	# 8	All	0.5<Cn<1.5
Dr Relative Density see NOTE #7	Specific Sands: $Dr = \frac{100}{C2} * \ln \left[\frac{Qc}{C1 \cdot C0\ sv'} \right]$ where: All are NC & UNAGED Sand | C0 | C1 | C2 Ticino | 17.37 | .558 | 2.58 Schmertmann | 15.32 | .520 | 2.75	# 8 # 1 # 1	/ Sand-- \	7 to 10 0<Qt<500bar 0<sv'<5bar
Compressibility moderate high				
all	ALL SANDS: NC, OC, ALL TESTS $Dr = C3 + C4 \log_{10} \left[\frac{Qc / C1}{sv' + C2 / C0} \right]$ where: C0 | C1 | C2 | C3 | C4 0.100 | 0.0981 | 0.5 | -98 | 66	# 5	Sand	7 to 10 (6 possible)
Phi Friction Angle	Methods: 1) Robertson & Campanella 2) Durgunoglu & Mitchell 3) Janbu beta = +15 degree 4) Janbu beta = 0 degree 5) Janbu beta = -15 degree	#6, #8 # 2 #6, #8 #6, #8 #6, #8	/ Sand-- \	7 to 10 & 6 0<Qt<500bar 0<sv'<4bar 29<phi<49

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Gmax Maximum Shear Modulus at very small strains	Clay: Gmax = alpha x Qt	# 8 Fig4.18	Clay	1 to 6
	Sand: Digitized figure of Qc vs Gmax with interpolation between sv'curves,R&C method	# 6 # 8 Fig4.13	Sand	(6 possible) 7 to 10 .25<sv'<8bar
CSR(Qc), t/s LEVEL ground Liquefaction SAND Resistance see NOTE #8	Seed's CSR vs N1(60) graph for specified equake Magnitude.Can include silty sand corr. for Zone 7. N1(60) from CPT correlations.	# 11 # 12	Sand	7 to 10 (6 possible)
CSR(Eq), t/s Cyclic Stress Ratio applied by design quake	$CSR(Eq) = 0.65 \frac{Amax}{g} \frac{sv}{svo'} rd$ Amax=max surface acceleratn including Amplification	# 12 # 3	Sand	7 to 10 (6 possible)
[Note: Input value from input file is used if defined, & not calculated]				
rd Reduction Factor to find CSR(Eq)	Digitized graph to use for depth vs rd: 1) Seed's mean 2) Fraser Delta	# 12 # 3	Sand	(6 possible) 7 to 10 0<depth<30m
FL,Safety Factor against Liquefaction	FL = CSR(Qc)/CSR(Eq)	# 3	Sand	7 to 10 (6 possible)
Qcr Critical Bearng required to resist Liquefctn	Qcr backcalculated from CSR(Eq) for a specified FL. Qcr is only for the given GWT,EOS,OS,Amax/g & Eq.Mag	# 12	Sand	7 to 10 (6 possible)
Su, Undrained Shear Strength of CLAY METHODS:	Nk: $Su = \frac{Qc - st}{Nk}$	# 8	Clay	1 to 6
	Nke: $Su = \frac{Qt - U2}{Nke}$		Clay	1 to 6
	Nkt: $Su = \frac{Qt - sv}{Nkt}$		Clay	1 to 6
	Nc: $Su = \frac{Qt}{Nc}$		Clay	1 to 6
see NOTE #9	NdU: $Su = \frac{dU2 \text{ (dU1 or dU3)}}{NdU}$		Clay	1 to 6

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Su/EOS	$Su/EOS = \frac{Su}{sv'}$	# 8	Clay	1 to 6
Ko (NC) Normally Consolidated	(Ko)NC = 1 - Sin(f) see NOTE #10	# 8	Sand	7 to 10 (6 possible)
Ko (OC) Over Consolidated	$(Ko)OC = (Ko)NC \times OCR^{0.42}$	# 8	Sand	7 to 10 (6 possible)
E25 Youngs Modulus	E25 = alpha x Qt where user input alpha	# 8 4.11&12	Sand	(6) 7 to 10 0<Qt<500bar
M Constrained Modulus	CLAY: M = alpha x Qt where user input alpha SAND: Methods: Qt: M = alpha x Qt Baldi: $\frac{M}{Qt} = C0 \times pa \left[\frac{sv'}{pa} \right]^{C1} \times OCR^{C2} \times \exp(C3\ Dr)$	# 8 Tabl4.3 # 8 Fig4.10	Clay Sand Sand	1 to 6 7 to 10 (6 possible) 7 to 10
OCR (Clay) Over-Consolidation Ratio see NOTE #11	$OCR = \left[\frac{\frac{Su}{svo'}}{\left[\frac{Su}{svo'} \right]^{NC}} \right]^{1.25}$	# 6 # 8 Fig4.19	Clay	1 to 6
Ic Material Index After J&D(1993) see NOTE #18	$Ic = \left[\left[3 - \log_{10}(Q(1-Bq)) \right]^{2} + \left[1.5 + 1.3 \log_{10} F \right]^{2} \right]^{0.5}$	# 13 # 17	All	All
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After J&D(1993) see NOTE #16	Qc/N = 8.5(1-(Ic/4.75)) where Qc in bars	# 13	All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
State Parameter State, (e-units) Current Void Void Ratio minus Critical Void Ratio	$\text{State} = \dfrac{\ln\left[\dfrac{3M + 8.5M/F}{Q(1-Bq)}\right]}{11.9 - 1.33F}$ $M = \dfrac{6 \sin fcv}{3 - \sin fcv}$ fcv = const. vol. Phi angle	# 14	All	All
Fines Content FC(%) Percent less than #200 Sieve After Davies, 99	FC(%) = 42.4179(Ic) - 54.8574 FC(%) = 0% if Ic < 1.2933 FC(%) = 100% if Ic > 3.6508	# 15	All	All
OCR (Clay) Overcons. Ratio by Pore Press. U1 & U2 or U1 & U3 see NOTE #17	OCR = 0.5 + 1.50(PPD) PPD = (U1 - U2)/Uo or PPD = (U1 - U3)/Uo and default 0.5 & 1.5 are settable	# 16	Clay	1 to 6

1. Depth averaging may be in 0.5, 1, 2.5 or 5 ft. intervals or 0.1, 0.25, 0.5 or 1.0 m intervals, or no depth averaging if zero is selected. The average is the mean value of the readings in the interval. The depth value is the mid-depth of the averaged interval. It is convenient to start at half the depth averaging interval. For example, if you want "even" depths and the depth averaging is set at 0.50 m then start at 0.25 to get values of depth of 0.5, 1.0, 1.5, etc.

2. Basic input CPTU data columns are for Depth, Qc, Fs, U1, U2, U3, INC and TEMP may be selected. In addition the following parameters may also be specified as an INPUT data column: Qt, Gamma, Uo, Spt N, Rf Zone, Bq Zone and CSR(EQ). These values will be used where required to obtain other interpreted parameters. If they are not specified the program will estimate them when they are required. For example, you can create an OUTPUT data file of any of the above parameters and then edit some or all of the values to suite your measurements or your desires to specify their values. You can do that with "Gamma" values to input your measurements of unit weight, or with "Uo" if you want to input values of pore water pressure other than hydrostatic, or with any of the other input parameters. You would use your edited file of adjusted data as your new INPUT data file. Thus, you can specify these parameters if you want to override the Program's values.

You can also use the designated value of "9E9" to denote an unknown value.

You can use the "OTHER" designation to input other data that exists on your input file and identify its units. This allows you to output it, without operating on it, if you choose.

It is best NOT to use depth averaging when using input data that is not continuous at regular depth intervals. Always use DEPTH AVERAGING with extreme caution since the program averages ALL INPUT parameters over the interval chosen irregardless of soil type. Careful use of start and end depth choises can make depth averaging very effective.

3. Since there is no data in the file within the initial depth interval, a default Gamma (unit weight) must be specified from the surface to the starting depth. This is done in the "Param" Menu in units of kN/m^3 (1kN/m^3=6.36pcf). Also, you can specify the values of Gamma to be used by the program as in NOTE #2 above.

4. If pore pressures are not measured by the cone then the program will take Qc as being equal to Qt for all interpretations requiring Qt. Also, Uo may be specified in the input file as a column of Uo vs depth values, if the water pressures are not hydrostatic. See NOTE #2 for more info on customizing input data.

5. You can choose to use either the Rf classif. Zone or the Bq classif. Zone to divide soil into Undrained Parameters (Zones 1 to 6) and Drained Parameters (Zones 7 to 10) in the "Param" Menu. (However, in order to use the Bq Zone you must have Pore Pressure, U2, data.) Also, you may choose to switch Zone 6 to a Drained Zone from its Undrained Zone status. This is done if you feel that the soil identified as Zone 6 (sandy silt) is really coaser (using other sources of information) and/or you want it analyzed as a Drained rather than Undrained soil. Finally, the soil behavior names in each zone were shortened in version 5.0 for simplicity. For example, Zone 6 was named "sandy silt to clayey silt" but was shortened to "sandy silt".

6. Spt N is the same as Spt N(60) for 60% transferred energy. This value is calculated from the Qt/N ratios given for each Soil Zone (you can specify either Rf or Bq Zone) and these values are used in the Level Ground Liquefaction analysis. Values of Spt N may be specified in the Input File, if indepedently measured values are to be used. We suggest that you not use depth averaging if you only have selected Spt N values at a few depths. You may use "9E9" for missing data.

7. If Dr values are negative then soil is very loose or likely more of an undrained soil like a silty sand rather than a drained soil for which the Dr correlations were developed. Use Dr interpretations very cautiously since they also assume the soil is free draining, uncemented, unaged and has the same compressibility of grains as the soil used for the correlations in chamber calibration tests.

8. The simplified sand liquefaction analysis for level ground according to Seed et al requires Spt N1(60) and earthquake magnitude to obtain the cyclic stress ratio to cause liquefaction, CSR(Qc). The design maximum ground acceleration, the depth-reduction factor, Rd, and overburden total and effective stresses are required to calculate the cyclic stress ratio applied by the design earthquake, CSR(EQ). The program estimates the N1(60) values from the cone stresses, the operator identifies the earthquake magnitude and Seed et al chart is used to get CSR(Qc). The program also calculates CSR(EQ) from the user specified maximum ground acceleration including any amplification factors, the calculated overburden stresses and either Seed's mean or the Fraser Delta Rd factor. The Fraser Delta is used only when amplification factors of the order of 2 or more are used. See Reference Nos. 3, 6, 11 and 12 for more information. The user can INPUT specific values for Spt N, CSR(EQ), Soil Zones, Gamma's, etc. in order to customize the analysis for the existing data base of information. It is recommended that you do not use depth averaging when using specific input data but make calculations at specific depths where external input data exists. The calculated value of Qcr is the minimum value of cone bearing stress required at a given depth such that the factor of safety against liquefaction, or the ratio FL = CSR(Qc)/CSR(EQ) have the specified value for a given earthquake magnitude, max. ground acceleration, depth reduction factor, and calculated overburden stresses. This value of Qcr is useful to identify the required minimum level of soil improvement for a given design condition.

9. The NdU method to calculate undrained shear strength has been extended to allow the user to choose either dU1, or dU2 or dU3 provided such pore pressure measurements exist.

10. The Overconsolidation Ratio, OCR, for the sand must be estimated by the user in the "Param" menu if you want to estimate Ko in the sand layers. For the typical normally consolidated sand, OCR = 1.0.

11. It is currently only possible to estimate the OCR for a clay, which makes use of the correlations obtained from extensive laboratory tests.

12. An improved calculation and print routine was added to version 5.0 which uses swap routines to reduce memory requirements, but slows down the calculations.

13. The classification charts for Rf has been extended at all boundaries such that values of Rf>8 and values of Qc<1.00 are possible. The Bq classification chart which requires dU2 and can now accept values of Bq>1.2 and Qt<1. Unfortunately, this feature does not work.

14. Version 5.1ppd added several enhancements to the program. You may input an average vertical flow gradient, which is applied over the entire profile depth to be analysed so adjust the depth of interest accordingly. Zero gives hydrostatic and no flow, a negative gradient is upward flow which increases pore pressure and reduces vertical effective stress. A positive gradient gives downward flow.

15. A State Parameter or current void ratio minus critical void ratio is calculated according to the paper by Ref. 14, Plewes, Davies and Jefferies, 1994.

16. An alternate method to estimate SPT from CPT is provided according to Ref. 13, Jefferies and Davies, 1993 in ASTM.

17. An alternate method to estimate OCR in clays is provided which uses the measured pore pressure difference, ppd, so both U1 and U2 or U1 and U3 must be measured at the same time. (see Ref. 16)

18. Version 5.2 added the value Ic (Material Index) according to Jefferies & Davies, 1993, 1991 (Ref. 13 & 17) which combines all Normalized parameters Q, F and Bq.
(Note: QtN was changed to Q and RfN to F.)

18A. In Version 5.2, if at any depth the value of Bq>1 (in very sensitive saturated soil)then Bq is made equal to 0.99. Also, if Rf>8 it is made 7.99. These changes have a negligable effect on the results.

19. FC(%) or percent of dry weight less than #200 sieve (.074mm) was also added according to Davies, 1999 Ref.#15)

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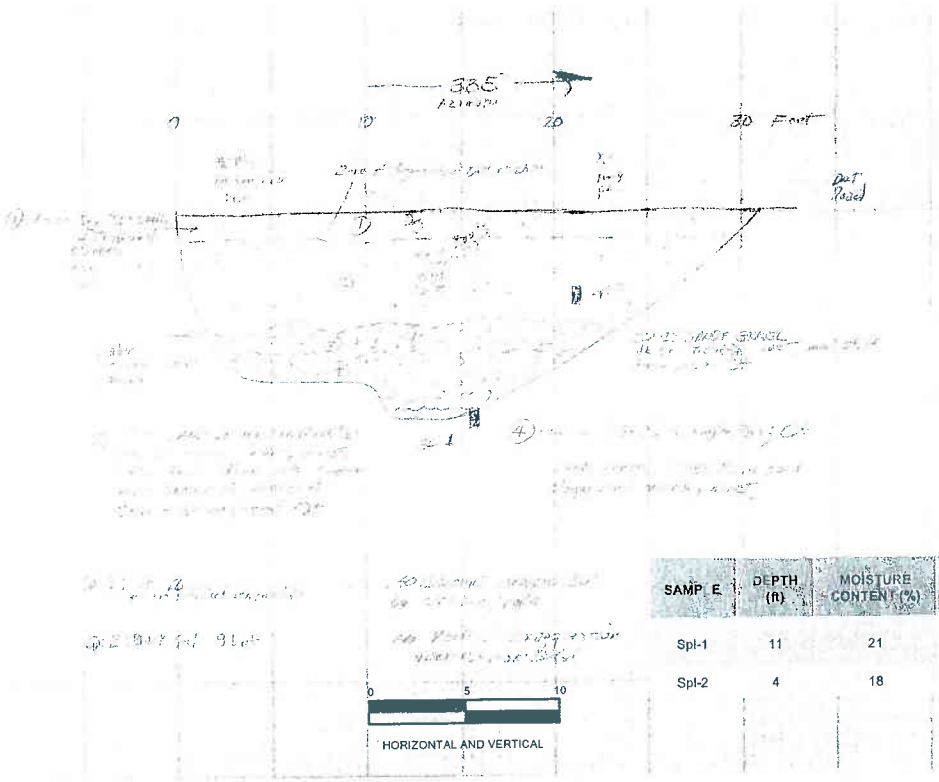
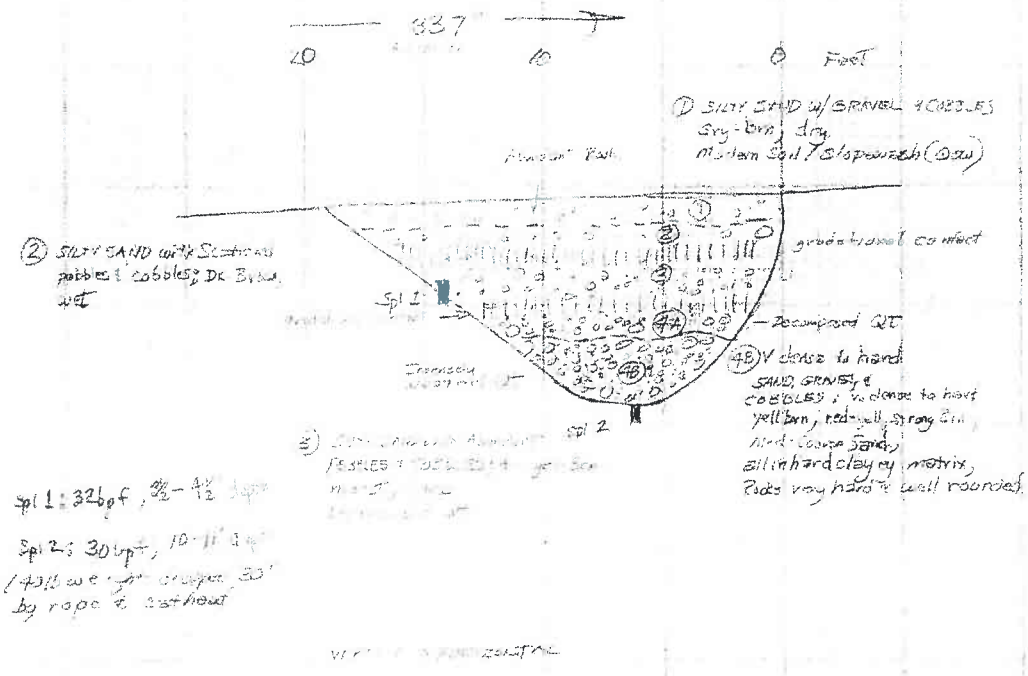
APPENDIX A4

TRENCH LOGS BY HAI



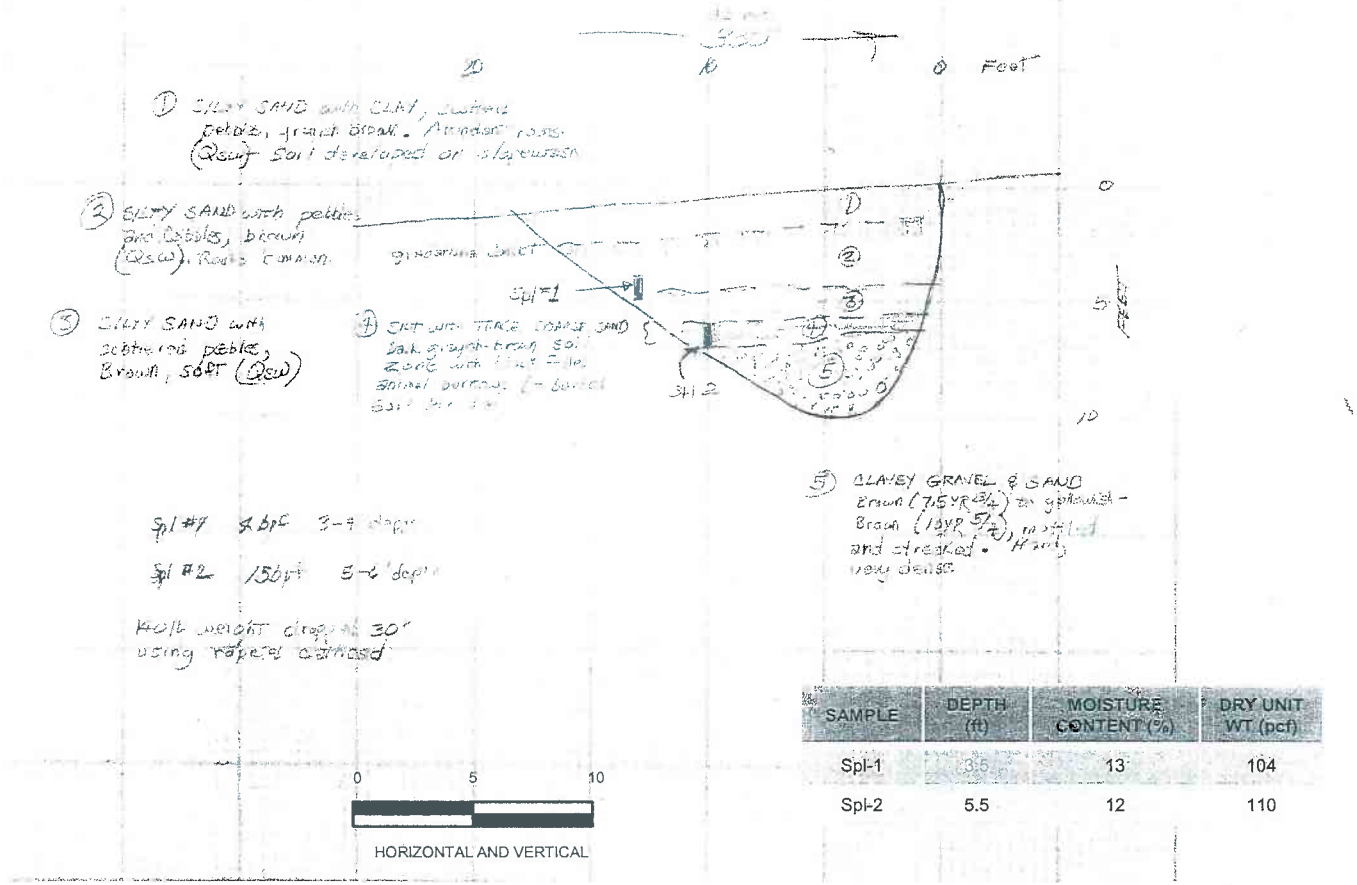
SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)	OTHER TESTS
Spl-1	11	21	97	CONS, CORR
Spl-2	4	18	106	

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-1	Figure A4-1
HAI	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



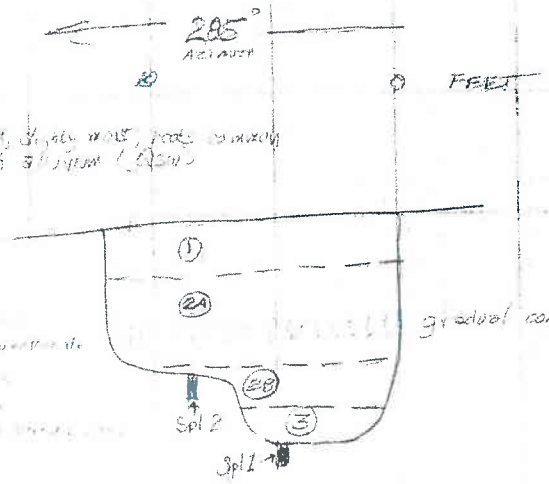
SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	3.5	8	133
Spl-2	10.5	15	116

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-2	Figure A4-2
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	3.5	13	104
Spl-2	5.5	12	110

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-3	Figure A4-3
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



(1) CLAYEY SAND, grayish brown, [illegible], slightly moist, roots common
Soil developed on slopewash alluvium ([illegible])

(3) SILTY SANDSTONE (Tco)
Fine grained [illegible]
Rock is weak, friable, slightly weathered
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]. Micaceous

Spl # 1 [illegible] 50 blows for 11 inches

Spl # 2 [illegible] 10 blows for 12 inches

140 lb weight dropped 30" using rope and cathead.

(2A) CLAYEY SAND. Decomposed Tco. Grades from grayish brown to yellowish brown in lower part, very moist to wet.

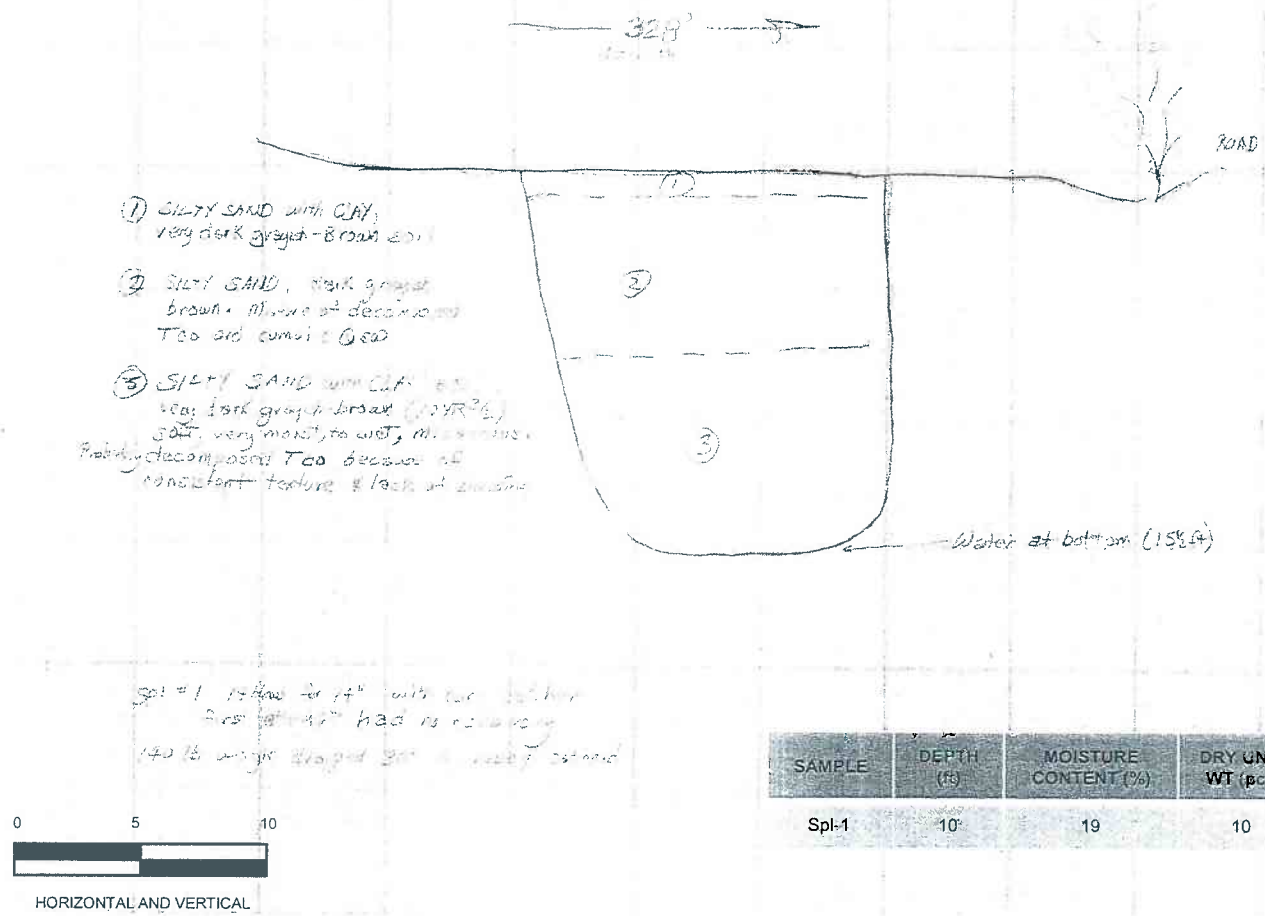
(2B) SILTY SAND, Brown (7.5YR 4/4), moist to wet (some free water). Fine grained, micaceous. Intensely weathered Tco.

0 5 10

HORIZONTAL AND VERTICAL

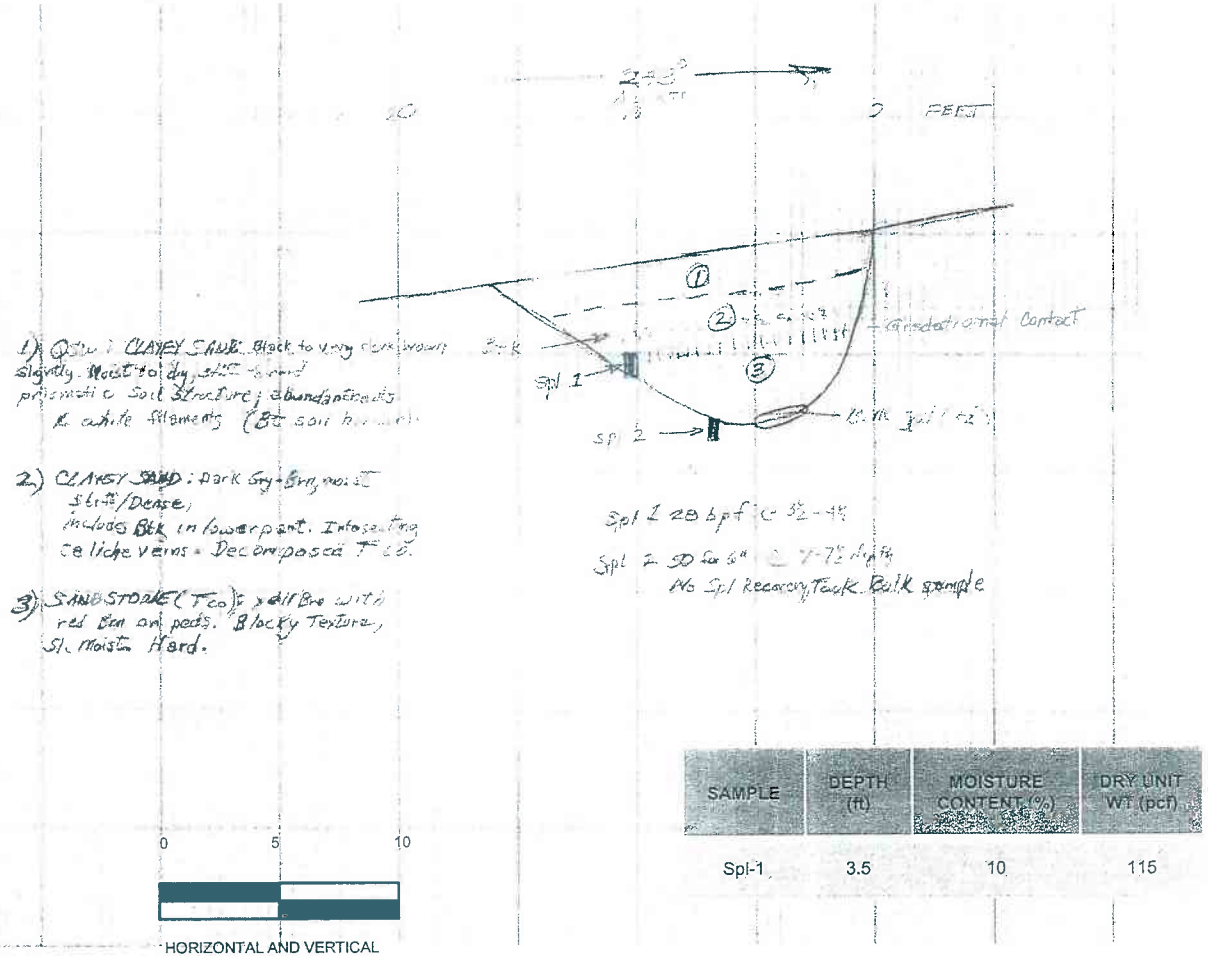
SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	10	10	106
Spl-2	6.5	12	117

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-4	Figure A4-4
HAI	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



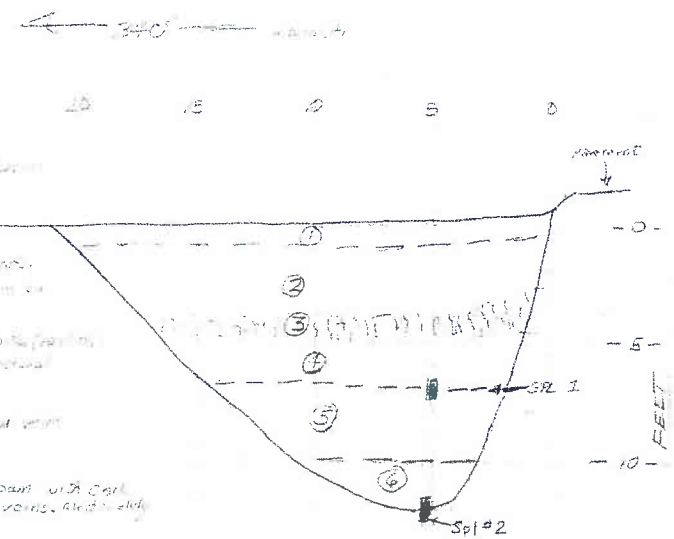
SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	10	19	10

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-5	Figure A4-5
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	3.5	10	115

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-6	Figure A4-6
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



① SAND, Black to very dark brown, loose Agriculture zone - Fill soil disturbed by nursery activities.

② SILTY CLAY: Dark to very dark brown (10YR 4/2 - 3/2), moist, abundant roots. Prismatic soil structure. Common or developed on decomposed Tco

③ SILTY CLAY: very dark brown with white (carbon) CaCO3 (carbonate) on surfaces of structural prisms (Bt-k Soil Horizon).

④ CLAYEY SAND: Brown (10YR 5/3), with brown veins. Intensely weathered Tco

⑤ SILTY SAND with CLAY: very pale brown with dark yellowish-brown (10YR 3/2) intersecting veins. Moderately weathered Tco

⑥ SILTY SAND: very pale brown (10YR 7/3) very fine sand (50%)/50% silt very slightly moist, very dense sand or Softrock. Massive unbedded slightly weathered Tco

Spl 1 55 bpf, 6½-7½ feet

Spl 2 20/46 blows 11½-12½ feet

140 lb weight falling 30 inches with rope & cathead

As contacts are gradational

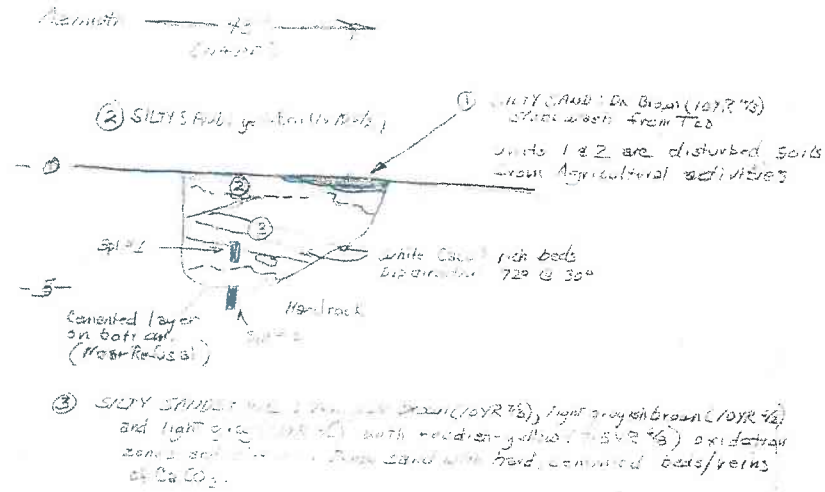
Summary: These materials represent a sequence of decreasing weathering of in-place Oso member of Capistrano Formation (Tco).

SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	8.0	9	112
Spl-2	11.5	14	109

0 5 10

HORIZONTAL AND VERTICAL

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-9	Figure A4-7
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



Sandstone outcrops
Shallow gully nearby

Spl 1 15/29 blows/6" [illegible]

Spl 2 50 for 7" @ 4'4" [illegible]

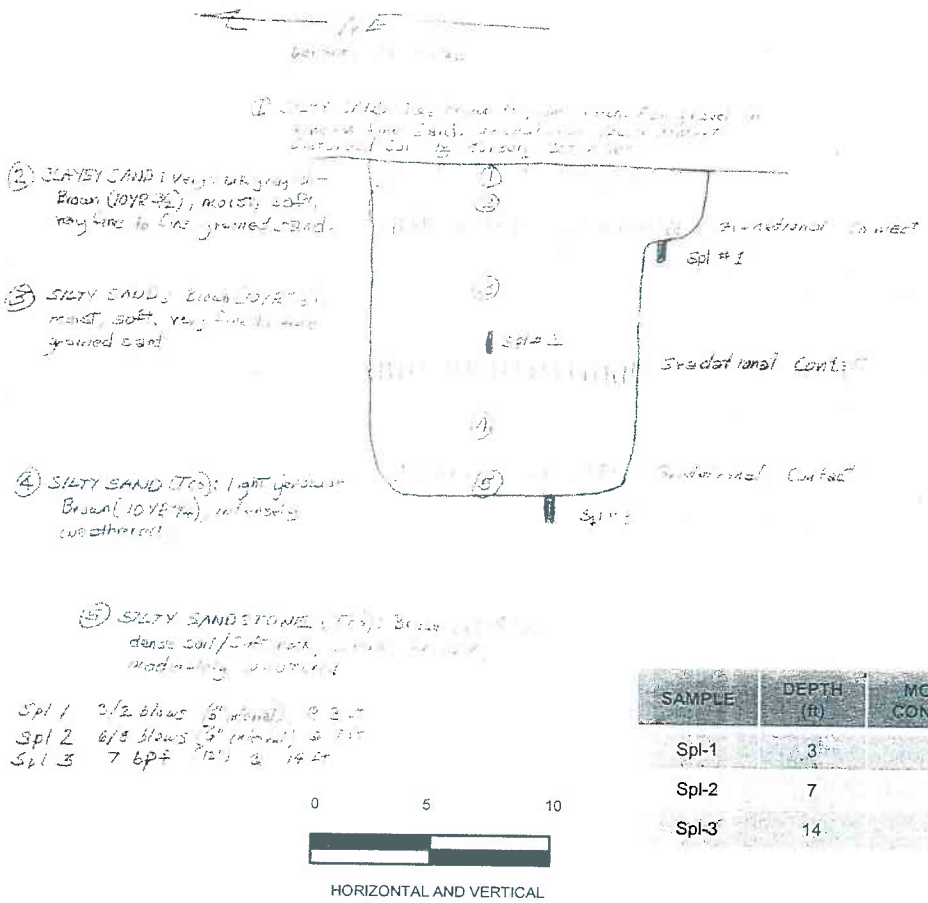
140 lb weight falling 30
0 sing ripple and [illegible]

SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	3	14	111
Spl-2	5	15	110

0 5 10

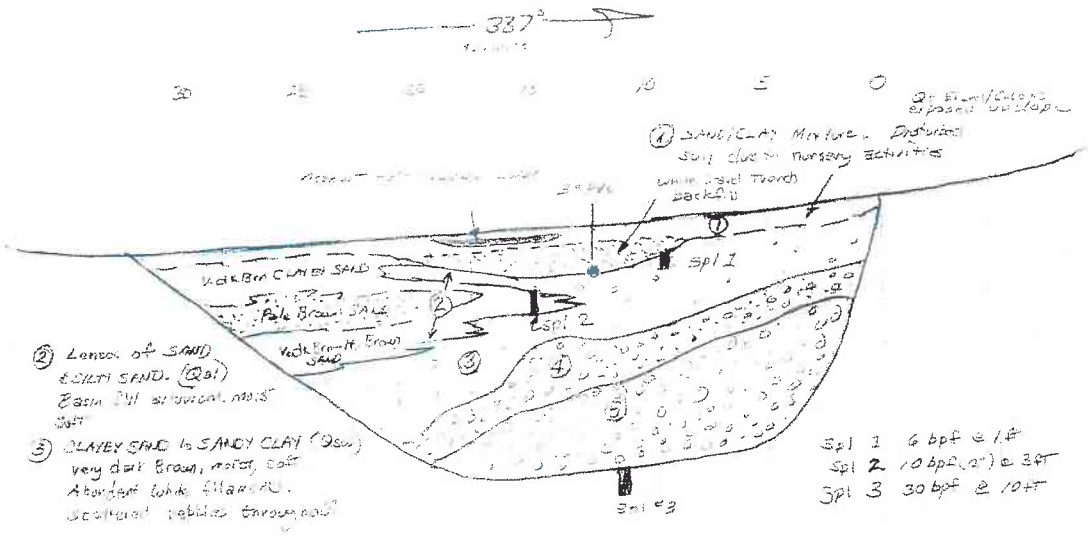
HORIZONTAL AND VERTICAL

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-10	Figure A4-8
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



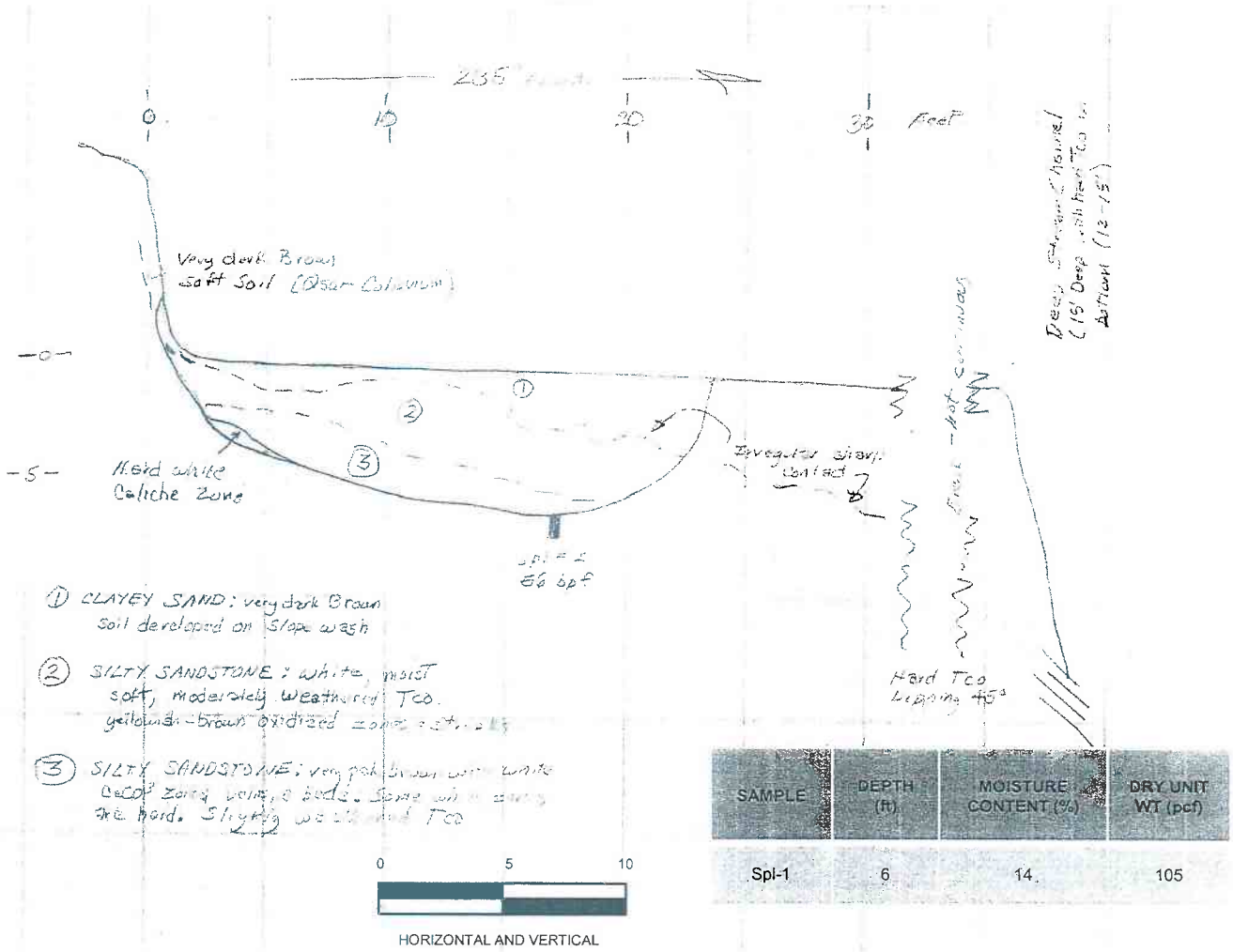
SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	3	12	100
Spl-2	7	15	115
Spl-3	14	8	95

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-11	Figure A4-9
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)	OTHER TESTS
Spl-1	3	8	109	-
Spl-2	14	9	122	-
Spl-3	2	14	116	-
Spl-4	12	-	-	CORR

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-12	Figure A4-10
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



SAMPLE	DEPTH (ft)	MOISTURE CONTENT (%)	DRY UNIT WT (pcf)
Spl-1	6	14	105

Project No. CLF-10-001	CITY OF LAKE FOREST ALTON PARKWAY GAP EXTENSION PROJECT	TRENCH PIT LOG HT-13	Figure A4-11
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		

APPENDIX C

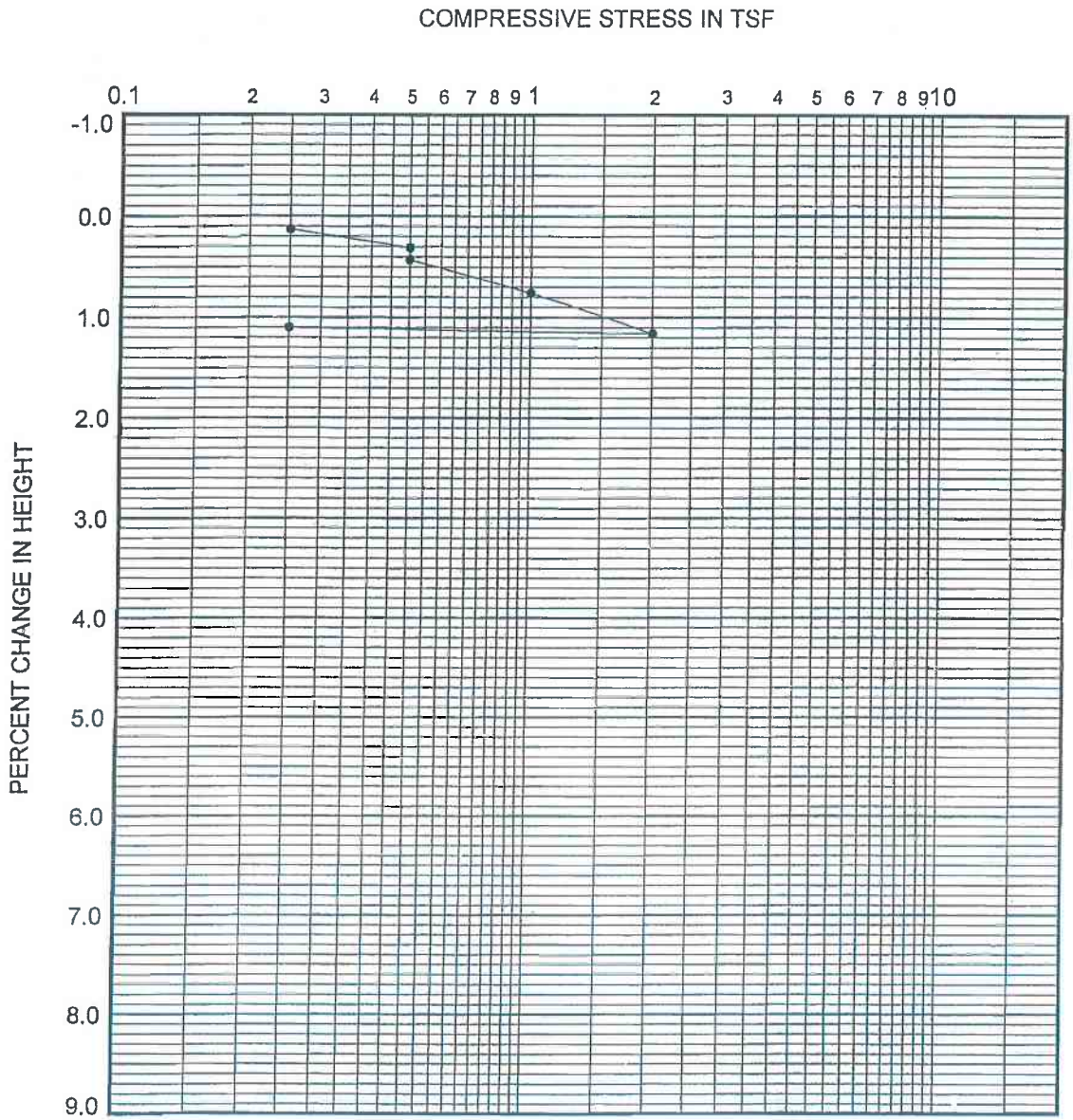
LAB DATA BY PSE (2002)

TABLE C-1

Summary of Laboratory Test Data

Boring/Pit No.	Depth	Soil Description	Group Symbol - Unified Soil Classification System	Maximum Dry Density		Grain Size Analysis					Expansion Index, UBC 18-2	Chemical		
				Maximum Density, (pcf)	Optimum Moisture, (%)	% + No. 4 Screen	% Coarse Sand	% Med.- Fine Sand	%Silt (0.074 to 0.005mm)	% Clay (-0.005 mm)		pH	Resistivity, Ω-cm	Sulfate Content, (% wt)*
B-2E	10	Clayey sand (Qac)	SC	116.8	12.4	0	0	76	12	12	0	7.4	2381	<.001
B-5E	10	Gravelly Sand (Qt)	SP			2.2	11.7	60	25	15				
B-7E	10	Silty Sand (Qt)	SM			0	0	73	20	7				
B-7E	34	Gravelly Sand (Qt)	SP			20.4	10.3	53.3	11	5				
B-12E	10	Silty Sand (Af)	SM	124.3	10.8	0	1.4	77.6	11	10	5	7.9	4676	0.005

* By KYH Co. Analytical Laboratory



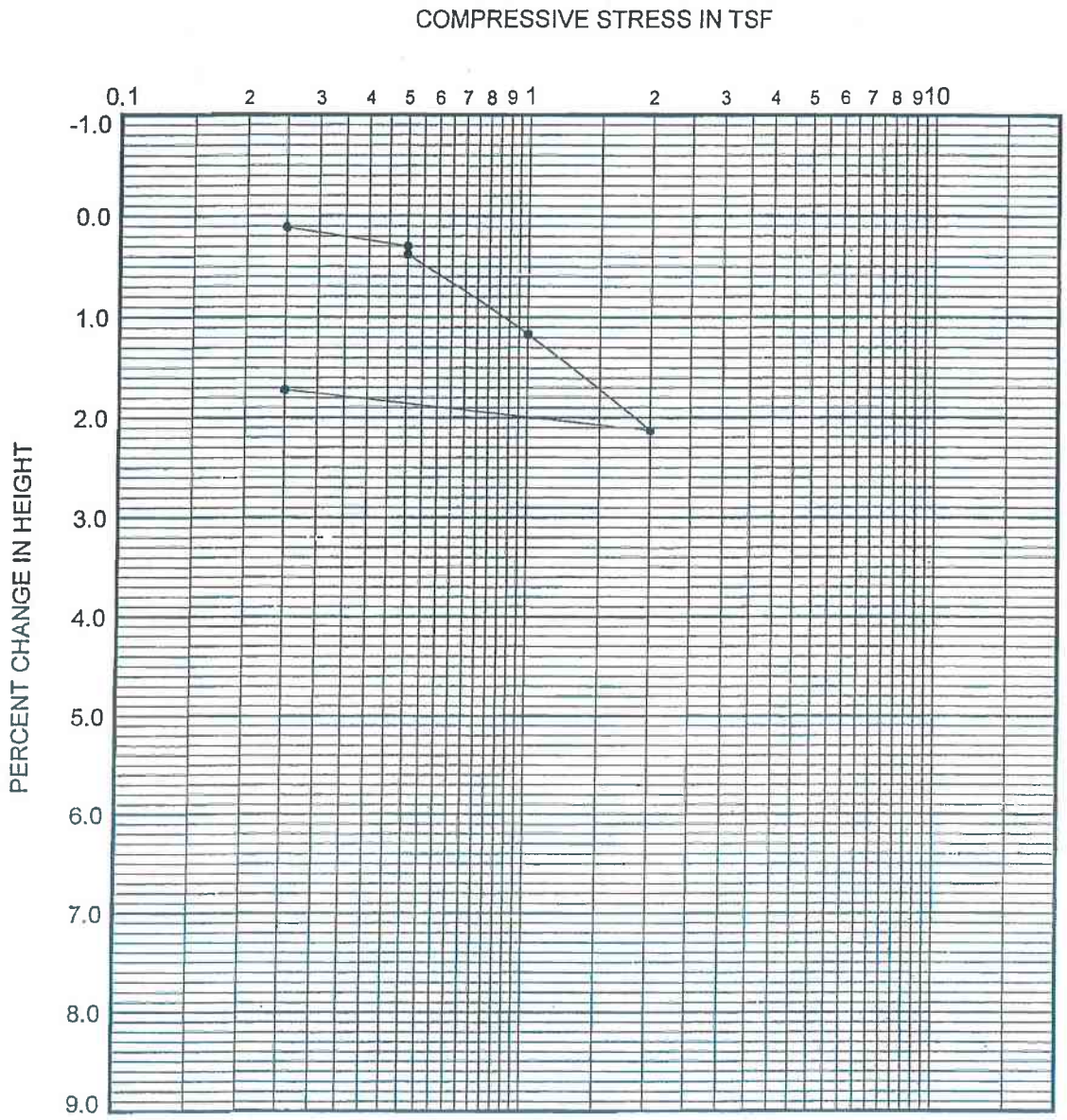
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-05E	10.0	117.5	6.6	21	SP	Gravelly Sand (Qt)

REMARKS: WATER ADDED AT 1/2 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-1



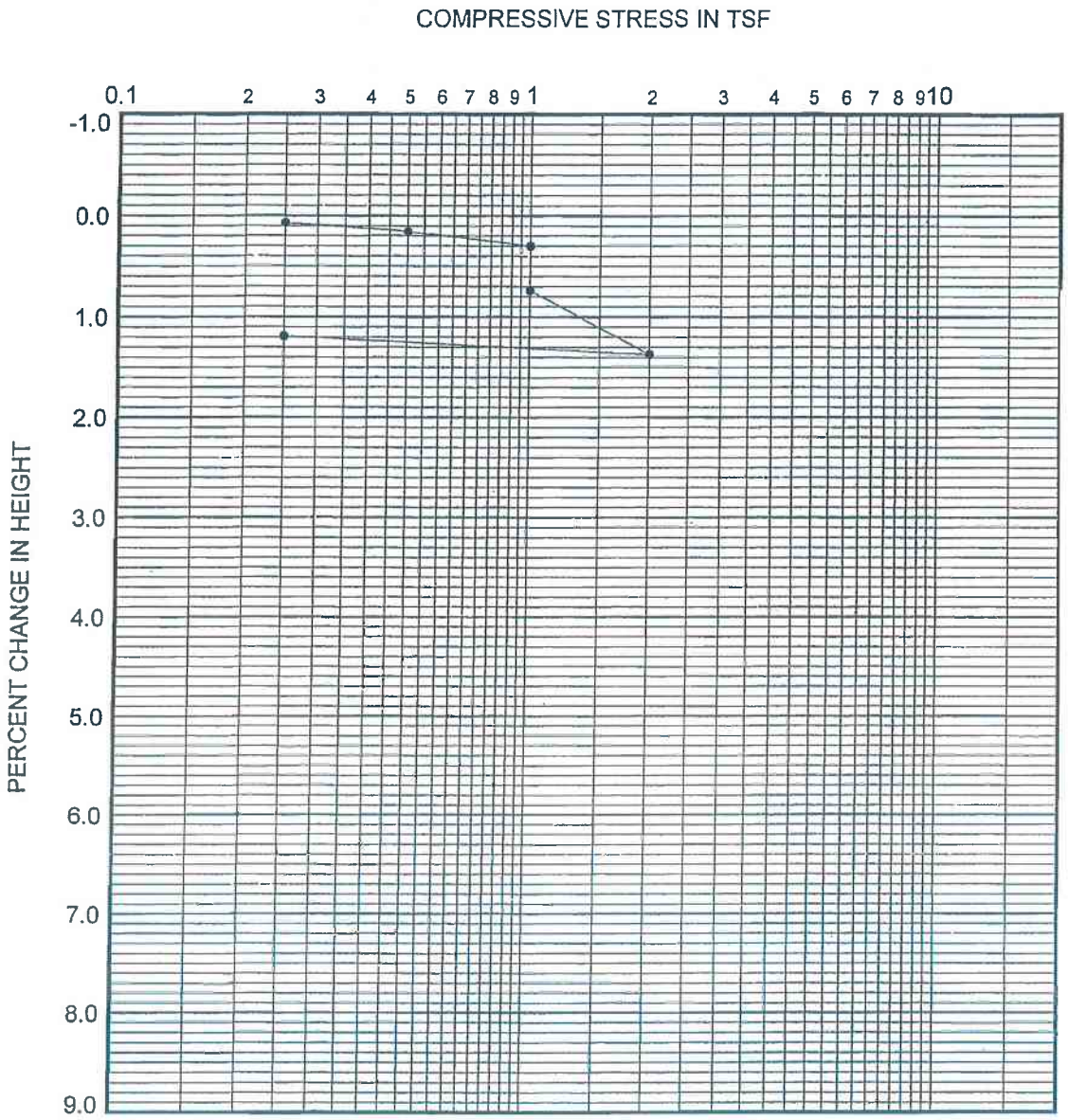
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-07E	10.0	96.8	5.2	27	SM	Silty Sand (Qt)

REMARKS: WATER ADDED AT 1/2 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-2



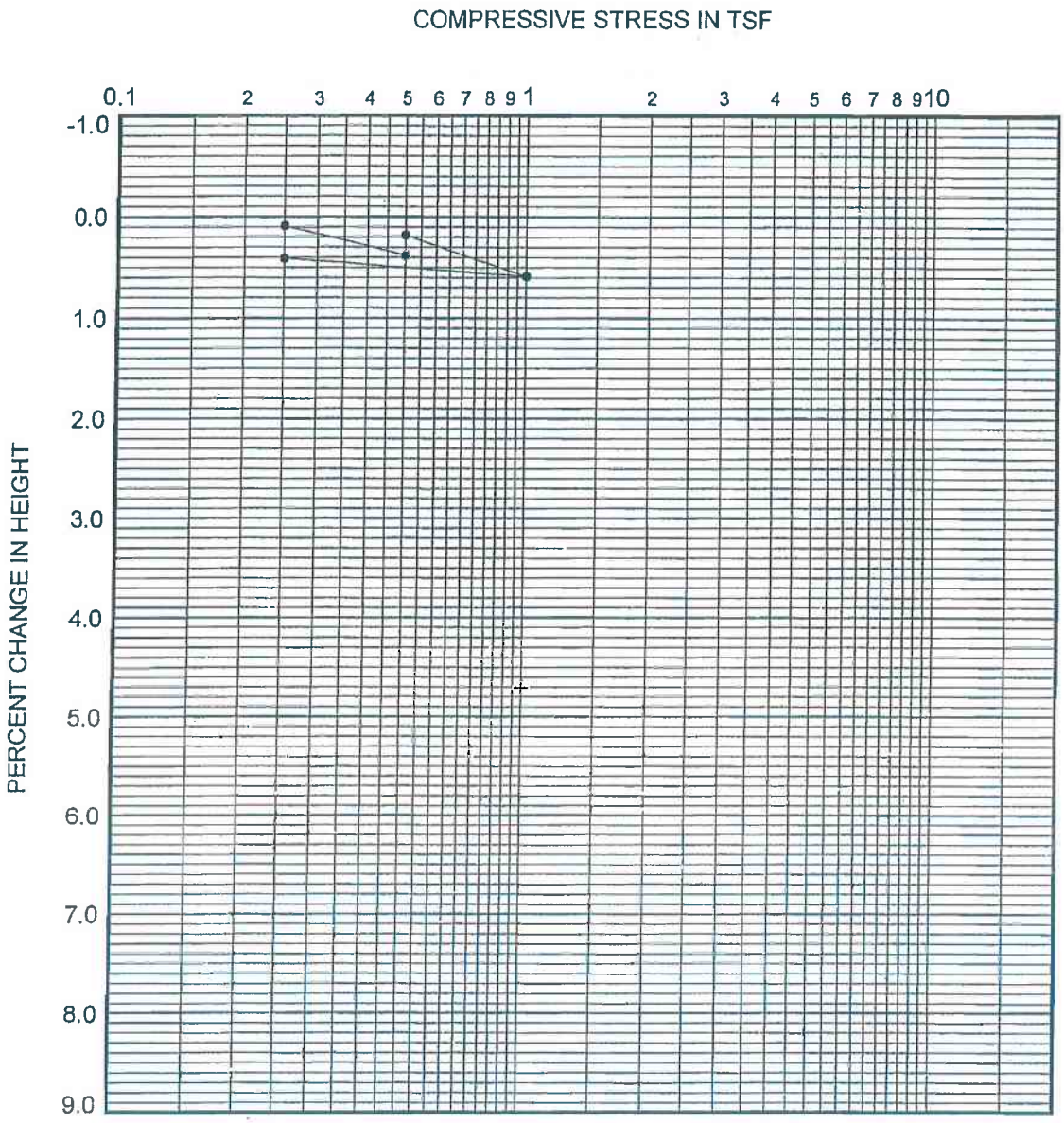
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-07E	34.0	106.4	3.9	16	SP	Gravelly Sand (Qt)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-3



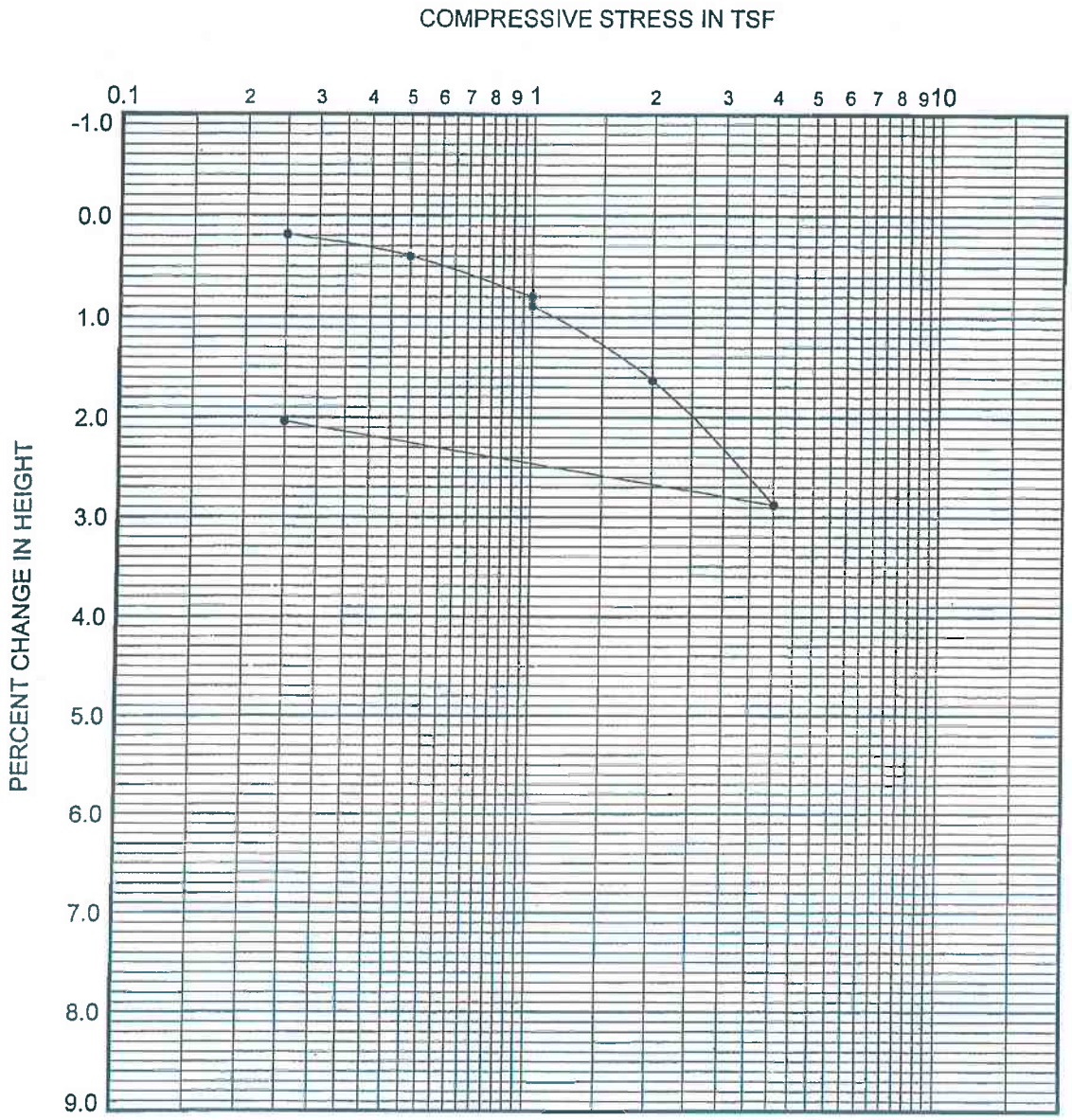
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-12E	10.0	114.1	8.8	21	SP	Sand (Af)

REMARKS: WATER ADDED AT 1/2 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-4



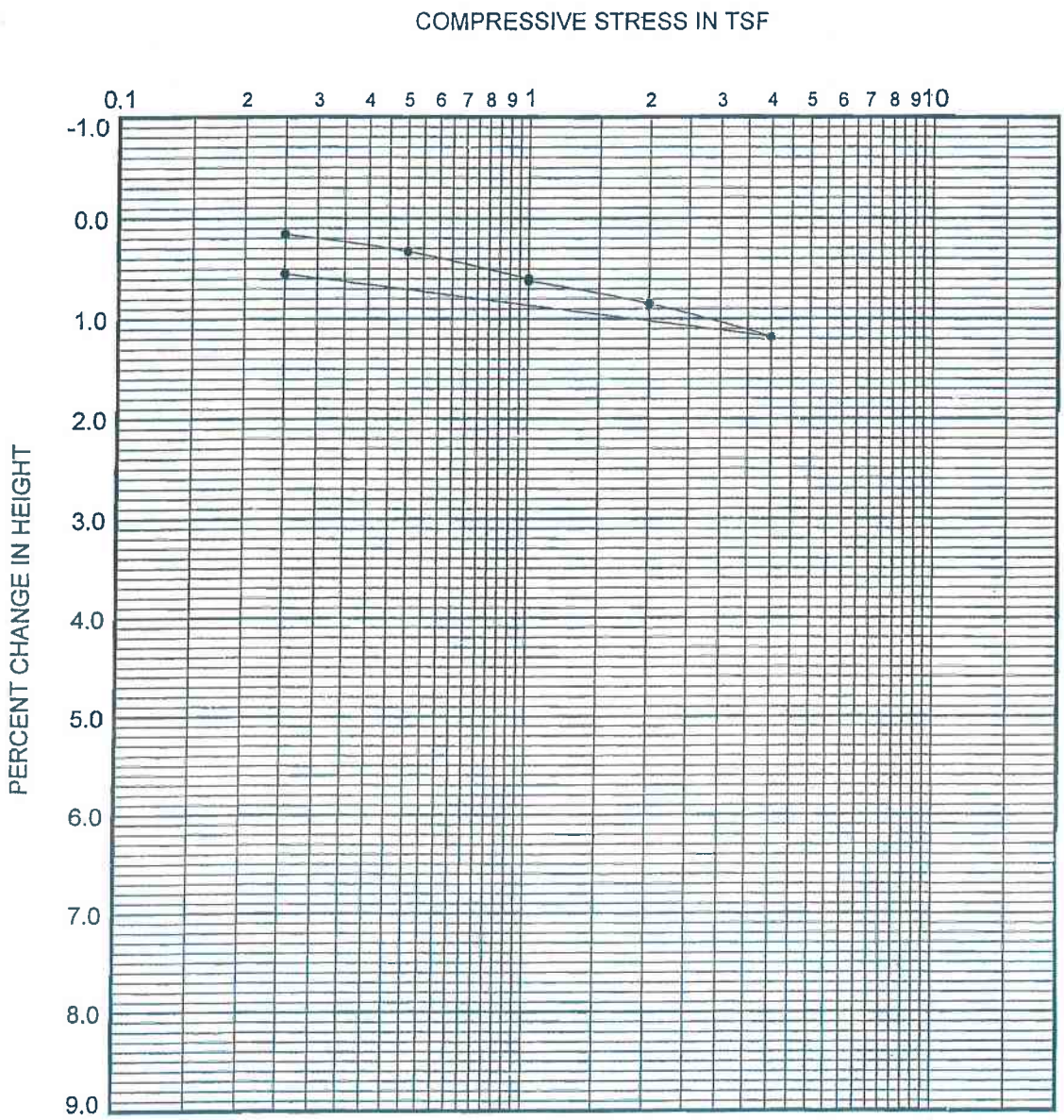
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-12E	30.0	112.4	12.1		SC	Clayey Sand (Af)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-5



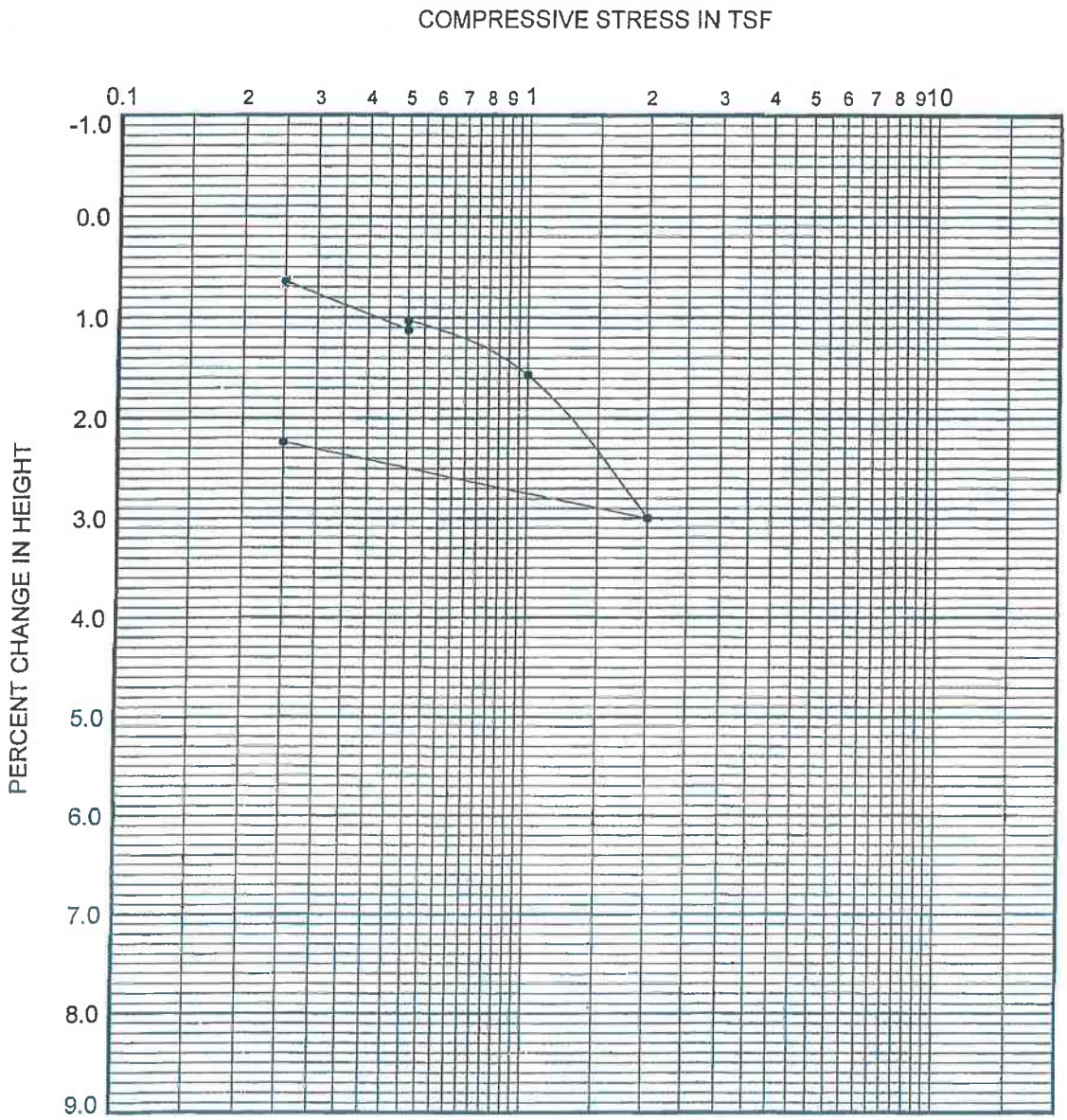
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-12E	45.0	123.1	11.9			Sandstone (Tco)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 **PLATE C-6**



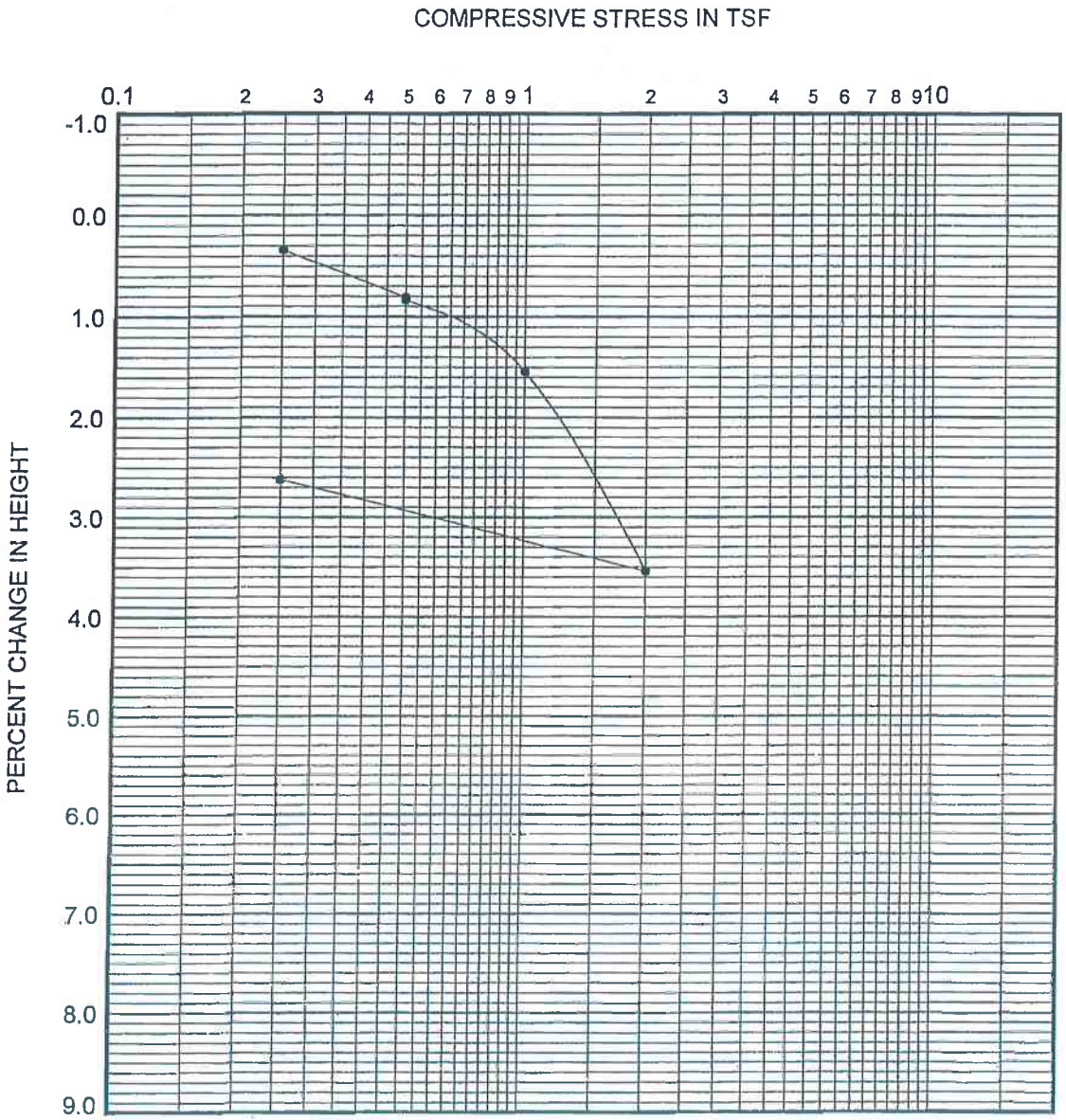
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-13E	10.0	106.8	20.4		SC	Clayey Sand (Qac)

REMARKS: WATER ADDED AT 1/2 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-7



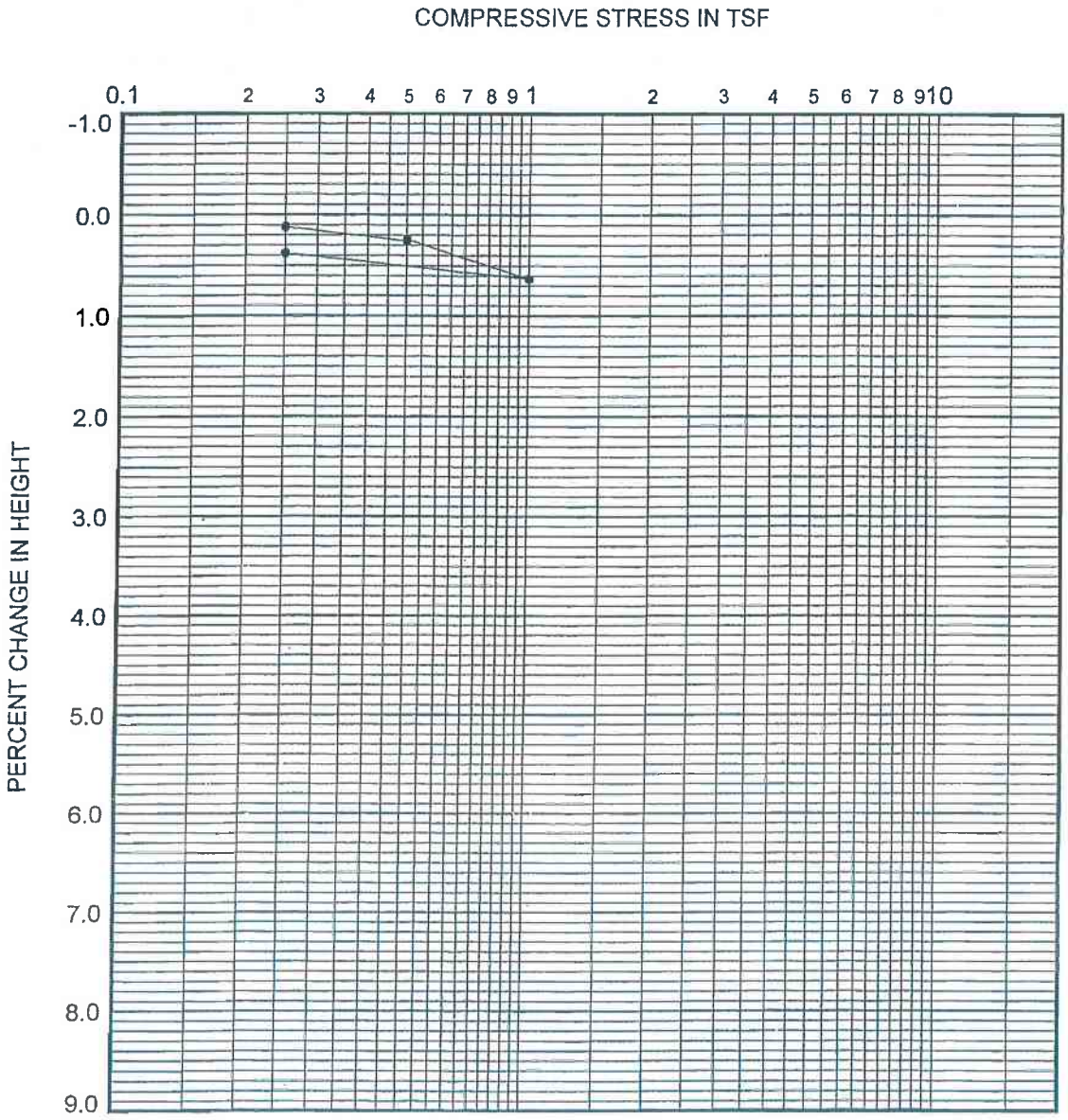
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-13E	15.0	112.5	13.3		SP	Sand (Qac)

REMARKS: WATER ADDED AT 1/2 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-8



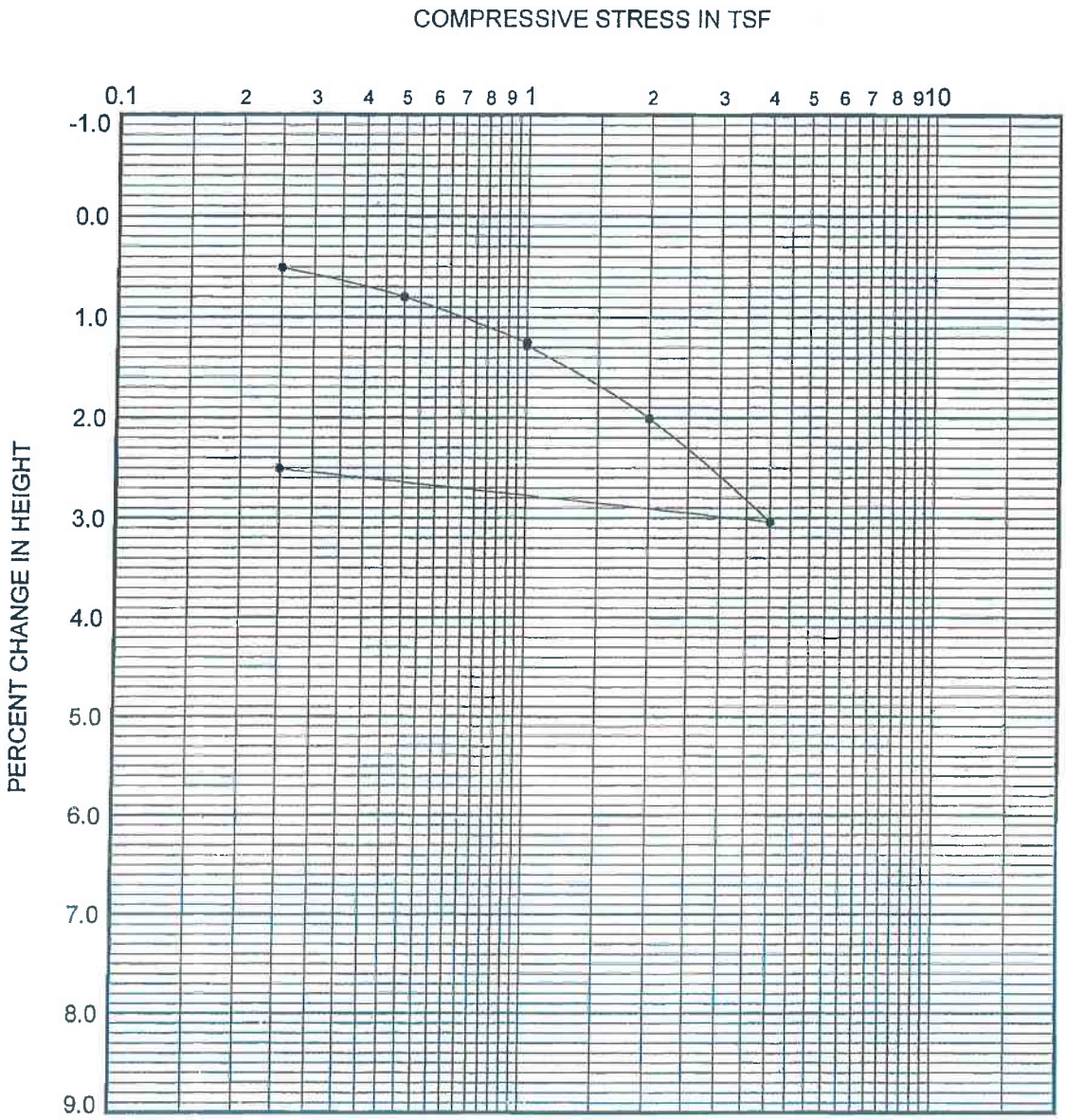
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-14E	20.0	107.4	11.8		SC	Clayey Sand (Af)

REMARKS: WATER ADDED AT 1/2 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-9



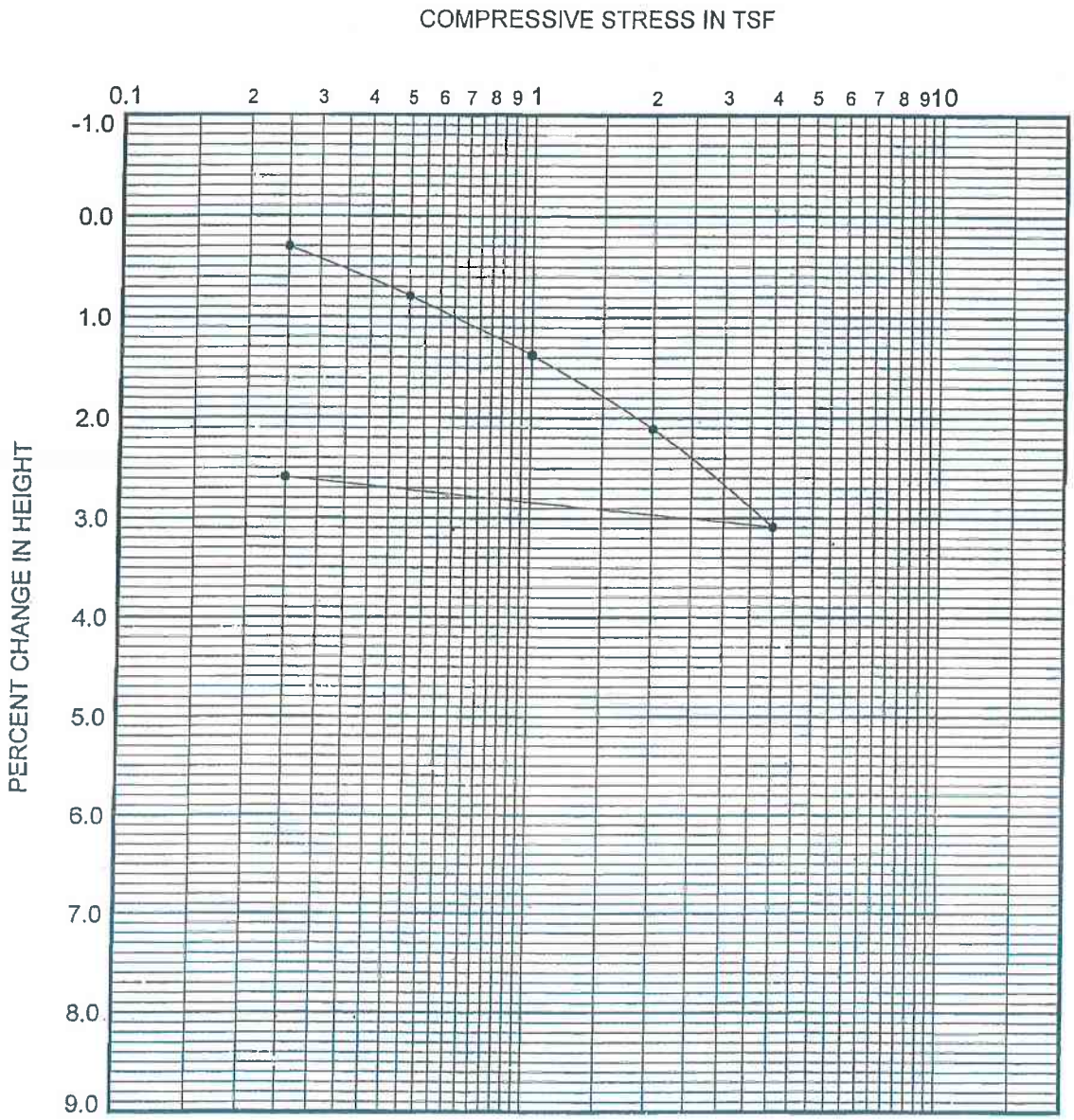
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-14E	41.0	116.8	14.7		SM	Silty Sand (Af)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-10



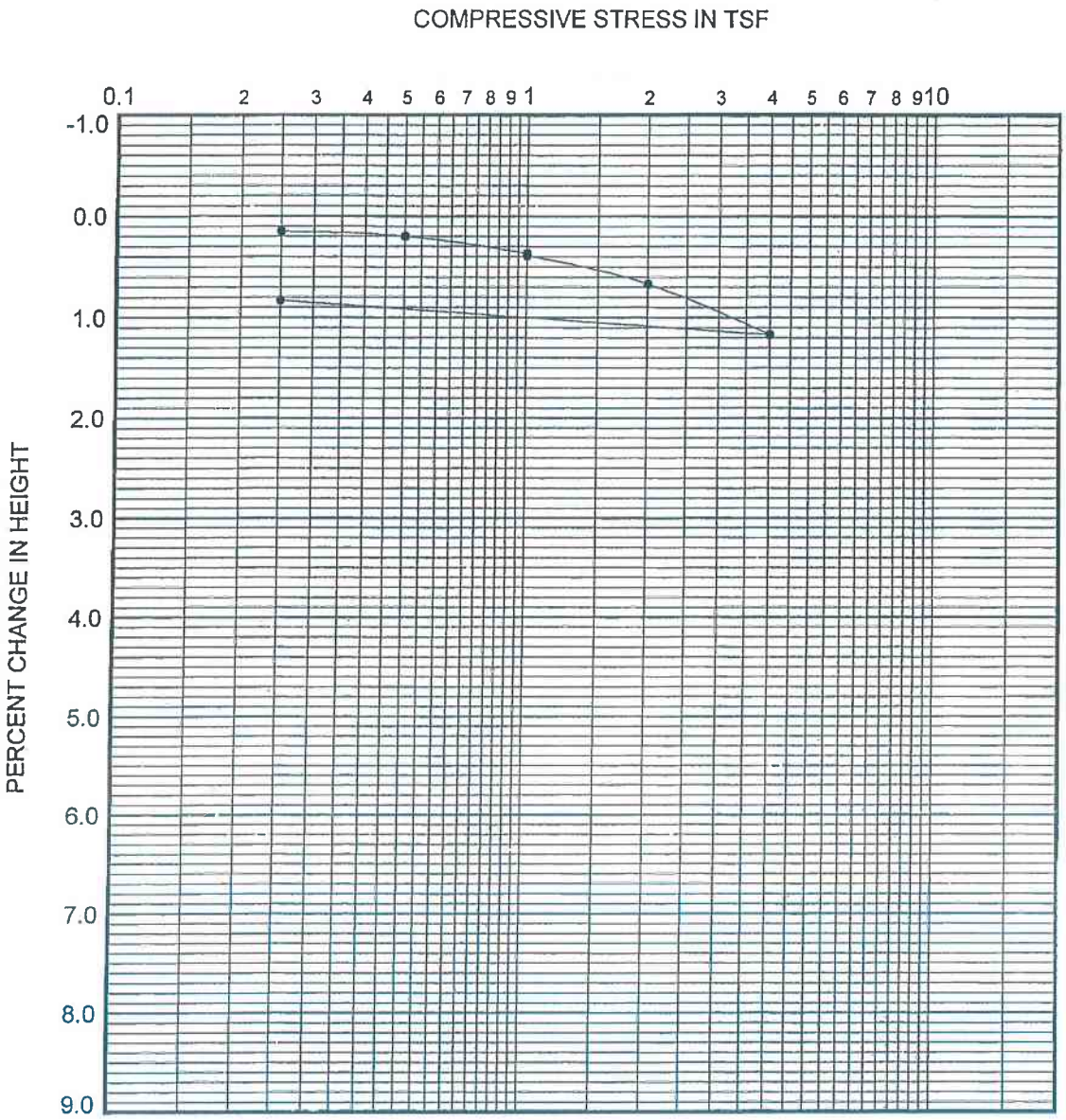
boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-14E	50.0	107.4	20.4		SC	Clayey Sand (Qac)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-11



boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-14E	60.0	106.7	20.0		SP	Sand (Qac)

REMARKS: WATER ADDED AT 1 TSF

CONSOLIDATION CURVE

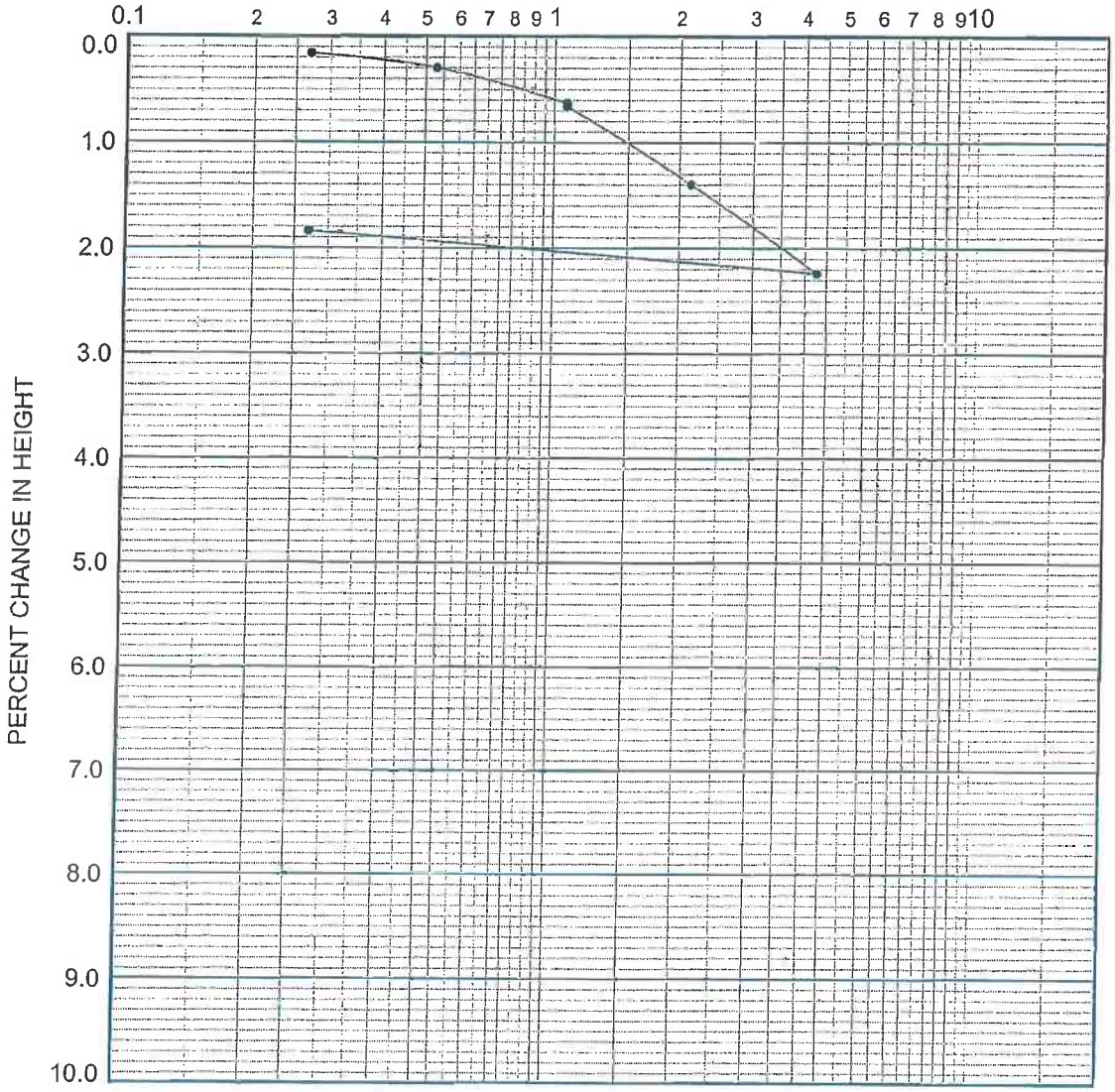
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505 PLATE C-12

TABLE B-1

Summary of Laboratory Test Data

Boring/Pit No.	Depth	Soil Description	Group Symbol - Unified Soil Classification System	Maximum Dry Density		Grain Size Analysis				Expansion Index, UBC 18-2	R-Value
				Maximum Density (pcf)	Optimum Moisture (%)	% Gravel (+ No. 4 Screen)	% Sand	% Silt (0.074 to 0.005mm)	% Clay (-0.005 mm)		
RW-1	5	Silty Sand	SM			3	65	16	26		
RW-1	7.5	Sand	SP			3	86	5	6		
RW-2	5	Silty Sand	SM			6	80	8	6		
RW-2	10	Silty Sand	SM			0	72	15	13		
RW-2	15	Gravely Sand	SP			30	60	5	5		
RW-2	17.5	Silty Sand	SM			0	57	28	15		
RW-2	20	Gravely Sand	SP			40	53	5	2		
RW-2	25	Gravel	GP			61	37	1	1		
RW-2	30	Gravely Sand	SP			44	54	0	2		
RW-2	35	Sand	SP			6	88	3	3		
RW-2	51	Silty Sand	SM			0	70	15	15		
RW-3	2.5	Silty Sand	SM			1	51	32	16		
RW-3	7.5	Silty Sand	SM			12	51	16	21		
RW-3	10	Silty Sand	SM			12	56	16	16		
RW-3	18	Silty Sand	SM			10	72	9	9		
RW-4	5	Silty Sand	SM			0	60	28	12		
RW-4	10	Sand	SP			11	80	5	4		
RW-4	15	Silty Sand	SM			3	81	8	8		
RW-4	20	Silty Sand	SM			3	76	11	10		
RW-4	25	Sand	SP			8	88	1	3		
RW-4	30	Sand	SP			29	68	1	2		
RW-4	35	Sand	SP			15	79	3	3		
RW-4	37.5	Sand	SP			8	88	3	1		
RW-4	40	Clayey Sand	SC			9	77	0	14		
RW-4	45	Sand	SP			1	87	7	5		
RW-4	50	Silty Sand	SM			0	80	12	8		

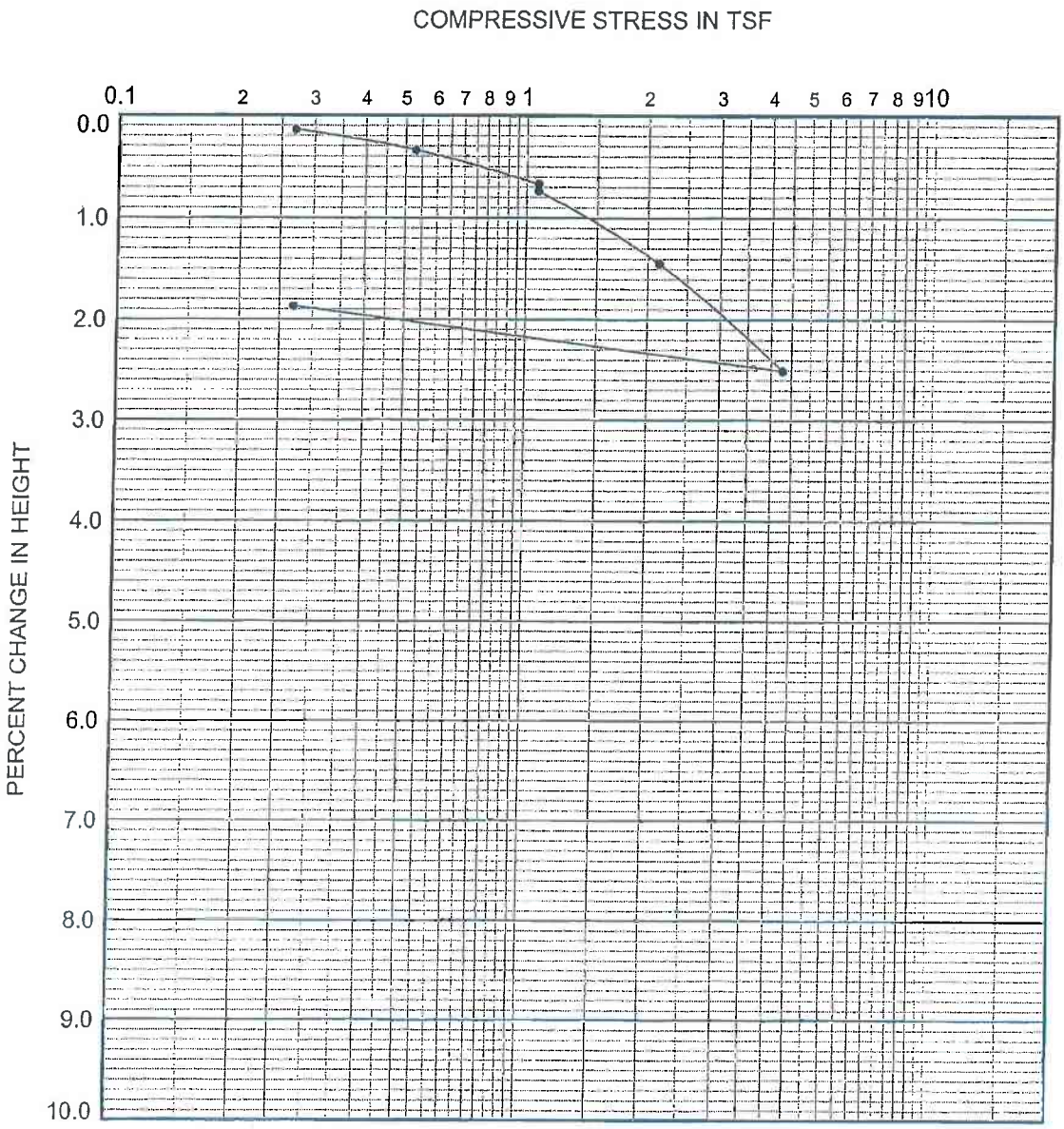


boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
RW-8	15.0	108.5	14.3		CL	

REMARKS: WATER ADDED AT 1.07 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122
W.O. 500505G PLATE B-1



boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
RW-8	25.0	112.8	13.7		CL	

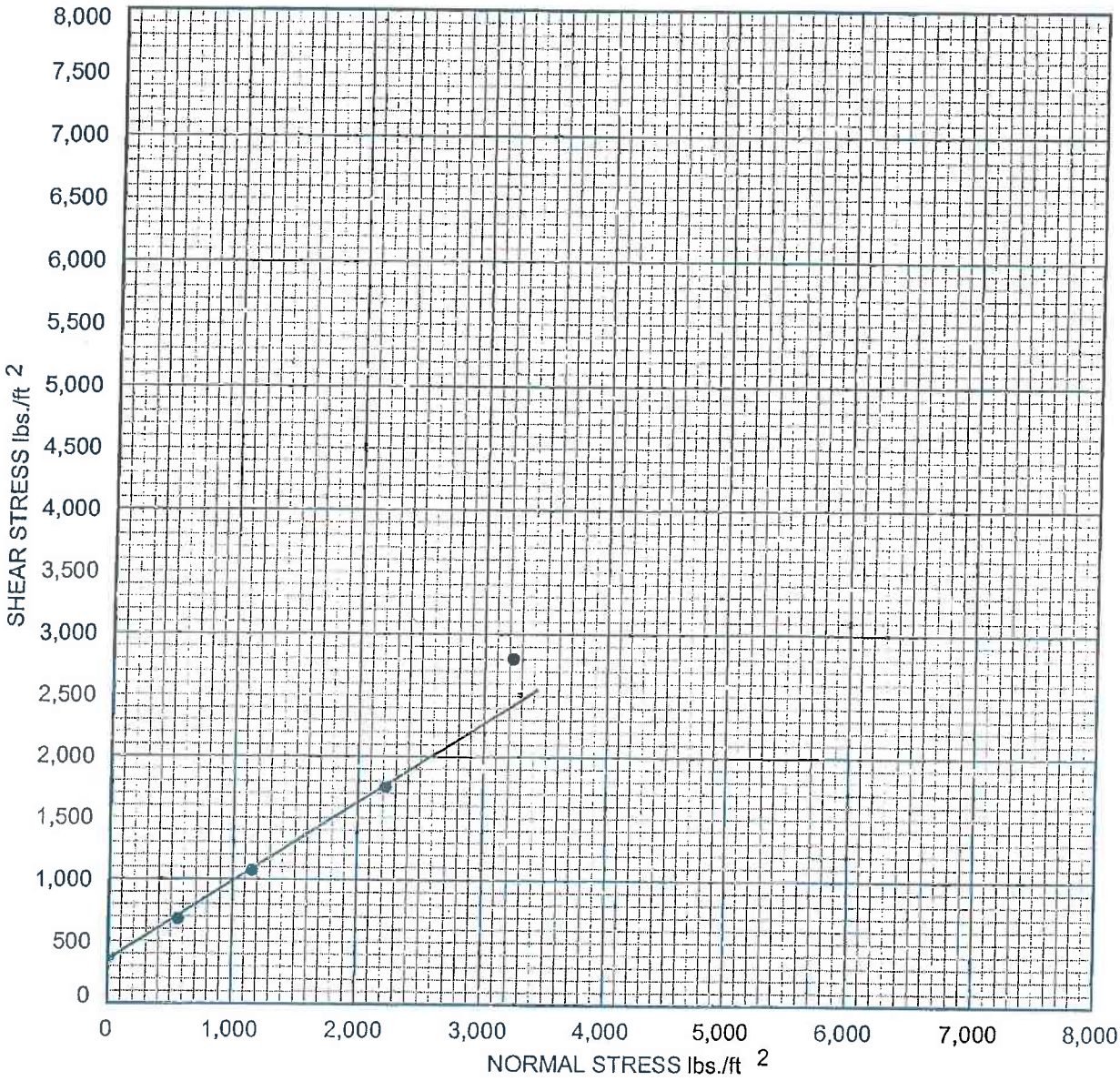
REMARKS: WATER ADDED AT 1.07 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505G PLATE B-2

DIRECT SHEAR TEST



	COHESION	350 psf.
SP	FRICTION ANGLE	33.0 degrees

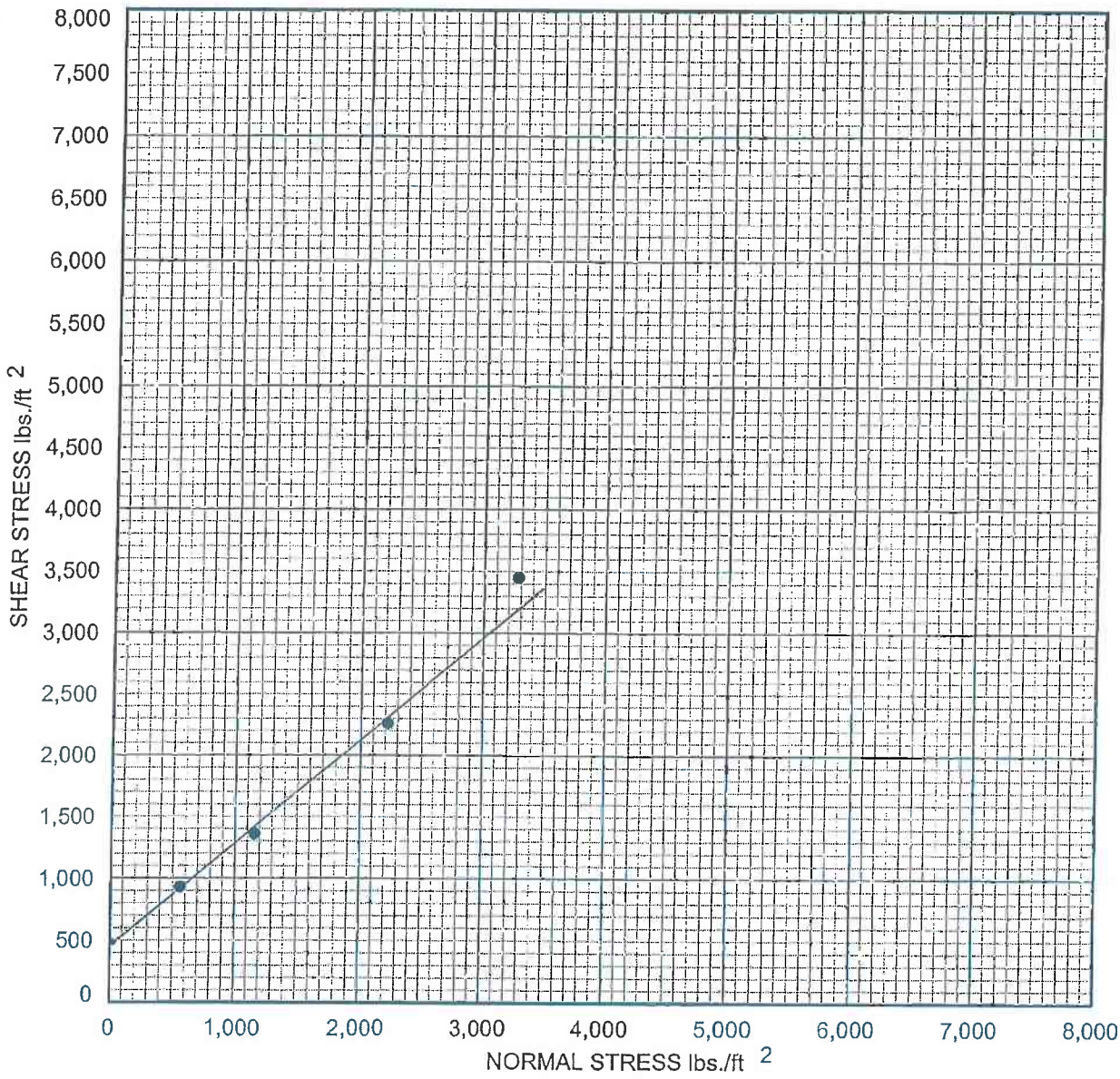
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	RW-1	7.50			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505G **PLATE B-3**

DIRECT SHEAR TEST
Peak, Saturated, Undisturbed



COHESION	500 psf.
FRICTION ANGLE	40.0 degrees

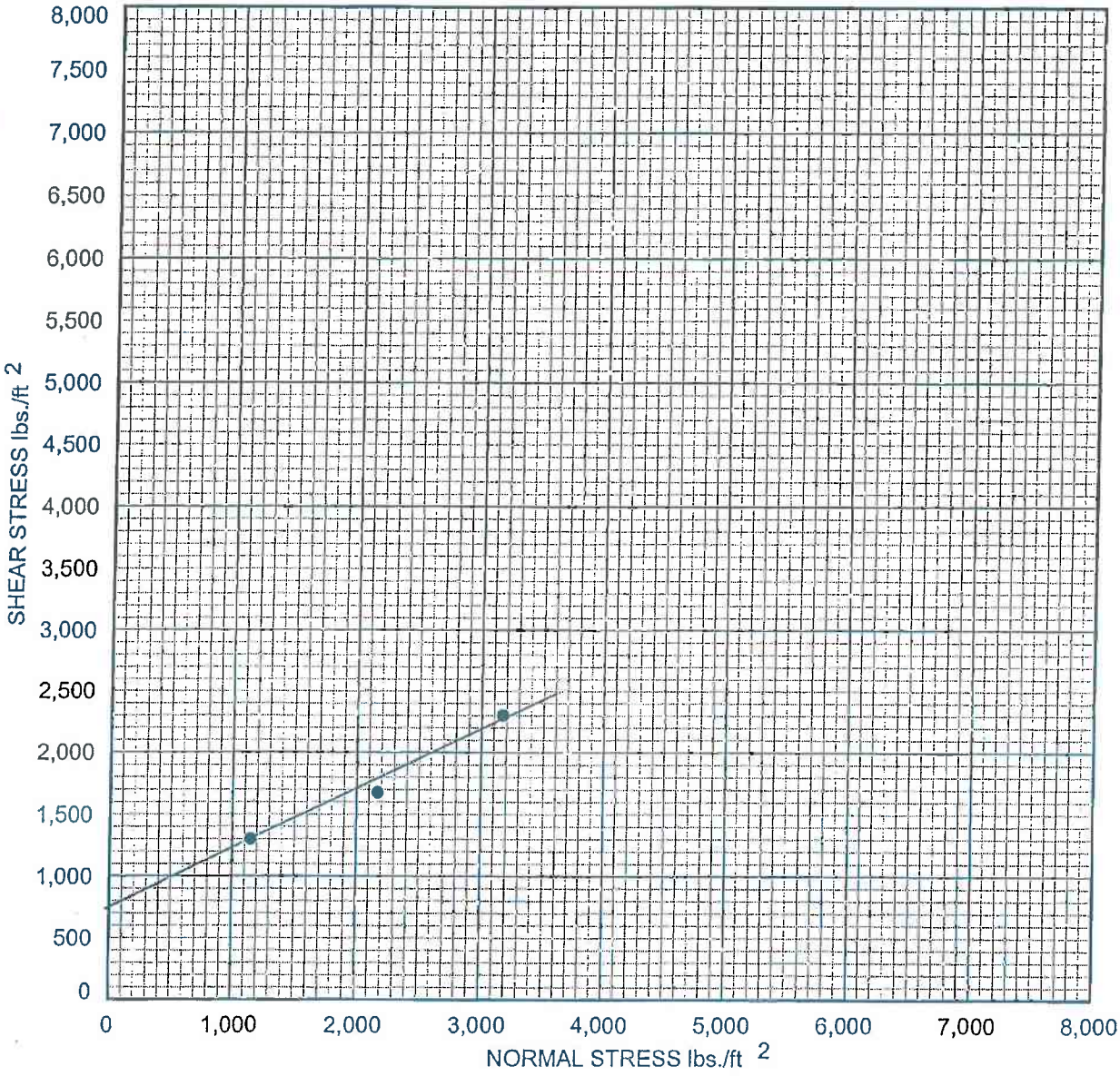
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	RW-1	7.60			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505G PLATE B-4

DIRECT SHEAR TEST
Residual Undisturbed Saturated



	COHESION	750 psf.
SM	FRICTION ANGLE	25.0 degrees

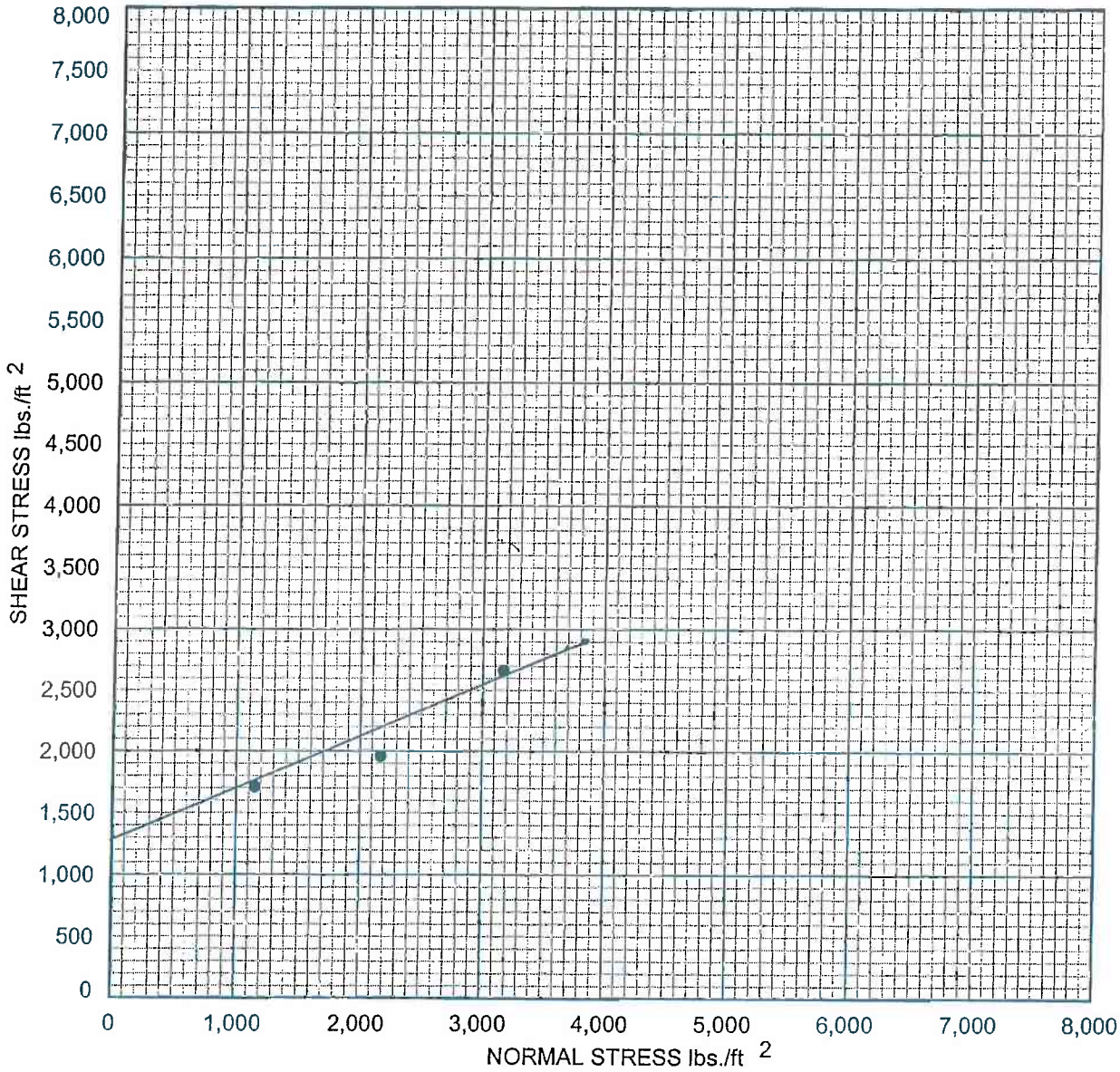
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	RW-2	17.50			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505G **PLATE B-5**

DIRECT SHEAR TEST
Peak, Undisturbed, Saturated



	COHESION	1300	psf.
SM	FRICTION ANGLE	22.0	degrees

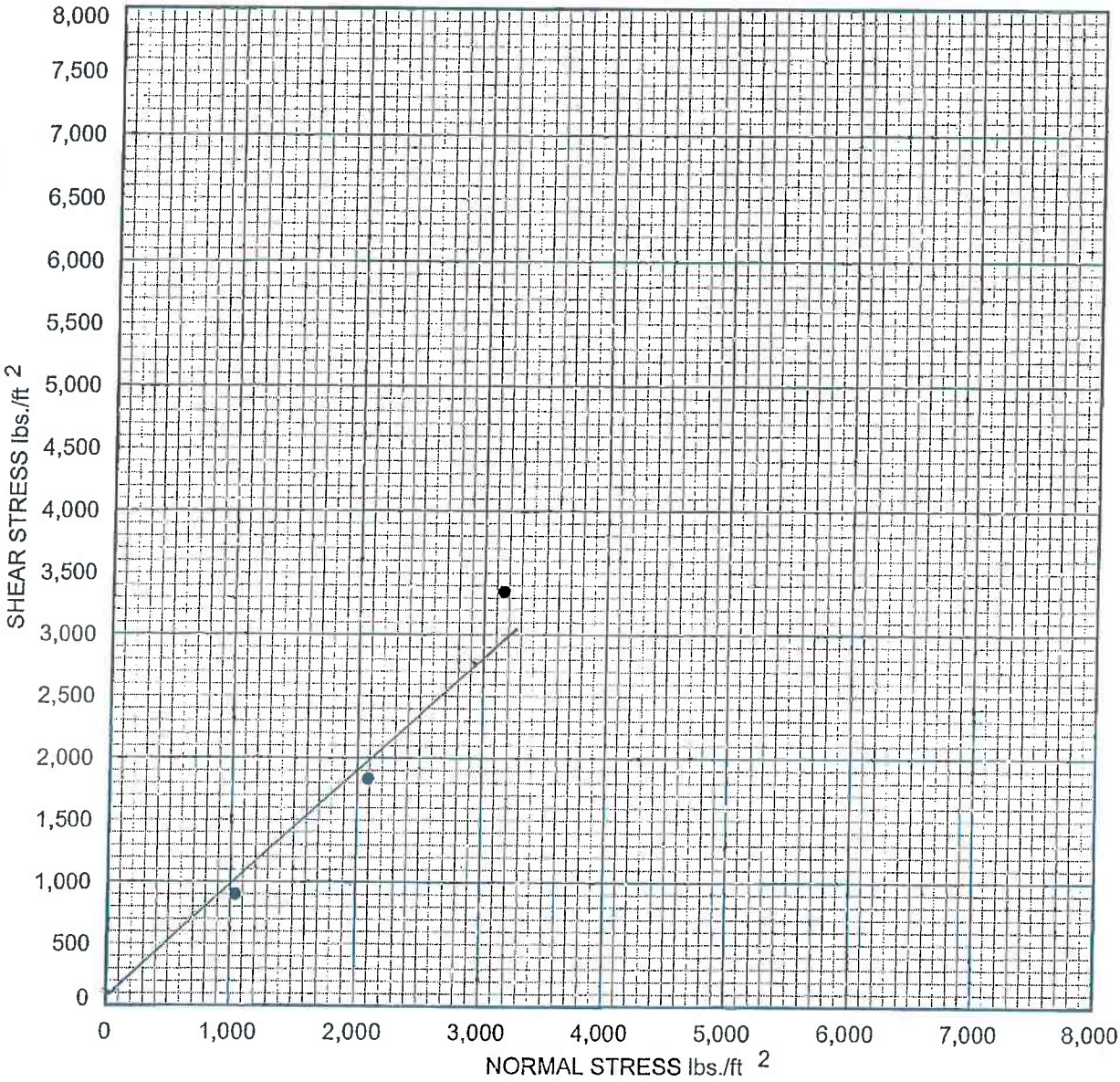
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	RW-2	17.60			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505G **PLATE B-6**

DIRECT SHEAR TEST
Undisturbed Saturated



		COHESION	100 psf.
SM		FRICTION ANGLE	42.0 degrees

symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	RW-3	10.00			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92780 714-730-2122

W.O. 500505G **PLATE B-7**

LAB DATA BY PSE (1981, 1988, &1989) IN PSE REPORT (2002)

TABLE II
SUMMARY OF LABORATORY TEST DATA

BORING/PIT NO.	DEPTH (ft.)	SOIL DESCRIPTION	GROUP SYMBOL, Unified Soil Classification System	MAXIMUM DRY DENSITY: Maximum Density (pcf)	MAXIMUM DRY DENSITY: Optimum Moisture (%)	GRAIN SIZE ANALYSIS: % + No. 4 Screen	% Coarse Sand	% Med.-Fine Sand	% Silt (0.074 to 0.005 mm)	% Clay (-0.005 mm)	EXPANSION INDEX, UBC 29-2	DIRECT SHEAR: Cohesion (psf)	DIRECT SHEAR: Ø, (Degrees)	DIRECT SHEAR: Test Conditions	OTHER TESTS
B-1D	10	Yellow brown silty sand (Qac)	SM				81	15	4						CONSOL-PLATE C-1
	30	Brown silty sand (Qac)	SM	110.5	10.5		83	13	4						CONSOL-PLATE C-2
B-2D	25	Brown silty sand (Qac)	SM				72	12	16						CONSOL-PLATE C-3
B-3D	25	Gray brown silty sand (Qac)	SM	120.0	12.5	3	69	19	9						
	30	Brown very silty sand (Qac)	SM				69	23	8						CONSOL-PLATE C-4
	40	Gray brown very silty sand (Qac)	SM				69	25	6						CONSOL-PLATE C-5
B-4D	10	Light gray silty sand (Tco)	SM				79	17	4					U/S	SHEAR-PLATE D-6
	20	Light gray silty sand (Tco)	SM				76	22	2					U/S	SHEAR PLATE D-6
	36	Light gray silty sand (Tco)	SM	112.0	13.0		84	13	3					R/S	CHEM SHEAR PLATE D-2
	40	Light gray silty sand (Tco)	SM				76	19	5					U/S	SHEAR PLATE D-6
	52	Gray brown silty sand (Tco)	SM	113.0	14.5		83	14	3					R/S	SHEAR PLATE D-2
B-5D	67	Gray brown silty sand (Tco)	SP/SM	111.0	12.0		83	14	3						
	10	Brown clayey sand (Qac)	SC				74	9	47						CONSOL-PLATE C-6
	15	Light brown silty sand (Qac)	SM				83	9	7					U/S	SHEAR PLATE D-7
	19	Brown Clayey sand (Qac)	SC	121.0	12.0		67	16	17	31				R/S	CHEM SHEAR PLATE D-4

TEST CONDITIONS: R — Remolded, S — Saturated, U — Undisturbed, N — Natural Moisture

TABLE II
SUMMARY OF LABORATORY TEST DATA

BORING/PIT NO.	DEPTH (ft.)	SOIL DESCRIPTION	GROUP SYMBOL, Unified Soil Classification System	MAXIMUM DRY DENSITY: Maximum Density (pcf)	MAXIMUM DRY DENSITY: Optimum Moisture (%)	GRAIN SIZE ANALYSIS: % + No. 4 Screen	GRAIN SIZE ANALYSIS: % Coarse Sand	GRAIN SIZE ANALYSIS: % Med.-Fine Sand	GRAIN SIZE ANALYSIS: % Silt (0.074 to 0.005 mm)	GRAIN SIZE ANALYSIS: % Clay (-0.005 mm)	EXPANSION INDEX, UBC 29-2	DIRECT SHEAR: Cohesion (psf)	DIRECT SHEAR: Ø, (Degrees)	DIRECT SHEAR: Test Conditions	OTHER TESTS
B-6D	12	Light gray silty sand (Tco)	SM	117.0	13.5									R/S	CHEM SHEAR PLATE D-1
B-7D	11	Red brown silty sand (Qt)	SM	129.5	9.0						1			R/S	CHEM SHEAR PLATE D-6
	20	Yellow brown silty sand (Qt)	SM											R/S	SHEAR PLATE D-3
B-7D	21	Yellow brown silty sand (Qt)	SM												
B-8D	10	Red brown gravelly sand (Qt)	SP				6.0	89	2	3					CONSOL-PLATE C-7
	15	Red Brown gravelly sand (Qt)	SP				5.0	92	1	2					CONSOL-PLATE C-8
B-9D	23	White silty sand (Tco)	SM	118.0	14.0									R/S	SHEAR PLATE D-1
	30	Light gray silty sand (Tco)	SM					72	22	6				U/S	SHEAR PLATE D-5
	50	Light gray silty sand (Tco)	SM					76	20	4				U/S	SHEAR PLATE D-5
B-10D	6	White silty sand (Tco)	SM	122.0	11.5									R/S	SHEAR PLATE D-1
	25	Light gray silty sand (Tco)	SM				9	85	9	5				U/S	SHEAR PLATE D-5
	50	Light gray slightly silty sand (Tco)	SP-SM	122.5	11.5		3	86	7	4				R/S	R-VALUE SHEAR PLATE D-1
	55	Light gray silty sand	SM						19	4				U/S	SHEAR PLATE D-5
B-11D	12	Gray brown clayey sand (Qac)	SC	124.5	10.0	1	3	67	13	16				R/S	SHEAR PLATE D-4
	20	Brown clayey sand (Qac)	SC				3	65	15	17					CONSOL-PLATE C-9

TEST CONDITIONS: R — Remolded, S — Saturated, U — Undisturbed, N — Natural Moisture

TABLE II
SUMMARY OF LABORATORY TEST DATA

BORING/PIT NO.	DEPTH (ft)	SOIL DESCRIPTION	GROUP SYMBOL, Unified Soil Classification System	MAXIMUM DRY DENSITY: Maximum Density (pcf)	MAXIMUM DRY DENSITY: Optimum Moisture (%)	GRAIN SIZE ANALYSIS: % + No. 4 Screen	GRAIN SIZE ANALYSIS: % Coarse Sand	GRAIN SIZE ANALYSIS: % Med.-Fine Sand	GRAIN SIZE ANALYSIS: % Silt (0.074 to 0.005 mm)	GRAIN SIZE ANALYSIS: % Clay (-0.005 mm)	EXPANSION INDEX, UBC 29-2	DIRECT SHEAR: Cohesion (psf)	DIRECT SHEAR: ø, (Degrees)	DIRECT SHEAR: Test Conditions	OTHER TESTS
B-12D	23	Red brown sand clay (Qac)	CL	117.0	13.0		2	38	27	33					
B-12D	30	Red brown silty sand (Qac)	SM				4	81	9	6					CONSOL-PLATE C-10
	40	Brown silty sand (Qac)	SM				9	76	9	6					CONSOL-PLATE C-11
B-13D	20	Brown clayey sand (Qac)	SC												CONSOL-PLATE C-12
	22	Brown clayey sand (Qac)	SC	122.0	12.0	1	68	14	17						
B-14D	20	Tan silty sand (Qac)	SM												CONSOL-PLATE C-13
B-15D	20	White silty sand (Tco)	SM											U/S	SHEAR PLATE D-5
	21	White silty sand (Tco)	SM	118.0	13.5		3	82	13	2				R/S	SHEAR PLATE D-1
	40	White silty snad (Tco)	SM											U/S	SHEAR PLATE D-5
B-17D	10	Red Brown silty sand (Qt)					3	63	28	6				U/S	SHEAR PLATE D-6
	23	Red brown silty sand (Qt)	SM	118.0	10.5	2	4	82	10	2					
	30	Red brown silty sand (Qt)	SM				5	90	3	2				R/S	SHEAR PLATE D-6
B-18D	9	Tan silty sand (Qt)	SM	120.0	12.5	4	7	65	19	5	15				CHEM
	20	Gray brown silty sand (Qt)	SM					86	11	3				U/S	SHEAR PLATE D-6
	25	Light gray silty sand (Qt)	SM				1	69	24	6					CONSOL-PLATE C-14

TEST CONDITIONS: R — Remolded, S — Saturated, U — Undisturbed, N — Natural Moisture

TABLE II
SUMMARY OF LABORATORY TEST DATA

BORING/PIT NO.	DEPTH (ft.)	SOIL DESCRIPTION	GROUP SYMBOL, Unified Soil Classification System	MAXIMUM DRY DENSITY: Maximum Density (pcf)	MAXIMUM DRY DENSITY: Optimum Moisture (%)	GRAIN SIZE ANALYSIS: % + No. 4 Screen	GRAIN SIZE ANALYSIS: % Coarse Sand	GRAIN SIZE ANALYSIS: % Med.-Fine Sand	GRAIN SIZE ANALYSIS: % Silt (0.074 to 0.005 mm)	GRAIN SIZE ANALYSIS: % Clay (-0.005 mm)	EXPANSION INDEX, UBC 29-2	DIRECT SHEAR: Cohesion (psf)	DIRECT SHEAR: ϕ, (Degrees)	DIRECT SHEAR: Test Conditions	OTHER TESTS
B-19D	30	Brown clayey sand (Qac)	SC				1	51	20	28					CONSOL-PLATE C-15
	40	Gray brown clayey sand (Qac)	SC					60	17	23					CONSOL-PLATE C-16
B-25D	6	Red brown gravelly sand (Qt)	SM			11	6	67	8	8					
	16	Tan silty sand (Qt)	SM			1	4	60	32	3					
B-26D	25	Light gray silty sand (Tco)	SP-SM					88	10	2					
B-28D	35	Brown clayey sand (Qac)	SC				1	54	27	18					CONSOL-PLATE C-17
	50	Red brown gravelly sand (Qac)	SM			22	6	43	20	9					CONSOL-PLATE C-18
B-29D	35	Gray brown clayey sand (Qac)	SC				2	57	24	17					CONSOL-PLATE C-19
B-31D	25	Tan clayey sand (Qac)	SC				3	64	19	14					CONSOL-PLATE C-20
B-33D	30	Light red brown clayey sand (Qac)	SC				1	62	23	14					CONSOL-PLATE C-21
B-35D	20	Light brown clayey sand.	SC					77	8	15					CONSOL-PLATE C-22

TEST CONDITIONS: R — Remolded, S — Saturated, U — Undisturbed, N — Natural Moisture

TABLE II
SUMMARY OF LABORATORY TEST DATA

BORING/PIT NO.	DEPTH (ft.)	SOIL DESCRIPTION	GROUP SYMBOL, Unified Soil Classification System	MAXIMUM DRY DENSITY: Maximum Density (pcf)	MAXIMUM DRY DENSITY: Optimum Moisture (%)	GRAIN SIZE ANALYSIS: % + No. 4 Screen	GRAIN SIZE ANALYSIS: % Coarse Sand	GRAIN SIZE ANALYSIS: % Med.-Fine Sand	GRAIN SIZE ANALYSIS: % Silt (0.074 to 0.005 mm)	GRAIN SIZE ANALYSIS: % Clay (-0.005 mm)	EXPANSION INDEX, UBC 29-2	DIRECT SHEAR: Cohesion (psf)	DIRECT SHEAR: ø, (Degrees)	DIRECT SHEAR: Test Conditions	OTHER TESTS
B-20SE	6	Light gray silty sand	SM					83	8	9					SE SEE TABLE IIA
	16	Light gray silty sand	SM					84	9	7					SE SEE TABLE IIA
	26	Light gray silty sand	SM					81	12	7					SE SEE TABLE IIA
	36	Light gray silty sand	SM					78	15	7					SE SEE TABLE IIA
	46	Light gray silty sand	SM				2	82	11	5					SE SEE TABLE IIA
	56	Light gray silty sand	SM				2	86	7	5					SE SEE TABLE IIA
B-21SE	6	Light gray silty sand	SP-SM					89	9	2					SE SEE TABLE IIA
	16	Light gray silty sand	SM					87	11	2					SE SEE TABLE IIA
	26	Light gray silty sand	SP-SM					90	8	2					SE SEE TABLE IIA
	36	Light gray silty sand	SM					87	11	2					SE SEE TABLE IIA
	46	Light gray silty sand	SP-SM					88	10	2					SE SEE TABLE IIA
	56	Light gray silty sand	SM					90	8	2					SE SEE TABLE IIA
B-22SE	5	White silty sand	SP-SM					88	9	3					SE SEE TABLE IIA
	15	White silty sand	SP-SM			3	0	87	8	2					SE SEE TABLE IIA
	25	White silty sand	SP-SM			0	1.4	89	8	2					SE SEE TABLE IIA

TEST CONDITIONS: R — Remolded, S — Saturated, U — Undisturbed, N — Natural Moisture

TABLE II
SUMMARY OF LABORATORY TEST DATA

BORING/PIT NO.	DEPTH (ft.)	SOIL DESCRIPTION	GROUP SYMBOL, Unified Soil Classification System	MAXIMUM DRY DENSITY: Maximum Density (pcf)	MAXIMUM DRY DENSITY: Optimum Moisture (%)	GRAIN SIZE ANALYSIS: % + No. 4 Screen	GRAIN SIZE ANALYSIS: % Coarse Sand	GRAIN SIZE ANALYSIS: % Med.-Fine Sand	GRAIN SIZE ANALYSIS: % Silt (0.074 to 0.005 mm)	GRAIN SIZE ANALYSIS: % Clay (-0.005 mm)	EXPANSION INDEX, UBC 29-2	DIRECT SHEAR: Cohesion (psf)	DIRECT SHEAR: ø, (Degrees)	DIRECT SHEAR: Test Conditions	OTHER TESTS
B-22SE	35	Light gray silty sand	SM			6	2	76	14	2					SE SEE TABLE IIA
	45	Light gray silty sand	SM			13	1	73	10	3					SE SEE TABLE IIA
	55	Light gray silty sand	SM					81	16	3					SE SEE TABLE IIA
	65	Light gray silty sand	SP-SM					88	8	4					SE SEE TABLE IIA
B-23SE	5	Light gray silty sand	SM					84	14	2					SE SEE TABLE IIA
	15	Light gray silty sand	SP-SM					88	6	2					SE SEE TABLE IIA
	25	Light gray silty sand	SP-SM					88	10	2					SE SEE TABLE IIA
	35	Light gray silty sand	SP-SM					88	10	2					SE SEE TABLE IIA
	45	Light gray silty sand	SP-SM					90	8	2					SE SEE TABLE IIA

TEST CONDITIONS: R — Remolded, S — Saturated, U — Undisturbed, N — Natural Moisture

T A B L E IIA

SAMPLE,	DEPTH	GRAIN SIZE ANALYSES %GRAVEL	SAND	SILT	CLAY	R VALUE	SAND EQUIVALENT
B-10D	50	3	86	7	4	72	
B-20SE	6	--	83	8	9		24
B-20SE	16	--	84	9	7	74	21
B-20SE	26	--	81	12	7		18
B-20SE	36	--	78	15	7		9
B-20SE	46	--	84	11	5		25
B-20SE	56	--	88	7	5		34
B-21SE	6	--	89	9	2		16
B-21SE	16	--	87	11	2		22
B-21SE	26	--	90	8	2	78	30
B-21SE	36	--	87	11	2		23
B-21SE	46	--	88	10	2		23
B-21SE	56	--	90	8	2		25
B-22SE	5	--	88	9	3		33
B-22SE	15	3	87	8	2		24
B-22SE	25	--	90	8	2		29
B-22SE	35	6	78	14	2		18
B-22SE	45	13	74	10	3		24
B-22SE	55	--	81	16	3		19
B-22SE	65	--	88	8	4		28
B-23SE	5	--	84	14	2		22
B-23SE	15	--	88	10	2		24
B-23SE	25	--	88	10	2		33
B-23SE	35	--	88	10	2		27
B-23SE	45	--	90	8	2		28

M. J. SCHIFF & ASSOCIATES

Consulting Corrosion Engineers

1291 NORTH INDIAN HILL BOULEVARD
CLAREMONT, CALIFORNIA 91711
714/626-0967
FAX 714/621-1419

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November 17, 1989

PACIFIC SOILS ENGINEERING,INC.
P. O. Box 2249
Cypress, California 90630

Attention: Mr. Jim Castles

Re: Soil Corrosivity Study
Baker Ranch
Orange County, California
Your #101675, MJS&A #89277

Gentlemen:

Laboratory tests have been completed on three soil samples you provided from your borings for the subject grading project for commercial and light industrial development East of Bake Parkway. The purpose of these tests was to determine if the soils may have deleterious effects on underground utilities, hydraulic elevator cylinders, and concrete foundations.

The electrical resistivity of each sample was measured in its as-received condition and again with distilled water added to create the standardized condition of saturation. Resistivities are at about their lowest value when the soil is saturated. The samples were chemically analyzed for the major anions and cations, and pH was measured. Results are shown on Table 1.

One of the most useful factors in determining soil corrosivity is electrical resistivity. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. A soil's resistivity decreases and, therefore, its corrosivity increases as its moisture and chemical contents increase.

A commonly accepted correlation between electrical resistivity and corrosivity toward ferrous metals is:

Soil Resistivity in ohm-centimeters	Corrosivity Category
0 to 1,000	severely corrosive
1,000 to 2,000	corrosive
2,000 to 10,000	moderately corrosive
over 10,000	mildly corrosive

Electrical resistivities measured in the laboratory with as-received moisture content were in the mildly corrosive category. When saturated, they dropped into moderately and severely corrosive categories. The resistivities dropped considerably with added moisture indicating that the samples were dry as-received. The wide variations in soil resistivity can create concentration type corrosion cells that increase corrosion above what would be expected from the soil characteristics alone.

pH values varied from 7.1 to 7.5 which are neutral to mildly alkaline. This is not significant in evaluating corrosivity in this case. The chemical content of the samples was low.

This soil is classified as severely corrosive to ferrous metals. Consideration should be given to testing soils at individual building sites after grading, particularly if finer grained soils might be encountered.

The life of buried materials depends on thickness, strength, loads, construction details, and soil moisture as well as soil corrosivity and is, therefore, difficult to predict. Of more practical value are corrosion control methods that will increase the life of the material at a reasonable cost. Some corrosion control measures that can be used to prolong the life of materials buried in these soils follow.

Underground steel utilities should be blasted and given a high quality protective coating such as extruded polyethylene, a tape coating system, or hot applied coal tar enamel.

Buried steel piping should be electrically insulated from dissimilar metals, cement-mortar or concrete coated steel, and above ground steel pipe. Underground steel pipe should be bonded for electrical continuity if rubber gasketed, mechanical, grooved end, or other nonconductive type joints are used.

Cathodic protection is recommended for underground steel utilities.

Hydraulic elevator cylinders should be well coated as described above. Each cylinder should be isolated from building metals by installing dielectric material between the piston platen and car and also in the oil line. The oil line should be placed above ground if possible but, if underground, should be protected as described above for steel utilities. Cathodic protection is recommended for hydraulic cylinders or, as an alternate, each cylinder may be placed in a plastic casing with a plastic watertight seal at the bottom.

Cast or ductile iron pipe, valves, and fittings should be encased in an 8 mil polyethylene tube or wrap per AWWA Standard C105/ANSI 21.5. Underground iron pipe should also be electrically insulated from dissimilar metals and above ground iron pipe.

No special precautions are required for copper, asbestos-cement, or plastic utilities placed underground from a corrosion viewpoint. However, any iron valves or fittings should be protected as mentioned above.

Where metallic pipelines penetrate concrete structures such as building floors or walls, plastic sleeves, rubber seals, or other dielectric material should be used to prevent pipe contact with the concrete and reinforcing steel.

On any type of pipe, bare steel appurtenances such as bolts, joint harnesses, or flexible couplings should be coated with a coal tar or rubber based mastic after assembly.

Standard construction practices and concrete mixes may be used for concrete in contact with these soils using type 1 or 2 cement.

The scope of this study is limited to a determination of soil corrosivity and its general effects on materials likely to be used for construction. If the architect and/or engineers desire more specific information, designs, specifications, or review of design, we will be happy to work with them as a separate phase of this project.

Respectfully submitted,
M. J. SCHIFF & ASSOCIATES

Paul R. Smith

Paul R. Smith, P.E.
cb

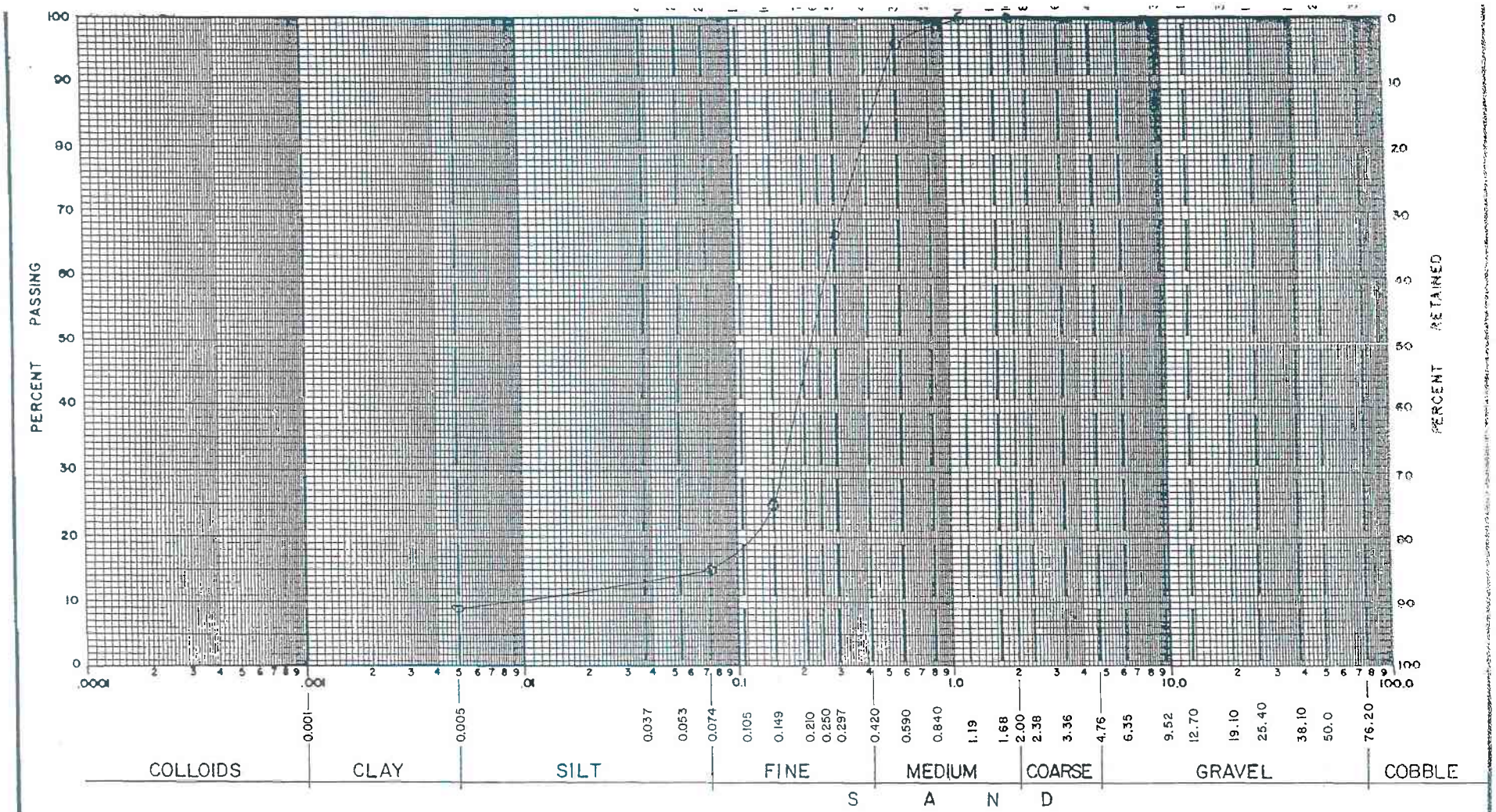
Enc: Table 1
L38

Table 1 - LABORATORY TESTS ON SOIL SAMPLES

Location and Depth	Soil Type	Soil Resistivity ohm-centimeters As Rec'd	Sat'd	pH	Chemical Analysis in mg/kg (ppm) of dry soil: Calcium Ca	Magnesium Mg	Sodium Na	Bicarbonate HCO3	Chloride Cl	Sulfate SO4
B6D 12-14'	silty sand	40,100	3,100	7.5	trace	trace	69	trace	142	trace
B7D 20-21'	silty sand	20,300	2,500	7.4	trace	trace	80	trace	212	trace
B18D 9-10'	silty sand	10,600	750	7.1	40	24	288	244	425	40

Carbonates = 0 for all samples

Baker Ranch
Orange County, California
Your #101675, MJS&A #89277
F11



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-20 SE	5-6'				24		

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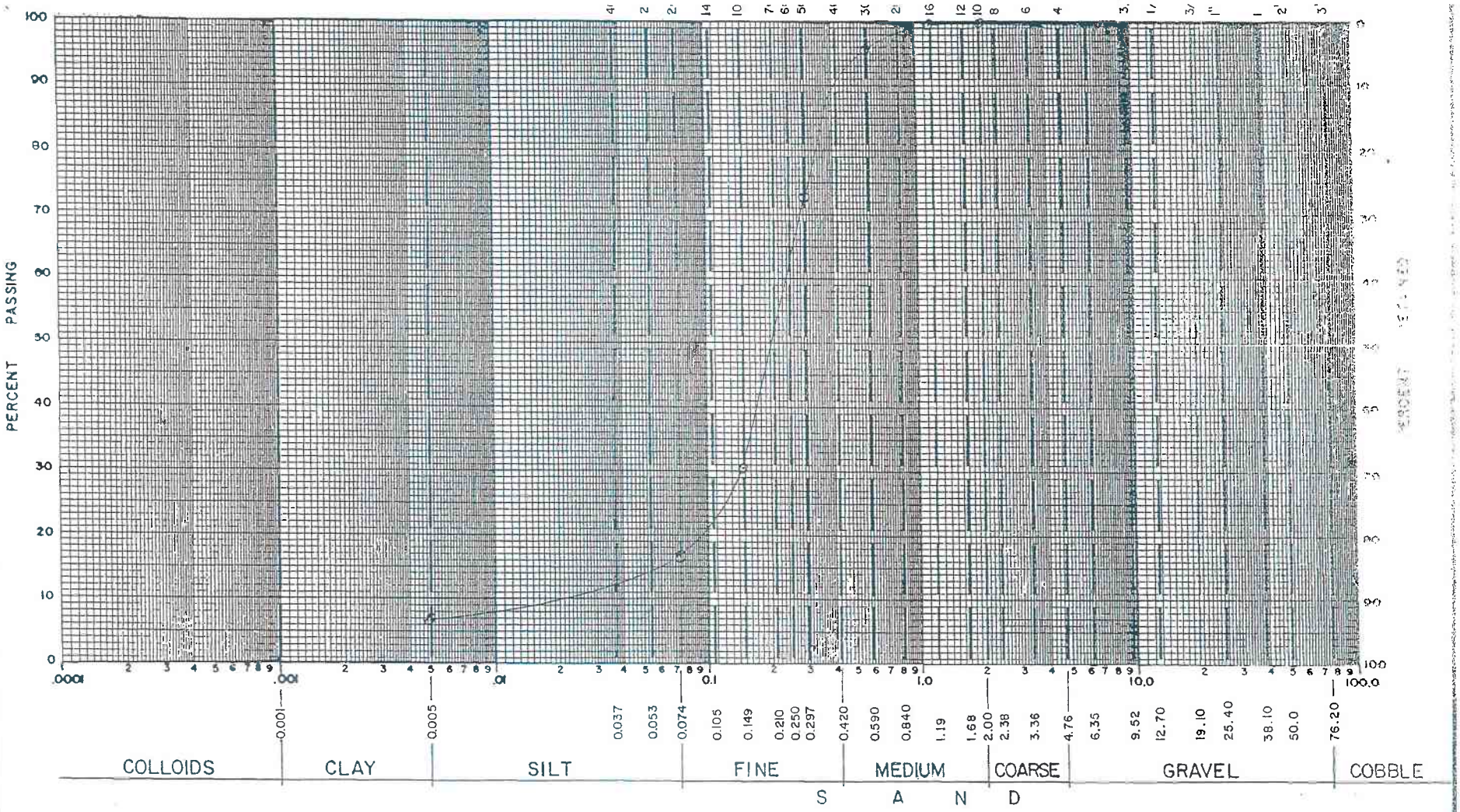
PLATE B-1



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-20 SE	15-16'				21		

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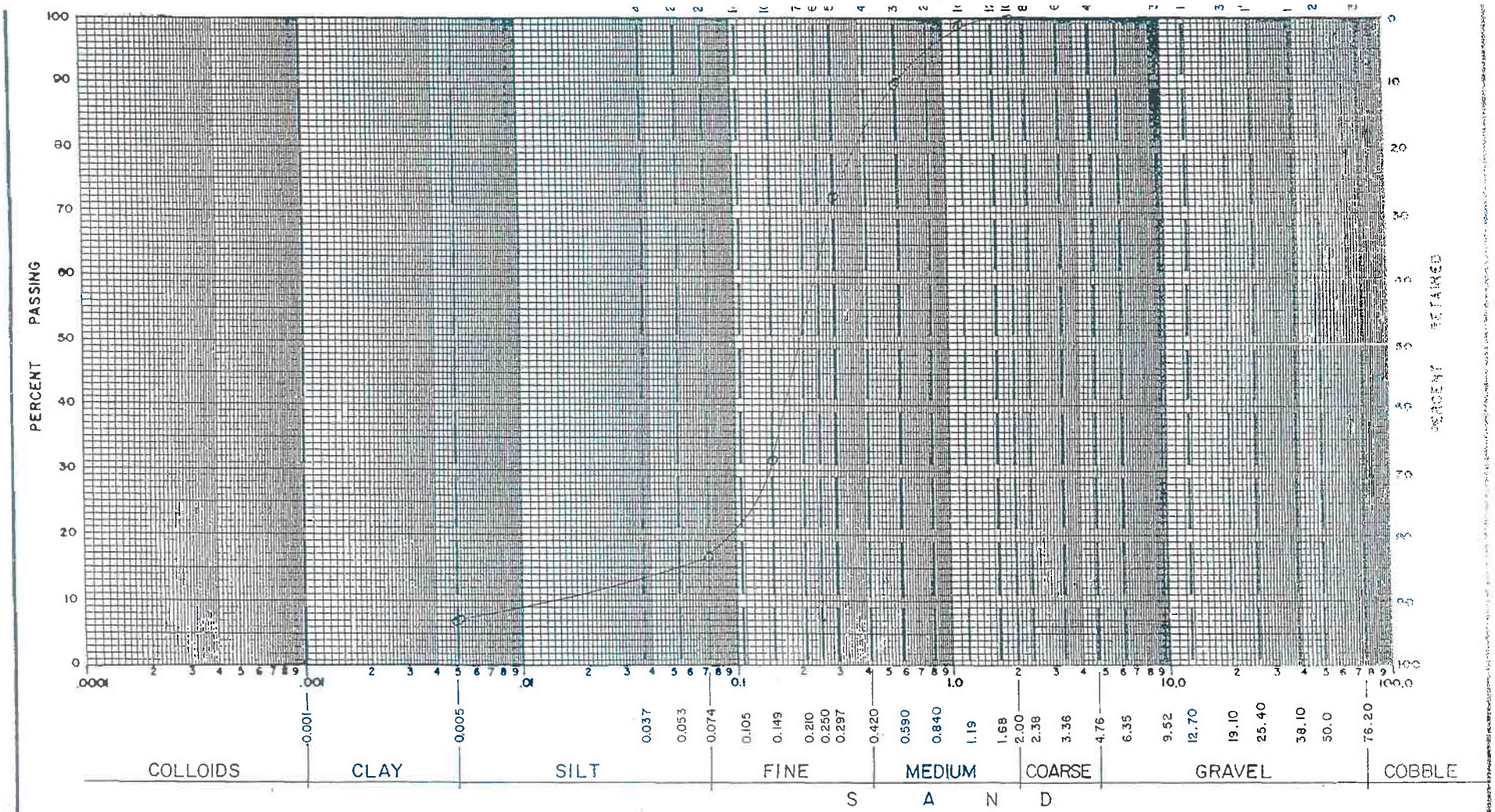

boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-20SE	26-27				18		

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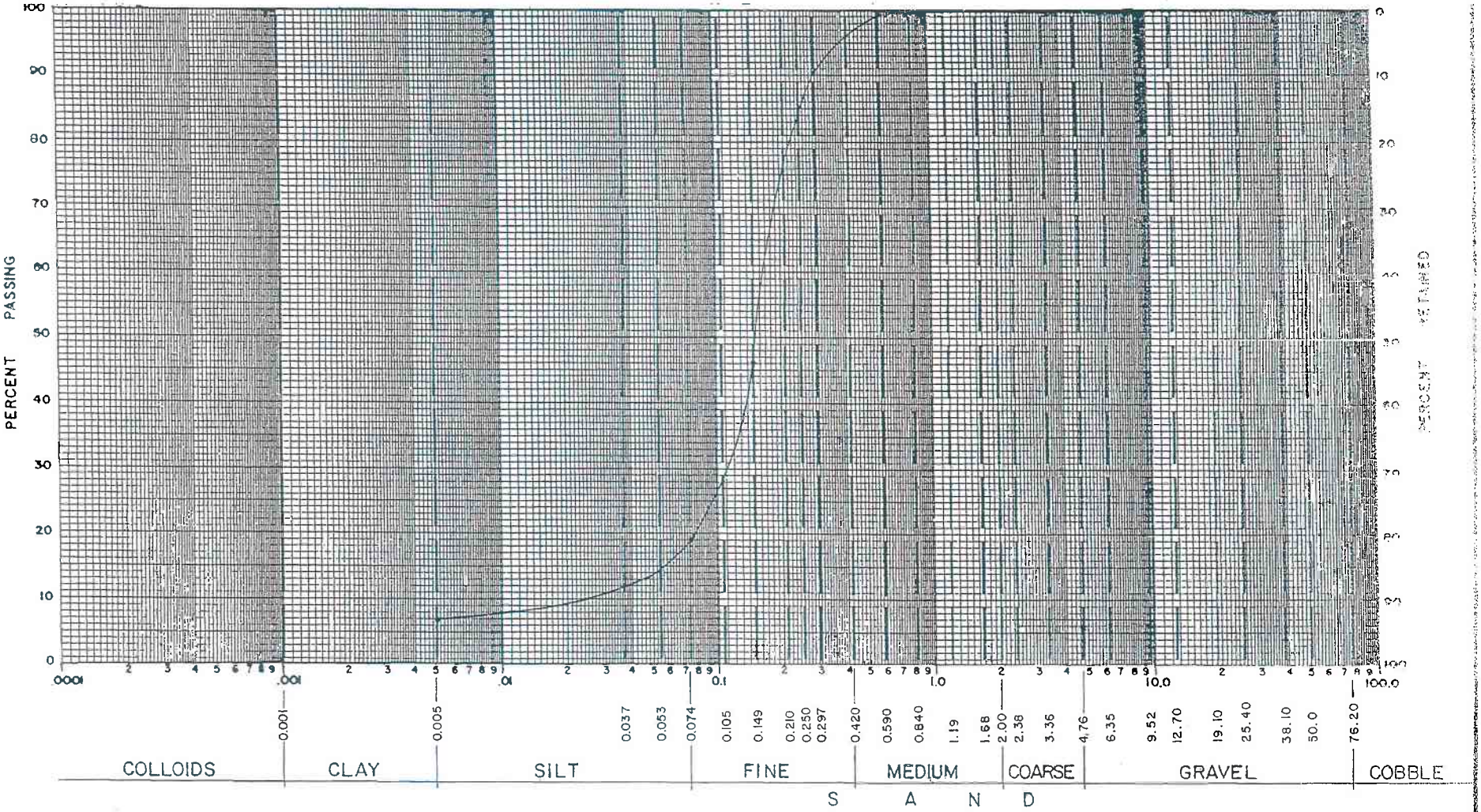
PLATE B-3



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-20SE	35'-36'				9		

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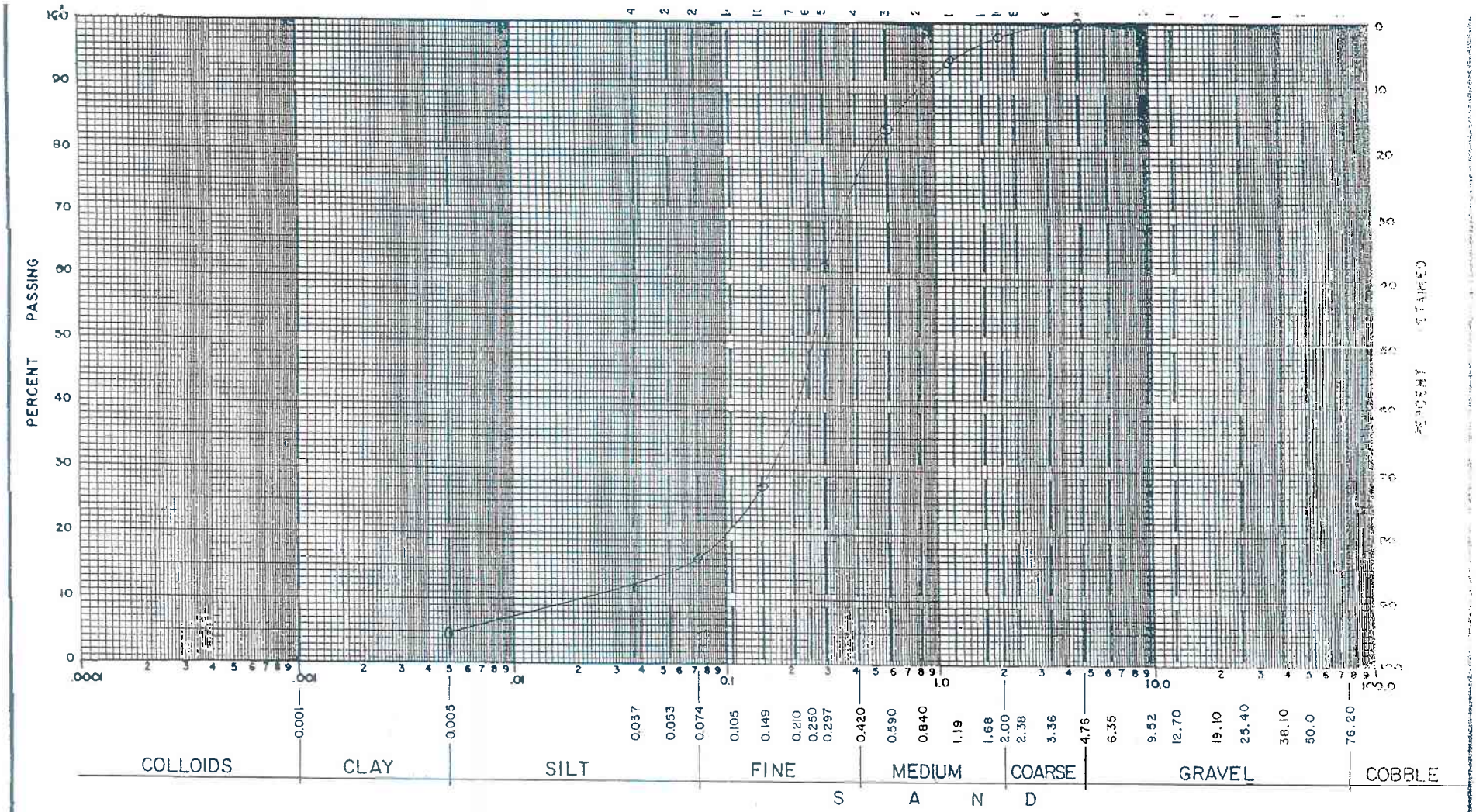
PLATE B-4



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-20SE	45-46'				25		

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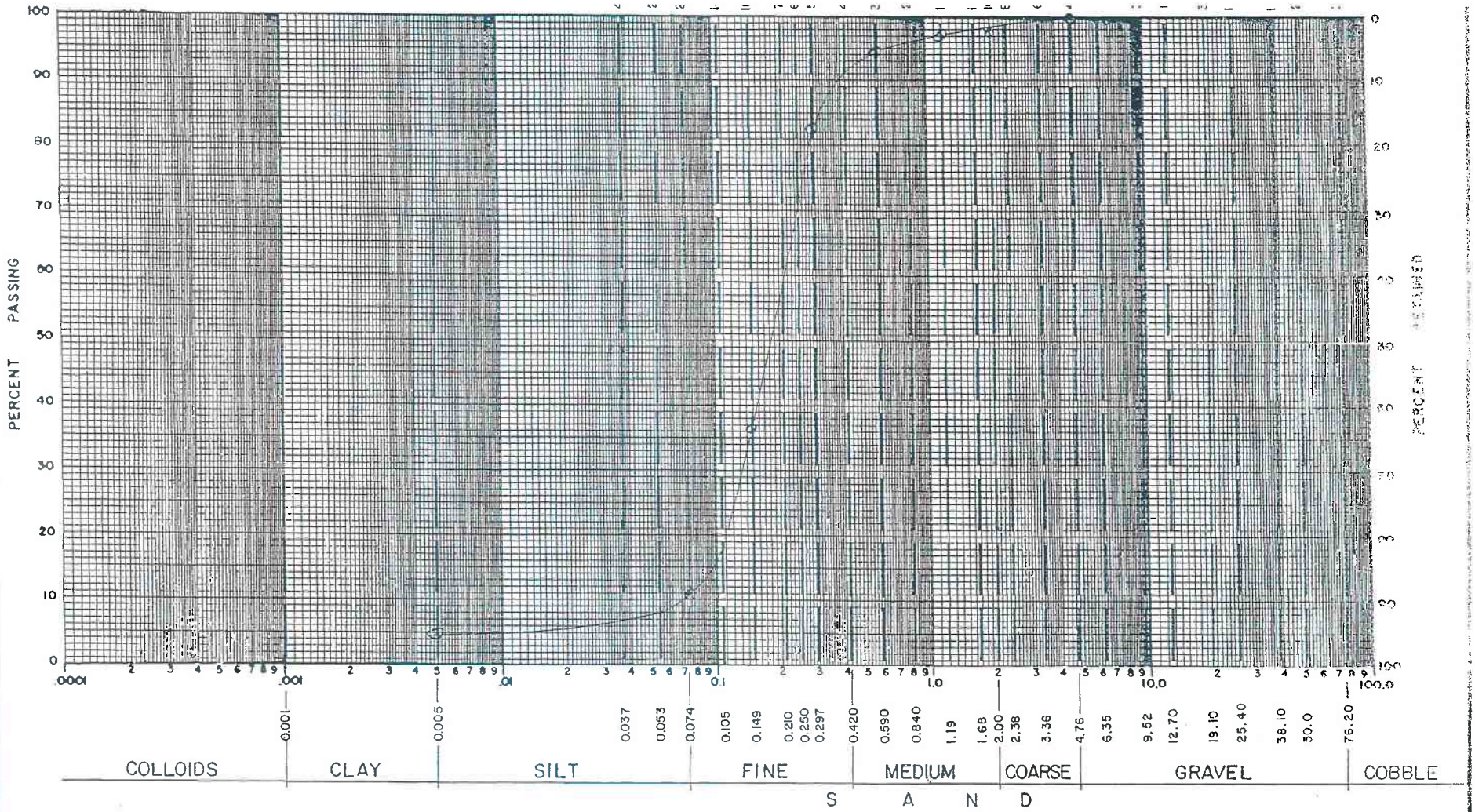
PLATE B-5



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-20SE	55-56				34		

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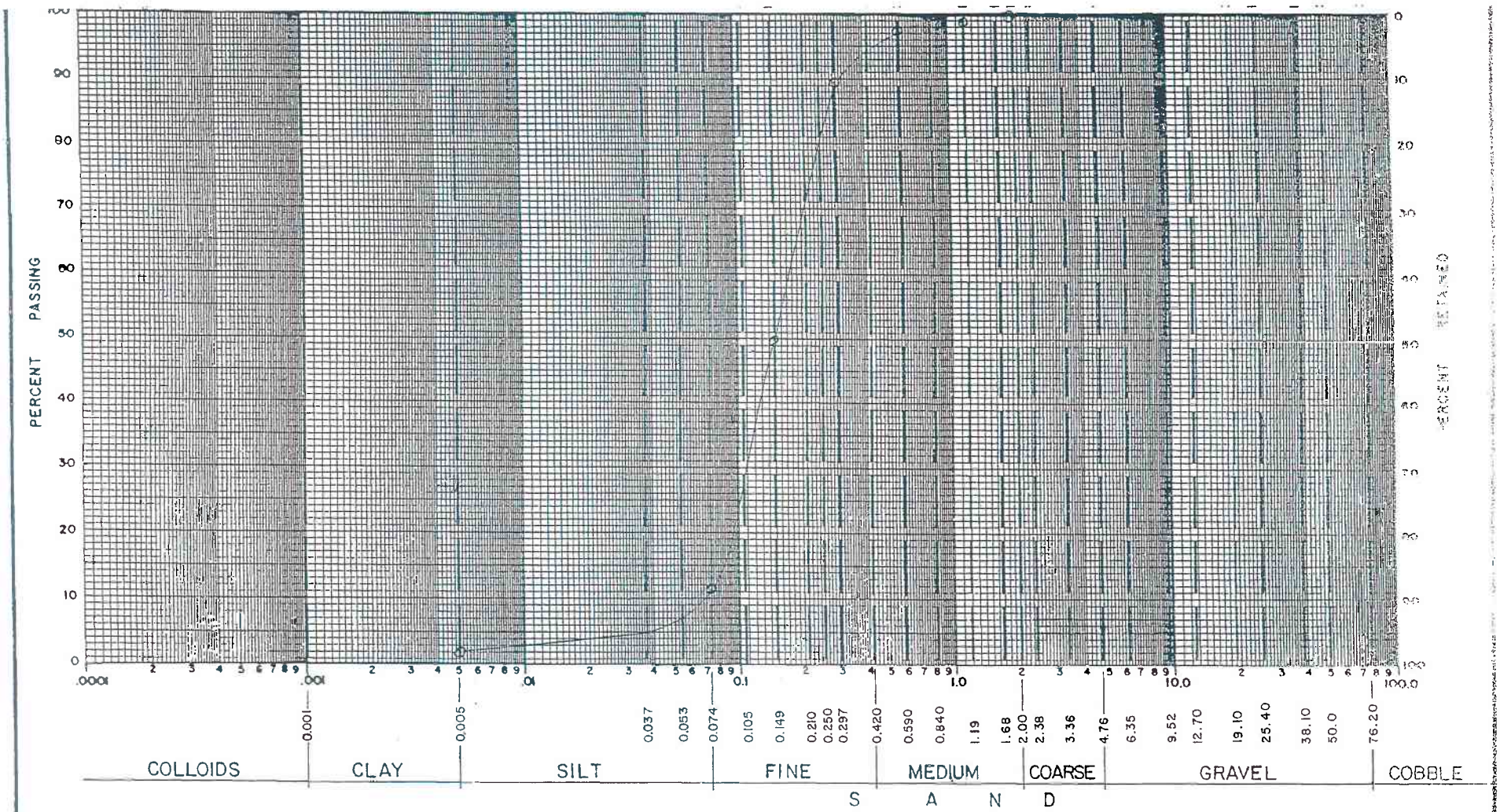
PLATE B-6



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-21 SE	5-6'				16		

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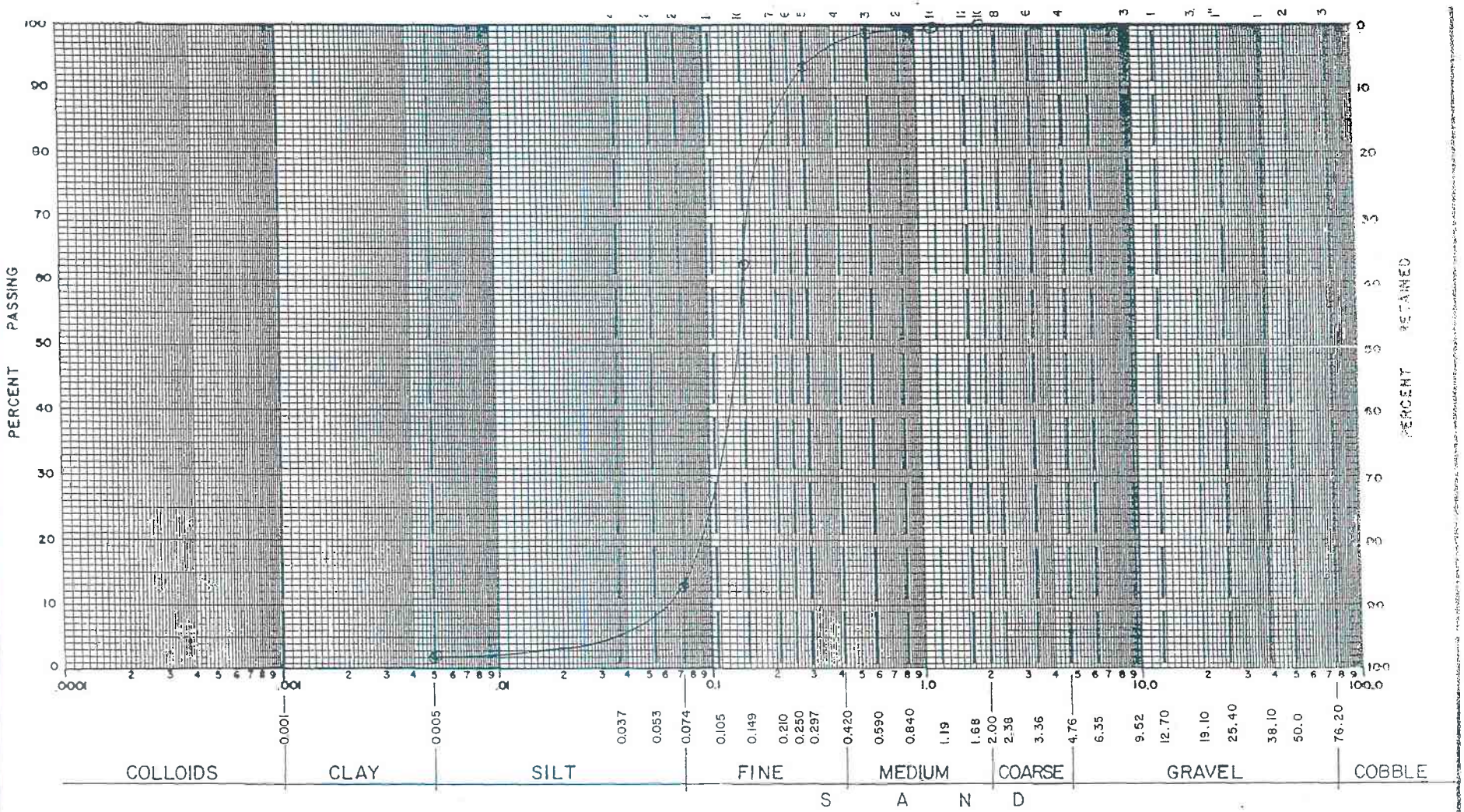
PLATE B-7



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-21 SE	15-16'				22		

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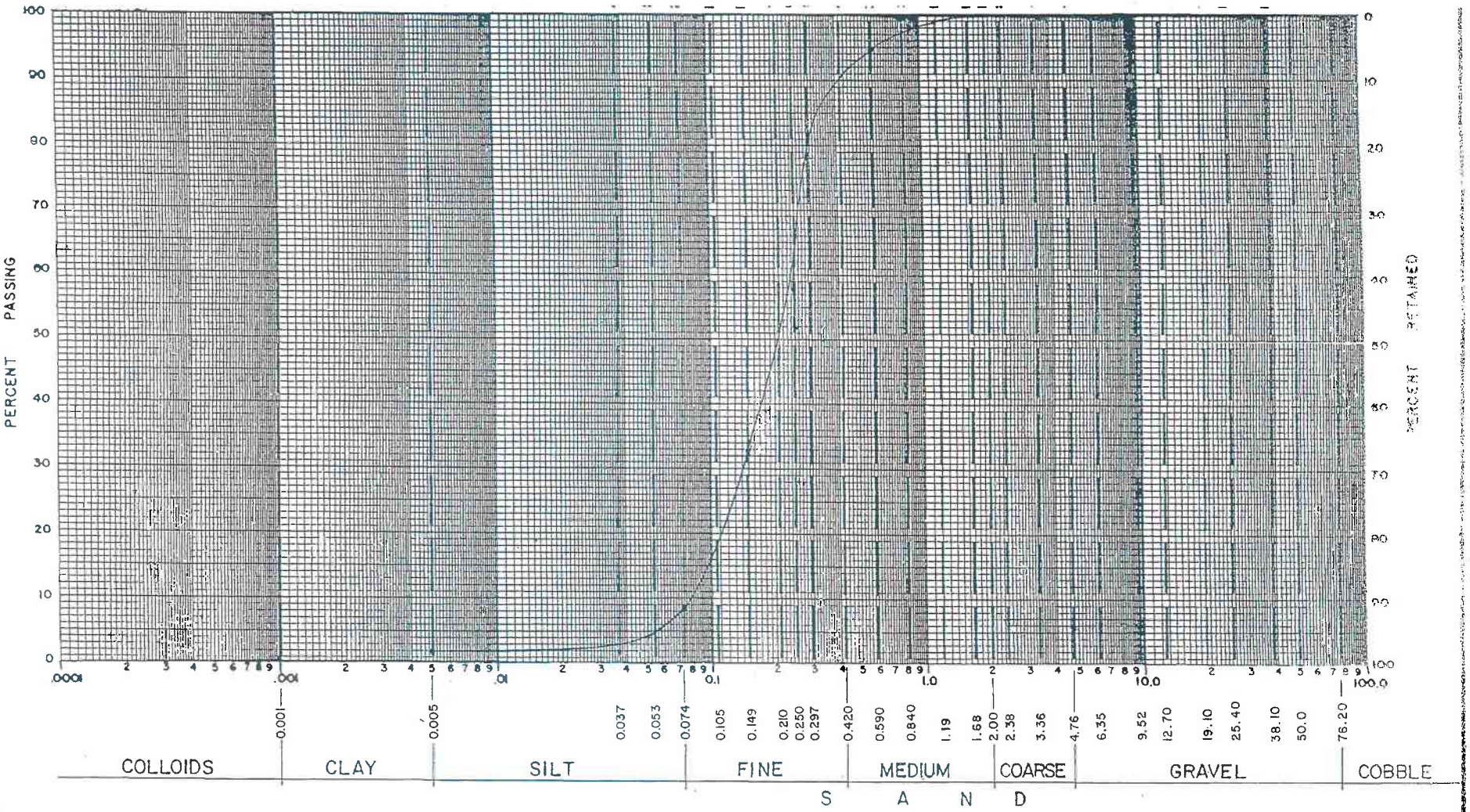

boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-21 SE	25'-26'				30		

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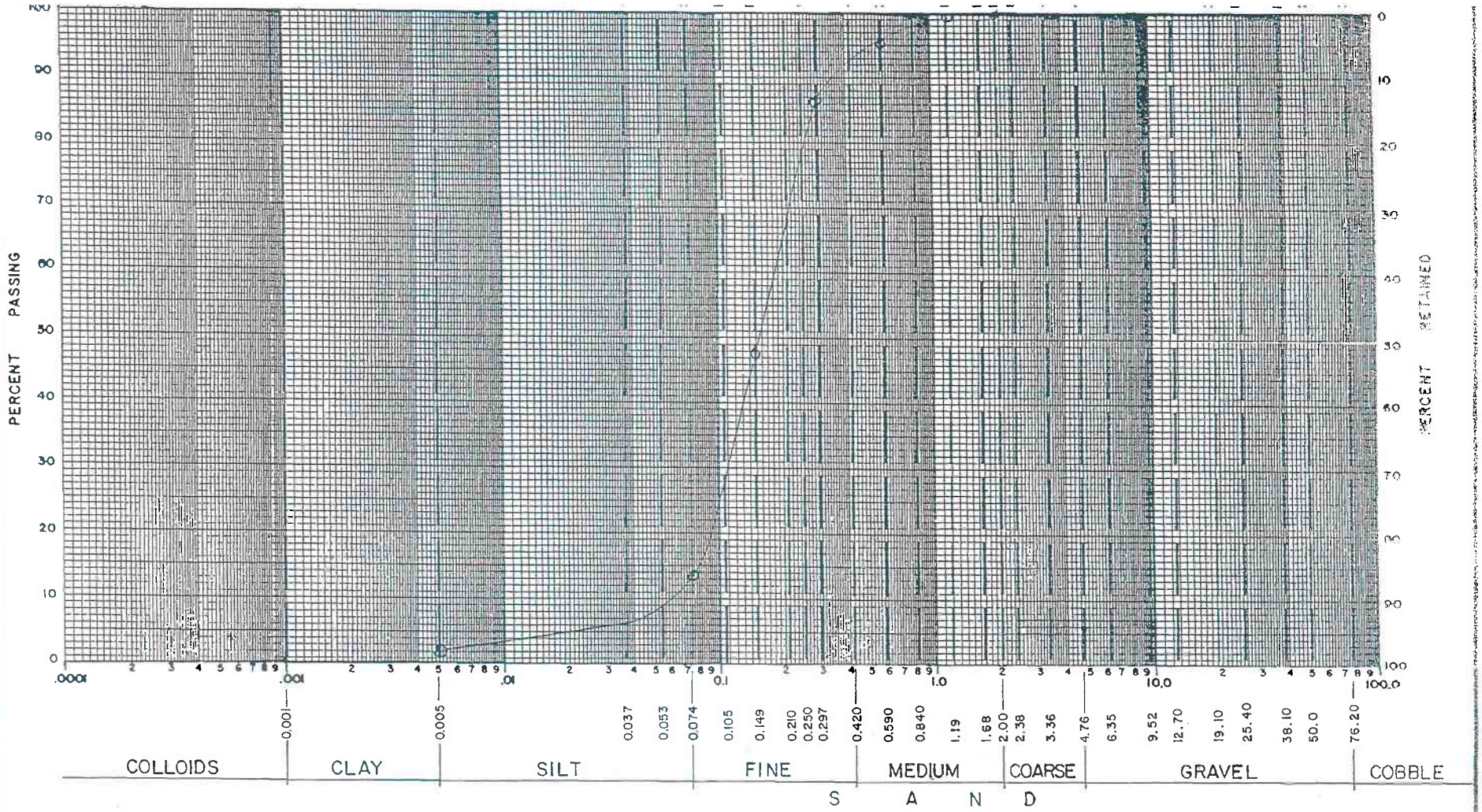
PLATE B-9



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-21 SE	35-36				23		

GRAIN SIZE DISTRIBUTION

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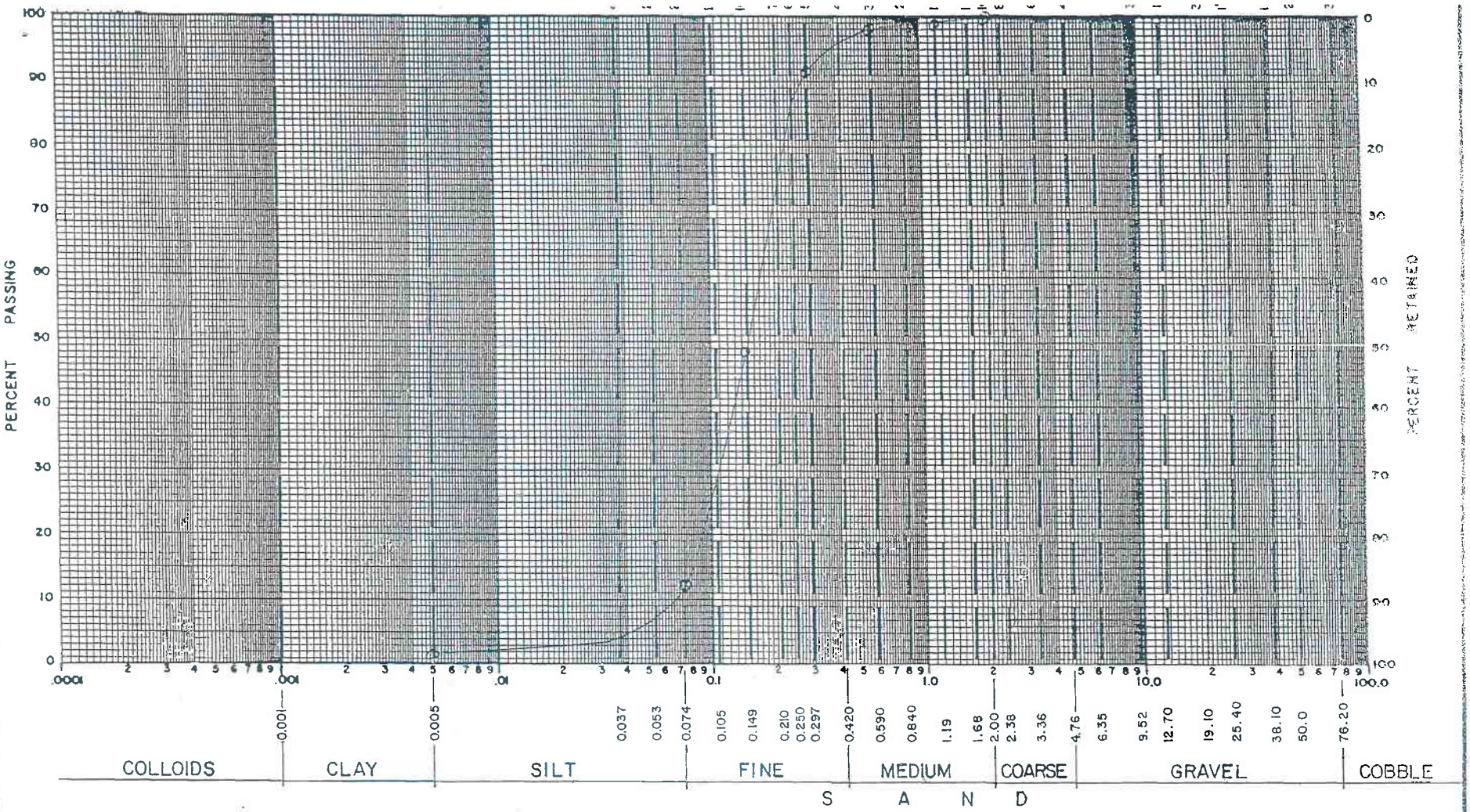
PLATE B-10



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-21SE	45-46'				23		

GRAIN SIZE DISTRIBUTION

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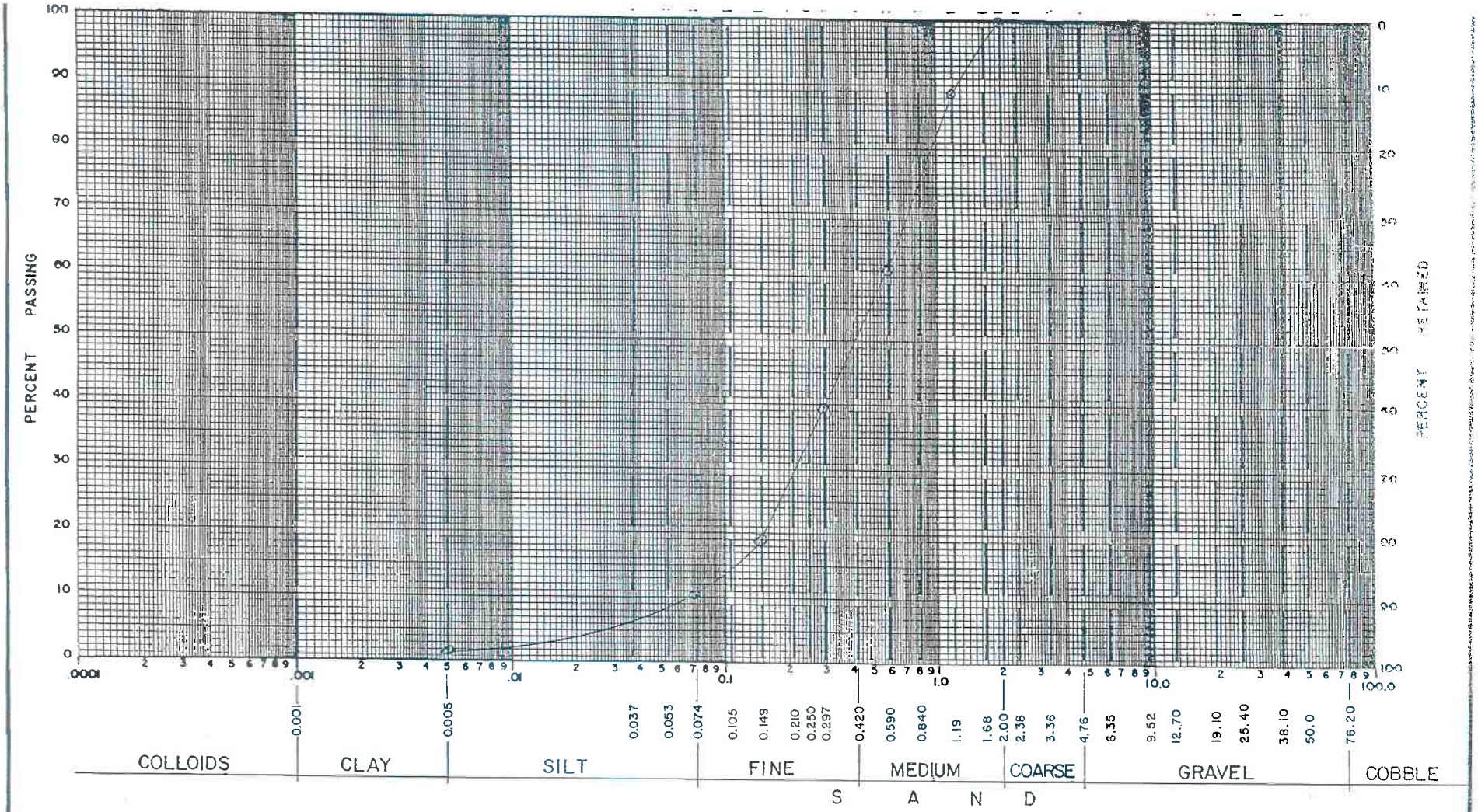
PLATE B-11



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-21SE	55-56'				25		

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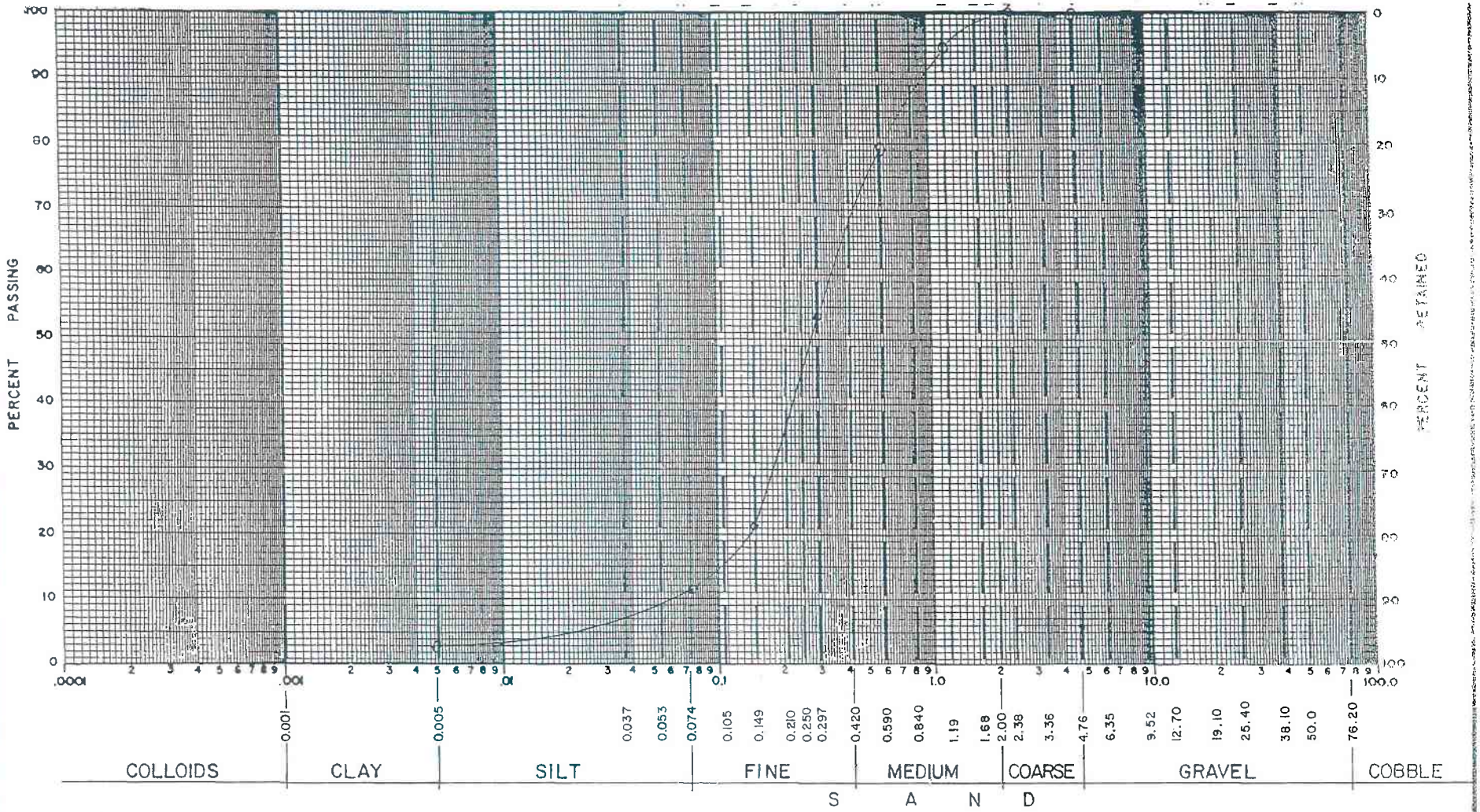
PLATE B-12



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22SE	5-6'				33		

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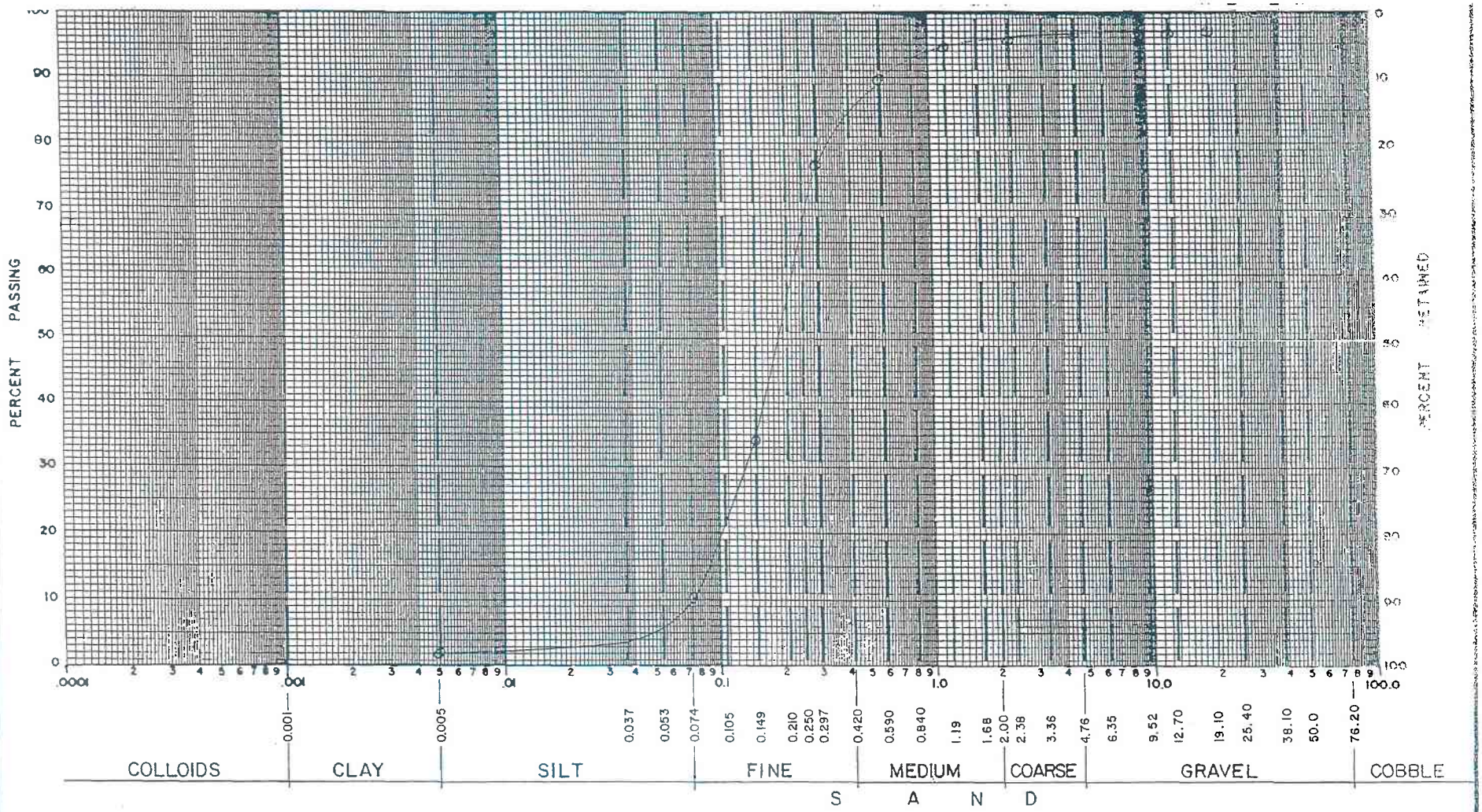
PLATE B-13



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22SE	15-16				24		

GRAIN SIZE DISTRIBUTION

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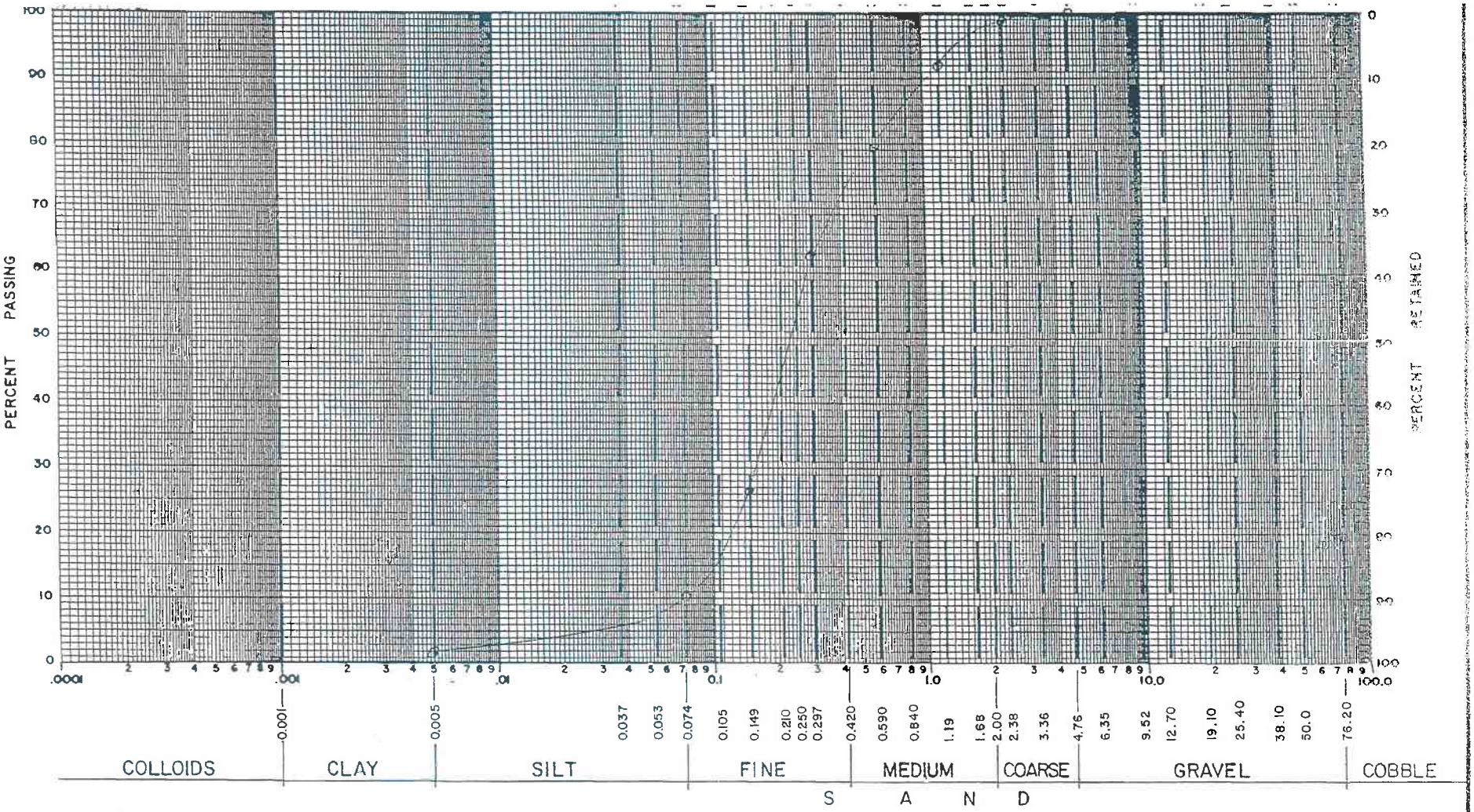
PLATE B-14



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22SE	25-26'				29		

GRAIN SIZE DISTRIBUTION

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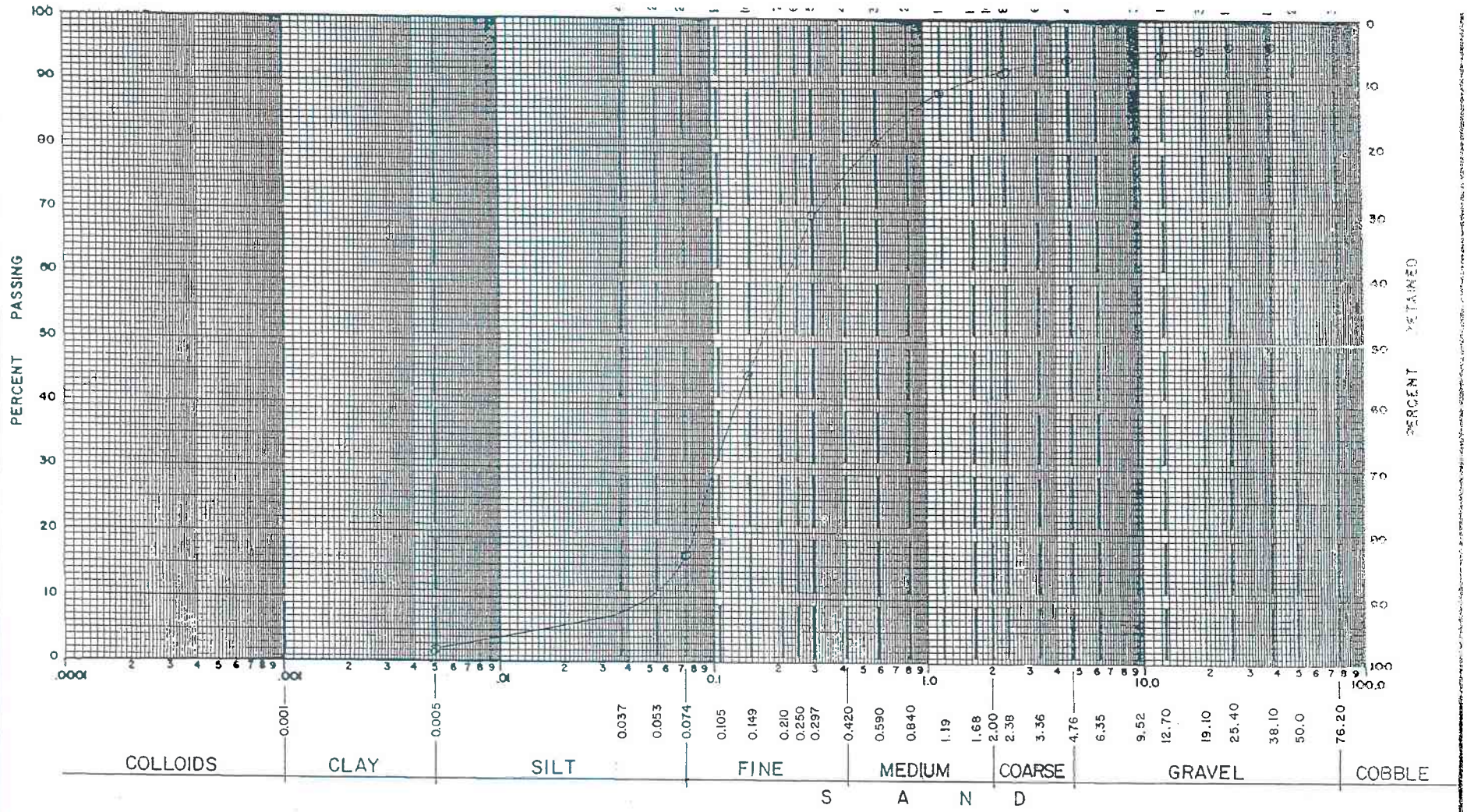
PLATE B-15



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22SE	35-36'				18		

GRAIN SIZE DISTRIBUTION

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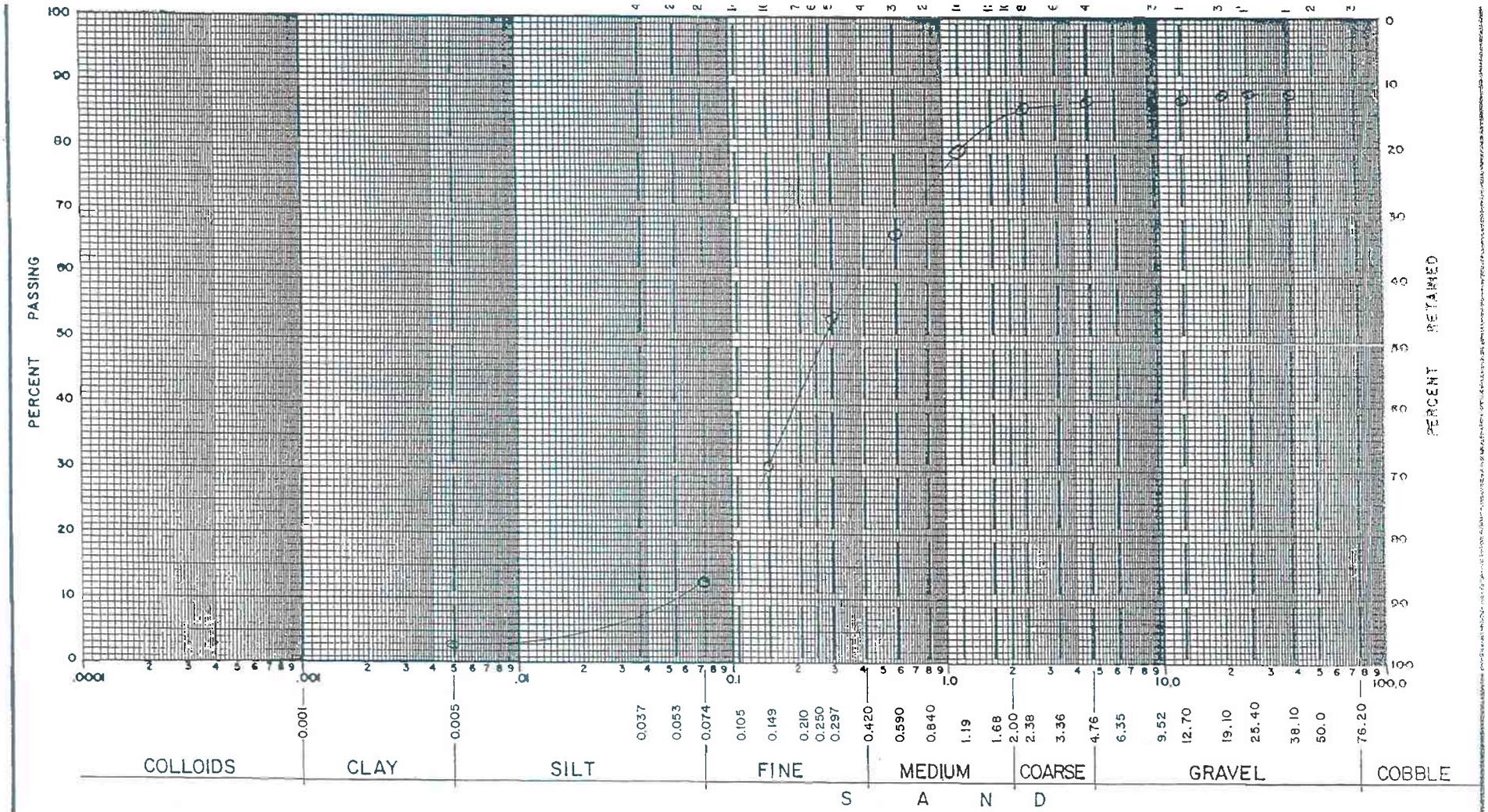
PLATE B-16



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22SE	45-46				24		

GRAIN SIZE DISTRIBUTION

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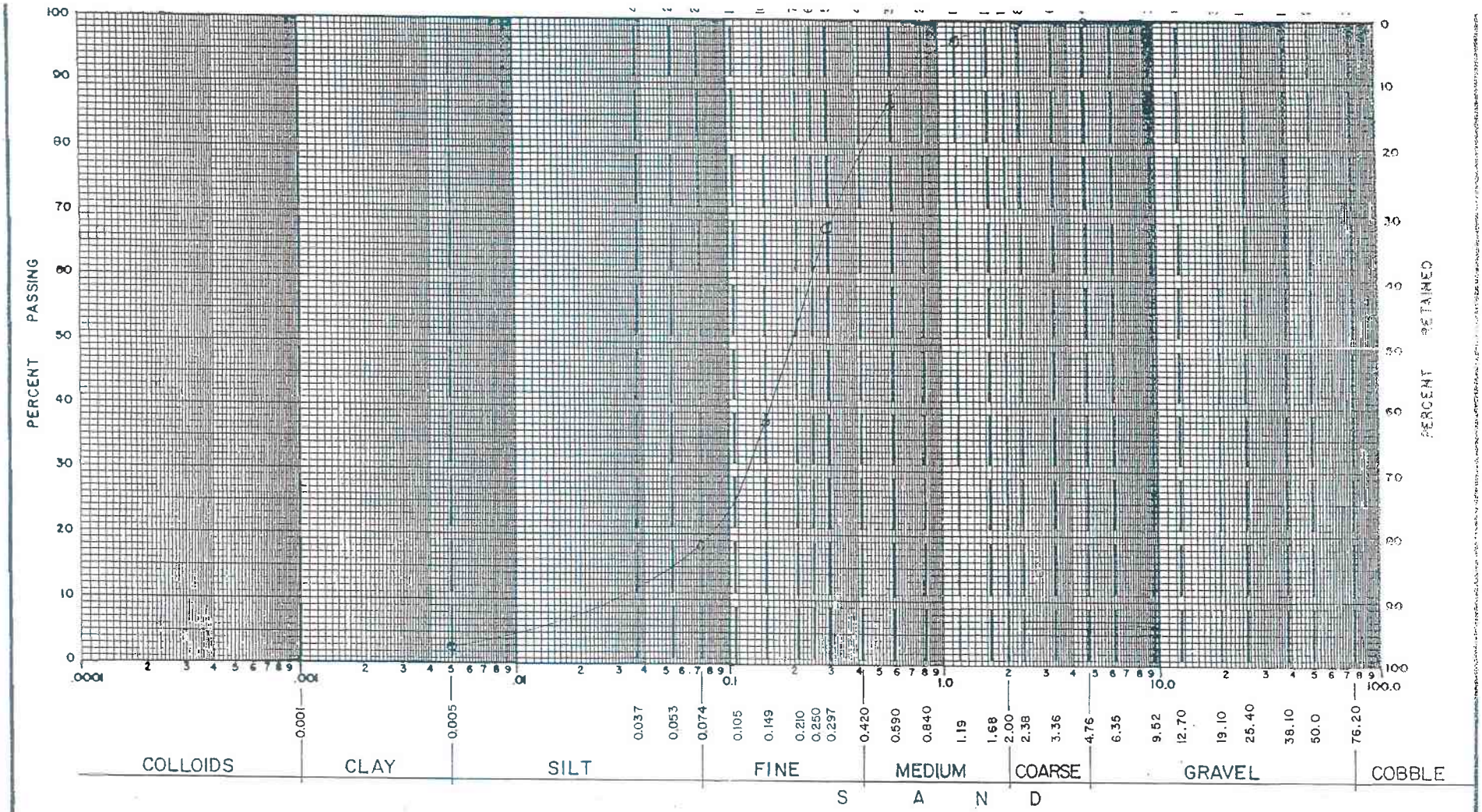
W.O. 101675SE DATE 11-14-89

PLATE B-17



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22SE	55-56				19		

GRAIN SIZE DISTRIBUTION

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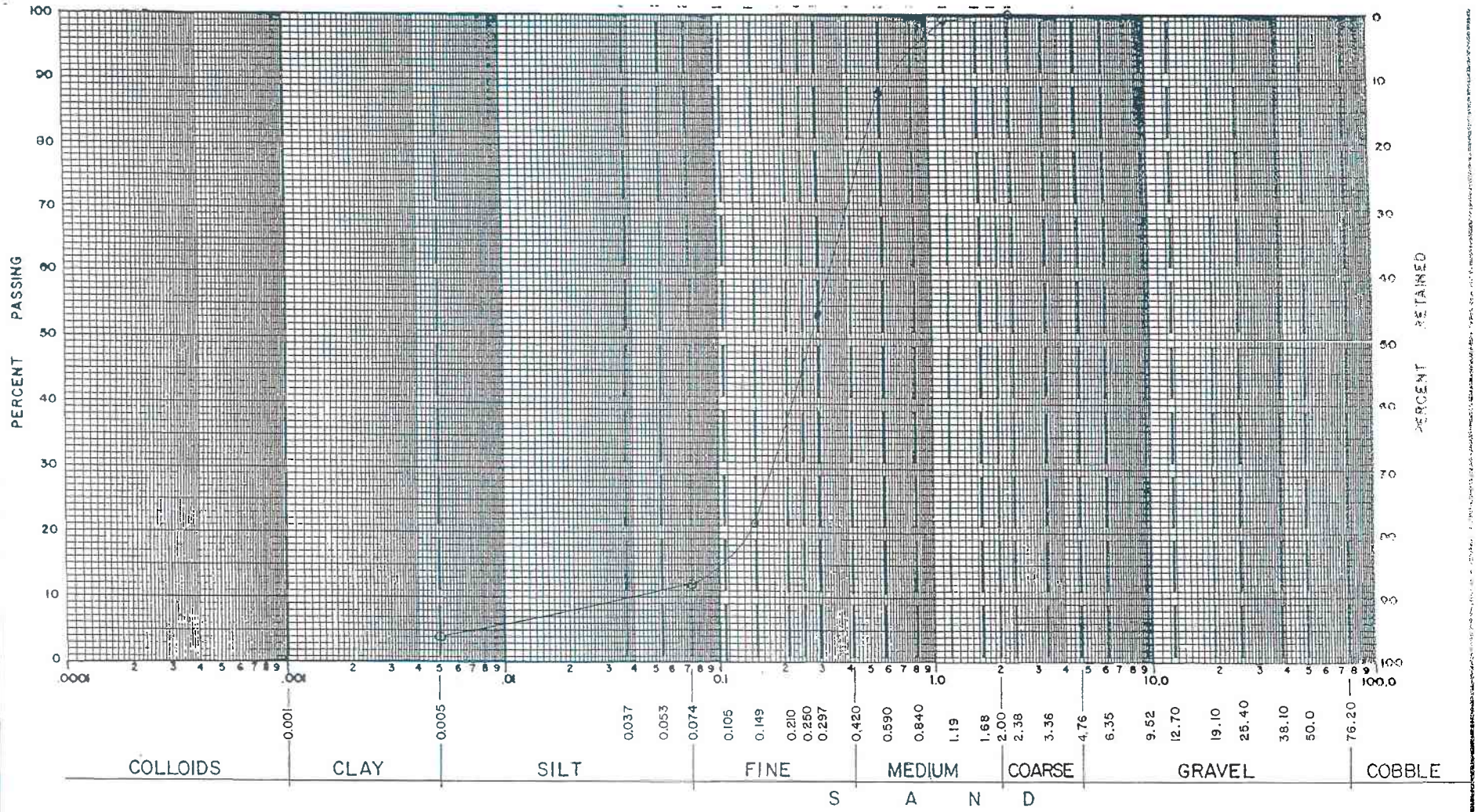
W.O. 101675SE DATE 11-14-89

PLATE B-18



boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-22 SE	65-66				28		

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
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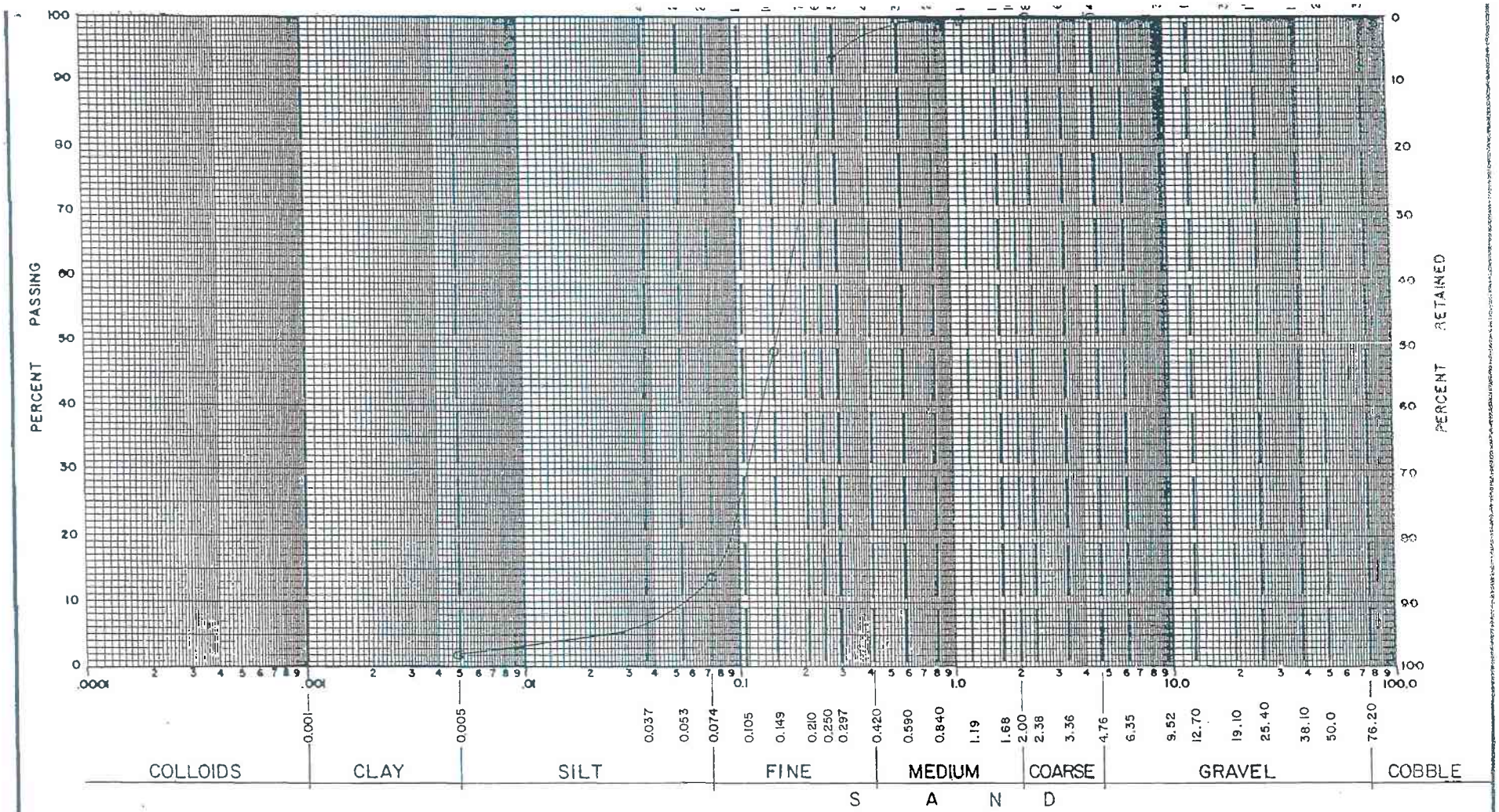
PLATE B-19



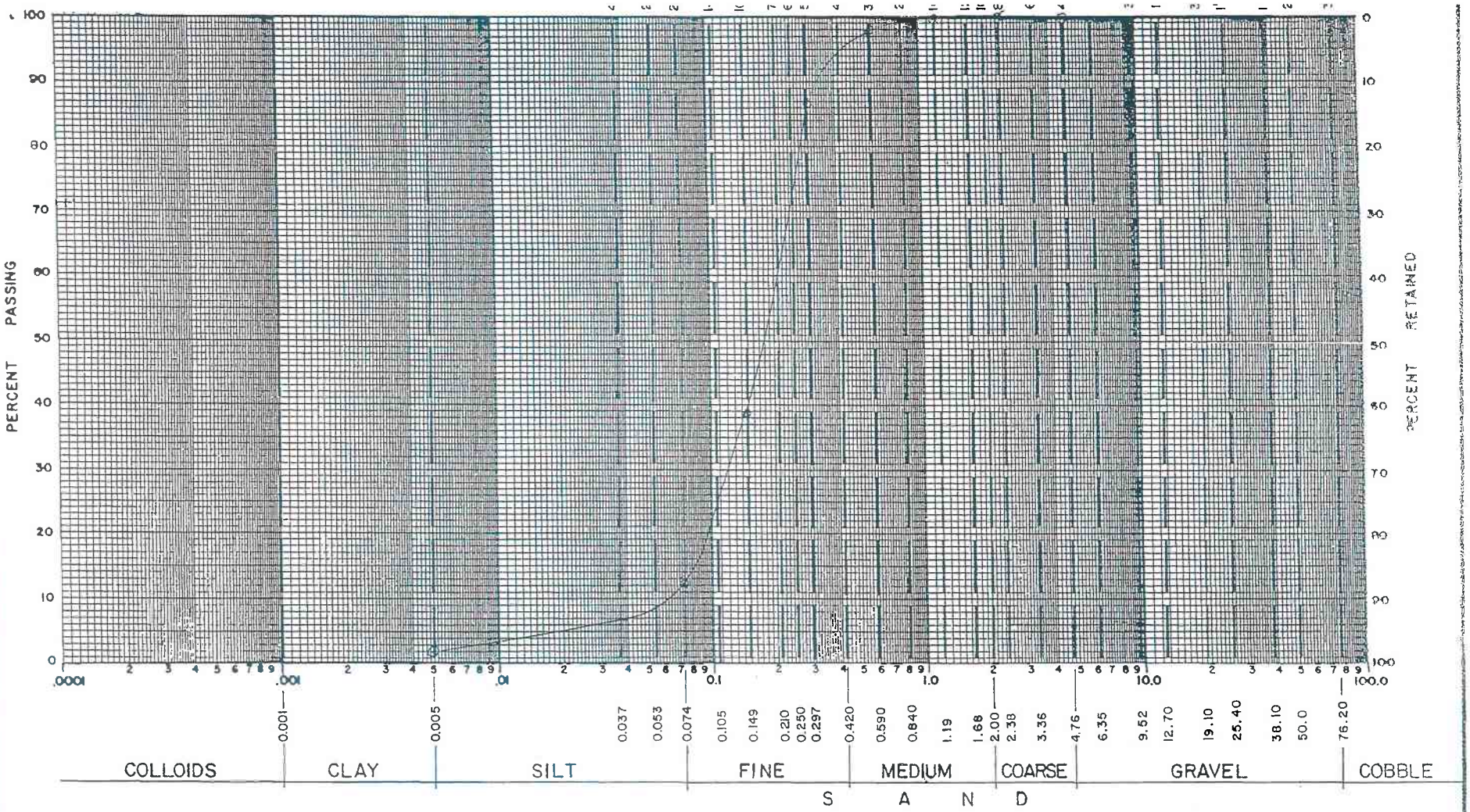
boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-235E	5-6'				22		

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714) 863-9118

W.O. 101675SE DATE

PLATE B-20

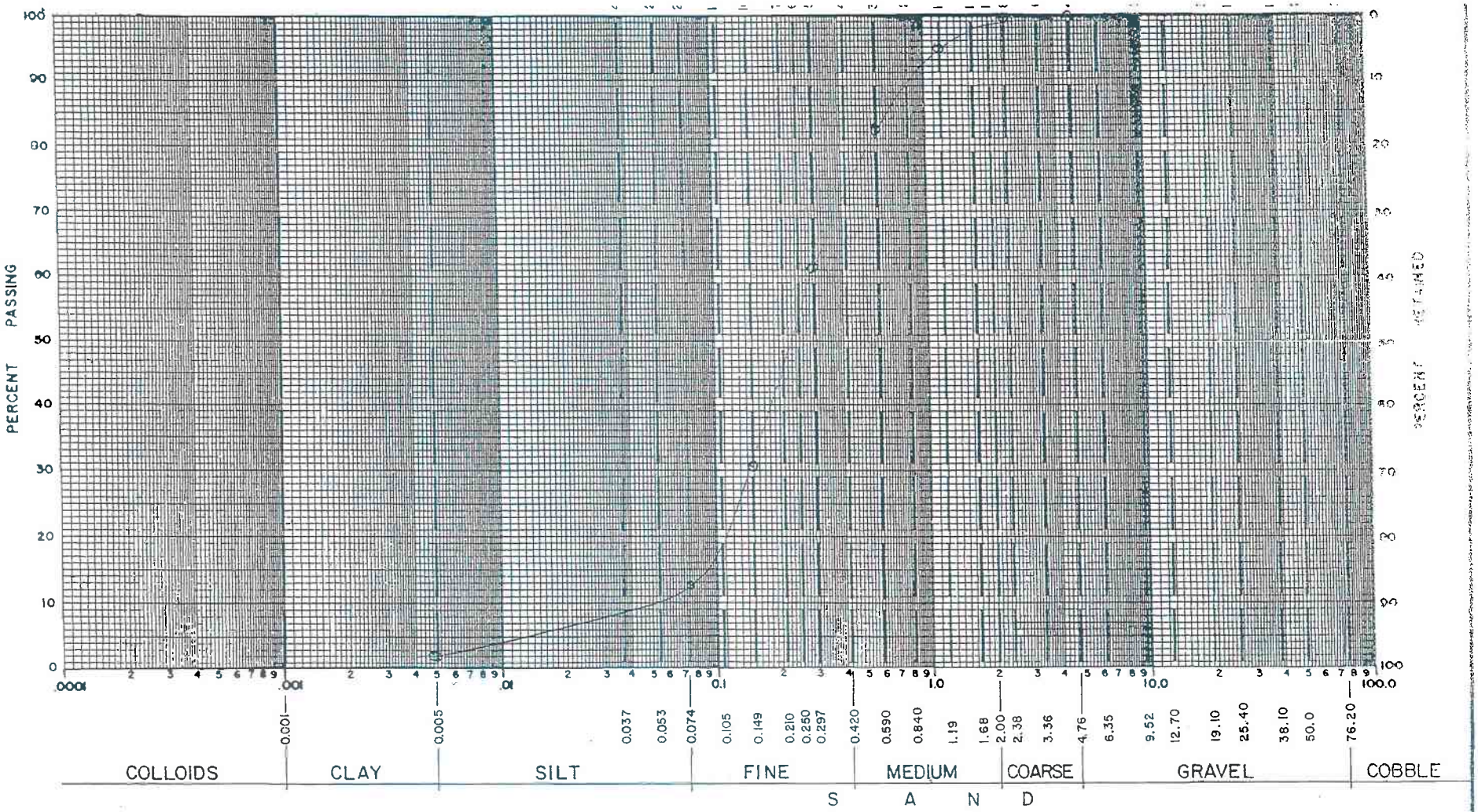


boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-23-SE	15-16				24		

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714) 863-9118
W.O. 101675 SE **DATE** 11-14-89

PLATE B-21



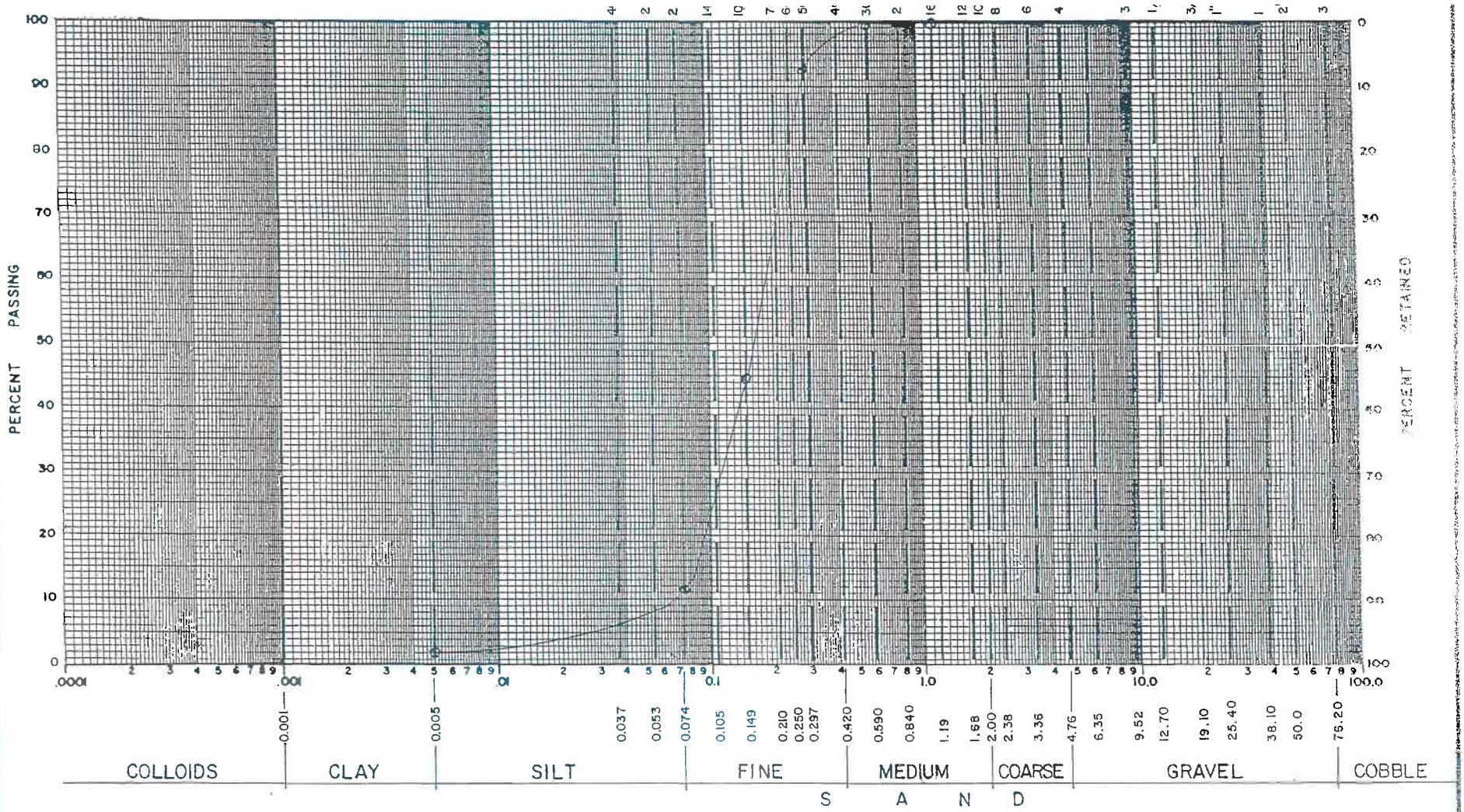
boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-23 SE	25-26				33		

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714) 863-9118

W.O. 101675 SE DATE 11-14-85

PLATE B-22

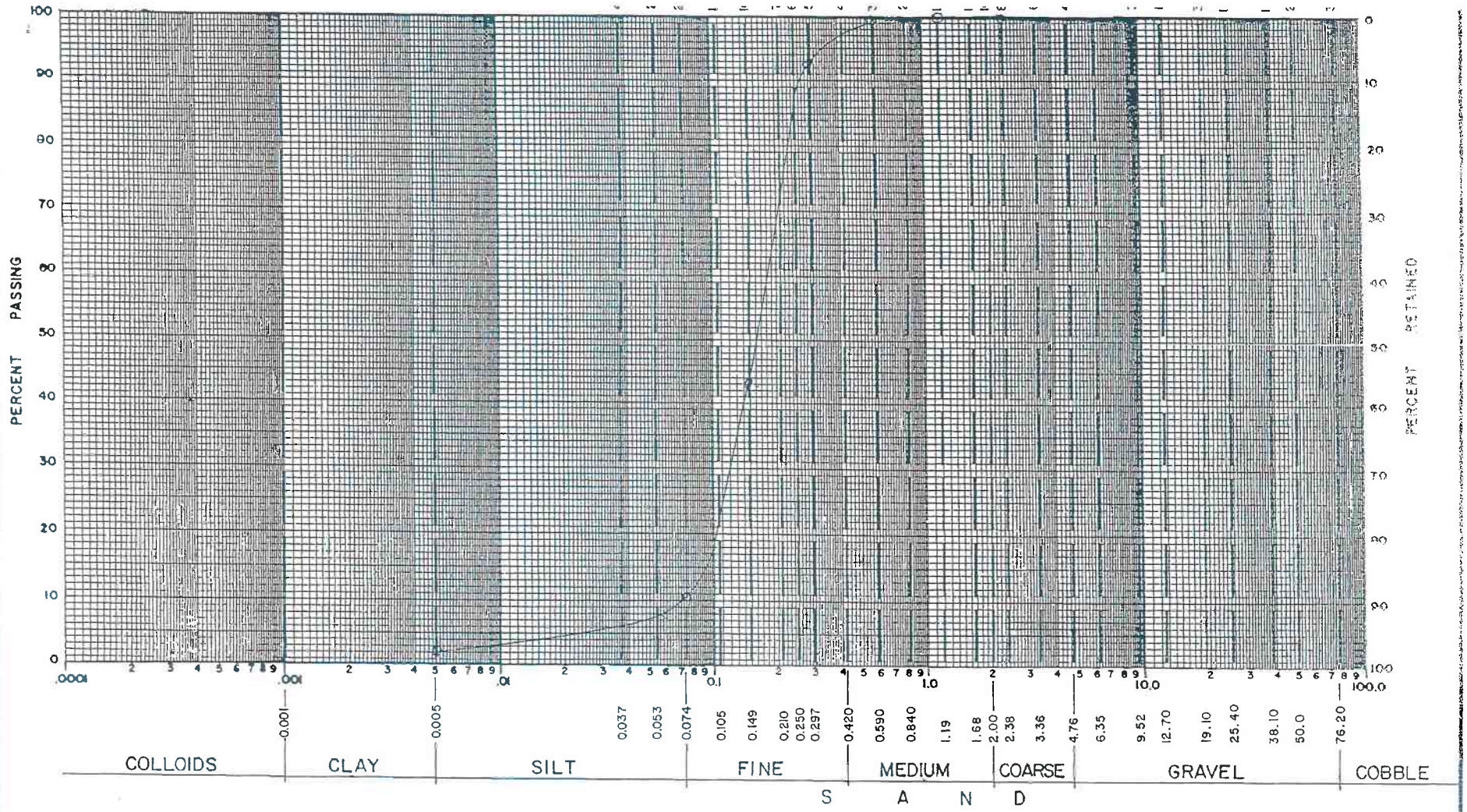


boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-23SE	35-36'				27		

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714) 863-9118
W.O. 101675 SE DATE 11-14-89

PLATE B-23



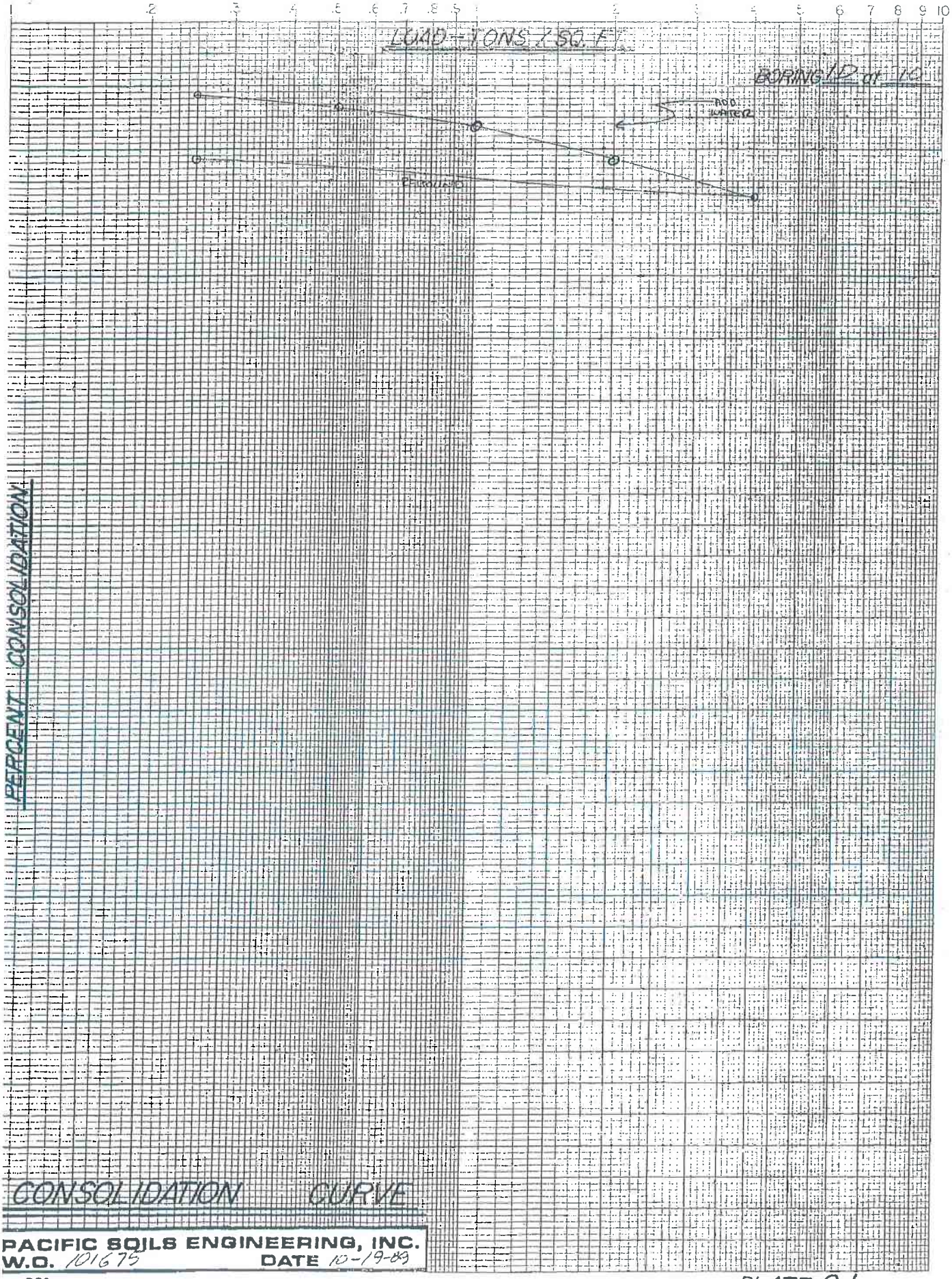
boring or trench	depth (ft.)	L.L.	P.L.	P.I.	S.E.	group symbol	typical names
B-23SE	45-46'				28		

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714) 863-9118

W.O. 101675SE DATE 11-19-89

PLATE B-24

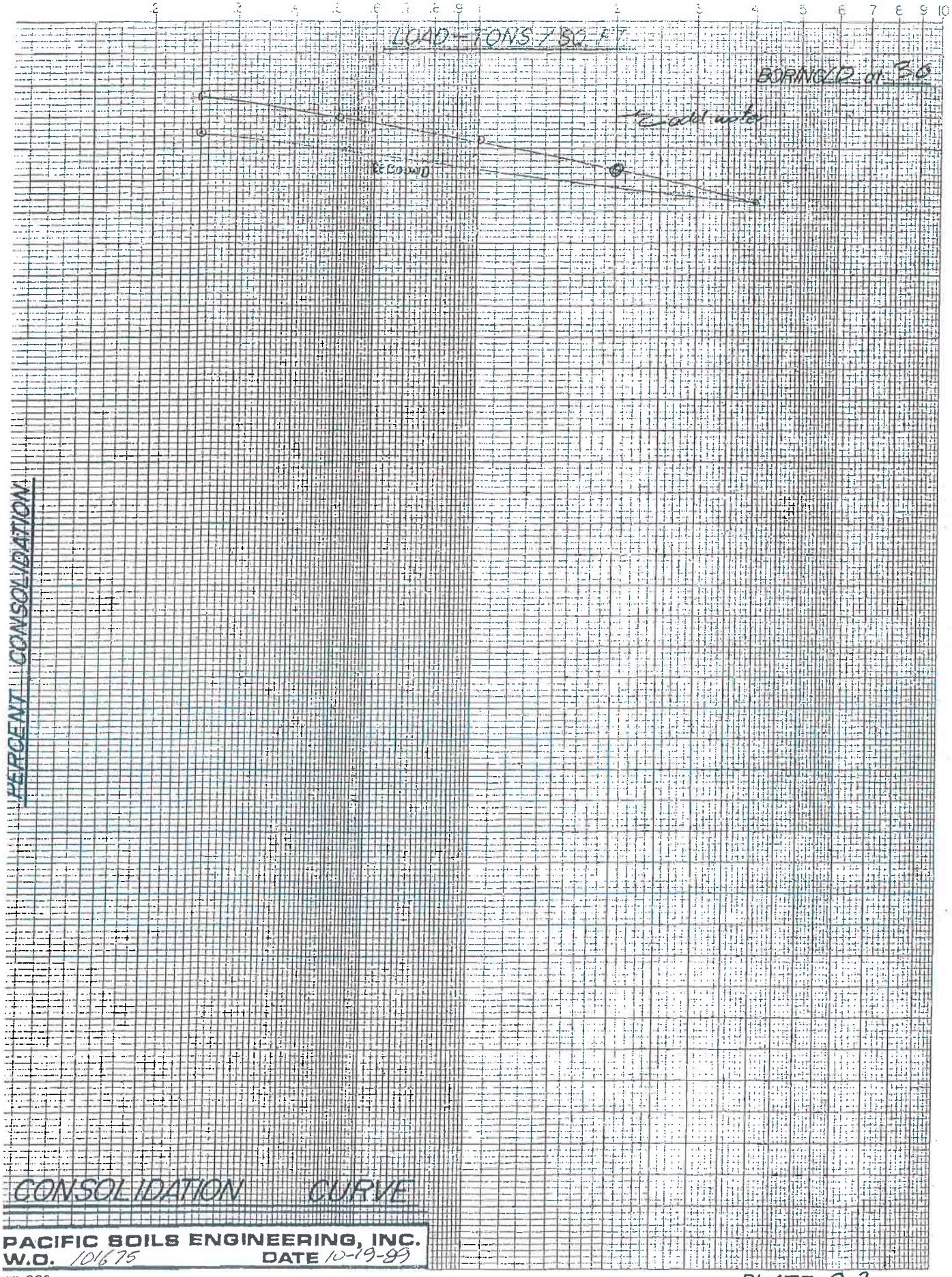


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 **DATE** 10-19-89

rm CC2

PLATE C-1

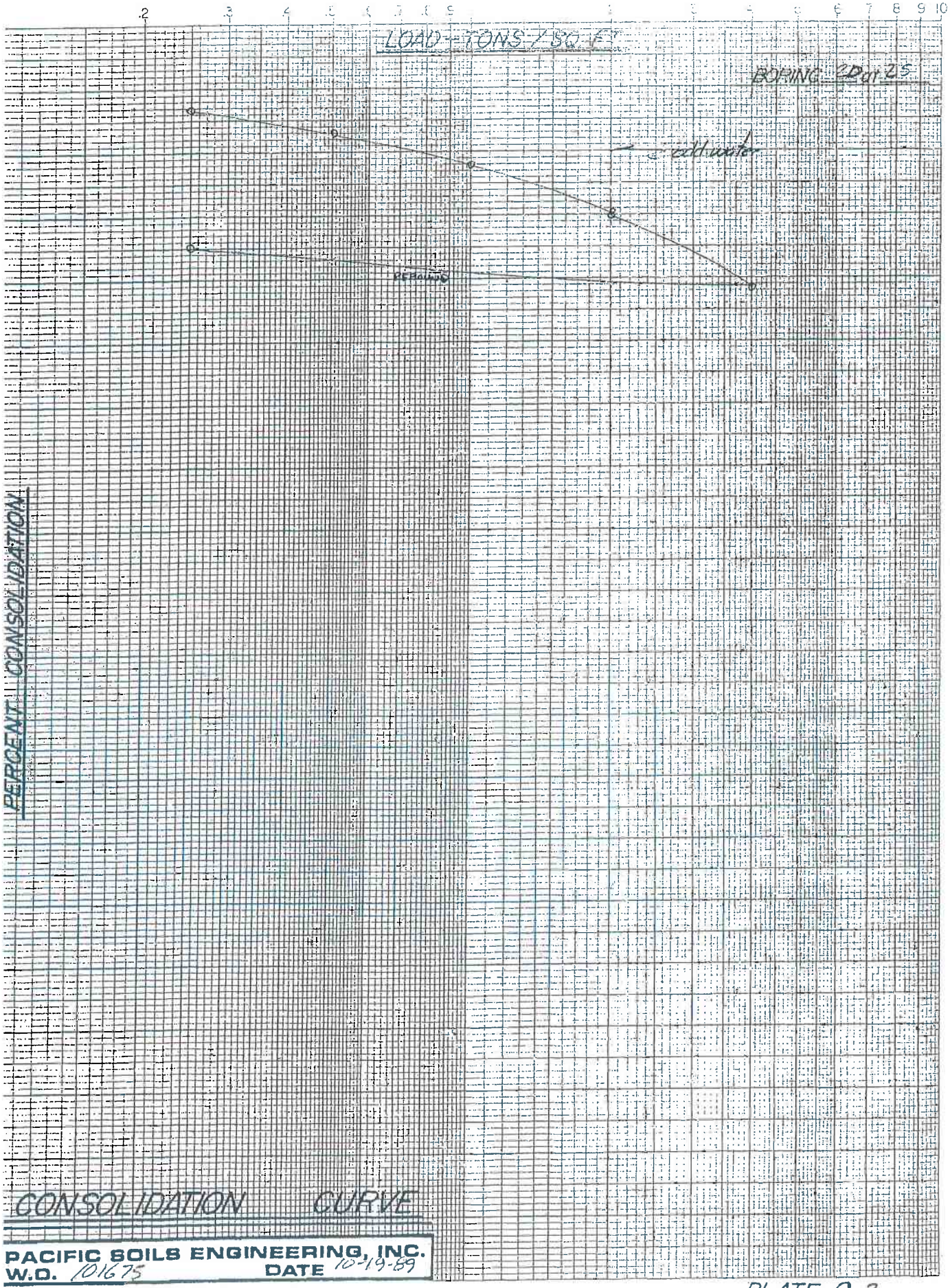


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10-19-99

rm CC2

PLATE C-2

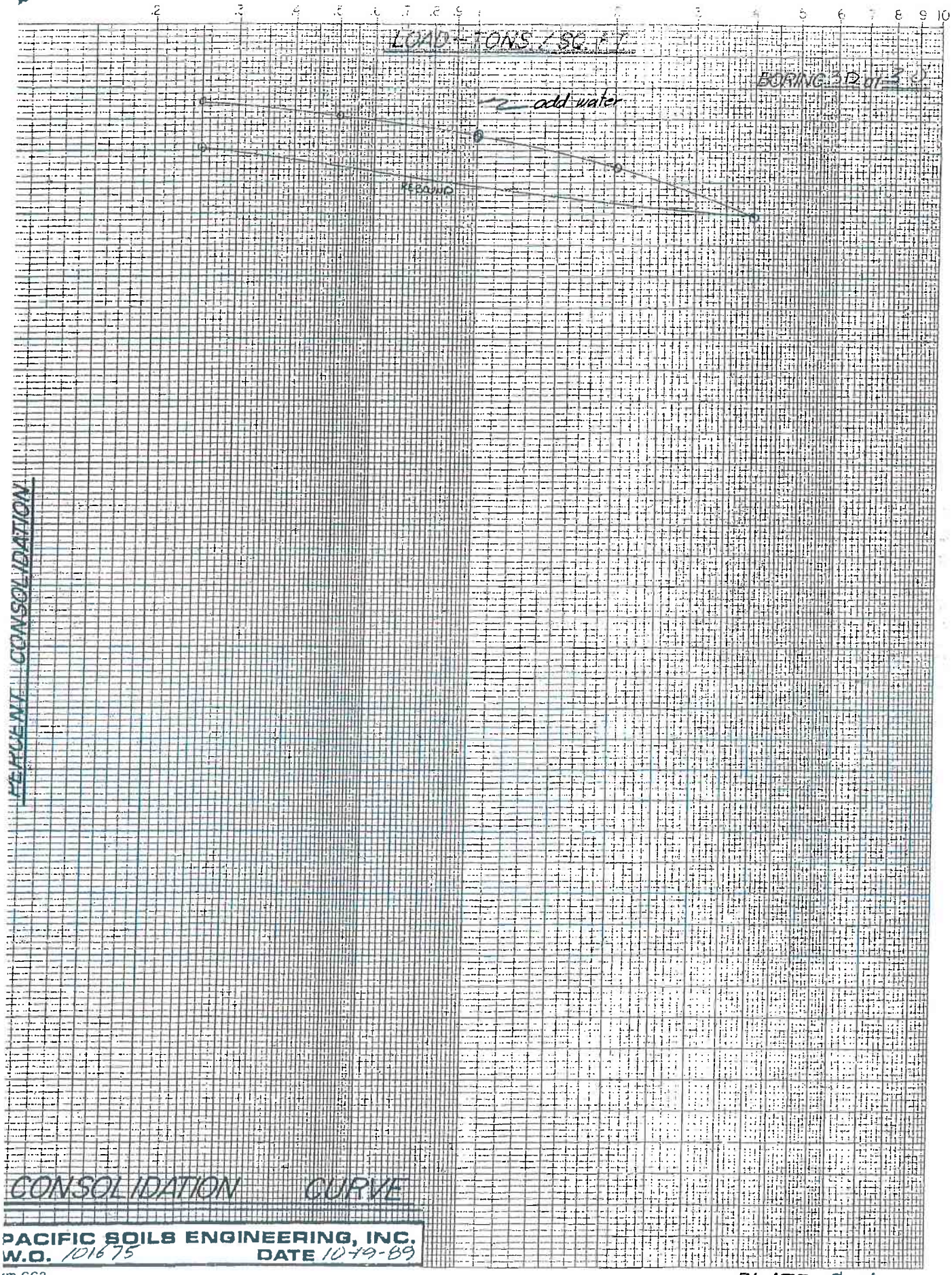


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10-19-89

orm CC2

PLATE C-3

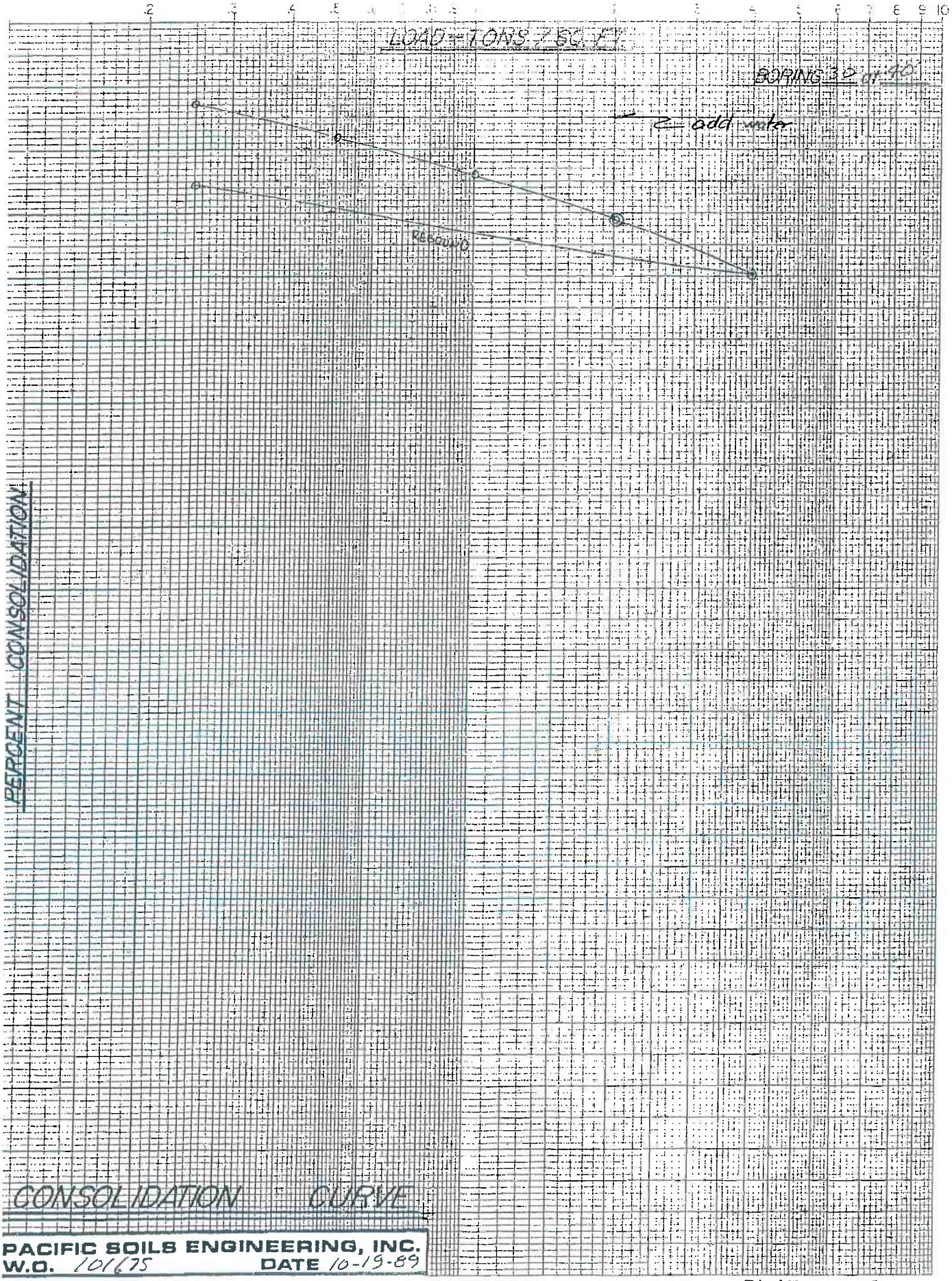


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10-19-89

rm CC2

PLATE C-4



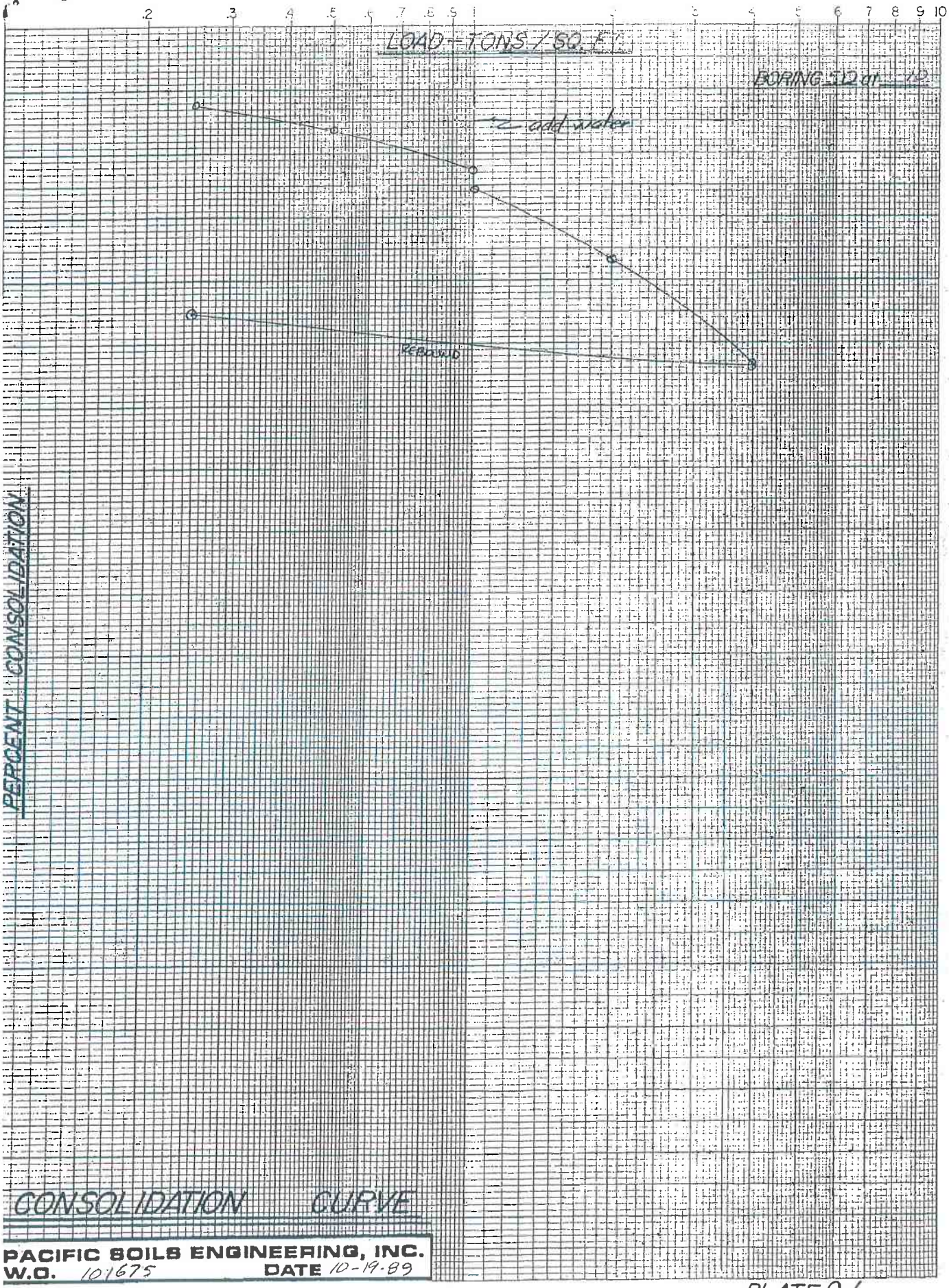
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 **DATE** 10-19-89

rm CC2

PLATE C-5

#6

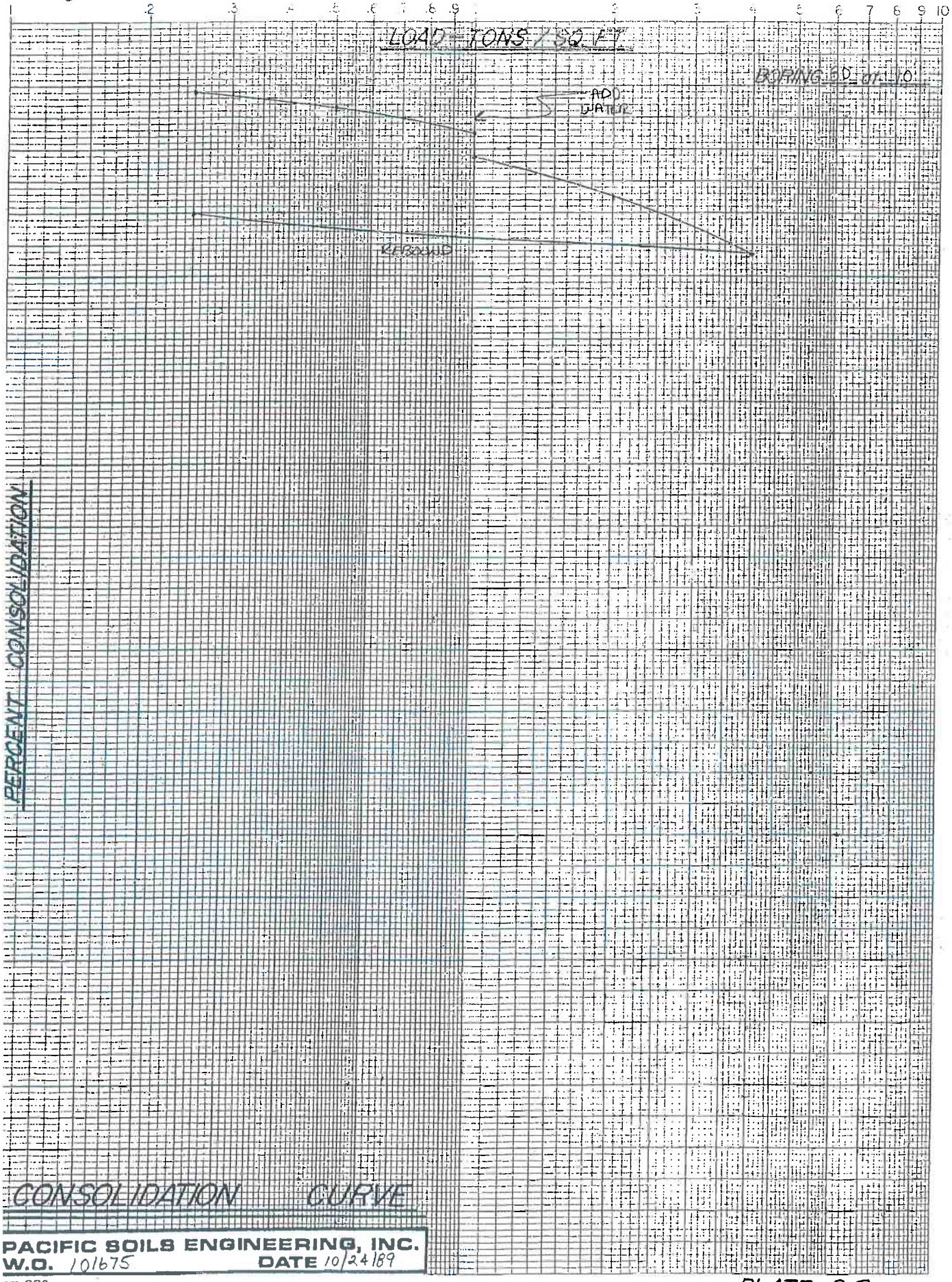


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10-19-89

rm CC2

PLATE C-6

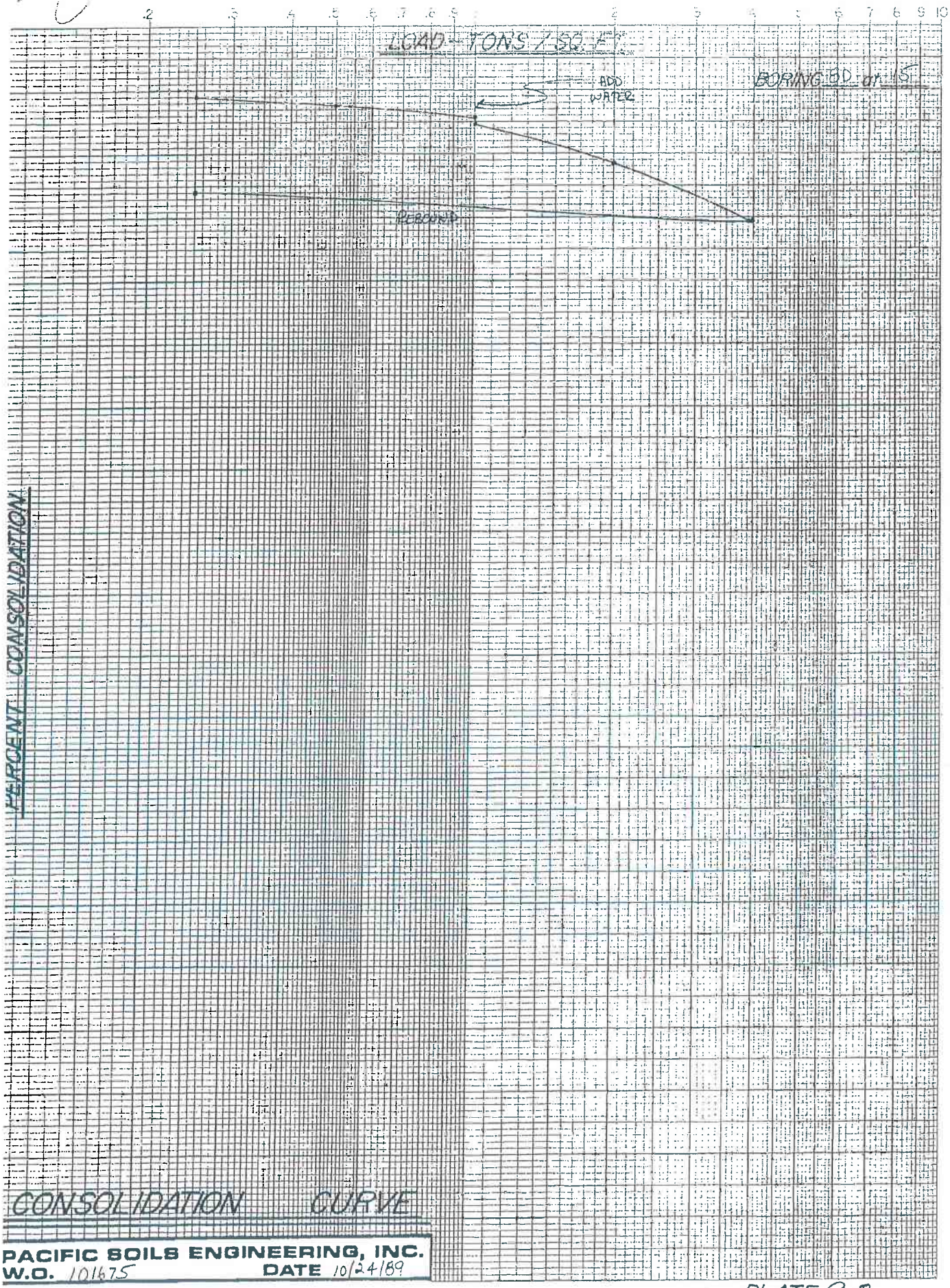


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10/24/89

rm CC2

PLATE C-7

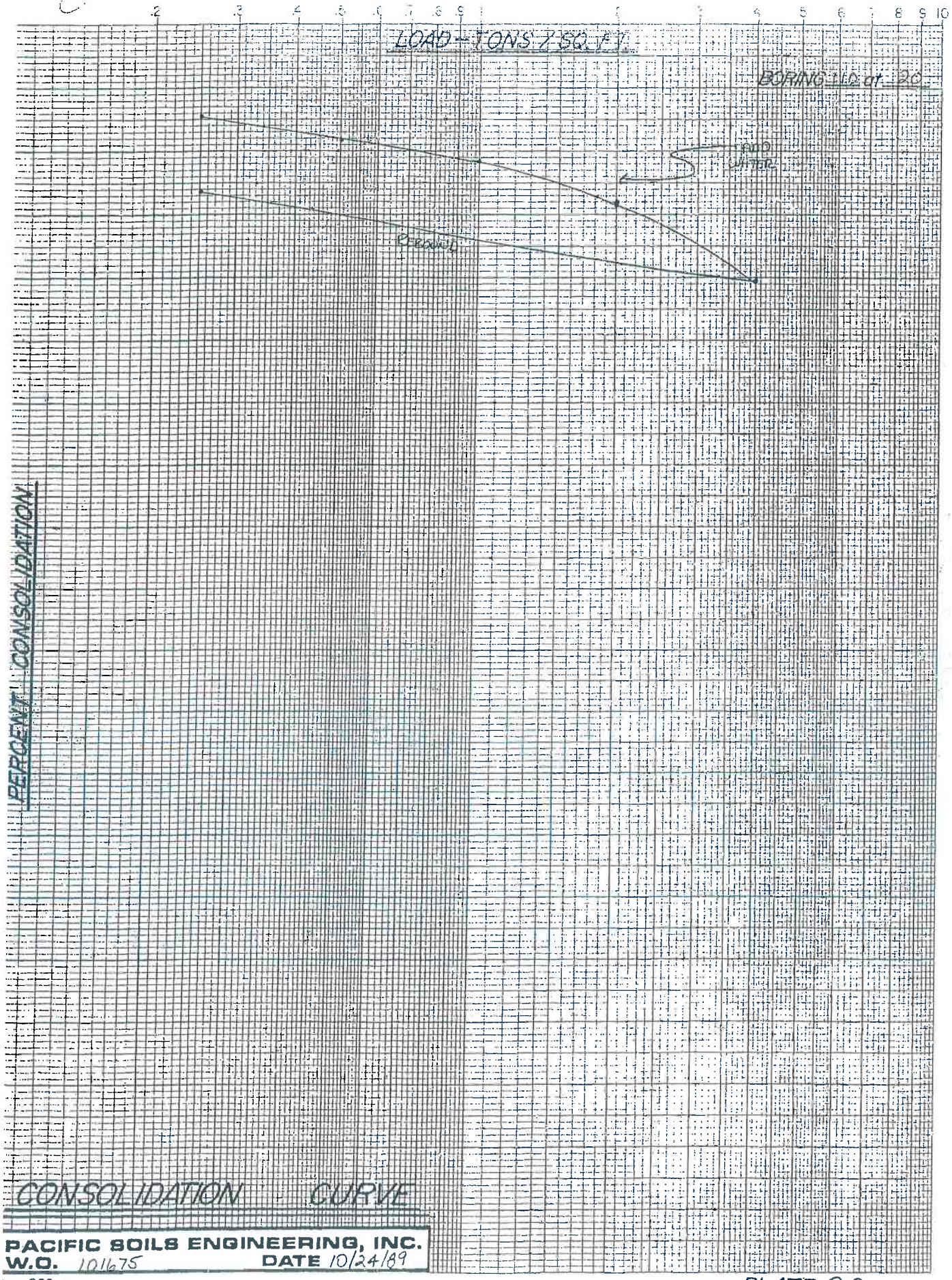


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10/24/89

rm CC2

PLATE C-8

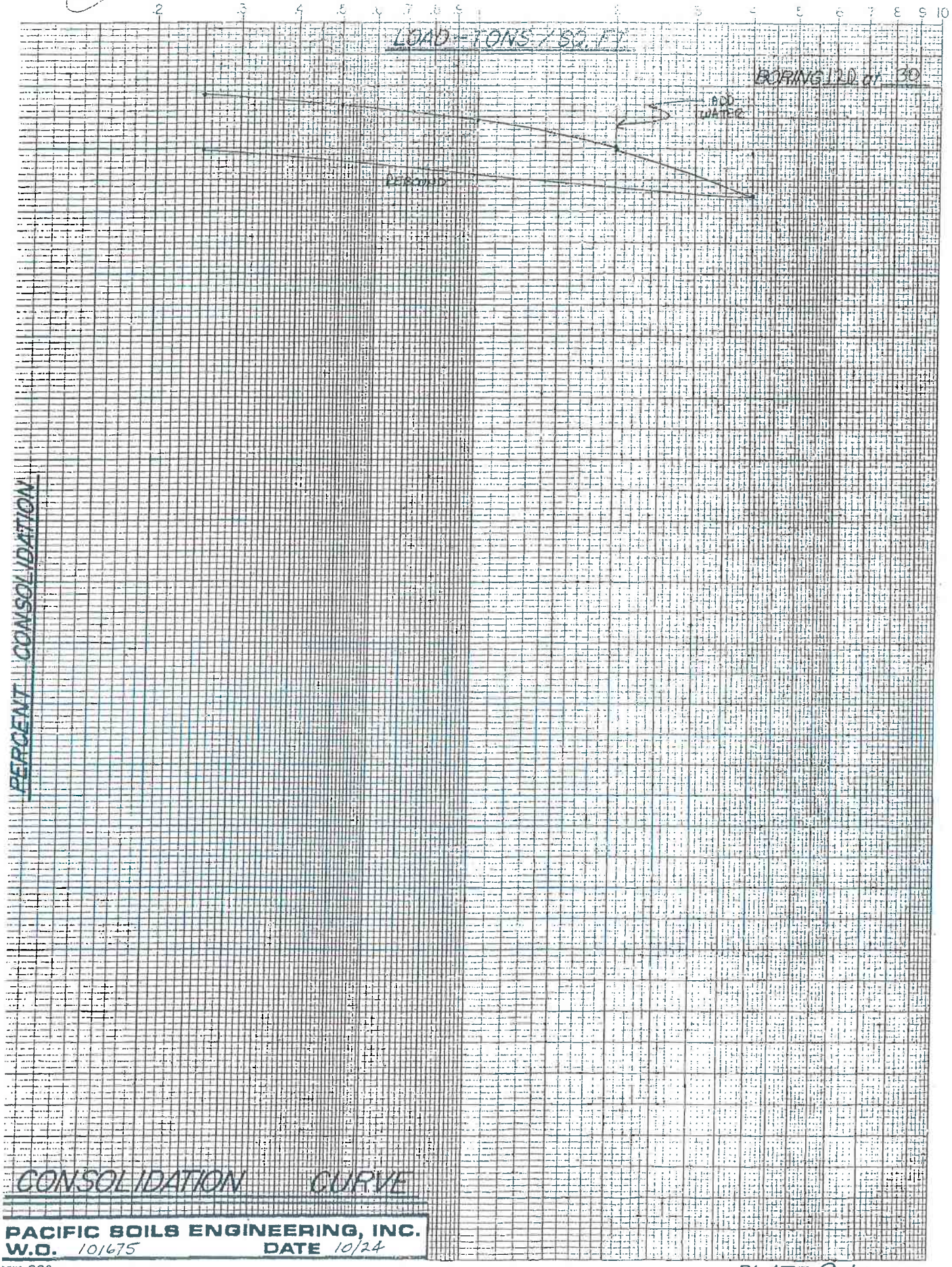


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 **DATE** 10/24/89

orm CC2

PLATE C-9



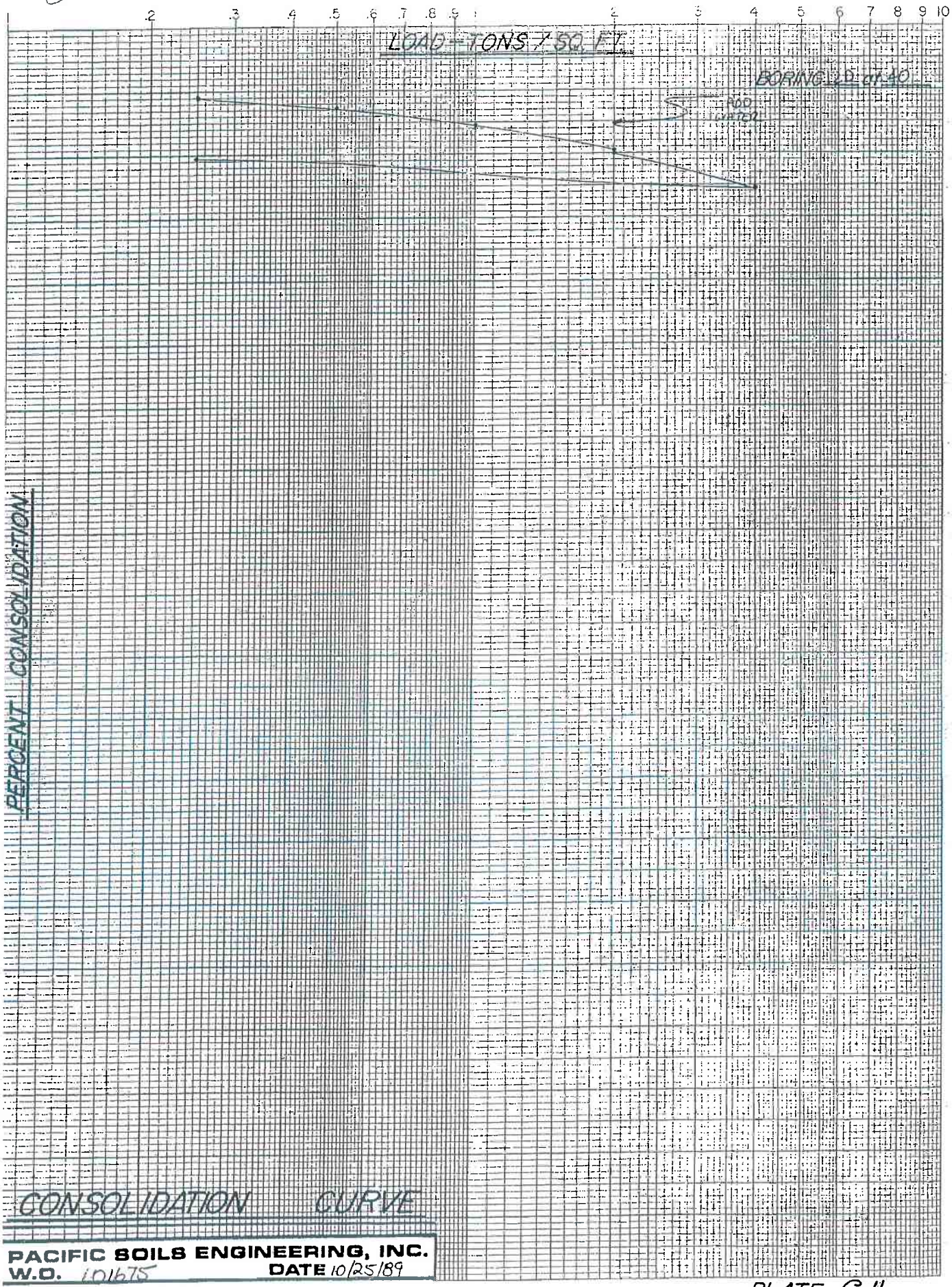
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 **DATE** 10/24

orm CC2

PLATE C-10

G

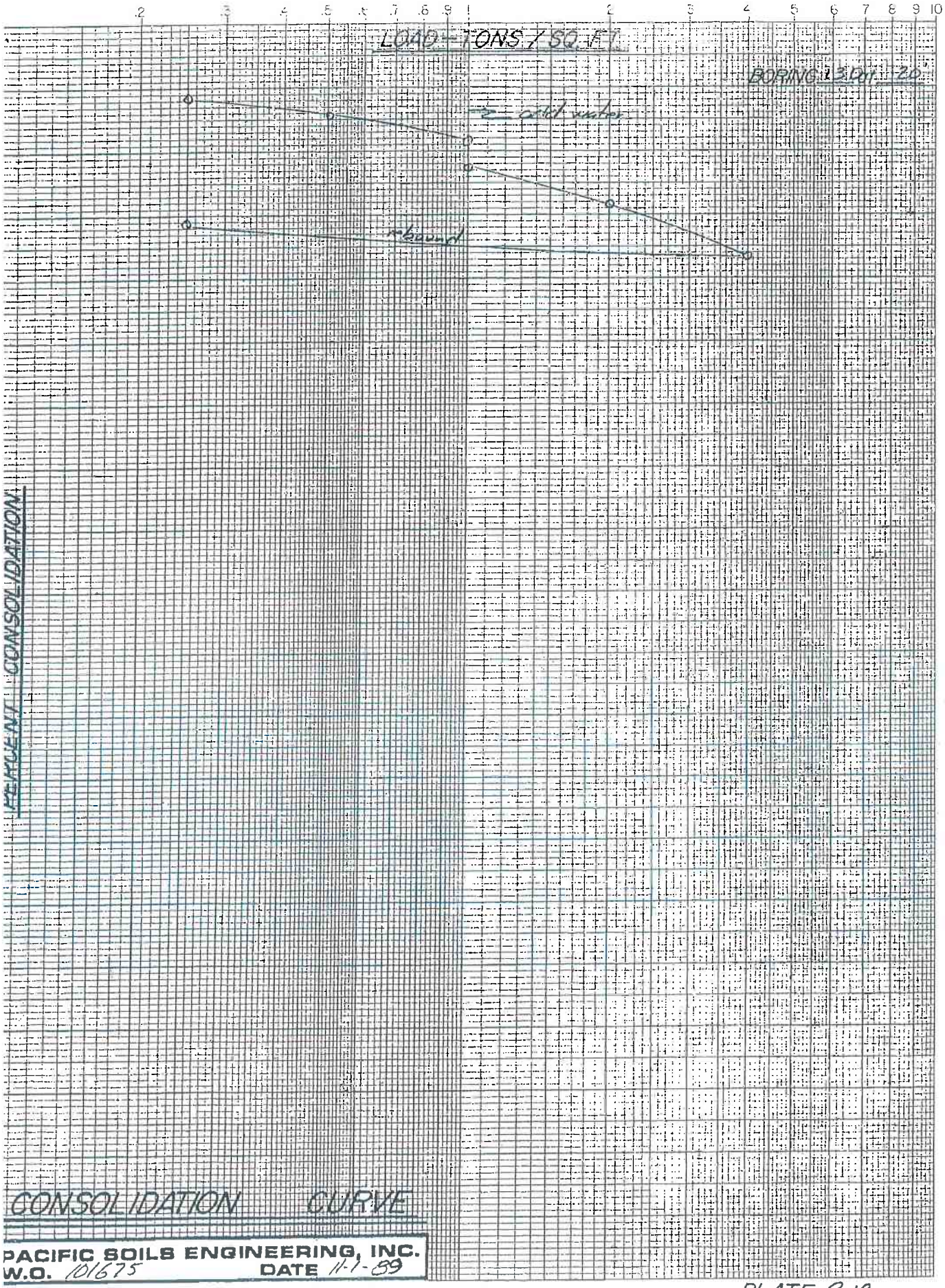


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10/25/89

orm CC2

PLATE C-11



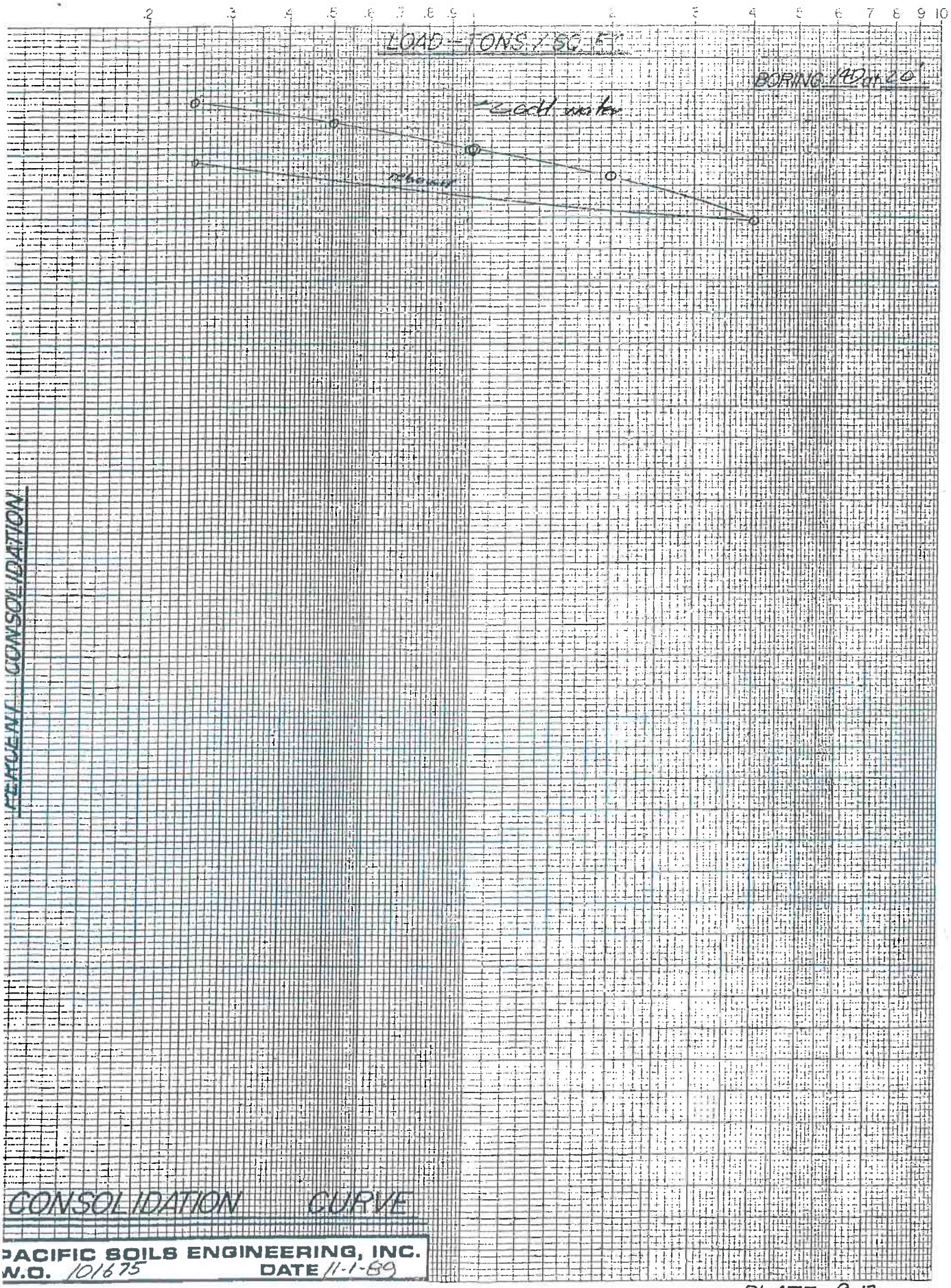
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-1-89

rm CC2

PLATE C-12

#2

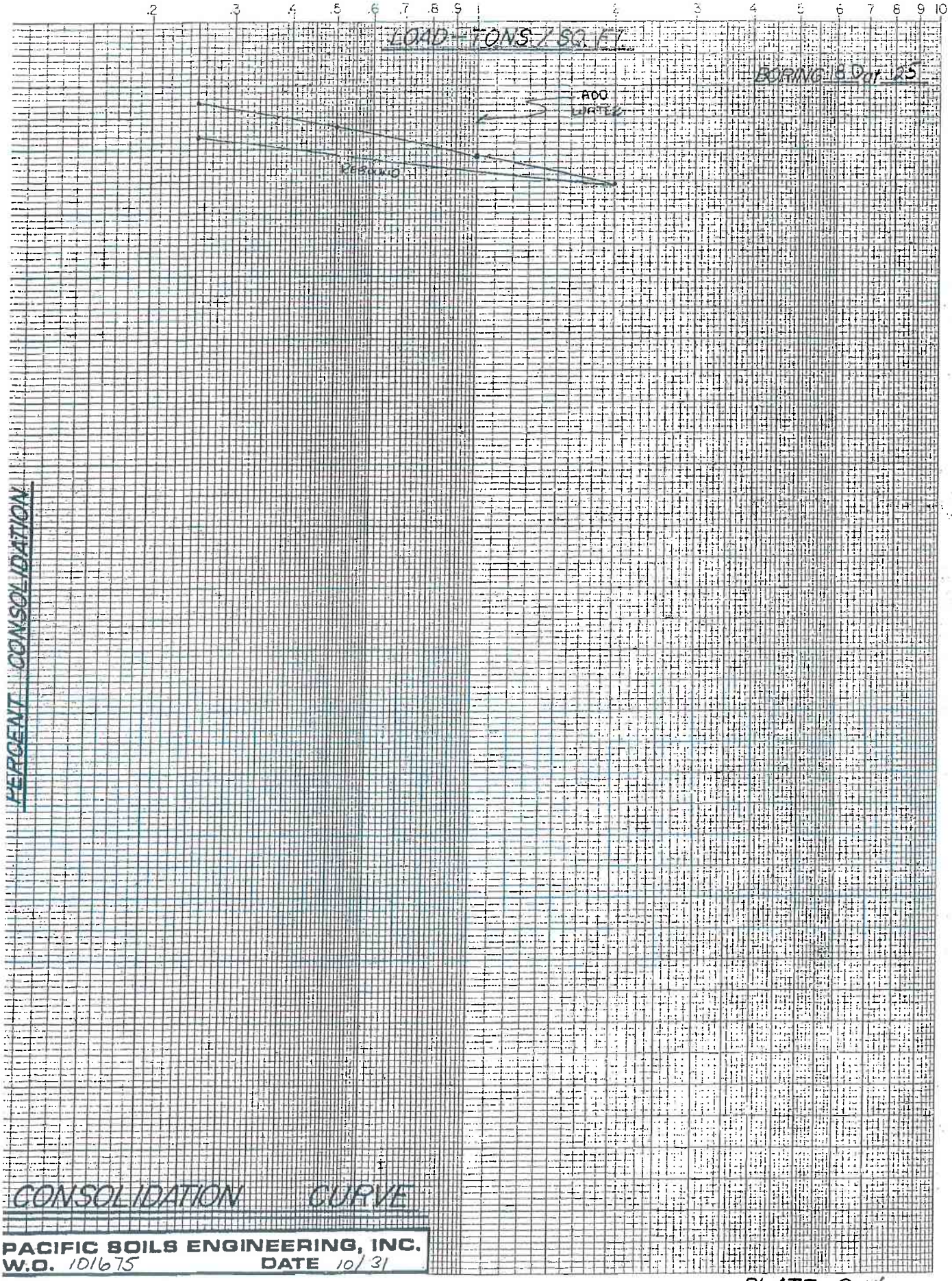


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-1-89

m CC2

PLATE C-13

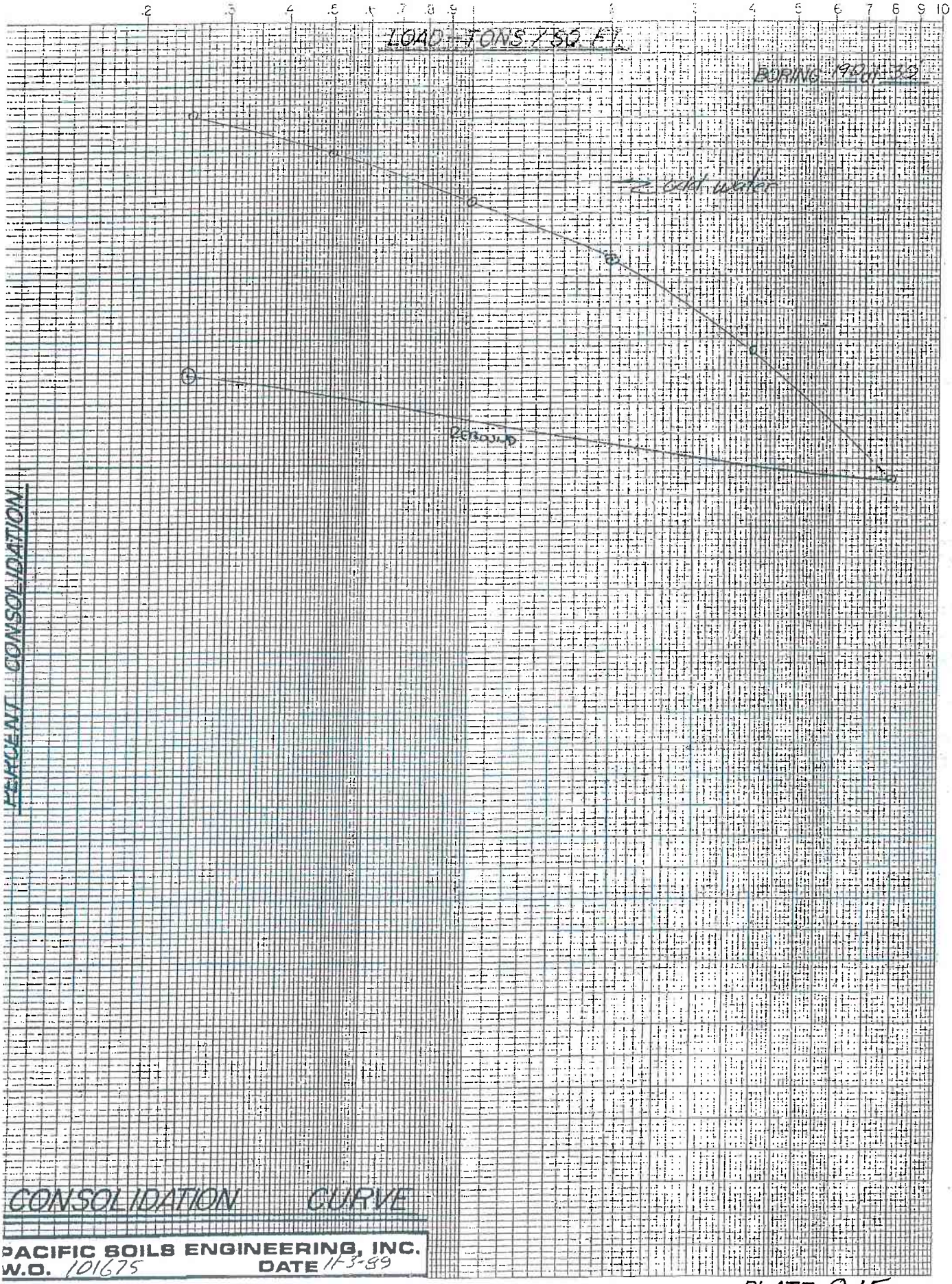


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 10/31

rm CC2

PLATE C-14

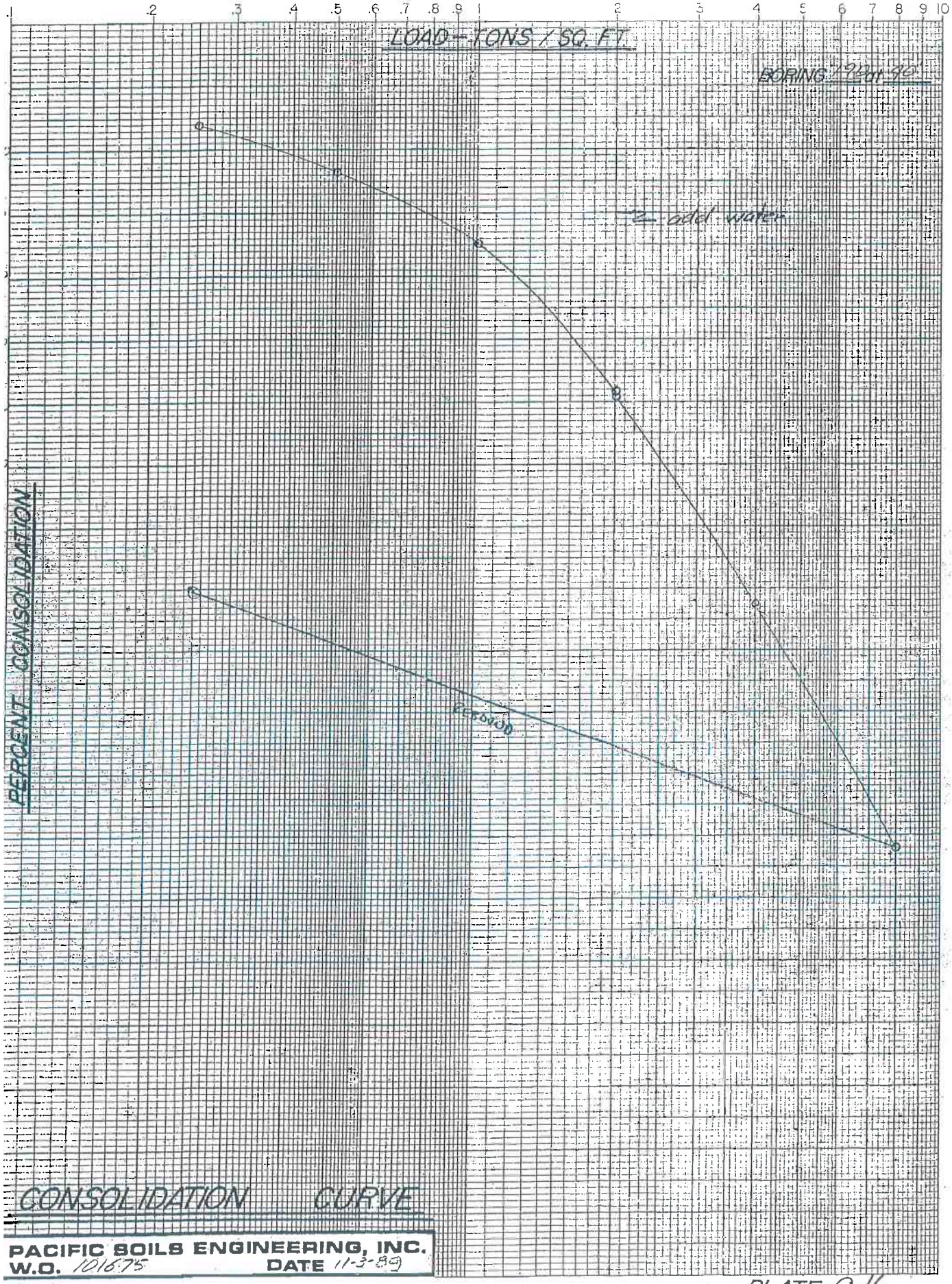


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-3-89

m CC2

PLATE C-15



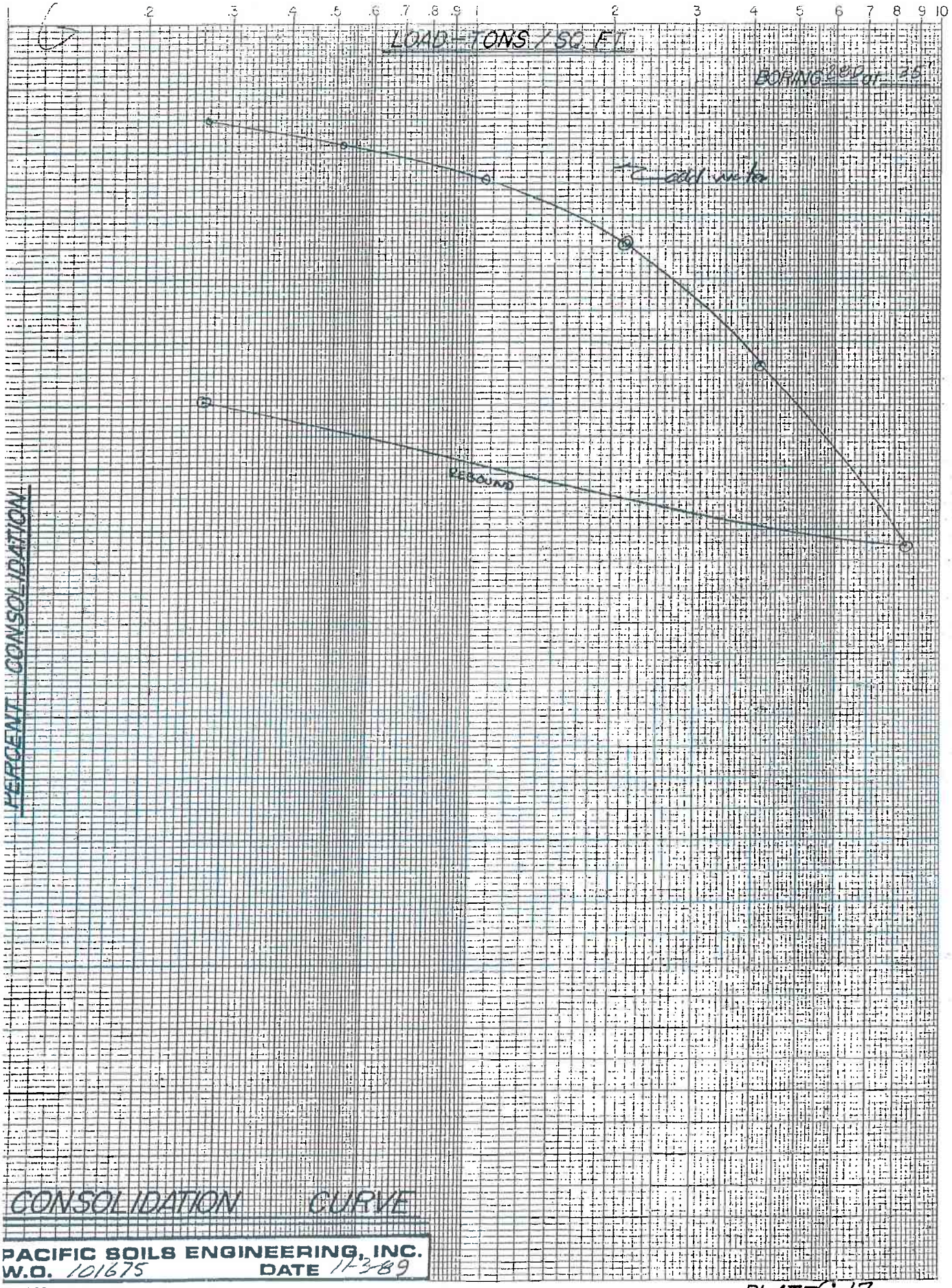
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 1016.75 DATE 11-3-89

orm CC2

PLATE C-16

#4



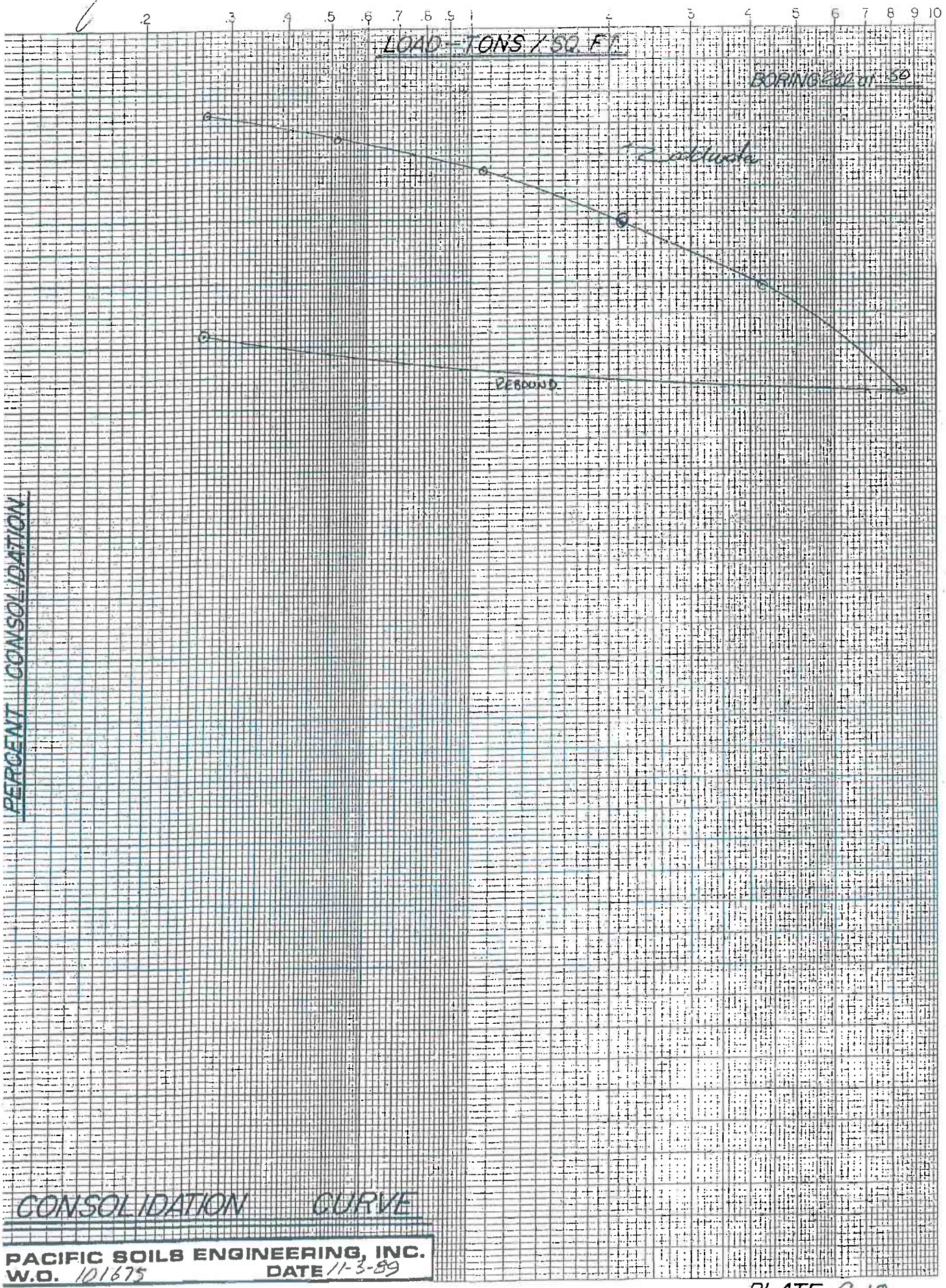
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-3-89

rm CC2

PLATE C-17

#8

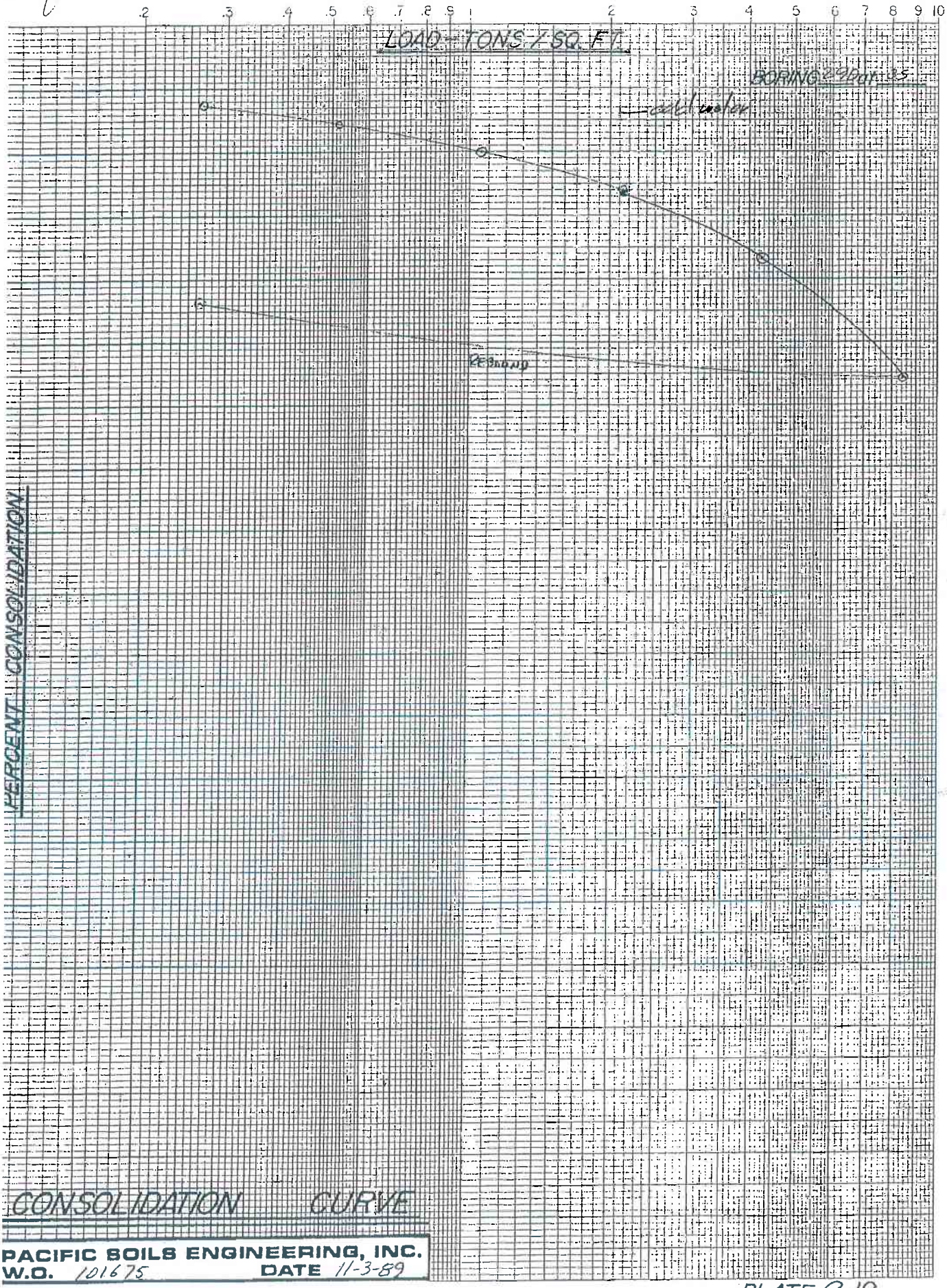


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-3-89

orm CC2

PLATE C-18

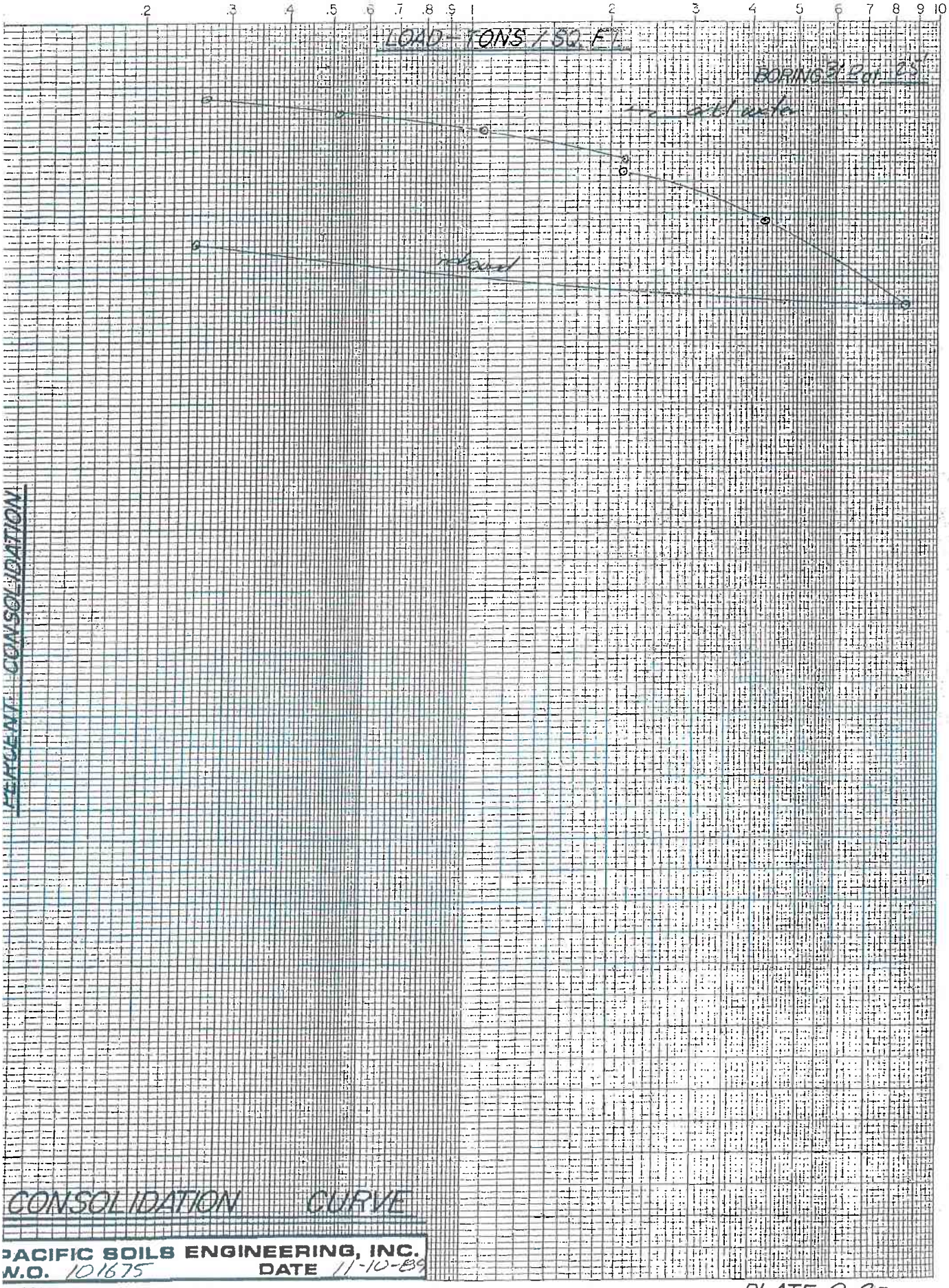


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-3-89

rm CC2

PLATE C-19

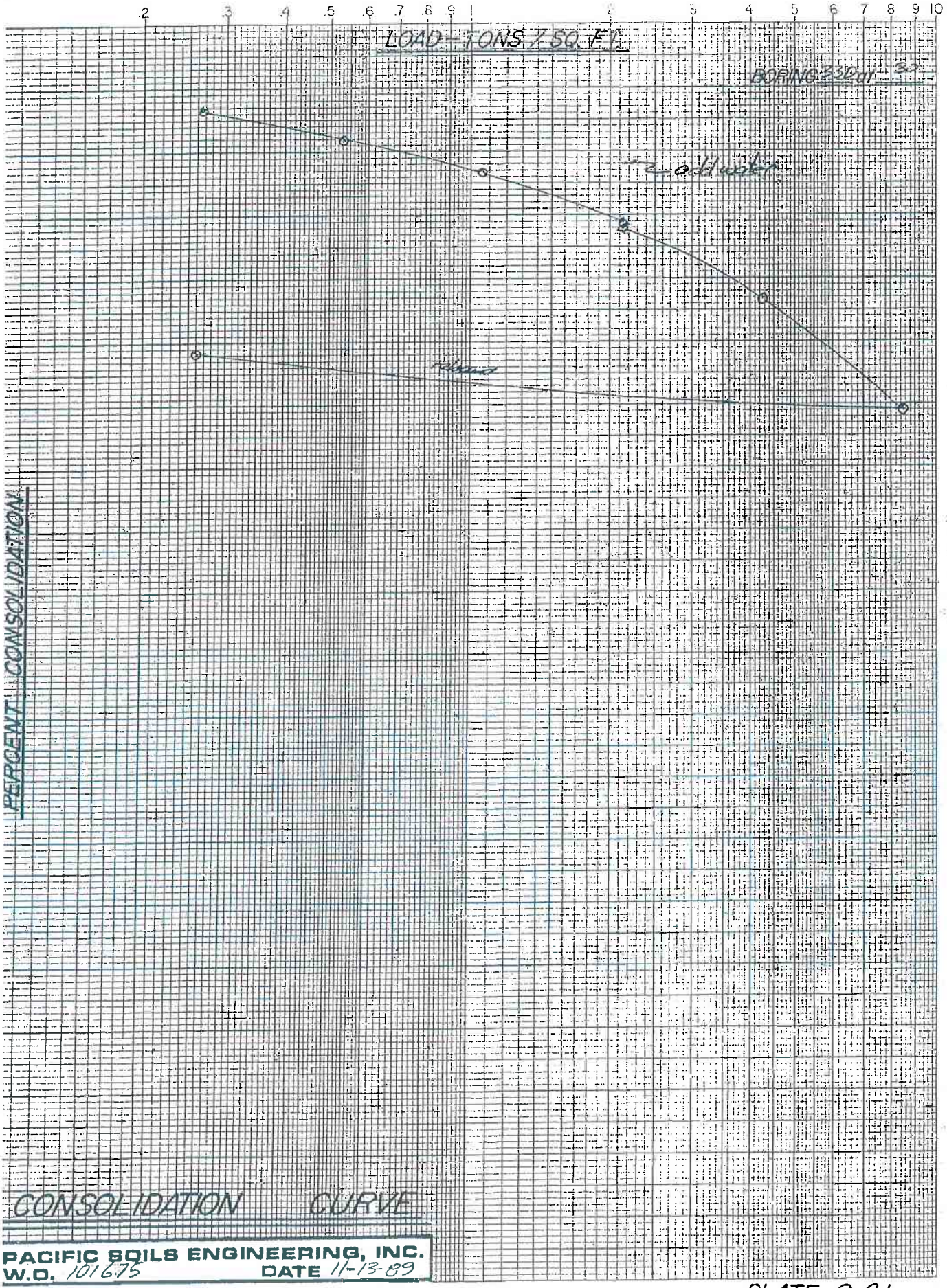


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-10-89

m.CC2

PLATE C-20

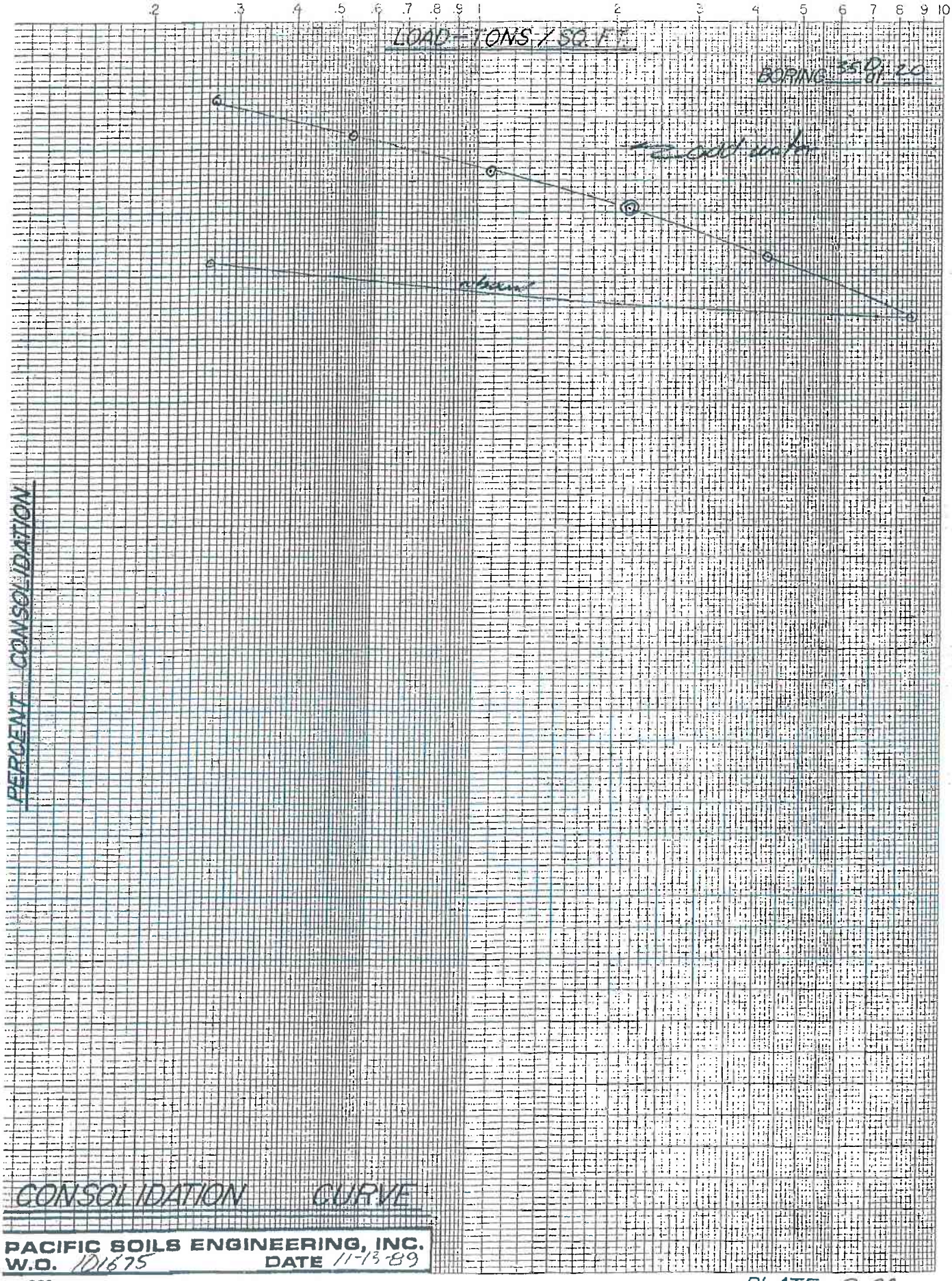


CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-13-89

rm CC2

PLATE C-21



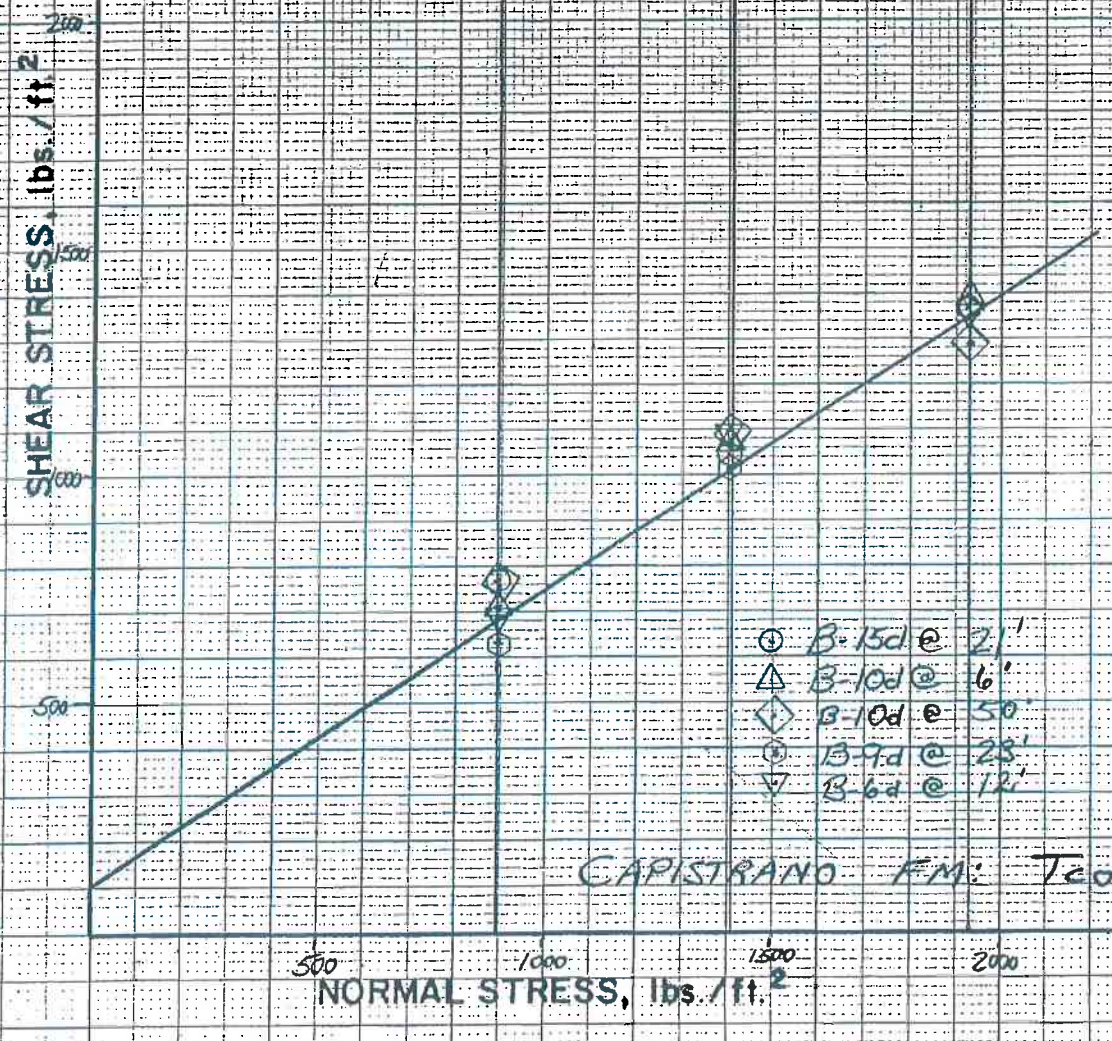
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
W.O. 101675 DATE 11-13-89

Form CC2

PLATE C-22

DIRECT SHEAR TESTS
REMOLDED

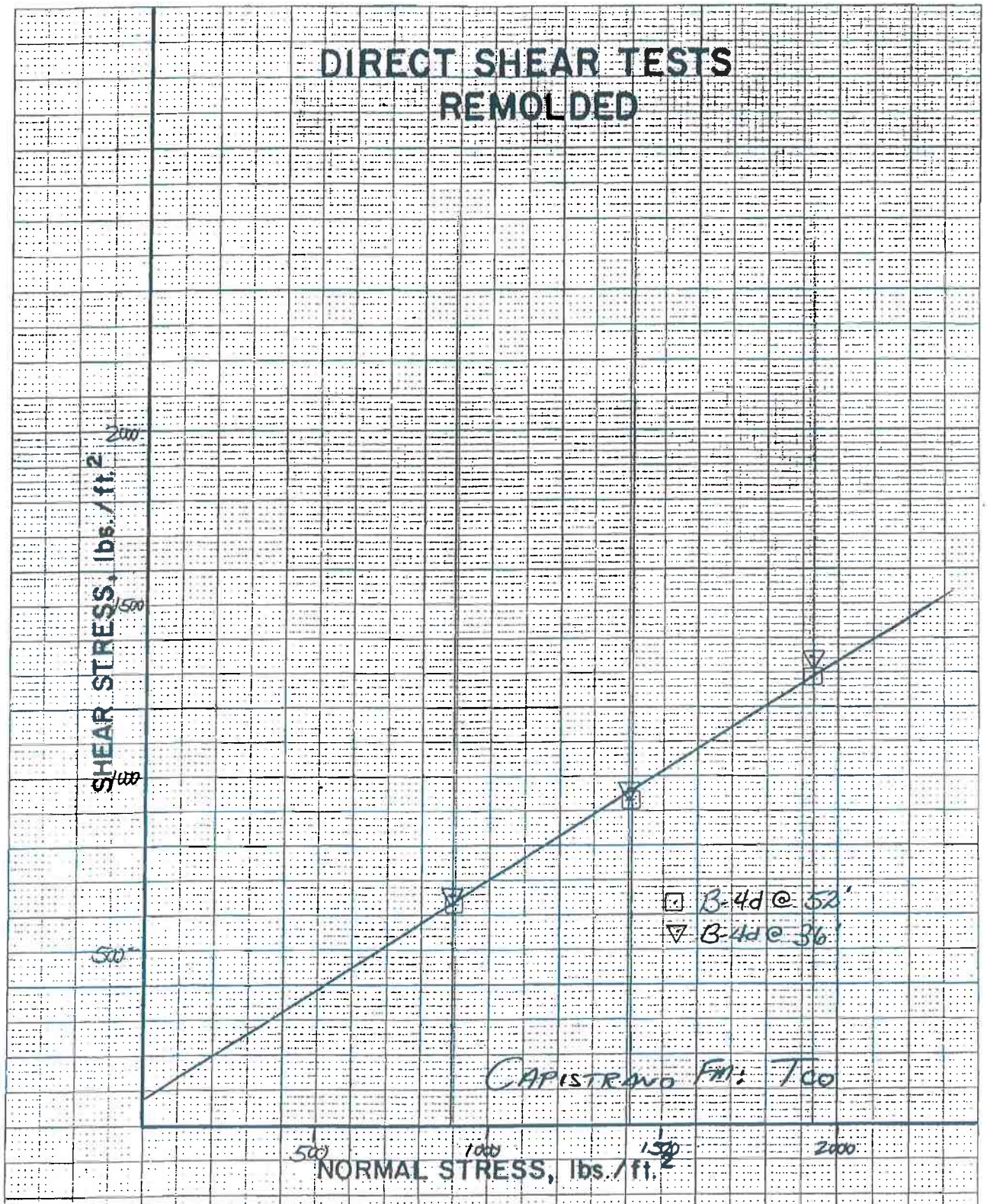


REMOLDED SHEAR TESTS:
SAMPLES REMOLDED TO 90%
OF MAXIMUM DENSITY AT ±2%
OVER-OPTIMUM MOISTURE.

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9118
W.O. 101675 DATE

PLATE D-1

DIRECT SHEAR TESTS
REMOLDED

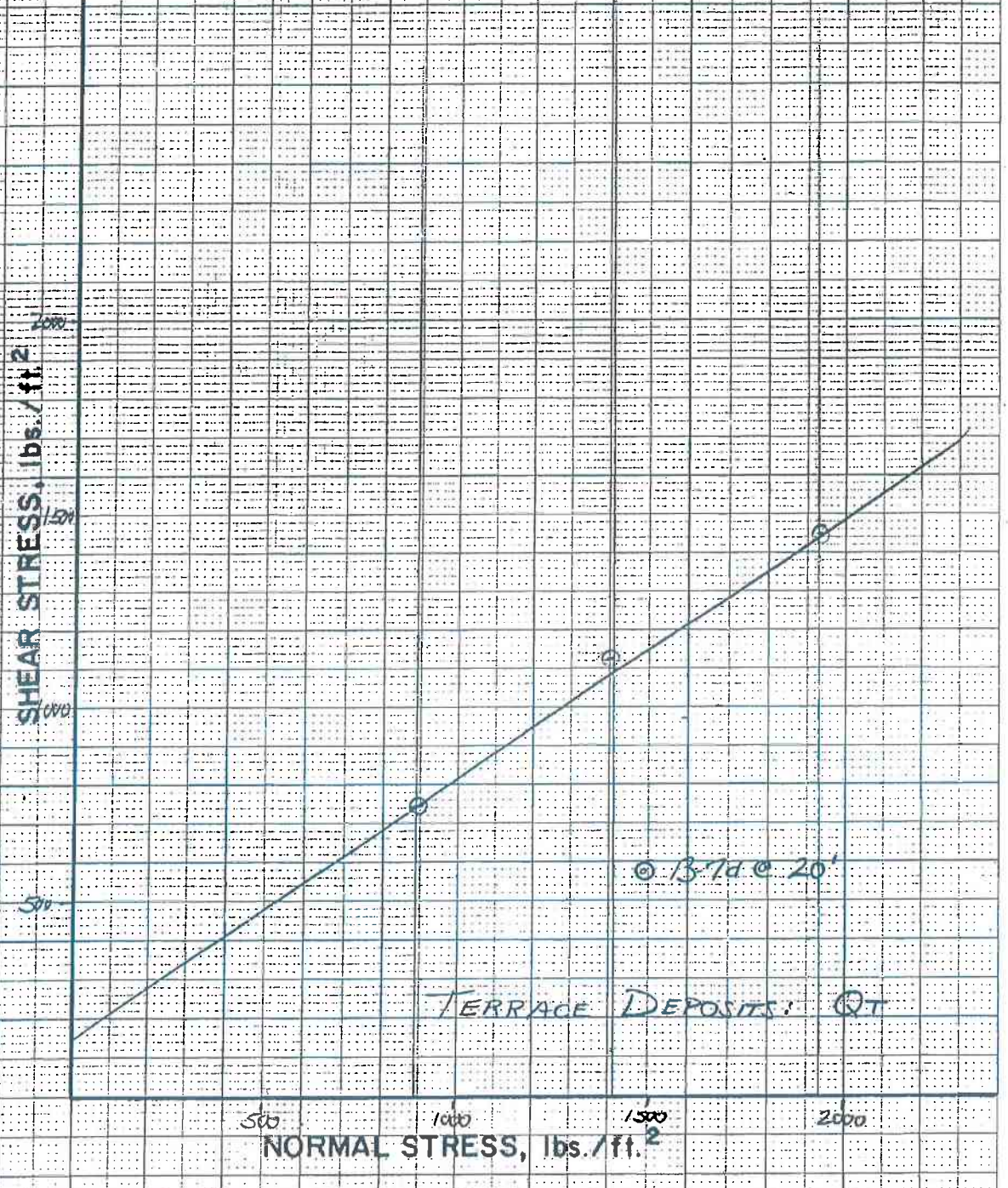


REMOLDED SHEAR TESTS:
SAMPLES REMOLDED TO 90%
OF MAXIMUM DENSITY AT ±2%
OVER-OPTIMUM MOISTURE.

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9118
W.O. 101675 DATE

PLATE D-2

DIRECT SHEAR TESTS
REMOLDED

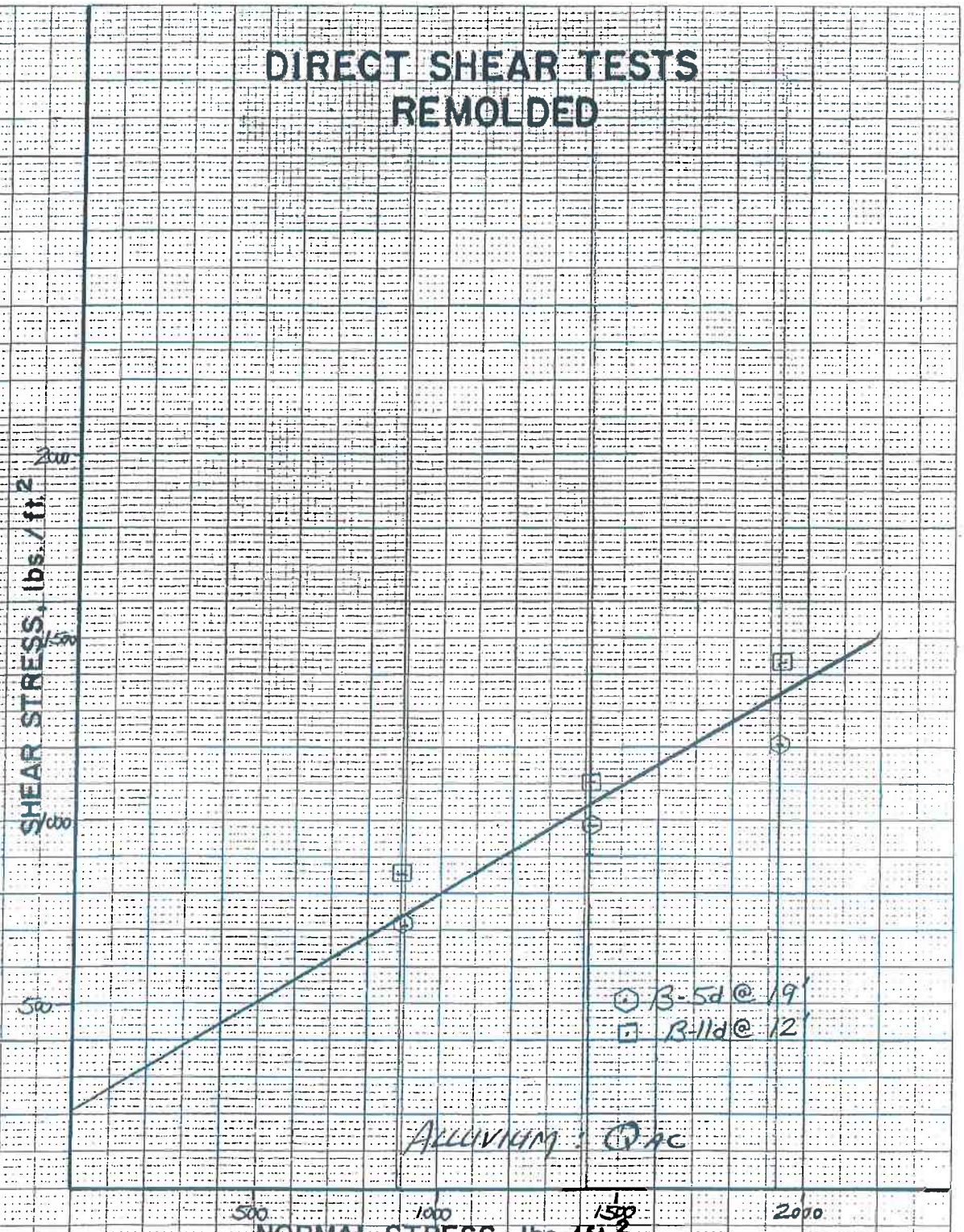


REMOLDED SHEAR TESTS:
SAMPLES REMOLDED TO 90%
OF MAXIMUM DENSITY AT ±2%
OVER-OPTIMUM MOISTURE.

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9118
W.O. 101675 DATE

PLATE D-3

DIRECT SHEAR TESTS
REMOLDED

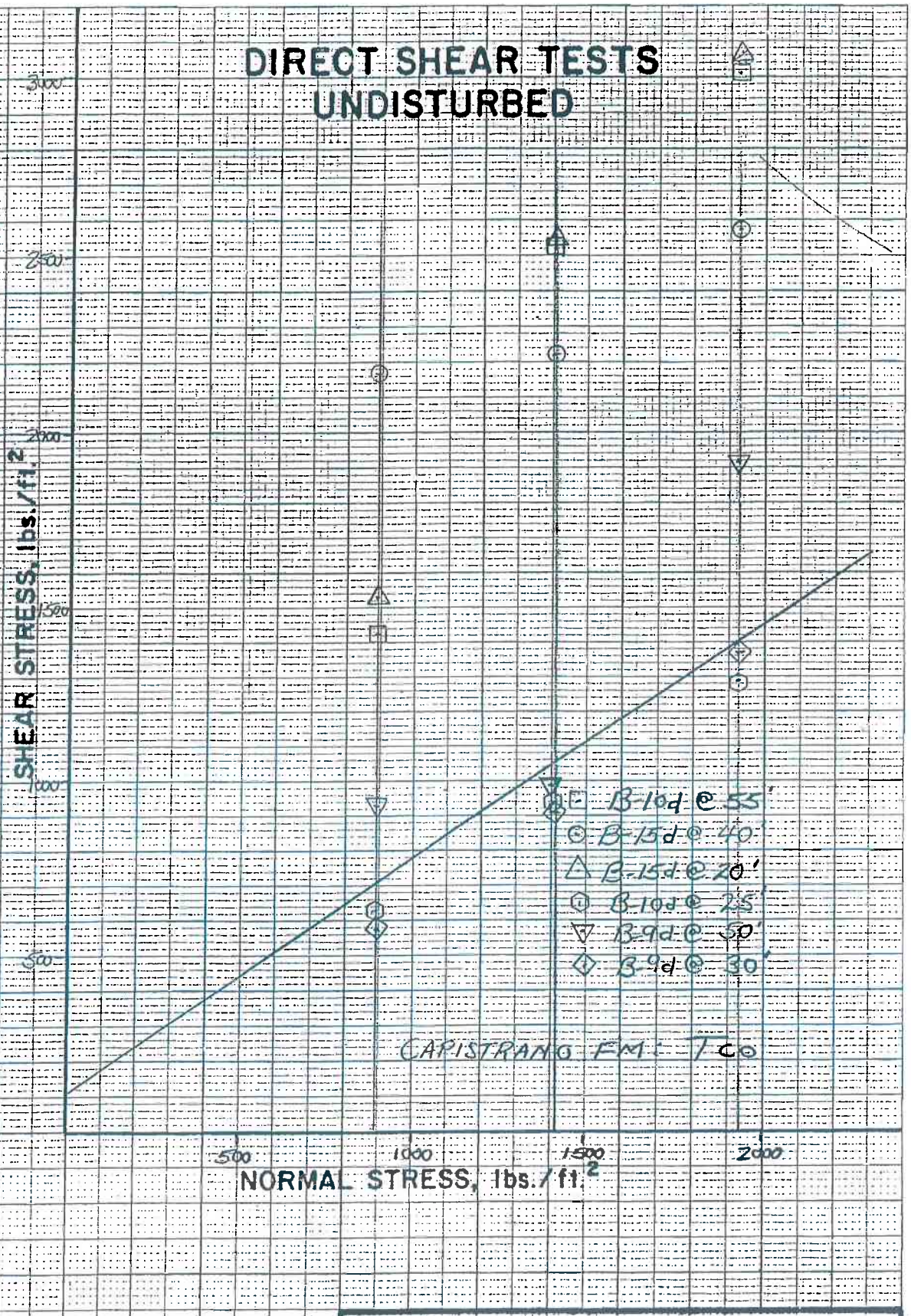


REMOLDED SHEAR TESTS:
SAMPLES REMOLDED TO 90%
OF MAXIMUM DENSITY AT ±2%
OVER-OPTIMUM MOISTURE.

PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9118
W.O. 101675 DATE

PLATE D-4

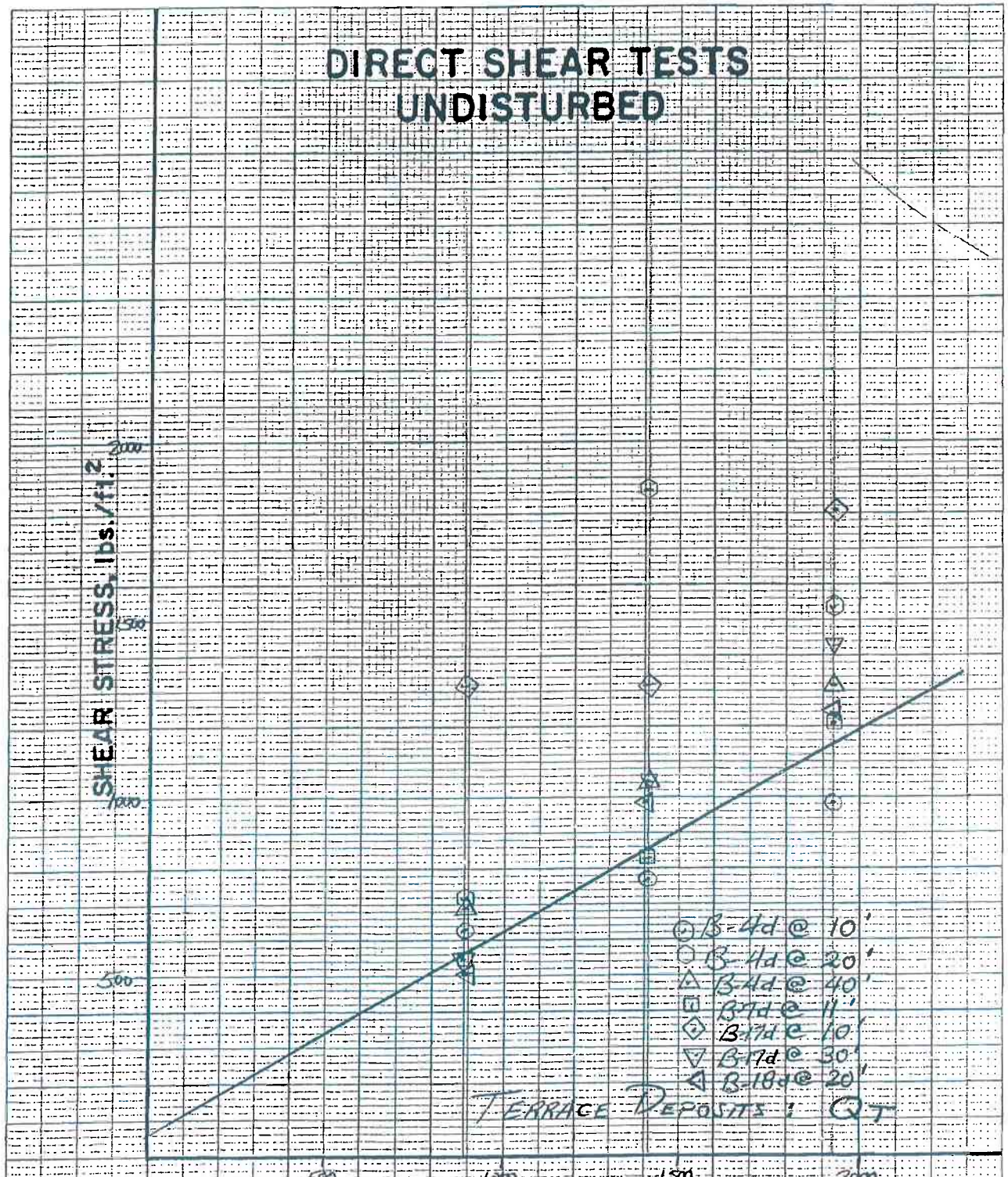
DIRECT SHEAR TESTS
UNDISTURBED



PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9118
W.O. 101675 DATE

PLATE D-5

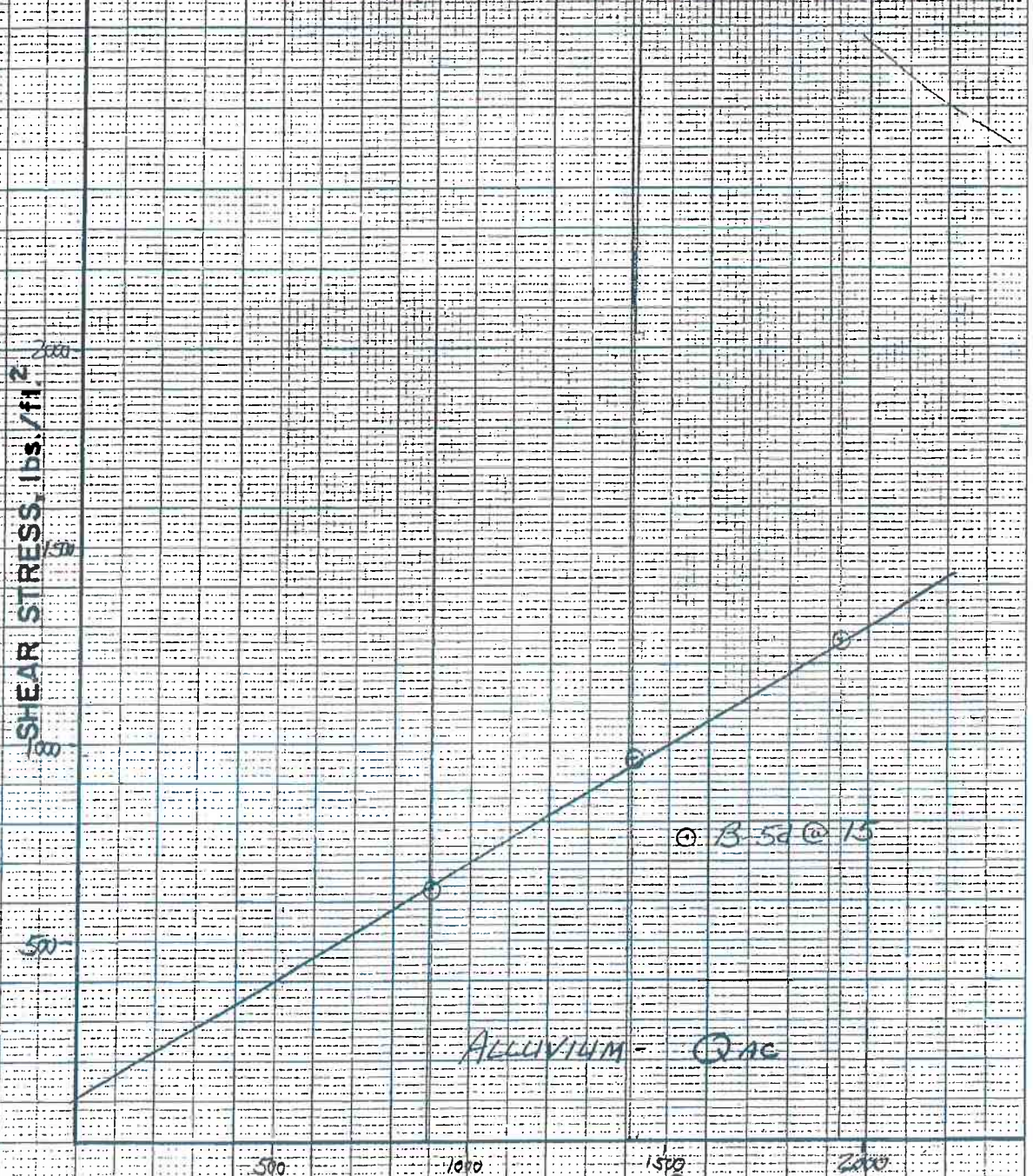
DIRECT SHEAR TESTS
UNDISTURBED



PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9118
W.O. 101675 DATE

PLATE D-6

DIRECT SHEAR TESTS
UNDISTURBED



PACIFIC SOILS ENGINEERING, INC.
17909 FITCH IRVINE, CA (714)863-9718
W.O. 101675 DATE

PLATE D-7

LAB DATA BY HUSHMAND (2010)

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ
Date: 3/31/2010

Boring No.		HB-1							HB-3			
Sample No.		MC 1	MC 2	MC 4	MC 6	MC 8	MC 10	MC 12	MC 1	MC 2	MC 4	MC 6
Depth (ft)		2.5	5	15	25	35	45	55	2.5	5	15	25
Total wt of rings and soil	gr	1135.4	1148.0	1197.4	960.1	1050.5	1203.8	1153.8	1156.5	1254.7	1162.2	1224.6
Height of sample	in	6	6	6	5	6	6	6	6	6	6	6
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0159	0.0159	0.0159	0.0133	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159
Weight of rings	gr	254.48	254.48	254.48	212.06	254.48	254.48	254.48	254.48	254.48	254.48	254.48
Weight of soil	lbs.	1.942	1.970	2.079	1.649	1.755	2.093	1.983	1.989	2.205	2.001	2.139
Wet Density	pcf	122.0	123.8	130.6	124.3	110.2	131.5	124.6	124.9	138.5	125.7	134.4
Container No.		39	29	43	28	38	36	25	27	21	40	12
Weight of cont.+ wet soil	gr	88.38	88.88	85.79	86.44	88.31	85.30	87.07	82.87	84.01	83.55	85.25
Weight of cont.+ dry soil	gr	80.48	75.55	74.98	75.19	84.28	74.05	71.27	75.96	76.12	72.30	74.52
Weight of container	gr	4.98	4.97	5.06	4.91	4.93	5.03	4.93	5.03	4.88	5.15	5.00
Weight of water	gr	7.90	13.33	10.81	11.25	4.03	11.25	15.80	6.91	7.89	11.25	10.73
Weight of dry soil	gr	75.50	70.58	69.92	70.28	79.35	69.02	66.34	70.93	71.24	67.15	69.52
Moisture Content	%	**10.5**	**18.9**	**15.5**	**16.0**	**5.1**	**16.3**	**23.8**	**9.7**	**11.1**	**16.8**	**15.4**
Dry Density	pcf	**110.4**	**104.1**	**113.1**	**107.2**	**104.9**	**113.1**	**100.6**	**113.8**	**124.7**	**107.7**	**116.4**
Degree of Saturation	%	**56**	**85**	**89**	**78**	**23**	**93**	**98**	**57**	**90**	**83**	**97**

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

Boring No.		HB-4					HB-5			HB-7			
Sample No.		MC 1	MC 2	MC 6	MC 8	MC 10	MC 1	MC 2	MC 4	MC 1	MC 2	MC 4	MC 6
Depth (ft)		**2.5**	**5**	**25**	**35**	**45**	**2.5**	**5**	**15**	**2.5**	**5**	**15**	**25**
Total wt of rings and soil	gr	1236.7	1163.6	986.5	992.0	1161.1	998.9	1209.4	1254.7	1203.0	1242.8	1181.2	1219.7
Height of sample	in	6	6	5	5	6	5	6	6	6	6	6	6
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0159	0.0159	0.0133	0.0133	0.0159	0.0133	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159
Weight of rings	gr	254.48	254.48	212.06	212.06	254.48	212.06	254.48	254.48	254.48	254.48	254.48	254.48
Weight of soil	lbs.	2.165	2.004	1.707	1.719	1.999	1.735	2.105	2.205	2.091	2.179	2.043	2.128
Wet Density	pcf	136.0	125.9	128.7	129.6	125.6	130.8	132.3	138.5	131.4	136.9	128.3	133.7
Container No.		36	29	38	33	39	30	22	35	32	26	23	41
Weight of cont.+ wet soil	gr	82.87	87.63	85.88	86.45	83.48	86.58	89.11	87.69	84.34	84.06	84.43	83.59
Weight of cont.+ dry soil	gr	74.68	82.44	71.92	74.65	68.45	77.08	78.13	76.67	71.59	72.29	71.32	72.25
Weight of container	gr	5.04	4.96	4.93	4.95	4.97	4.99	5.00	5.09	4.99	5.05	5.01	4.97
Weight of water	gr	8.19	5.19	13.96	11.80	15.03	9.50	10.98	11.02	12.75	11.77	13.11	11.34
Weight of dry soil	gr	69.64	77.48	66.99	69.70	63.48	72.09	73.13	71.58	66.60	67.24	66.31	67.28
Moisture Content	%	**11.8**	**6.7**	**20.8**	**16.9**	**23.7**	**13.2**	**15.0**	**15.4**	**19.1**	**17.5**	**19.8**	**16.9**
Dry Density	pcf	121.7	118.0	106.5	110.9	101.5	115.5	115.0	120.0	110.3	116.5	107.2	114.4
Degree of Saturation	%	87	44	100	91	100	81	91	108	102	111	96	100

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

Boring No.		HB-9			HB-10					HB-11	HB-12			
Sample No.		MC 1	ST 3	MC 4	MC 1	MC 2	MC 4	MC 6	MC 8	MC 2	MC 1	MC 2	MC 4	MC 6
Depth (ft)		5	11.5	15	2.5	5	15	25	35	5	2.5	5	15	25
Total wt of rings and soil	gr	1186.0	1094.9	1156.1	1181.1	1207.3	1224.6	1196.7	1177.8	1061.6	1229.2	1019.4	1046.0	1167.4
Height of sample	in	6	4.09	6	6	6	6	6	6	6	6	5	6	6
Diameter of sample	in	2.416	2.86	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0159	0.0152	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0133	0.0159	0.0159
Weight of rings	gr	254.48	291.11	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	212.06	254.48	254.48
Weight of soil	lbs.	2.054	1.772	1.988	2.043	2.101	2.139	2.077	2.036	1.779	2.149	1.780	1.745	2.013
Wet Density	pcf	129.0	116.5	124.9	128.3	132.0	134.4	130.5	127.9	111.8	135.0	134.2	109.6	126.4
Container No.		44	33	25	34	24	28	43	200	116	102	108	L-2A	L-1
Weight of cont.+ wet soil	gr	84.30	64.96	88.88	84.38	84.54	84.03	82.53	84.81	68.10	62.62	60.59	61.31	65.83
Weight of cont.+ dry soil	gr	73.06	51.75	74.25	79.33	78.52	74.77	70.58	72.02	61.64	56.17	54.66	57.40	60.18
Weight of container	gr	5.01	4.96	5.02	5.00	5.04	4.93	5.06	6.37	9.43	11.10	10.71	10.64	10.16
Weight of water	gr	11.24	13.21	14.63	5.05	6.02	9.26	11.95	12.79	6.46	6.45	5.93	3.91	5.65
Weight of dry soil	gr	68.05	46.79	69.23	74.33	73.48	69.84	65.52	65.65	52.21	45.07	43.95	46.76	50.02
Moisture Content	%	**16.5**	**28.2**	**21.1**	**6.8**	**8.2**	**13.3**	**18.2**	**19.5**	**12.4**	**14.3**	**13.5**	**8.4**	**11.3**
Dry Density	pcf	**110.7**	**90.8**	**103.1**	**120.2**	**122.0**	**118.6**	**110.4**	**107.0**	**99.5**	**118.1**	**118.2**	**101.2**	**113.6**
Degree of Saturation	%	**89**	**91**	**93**	**48**	**61**	**89**	**97**	**95**	**50**	**95**	**90**	**35**	**66**

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

Boring No.		HB-13			HB-14						HB-15			
Sample No.		MC 1	MC 2	MC 4	MC 1	MC 2	MC 4	MC 6	MC 8	MC 10	MC 1	MC 2	MC 4	MC 6
Depth (ft)		2.5	5	15	2.5	5	15	25	35	45	2.5	5	15	25
Total wt of rings and soil	gr	967.3	983.0	1059.7	1226.0	1244.9	1228.3	1047.2	1089.2	1058.4	1248.8	1216.5	993.4	1228.4
Height of sample	in	5	5	6	6	6	6	6	6	6	6	6	5	6
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0133	0.0133	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0133	0.0159
Weight of rings	gr	212.06	212.06	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	212.06	254.48
Weight of soil	lbs.	1.665	1.700	1.775	2.142	2.183	2.147	1.748	1.840	1.772	2.192	2.121	1.723	2.147
Wet Density	pcf	125.5	128.1	111.5	134.6	137.2	134.9	109.8	115.6	111.3	137.7	133.2	129.9	134.9
Container No.		107	101	113	105	106	110	AB1	7	104	5	8	12	17
Weight of cont.+ wet soil	gr	62.66	64.42	69.01	63.45	62.38	66.40	67.23	67.00	64.46	61.03	64.38	61.11	59.05
Weight of cont.+ dry soil	gr	57.19	57.87	64.38	57.06	55.62	62.16	65.52	65.60	62.66	56.13	58.98	56.04	53.58
Weight of container	gr	10.40	10.90	11.32	10.25	10.46	10.84	10.25	11.00	11.08	11.10	11.11	11.04	11.08
Weight of water	gr	5.47	6.55	4.63	6.39	6.76	4.24	1.71	1.40	1.80	4.90	5.40	5.07	5.47
Weight of dry soil	gr	46.79	46.97	53.06	46.81	45.16	51.32	55.27	54.60	51.58	45.03	47.87	45.00	42.50
Moisture Content	%	**11.7**	**13.9**	**8.7**	**13.7**	**15.0**	**8.3**	**3.1**	**2.6**	**3.5**	**10.9**	**11.3**	**11.3**	**12.9**
Dry Density	pcf	**112.4**	**112.4**	**102.6**	**118.4**	**119.3**	**124.6**	**106.5**	**112.7**	**107.6**	**124.2**	**119.7**	**116.7**	**119.5**
Degree of Saturation	%	**66**	**79**	**38**	**91**	**103**	**67**	**15**	**15**	**17**	**87**	**78**	**72**	**89**

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

Boring No.		HB-15			HB-16			HB-17			
Sample No.		MC 8	MC 10	MC 12-2	MC 1	MC 2	MC 4	MC 1	MC 2	MC 4	MC 6-2
Depth (ft)		35	45	56	2.5	5	10	2.5	5	15	26
Total wt of rings and soil	gr	988.5	1228.9	1089.9	1055.7	1114.7	1029.2	1207.4	1241.1	1191.9	1223.7
Height of sample	in	5	6	6	6	6	6	6	6	6	6
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0133	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159
Weight of rings	gr	212.06	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48
Weight of soil	lbs.	1.712	2.148	1.842	1.766	1.896	1.708	2.101	2.175	2.067	2.137
Wet Density	pcf	129.0	135.0	115.7	111.0	119.1	107.3	132.0	136.6	129.8	134.2
Container No.		9	1	20	21	39	36	14	18	15	3
Weight of cont.+ wet soil	gr	57.73	61.33	57.27	83.72	83.54	82.18	64.00	55.37	63.90	58.26
Weight of cont.+ dry soil	gr	53.96	57.72	45.23	78.40	76.34	81.21	57.16	49.92	55.57	51.28
Weight of container	gr	11.03	11.07	10.93	4.88	4.99	5.04	10.99	10.79	10.99	11.11
Weight of water	gr	3.77	3.61	12.04	5.32	7.20	0.97	6.84	5.45	8.33	6.98
Weight of dry soil	gr	42.93	46.65	34.30	73.52	71.35	76.17	46.17	39.13	44.58	40.17
Moisture Content	**%**	8.8	7.7	35.1	7.2	10.1	1.3	14.8	13.9	18.7	17.4
Dry Density	**pcf**	118.6	125.3	85.6	103.5	108.2	105.9	114.9	119.9	109.4	114.4
Degree of Saturation	**%**	59	64	100	32	51	6	90	97	97	103

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

Boring No.		HT 1		HT 2		HT 3		HT 4		HT 5	HT 6	HT 9	
Sample No.		1	2	1	2	1	2	1	2	1	1	1	2
Depth (ft)		**11**	**4**	**3.5**	**10.5**	**3.5**	**5.5**	**10**	**6.5**	**10**	**3.5**	**8**	**11.5**
Total wt of rings and soil	gr	1105.7	1159.0	995.1	1232.2	1103.6	1144.5	1099.6	1204.5	1178.8	1162.5	1252.5	1151.3
Height of sample	in	6	6	4.5	6	6	6	6	6	6	6	6	6
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0159	0.0159	0.0119	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159
Weight of rings	gr	254.48	254.48	212.06	269.20	254.48	254.48	254.48	254.48	254.48	254.48	368.39	254.48
Weight of soil	lbs.	1.877	1.994	1.726	2.123	1.872	1.962	1.863	2.094	2.038	2.002	1.949	1.977
Wet Density	pcf	117.9	125.3	144.6	133.4	117.6	123.3	117.0	131.6	128.0	125.8	122.4	124.2
Container No.		41	29	33	26	22	44	24	27	40	23	25	32
Weight of cont.+ wet soil	gr	82.88	193.16	84.54	86.12	83.42	82.78	81.46	84.07	86.60	89.46	82.75	86.00
Weight of cont.+ dry soil	gr	69.13	169.37	78.38	75.70	74.41	74.28	74.43	75.34	73.80	82.15	76.04	76.25
Weight of container	gr	4.98	38.96	4.96	5.05	5.10	5.04	5.04	5.02	5.14	4.99	4.93	4.98
Weight of water	gr	13.75	23.79	6.16	10.42	9.01	8.50	7.03	8.73	12.80	7.31	6.71	9.75
Weight of dry soil	gr	64.15	130.41	73.42	70.65	69.31	69.24	69.39	70.32	68.66	77.16	71.11	71.27
Moisture Content	%	**21.4**	**18.2**	**8.4**	**14.7**	**13.0**	**12.3**	**10.1**	**12.4**	**18.6**	**9.5**	**9.4**	**13.7**
Dry Density	pcf	**97.1**	**105.9**	**133.4**	**116.2**	**104.1**	**109.8**	**106.3**	**117.0**	**107.9**	**114.9**	**111.9**	**109.3**
Degree of Saturation	%	**81**	**86**	**93**	**92**	**58**	**64**	**48**	**80**	**93**	**57**	**52**	**71**

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

Boring No.		HT 10		HT 11			HT 12			HT 13	HBA 1	
Sample No.		1	2	1	2	3	1	2	3	1	1	2
Depth (ft)		3	5	3	7	14	3	14	2	6	5	15
Total wt of rings and soil	gr	1172.4	1167.6	1067.5	1210.7	996.7	1103.5	1220.2	1210.4	1120.4	1102.3	1244.1
Height of sample	in	6	6	6	6	6	6	6	6	6	6	6
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159	0.0159
Weight of rings	gr	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48	254.48
Weight of soil	lbs.	2.024	2.013	1.792	2.108	1.636	1.872	2.129	2.107	1.909	1.869	2.182
Wet Density	pcf	127.1	126.5	112.6	132.4	102.8	117.6	133.7	132.4	119.9	117.4	137.1
Container No.		35	38	42	43	34	28	29	30	200	106	104
Weight of cont.+ wet soil	gr	80.51	83.39	80.28	82.01	83.02	87.10	83.24	87.84	83.82	63.31	71.42
Weight of cont.+ dry soil	gr	71.14	73.24	72.14	71.73	77.03	81.08	76.57	77.73	74.45	50.97	64.44
Weight of container	gr	5.03	5.06	4.99	5.06	5.01	4.93	4.96	5.00	6.37	10.44	11.07
Weight of water	gr	9.37	10.15	8.14	10.28	5.99	6.02	6.67	10.11	9.37	12.34	6.98
Weight of dry soil	gr	66.11	68.18	67.15	66.67	72.02	76.15	71.61	72.73	68.08	40.53	53.37
Moisture Content	%	**14.2**	**14.9**	**12.1**	**15.4**	**8.3**	**7.9**	**9.3**	**13.9**	**13.8**	**30.4**	**13.1**
Dry Density	pcf	**111.3**	**110.1**	**100.4**	**114.7**	**94.9**	**109.0**	**122.4**	**116.2**	**105.4**	**90.0**	**121.2**
Degree of Saturation	%	**77**	**79**	**50**	**93**	**30**	**40**	**70**	**87**	**64**	**96**	**95**

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

MOISTURE CONTENT AND DRY DENSITY OF RING SAMPLES

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: JJ

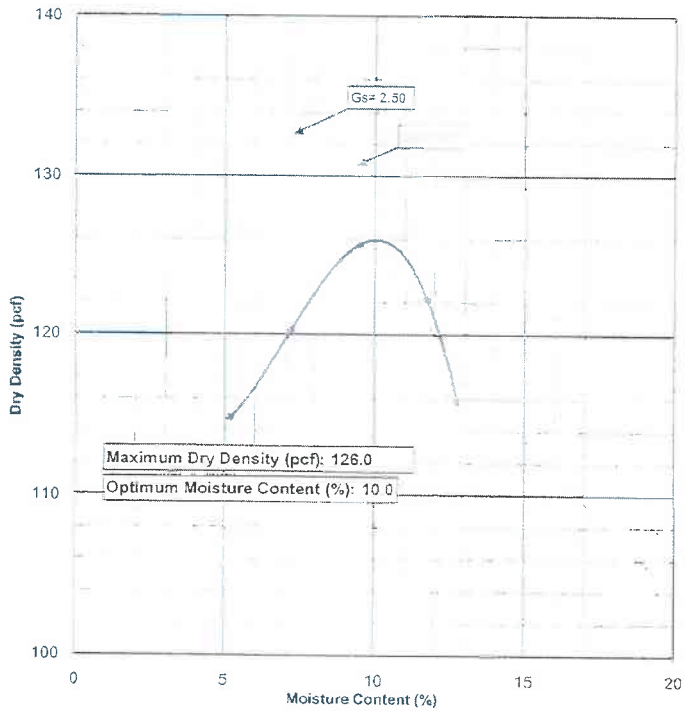
Boring No.		HBA 2		HBA 3			
Sample No.		1-1	1-2	1	2	3	4
Depth (ft)		5	18	6	20	37	50
Total wt of rings and soil	gr	1229.4	1198 2	1032.1	1021.4	1120.6	974.1
Height of sample	in	6	6	6	6	6	5
Diameter of sample	in	2.416	2.416	2.416	2.416	2.416	2.416
Volume of sample	cu.ft	0.0159	0.0159	0.0159	0.0159	0.0159	0.0133
Weight of rings	gr	254.48	254.48	254.48	254.48	254.48	212.06
Weight of soil	lbs.	2.149	2.081	1.714	1.691	1.909	1.680
Wet Density	pcf	135.0	130.7	107.7	106.2	120.0	126.6
Container No.		113	AB1	102	105	108	101
Weight of cont.+ wet soil	gr	65.09	61.25	68.24	67.41	68.25	68.58
Weight of cont.+ dry soil	gr	58.06	53.28	66.03	65.36	64.24	58.58
Weight of container	gr	11.32	10.22	11.06	10 22	10.72	10.89
Weight of water	gr	7.03	7.97	2.21	2.05	4.01	10.00
Weight of dry soil	gr	46.74	43.06	54.97	55.14	53.52	47.69
Moisture Content	%	**15.0**	**18.5**	**4.0**	**3.7**	**7.5**	**21.0**
Dry Density	pcf	**117.4**	**110.3**	**103.5**	**102.4**	**111.6**	**104.7**
Degree of Saturation	%	**97**	**98**	**18**	**16**	**41**	**96**

HUSHMAND ASSOCIATES INC.
Geotechnical and Earthquake Engineers

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

COMPACTION CURVE
(ASTM D1557)

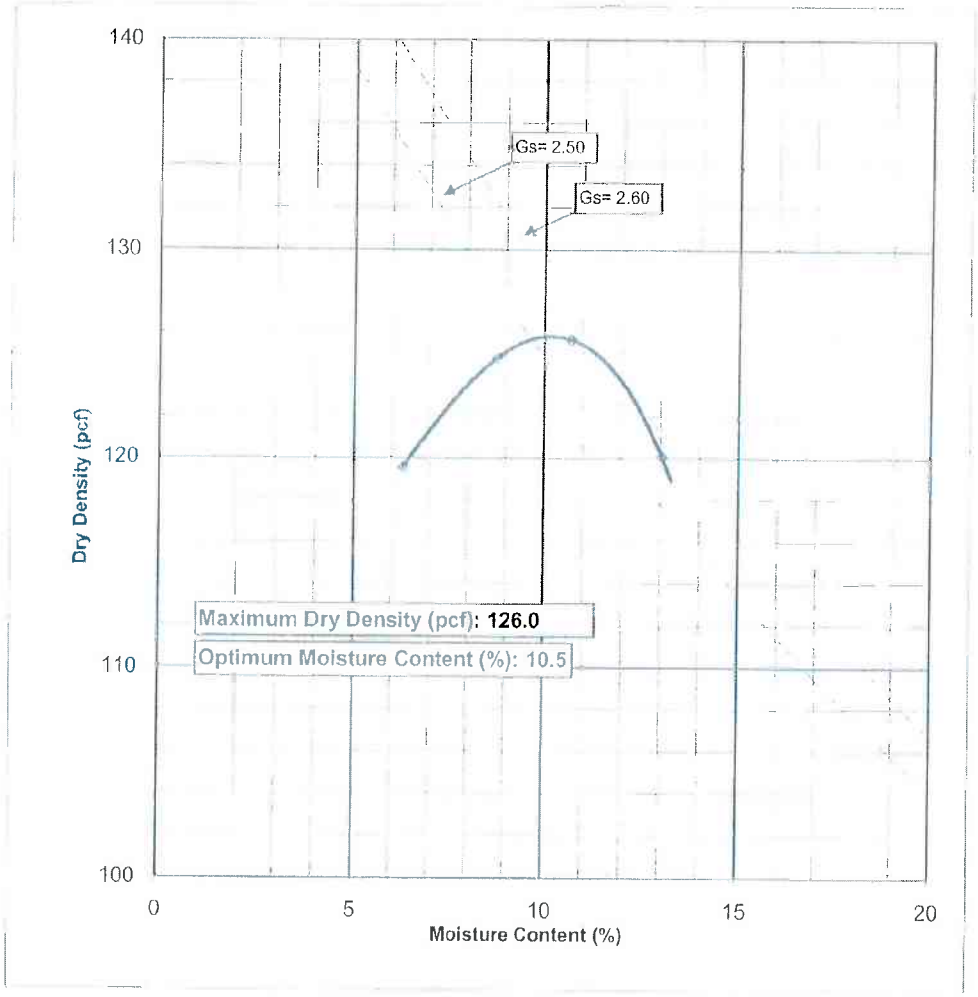
Client:	City of Lake Forest	*HAI Project No.:*	CLF-10-001
Project Name:	Alton Pkwy	*Tested by:*	MG/PM
Project No.:	--	*Checked by:*	SS
Boring No:	HB 11	*Date:*	4/7/2010
Sample No.:	AU 1 *Depth:* 0 - 5'	*Mold size:*	4 in
Soil Description:	Olive Brown, Clayey Sand (SC)	*Procedure:*	A
		% Ret. on # 4:	0.0



HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

COMPACTION CURVE
(ASTM D1557)

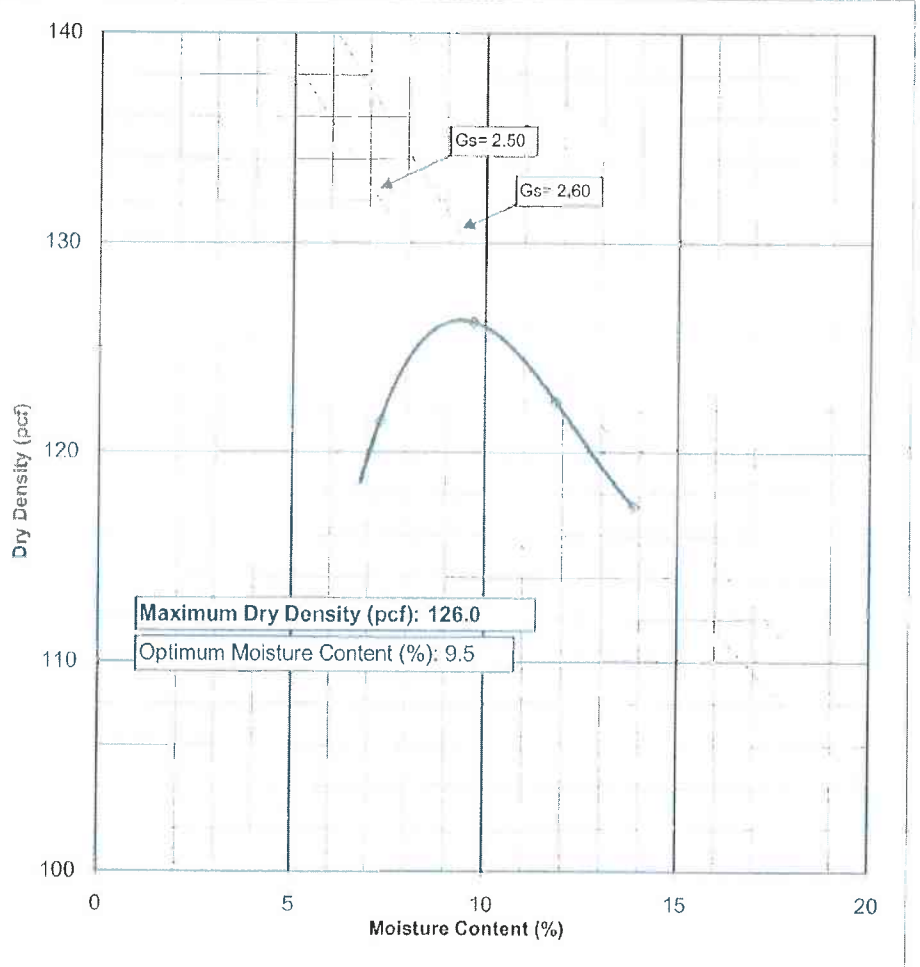
Client :	City of Lake Forest	*HAI Project No.:*	CLF-10-001
Project Name:	Alton Pkwy	*Tested by:*	MG/PM
Project No.:	---	*Checked by:*	SS
Boring No:	HB 16	*Date:*	4/7/2010
Sample No.:	AU 1 *Depth:* 0 - 5'	*Mold size:*	4 in
Soil Description:	Olive Brown, Clayey Sand (SC)	*Procedure:*	A
		% Ret. on # 4:	4.5



HAI HUSHMAND ASSOCIATES, INC.
Geotechnical Laboratory

COMPACTION CURVE
(ASTM D1557)

Client :	City of Lake Forest	***HAI Project No.:***	CLF-10-001
Project Name:	Alton Pkwy	***Tested by:***	MG/PM
Project No.:	---	***Checked by:***	SS
Boring No:	HB 1	***Date:***	4/7/2010
Sample No.:	AU 1 ***Depth:*** 0 - 5'	***Mold size:***	4 in
Soil Description:	Light Brown, Silty Sand (SM)	***Procedure:***	A
		% Ret. on # 4:	2.4

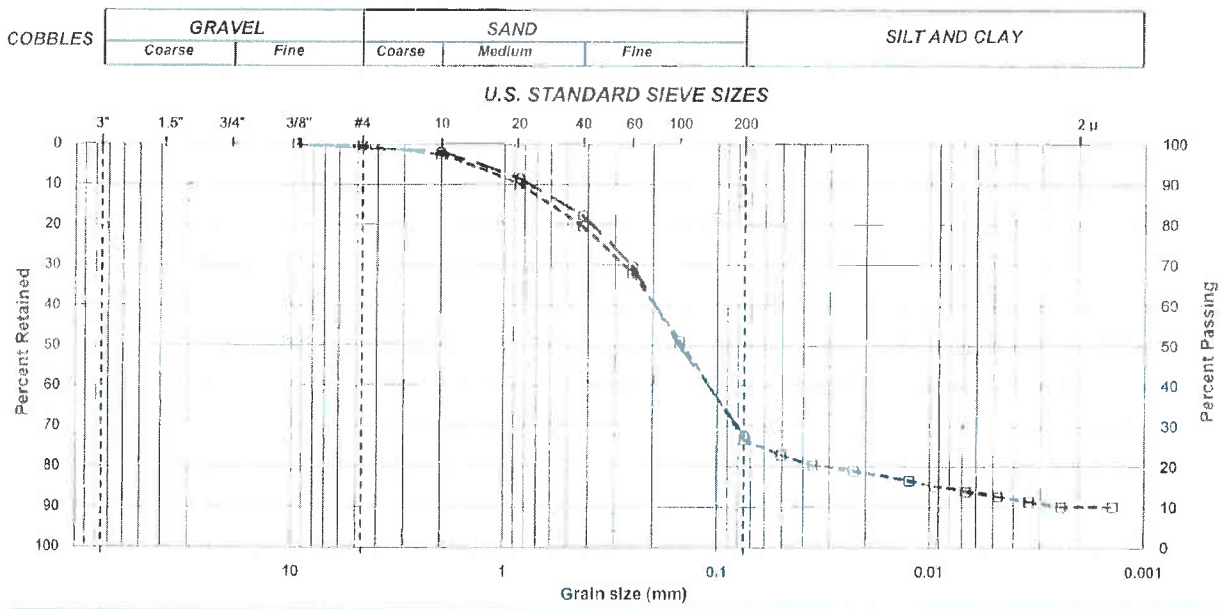


HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines	2µ
HB 1	SPT 3 @ 10	○	--	--	Olive Brown, Clayey Sand (SC)	1.1	71.1	27.8	---
	MC 6 @ 25	□	--	--	Gray with Yellow dots, Silty Sand (SM)	0.6	72.8	26.6	10.2

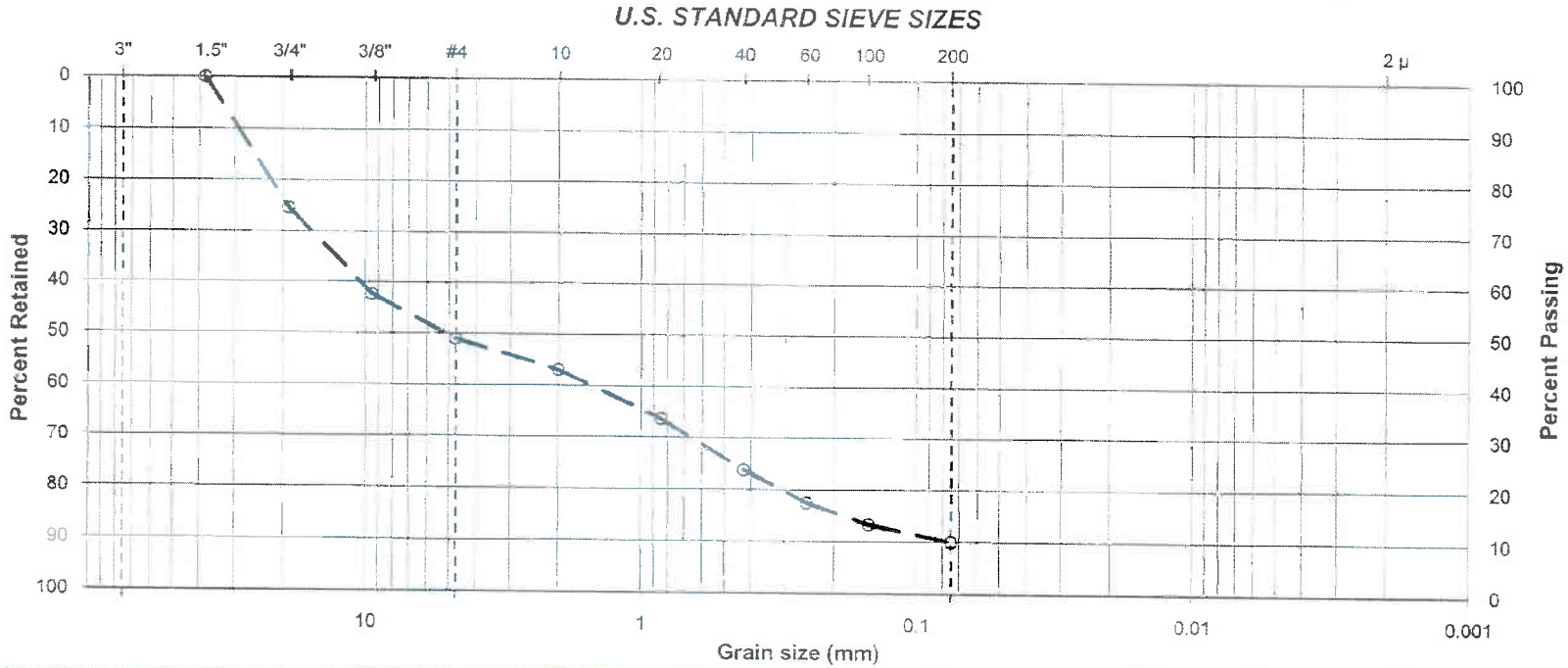
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines
HB 3	SPT 5 @ 20	O	--	--	Reddish Brown, Poorly graded Gravel with Silt and Sand (GP-GM)	51.0	38.9	10.1

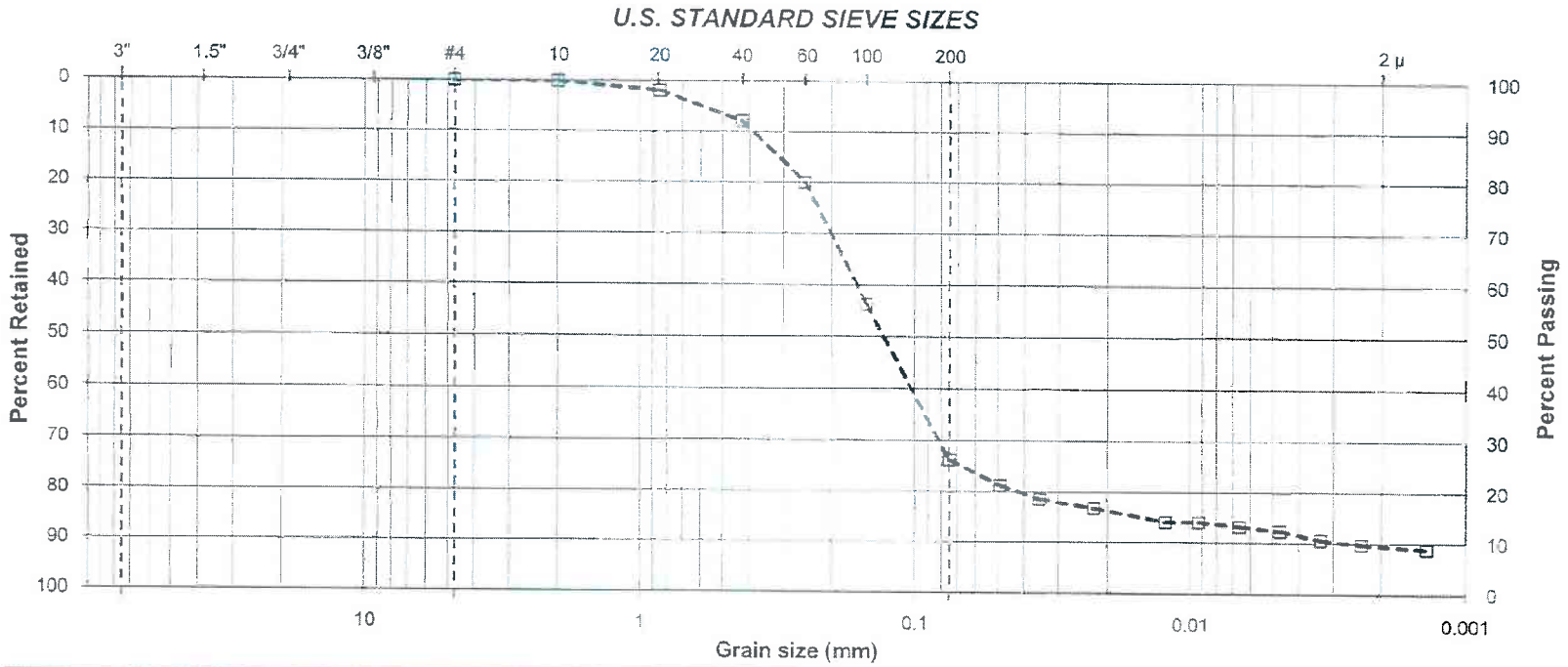
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: TRUE
Project No.: CLF-10-001

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



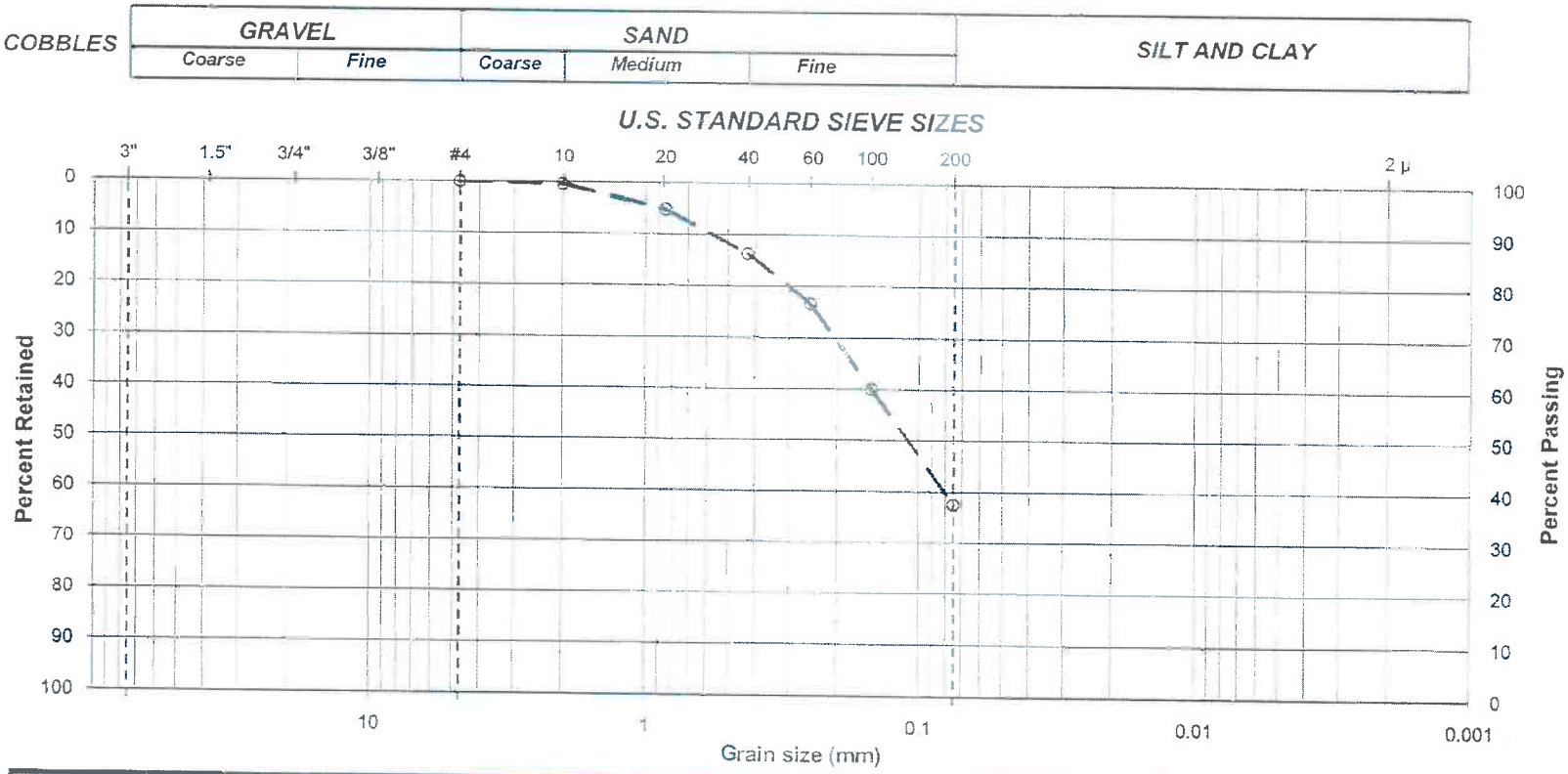
Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines	2µ
HB 4	SPT 5 @ 20	□	--	--	Olive Brown, Silty Sand (SM)	0.0	73.8	26.2	9.3

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines
HB 5	SPT 3 @ 10	○	--	--	Yellowish Brown, Clayey Sand (SC)	0.0	62.5	37.5

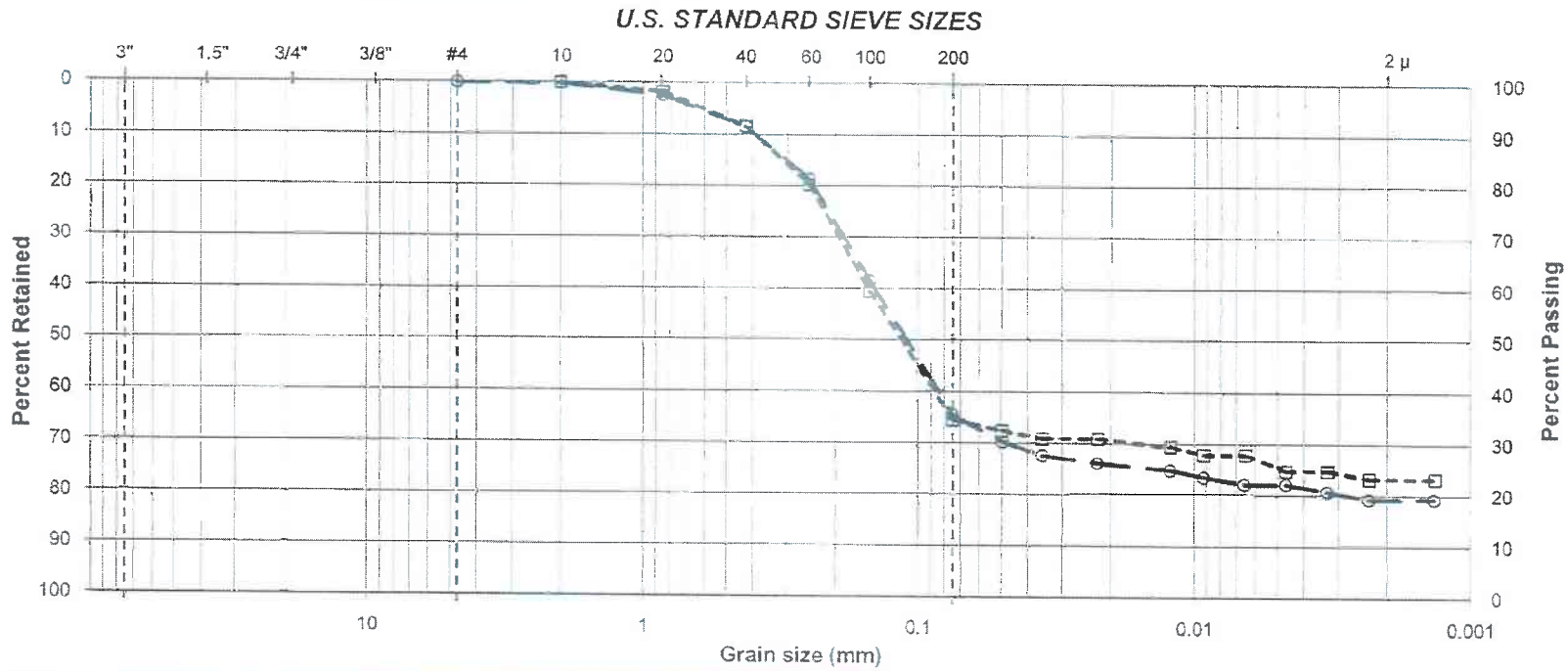
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



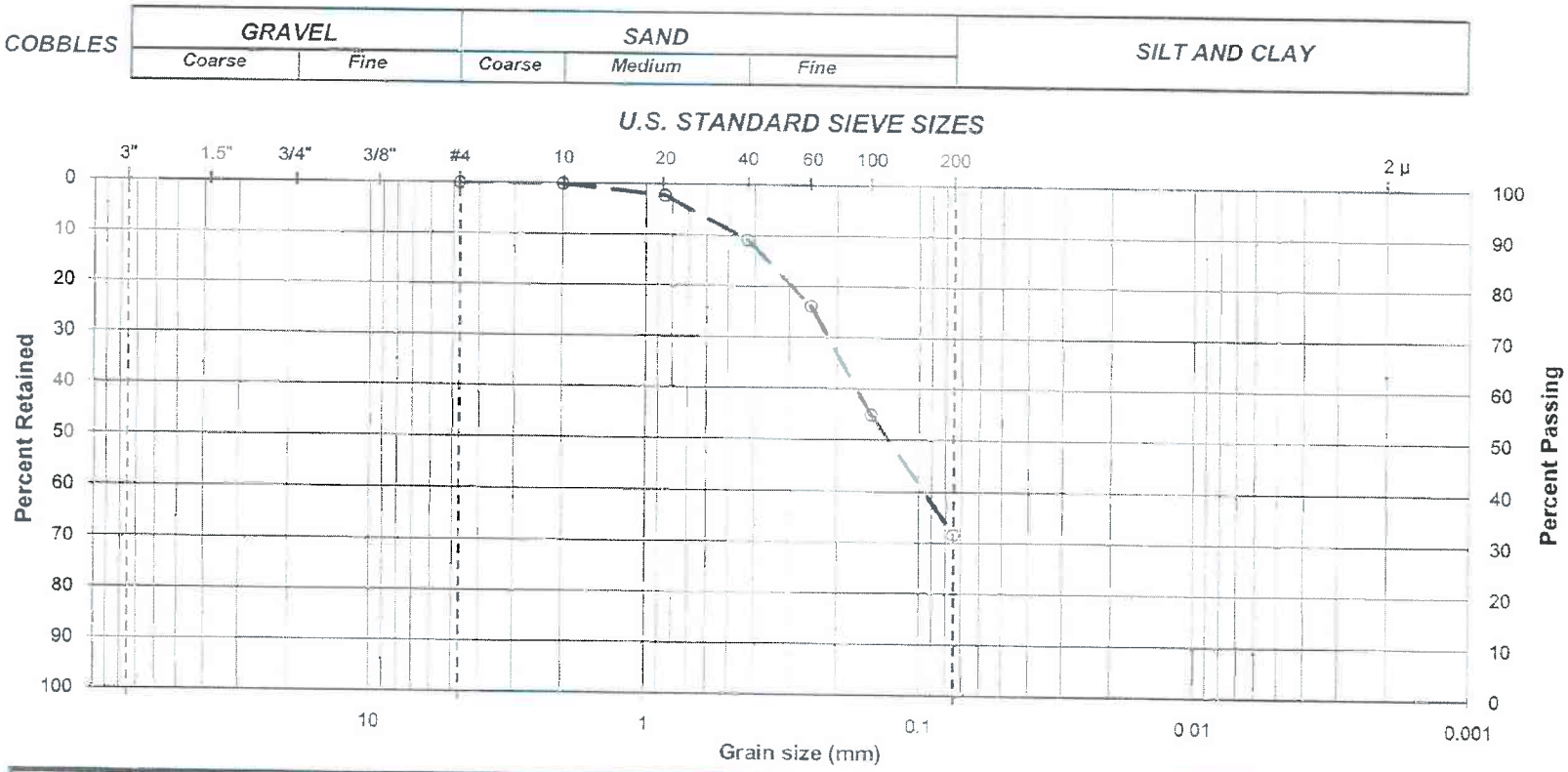
Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines	2µ
HB 7	MC 2 @ 5	○	--	--	Dark Brown, Silty Sand (SM)	0.0	64.5	35.5	19.3
	MC 4 @ 15	□	--	--	Olive Brown, Silty Sand (SM)	0.0	65.4	34.6	23.2

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines
HB 10	SPT 3 @ 10	O	--	--	Brown, Silty Sand (SM)	0.0	68.4	31.6

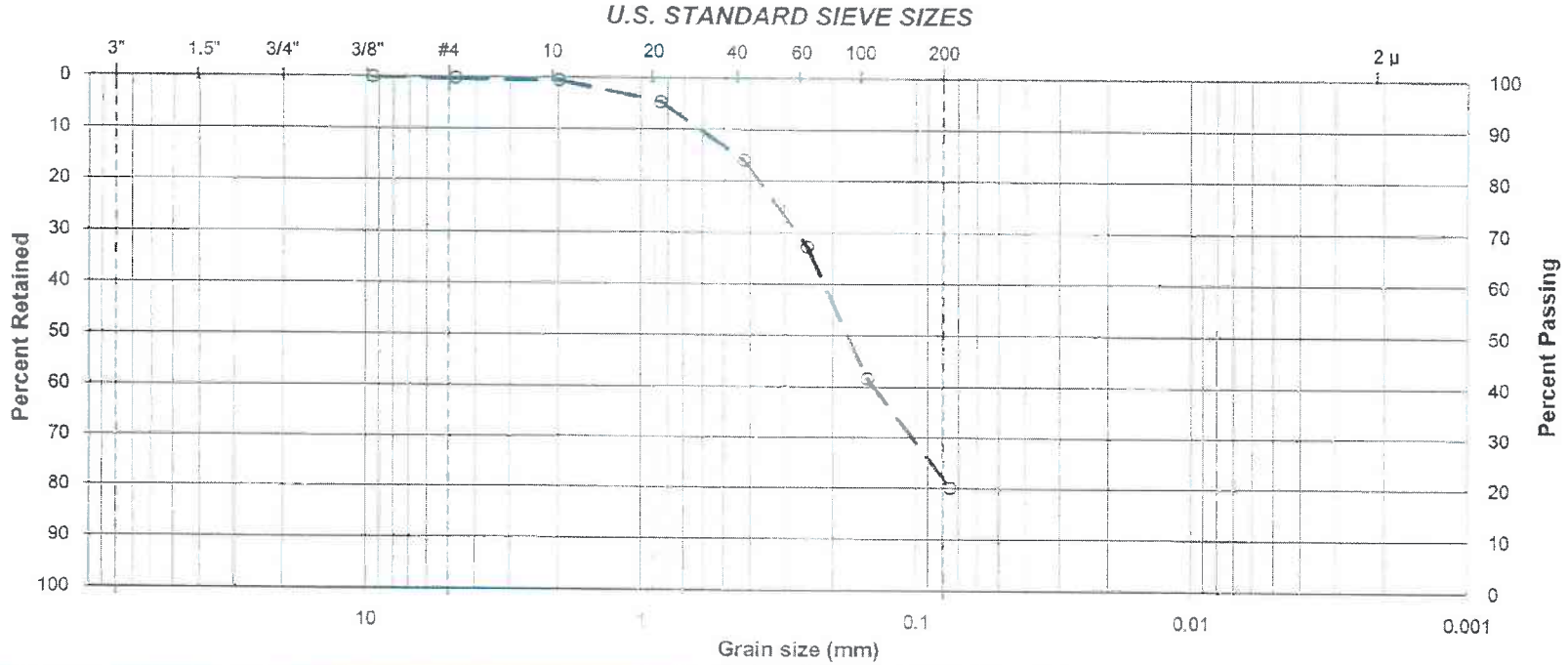
HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines
HB 12	SPT 3 @ 10	O	--	--	Olive Brown, Silty Sand (SM)	0.3	79.8	20.0

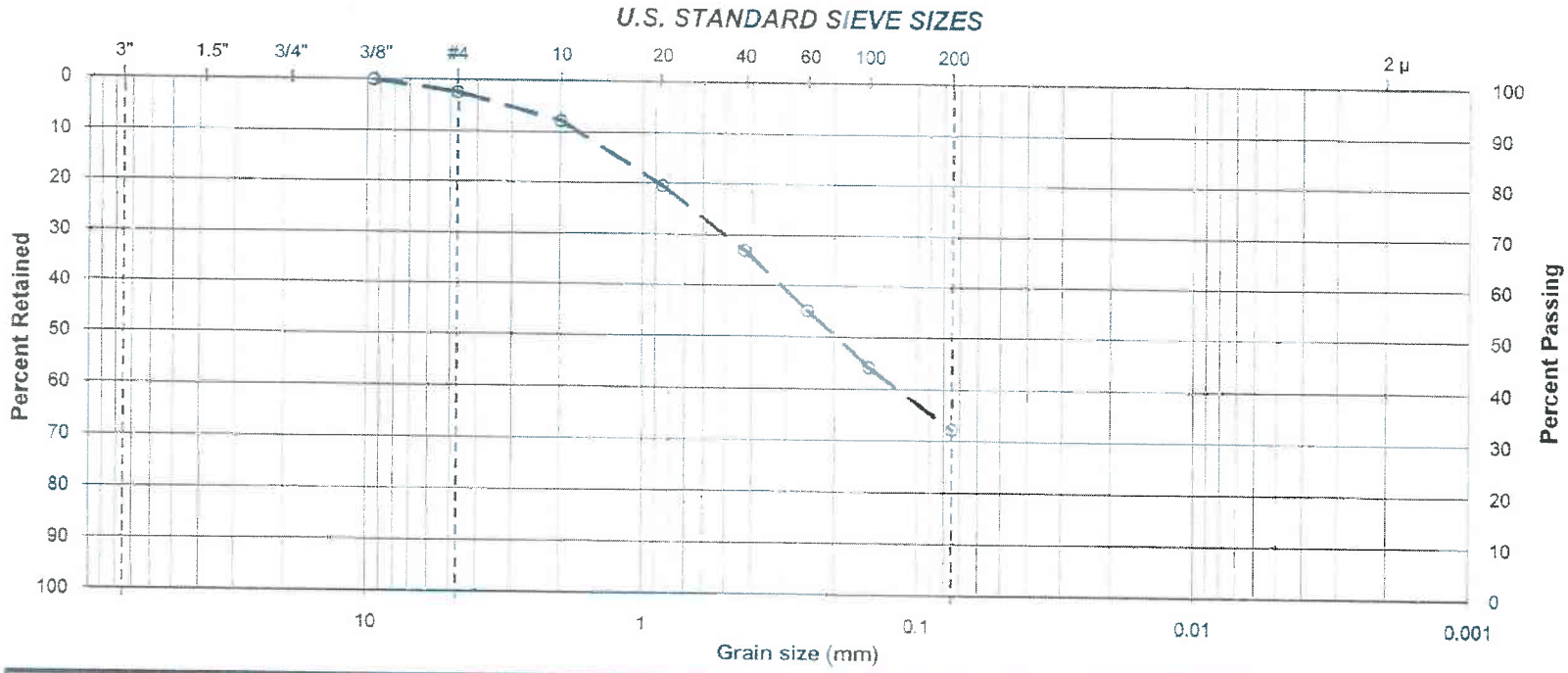
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/1/2010

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines
HB 14	SPT 3 @ 10	○	--	--	Dark Brown, Silty Sand (SM)	2.4	65.4	32.2

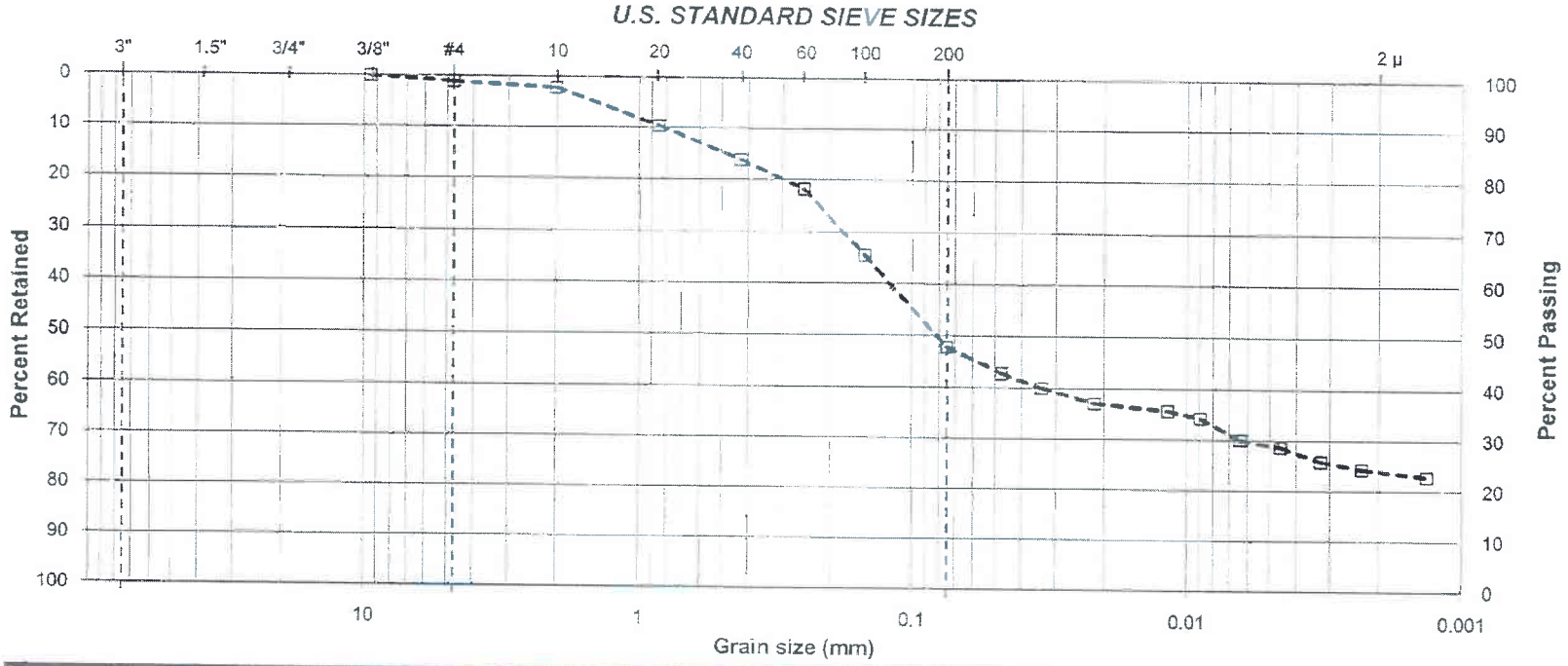
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/9/2010

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No. & Depth (ft)	Symbol	LL	PI	USCS	% Gravel	% Sand	% Fines	2µ
HBA 1	1 @ 5	□	43	11	Light Gray, Silty Sand (SM)	1.1	51.1	47.8	23.5

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

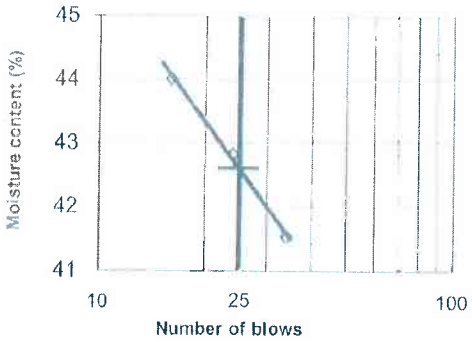
ATTERBERG LIMITS
(ASTM D 4318)

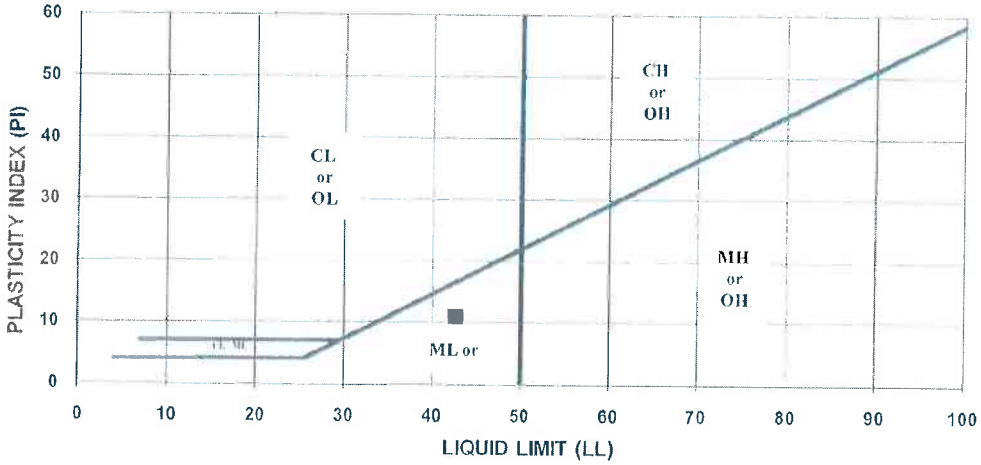
Client: City of Lake Forest
Project Name: Alton Pkwy
Project No.: ---
Boring No.: HBA 1
Sample No.: 1 **Depth:** 5'
Soil Description: Light Gray, Silty Sand (SM)
(Passing # 200 < 50%)

HAI Project No.: CLF-10-001
Tested by: PM
Checked by: SS
Date: 4/11/2010

Test		LL	LL	LL	PL	PL
Tare No.		20	17	9	F2	F5
No. of blows		**34**	**24**	**16**		
Wt. of wet soil + tare	(g)	22.44	22.60	22.89	9.51	9.16
Wt. of dry soil + tare	(g)	19.06	19.14	19.26	7.49	7.23
Wt. of tare	(g)	10.92	11.06	11.01	1.13	1.12
Water content	(%)	**41.5**	**42.8**	**44.0**	**31.8**	**31.6**

Liquid Limit	43
Plastic Limit	32
Plasticity Index	11
USCS	ML





HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 5333)

Client : City of Lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-002
Tested by: PM
Checked by: JT
Date: 4/10/2010

Boring No.: HB 7 *Sample No.:* MC 4 *Depth:* 15'
Soil Description: Olive Brown, Silty Sand (SM)
Type of Sample: Undisturbed ring

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
156.19	153.94	130.26

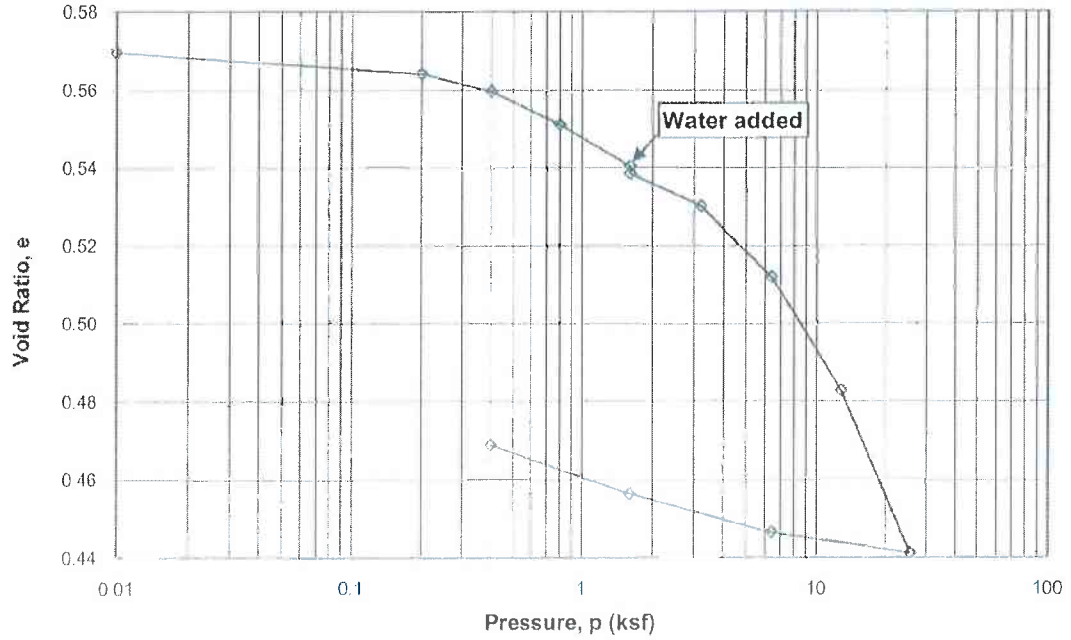
			Initial Conditions	Unload
Height	H	(in)	1.0080	0.9433
Height of Solids	Hs	(in)	0.642	0.642
Height of Water	Hw	(in)	0.345	0.315
Height of Air	Ha	(in)	0.021	-0.014
Dry Density		(pcf)	**108.2**	**114.7**
Water Content		(%)	**19.9**	**18.2**
Saturation		(%)	**94.4**	**104.7**

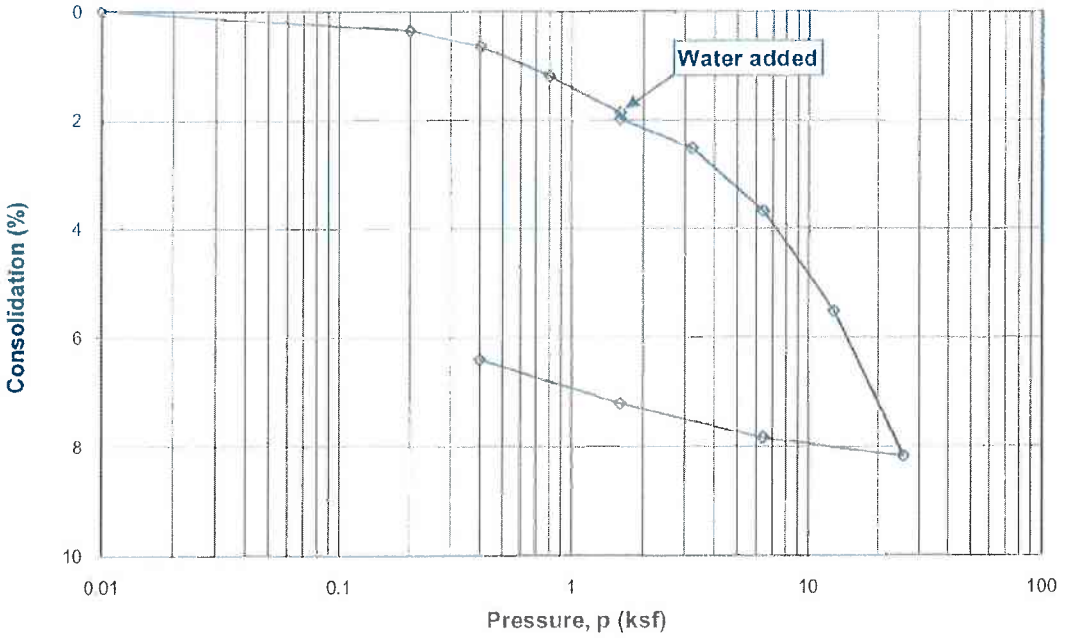
Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	t_{50} (sec)	a_v (ksf)	M_v (ksf)
0.01	------	1.0080	0.366	0.570	0			
0.2	0.0035	1.0045	0.362	0.564	0.3		2.9E-02	1.8E-02
0.4	0.0064	1.0016	0.359	0.560	0.6		2.3E-02	1.4E-02
0.8	0.0119	0.9961	0.354	0.551	1.2		2.1E-02	1.4E-02
1.6	0.0188	0.9892	0.347	0.540	1.9		1.3E-02	8.7E-03
1.6	0.0200	0.9880	0.346	0.538	2.0	ADD WATER		
3.2	0.0254	0.9826	0.340	0.530	2.5		5.3E-03	3.4E-03
6.4	0.0371	0.9709	0.329	0.512	3.7		5.7E-03	3.8E-03
12.8	0.0557	0.9523	0.310	0.483	5.5		4.5E-03	3.1E-03
25.6	0.0825	0.9255	0.283	0.441	8.2		3.3E-03	2.3E-03
6.4	0.0791	0.9289	0.287	0.446	7.8	UNLOAD		
2	0.0727	0.9353	0.293	0.456	7.2			
0.4	0.0647	0.9433	0.301	0.469	6.4			

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 5333)

Project Name: Alton Pkwy
Boring No.: **HB 7** ***Sample No.:*** **MC 4** ***Depth:*** **15'**
Soil Description: Olive Brown, Silty Sand (SM)





HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D2435)

Client :	City of Lake Forest	*HAI Project No.:*	CLF-10-002
Project Name:	Alton Pkwy	*Tested by:*	PM
Project No.:	---	*Checked by:*	JT
		Date:	4/7/2010

Boring No.: **HB 9** *Sample No.:* **ST 3** *Depth:* **11.5'**
Soil Description: Olive Brown, Sandy Lean Clay (CL)
Type of Sample: Extracted from Shelby tube

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
133.38	133.88	100.68

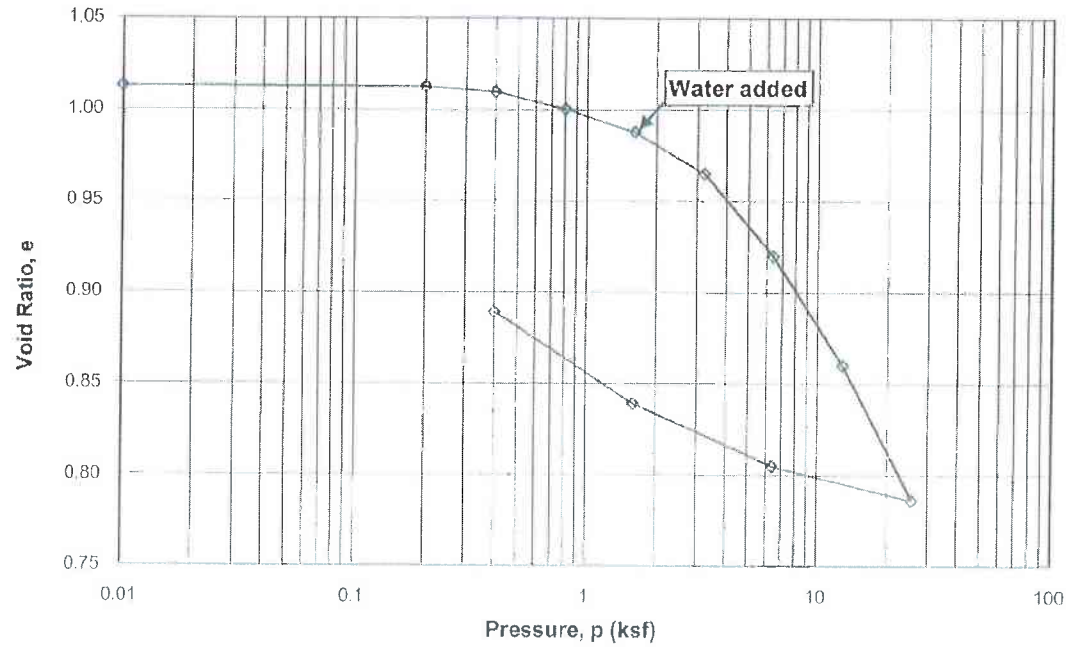
			Initial Conditions	Unload
Height	**H**	**(in)**	0.999	0.9377
Height of Solids	**Hs**	**(in)**	0.496	0.496
Height of Water	**Hw**	**(in)**	0.435	0.442
Height of Air	**Ha**	**(in)**	0.067	-0.001
Dry Density		**(pcf)**	**83.6**	**89.2**
Water Content		**(%)**	**32.5**	**33.0**
Saturation		**(%)**	**86.6**	**100.1**

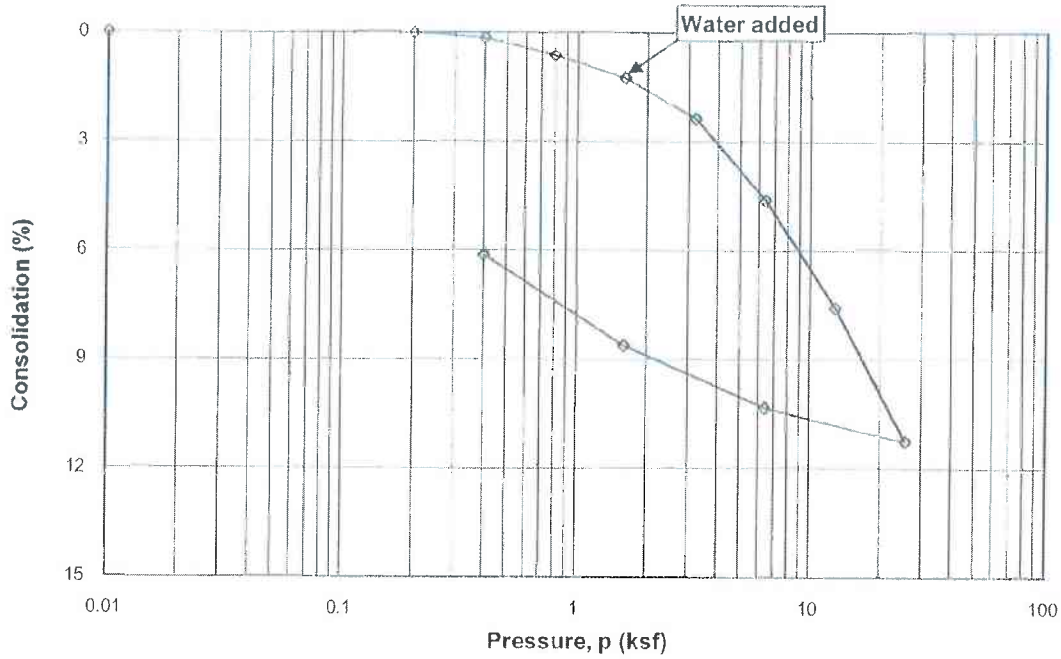
Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	t_{50} (sec)	a_v (ksf)	M_v (ksf)
0.01	------	0.9990	0.503	1.013	0			
0.2	0.0001	0.9989	0.503	1.012	0.0		1.1E-03	5.3E-04
0.4	0.0015	0.9975	0.501	1.010	0.2		1.4E-02	7.0E-03
0.8	0.0062	0.9928	0.496	1.000	0.6		2.4E-02	1.2E-02
1.6	0.0124	0.9866	0.490	0.988	1.2		1.6E-02	7.9E-03
1.6	0.0124	0.9866	0.490	0.988	1.2	ADD WATER		
3.2	0.0238	0.9752	0.479	0.965	2.4		1.4E-02	7.3E-03
6.4	0.0462	0.9528	0.456	0.920	4.6		1.4E-02	7.3E-03
12.8	0.0758	0.9232	0.427	0.860	7.6		9.3E-03	5.0E-03
25.6	0.1125	0.8865	0.390	0.786	11.3		5.8E-03	3.2E-03
6.4	0.1032	0.8958	0.399	0.805	10.3	UNLOAD		
2	0.0862	0.9128	0.416	0.839	8.6			
0.4	0.0613	0.9377	0.441	0.889	6.1			

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D2435)

Project Name:	Alton Pkwy				
Boring No.:	**HB 9**	***Sample No.:***	**ST 3**	***Depth:***	**11.5'**
Soil Description:	Olive Brown, Sandy Lean Clay (CL)				





HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 2435)

Client :	City of Lake Forest	*HAI Project No.:*	CLF-10-002
Project Name:	Alton Pkwy	*Tested by:*	PM
Project No.:	---	*Checked by:*	SS
		Date:	4/16/2010

Boring No.: HB 12 *Sample No.:* MC 4 (B) *Depth:* 15'
Soil Description: Olive Brown, Silty Sand (SM)
Type of Sample: Undisturbed ring

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
129.21	141.53	117.23

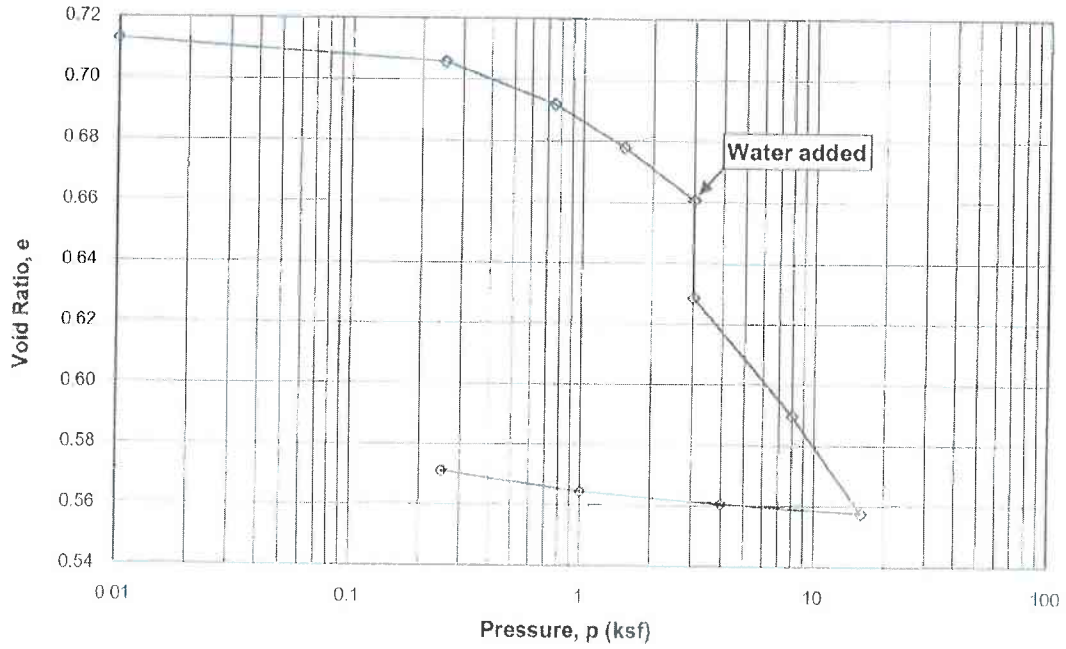
			Initial Conditions	Unload
Height	H	(in)	0.9900	0.9080
Height of Solids	Hs	(in)	0.578	0.578
Height of Water	Hw	(in)	0.159	0.323
Height of Air	Ha	(in)	0.253	0.007
Dry Density		(pcf)	**97.4**	**107.2**
Water Content		(%)	**10.2**	**20.7**
Saturation		(%)	**38.7**	**98.0**

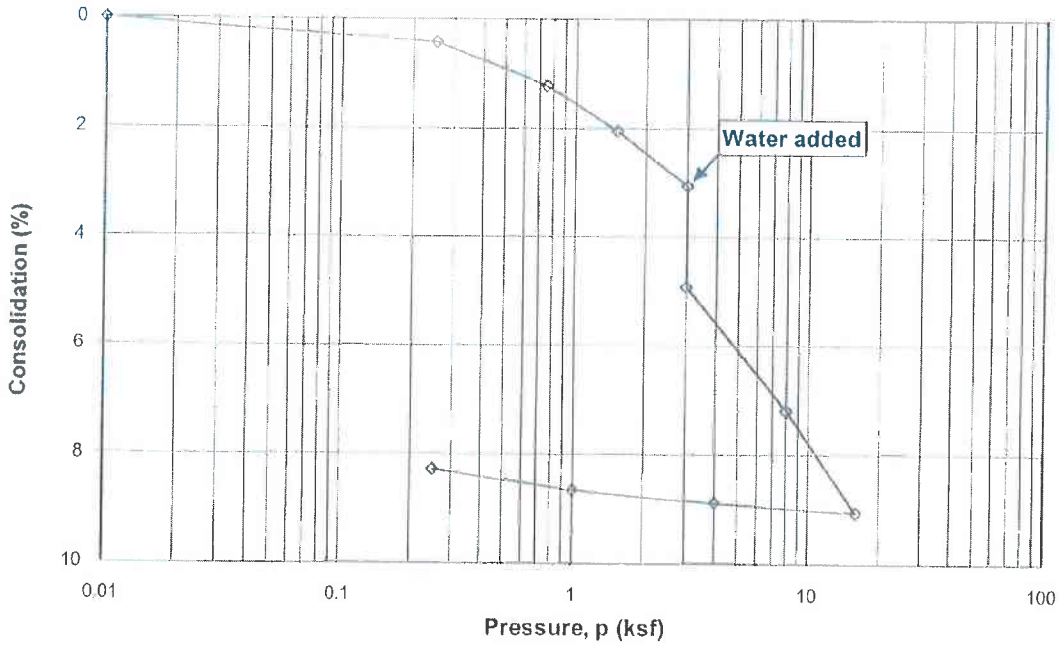
Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	t_{50} (sec)	a_v (ksf)	M_v (ksf)
0.01	-------	0.9900	0.412	0.713	0			
0.25	0.0042	0.9858	0.408	0.706	0.4		3.0E-02	1.8E-02
0.75	0.0121	0.9779	0.400	0.692	1.2		2.7E-02	1.6E-02
1.5	0.0203	0.9697	0.392	0.678	2.1		1.9E-02	1.1E-02
3	0.0303	0.9597	0.382	0 661	3.1		1.2E-02	6.9E-03
3	0.0488	0.9412	0.363	0.629	4.9	ADD WATER		
8	0.0713	0.9187	0.341	0.590	7.2		7.8E-03	4.9E-03
16	0.0898	0.9002	0.322	0.558	9.1		4.0E-03	2.6E-03
4	0.0881	0.9019	0.324	0.561	8.9	UNLOAD		
1	0.0858	0.9042	0.326	0.564	8.7			
0.25	0.0820	0.9080	0.330	0.571	8.3			

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 2435)

Project Name: Alton Pkwy
Boring No.: **HB 12** ***Sample No.:*** **MC 4 (B)** ***Depth:*** **15'**
Soil Description: Olive Brown, Silty Sand (SM)





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HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 5333)

Client : City of Lake Forest
Project Name: Alton Pkwy
Project No.: ---

HAI Project No.: CLF-10-002
Tested by: PM
Checked by: JT
Date: 4/7/2010

Boring No.: HB 12 *Sample No.:* MC 4 *Depth:* 15'
Soil Description: Olive Brown, Silty Sand (SM)
Type of Sample: Undisturbed ring

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
134.05	144.24	123.37

			Initial Conditions	Unload
Height	H	(in)	0.9945	0.9161
Height of Solids	Hs	(in)	0.613	0.613
Height of Water	Hw	(in)	0.142	0.278
Height of Air	Ha	(in)	0.240	0.026
Dry Density		(pcf)	**102.5**	**111.9**
Water Content		(%)	**8.7**	**16.9**
Saturation		(%)	**37.2**	**91.6**

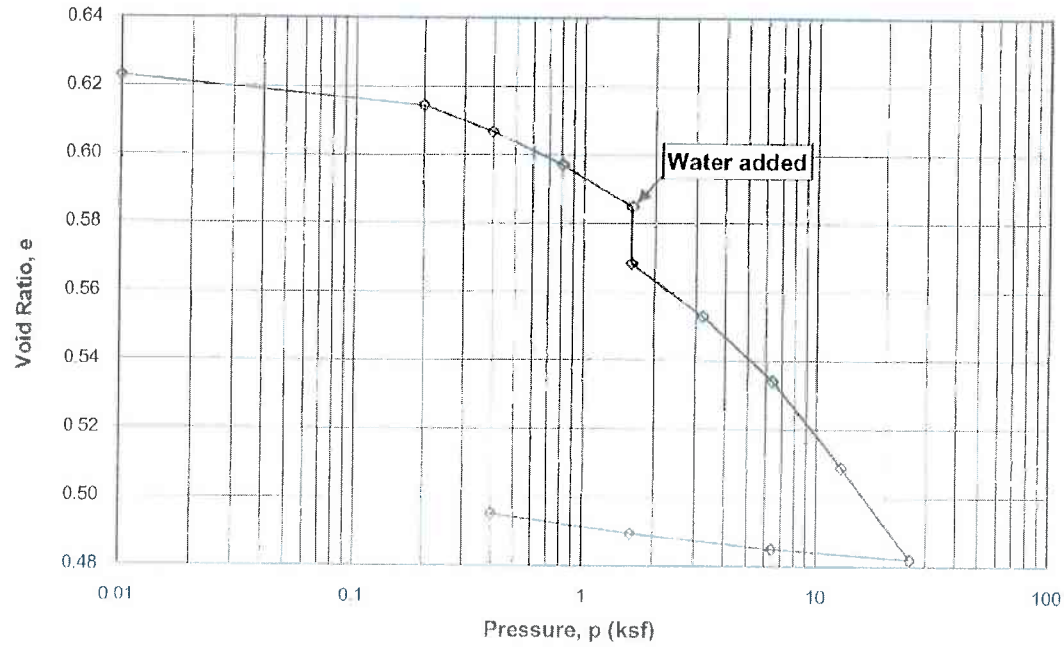
Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	t_{50} (sec)	a_v (ksf)	M_v (ksf)
0.01	-------	0.9945	0.382	0.623	0			
0.2	0.0053	0.9892	0.376	0.614	0.5		4.6E-02	2.8E-02
0.4	0.0100	0.9845	0.372	0.607	1.0		3.8E-02	2.4E-02
0.8	0.0159	0.9786	0.366	0.597	1.6		2.4E-02	1.5E-02
1.6	0.0234	0.9711	0.358	0.585	2.4		1.5E-02	9.7E-03
1.6	0.0335	0.9610	0.348	0.568	3.4	ADD WATER		
3.2	0.0430	0.9515	0.339	0.553	4.3		9.7E-03	6.2E-03
6.4	0.0546	0.9399	0.327	0.534	5.5		5.9E-03	3.9E-03
12.8	0.0700	0.9245	0.312	0.509	7.0		3.9E-03	2.6E-03
25.6	0.0864	0.9081	0.295	0.482	8.7		2.1E-03	1.4E-03
6.4	0.0846	0.9099	0.297	0.485	8.5	UNLOAD		
2	0.0819	0.9126	0.300	0.489	8.2			
0.4	0.0784	0.9161	0.303	0.495	7.9			

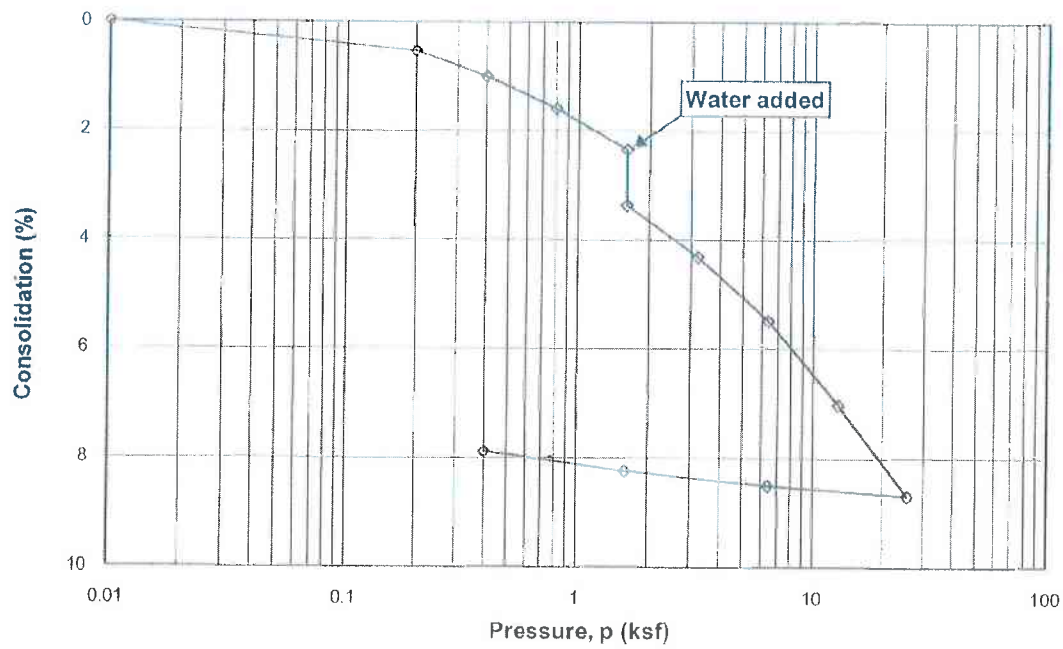
Duplicate

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 5333)

Project Name: Alton Pkwy
Boring No.: HB 12 *Sample No.:* MC 4 *Depth:* 15'
Soil Description: Olive Brown, Silty Sand (SM)





HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 5333)

Client :	City of Lake Forest	*HAI Project No.:*	CLF-10-002
Project Name:	Alton Pkwy	*Tested by:*	PM
Project No.:	---	*Checked by:*	SS
		Date:	4/7/2010

Boring No.: **HB 17** *Sample No.:* **MC 2** *Depth:* **5'**
Soil Description: Dark Brown, Lean Clay with Sand (CL)
Type of Sample: Extracted from Shelby tube

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
158.96	157.93	139.22

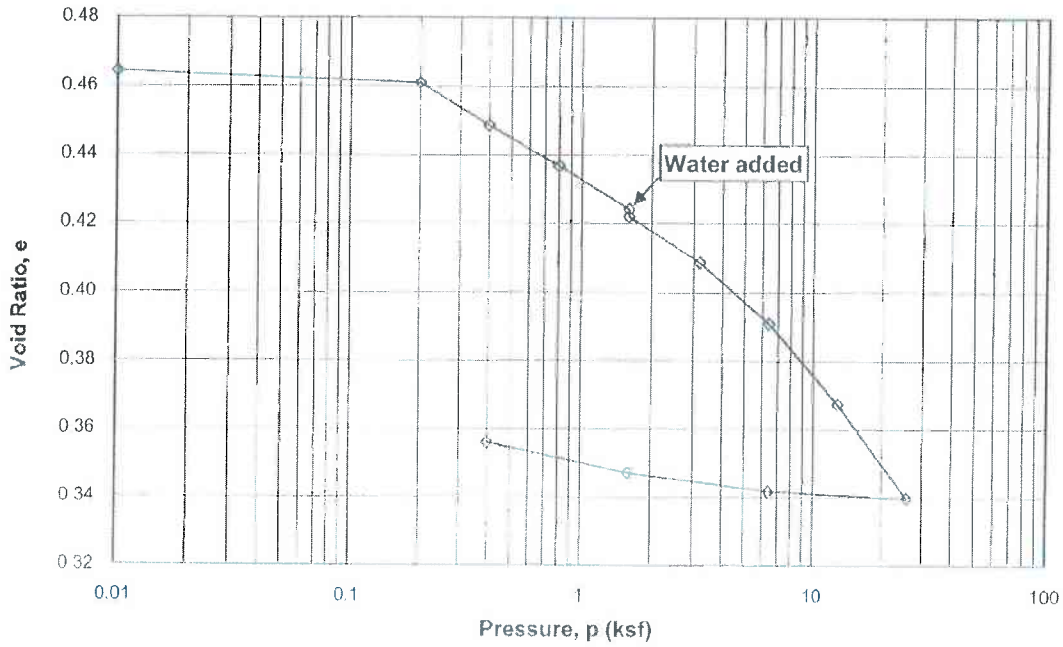
			Initial Conditions	Unload
Height	H	(in)	1.0050	0.9307
Height of Solids	Hs	(in)	0.686	0.686
Height of Water	Hw	(in)	0.263	0.249
Height of Air	Ha	(in)	0.056	-0.005
Dry Density		(pcf)	**115.6**	**124.2**
Water Content		(%)	**14.2**	**13.4**
Saturation		(%)	**82.5**	**101.9**

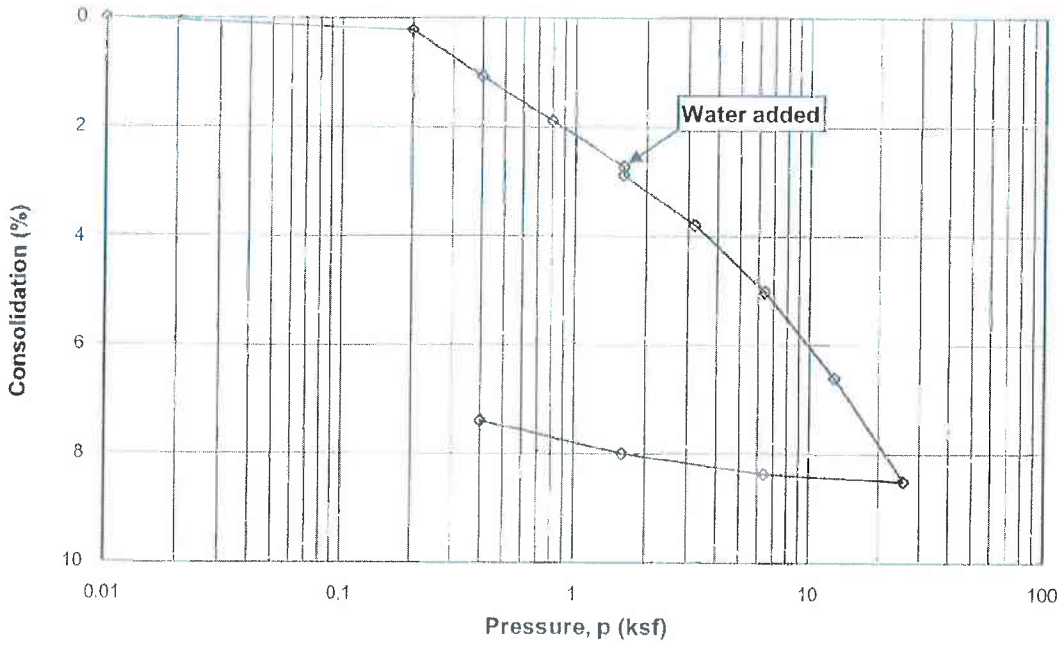
Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	t_{50} (sec)	a_v (ksf)	M_v (ksf)
0.01	------	1.0050	0.319	0.464	0			
0.2	0.0022	1.0028	0.316	0.461	0.2		1.7E-02	1.2E-02
0.4	0.0108	0.9942	0.308	0.449	1.1		6.3E-02	4.3E-02
0.8	0.0189	0.9861	0.300	0.437	1.9		3.0E-02	2.1E-02
1.6	0.0275	0.9775	0.291	0.424	2.7		1.6E-02	1.1E-02
1.6	0.0290	0.9760	0.290	0.422	2.9	ADD WATER		
3.2	0.0381	0.9669	0.281	0.409	3.8		8.3E-03	5.9E-03
6.4	0.0504	0.9546	0.268	0.391	5.0		5.6E-03	4.0E-03
12.8	0.0665	0.9385	0.252	0.367	6.6		3.7E-03	2.7E-03
25.6	0.0855	0.9195	0.233	0.340	8.5		2.2E-03	1.6E-03
6.4	0.0841	0.9209	0.235	0.342	8.4			
2	0.0804	0.9246	0.238	0.347	8.0	UNLOAD		
0.4	0.0743	0.9307	0.244	0.356	7.4			

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 5333)

Project Name: Alton Pkwy
Boring No.: **HB 17** ***Sample No.:*** **MC 2** ***Depth:*** **5'**
Soil Description: Dark Brown, Lean Clay with Sand (CL)





HAI HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

CONSOLIDATION TEST
(ASTM D 2435)

Client :	City of Lake Forest	*HAI Project No.:*	CLF-10-002
Project Name:	Alton Pkwy	*Tested by:*	PM
Project No.:	---	*Checked by:*	SS
		Date:	4/12/2010

Boring No.: HT 1 *Sample No.:* 2 *Depth:* 4'
Soil Description: Dark Gray to Brown, Silty Sand (SM)
Type of Sample: Undisturbed ring

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
154.20	151.78	130.41

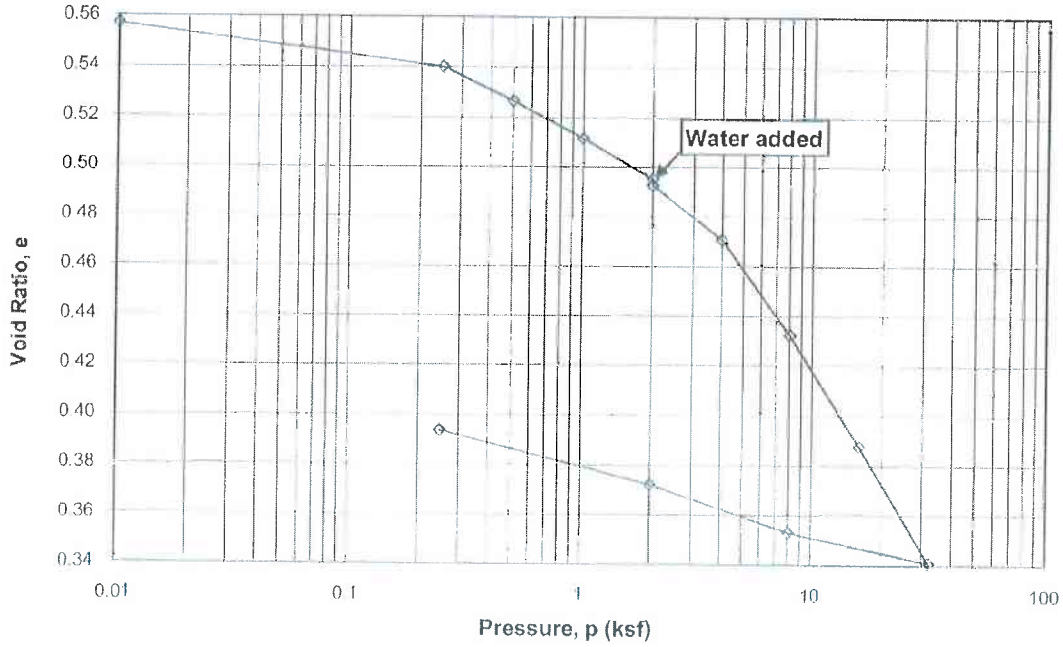
			Initial Conditions	Unload
Height	H	(in)	1.0010	0.8960
Height of Solids	Hs	(in)	0.643	0.643
Height of Water	Hw	(in)	0.317	0.284
Height of Air	Ha	(in)	0.041	-0.031
Dry Density		(pcf)	**108.3**	**120.9**
Water Content		(%)	**18.2**	**16.4**
Saturation		(%)	**88.4**	**112.4**

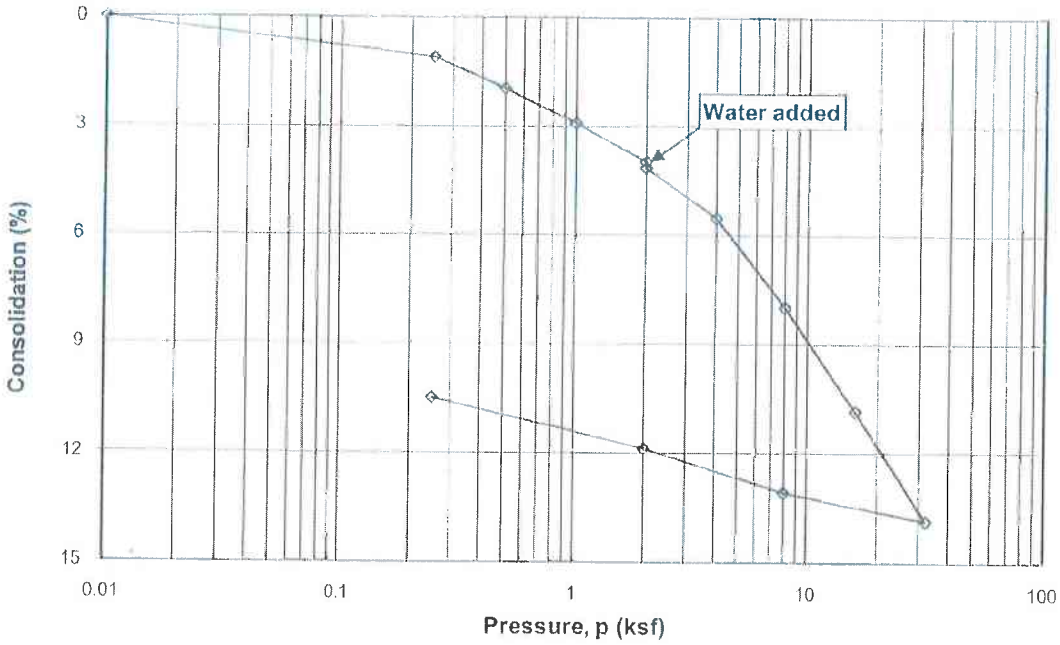
Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	t_{50} (sec)	a_v (ksf)	M_v (ksf)
0.01	-------	1.0010	0.358	0.557	0			
0.25	0.0108	0.9902	0.347	0.540	1.1		7.0E-02	4.5E-02
0.5	0.0196	0.9814	0.338	0.526	2.0		5.5E-02	3.6E-02
1	0.0292	0.9718	0.329	0.512	2.9		3.0E-02	2.0E-02
2	0.0397	0.9613	0.318	0.495	4.0		1.6E-02	1.1E-02
2	0.0414	0.9596	0.317	0.493	4.1	ADD WATER		
4	0.0555	0.9455	0.303	0.471	5.5		1.1E-02	7.5E-03
8	0.0801	0.9209	0.278	0.432	8.0		9.6E-03	6.7E-03
16	0.1087	0.8923	0.249	0.388	10.9		5.6E-03	4.0E-03
32	0.1389	0.8621	0.219	0.341	13.9		2.9E-03	2.2E-03
8	0.1311	0.8699	0.227	0.353	13.1			
2	0.1189	0.8821	0.239	0.372	11.9	UNLOAD		
0.25	0.1050	0.8960	0.253	0.394	10.5			

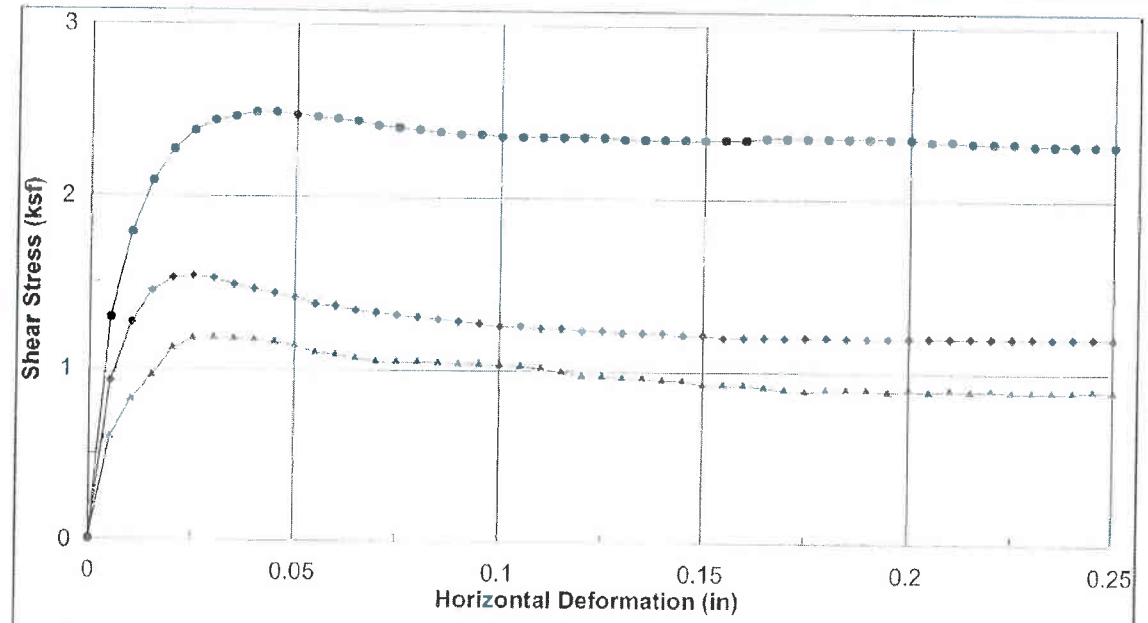
HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

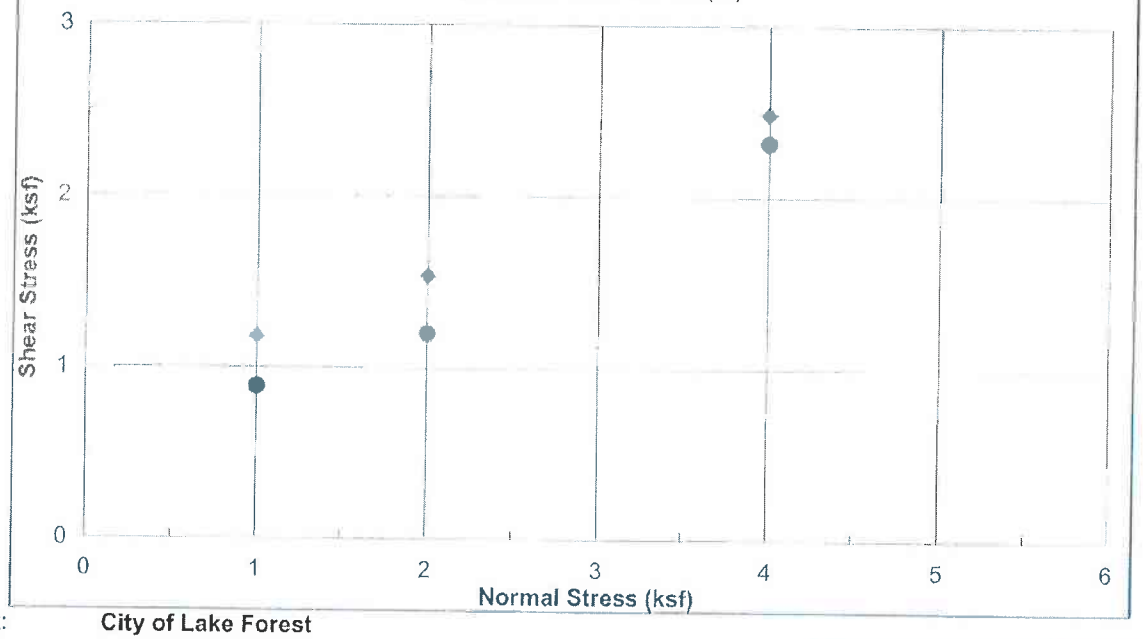
CONSOLIDATION TEST
(ASTM D 2435)

Project Name: Alton Pkwy
Boring No.: **HT 1** ***Sample No.:*** **2** ***Depth:*** **4'**
Soil Description: Dark Gray to Brown, Silty Sand (SM)









Client: **City of Lake Forest**
Project Name: **Alton Pkwy**
Boring No.: **HB 11**
Sample No.: **AU 1**
Depth (ft): **0 - 5'**

	▲	◆	●
Normal Stress (ksf)	1	2	4
Deformation Rate (in/min)	0.002		
Peak Shear Stress (ksf) ◆	1.18	1.54	2.48
Shear stress @ end of test (ksf) ●	0.89	1.20	2.32
Initial height of sample (in)	1.0030	1.0000	0.9910
Height of sample before shear (in)	1.0073	0.9974	0.9906
Diameter of sample (in)	2.42	2.42	2.42
Initial Moisture Content (%)	9.7	9.7	9.7
Final Moisture Content (%)	16.7	15.5	15.6
Dry Density (pcf)	113.6	113.5	113.4
Final Saturation (%)	95.8	91.8	94.0

Sample type:

Remolded to 90 % Maximum Dry Density and Optimum Moisture Content

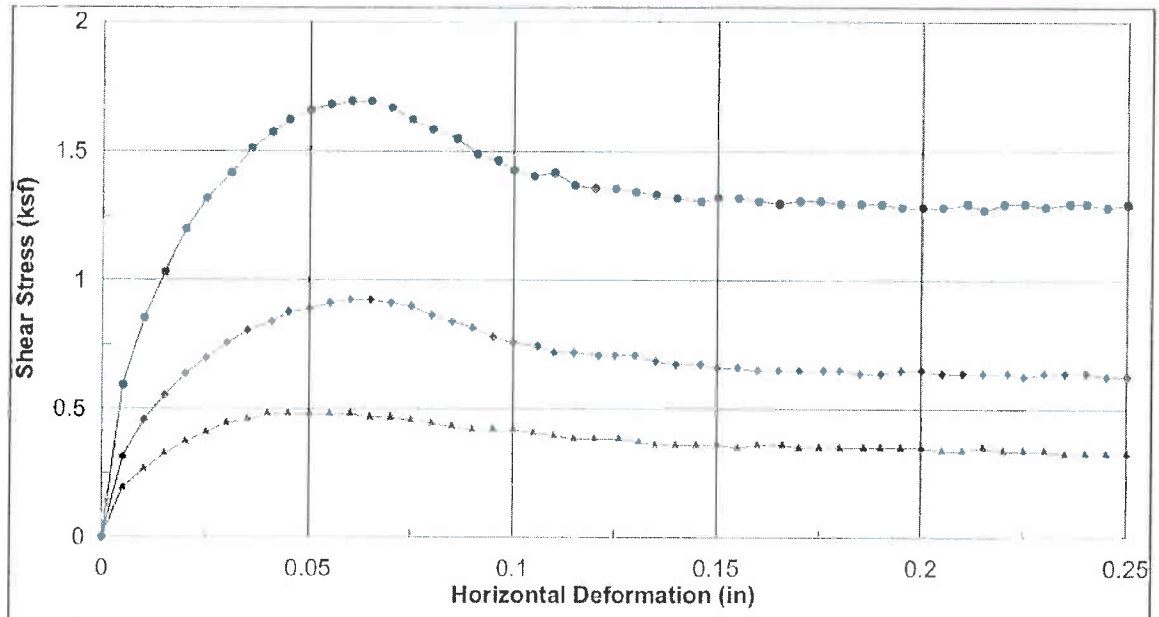
Soil Identification:

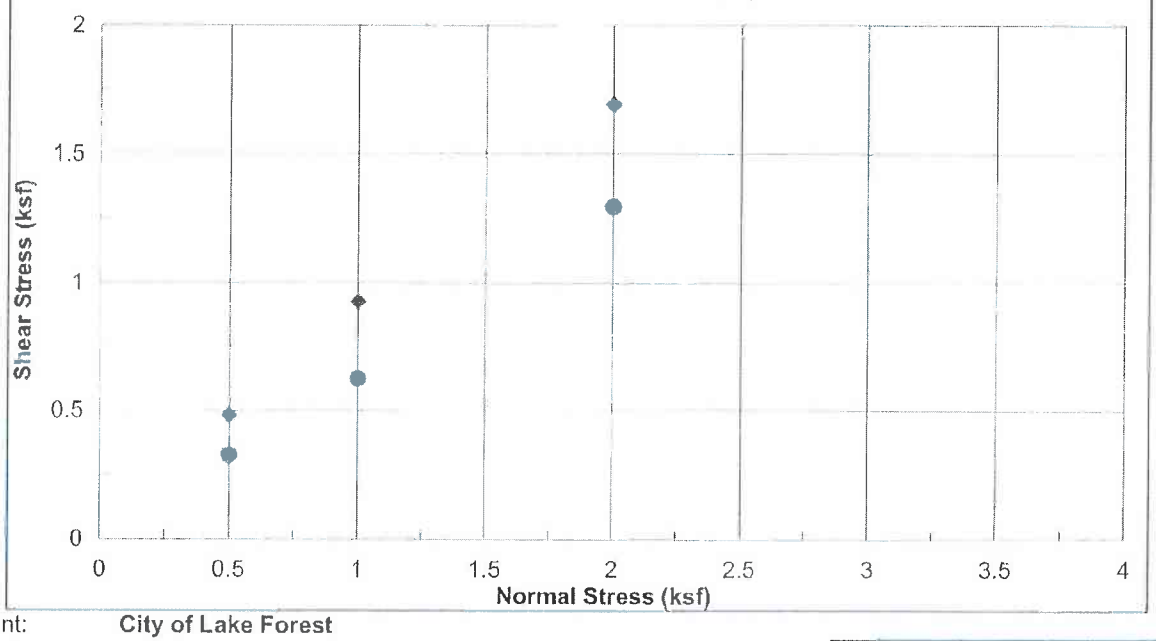
Yellowish Brown, Silty Sand (SM)

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST
Consolidated Drained (ASTM D3080)

Project No.: ---
HAI Pr No.: CLF-10-001
Date: 4/10/2010





Client: City of Lake Forest
Project Name: Alton Pkwy
Boring No.: HB 16
Sample No.: MC 4
Depth (ft): 15'

Sample type:

Undistrbed ring

Soil Identification:

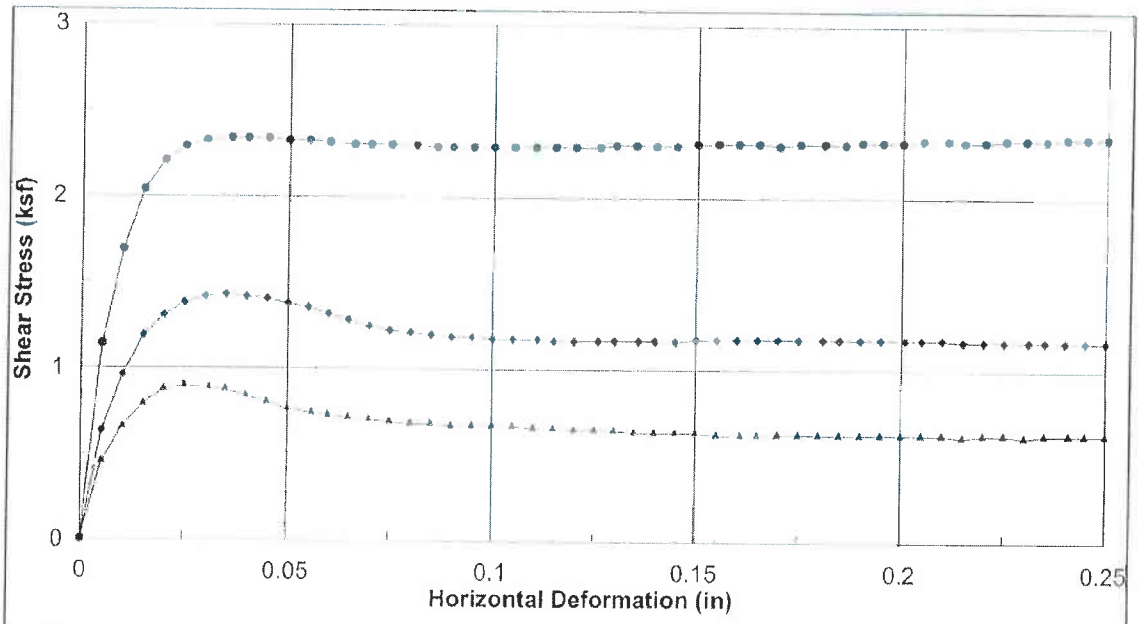
Light Gray, Poorly graded Sand (SP)

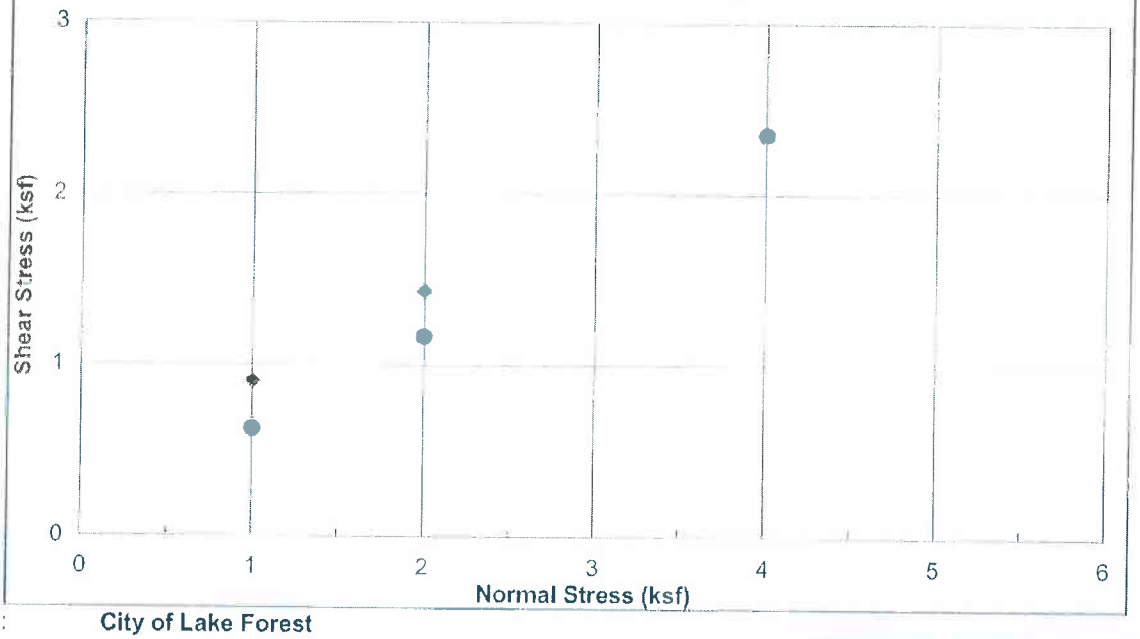
	▲	◆	●
Normal Stress (ksf)	0.5	1	2
Deformation Rate (in/min)	0.02		
Peak Shear Stress (ksf) ◆	0.48	0.92	1.69
Shear stress @ end of test (ksf) ●	0.32	0.62	1.30
Initial height of sample (in)	1.0000	0.9900	0.9940
Height of sample before shear (in)	0.9962	0.9770	0.9820
Diameter of sample (in)	2.42	2.42	2.42
Initial Moisture Content (%)	3.7	3.7	3.7
Final Moisture Content (%)	18.0	19.2	16.9
Dry Density (pcf)	99.8	98.1	104.1
Final Saturation (%)	80.6	86.6	89.9

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST
Consolidated Undrained (ASTM D3080)

Project No.: ---
HAI Pr No.: CLF-10-001
Date: 4/10/2010





Client: **City of Lake Forest**

Project Name: **Alton Pkwy**

Boring No.: **HB 16**

Sample No.: **AU 1**

Depth (ft): **0 - 5'**

Sample type:

Remolded to 90 % Maximum Dry Density and Optimum Moisture Content

Soil Identification:

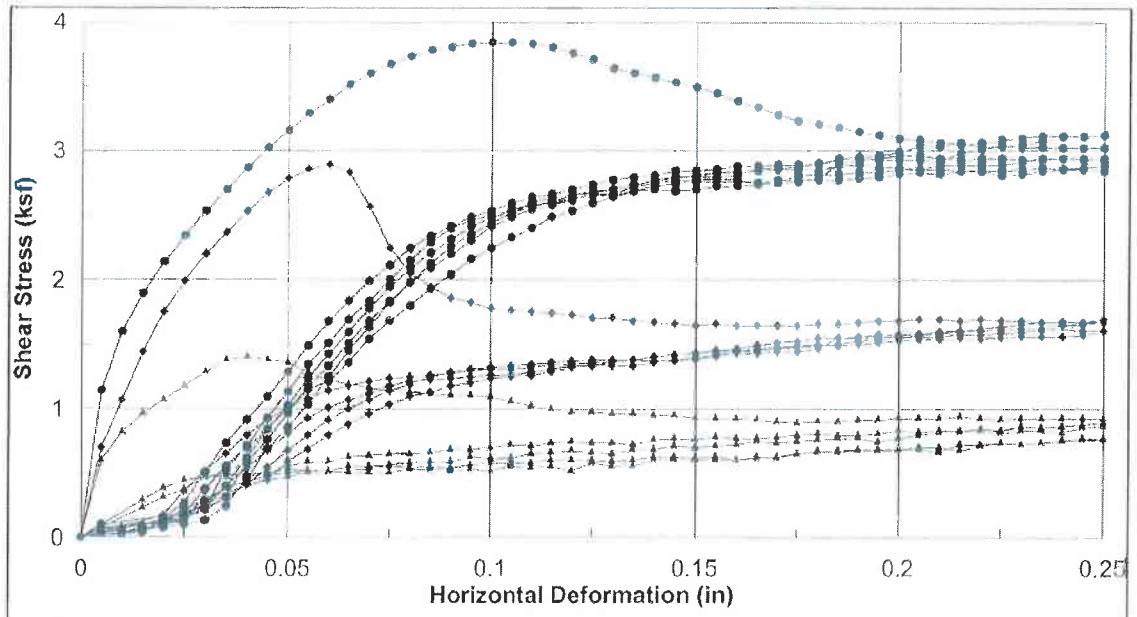
Brown, Silty Sand (SM)

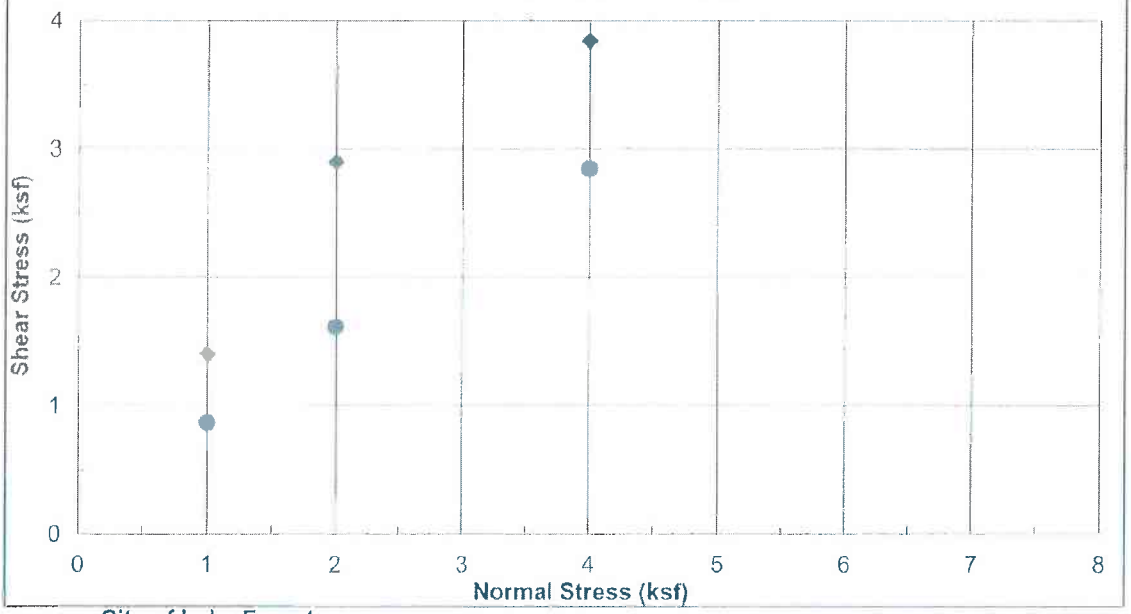
	▲	◆	●
Normal Stress (ksf)	1	2	4
Deformation Rate (in/min)	0.02		
Peak Shear Stress (ksf) ◆	0.90	1.43	2.35
Shear stress @ end of test (ksf) ●	0.62	1.16	2.35
Initial height of sample (in)	0.9960	0.9980	0.9950
Height of sample before shear (in)	0.9957	0.9859	0.9868
Diameter of sample (in)	2.42	2.42	2.42
Initial Moisture Content (%)	10.4	10.4	10.4
Final Moisture Content (%)	16.3	16.5	16.2
Dry Density (pcf)	114.0	114.0	114.0
Final Saturation (%)	95.9	100.1	97.8

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST
Consolidated Undrained (ASTM D3080)

Project No.: ---
HAI Pr No.: CLF-10-001
Date: 4/10/2010





Client: City of Lake Forest
Project Name: Alton Pkwy
Boring No.: HBA 1
Sample No.: 1
Depth (ft): 5'

Sample type:

Undisturbed ring

Soil Identification:

Light Gray, Silty Sand (SM)

	▲	◆	●
Normal Stress (ksf)	1	2	4
Deformation Rate (in/min)	0.002		
Peak Shear Stress (ksf) ◆	1.40	2.89	3.84
Shear stress @ end of test (ksf) ●	0.86	1.61	2.84
Initial height of sample (in)	1.0000	1.0000	1.0000
Height of sample before shear (in)	1.0033	0.9935	0.9776
Diameter of sample (in)	2.42	2.42	2.42
Initial Moisture Content (%)	22.4	22.4	22.4
Final Moisture Content (%)	36.4	42.9	40.2
Dry Density (pcf)	83.4	82.7	83.5
Final Saturation (%)	97.5	115.2	113.9

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST
Consolidated Drained (ASTM D3080)

Project No.: ---
HAI Pr No.: CLF-10-001
Date: 4/10/2010

APPENDIX D

0.2 1.405 (Ss, Site Class B)

1.0 0.501 (S1, Site Class B)

Conterminous 48 States

2005 ASCE 7 Standard

Latitude = 33.6743

Longitude = -117.67929999999998

Spectral Response Accelerations SMs and SM1

SMs = Fa x Ss and SM1 = Fv x S1

Site Class D - Fa = 1.0 ,Fv = 1.5

Period Sa

(sec) (g)

0.2 1.405 (SMs, Site Class D)

1.0 0.751 (SM1, Site Class D)

Conterminous 48 States

2005 ASCE 7 Standard

Latitude = 33.6743

Longitude = -117.67929999999998

Design Spectral Response Accelerations SDs and SD1

SDs = 2/3 x SMs and SD1 = 2/3 x SM1

Site Class D - Fa = 1.0 ,Fv = 1.5

Period Sa

(sec) (g)

0.2 0.937 (SDs, Site Class D)

1.0 0.501 (SD1, Site Class D)

*** Deaggregation of Seismic Hazard for PGA & 2 Periods of Spectral Accel. ***
*** Data from U.S.G.S. National Seismic Hazards Mapping Project, 2002 version ***
PSHA Deaggregation. %contributions. site: Baker_Ranch long: 117.679 W., lat: 33.674 N.
USGS 2002-03 update files and programs. dM=0.2. Site descr:ROCK
Return period: 2475 yrs. Exceedance PGA =0.5687 g.
#Pr[at least one eq with median motion>=PGA in 50 yrs]=0.00316

DIST(KM)	MAG(MW)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
7.1	5.05	2.048	1.296	0.751	0.000	0.000	0.000	0.000
13.1	5.05	0.193	0.193	0.000	0.000	0.000	0.000	0.000
7.1	5.20	4.060	2.255	1.805	0.000	0.000	0.000	0.000
13.3	5.20	0.481	0.481	0.000	0.000	0.000	0.000	0.000
7.2	5.40	4.026	1.732	2.294	0.000	0.000	0.000	0.000
13.6	5.40	0.630	0.630	0.000	0.000	0.000	0.000	0.000
7.2	5.60	3.997	1.328	2.606	0.063	0.000	0.000	0.000
13.9	5.60	0.793	0.785	0.009	0.000	0.000	0.000	0.000
7.3	5.80	3.916	1.023	2.557	0.337	0.000	0.000	0.000
14.1	5.80	0.953	0.843	0.111	0.000	0.000	0.000	0.000
7.1	6.01	4.932	0.980	3.175	0.777	0.000	0.000	0.000
14.1	6.00	1.088	0.849	0.239	0.000	0.000	0.000	0.000
21.1	6.01	0.053	0.053	0.000	0.000	0.000	0.000	0.000
6.7	6.20	6.850	0.991	3.957	1.903	0.000	0.000	0.000
13.7	6.20	1.521	0.951	0.570	0.000	0.000	0.000	0.000
21.2	6.21	0.100	0.100	0.000	0.000	0.000	0.000	0.000
6.6	6.37	12.804	1.201	5.829	5.605	0.170	0.000	0.000
13.8	6.40	1.913	0.995	0.918	0.000	0.000	0.000	0.000
22.3	6.40	0.095	0.095	0.000	0.000	0.000	0.000	0.000
6.5	6.59	27.028	1.876	10.378	13.438	1.335	0.000	0.000
16.5	6.62	4.634	3.849	0.776	0.009	0.000	0.000	0.000
20.6	6.64	0.764	0.764	0.000	0.000	0.000	0.000	0.000
6.5	6.79	8.046	0.644	3.746	3.459	0.197	0.000	0.000
16.6	6.83	4.373	3.754	0.606	0.012	0.000	0.000	0.000
20.7	6.85	0.794	0.794	0.000	0.000	0.000	0.000	0.000
5.8	6.95	2.231	0.138	0.841	1.177	0.075	0.000	0.000
14.8	7.01	0.837	0.503	0.324	0.010	0.000	0.000	0.000
21.3	6.97	0.405	0.405	0.000	0.000	0.000	0.000	0.000
21.8	7.13	0.310	0.310	0.000	0.000	0.000	0.000	0.000
21.4	7.32	0.086	0.086	0.000	0.000	0.000	0.000	0.000

Summary statistics for above PSHA PGA deaggregation, R=distance, e=epsilon:
Mean src-site R= 8.6 km; M= 6.30; eps0= 0.96. Mean calculated for all sources.
Modal src-site R= 6.5 km; M= 6.59; eps0= 0.23 from peak (R,M) bin
Gridded source distance metrics: Rseis Rrup and Rjb
MODE R*= 6.2km; M*= 6.59; EPS.INTERVAL: 0 to 1 sigma % CONTRIB.= 13.438

Principal sources (faults, subduction, random seismicity having >10% contribution)

Source Category:	% contr.	R(km)	M	epsilon0 (mean values)
Calif. thrust/reverse faults	29.89	6.6	6.54	0.22
California shallow gridded	61.08	8.1	6.10	1.12
Individual fault hazard details if contrib.>1%:				
2 Chino-Central Ave	1.38	17.4	6.68	2.29

```
2   San Joaquin Hills Thrust      19.01     6.6   6.56    0.21
2   San Joaquin Hills Thrust GR M 10.88     6.6   6.51    0.23
Elsinore-16                        5.16    17.6   6.78    2.27
Elsinore-15                        1.28    20.4   6.78    2.47
******************** Southern California ****************************************
PSHA Deaggregation. %contributions. ROCK site: Baker_Ranch  long: 117.679 d W., lat:
33.674 N.
USGS 2002-2003 update files and programs. Analysis on DaMoYr:09/03/2011
Return period: 2475 yrs. 1.00 s. PSA =0.4923   g.
#Pr[at least one eq with median motion>=PSA in 50 yrs]=0.00003
```

DIST(km)	MAG(Mw)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
6.5	5.21	0.132	0.132	0.000	0.000	0.000	0.000	0.000
7.0	5.41	0.318	0.318	0.000	0.000	0.000	0.000	0.000
7.1	5.61	0.587	0.519	0.069	0.000	0.000	0.000	0.000
13.3	5.62	0.084	0.084	0.000	0.000	0.000	0.000	0.000
7.1	5.80	0.911	0.635	0.276	0.000	0.000	0.000	0.000
14.2	5.81	0.258	0.258	0.000	0.000	0.000	0.000	0.000
6.9	6.02	1.695	0.792	0.903	0.000	0.000	0.000	0.000
14.5	6.01	0.475	0.469	0.006	0.000	0.000	0.000	0.000
21.8	6.02	0.055	0.055	0.000	0.000	0.000	0.000	0.000
6.4	6.20	3.067	0.854	2.189	0.024	0.000	0.000	0.000
14.1	6.21	0.881	0.748	0.133	0.000	0.000	0.000	0.000
22.7	6.21	0.185	0.185	0.000	0.000	0.000	0.000	0.000
6.4	6.38	6.985	1.285	4.913	0.786	0.000	0.000	0.000
14.6	6.40	1.533	1.017	0.516	0.000	0.000	0.000	0.000
23.9	6.41	0.292	0.292	0.000	0.000	0.000	0.000	0.000
6.5	6.57	14.036	1.702	8.689	3.644	0.000	0.000	0.000
17.2	6.64	9.719	6.843	2.876	0.000	0.000	0.000	0.000
21.9	6.60	2.255	2.252	0.003	0.000	0.000	0.000	0.000
31.6	6.62	0.537	0.537	0.000	0.000	0.000	0.000	0.000
6.2	6.77	9.397	0.737	4.529	4.130	0.000	0.000	0.000
17.2	6.84	11.975	6.650	5.319	0.007	0.000	0.000	0.000
20.9	6.81	5.581	4.219	1.362	0.000	0.000	0.000	0.000
31.1	6.83	2.145	2.145	0.000	0.000	0.000	0.000	0.000
5.4	6.95	2.184	0.137	0.858	1.174	0.015	0.000	0.000
16.5	7.00	2.520	0.896	1.601	0.023	0.000	0.000	0.000
21.9	6.96	3.749	2.717	1.032	0.000	0.000	0.000	0.000
32.2	7.03	0.499	0.499	0.000	0.000	0.000	0.000	0.000
43.2	7.00	0.149	0.149	0.000	0.000	0.000	0.000	0.000
52.6	6.96	0.087	0.087	0.000	0.000	0.000	0.000	0.000
17.7	7.12	0.193	0.168	0.025	0.000	0.000	0.000	0.000
22.2	7.14	3.023	1.741	1.283	0.000	0.000	0.000	0.000
33.0	7.13	0.183	0.181	0.002	0.000	0.000	0.000	0.000
42.7	7.18	0.194	0.194	0.000	0.000	0.000	0.000	0.000
53.2	7.14	0.260	0.260	0.000	0.000	0.000	0.000	0.000
21.5	7.32	0.513	0.142	0.371	0.000	0.000	0.000	0.000
42.6	7.35	0.565	0.565	0.000	0.000	0.000	0.000	0.000
50.5	7.33	0.171	0.171	0.000	0.000	0.000	0.000	0.000
66.7	7.42	0.066	0.066	0.000	0.000	0.000	0.000	0.000
70.7	7.38	0.339	0.339	0.000	0.000	0.000	0.000	0.000
42.6	7.57	0.074	0.062	0.012	0.000	0.000	0.000	0.000
50.8	7.53	0.372	0.372	0.000	0.000	0.000	0.000	0.000

66.9	7.57	0.609	0.609	0.000	0.000	0.000	0.000	0.000
70.7	7.55	0.086	0.086	0.000	0.000	0.000	0.000	0.000
50.7	7.75	0.496	0.430	0.065	0.000	0.000	0.000	0.000
66.9	7.76	3.075	3.075	0.000	0.000	0.000	0.000	0.000
70.6	7.81	3.623	3.623	0.000	0.000	0.000	0.000	0.000
66.9	8.06	1.979	1.500	0.479	0.000	0.000	0.000	0.000
70.6	7.98	0.688	0.602	0.086	0.000	0.000	0.000	0.000
66.9	8.24	0.910	0.605	0.305	0.000	0.000	0.000	0.000

Summary statistics for above 1.0s PSA deaggregation, R=distance, e=epsilon:
Mean src-site R= 20.7 km; M= 6.81; eps0= 1.55. Mean calculated for all sources.
Modal src-site R= 6.5 km; M= 6.57; eps0= 0.82 from peak (R,M) bin
Gridded source distance metrics: Rseis Rrup and Rjb
MODE R*= 6.7km; M*= 6.58; EPS.INTERVAL: 1 to 2 sigma % CONTRIB.= 8.689

Principal sources (faults, subduction, random seismicity having >10% contribution)

Source Category:	% contr.	R(km)	M	epsilon0 (mean values)
California SS faults	36.93	34.9	7.13	1.99
Calif. thrust/reverse faults	17.48	7.2	6.58	0.82
California shallow gridded	30.89	9.1	6.48	1.24
Calif b, SS or Thrust	14.69	25.1	6.97	1.96
Individual fault hazard details if contrib.>1%:				
2 Chino-Central Ave	3.59	17.8	6.71	1.89
2 Newport-Inglewood offshore	4.11	21.3	7.06	1.77
2 Newport-Inglewood	1.73	24.0	7.06	1.93
2 Chino-Central Ave GR M-distri	1.10	19.3	6.64	2.03
2 Newport-Inglewood offshore GR	1.56	22.6	6.83	2.02
2 San Joaquin Hills Thrust	11.06	6.6	6.58	0.77
2 San Joaquin Hills Thrust GR M	6.03	6.6	6.54	0.82
SAF-All southern segments Amod1	2.87	66.9	8.12	1.93
SAF - 1857 Amod1	1.77	70.6	7.83	2.21
SAF - Southern 2 segments Amod1	1.21	66.9	7.74	2.26
SAF - 1857 Amod2	2.56	70.6	7.83	2.21
SAF - Southern 2 segments Amod2	2.43	66.9	7.74	2.26
Elsinore-17	2.67	30.9	6.83	2.42
Elsinore-16	16.56	17.6	6.81	1.80
Elsinore-15	6.15	20.4	6.81	1.91

********** Southern California **********
PSHA Deaggregation. %contributions. ROCK site: Baker_Ranch long: 117.679 d W., lat: 33.674 N.
USGS 2002-2003 update files and programs. Analysis on DaMoYr:09/03/2011
Return period: 2475 yrs. 0.20 s. PSA =1.3832 g.
#Pr[at least one eq with median motion>=PSA in 50 yrs]=0.00179

DIST(km)	MAG(Mw)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
7.2	5.05	1.959	1.270	0.689	0.000	0.000	0.000	0.000
13.0	5.05	0.192	0.192	0.000	0.000	0.000	0.000	0.000
7.2	5.20	3.856	2.255	1.601	0.000	0.000	0.000	0.000
13.3	5.20	0.508	0.508	0.000	0.000	0.000	0.000	0.000
7.3	5.40	3.787	1.782	2.005	0.000	0.000	0.000	0.000
13.7	5.40	0.694	0.694	0.000	0.000	0.000	0.000	0.000
7.3	5.60	3.731	1.349	2.382	0.000	0.000	0.000	0.000
14.0	5.60	0.888	0.879	0.008	0.000	0.000	0.000	0.000

7.3	5.80	3.652	1.033	2.408	0.210	0.000	0.000	0.000
14.2	5.80	1.068	0.957	0.111	0.000	0.000	0.000	0.000
21.4	5.81	0.052	0.052	0.000	0.000	0.000	0.000	0.000
7.2	6.01	4.602	0.994	3.064	0.544	0.000	0.000	0.000
14.3	6.00	1.233	0.984	0.249	0.000	0.000	0.000	0.000
21.8	6.01	0.101	0.101	0.000	0.000	0.000	0.000	0.000
6.6	6.21	6.850	1.004	4.189	1.658	0.000	0.000	0.000
13.8	6.20	1.702	1.090	0.612	0.000	0.000	0.000	0.000
22.0	6.21	0.178	0.178	0.000	0.000	0.000	0.000	0.000
6.6	6.38	11.294	1.206	5.817	4.271	0.000	0.000	0.000
14.1	6.40	2.144	1.165	0.980	0.000	0.000	0.000	0.000
22.9	6.41	0.195	0.195	0.000	0.000	0.000	0.000	0.000
6.4	6.58	24.876	1.895	10.822	11.804	0.355	0.000	0.000
16.8	6.63	6.501	5.639	0.858	0.003	0.000	0.000	0.000
20.9	6.64	1.264	1.264	0.000	0.000	0.000	0.000	0.000
6.6	6.79	7.224	0.624	3.754	2.766	0.081	0.000	0.000
16.8	6.83	5.745	5.054	0.680	0.010	0.000	0.000	0.000
20.9	6.84	1.296	1.296	0.000	0.000	0.000	0.000	0.000
5.7	6.95	1.937	0.138	0.838	0.932	0.028	0.000	0.000
14.3	6.98	0.701	0.349	0.342	0.009	0.000	0.000	0.000
21.5	6.96	0.792	0.792	0.001	0.000	0.000	0.000	0.000
17.6	7.10	0.268	0.236	0.032	0.000	0.000	0.000	0.000
21.8	7.16	0.623	0.623	0.000	0.000	0.000	0.000	0.000

```
Summary statistics for above 0.2s PSA  deaggregation, R=distance, e=epsilon:
 Mean src-site R=    9.3 km; M= 6.31; eps0=   1.12. Mean calculated for all sources.
Modal src-site R=    6.4 km; M= 6.58; eps0=   0.36 from peak (R,M) bin
Gridded source distance metrics: Rseis Rrup and Rjb
 MODE R*=   6.1km; M*= 6.59; EPS.INTERVAL: 0 to 1 sigma  % CONTRIB.= 11.804

Principal sources (faults, subduction, random seismicity having >10% contribution)
Source Category:                  % contr.   R(km)    M   epsilon0 (mean values)
Calif. thrust/reverse faults       27.64      6.6   6.54    0.35
California shallow gridded         58.76      8.5   6.10    1.23
Individual fault hazard details if contrib.>1%:
2   Chino-Central Ave               1.98     17.5   6.68    2.20
2   San Joaquin Hills Thrust       17.54      6.5   6.56    0.34
2   San Joaquin Hills Thrust GR M 10.05      6.6   6.51    0.36
Elsinore-16                         7.47     17.6   6.78    2.17
Elsinore-15                         2.06     20.4   6.78    2.33
******************** Southern California ****************************************
```

APPENDIX E

Summary of Slope Stability Analysis

Filename	Description	Factor of Safety (FS)	
		Static	*Pseudostatic*
01,01p	Stability of Highest Cut Slope with Out-of-Slope Clay Beds with 14° Internal Friction Angle; 25' Slope; With Stabilization Key (3'Dx15'W)	1.70	1.29
02,02p	Stability of Highest Cut Slope with Out-of-Slope Clay Beds with 12° Internal Friction Angle; 25' Slope; With Stabilization Key (3'Dx15'W)	1.63	1.22
01,01p	Stability of Highest Cut Slope with Neutral Bedding; 35' Slope; Circular Failure	2.48	2.16
01,01p	Stability of Highest Fill Slope; 58' Slope; Circular Failure	1.70	1.51

Project No.: Shea Homes / Baker Ranch

Project Name: 10028-01

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APPENDIX E

SLOPE STABILITY ANALYSIS AND SUMMARY OF SHEAR STRENGTH DESIGN VALUES

Introduction

The results of our slope stability analyses are presented in this appendix. Slope stability analysis was performed using the computer program GSTABL7. The computer output and plots for selected trial failure surfaces analyzed are included for selected typical cross-sections. Our analysis is summarized on a case-by-case basis. We have analyzed the stability of highest cut slope for neutral and out-of-slope bedding and the highest fill slope.

Computer Program

GSTABL7 solves slope stability problems by two-dimensional limiting equilibrium method and was developed at Purdue University. The methods employed in this program include the Modified Bishop Method, which permits circular arc failure surfaces, and the Simplified Janbu Method and Spencer Method, which allow failure surfaces of general shape (circular arc and non-circular). The Simplified Janbu Method provides a solution that satisfies the force equilibrium, while the Spencer Method satisfies both force and moment equilibriums. All methods yield a "factor of safety" (FOS) against instability of the slope. A minimum static FOS of 1.5 and a minimum pseudostatic FOS of 1.1 were used for design.

Summary of Shear Strength Design Values

The soil strength parameters utilized in our slope stability analysis for static conditions are listed in the following table for the associated earth units. These strengths are considered appropriate values for long-term design strengths for slope stability analyses. We have used an average soil unit weight of 120 pcf.

Pseudostatic Shear Strengths

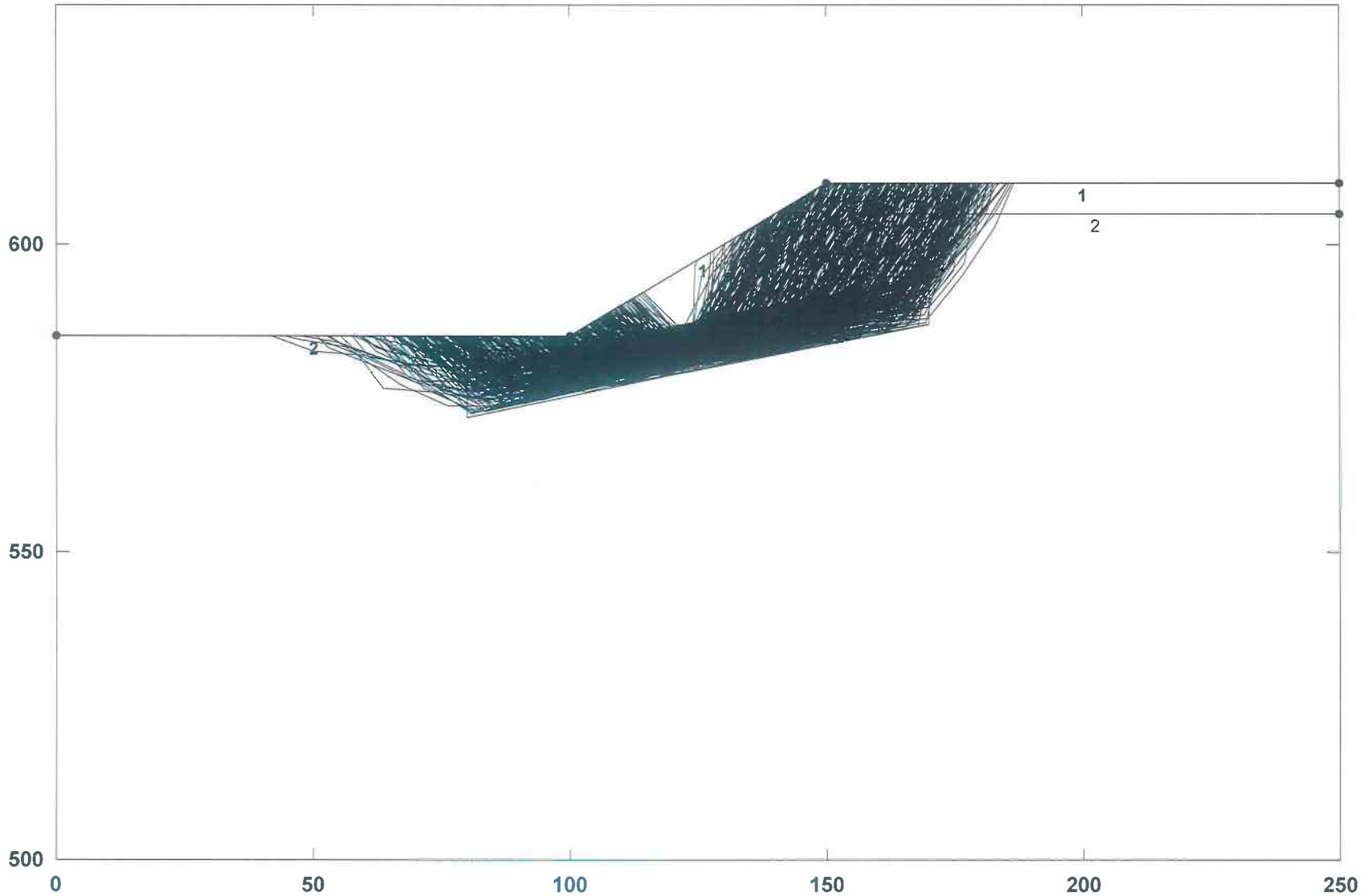
Shear strengths used for pseudostatic analysis are based on the peak direct shear test results and are typically 20 percent higher than the design static strength parameters. Pseudostatic shear strengths for rupture surfaces were not increased from the applicable static values. The soil strength parameters utilized in our pseudostatic slope analysis are listed below:

DESIGN SOIL STRENGTH PARAMETERS

Earth Unit	Static		Pseudostatic	
	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)
Bedrock of Capistrano Oso Formation (Tco)	32	300	38	360
Along Clay Seam	12 and 14	150	14 and 16	180
Compacted Fill (Af)	30	150	36	180

Shea Homes; Baker Ranch; Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\01.PLT Run By: RS 3/22/2011 1:50PM



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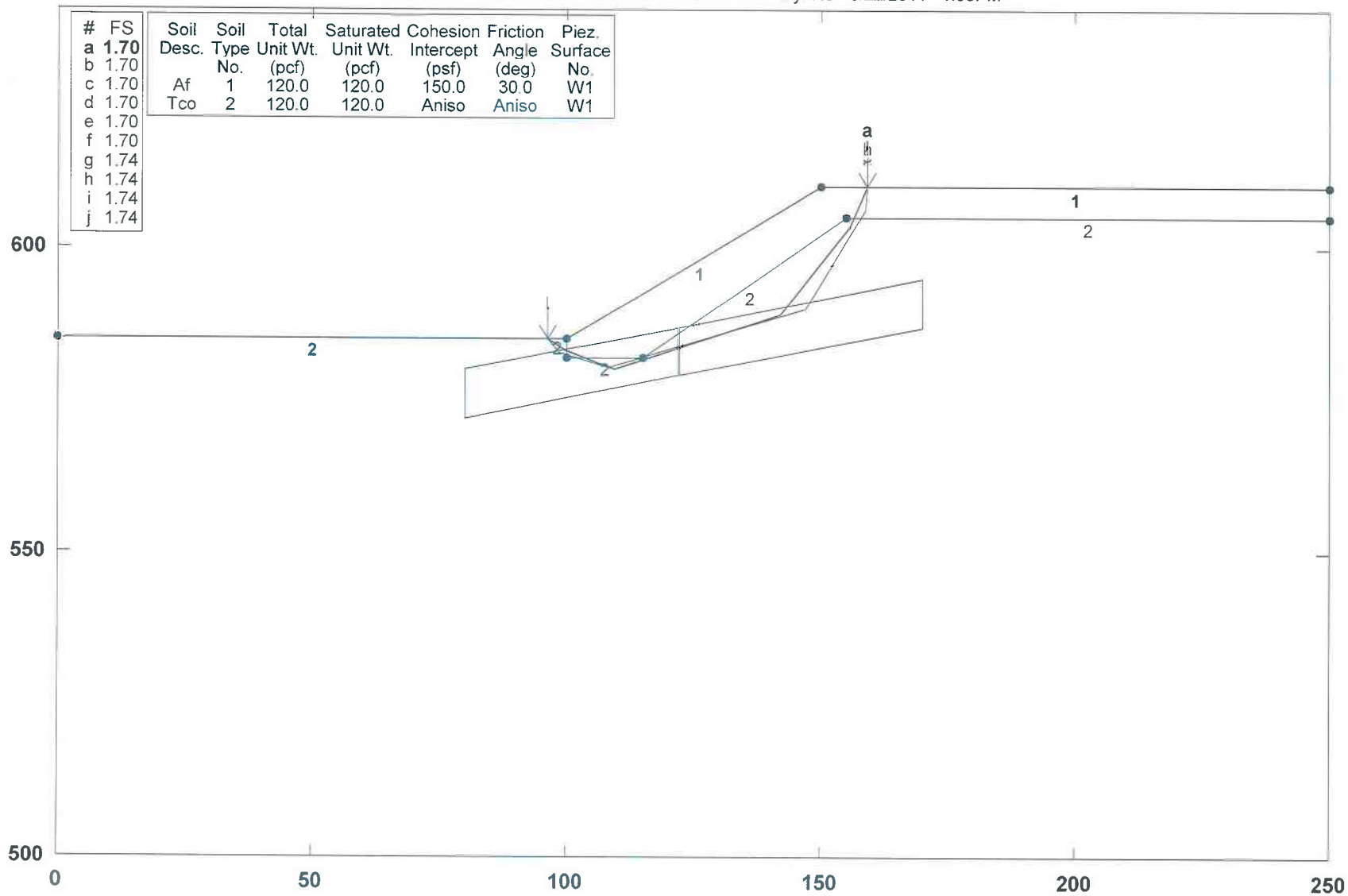
Shea Homes; Baker Ranch; Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\01.PL2 Run By: RS 3/22/2011 1:50PM

#	FS
a	**1.70**
b	1.70
c	1.70
d	1.70
e	1.70
f	1.70
g	1.74
h	1.74
i	1.74
j	1.74

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Tco	2	120.0	120.0	Aniso	Aniso	W1



GSTABL7 v.2 FSmin=1.70

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

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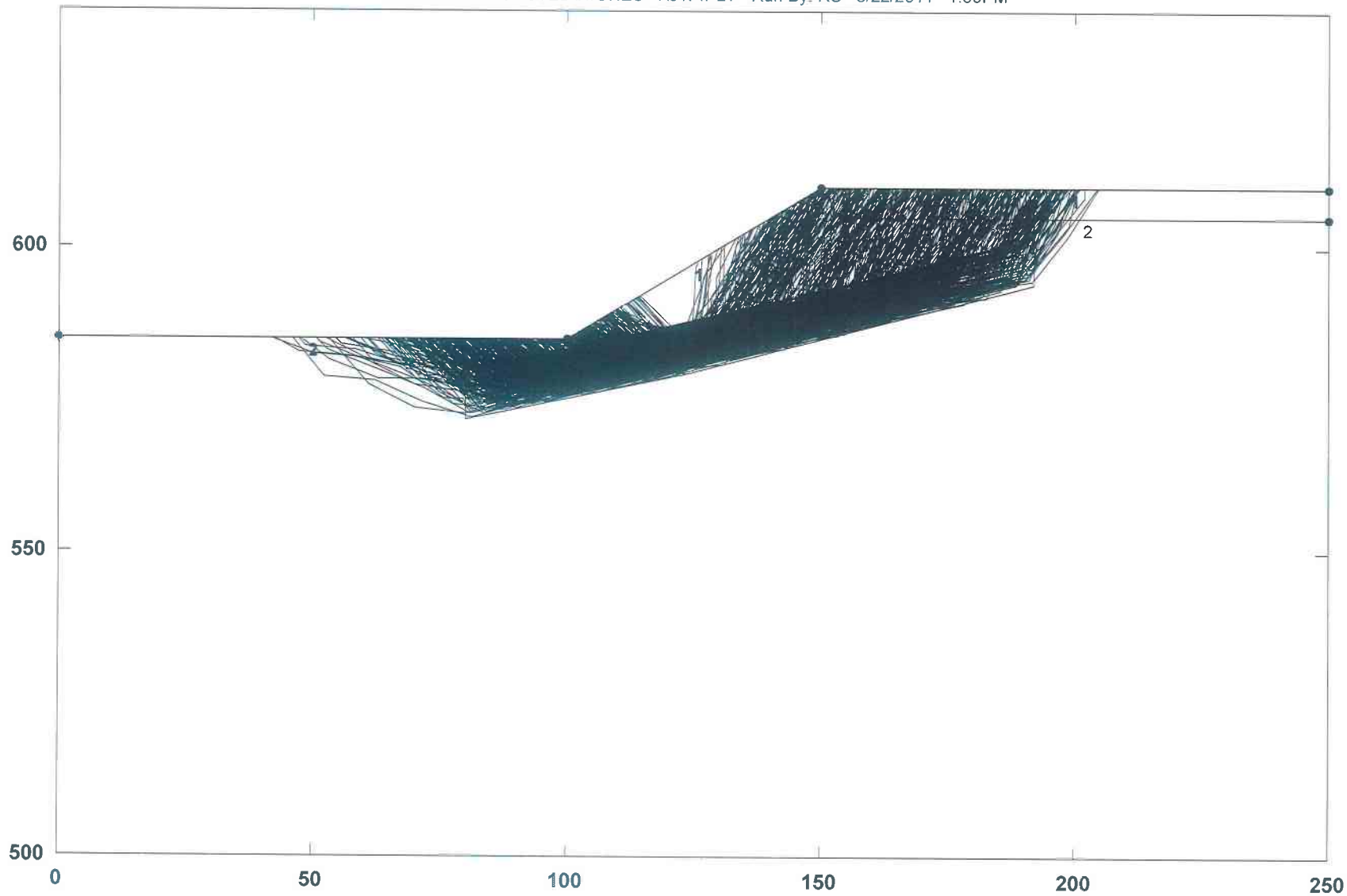
                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                   SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
 Analysis Run Date:          3/22/2011
 Time of Run:                1:50PM
 Run By:                     RS
 Input Data Filename:        P:01.
 Output Filename:            P:01.OUT
 Unit System:                English
 Plotted Output Filename:    P:01.PLT
 PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; Static; Highest
                       Cut Slope w/ Clay Beds; 15'w Key
 BOUNDARY COORDINATES
     3 Top   Boundaries
     7 Total Boundaries
 Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
    No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
     1         0.00      585.00      100.00      585.00         2
     2       100.00      585.00      150.00      610.00         1
     3       150.00      610.00      250.00      610.00         1
     4       100.00      585.00      100.10      582.00         2
     5       100.10      582.00      115.00      582.00         2
     6       115.00      582.00      155.00      605.00         2
     7       155.00      605.00      250.00      605.00         2
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Pier.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   120.0    120.0     150.0     30.0     0.00      0.0      1
   2   120.0    120.0     300.0     32.0     0.00      0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified -  3
 Direction     Counterclockwise     Cohesion      Friction
   Range        Direction Limit    Intercept       Angle
    No.             (deg)            (psf)         (deg)
     1               5.0             300.00        32.00
     2              16.0             150.00        14.00
     3              90.0             300.00        32.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 Janbu Empirical Coef is being used for the case of  c & phi both > 0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
3000 Trial Surfaces Have Been Generated.
 2 Boxes Specified For Generation Of Central Block Base
 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  10.0
 Box         X-Left      Y-Left     X-Right     Y-Right       Height
```



```
  No.          (ft)        (ft)        (ft)        (ft)        (ft)
   1           80.00      576.00      122.00      583.00       8.00
   2          122.10      583.00      170.00      591.00       8.00
        * * Safety Factors Are Calculated By The Simplified Janbu Method * *
        Total Number of Trial Surfaces Evaluated -  3000
        Statistical Data On All Valid FS Values:
           FS Max -   8.245   FS Min -   1.697   FS Ave -   2.741
           Standard Deviation -    0.842   Coefficient of Variation -   30.72 %
        Failure Surface Specified By  7 Coordinate Points
          Point      X-Surf      Y-Surf
          No.         (ft)        (ft)
           1         96.33      585.00
           2         99.81      583.19
           3        109.32      580.11
           4        141.77      588.97
           5        148.73      596.14
           6        155.49      603.52
           7        159.15      610.00
              Factor of Safety
             ***    1.697   ***
            Individual data on the    13  slices
                          Water  Water     Tie     Tie     Earthquake
                          Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm     Tan      Hor     Ver    Load
 No.    (ft)    (lbs)    (lbs)  (lbs)    (lbs)   (lbs)    (lbs)   (lbs)  (lbs)
  1      3.5     378.5     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  2      0.2      41.9     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  3      0.1      14.4     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  4      3.4    1366.9     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  5      5.8    5010.9     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  6      5.7    6946.7     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  7     26.8   44576.2     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  8      7.0   12598.8     0.0    0.0      0.0     0.0      0.0     0.0     0.0
  9      1.3    1951.6     0.0    0.0      0.0     0.0      0.0     0.0     0.0
 10      5.0    5846.1     0.0    0.0      0.0     0.0      0.0     0.0     0.0
 11      0.0     394.0     0.0    0.0      0.0     0.0      0.0     0.0     0.0
 12      0.0     577.2     0.0    0.0      0.0     0.0      0.0     0.0     0.0
 13      2.8     848.7     0.0    0.0      0.0     0.0      0.0     0.0     0.0
                 **** END OF GSTABL7 OUTPUT ****
```

Shea Homes; Baker Ranch; P-Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\01P.PLT Run By: RS 3/22/2011 1:50PM



NMG

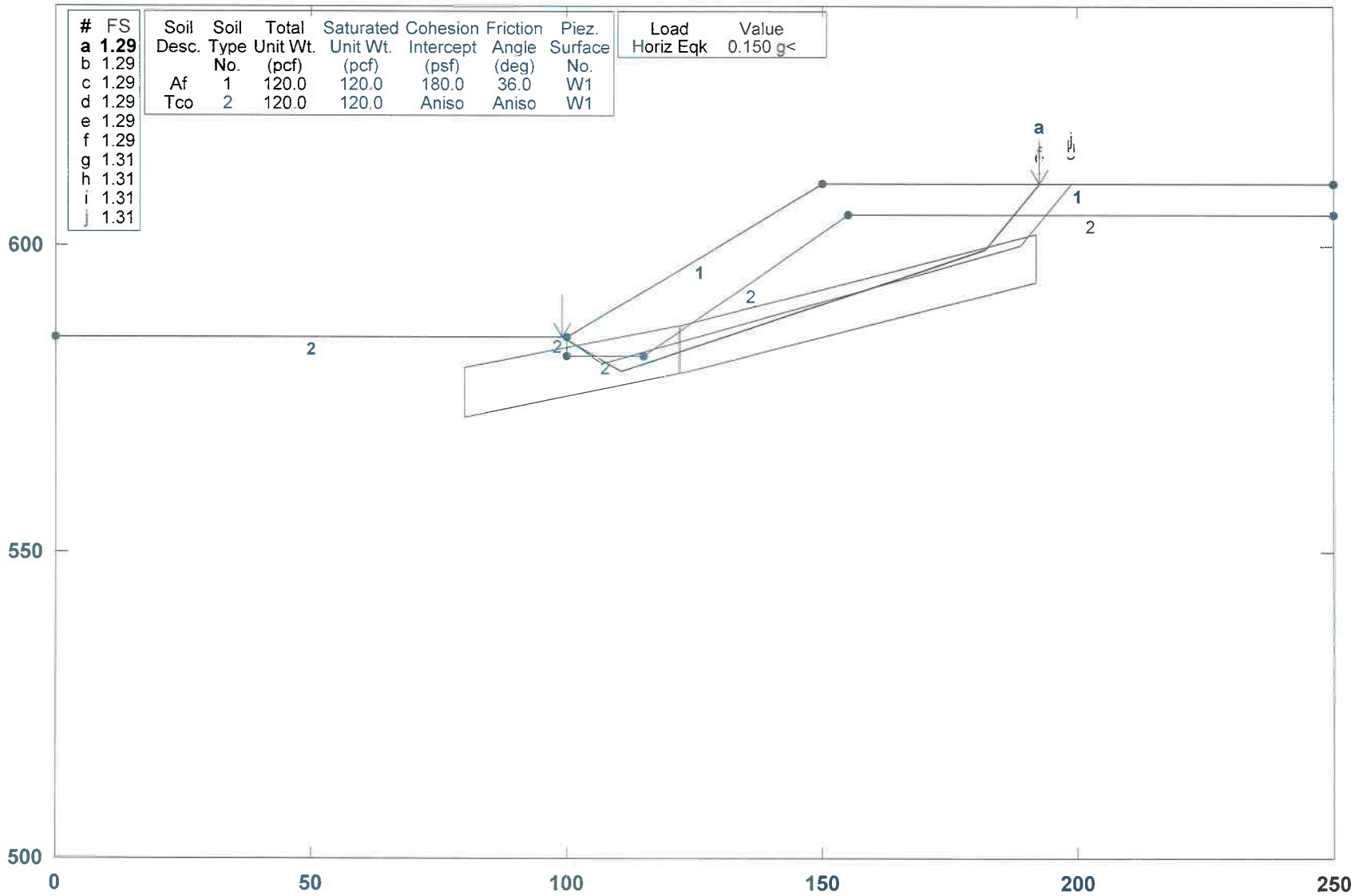
Shea Homes; Baker Ranch; P-Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\01P.PL2 Run By: RS 3/22/2011 1:50PM

#	FS
a	**1.29**
b	1.29
c	1.29
d	1.29
e	1.29
f	1.29
g	1.31
h	1.31
i	1.31
j	1.31

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	36.0	W1
Tco	2	120.0	120.0	Aniso	Aniso	W1

Load	Value
Horiz Eqk	0.150 g<



GSTABL7 v.2 FSmin=1.29

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

NMG

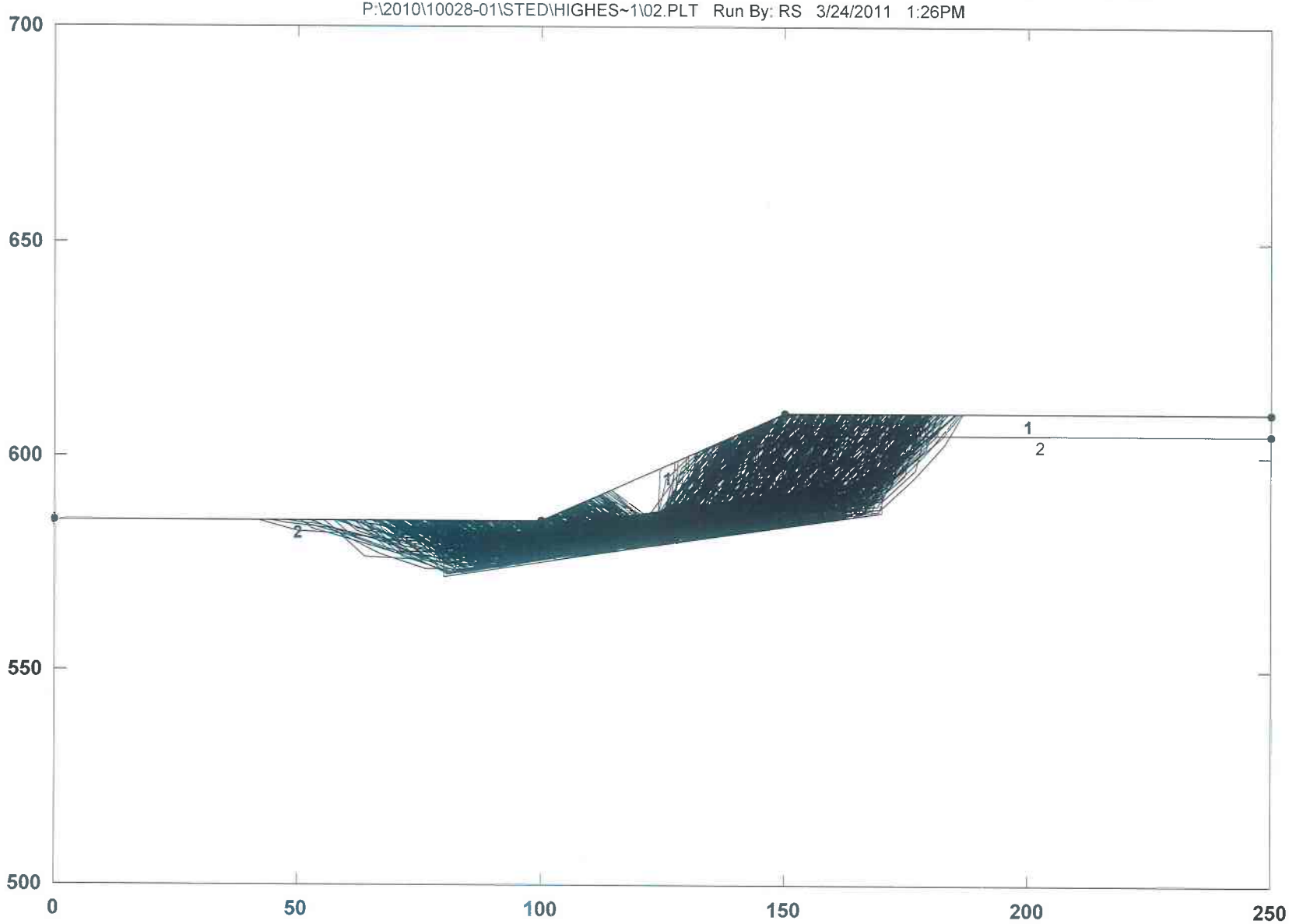
```
                          *** GSTABL7 ***
                     ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1986; Current Version 2.0, September 2001 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                      SLOPE STABILITY ANALYSIS SYSTEM
        Modified Bishop, Simplified Janbu, or GLE Method of Slices.
        (Includes Spencer & Morgenstern-Price Type Analysis)
        Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
        Nonlinear Undrained Shear Strength, Curved Phi Envelope,
        Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
        Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
 Analysis Run Date:          3/22/2011
 Time of Run:                1:50PM
 Run By:                     RS
 Input Data Filename:        P:01P.
 Output Filename:            P:01P.OUT
 Unit System:                English
 Plotted Output Filename:    P:01P.PLT
 PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; P-Static;
                       HighestCut Slope w/ Clay Beds; 15'w Key
 BOUNDARY COORDINATES
     3 Top   Boundaries
     7 Total Boundaries
 Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
    No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
     1         0.00     585.00     100.00     585.00        2
     2       100.00     585.00     150.00     610.00        1
     3       150.00     610.00     250.00     610.00        1
     4       100.00     585.00     100.10     582.00        2
     5       100.10     582.00     115.00     582.00        2
     6       115.00     582.00     155.00     605.00        2
     7       155.00     605.00     250.00     605.00        2
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   120.0    120.0     180.0     36.0    0.00       0.0      1
   2   120.0    120.0     360.0     38.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified -  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept      Angle
   No.            (deg)             (psf)        (deg)
    1              5.0              360.00        38.00
    2             16.0              180.00        36.00
    3             90.0              360.00        38.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 A Horizontal Earthquake Loading Coefficient
 Of0.150 Has Been Assigned
 A Vertical Earthquake Loading Coefficient
 Of0.000 Has Been Assigned
 Cavitation Pressure =    0.0(psf)
 Janbus Empirical Coef is being used for the case of  c & phi both > 0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
```



```
 3000 Trial Surfaces Have Been Generated.
  2 Boxes Specified For Generation Of Central Block Base
  Length Of Line Segments For Active And Passive Portions Of
  Sliding Block Is  10.0
  Box        X-Left     Y-Left    X-Right    Y-Right      Height
  No.         (ft)       (ft)       (ft)       (ft)        (ft)
   1          80.00     576.00     122.00     583.00       8.00
   2         122.10     583.00     192.00     598.00       8.00
        * * Safety Factors Are Calculated By The Simplified Janbu Method * *
        Total Number of Trial Surfaces Evaluated =  3000
        Statistical Data On All Valid FS Values:
           FS Max =   5.958   FS Min =   1.295   FS Ave =   1.985
           Standard Deviation =    0.610   Coefficient of Variation =   30.74 %
        Failure Surface Specified By  6 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1        99.05      585.00
            2       101.56      583.81
            3       110.56      579.45
            4       181.94      599.43
            5       188.97      606.54
            6       192.43      610.00
              Factor of Safety
             ***    1.295    ***
            Individual data on the    12  slices
                          Water  Water     Tie     Tie     Earthquake
                          Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm    Tan     Hor     Ver     Load
 No.    (ft)    (lbs)    (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     0.0      25.7     0.0    0.0      0.0     0.0     3.9     0.0     0.0
  2     0.0       0.8     0.0    0.0      0.0     0.0     0.1     0.0     0.0
  3     1.5     226.8     0.0    0.0      0.0     0.0    34.0     0.0     0.0
  4     3.7    1707.1     0.0    0.0      0.0     0.0   256.1     0.0     0.0
  5     5.3    5209.1     0.0    0.0      0.0     0.0   781.4     0.0     0.0
  6     4.4    6026.1     0.0    0.0      0.0     0.0   903.9     0.0     0.0
  7    35.0   65777.8     0.0    0.0      0.0     0.0  9866.7     0.0     0.0
  8     5.0   11288.2     0.0    0.0      0.0     0.0  1693.2     0.0     0.0
  9    26.9   46375.7     0.0    0.0      0.0     0.0  6956.4     0.0     0.0
 10     5.5    5146.9     0.0    0.0      0.0     0.0   772.0     0.0     0.0
 11     0.0     772.4     0.0    0.0      0.0     0.0   115.9     0.0     0.0
 12     0.0     717.9     0.0    0.0      0.0     0.0   107.7     0.0     0.0
                  **** END OF GSTABL7 OUTPUT ****
```

Shea Homes; Baker Ranch; Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\02.PLT Run By: RS 3/24/2011 1:26PM



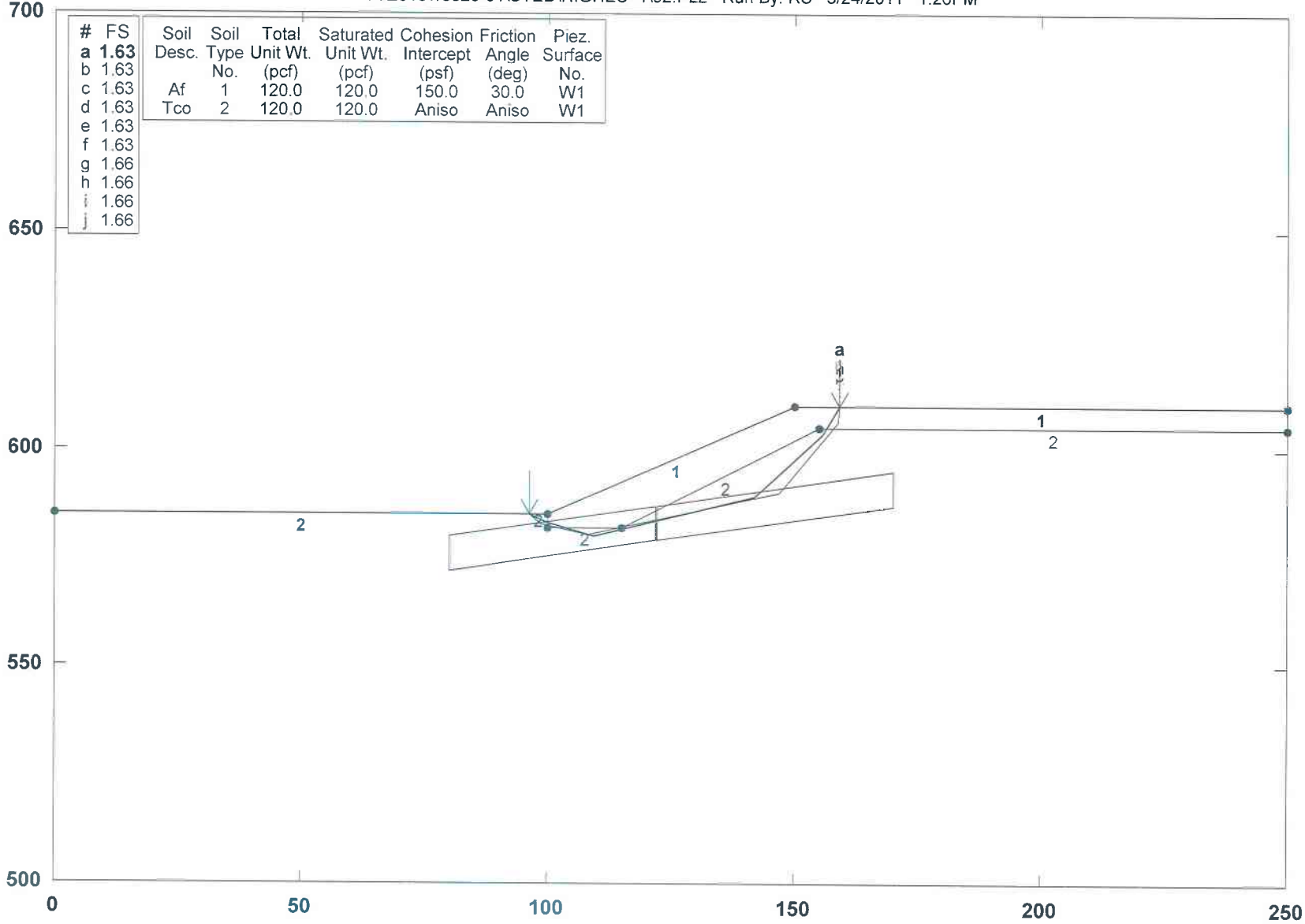
NMG

Shea Homes; Baker Ranch; Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\02.PL2 Run By: RS 3/24/2011 1:26PM

#	FS
a	**1.63**
b	1.63
c	1.63
d	1.63
e	1.63
f	1.63
g	1.66
h	1.66
i	1.66
j	1.66

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Tco	2	120.0	120.0	Aniso	Aniso	W1



GSTABL7 v.2 FSmin=1.63

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

NMG

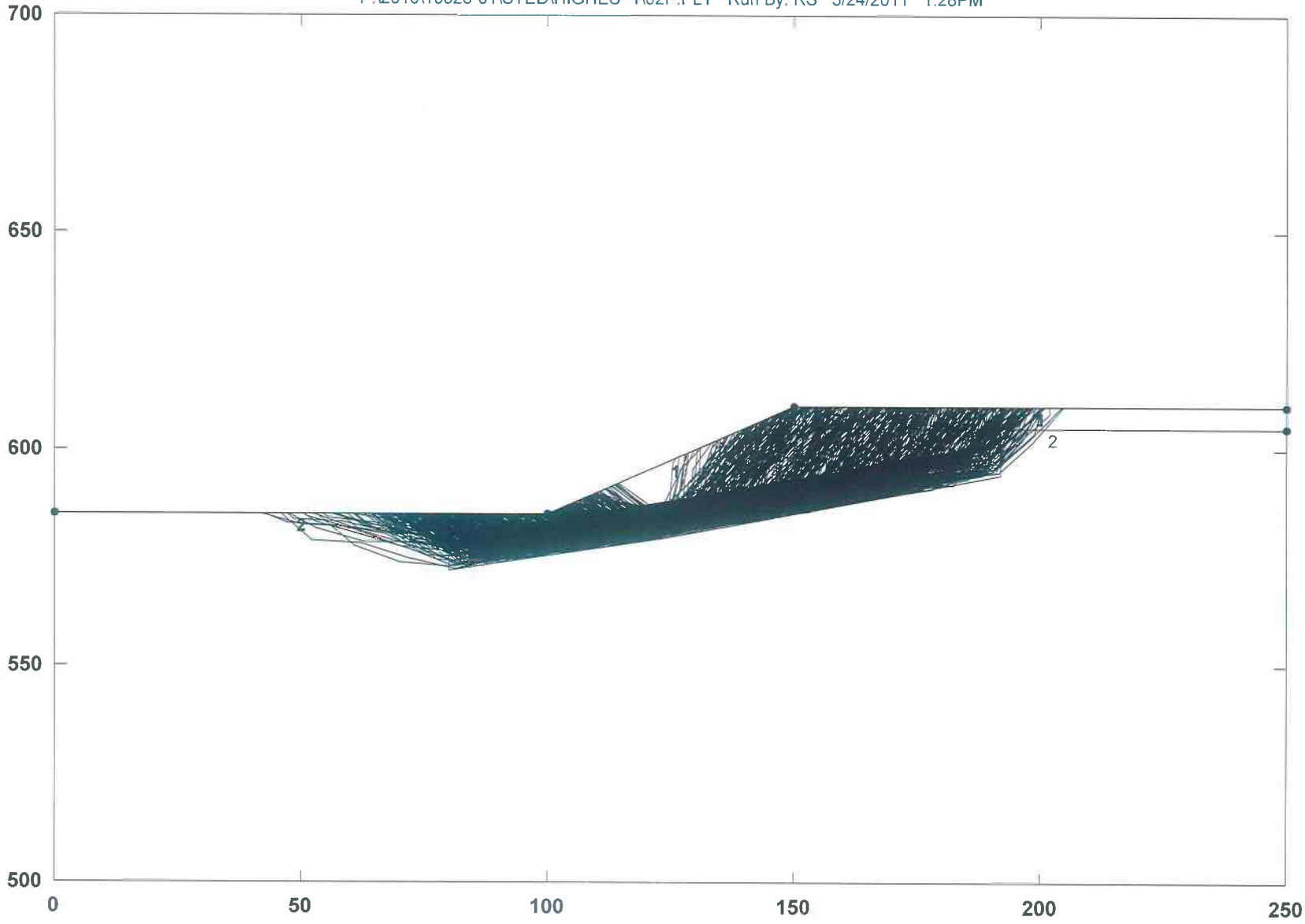
```
                    ***  GSTABL7  ***
          ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
          (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        3/24/2011
Time of Run:              1:26PM
Run By:                   RS
Input Data Filename:      P:02.
Output Filename:          P:02.OUT
Unit System:              English
Plotted Output Filename:  P:02.PLT
PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; Static; Highest
                      Cut Slope w/ Clay Beds; 15'w Key
BOUNDARY COORDINATES
    3 Top   Boundaries
    7 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     585.00     100.00     585.00        2
    2       100.00     585.00     150.00     610.00        1
    3       150.00     610.00     250.00     610.00        1
    4       100.00     585.00     100.10     582.00        2
    5       100.10     582.00     115.00     582.00        2
    6       115.00     582.00     155.00     605.00        2
    7       155.00     605.00     250.00     605.00        2
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Pier.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    120.0     150.0     30.0     0.00      0.0      1
  2   120.0    120.0     300.0     32.0     0.00      0.0      1
ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)
Soil Type  2 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion      Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              5.0             300.00         32.00
    2             16.0             150.00         12.00
    3             90.0             300.00         32.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
       C equal to zero, with water weight in the tension crack.
Janbu Empirical Coef is being used for the case of  c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  10.0
Box        X-Left     Y-Left    X-Right    Y-Right      Height
```



```
 No.        (ft)       (ft)       (ft)       (ft)       (ft)
  1        80.00     576.00     122.00     583.00       8.00
  2       122.10     583.00     170.00     591.00       8.00
     * * Safety Factors Are Calculated By The Simplified Janbu Method * *
     Total Number of Trial Surfaces Evaluated =  3000
     Statistical Data On All Valid FS Values:
        FS Max =   8.245   FS Min =   1.633   FS Ave =   2.671
        Standard Deviation =    0.867   Coefficient of Variation =   32.46 %
     Failure Surface Specified By  7 Coordinate Points
       Point       X-Surf      Y-Surf
        No.         (ft)        (ft)
         1         96.33      585.00
         2         99.81      583.19
         3        109.32      580.11
         4        141.77      586.97
         5        148.73      596.14
         6        155.49      603.52
         7        159.15      610.00
           Factor of Safety
             ***     1.633   ***
           Individual data on the    13  slices
                        Water  Water     Tie     Tie     Earthquake
                        Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm    Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)  (lbs)
  1      3.5     378.5     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  2      0.2      41.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  3      0.1      14.4     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  4      3.4    1366.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  5      5.6    5010.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  6      5.7    6946.7     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  7     26.8   44576.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  8      7.0   12598.8     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  9      1.3    1951.6     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 10      5.0    5846.1     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 11      0.0     394.0     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 12      0.0     577.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 13      2.8     848.7     0.0    0.0     0.0     0.0     0.0     0.0     0.0
                 **** END OF GSTABL7 OUTPUT ****
```

Shea Homes; Baker Ranch; P-Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\02P.PLT Run By: RS 3/24/2011 1:28PM



NMG

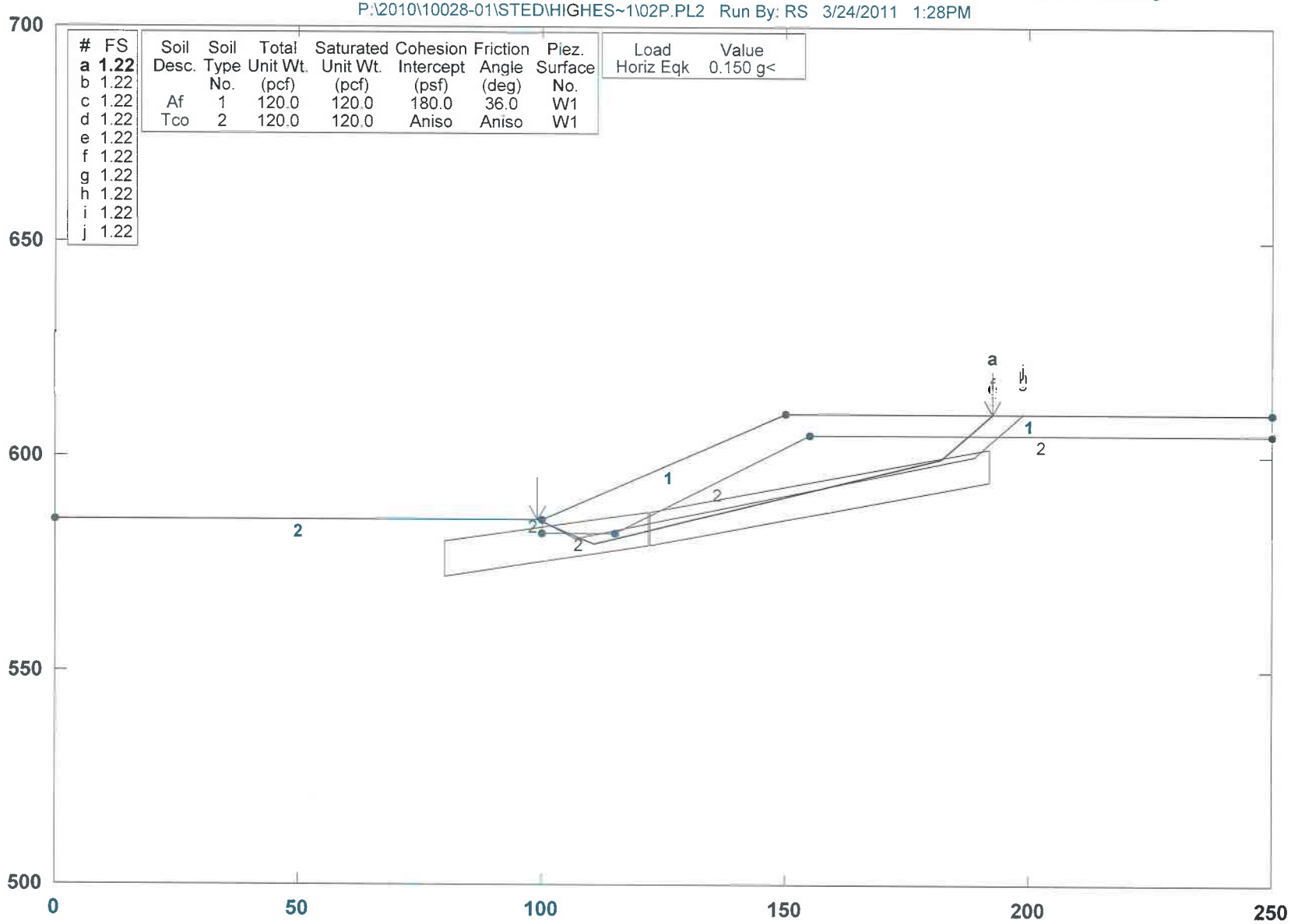
Shea Homes; Baker Ranch; P-Static; HighestCut Slope w/ Clay Beds; 15'w Key

P:\2010\10028-01\STED\HIGHES~1\02P.PL2 Run By: RS 3/24/2011 1:28PM

#	FS
a	**1.22**
b	1.22
c	1.22
d	1.22
e	1.22
f	1.22
g	1.22
h	1.22
i	1.22
j	1.22

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	36.0	W1
Tco	2	120.0	120.0	Aniso	Aniso	W1

Load	Value
Horiz Eqk	0.150 g<



GSTABL7 v.2 FSmin=1.22

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

NMG

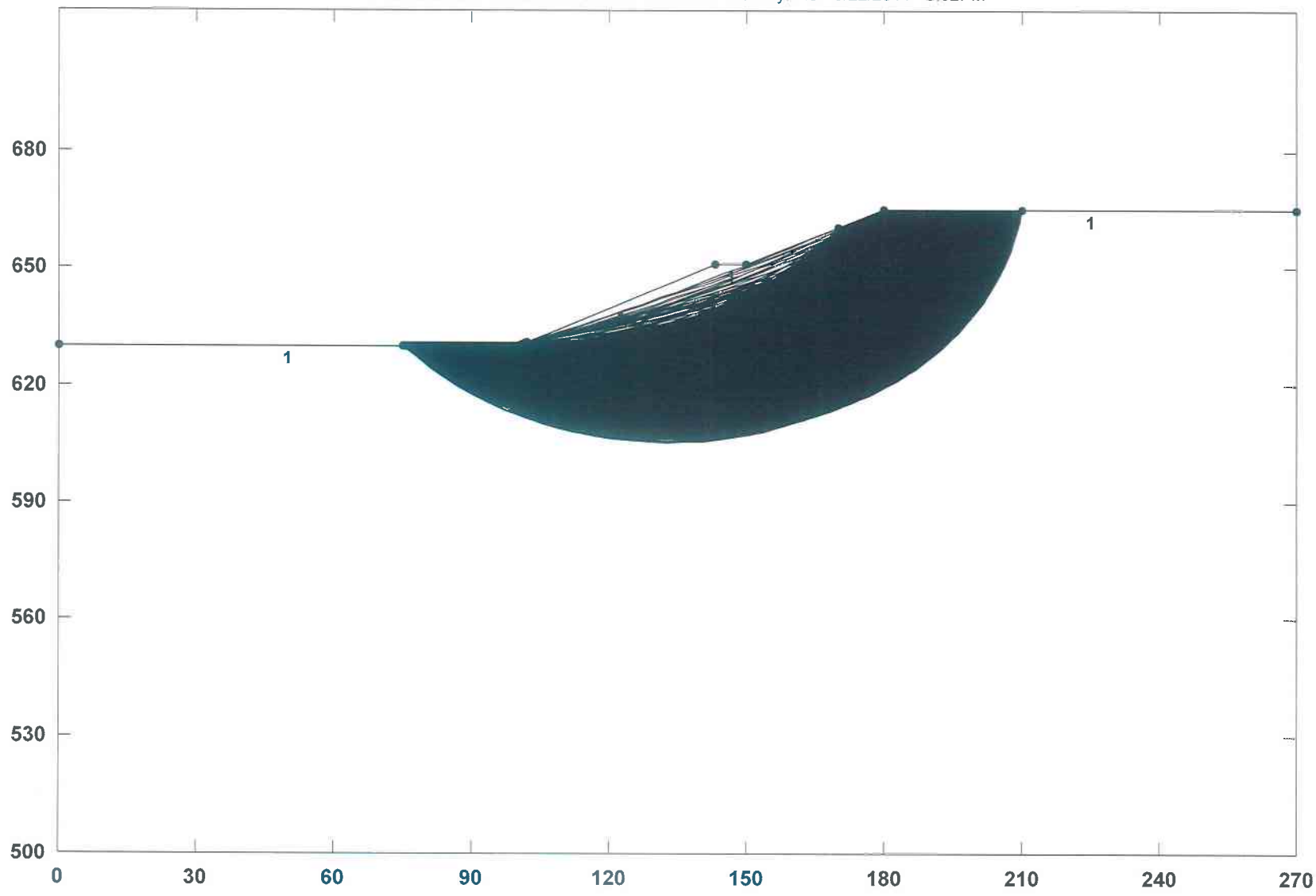
```
                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
        Modified Bishop, Simplified Janbu, or GLE Method of Slices.
        (Includes Spencer & Morgenstern-Price Type Analysis)
        Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
        Nonlinear Undrained Shear Strength, Curved Phi Envelope,
        Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
        Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
 Analysis Run Date:          3/24/2011
 Time of Run:                1:28PM
 Run By:                     RS
 Input Data Filename:        P:02P.
 Output Filename:            P:02P.OUT
 Unit System:                English
 Plotted Output Filename:    P:02P.PLT
 PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; P-Static;
                       HighestCut Slope w/ Clay Beds; 15'w Key
 BOUNDARY COORDINATES
     3 Top   Boundaries
     7 Total Boundaries
 Boundary      X-Left      Y-Left     X-Right     Y-Right     Soil Type
    No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
     1          0.00      585.00      100.00      585.00         2
     2        100.00      585.00      150.00      610.00         1
     3        150.00      610.00      250.00      610.00         1
     4        100.00      585.00      100.10      582.00         2
     5        100.10      582.00      115.00      582.00         2
     6        115.00      582.00      155.00      605.00         2
     7        155.00      605.00      250.00      605.00         2
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)     (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   120.0    120.0     180.0     36.0     0.00      0.0      1
   2   120.0    120.0     360.0     38.0     0.00      0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     1 soil type(s)
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified -  3
 Direction     Counterclockwise     Cohesion      Friction
   Range        Direction Limit    Intercept       Angle
   No.             (deg)             (psf)         (deg)
    1               5.0              360.00         38.00
    2              16.0              180.00         14.00
    3              90.0              360.00         38.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Anisc
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 A Horizontal Earthquake Loading Coefficient
 Of0.150 Has Been Assigned
 A Vertical Earthquake Loading Coefficient
 Of0.000 Has Been Assigned
 Cavitation Pressure -     0.0(psf)
 Janbus Empirical Coef is being used for the case of  c & phi both > 0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
```



```
 3000 Trial Surfaces Have Been Generated.
  2 Boxes Specified For Generation Of Central Block Base
  Length Of Line Segments For Active And Passive Portions Of
  Sliding Block Is  10.0
  Box        X-Left      Y-Left     X-Right     Y-Right      Height
  No.         (ft)        (ft)        (ft)        (ft)        (ft)
   1          80.00      576.00      122.00      583.00       8.00
   2         122.10      583.00      192.00      598.00       8.00
        * * Safety Factors Are Calculated By The Simplified Janbu Method * *
        Total Number of Trial Surfaces Evaluated -  3000
        Statistical Data On All Valid FS Values:
           FS Max -   5.958   FS Min -   1.217   FS Ave -   1.926
           Standard Deviation -    0.631   Coefficient of Variation -   32.78 %
        Failure Surface Specified By  6 Coordinate Points
          Point       X-Surf      Y-Surf
           No.         (ft)        (ft)
            1         99.05      585.00
            2        101.56      583.81
            3        110.56      579.45
            4        181.94      599.43
            5        188.97      606.54
            6        192.43      610.00
               Factor of Safety
             ***    1.217   ***
             Individual data on the    12  slices
                                Water  Water     Tie     Tie     Earthquake
                                Force  Force    Force   Force       Force   Surcharge
 Slice  Width   Weight    Top    Bot     Norm    Tan     Hor     Ver    Load
 No.    (ft)    (lbs)    (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)  (lbs)
  1      0.0      25.7     0.0    0.0     0.0     0.0     3.9     0.0     0.0
  2      0.0       0.8     0.0    0.0     0.0     0.0     0.1     0.0     0.0
  3      1.5     226.8     0.0    0.0     0.0     0.0    34.0     0.0     0.0
  4      3.7    1707.1     0.0    0.0     0.0     0.0   256.1     0.0     0.0
  5      5.3    5209.1     0.0    0.0     0.0     0.0   781.4     0.0     0.0
  6      4.4    6026.1     0.0    0.0     0.0     0.0   903.9     0.0     0.0
  7     35.0   65777.6     0.0    0.0     0.0     0.0  9866.7     0.0     0.0
  8      5.0   11288.2     0.0    0.0     0.0     0.0  1693.2     0.0     0.0
  9     26.9   46375.7     0.0    0.0     0.0     0.0  6956.4     0.0     0.0
 10      5.5    5146.9     0.0    0.0     0.0     0.0   772.0     0.0     0.0
 11      0.0     772.4     0.0    0.0     0.0     0.0   115.9     0.0     0.0
 12      0.0     717.9     0.0    0.0     0.0     0.0   107.7     0.0     0.0
                 **** END OF GSTABL7 OUTPUT ****
```

Shea Homes; Baker Ranch; Static; HighestCut Slope; General Stability

P:\2010\10028-01\STED\HIGHES~3\01.PLT Run By: RS 3/22/2011 2:02PM



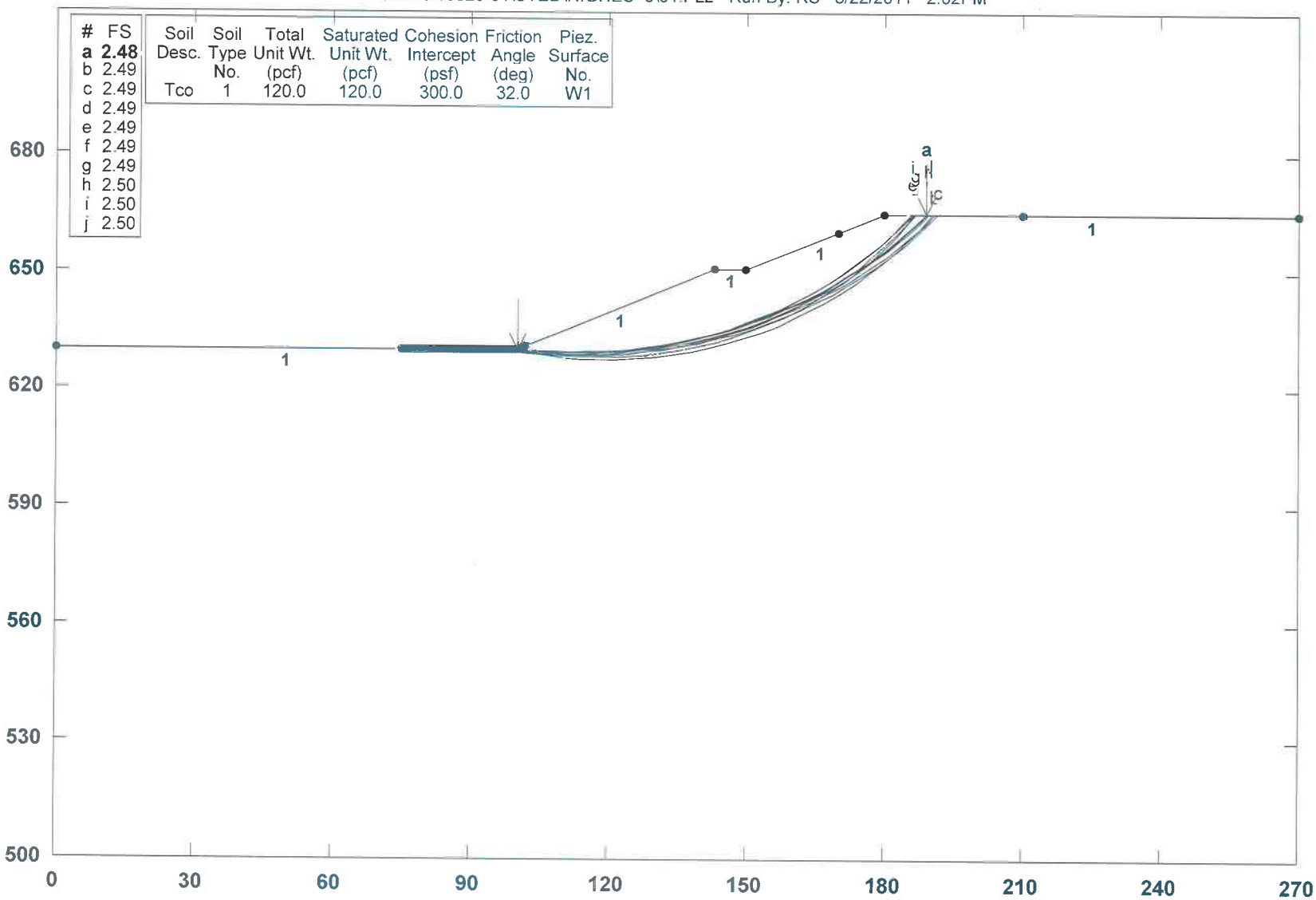
NMG

Shea Homes; Baker Ranch; Static; HighestCut Slope; General Stability

P:\2010\10028-01\STED\HIGHES~3\01.PL2 Run By: RS 3/22/2011 2:02PM

#	FS
a	**2.48**
b	2.49
c	2.49
d	2.49
e	2.49
f	2.49
g	2.49
h	2.50
i	2.50
j	2.50

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Tco	1	120.0	120.0	300.0	32.0	W1



GSTABL7 v.2 FSmin=2.48

Safety Factors Are Calculated By The Modified Bishop Method

NMG

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        3/22/2011
Time of Run:              2:02PM
Run By:                   RS
Input Data Filename:      P:01.
Output Filename:          P:01.OUT
Unit System:              English
Plotted Output Filename:  P:01.PLT
PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; Static; Highest
                      Cut Slope; General Stability
BOUNDARY COORDINATES
    5 Top   Boundaries
    5 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     630.00     100.00     630.00        1
    2       100.00     630.00     143.00     651.00        1
    3       143.00     651.00     150.00     651.00        1
    4       150.00     651.00     180.00     665.00        1
    5       180.00     665.00     270.00     665.00        1
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    120.0     300.0     32.0     0.00      0.0      1
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4800 Trial Surfaces Have Been Generated.
  80 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between  X =  75.00(ft)
                                 and  X = 102.00(ft)
Each Surface Terminates Between   X = 170.00(ft)
                                 and  X = 210.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
 4.00(ft) Line Segments Define Each Trial Failure Surface.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Evaluated =  4800
      Statistical Data On All Valid FS Values:
         FS Max =   6.487   FS Min =   2.483   FS Ave =   3.048
         Standard Deviation =    0.341   Coefficient of Variation =   11.20 %
      Failure Surface Specified By 26 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        100.17      630.08
          2        104.15      629.69
          3        108.14      629.46
          4        112.14      629.38
          5        116.14      629.46
          6        120.13      629.70
          7        124.12      630.10
          8        128.08      630.65
          9        132.03      631.37
         10        135.92      632.23
```



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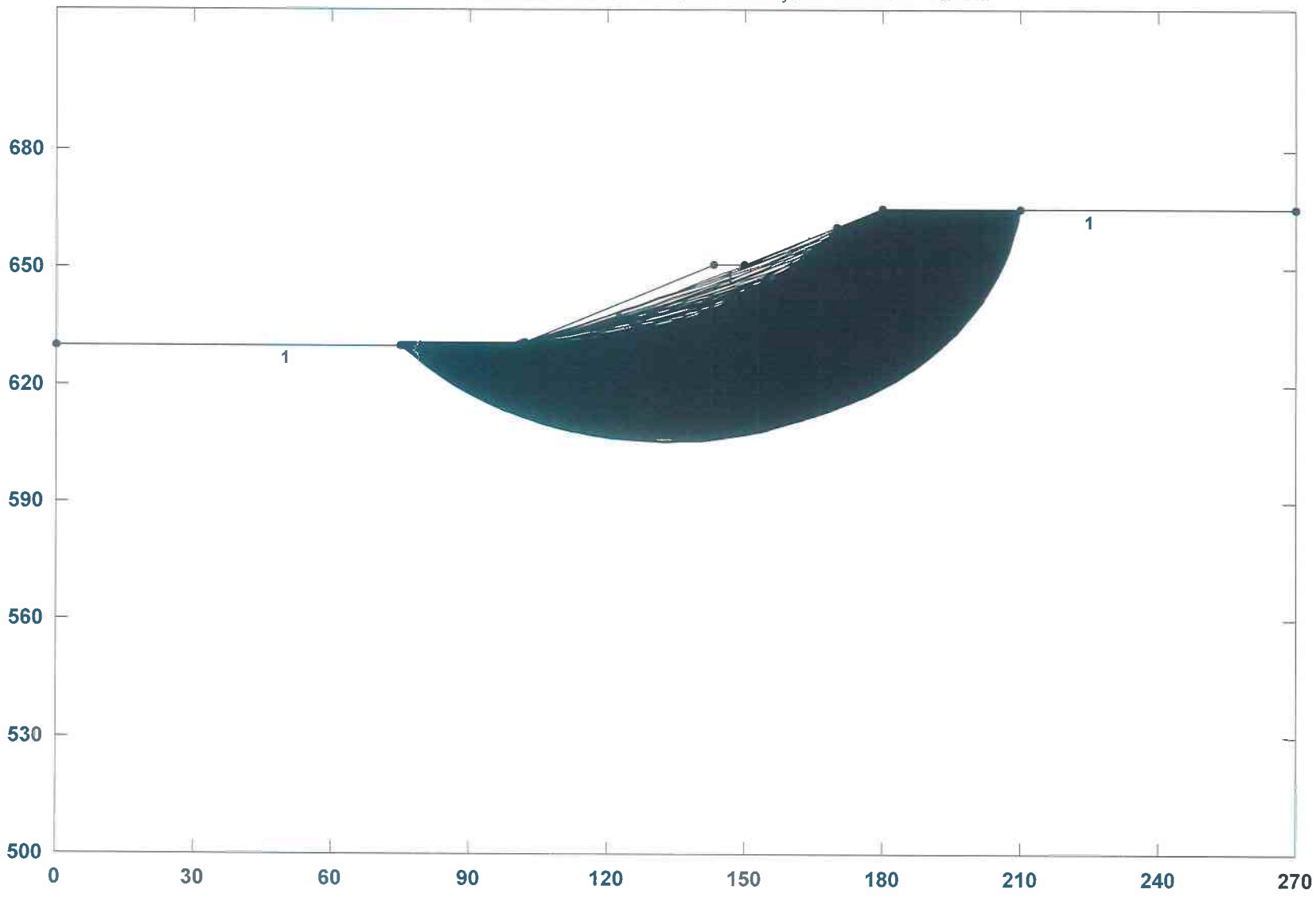
         11        139.79      633.25
         12        143.61      634.43
         13        147.38      635.75
         14        151.10      637.22
         15        154.76      638.84
         16        158.35      640.60
         17        161.87      642.50
         18        165.31      644.54
         19        168.67      646.71
         20        171.94      649.02
         21        175.11      651.45
         22        178.19      654.01
         23        181.16      656.69
         24        184.03      659.48
         25        186.78      662.38
         26        189.07      665.00
      Circle Center At X =  112.1 ; Y =  730.4  and Radius,  101.0
          Factor of Safety
            ***    2.483    ***
          Individual data on the    28  slices
                          Water  Water    Tie    Tie     Earthquake
                          Force  Force   Force  Force       Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm   Tan     Hor     Ver     Load
 No.    (ft)    (lbs)    (lbs)  (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)
  1     2.7     556.1     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  2     4.0    1643.1     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  3     4.0    2656.9     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  4     4.0    3592.8     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  5     4.0    4445.0     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  6     4.0    5208.4     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  7     4.0    5879.1     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  8     3.9    6453.6     0.0    0.0     0.0    0.0     0.0     0.0     0.0
  9     3.9    6929.9     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 10     3.9    7306.6     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 11     0.0    6353.3     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 12     0.0    1219.0     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 13     0.0    7208.1     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 14     2.6    4624.7     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 15     1.1    1888.1     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 16     3.7    6295.0     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 17     3.6    6180.9     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 18     3.5    5983.3     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 19     3.4    5707.4     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 20     3.4    5359.3     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 21     3.3    4945.6     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 22     3.2    4473.9     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 23     3.1    3952.2     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 24     0.0    2117.5     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 25     0.0    1233.8     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 26     2.9    2377.7     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 27     2.8    1343.9     0.0    0.0     0.0    0.0     0.0     0.0     0.0
 28     2.3     360.0     0.0    0.0     0.0    0.0     0.0     0.0     0.0
                  **** END OF GSTABL7 OUTPUT ****
```

Shea Homes; Baker Ranch; P-Static; Highest Cut Slope; General Stability

P:\2010\10028-01\STED\HIGHES~3\01P.PLT Run By: RS 3/22/2011 2:04PM



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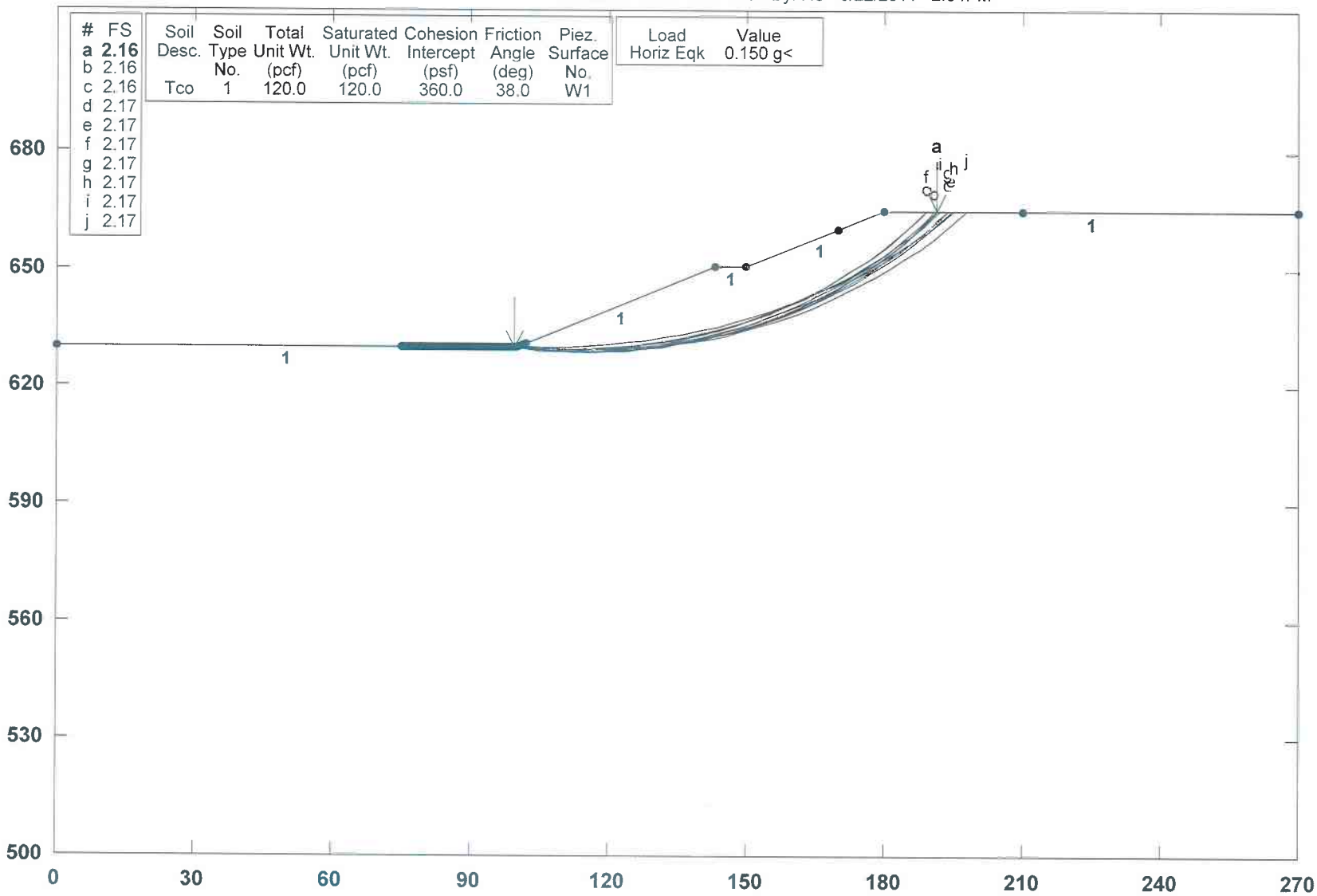
Shea Homes; Baker Ranch; P-Static; Highest Cut Slope; General Stability

P:\2010\10028-01\STED\HIGHES~3\01P.PL2 Run By: RS 3/22/2011 2:04PM



#	FS
a	**2.16**
b	2.16
c	2.16
d	2.17
e	2.17
f	2.17
g	2.17
h	2.17
i	2.17
j	2.17

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Tco	1	120.0	120.0	360.0	38.0	W1

Load	Value
Horiz Eqk	0.150 g<

GSTABL7 v.2 FSmin=2.16

Safety Factors Are Calculated By The Modified Bishop Method

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                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        3/22/2011
Time of Run:              2:04PM
Run By:                   RS
Input Data Filename:      P:01P.
Output Filename:          P:01P.OUT
Unit System:              English
Plotted Output Filename:  P:01P.PLT
PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; P-Static;
                      Highest Cut Slope; General Stability
BOUNDARY COORDINATES
    5 Top   Boundaries
    5 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     630.00     100.00     630.00        1
    2       100.00     630.00     143.00     651.00        1
    3       143.00     651.00     150.00     651.00        1
    4       150.00     651.00     180.00     665.00        1
    5       180.00     665.00     270.00     665.00        1
ISOTROPIC SOIL PARAMETERS
 1 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    120.0     360.0     38.0    0.00       0.0      1
A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure =    0.0(psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4800 Trial Surfaces Have Been Generated.
 80 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between  X =  75.00(ft)
                                 and  X = 102.00(ft)
Each Surface Terminates Between   X = 170.00(ft)
                                 and  X = 210.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
 4.00(ft) Line Segments Define Each Trial Failure Surface.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Evaluated =  4800
      Statistical Data On All Valid FS Values:
         FS Max =   5.719   FS Min =   2.159   FS Ave =   2.636
         Standard Deviation =    0.304   Coefficient of Variation =   11.53 %
      Failure Surface Specified By 27 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        99.71      630.00
          2       103.67      629.44
          3       107.65      629.04
          4       111.65      628.81
          5       115.65      628.74
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          6       119.64      628.84
          7       123.64      629.09
          8       127.61      629.51
          9       131.57      630.10
         10       135.50      630.84
         11       139.40      631.75
         12       143.25      632.81
         13       147.06      634.03
         14       150.82      635.40
         15       154.52      636.93
         16       158.15      638.61
         17       161.71      640.43
         18       165.19      642.40
         19       168.59      644.51
         20       171.90      646.76
         21       175.11      649.14
         22       178.23      651.65
         23       181.24      654.28
         24       184.14      657.04
         25       186.92      659.91
         26       189.59      662.89
         27       191.32      665.00
   Circle Center At X =  115.3 ; Y =  726.5  and Radius,   97.8
         Factor of Safety
        ***    2.159    ***
       Individual data on the    30  slices
                          Water  Water    Tie     Tie     Earthquake
                          Force  Force   Force   Force      Force   Surcharge
Slice  Width   Weight     Top    Bot    Norm    Tan     Hor     Ver    Load
 No.    (ft)    (lbs)    (lbs)  (lbs)  (lbs)   (lbs)   (lbs)   (lbs)  (lbs)
  1     0.2      0.7      0.0    0.0    0.0     0.0     0.1     0.0    0.0
  2     3.7    527.5      0.0    0.0    0.0     0.0    79.1     0.0    0.0
  3     4.0   1682.6      0.0    0.0    0.0     0.0   252.4     0.0    0.0
  4     4.0   2771.9      0.0    0.0    0.0     0.0   415.8     0.0    0.0
  5     4.0   3785.5      0.0    0.0    0.0     0.0   567.8     0.0    0.0
  6     4.0   4716.5      0.0    0.0    0.0     0.0   707.5     0.0    0.0
  7     4.0   5558.4      0.0    0.0    0.0     0.0   833.8     0.0    0.0
  8     4.0   6306.2      0.0    0.0    0.0     0.0   945.9     0.0    0.0
  9     4.0   6955.6      0.0    0.0    0.0     0.0  1043.3     0.0    0.0
 10     3.9   7503.2      0.0    0.0    0.0     0.0  1125.5     0.0    0.0
 11     0.0   7946.9      0.0    0.0    0.0     0.0  1192.0     0.0    0.0
 12     0.0   7727.2      0.0    0.0    0.0     0.0  1159.1     0.0    0.0
 13     0.0    556.5      0.0    0.0    0.0     0.0    83.5     0.0    0.0
 14     3.8   8037.1      0.0    0.0    0.0     0.0  1205.6     0.0    0.0
 15     2.9   5790.4      0.0    0.0    0.0     0.0   868.6     0.0    0.0
 16     0.8   1568.8      0.0    0.0    0.0     0.0   235.3     0.0    0.0
 17     3.7   7133.1      0.0    0.0    0.0     0.0  1070.0     0.0    0.0
 18     3.6   7053.5      0.0    0.0    0.0     0.0  1058.0     0.0    0.0
 19     3.6   6883.2      0.0    0.0    0.0     0.0  1032.5     0.0    0.0
 20     3.5   6627.4      0.0    0.0    0.0     0.0   994.1     0.0    0.0
 21     3.4   6291.9      0.0    0.0    0.0     0.0   943.8     0.0    0.0
 22     3.3   5883.6      0.0    0.0    0.0     0.0   882.5     0.0    0.0
 23     3.2   5410.2      0.0    0.0    0.0     0.0   811.5     0.0    0.0
 24     0.0   4880.2      0.0    0.0    0.0     0.0   732.0     0.0    0.0
 25     0.0   2586.0      0.0    0.0    0.0     0.0   387.9     0.0    0.0
 26     1.2   1673.5      0.0    0.0    0.0     0.0   251.0     0.0    0.0
 27     2.9   3250.3      0.0    0.0    0.0     0.0   487.5     0.0    0.0
 28     2.8   2181.1      0.0    0.0    0.0     0.0   327.2     0.0    0.0
 29     2.7   1151.1      0.0    0.0    0.0     0.0   172.7     0.0    0.0
 30     1.7    219.3      0.0    0.0    0.0     0.0    32.9     0.0    0.0
                  **** END OF GSTABL7 OUTPUT ****
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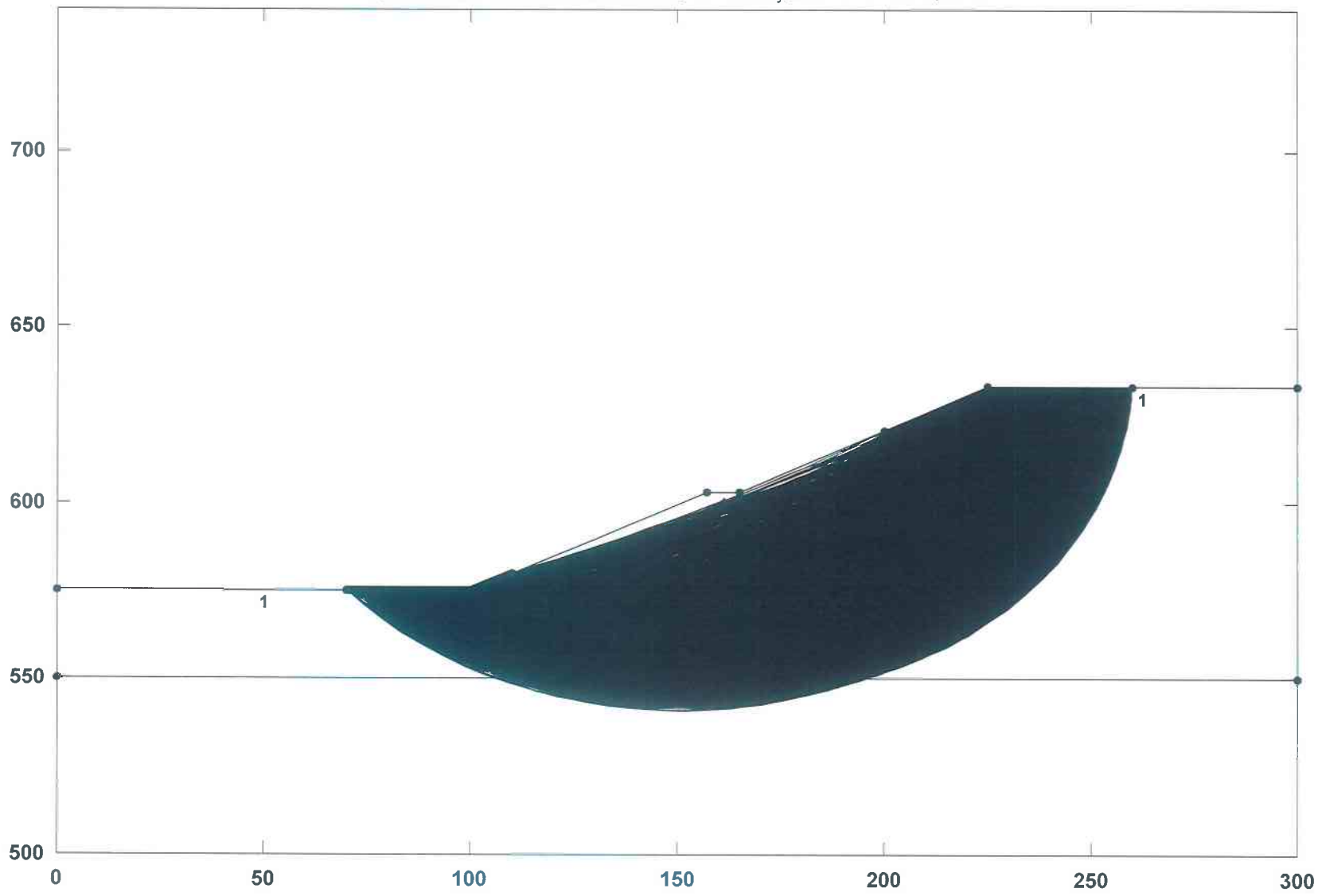
Shea Homes; Baker Ranch; Static; HighestFill Slope; General Stability

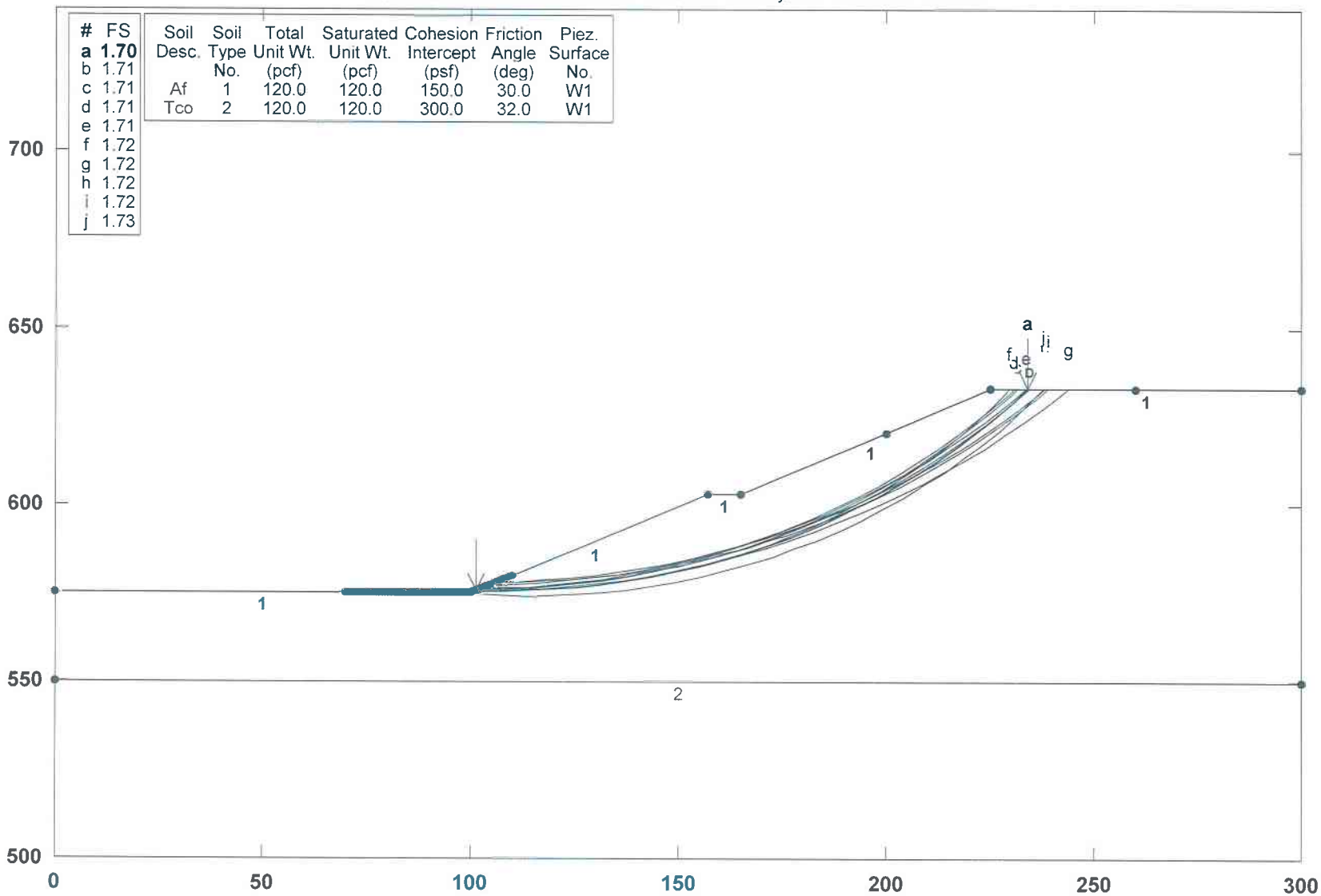
P:\2010\10028-01\STED\HIGHES~2\01.PLT Run By: RS 3/22/2011 2:17PM



NMG

Shea Homes; Baker Ranch; Static; HighestFill Slope; General Stability

P:\2010\10028-01\STED\HIGHES~2\01.PL2 Run By: RS 3/22/2011 2:17PM



#	FS
a	**1.70**
b	1.71
c	1.71
d	1.71
e	1.71
f	1.72
g	1.72
h	1.72
i	1.72
j	1.73

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Tco	2	120.0	120.0	300.0	32.0	W1

GSTABL7 v.2 FSmin=1.70

Safety Factors Are Calculated By The Modified Bishop Method

NMG

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                    *** GSTABL7 ***
          ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
          (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        3/22/2011
Time of Run:              2:17PM
Run By:                   RS
Input Data Filename:      P:01.
Output Filename:          P:01.OUT
Unit System:              English
Plotted Output Filename:  P:01.PLT
PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; Static; Highest
                      Fill Slope; General Stability
BOUNDARY COORDINATES
    5 Top   Boundaries
    6 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      575.00      100.00      575.00         1
    2       100.00      575.00      157.00      603.00         1
    3       157.00      603.00      165.00      603.00         1
    4       165.00      603.00      225.00      633.00         1
    5       225.00      633.00      300.00      633.00         1
    6         0.00      550.00      300.00      550.00         2
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    120.0     150.0     30.0    0.00      0.0       1
  2   120.0    120.0     300.0     32.0    0.00      0.0       1
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4800 Trial Surfaces Have Been Generated.
 80 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between  X =  70.00(ft)
                                 and  X = 110.00(ft)
Each Surface Terminates Between   X = 200.00(ft)
                                 and  X = 260.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
 6.00(ft) Line Segments Define Each Trial Failure Surface.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Evaluated =  4800
      Statistical Data On All Valid FS Values:
         FS Max =   3.432   FS Min =   1.704   FS Ave =   2.338
         Standard Deviation =    0.387   Coefficient of Variation =   16.56 %
      Failure Surface Specified By 26 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1       101.19      575.56
          2       107.19      575.51
          3       113.18      575.65
          4       119.17      576.01
          5       125.15      576.57
          6       131.10      577.34
          7       137.02      578.32
          8       142.90      579.51
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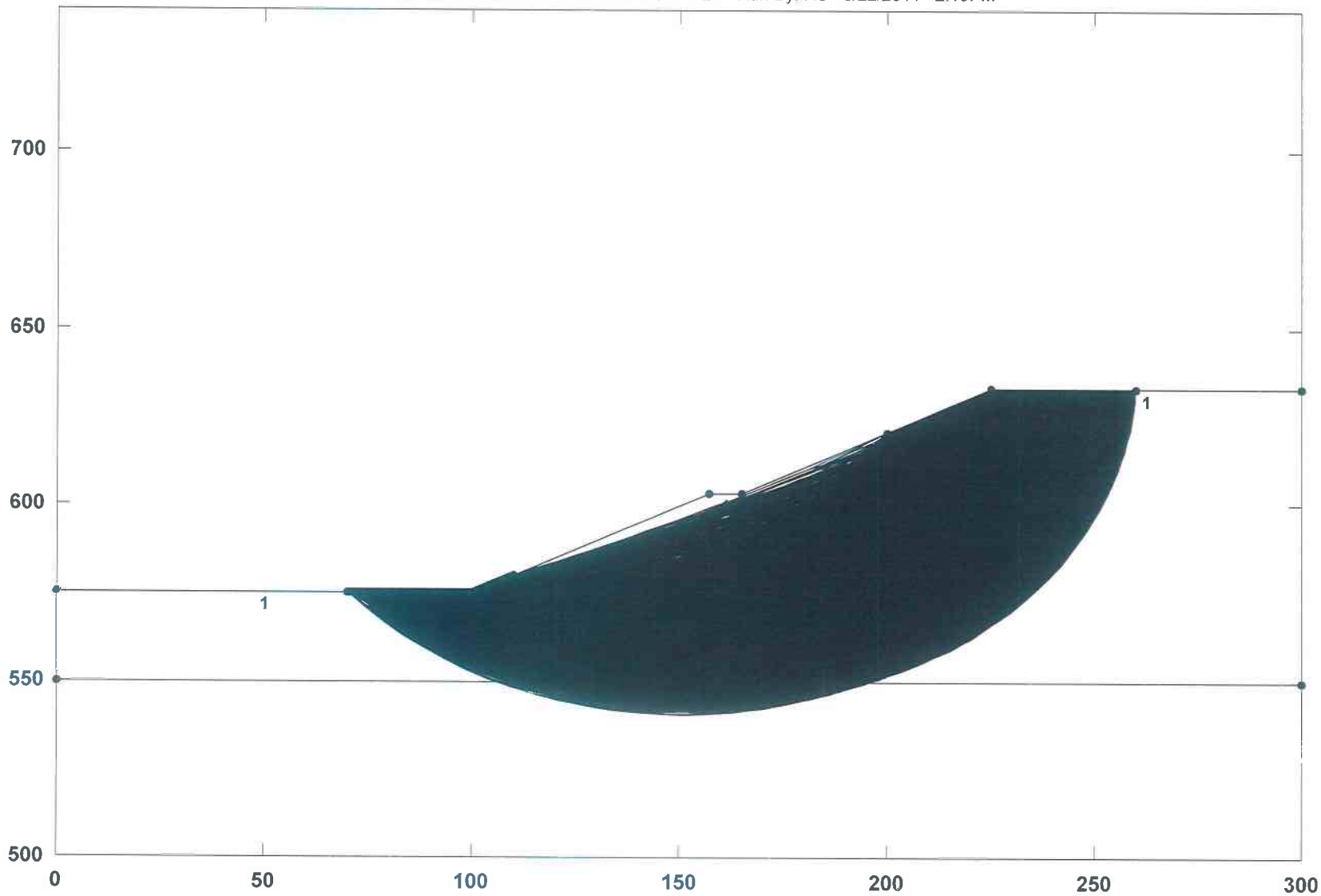
          9       148.73      580.91
         10       154.52      582.51
         11       160.24      584.31
         12       165.90      586.31
         13       171.48      588.51
         14       176.98      590.91
         15       182.39      593.49
         16       187.71      596.27
         17       192.93      599.23
         18       198.04      602.38
         19       203.04      605.70
         20       207.91      609.19
         21       212.66      612.86
         22       217.28      616.69
         23       221.76      620.68
         24       226.10      624.82
         25       230.29      629.12
         26       233.82      633.00
Circle Center At X =  106.2 ; Y =  745.9  and Radius,  170.4
      Factor of Safety
        ***    1.704    ***
      Individual data on the    26  slices
                          Water  Water    Tie     Tie     Earthquake
                          Force  Force   Force   Force       Force   Surcharge
Slice  Width   Weight     Top    Bot     Norm    Tan     Hor     Ver     Load
 No.    (ft)    (lbs)    (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1     6.0     1066.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  2     6.0     3181.6     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  3     6.0     5116.3     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  4     6.0     6881.1     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  5     6.0     8468.5     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  6     5.9     9872.6     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  7     5.9    11088.5     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  8     5.8    12113.0     0.0    0.0     0.0     0.0     0.0     0.0     0.0
  9     5.8    12944.7     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 10     2.5     5809.1 0.0E+00    0.0     0.0     0.0     0.0     0.0     0.0
 11     3.2     7464.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 12     4.8    10196.5     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 13     0.9     1834.7     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 14     5.6    11677.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 15     5.5    11820.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 16     5.4    11765.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 17     5.3    11581.1     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 18     5.2    11214.1     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 19     5.1    10694.5     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 20     5.0    10033.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 21     4.9     9242.2     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 22     4.8     8334.5     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 23     4.6     7324.4     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 24     4.5     6227.1     0.0    0.0 0.0E+00     0.0     0.0     0.0     0.0
 25     3.2     3871.1     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 26     1.1     1150.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 27     4.2     3031.9     0.0    0.0     0.0     0.0     0.0     0.0     0.0
 28     3.5      822.4     0.0    0.0     0.0     0.0     0.0     0.0     0.0
                 **** END OF GSTABL7 OUTPUT ****
```

Shea Homes; Baker Ranch; P-Static; Highest Fill Slope; General Stability

P:\2010\10028-01\STED\HIGHES~2\01P.PLT Run By: RS 3/22/2011 2:19PM



NMG

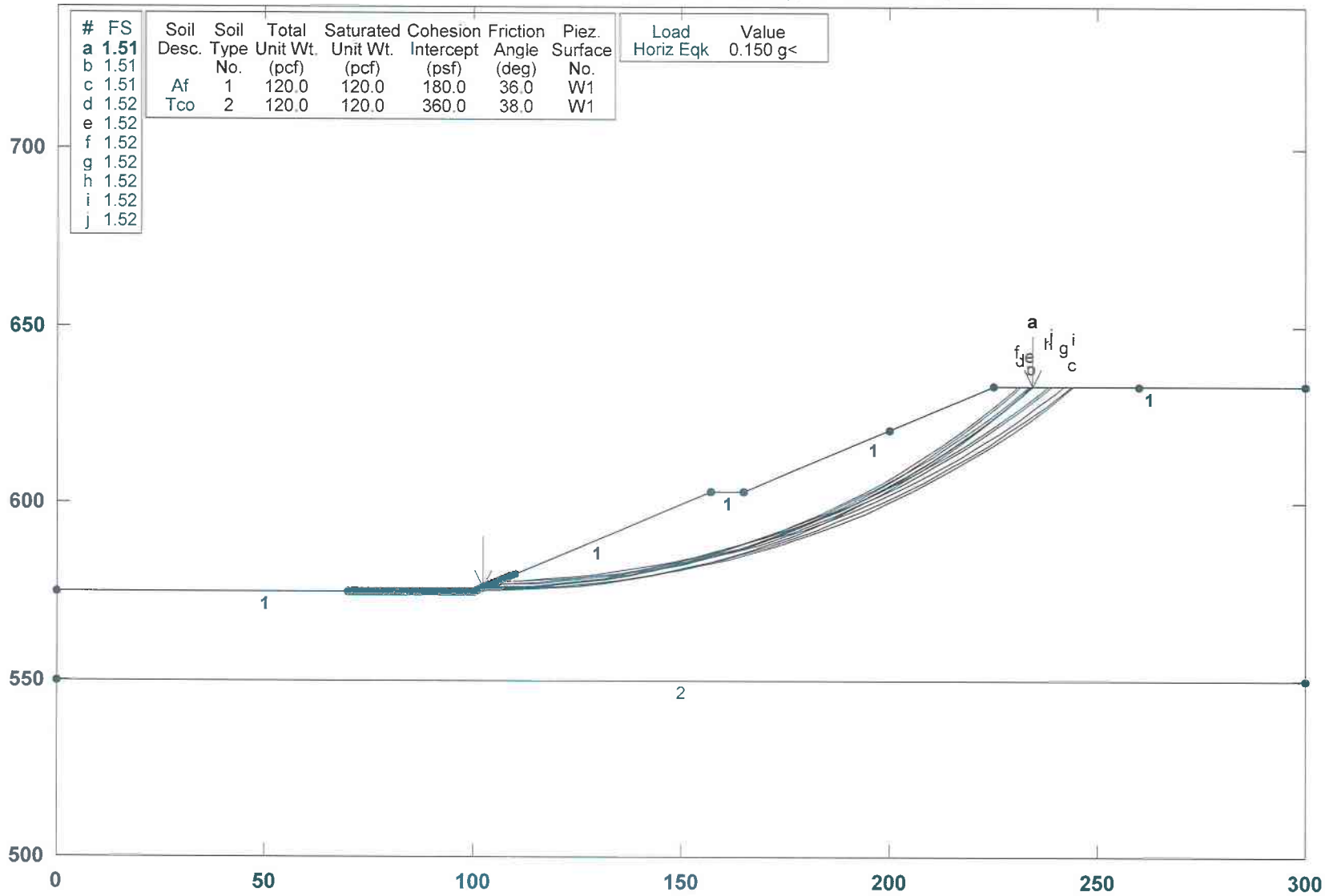
Shea Homes; Baker Ranch; P-Static; Highest Fill Slope; General Stability

P:\2010\10028-01\STED\HIGHES~2\01P.PL2 Run By: RS 3/22/2011 2:19PM

#	FS
a	**1.51**
b	1.51
c	1.51
d	1.52
e	1.52
f	1.52
g	1.52
h	1.52
i	1.52
j	1.52

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	36.0	W1
Tco	2	120.0	120.0	360.0	38.0	W1

Load	Value
Horiz Eqk	0.150 g<



GSTABL7 v.2 FSmin=1.51

Safety Factors Are Calculated By The Modified Bishop Method

NMG

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                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        3/22/2011
Time of Run:              2:19PM
Run By:                   RS
Input Data Filename:      P:01P.
Output Filename:          P:01P.OUT
Unit System:              English
Plotted Output Filename:  P:01P.PLT
PROBLEM DESCRIPTION:  Shea Homes; Baker Ranch; P-Static;
                      Highest Fill Slope; General Stability
BOUNDARY COORDINATES
    5 Top   Boundaries
    6 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     575.00     100.00     575.00        1
    2       100.00     575.00     157.00     603.00        1
    3       157.00     603.00     165.00     603.00        1
    4       165.00     603.00     225.00     633.00        1
    5       225.00     633.00     300.00     633.00        1
    6         0.00     550.00     300.00     550.00        2
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.   (psf)     No.
  1   120.0    120.0     180.0     36.0    0.00      0.0      1
  2   120.0    120.0     360.0     38.0    0.00      0.0      1
A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure =    0.0(psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4800 Trial Surfaces Have Been Generated.
 80 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between  X =  70.00(ft)
                                 and  X = 110.00(ft)
Each Surface Terminates Between   X = 200.00(ft)
                                 and   X = 260.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
 6.00(ft) Line Segments Define Each Trial Failure Surface.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Evaluated =  4800
      Statistical Data On All Valid FS Values:
         FS Max =   3.053   FS Min =   1.512   FS Ave =   2.090
         Standard Deviation =    0.359   Coefficient of Variation =   17.17 %
      Failure Surface Specified By 26 Coordinate Points
        Point       X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        102.54      576.25
          2        108.54      576.37
          3        114.53      576.69
```



```
          4        120.51      577.20
          5        126.47      577.91
          6        132.40      578.81
          7        138.30      579.91
          8        144.16      581.20
          9        149.97      582.68
         10        155.73      584.36
         11        161.44      586.22
         12        167.08      588.27
         13        172.65      590.50
         14        178.14      592.91
         15        183.55      595.50
         16        188.88      598.27
         17        194.11      601.21
         18        199.24      604.32
         19        204.26      607.60
         20        209.18      611.04
         21        213.98      614.64
         22        218.66      618.39
         23        223.21      622.30
         24        227.63      626.36
         25        231.92      630.55
         26        234.26      633.00
   Circle Center At X =  101.9 ; Y =  758.9  and Radius,  182.7
        Factor of Safety
          ***    1.512   ***
       Individual data on the    28  slices
                          Water  Water    Tie     Tie     Earthquake
                          Force  Force   Force   Force       Force   Surcharge
Slice  Width   Weight     Top    Bot    Norm    Tan      Hor     Ver    Load
 No.    (ft)    (lbs)    (lbs)  (lbs)   (lbs)   (lbs)    (lbs)   (lbs)   (lbs)
  1      6.0    1017.4     0.0    0.0     0.0     0.0    152.6     0.0     0.0
  2      6.0    2976.7     0.0    0.0     0.0     0.0    446.5     0.0     0.0
  3      6.0    4781.3     0.0    0.0     0.0     0.0    717.2     0.0     0.0
  4      6.0    6424.4     0.0    0.0     0.0     0.0    963.7     0.0     0.0
  5      5.9    7900.2     0.0    0.0     0.0     0.0   1185.0     0.0     0.0
  6      5.9    9204.5     0.0    0.0     0.0     0.0   1380.7     0.0     0.0
  7      5.9   10333.8     0.0    0.0     0.0     0.0   1550.1     0.0     0.0
  8      5.8   11286.2     0.0    0.0     0.0     0.0   1692.9     0.0     0.0
  9      5.8   12060.7     0.0    0.0     0.0     0.0   1809.1     0.0     0.0
 10      1.3    2752.2 0.0E+00    0.0     0.0     0.0    412.8     0.0     0.0
 11      4.4    9324.6     0.0    0.0     0.0     0.0   1398.7     0.0     0.0
 12      3.6    6895.5     0.0    0.0     0.0     0.0   1034.3     0.0     0.0
 13      2.1    3899.3     0.0    0.0     0.0     0.0    584.9     0.0     0.0
 14      5.6   10728.1     0.0    0.0     0.0     0.0   1609.2     0.0     0.0
 15      5.5   10874.0     0.0    0.0     0.0     0.0   1631.1     0.0     0.0
 16      5.4   10857.0     0.0    0.0     0.0     0.0   1628.5     0.0     0.0
 17      5.3   10683.1     0.0    0.0     0.0     0.0   1602.5     0.0     0.0
 18      5.2   10359.5     0.0    0.0     0.0     0.0   1553.9     0.0     0.0
 19      5.1    9894.4     0.0    0.0     0.0     0.0   1484.2     0.0     0.0
 20      5.0    9297.0     0.0    0.0     0.0     0.0   1394.5     0.0     0.0
 21      4.9    8577.5     0.0    0.0     0.0     0.0   1286.6     0.0     0.0
 22      4.8    7747.1     0.0    0.0     0.0     0.0   1162.1     0.0     0.0
 23      4.7    6817.7     0.0    0.0     0.0     0.0   1022.6     0.0     0.0
 24      4.6    5802.0     0.0    0.0     0.0     0.0    870.3     0.0     0.0
 25      1.8    2025.0     0.0    0.0     0.0     0.0    303.7     0.0     0.0
 26      2.6    2480.7     0.0    0.0     0.0     0.0    372.1     0.0     0.0
 27      4.3    2338.1     0.0    0.0     0.0     0.0    350.7     0.0     0.0
 28      2.3     343.3     0.0    0.0     0.0     0.0     51.5     0.0     0.0
                  **** END OF GSTABL7 OUTPUT ****
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APPENDIX F

APPENDIX F

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 Geotechnical Consultant: Prior to commencement of work, the owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed

immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

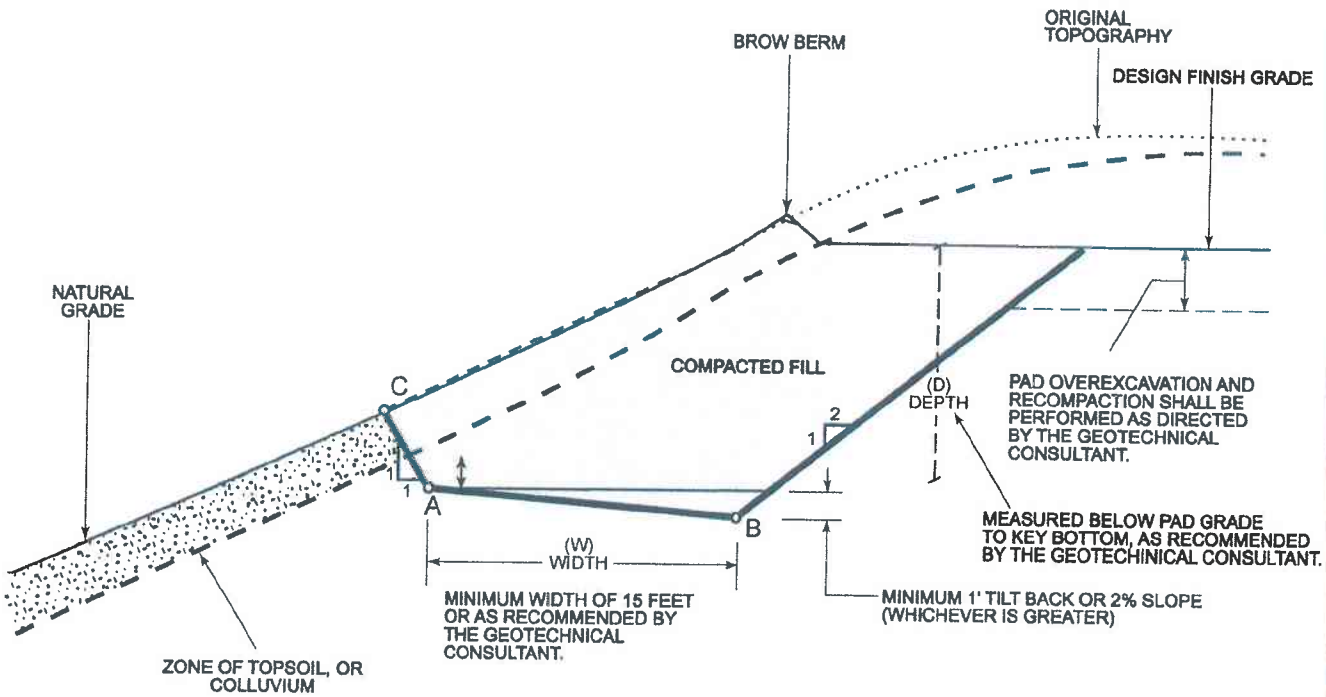
7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.



NOTES

1) WIDTH OF KEY SHOULD BE MEASURED HORIZONTALLY FROM POINT A BACK INTO SLOPE.

2) THE KEY BOTTOM SHOULD HAVE A ONE FOOT TILT BACK OR 2% SLOPE (WHICHEVER IS GREATER).

3) FRONT CUT SHOULD BE NO STEEPER THAN 1H:1V.

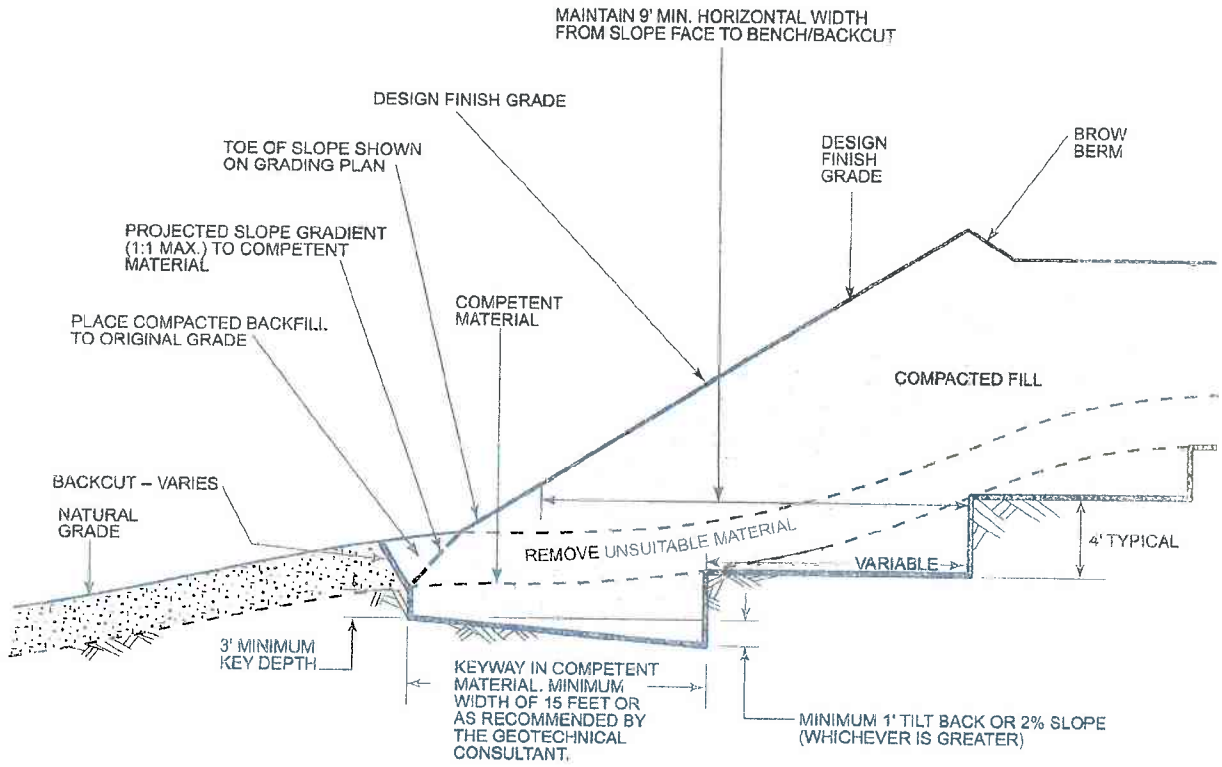
4) SUBDRAIN SHOULD BE INSTALLED NEAR BACK OF KEY (B) WHEN KEY DEPTH IS GREATER THAN 10 FEET OR AS THE GEOTECHNICAL CONSULTANT RECOMMENDS.

5) BENCHING SHALL BE PERFORMED FOR THE FRONT AND BACK CUTS AS FILL IS PLACED.

FIGURE G-1

TYPICAL SIDE HILL KEY FOR DAYLIGHT CUTS ABOVE NATURAL SLOPES MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.



NOTES:

1) BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE SOIL ENGINEER. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.

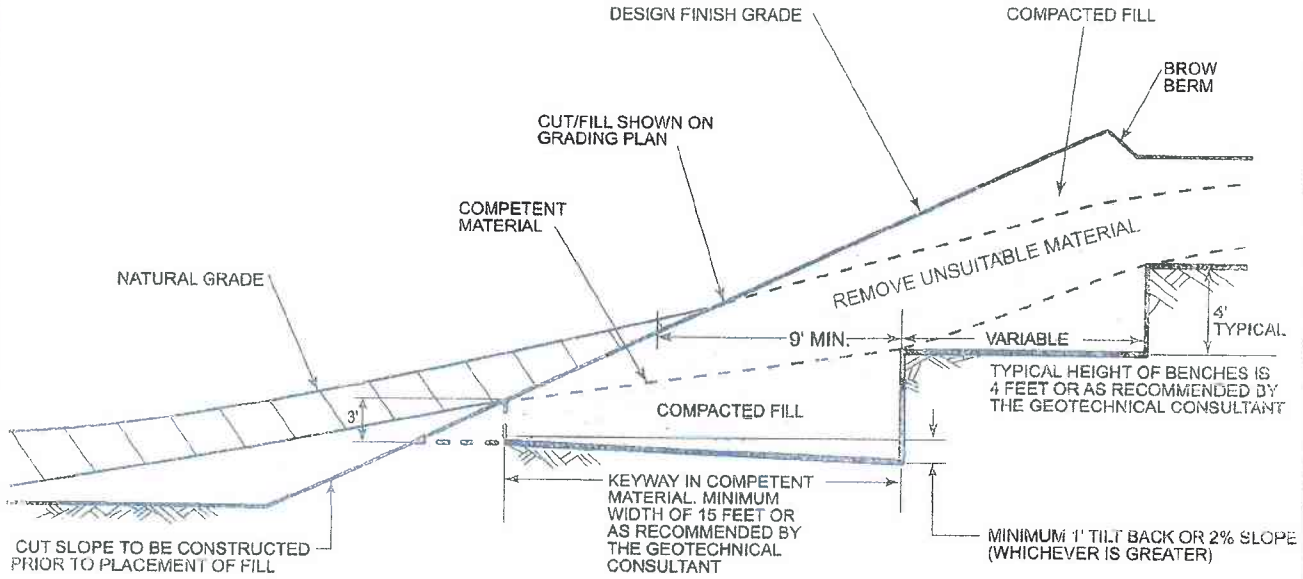
2) SUBDRAINS SHOULD BE INSTALLED AS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT

FIGURE G-2

TYPICAL FILL ABOVE NATURAL SLOPE MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

1/04 TYP FILL ABOVE NAT. SLOPE.ai



NOTES:

1) THE FILL PORTION OF THE SLOPE SHALL BE COMPACTED AS STATED IN THE PROJECT SPECIFICATIONS.

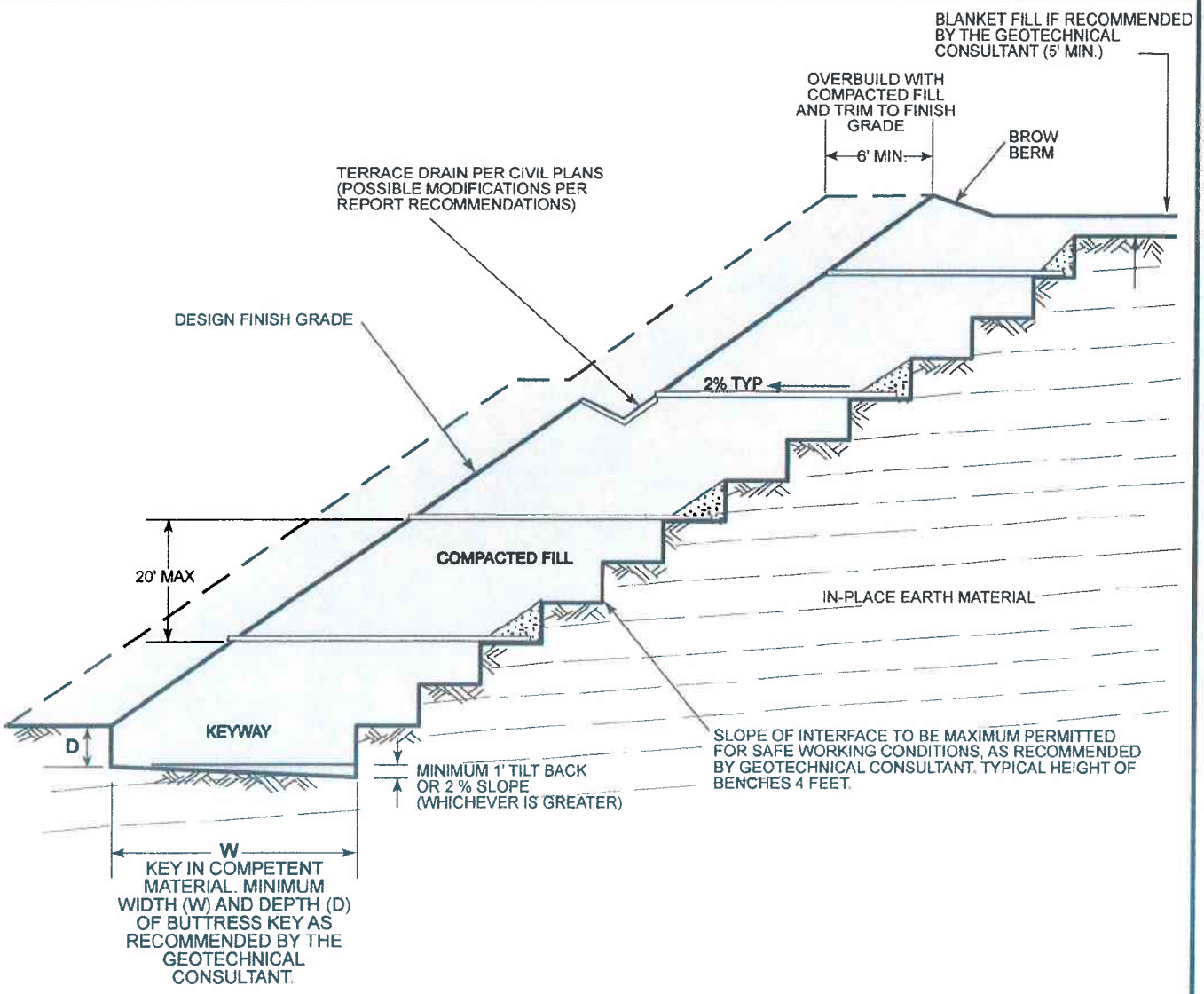
2) SUBDRAINS SHOULD BE INSTALLED AS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT.

FIGURE G-3

TYPICAL FILL ABOVE CUT SLOPE MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

1/04 TYP FILL ABOVE CUT SLOPE.ai

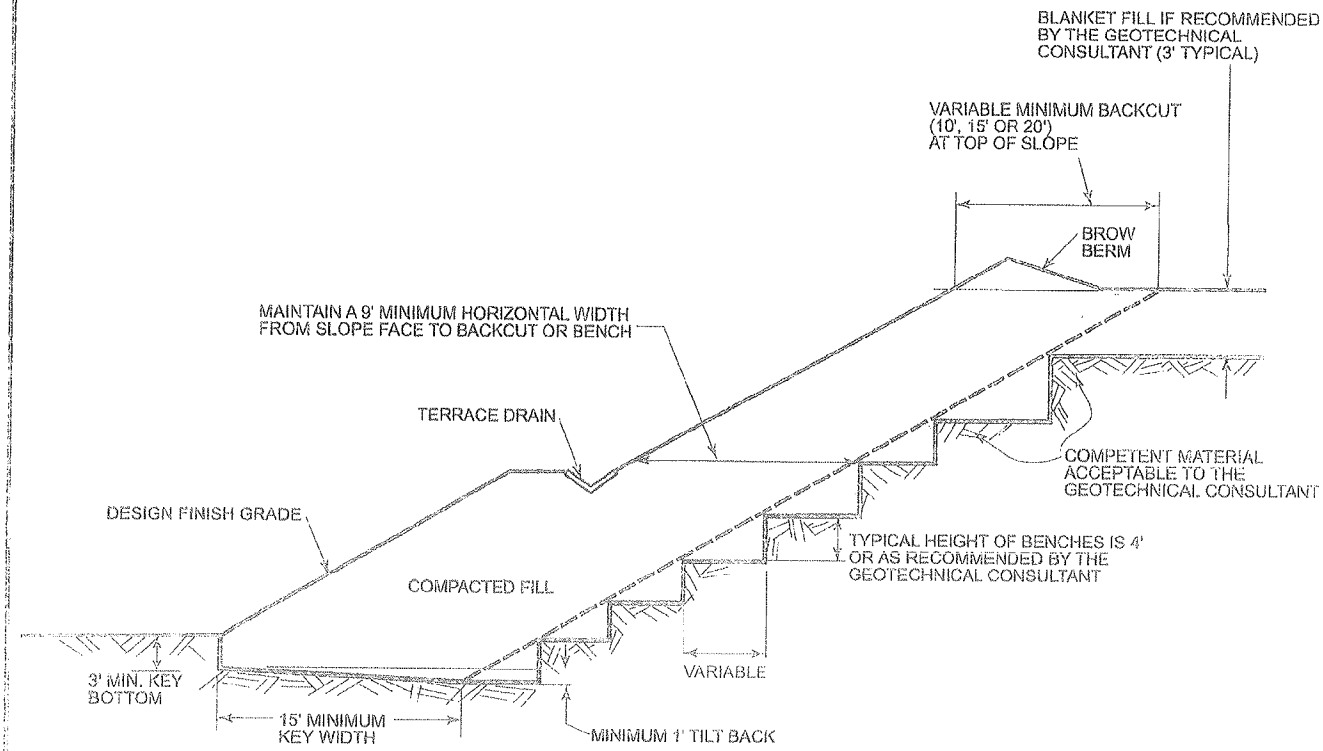


NOTE: FOR TYPICAL SUBDRAIN DETAILS, SEE FIGURE G-6.

FIGURE G-4

TYPICAL BUTTRESS AND SLOPE RECONSTRUCTION FILL MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.



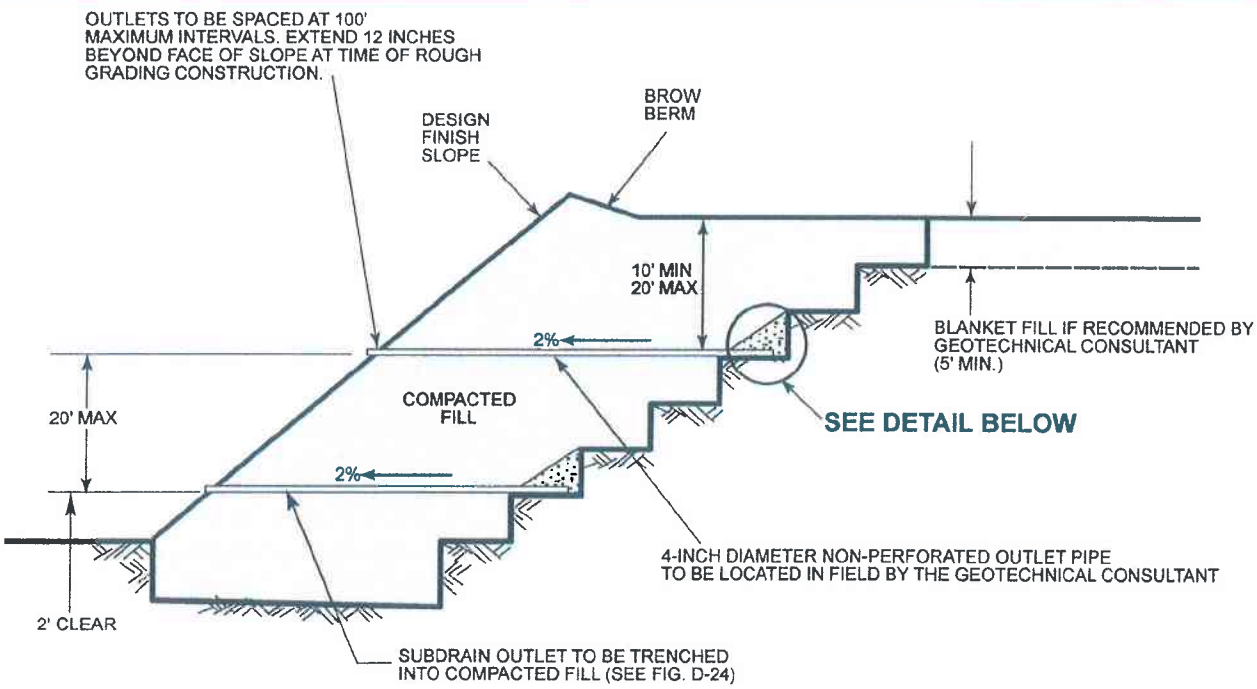
NOTE: FOR TYPICAL SUBDRAIN DETAILS, SEE FIGURE G-6.

FIGURE G-5

TYPICAL STABILIZATION FILL MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

1/04 TYP STABILIZATION FILL.ai



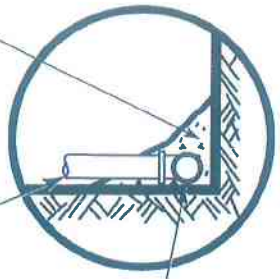
SUBDRAINS TO CONSIST OF 4 CUBIC FEET OF "GRAVEL" PER FOOT OF SUBDRAIN ENCASED IN FILTER FABRIC. SEE FIGURE D-8 FOR FILTER FABRIC SPECIFICATION.

"GRAVEL" TO CONSIST OF 1/2" TO 1" CRUSHED ROCK PER STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.

FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

ALTERNATIVELY SUBDRAINS MAY BE CONSTRUCTED WITHOUT FILTER FABRIC USING THE "FILTER MATERIAL" SPECIFIED IN THE TABLE BELOW.

DETAIL



OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW

MINIMUM 4-INCH DIAMETER SCHEDULE 40 OR EQUIVALENT FOR ASTM STANDARDS. FOR FILL DEPTH OF 90 FEET OR GREATER, USE ONLY SCHEDULE 80 OR APPROVED EQUIVALENT. THERE SHALL BE A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT.

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOTE:
TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

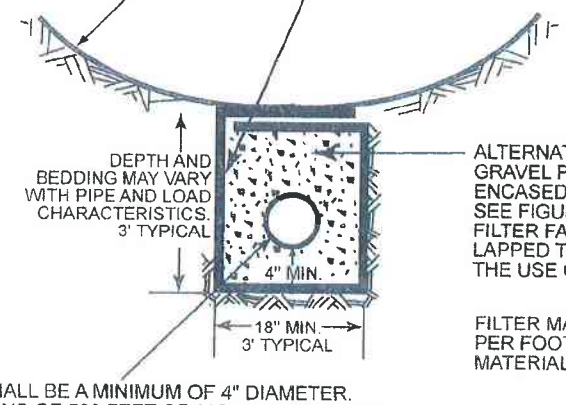
FIGURE G-6

TYPICAL STABILIZATION AND BUTTRESS FILL SUBDRAINS MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

FILTER FABRICS SHALL BE PERMEABLE NON-WOVEN POLYESTER, NYLON OR POLYPROPYLENE MATERIAL CONFORMING TO THE FOLLOWING:

1) GRAB TENSILE STRENGTH. POUNDS, MIN. ASTM D 4632..... 90
2) ELONGATION, AT PEAK LOAD, PERCENT, MIN. ASTM D 4632..... 50
3) PUNCTURE STRENGTH, LBS., MIN. ASTM D 3787..... 45
4) COEFFICIENT OF WATER PERMITTIVITY, 1/SEC. ASTM D 4491..... >0.7
5) BURST STRENGTH, P.S.I., MIN. ASTM D 3786.....180



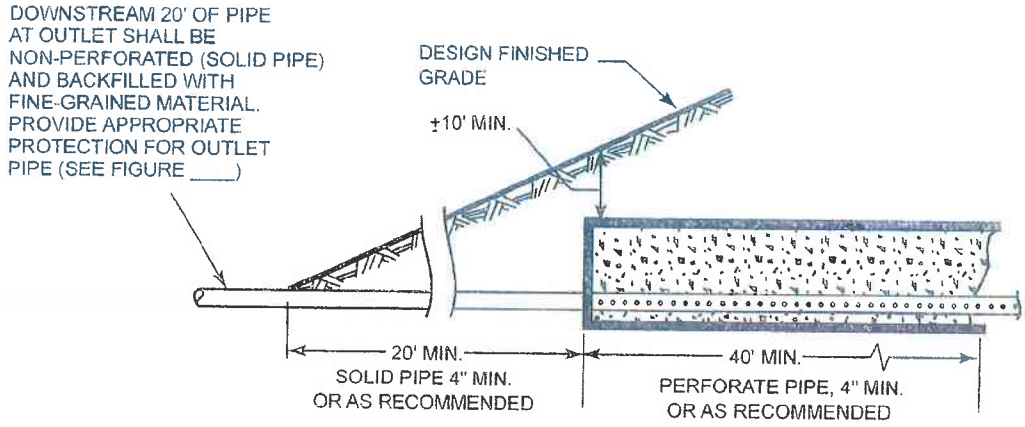
ALTERNATE: IN LIEU OF FILTER MATERIAL, NINE CUBIC FEET OF GRAVEL PER FOOT OF SUBDRAIN (WITHOUT PIPE) MAY BE ENCASED IN FILTER FABRIC, MIRAFI 140N OR EQUIVALENT SEE FIGURE 5 FOR GRAVEL SPECIFICATION. SEE ABOVE FOR FILTER FABRIC SPECIFICATION. FILTER FABRIC SHALL BE LAPPED THE WIDTH OF THE TRENCH OR MIN. 1 FOOT WITH THE USE OF "HOG RINGS" OR SIMILAR FASTENERS.

FILTER MATERIAL - MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE. SEE TABLE BELOW FOR FILTER MATERIAL SPECIFICATIONS

PIPE SHALL BE A MINIMUM OF 4" DIAMETER. FOR RUNS OF 500 FEET OR MORE, USE 6 INCH DIAMETER PIPE, OR AS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT. MINIMUM 4 INCH DIAMETER SCHEDULE 40 ASTM D 1527 OR D 1785. FOR FILL DEPTH OF 90 FEET OR GREATER, USE ONLY SCHEDULE 80 OR APPROVED EQUIVALENT. THE REQUIREMENTS OF PERFORATED PIPES SHALL BE CONSISTENT WITH ASTM F 758 AND AASHTO M278-81.

"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT.

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3



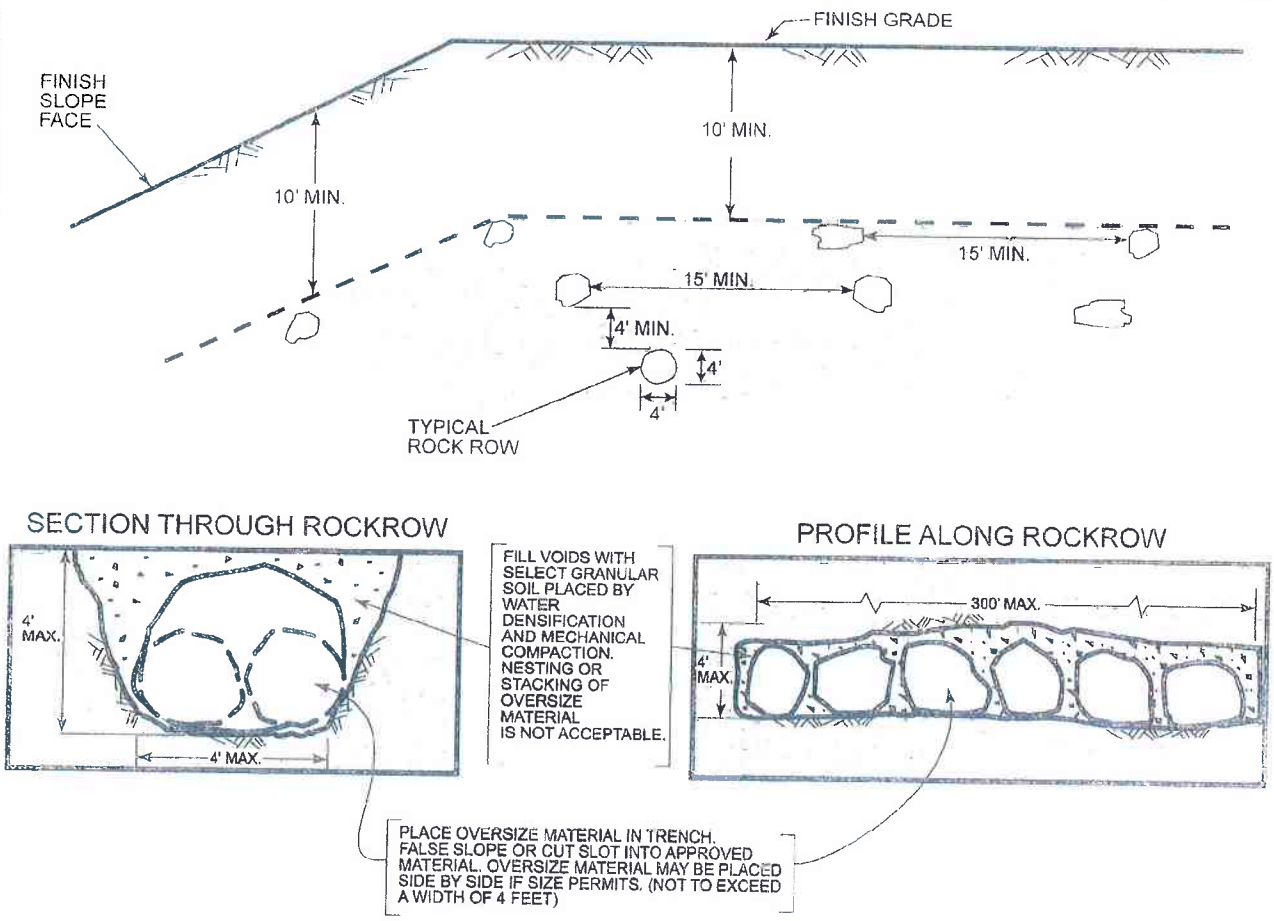
CANYON SUBDRAIN OUTLET

FIGURE G-7

TYPICAL CANYON SUBDRAIN AND OUTLET MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

Rev. 8/19/03 TYP. CANYON SUBDRAIN AND OUTLET.ai



NOTES:

A) OVERSIZED ROCK IS DEFINED AS LARGER THAN 8" IN SIZE (IN GREATEST DIMENSION).

B) SPACE BETWEEN ROCKROWS SHOULD BE ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.

C) THE WIDTH AND HEIGHT OF THE ROCKROW SHALL BE LIMITED TO FOUR FEET AND THE LENGTH LIMITED TO 300 FEET UNLESS APPROVED OTHERWISE BY THE GEOTECHNICAL CONSULTANT. OVERSIZE SHOULD BE PLACED WITH FLATEST SIDE ON THE BOTTOM.

D) OVERSIZE MATERIAL EXCEEDING FOUR FEET MAY BE PLACED ON AN INDIVIDUAL BASIS IF APPROVED BY THE GEOTECHNICAL CONSULTANT.

E) FILLING OF VOIDS WILL REQUIRE SELECT GRANULAR SOIL (SE > 20, OR LESS THAN 20 PERCENT FINES) AS APPROVED BY THE GEOTECHNICAL CONSULTANT. VOIDS IN THE ROCKROW TO BE FILLED BY WATER DENSIFYING GRANULAR SOIL INTO PLACE ALONG WITH MECHANICAL COMPACTION EFFORT.

F) IF APPROVED BY THE GEOTECHNICAL CONSULTANT, ROCKROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK, PROVIDED ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.

G) THE FIRST LIFT OF MATERIAL ABOVE THE ROCKROW SHALL CONSIST OF GRANULAR MATERIAL AND SHALL BE PROOF-ROLLED WITH A D-8 OR LARGER DOZER OR EQUIVALENT.

H) ROCKROWS NEAR SLOPES SHOULD BE ORIENTED PARALLEL TO SLOPE FACE.

I) NESTING OR STACKING OF ROCKS IS NOT ACCEPTABLE.

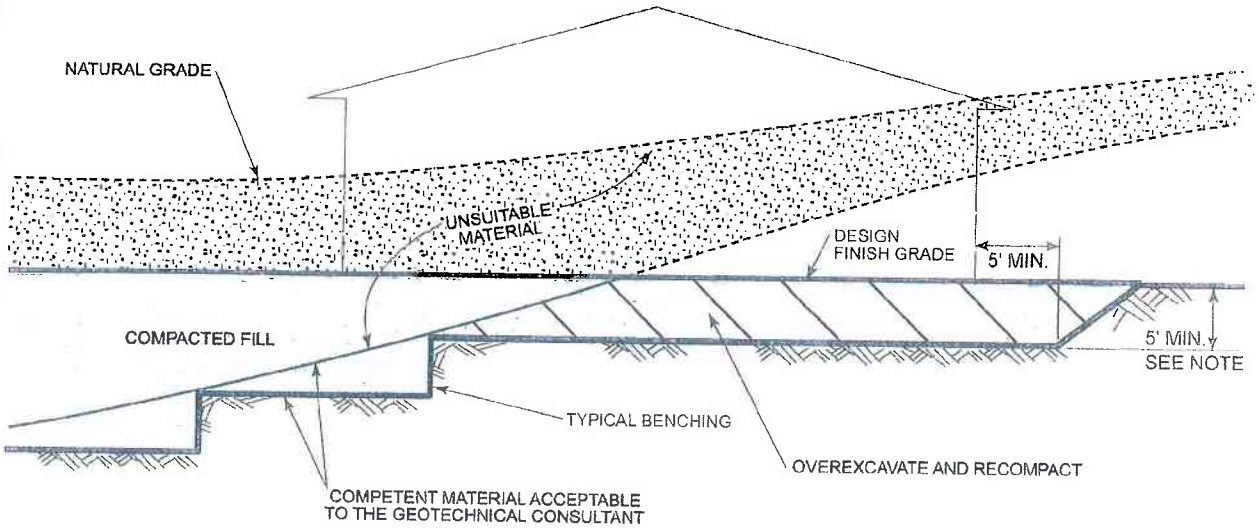
FIGURE G-8

TYPICAL OVERSIZE ROCK PLACEMENT METHOD MINIMUM STANDARD GRADING DETAIL FOR STRUCTURAL FILL

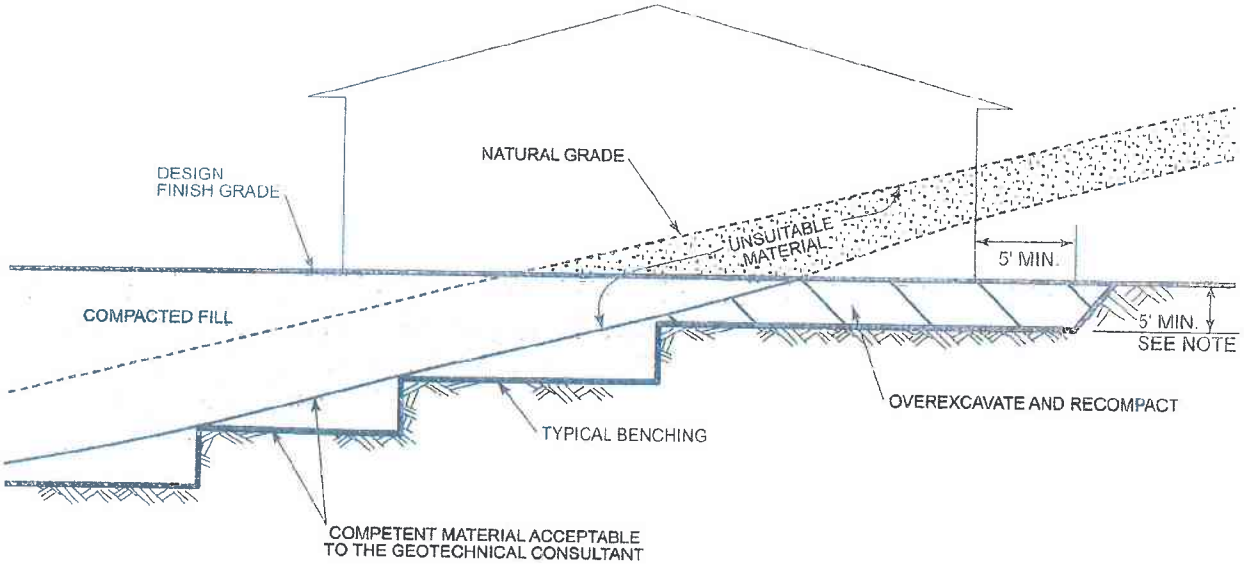
NMG Geotechnical, Inc.

1/04 TYP OVERSIZE ROCK PLACEMENT METHOD.ai

CUT LOT



CUT FILL LOT (TRANSITION)



NOTE: DEEPER THAN THE 5-FOOT OVEREXCAVATION MAY BE RECOMMENDED BY THE GEOTECHNICAL CONSULTANT IN STEEP TRANSITIONS.

FIGURE G-9

TYPICAL OVEREXCAVATION OF DAYLIGHT LINE
MINIMUM STANDARD GRADING DETAILS

NMG Geotechnical, Inc.

1/04 TYP OVEREXCAVATION OF DAYLIGHT LINE.al

NOTES

1. EXISTING LAND USES: VACANT - MASS GRADED PADS, COMMERCIAL NURSERY, OPEN SPACE AND ALTON PARKWAY EXTENSION.
2. PROPOSED LAND USES: RESIDENTIAL, COMMERCIAL AND RETAIL.
3. SURROUNDING LAND USES:
   NORTH: OPEN SPACE AND EXISTING LIGHT INDUSTRIAL/COMMERCIAL DEVELOPMENT
   EAST: EXISTING BUSINESS PARK, WATER RESERVOIRS AND 241 FOOTHILL TRANSPORTATION CORRIDOR
   SOUTH: EXISTING LIGHT INDUSTRIAL/COMMERCIAL DEVELOPMENT
   WEST: OPEN SPACE AND EXISTING LIGHT INDUSTRIAL/COMMERCIAL DEVELOPMENT
4. GENERAL PLAN LAND USE DESIGNATIONS: LOW DENSITY RESIDENTIAL, LOW-MEDIUM DENSITY RESIDENTIAL, LOW-MEDIUM DENSITY RESIDENTIAL WITH PUBLIC FACILITIES OVERLAY, MEDIUM DENSITY RESIDENTIAL, MIXED USE, MIXED USE WITH PUBLIC FACILITIES OVERLAY AND LIGHT INDUSTRIAL.
5. ZONING: BAKER RANCH PLANNED COMMUNITY
6. ASSESSOR PARCEL NUMBERS: 610-421-07 THROUGH 09, 610-422-01, 610-431-01 THROUGH 12, 610-432-01 THROUGH 17, 612-132-01 & 612-134-05.
7. UTILITY PURVEYORS:
   WATER: IRVINE RANCH WATER DISTRICT
   SEWER: IRVINE RANCH WATER DISTRICT
   GAS: SOUTHERN CALIFORNIA GAS COMPANY
   ELECTRIC: SOUTHERN CALIFORNIA EDISON
   TELEPHONE: AT&T AND COX COMMUNICATIONS
   CABLE: COX COMMUNICATIONS
8. ALL PROPOSED UTILITIES SHALL BE UNDERGROUND.
9. THE PROJECT SITE IS LOCATED WITHIN SADDLEBACK VALLEY UNIFIED SCHOOL DISTRICT.
10. ALL GRADING, DRAINAGE AND EROSION CONTROL SHALL BE CONSISTENT WITH THE LAKE FOREST GRADING AND EXCAVATION CODE AND LAKE FOREST GRADING MANUAL.
11. ALL STREET AND STORM DRAIN IMPROVEMENTS SHALL BE DESIGNED PER THE CITY OF LAKE FOREST'S STANDARD PLANS AND SPECIFICATION. COUNTY DRAINAGE FACILITIES SHALL BE DESIGNED PER O.C.P.W. FLOOD CONTROL SPECIFICATIONS.
12. ALL WATER AND SEWER IMPROVEMENTS SHALL BE DESIGNED PER THE STANDARD DETAIL DRAWINGS AND TECHNICAL SPECIFICATIONS FROM THE IRWD CONSTRUCTION MANUAL.
13. A PORTION OF THE PROJECT SITE IS LOCATED WITHIN A SPECIAL FLOOD HAZARD AREA SUBJECT TO INUNDATION BY A 100-YEAR FLOOD AND SHOWN AS ZONE A (NO BASE FLOOD ELEVATIONS DETERMINED) ON FIRM MAP NUMBERS 06059C0161J AND 06059C0161H DATED DECEMBER , 2009.
14. THE PROPERTY OWNER RESERVES THE RIGHT TO FILE MULTIPLE FINAL TRACT MAPS FOR THIS TENTATIVE TRACT MAP.
15. A PORTION OF THIS TENTATIVE TRACT MAP IS FOR CONDOMINIUM PURPOSES AND SHALL PROVIDE THE RIGHT TO CREATE CONDOMINIUM AIR SPACE WITH THE RECORDATION OF A FINAL TRACT MAP AND CONDOMINIUM PLANS.
16. PERMISSION TO GRADE LETTERS FROM ADJACENT PROPERTY OWNERS SHALL BE OBTAINED IF OFF-SITE GRADING IS REQUIRED.
17. AN ENCROACHMENT PERMIT SHALL BE OBTAINED FOR ANY WORK LOCATED WITHIN PUBLIC RIGHT OF WAY.
18. APPROXIMATE RAW EARTHWORK QUANTITIES:
    CUT: 1,370,000 CYS
    FILL: 1,170,000 CYS
19. ALL LETTERED STREETS AND DIMENSION DRIVE ARE PUBLIC AND ARE TO BE DEDICATED TO THE CITY OF LAKE FOREST.
20. A PORTION OF EXISTING BAFFIN BAY RIGHT OF WAY IS TO BE ABANDONED.

LOT SUMMARY TABLE

LOT No.	LAND USE
1-436, 418-653	FUTURE RESIDENTIAL
497	RETAIL
654-666	PARK SITE
665	CENTRAL LINEAR PARK
667	EXISTING LIFT STATION
A-WWWW	OPEN SPACE/SLOPE
XXXX	WATER QUALITY BASIN
YYYY-BBBBB	TRAIL/FLOOD CONTROL

LEGAL DESCRIPTION

PARCEL 1 - THROUGH 5, INCLUSIVE, OF LOT LINE ADJUSTMENT NO. LLA-2006-01 IN THE CITY OF LAKE FOREST, COUNTY OF ORANGE, STATE OF CALIFORNIA, RECORDED MARCH 7, 2007, AS INSTRUMENT NO. 2007000044620 OF OFFICIAL RECORDS OF SAID COUNTY.
PARCEL 2 OF LOT LINE ADJUSTMENT NO. LLA-2002-02 IN THE CITY OF LAKE FOREST, COUNTY OF ORANGE, STATE OF CALIFORNIA, RECORDED OCTOBER 30, 2002, AS INSTRUMENT NO. 20020448495 OF OFFICIAL RECORDS OF SAID COUNTY.
PARCEL B OF PARCEL MAP NO. 97-173 AS SHOWN ON A MAP FILED IN BOOK 301, PAGES 43, 44 AND 45, OF PARCEL MAPS IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.
ALL OF TRACT NO. 16224 AS SHOWN ON A MAP FILED IN BOOK 913, PAGES 36 THROUGH 41, INCLUSIVE, OF MISCELLANEOUS MAPS IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.
LOT B OF TRACT NO. 14792 AS SHOWN ON A MAP FILED IN BOOK 715, PAGES 12 THROUGH 18, INCLUSIVE, OF MISCELLANEOUS MAPS IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

OWNERS:

BAKER RANCH PROPERTIES L.L.C.
3 CORPORATE PARK
SUITE 220
IRVINE, CA 92606
(949) 475-0890

SHEA/BAKER RANCH ASSOC. L.L.C.
1250 CORONA POINTE COURT
SUITE 600
CORONA, CA 92879
(951) 739-9700

STATEMENT OF OWNERSHIP

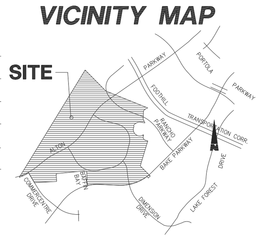
REGISTERED PROFESSIONAL ENGINEER No. 59089 CIVIL STATE OF CALIFORNIA

I HEREBY STATE THAT THIS MAP WAS PREPARED UNDER MY SUPERVISION AND THAT THE OWNER OF RECORD HAS KNOWLEDGE OF AND CONSENTS TO THE FILING OF THIS MAP.

DATE

SCALE _____ SCALE
DATE _____ DATE
W.O. _____ WORKORDER
GROSS AREA _____ GROSS_AREA±
CONTOUR INTERVAL _____ CONTOUR
TOTAL LOTS _____ TOTAL_LOTS
LETTERED_LOTS

VICINITY MAP



PREPARED FOR:

SHEA/BAKER RANCH
ASSOC. L.L.C.
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PREPARED BY:

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GEOLOGIC MAP
BAKER RANCH TENTATIVE TRACT 16466
CITY OF LAKE FOREST, CALIFORNIA

Project No.: 10028-01 By: WG/TM
Project Name: Shea/Baker Tentative Tract
Date: 3/25/11 SCALE: 1" = 100'
NMG Geotechnical, Inc.

PLATE 1

LEGEND

EARTH UNITS - CIRCLED WHERE BURIED

Afu	UNCERTIFIED/UNDOCUMENTED FILL
Afe	ENGINEERED FILL
Qac	QUATERNARY ALLUVIUM / COLLUVIUM
Qtn	QUATERNARY TERRACE DEPOSIT
Tco	TERTIARY CAPISTRANO FORMATION, OSO MEMBER
Tm	TERTIARY MONTEREY FORMATION

SYMBOLS LOCATIONS ARE APPROXIMATE, QUERIED WHERE UNCERTAIN

GEOLOGIC CONTACT, DOTTED WHERE BURIED

FAULT, DOTTED WHERE BURIED

GEOLOGIC ATTITUDES- LOCATIONS ARE APPROXIMATE, DASHED WHERE BURIED

SHEAR

BEDDING

CLAY BED

JOINT

HLB-3 — TD 41' / Qac 0' to 1' / Tco 1'+ — HV LAWMASTER BORING (1988) SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

HLT-2 — TD 13' / Qac 0' to 11' / Tco 11'+ — HV LAWMASTER TRENCH (1988) SHOWING TOTAL DEPTH

HB-1 — TD 61' / @40.5' / Af 0' to 10' / Qac 10' to 55' / Tco 55'+ — HUSHMAND AND ASSOCIATES HOLLOW STEM BORING (2010) SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

HBA-1 — TD 29' / @ 19' & 24' / Qac 0' to 2.5' / Tco 2.5'+ — HUSHMAND AND ASSOCIATES BUCKET AUGER BORING (2010) SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

HCPT-1 — TD 41' — HUSHMAND AND ASSOCIATES CPT (2010) SHOWING TOTAL DEPTH

HT-5 — TD 15.5' / @15.5' / Qac 0' to 7' / Tco 7'+ — HUSHMAND AND ASSOCIATES TRENCH (2010) SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

B-1 — TD 26' / Afu 0' to 2' / Qac 2' to 23' / Tco 23'+ — PACIFIC SOILS BUCKET AUGER BORING (2002), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

B-3E — TD 35' / @26' / Afe 0' to 5' / Qac 5'+ — PACIFIC SOILS BUCKET AUGER BORING (1999), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

B-9D — TD 90' / Tco 0'+ — PACIFIC SOILS BUCKET AUGER BORING (1989), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

B-9 — TD 10' / Qac 0'+ — PACIFIC SOILS BUCKET AUGER BORING (1989), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

B-1A — TD 25' / Afe 0' to 2' / Qac 2' to 23' / Tco 23'+ — PACIFIC SOILS BUCKET AUGER BORING (1989), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

RW-1 — TD 12.5' / Qac 0' to 10' / Tco 10'+ — PACIFIC SOILS ROTARY WASH BORING (2002), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

CPT-3 — TD 48' — PACIFIC SOILS CPT (2002), SHOWING TOTAL DEPTH

LB-3 — TD 70' / @61' / Qac 0' to 70' / Tco 70'+ — LEIGHTON AND ASSOCIATES BORING (1988), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

T-32 — TD 6' / Qac 0'+ — PACIFIC SOILS TRENCH (1989), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

T-6A — TD 15.5' / Qac 0' to 14.5' / Tco 14.5'+ — PACIFIC SOILS TRENCH (1989), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

T-32D — TD 6' / Qac 0' to 1' / Tco 1'+ — PACIFIC SOILS TRENCH (1989), SHOWING TOTAL DEPTH AND DEPTH TO GROUND WATER

IG-B1 — TD 33.5' / @31' / Qac 0'+ — HUSHMAND/NMG BORING (2011) DURING GRADING OF ALTON PARKWAY SHOWING TOTAL DEPTH AND DEPTH TO GROUNDWATER

Existing Subdrain elev. 740' — APPROXIMATE LOCATION OF EXISTING SUBDRAIN RISER SHOWING ELEVATION

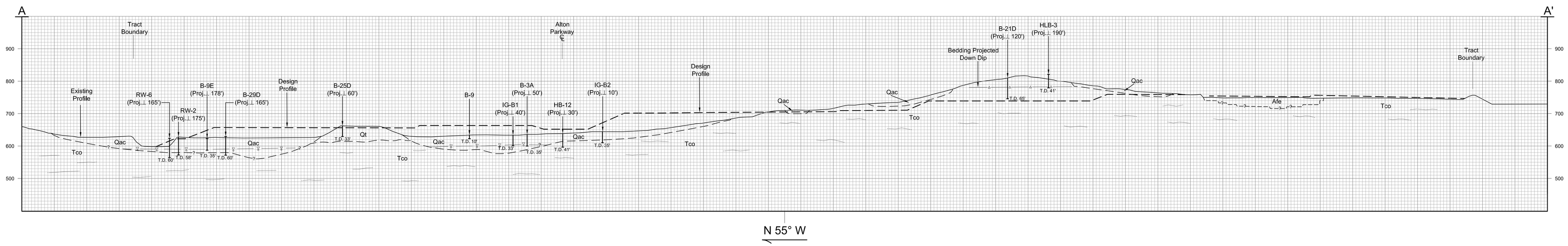
A — A' — CROSS-SECTION

LIMITS OF PROJECT

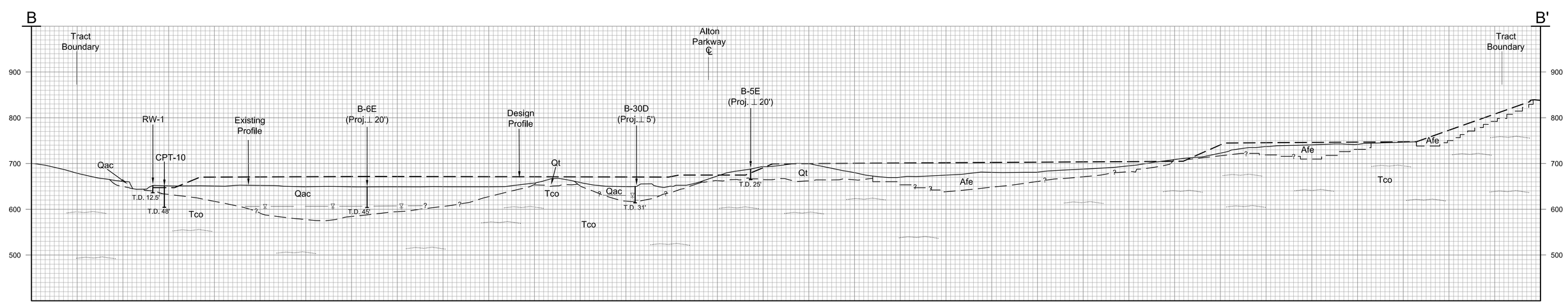
TENTATIVE TRACT MAP NO. 16466
FOR CONDOMINIUM PURPOSES

SHEET 1 OF 3

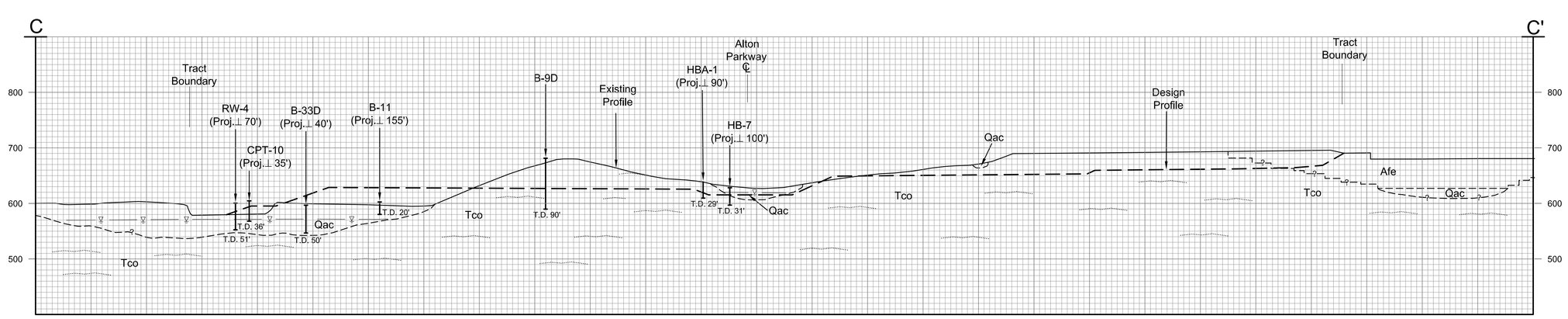
Project No.: 10028-01
Project Name: Shea/Baker Tentative Tract
Date: 3/25/11
By: TM/WG
SCALE: 1" = 100'
NMG
Geotechnical, Inc.
PLATE 2
A
A'
B
B'
C
C'
Restricted Use Area
MATCHLINE SEE SHEET
LOT QQQ
LOT AAAAA
LOT UUUU
SECTION A - A
BORREGO LINEAR PARK
PAD PER PLAN
SECTION B - B
FEET
INCHES
PREPARED FOR:
SHEA/BAKER RANCH ASSOC. L.L.C.
1250 CORONA POINTE COURT
SUITE 600
CORONA, CA 92789
(951) 739-9700
PREPARED BY:
HUNSAKER & ASSOCIATES
TENTATIVE TRACT MAP NO. 16466
FOR CONDOMINIUM PURPOSES
SHEET 2 OF 3



N 55° W



N 52° W



N 30° W

PLATE 3

Project No.: 10028-01	By: TM/WG
Project Name: Shea/Baker Tentative Tract	
Date: 3/25/11	SCALE: 1" = 100'

NMG Geotechnical, Inc.