

Del Mar Bluffs Geotechnical Study

Part 1: Geotechnical Evaluation
Volume II

prepared for



NCTD
North County
Transit District

prepared by



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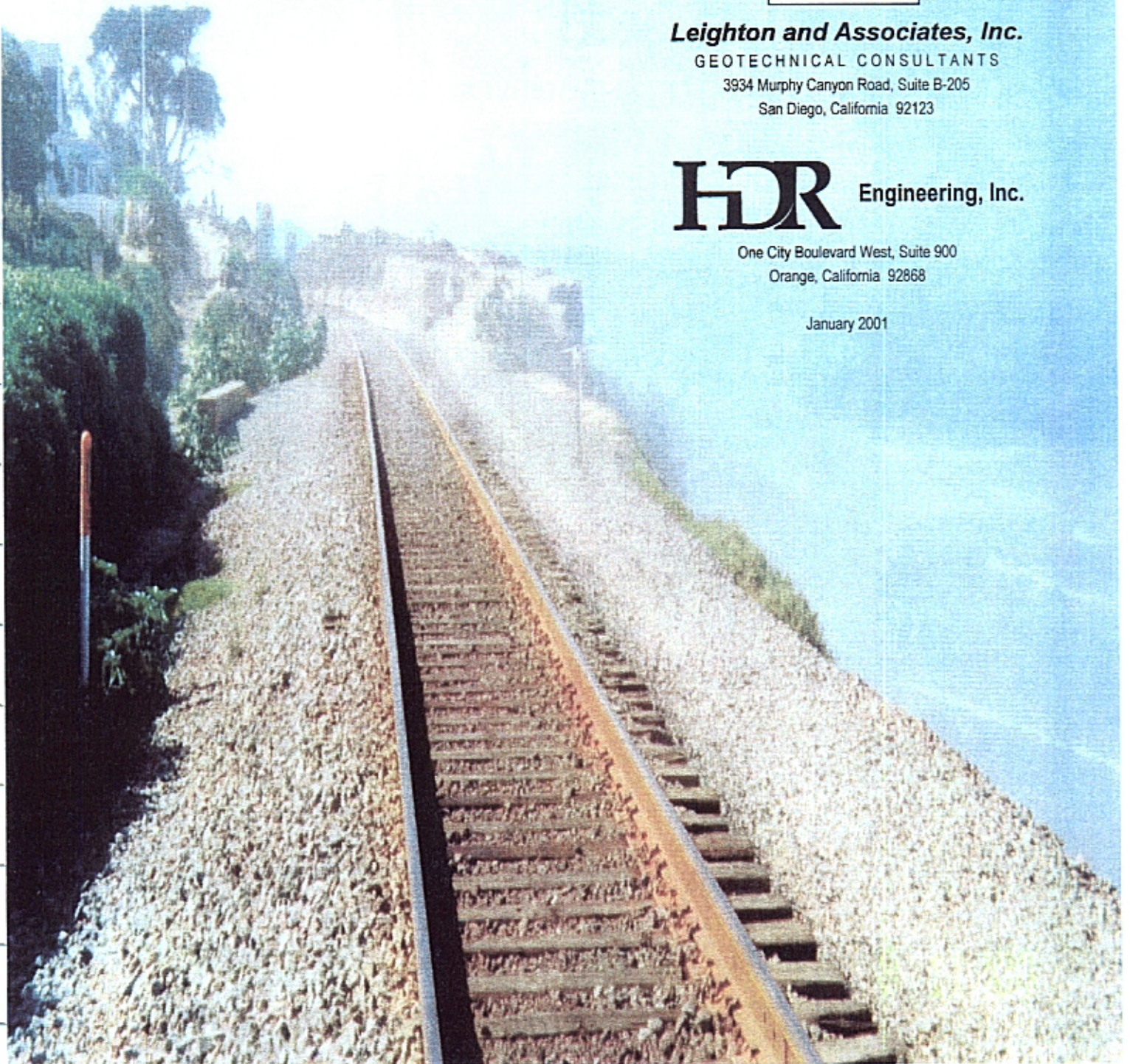


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APPENDIX D

BORING LOGS

BORING LOGS FROM CURRENT
INVESTIGATION

GEOTECHNICAL BORING LOG LB-1

Date 6-13-00
 Project _____
 Drilling Co. _____
 Hole Diameter 24 in.
 Elevation Top of Hole 63 ft.

HDR/Del Mar
San Diego Drilling

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446#
 Ref. or Datum See Map

Sheet 1 of 3
 Project No. 040151-001
 Type of Rig E-120 Bucket
 Drop 12 in.

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
0			Bag-1 @2'-4'				SM	BAYPOINT FORMATION (Qbp) @ 0'-5': Light brown, mottled with reddish brown, moist to wet, medium dense, fine to medium SAND with few cobbles; caving, weakly cemented	
5							ML	@ 5': Seepage at base of Baypoint Formation, very active DELMAR FORMATION (Td) @ 5': Light olive-gray, moist, slightly stiff, SILTSTONE	
				Bag-2 @8'-10'				SM-ML	@ 7': Blue-gray, very damp, slightly stiff to stiff, fine to medium sandy SILTSTONE
								SM	@ 8.5': Blue-gray, very damp, stiff, silty CLAYSTONE; fractured; approximately 1/2' thick interbedded with gray medium SANDSTONE with subhorizontal laminations below
10				R-1	Push/8" 5/4"			ML/CL	@ 10': Bluish gray, damp, stiff to very stiff, silty CLAYSTONE @ 10.5': Silty CLAYSTONE becomes SILTSTONE
15								SM/ML	@ 19': Change in material to dark gray, very damp, dense, silty fine to medium SAND, interbedded with SILTSTONE between 19' and 20'
20				R-2	10			SM	@ 20'-23.5': Light maroon gray, very moist to wet at base, medium dense, medium SANDSTONE; thin clay lenses, subhorizontal laminations @ 20': Light gray, moist, medium dense, silty fine to medium SANDSTONE; grades to slightly coarser sand at tip @ 21'-23': Material same as Sample R-2
				Bag-3 @21'-23'				ML/CL	@ 23.5'-24.5': Interbed of dark gray, very damp, very stiff to hard, silty CLAYSTONE; 1" thick, subhorizontal contacts @ 24.5'-26.5': Material same as between 20'-23.5' sand coarsens to base of unit, moisture increases to minor seepage at base. Rip-up clasts of blue-gray SILTSTONE within SANDSTONE @ 26': Blue-gray, very damp, slightly stiff, silty CLAYSTONE
25								ML	@ 29'-33.5': Light blue/green-gray, damp, hard, very fine sandy SILTSTONE grades to coarse sandy SILTSTONE; iron-oxide mottled
30									

GEOTECHNICAL BORING LOG LB-1

Date 6-13-00

Sheet 2 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446#

Drop 12 in.

Elevation Top of Hole 63 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30			R-3	14			ML-SM	Logged By <u>KTS/RKW</u> Sampled By <u>KTS</u>
35								@ 32': Light blue gray, very damp to slightly moist, stiff/dense, fine SANDSTONE @ 33.5': Planar subhorizontal contact to blue-gray silty CLAYSTONE, fractured, iron-oxide on surfaces, few waxy surfaces, spalling material, possible minor seepage from fractures @ 37': Localized cemented zones
40			R-4	6	110.1	16.6	ML	@ 40': Dark blue-gray, damp, stiff to very stiff, clayey SILTSTONE @ 41.5': Increased cementation, mottled yellow and red-brown, oxide staining @ 42.5': Blue-gray to dark blue-gray, damp, hard/very dense, very fine sandy SILTSTONE, moderately cemented, reddish oxide staining
45								@ 47'-61': Light gray to dark blue gray, damp, very stiff, clayey SILTSTONE; fractured, lacks continuation
50				R-5	9	110.2	17.0	ML-SM
55								
60								

GEOTECHNICAL BORING LOG LB-1

Date 6-13-00 Sheet 3 of 3
 Project HDR/Del Mar Project No. 040151-001
 Drilling Co. San Diego Drilling Type of Rig E-120 Bucket
 Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.
 Elevation Top of Hole 63 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
Logged By <u>KTS/RKW</u> Sampled By <u>KTS</u>								
60			R-6	28			ML-SM	@ 60': Light blue-gray, damp to very damp, stiff to very stiff, fine SANDSTONE @ 61': Light brown, medium SANDSTONE with subhorizontal laminations @ 62.5': Blue gray to dark blue-gray, damp, hard/very dense, very fine sandy SILTSTONE; moderately cemented @ 65': Light blue-gray, damp, hard silty CLAYSTONE; a few waxy, polished, fractured, surfaces; randomly oriented (Logged to 65') @ 70': Light blue gray, slightly damp, very stiff to slightly hard, clayey SILTSTONE; massive Total Depth = 70 Feet Backfilled/tamped 6/13/00 Upper 5 Feet slurry cap Active seepage at 5 Feet
65			Bag-4 @61'-63'				SM	
70				R-7	18	111.7	17.3	
75								
80								
85								
90								

GEOTECHNICAL BORING LOG LB-2

Date 6-14-00

Sheet 1 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#

Drop 12 in.

Elevation Top of Hole 58 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
<p>Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u></p>								
0							SM	<u>BAYPOINT FORMATION (Qbp)</u> @ 0'-1-1/2': Light brown, very dry, loose, SAND @ 1-1/2': Reddish brown and blue-gray, mottled, very damp to moist, loose to slightly dense, silty SAND
5			Bag-1 @ 3'-5'				SM	@ 5': Reddish brown, very moist to wet, loose to slightly dense, clayey fine to medium SAND, weakly cemented
10			R-1				SM	@ 9': Grade to light reddish brown, very moist to wet, loose to slightly dense, very fine to medium SAND, with SILT
15							SM	@ 14'-15': Contact at base of Baypoint Formation is extremely undulatory, black staining, scoured/rip-ups of Td in Qbp <u>DELMAR FORMATION (Td)</u> @ 14'-28': Yellow, moist to wet at base, stiff, grades to very dense, silty, very fine SANDSTONE; grades to silty coarse SANDSTONE; seepage at base
20			Bag-2 @ 20'-22'					@ 20'-22': Light yellow, moist, slightly dense to dense, silty fine to medium SANDSTONE
25			GB:N85E, 10N	R-2	8			@ 22': Light yellow, wet, dense, silty fine to coarse SANDSTONE; massive @ 23': General bedding attitude on 4" thick lense of dark brown SAND
28			GB:N10E, 9N					@ 26': Pebbly sand lense, 2" thick, heavy free-flowing seepage, general bedding attitude on faint subhorizontal laminations
30							ML/CL	@ 28': Slightly undulatory, irregular erosional contact with iron-oxide along contact, material below is gray-brown, damp, stiff, silty CLAYSTONE; iron-oxide, joints, moderately fractured

GEOTECHNICAL BORING LOG LB-2

Date 6-14-00
 Project _____
 Drilling Co. _____
 Hole Diameter 24 in.
 Elevation Top of Hole 58 ft.

HDR/Del Mar
San Diego Drilling

Drive Weight _____
 Ref. or Datum _____

Sheet 2 of 3
 Project No. 040151-001
 Type of Rig E-120 Bucket
 Drop 12 in.
See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
30							ML	Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>	
32-34			Bag-3					@ 30': Blue-gray, moist, stiff to very stiff, clayey SILTSTONE and siltstone; zones weak of cementation in SILTSTONE material @ 32': Iron-oxide mottling (similar to staining above resistant beds seen in neighboring boreholes) @ 35': Material becomes very hard and competent, cemented	
35									
40		J:N60W, 33N J:N10E, 20S J:N55W, 42S						SM-ML	@ 39': Material change to blue-gray, very damp, very stiff to hard, clayey SILTSTONE to siltstone; randomly, fractured with waxy polished surfaces, non planar, slightly random, weakly cemented @ 40': Generalized joint/fracture attitudes, decrease in fractures below, more competent
45			R-3	9					@ 45': Blue-gray, damp, stiff to very stiff, SILTSTONE with clay; massive
50									Downhole logged to 50'
55									All tailings to T.D. are blue-gray clays and silts with iron-oxide bands, and extremely wet due to seepage above
60									

GEOTECHNICAL BORING LOG LB-2

Date 6-14-00

Sheet 3 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 58 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	<h2 style="text-align: center;">GEOTECHNICAL DESCRIPTION</h2> <p>Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u></p>
60								Total Depth = 60 Feet Backfilled and tamped 6/14/00 5 feet slurry cap Water at 27 feet; standing water at 53 feet at time of backfill
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								
75								
76								
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87								
88								
89								
90								

GEOTECHNICAL BORING LOG LB-3

 Date 6-14-00

 Sheet 1 of 3

 Project HDR/Del Mar

 Project No. 040151-001

 Drilling Co. San Diego Drilling

 Type of Rig E-120 Bucket

 Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

 Elevation Top of Hole 59 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>
0							SM	BAYPOINT FORMATION (Qbp) @ 0'-10': Reddish brown, damp to wet at base, slightly dense, clayey medium SAND grades to silty medium to coarse sand at base; seepage at base, boring is belling
5			R-1	Push	103.0	12.0	SM-SC	@ 5': Reddish brown, very moist to wet, loose to slightly dense, clayey SAND; lacks cementation
10		CS:N50E, 14N					ML	@ 9'-10': Zone of generally undulatory contact, rip-ups of Td within Qbp (8" diameter, dark brown, rip-up 1' above contact), few cobbles, dark brown staining @ 10': Clay seam attitude, paper thin, along contact
		J:N65W, 35S						DELMAR FORMATION (Td) @ 9.5'-10.5': Light yellow, very moist to wet, slightly stiff, SILTSTONE; very weakly cemented, mottled iron-oxide @ 10.5': Material change to green/blue-gray, very damp, soft to slightly stiff, silty CLAYSTONE; randomly oriented fractures, polished, waxy surfaces, iron-oxide on surfaces, seepage between fractures, material spalling, joint attitudes @ 13.5': Gradual change to gray, damp, stiff, SILTSTONE
		J:E-W, vertical						
15		J:N60W, 14S						
		S:N70E-60W, 25-35N					ML-CL	@ 18': Zone of CLAYSTONE with shears (remolded clay surfaces along similar orientation), iron-oxide on surfaces around portion of hole only, moisture in fractures, purple-brown staining (mottled), shear attitude, joint attitude
20		J:N34E, 38S					ML	@ 20': Blue-gray and yellowish gray, mottled SILTSTONE
		C:horizontal						@ 22': Horizontal contact to reddish brown, silty SAND, lenses of light sand at 25' and 27', 2" and 6" thick, respectively
25			R-2	8	117.4	11.5	ML-SM	@ 25': Blue-gray, damp, stiff to very stiff, SILTSTONE with very fine SAND; massive, weak to moderately cemented @ 26': Blue-green gray, damp, very stiff, silty CLAYSTONE; short, random non-planar; waxy fractures
		GB:N30E, 5N					SM	@ 28': General bedding attitude, blue-gray silty fine to medium SANDSTONE; 8" thick with dark green laminations
30							ML-CL	@ 29': Blue/green-gray very fine sandy SILTSTONE, grades to silty CLAYSTONE; randomly fractured with waxy, polished surfaces,

GEOTECHNICAL BORING LOG LB-3

Date 6-14-00

Sheet 2 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#

Drop 12 in.

Elevation Top of Hole 59 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>
30	[Hand-drawn log symbols]							iron-oxide, reddish mottled staining to 32.5' ML-SM @ 32.5': Light blue-gray, moist to wet, hard, SILTSTONE; moderately cemented, dark blue streaks and random, discontinuous polished surfaces
35	[Hand-drawn log symbols]							ML @ 36': Light blue-gray, moist, very stiff clayey SILTSTONE; iron oxide and waxy polished surfaces, short, randomly oriented fractures
40	[Hand-drawn log symbols]							ML-CL @ 38'-46': Blue-gray, very damp (to wet in fractures), very stiff to hard, SILTSTONE and silty CLAYSTONE, zones of random, waxy polished surfaces in clayier material, reddish brown mottled staining
45	[Hand-drawn log symbols]		R-3	12	124.7	9.8		SC @ 44': Lense of sandy CLAYSTONE SC-CL @ 45': Blue-gray, damp, very stiff, fine SANDSTONE, minor iron-oxide mottling, weakly cemented @ 46': Blue-gray, very damp, stiff, CLAYSTONE, fractures with waxy, polished surfaces, iron-oxide
50	[Hand-drawn log symbols]							SM @ 47.5': Gray grades to blue/green-gray, moist to wet, dense to very dense, fine grades to coarse SANDSTONE; massive, weakly cemented
55	[Hand-drawn log symbols]							CL @ 52': Dark gray silty CLAYSTONE, 7" thick, weakly cemented SM @ 53': Brown, damp, slightly dense, fine to coarse SANDSTONE; non-planar, subhorizontal contacts ML-CL @ 54.5': Blue-gray, silty CLAYSTONE; waxy, polished fractures
60	[Hand-drawn log symbols]							ML-SM @ 56.5'-65': Gray and brown, mottled, damp, very stiff, sandy SILTSTONE; weakly cemented

GEOTECHNICAL BORING LOG LB-3

 Date 6-14-00

 Sheet 3 of 3

 Project HDR/Del Mar

 Project No. 040151-001

 Drilling Co. San Diego Drilling

 Type of Rig E-120 Bucket

 Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

 Elevation Top of Hole 59 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60								Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>
65			R-4	23	123.4	11.0		
70								@ 65': Dark gray, dry to damp, hard, very fine SANDSTONE, moderately cemented Total Depth = 65 Feet Backfilled and Tamped 6/15/00 5 feet slurry cap Ground water encountered at 10, 12, 20, and 52 feet at time of drilling
75								
80								
85								
90								

GEOTECHNICAL BORING LOG LB-4

Date 6-14-00 Sheet 1 of 3
 Project HDR/Del Mar Project No. 040151-001
 Drilling Co. San Diego Drilling Type of Rig E-120 Bucket
 Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.
 Elevation Top of Hole 64 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0							SM-SC	BAYPOINT FORMATION (Obp) @ 0'-14': Reddish brown, moist to wet at base, loose to slightly dense, SAND with CLAY; seepage at base
5							SM	@ 12'-14': Moderate to active seepage and minor belling
10							SC-SM	DELMAR FORMATION (Td) @ 14'-64': Light yellowish gray, wet at top to moist with depth, soft at top grades to stiff, very fine sandy CLAY, grades to clayey, very fine SANDSTONE
15							CL	@ 16': Light greenish gray; moist to wet (from fractures), slightly stiff, silty CLAYSTONE; randomly fractured, iron-oxide
20				R-1	6		ML	@ 18': Material becomes cemented, yellowish gray, damp, hard SILTSTONE, mottled iron-oxide, lacks fractures @ 19'-20': Yellow-gray, wet, very dense, silty fine to medium SILTSTONE
25			J/S:N27W-40W, 32-40S J/S:N45W, 42N GB:N55W, 23S				SM-ML	@ 20': Blue-gray, damp, hard, clayey SILTSTONE; massive, moderately cemented, minor iron-oxide @ 20'-22': Mottled blue-gray CLAYSTONE and yellow-gray SANDSTONE; sheared zone (non-continuous), non-planar features, iron-oxide on surfaces, seepage from fractures @ 22'-25': Yellow-gray, moist to wet at base, dense, silty fine to medium SANDSTONE; weakly cemented, lense of dark gray clay, 2" thick, iron-oxide banding
25							CL	@ 25'-26.5': Greenish gray, very damp to moist, slightly stiff, CLAYSTONE; waxy, polished fractures with iron-oxide joint/shear attitudes on non-continuous features
30							SM	@ 26.5': Light gray, grades to blue-gray, moist to wet, very dense, very fine sandy SILTSTONE, cemented, general bedding attitude on yellow silt bed, lacks cementation, planar feature

GEOTECHNICAL BORING LOG LB-4

Date 6-14-00

Sheet 2 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446#

Elevation Top of Hole 64 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30		J:N45E, 35N					CL-ML	@ 30': Clay lense in above unit, then coarse SAND at base of unit @ 31': Blue-gray CLAYSTONE with polished waxy surfaces, some iron-oxide, joint attitude, lacks visible voids @ 34': Mottled zones of increased SILT content and partial cementation @ 36': Shear attitude on non-continuous, polished surface @ 37'-40': Blue-gray, wet, very dense, SILTSTONE; weakly cemented
35		S:N62E, 31S					ML	@ 40': Dark blue-gray and mottled reddish staining, damp, hard, CLAYSTONE and silty claystone; random waxy fracture, moderately cemented @ 42': Cemented SILTSTONE bed with reddish staining
40		R-2		8	110.5	18.0	ML-CL	@ 44': Slightly fractured CLAYSTONE with polished non-planar surfaces, very weakly cemented @ 46': Gray, moist to wet, very stiff to hard SILTSTONE; few joints with faint, non-continuous, polished surfaces, attitudes
45		J:N20W, 65N J:N20W, 77N					CL	@ 51': Color changes to light blue-gray @ 52': Shear attitude, continuous around hole but 1/2 steepens, irregular paper-thin CLAY, faintly polished
50		S:N70W, 5-35S					ML-SM	@ 57': Blue-gray, moist, dense/hard, very fine sandy SILTSTONE; weakly to moderately cemented
55								
60								(Downhole logged to 59 feet)

GEOTECHNICAL BORING LOG LB-4

Date 6-14-00

Sheet 3 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#, 60'-90' 2,446# Drop 12 in.

Elevation Top of Hole 64 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60	[Handwritten: HLL HPL]		R-3	20	112.7	16.4		Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u> @ 60': Blue-gray, damp, very stiff, silty CLAYSTONE
65								Total Depth = 64 Feet Backfilled and tamped 6/15/00 5 feet slurry cap Ground water encountered at 12 and 20 feet at time of drilling
70								
75								
80								
85								
90								

GEOTECHNICAL BORING LOG LB-5

Date 6-16-00

Sheet 1 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#

Drop 12 in.

Elevation Top of Hole 55 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>
0							SM	<u>BAYPOINT FORMATION (Qbp)</u> @ 0'-3.5': Reddish brown, moist (at base), loose to slightly dense, fine to medium SANDSTONE
3.5		C:N40W, 4N					ML-SM	@ 3.5': Contact attitude, generalized non-planar, undulatory, rip-ups of clay in sandstone, light seepage <u>DELMAR FORMATION (Td)</u>
5		C:N7W, 6S						@ 3.5': Yellow-orange, very damp to slightly moist, stiff, silty very fine SANDSTONE (grades to silty medium to coarse sandy SILTSTONE), iron-oxide bands @ 6': Blue gray, damp, stiff to very stiff with depth, very fine sandy CLAYSTONE/SILTSTONE (zones); cementation increases with depth, very short, non-planar fractures, decrease at 10', iron-oxide in upper portions
10								@ 14': Light brown, moist to wet, dense, very fine to medium SANDSTONE lense, subhorizontal, grades to material above @ 16': Dark blue-gray, very damp, stiff to very stiff, silty CLAYSTONE, few polished fracture surfaces, randomly oriented
15							ML-CL	@ 17.5': Clay seam attitude, paper thin clay seam, gently undulatory, material below is mottled (rip-ups?), dark gray CLAYSTONE and light gray, fine to medium SILTSTONE; very stiff @ 19.5': Interbedded blue-gray, fine to coarse SILTSTONE; wet (light seepage), dense to very dense (slightly cemented at base)
20		CS:N45E, 1N					CL-ML	@ 20.5': Blue-gray, damp, very stiff to hard, silty CLAYSTONE and claystone; moderately fractured with polished, popouts (non-planar, short), zones of weak cementation
25								@ 28': Joint or shear attitude on non-continuous planar, polished surface within CLAYSTONE, black rootlet staining
30		J/S:N10W, 37S						

GEOTECHNICAL BORING LOG LB-5

Date 6-16-00

Sheet 2 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#

Drop 12 in.

Elevation Top of Hole 55 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30								Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>
35		ML	@ 34': Moist zone, lacks continuation below, light seepage @ 35': Paleo-root, black charcoal branch, material below is blue-gray, very damp, slightly stiff, sandy SILTSTONE; massive					
40		ML-SM	@ 39': Dark gray lense of SILTSTONE with charcoal pieces @ 40': 4" sand lense then organic banded interbedded very fine SAND and CLAY, some charcoal pods, subhorizontal, minor seepage @ 41.5'-44.5': Blue-gray, moist to wet at base, stiff, SILTSTONE, grades to very fine sandy SILTSTONE; zones of cementation, seepage					
45		SM ML-SM	@ 44.5'-45.5': Zone similar to 40'; organized banded lenses of SANDSTONE; slightly moist @ 45.5': Blue/green, slightly damp, stiff, sandy SILTSTONE					
50			@ 48.5': Blue-gray, damp, slightly stiff CLAYSTONE; iron-oxide fractures, waxy, polished surface, randomly oriented @ 49': Blue/green, slightly damp, stiff, SILTSTONE					
55			@ 51.5': Blue-green gray, damp, stiff to hard, silty CLAYSTONE; few waxy fractures with iron-oxide, cemented					
60								

GEOTECHNICAL BORING LOG LB-5

Date 6-16-00

Sheet 3 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.

Elevation Top of Hole 55 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	<h2 style="text-align: center;">GEOTECHNICAL DESCRIPTION</h2> <p>Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u></p>
60								Total Depth = 60 Feet Backfilled and tamped 6/16/00 5 feet slurry cap Ground water encountered at 20, 34, 44 feet at time of drilling
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								
75								
76								
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								
90								

GEOTECHNICAL BORING LOG LB-6

Date 6-19-00 Sheet 1 of 3
 Project HDR/Del Mar Project No. 040151-001
 Drilling Co. San Diego Drilling Type of Rig E-120 Bucket
 Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841# Drop 12 in.
 Elevation Top of Hole 51 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u>								
0		J:N10-50W, 36-43S S:N73W, 47N GB:N30E, 16S S:N55E, 40S	R-1	9	120.3	7.1	SM-SC	<u>BAYPOINT FORMATION (Qbp)</u> @ 0'-2': Reddish brown, damp, slightly dense, clayey fine to medium SANDSTONE; weakly cemented, non-planar, gradual contact with Td, rip-ups of SILTSTONE, iron-oxide pods, pods of CLAY
2							ML	<u>DELMAR FORMATION (Td)</u> @ 2': Mottled gray and light brown in blocky pattern, very damp, slightly stiff, very fine sandy SILTSTONE; increase in cementation with depth
5							SM	@ 6': Mottled blue gray and light brown in blocky pattern, wet, dense, fine to medium SANDSTONE; iron-oxide staining in light brown portions, very minor seepage
8							ML-CL	@ 8': Green/blue-gray, very damp to wet in fractures, slightly stiff CLAYSTONE with SILT; polished waxy fracture surfaces, non-planar, joint attitudes are range of typical fracture planes
9.5							SM	@ 9.5': Non-horizontal, non-planar contact with light gray and blue-gray, silty fine to medium SANDSTONE; weakly cemented
12							ML-CL	@ 12': Shear contact attitude at base of 55°, below is blue-green CLAYSTONE that immediately grades to gray, very damp, soft to slightly stiff SILT/SILTSTONE; grades to increased cementation of stiffness below
15								@ 15': Reddish mottled staining @ 16': Blue-gray, very damp, slightly hard/dense, silty very fine SANDSTONE/very fine SILTSTONE; moderately cemented
19.5-20								@ 19.5'-20': Concretion, continuous @ 20': Yellowish gray, very damp, dense, silty fine to coarse SANDSTONE; massive, cemented @ 21': Undulatory contact between blue-gray material and yellowish gray material, weaker cementation at contact, slightly dense to dense, silty fine SANDSTONE, grades to fine to coarse SANDSTONE
26								@ 26': General bedding attitude on pebble lense, mostly continuous, possibly offset in portion? minor seepage in lense
28								@ 28': Shear attitude, material is blue-green CLAYSTONE with waxy polished fractures, partially discontinuous, random

GEOTECHNICAL BORING LOG LB-6

Date 6-19-00

Sheet 2 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in.

Drive Weight 0'-30' 4,991#, 30'-60' 3,841#,

Drop 12 in.

Elevation Top of Hole 51 ft.

Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30							ML-CL	Logged By <u>KTS/MRS</u> Sampled By <u>KTS</u> @ 30': Blue and gray mottled, silty CLAYSTONE/SILTSTONE, very moist to wet, mottled, stiff and very stiff, iron-oxide, gradual increase in cementation to 35', some red staining, moderately fractured with few randomly oriented polished surfaces
35							SM-ML	@ 35': Dark blue/green-gray, SILTSTONE; wet, very stiff, reddish staining @ 36': Reddish brown, fine SANDSTONE @ 36.5': Same as at 35'
40			R-2	15	119.7	13.7	SM	@ 39': Irregular contact to gray damp, very dense, silty fine to medium SANDSTONE
							CL	@ 40': Blue-gray, very damp, hard/dense, very fine SANDSTONE; massive, weakly to moderately cemented
							CL	@ 41': CLAYSTONE; few random polished surfaces
45							CL	@ 44': Mottled red and blue-gray, very hard CLAYSTONE with few random polished surfaces
50							SC	@ 49': Very hard in areas; with sand, very few fractures
							SC-SM	@ 51': Increase in sand, very dense, no fractures
55								
60								

GEOTECHNICAL BORING LOG LB-6

Date 6-19-00

Sheet 3 of 3

Project HDR/Del Mar

Project No. 040151-001

Drilling Co. San Diego Drilling

Type of Rig E-120 Bucket

Hole Diameter 24 in. Drive Weight 0'-30' 4,991#, 30'-60' 3,841#

Drop 12 in.

Elevation Top of Hole 51 ft. Ref. or Datum See Map

Depth (feet)	Graphic Log	Attitudes	Sample No.	Blows Per Foot	Dry Density (pcf)	Moisture Content (%)	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60			R-3	7/6" 27/12"	124.4	10.1		@ 60': Blue-gray, damp, hard, fine SANDSTONE Total Depth = 60 Feet Backfilled and Tamped 6/19/00 5 feet slurry cap Ground water encountered at 6, 8, 27 feet at time of drilling
65								
70								
75								
80								
85								
90								

Logged By KTS/MRS
 Sampled By KTS

PREVIOUS BORING LOGS BY
LEIGHTON AND ASSOCIATES

EXPLANATION OF GEOTECHNICAL BORING LOG

Date _____ Drill Hole No. _____ Sheet ___ of ___
 Project _____ Job No. _____
 Drilling Co. _____ Type of Rig _____
 Hole Diameter _____ Drive Weight _____ Drop _____ in.
 Elevation Top of Hole _____ Ref. or Datum _____

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0								Logged by _____ Sampled by _____
0-5		j:N10W/20E					SM	Attitudes: Strike/Dip (b) = Bedding (c) = Contact (j) = Joint (f) = Fracture (F) = Fault (cs) = Clay Seam (s) = Shear
5-10		b:Horizontal					ML	
10-15		c:N80W/10N	1	14	106.2	14.9	CL	Relatively undisturbed drive sample (Modified California Sampler) - Number to left represents Sample Number
10-15		f:N-S/65W	①					Bulk Sample (with sampling interval)
15-20		s:N50E/40W	2	15		15.8	SP	Standard Penetration Test (Split-Spoon Sampler)
15-20			N.R.	18				Sample not recovered
20-25		cs:N30W/20E					CL/CH	Graphic Log: silt sand clay contact fracture shear/clay seam zone with calcareous cement roots seep ground water table clast
25-30		F:N10E/70W						
30								Total Depth = 28' (depth of hole)

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P1 Sheet 1 of 2 -
 Project Santa Fe Railroad Job No. 478008-1
 Drilling Co. Pioneer Type of Rig B-53 Flite
 Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.
 Elevation Top of Hole 63.0 Ref. or Datum _____

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								Logged by	Sampled by
0								WH - DLH	WH
0 - 1							SM-SC		
1 - 2			1	17/6" 29/6"	119.4	11.3	SM		
2 - 3			2	9/19	111.4	14.1			
3 - 4			3	20/35	108.2	14.1	SM		
4 - 5			4	55/6"	102.2	12.7	SC		
5 - 6			5	41/6" 60/4"	106.0	21.3	ML		
6 - 7			6	61/6"	110.6	13.8			
7 - 8			7	60/5"	96.3	20.5			

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. p1 Sheet 2 of 2-
 Project Santa Fe Railroad Job No. 478008-1
 Drilling Co. Pioneer Type of Rig B-53 Flite
 Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.
 Elevation Top of Hole 63.0 Ref. or Datum _____

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								Logged by	Sampled by
30							ML	As above.	
			8	60/5"	100.8	14.0		Coarse grained sand in sample tube.	
35			①					@ 36': Very dense.	
			9	42/6"	105.8	18.8		@ 36.5': Less dense but still very hard.	
				60/4.5"					
40			10	63/6"	102.2	13.9		@ 43': Drilling becoming difficult moist material sticks to auger hard to clear cuttings from hole.	
45			②						
			11	61/6"	99.3	18.2		@ 53': Slight decrease in density.	
50									
55								T.D. 54'	No water - No Caving
60									

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P2 Sheet 1 of 1-
 Project Santa Fe Railroad Job No. 478008-1
 Drilling Co. Pioneer Type of Rig B-53 Flite
 Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.
 Elevation Top of Hole 63.0 Ref. or Datum _____

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								Logged by	Sampled by
0								Logged by <u>WH</u> Sampled by <u>WH</u>	
							SW SM		Track Bed - Sandy gravel, medium brown, m Fill - Dark orange, silty sand, fine to c grained, pebbly, moist, dense. @ 3': Less pebble, very moist, orange br to brown sand, somewhat silty.
5			12 13	18/6" 16/6" 27/6" 27/5"	117.8 122.6	6.7 7.8			
			14 15	20/6" 13/6" 34/6"	112.8 87.2	14.9 14.1	SM		@ 5.5': Orange brown, sand, fine-coarse grained (natural) very moist to wet, dense Terrace Deposit (Qt) @ 8': Somewhat denser.
10			16	60/5"	103.4	13.3			
							SM		@ 12.7': Tan, sand, fine-medium grained, moist, dense, Del Mar Formation (Ted) bedrock.
15			17	30/6" 60/6"	105.3	22.4	ML		@ 16': Light gray grained, clayey silt, moist, dense (bedrock).
20									T.D. 17' No Water - No Caving
25									
30									

GEOTECHNICAL BORING LOG

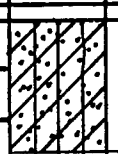
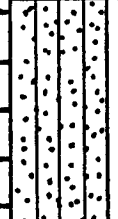
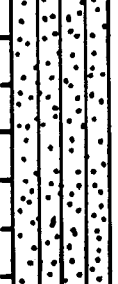
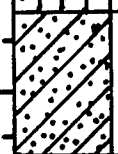
Date 1/20/78 Drill Hole No. P 3 Sheet 1 of 1-

Project Santa Fe Railroad Job No. 478008-1

Drilling Co. Pioneer Type of Rig B-53 Flite

Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.

Elevation Top of Hole 63.0 Ref. or Datum _____

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								Logged by <u>WH</u>	Sampled by <u>WH</u>
0							SM/ SC	Fill-Grayish brown to orange brown, sand, fine-coarse grained, moist, pebbles in upper foot, with gravel.	
			18	9/6"	107.2	14.0			
				26/6"			SM	@ 2.8': Brown to orange brown sand, fine-coarse grained, moist, dense, terrace deposit (Qt)	
5			19	18/6"	109.5	15.6			
				32/6"					
			20	23/6"					
				31/6"					
10			21	24/6"	109.1	16.4			
				42/6"					
15							SC	Tan, sand, fine-medium grained, moist, dense. Note: <u>Upper contact approximate Del Mar Formation (Ted) bedrock.</u>	
				25/6"					
			22	60/5"	102.9	21.5	ML	Light gray grained, clayey silt, moist, dense.	
20								T.D. 17.5' No Water - No Caving	
25									
30									

GEOTECHNICAL BORING LOG

Date 1/20/78 Drill Hole No. P4 Sheet 1 of 1
 Project Santa Fe Railroad Job No. 478008-1
 Drilling Co. Pioneer Type of Rig B-53 Flite
 Hole Diameter _____ Drive Weight 140 lb. Drop 30 in.
 Elevation Top of Hole 63.5 Ref. or Datum _____

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	
								Logged by	Sampled by
0								Logged by <u>WH</u>	Sampled by <u>WH</u>
0 - 2.3							SM/SC	Fill-Brown, silty sand, fine-medium grain, very moist, medium dense.	
2.3 - 3.0			23	9/6" 18/6"	112.3 113.6		SM	@ 2-3': Old road bed.	
3.0 - 5.0								@ 3': Orange brown, sand, fine-coarse grain (natural) very moist, dense. Terrace Deposits (Qt)	
5.0 - 10.0			24	17/6" 24/6"	111.1 113.2				
10.0 - 12.7			25	11/6" 20/6"	109.0 114.4				
12.7 - 16.7			26	62/6"	104.5 113.6		SC	@ 12.7': Tan, sand, fine-coarse, moist, dense. Del Mar Formation (Ted) bedrock.	
16.7 - 18.0			27	29/6" 51/6"	103.7 111.2		ML	@ 16.7': Light gray grained, clayey silt, moist, dense, (bedrock).	
18.0 - 30.0								T.D. 18' No Water - No Caving	

PREVIOUS BORING LOGS BY
OTHERS

APPENDIX A

Field Mapping and Subsurface Exploration Logs

Geologic Units and Feature Identification

The Site Plan and Geologic Map (in pocket) was prepared based upon information supplied by the client, or others, along with MAHG's field measurements and observations. Site geology including surficial units, bedrock units, measurement of bedrock structure, contacts, areas of notable seepage and springs as well as the approximate locations of exploratory borings and trenches associated with this field investigation are presented on the Geotechnical Map. In addition, ten geologic cross sections were prepared to enable the evaluation of slope stability at selected locations and these sections are presented in Appendix D.

General Field Procedures

The Boring and Trench Logs on the following pages depict or describe the subsurface (soil and water) conditions encountered at the specific exploration locations on the date that the exploration was performed. Subsurface conditions may differ between exploration locations and within areas of the site that were not explored. The subsurface conditions may also change at the exploration locations over the passage of time.

Boring and Test Trench Elevations

The ground surface elevations reported on the field logs were established from interpolation of elevations and contours illustrated on the Site Plan and Geologic Map.

Boring and Test Trench Locations

All subsurface exploration locations were located on-site based on visual observation and measurement from existing improvements. The locations are shown on the Geotechnical Map. Subsurface exploration locations reported for this study should be considered accurate only to the degree implied by the method used in determining them.

Water Level Measurement

The water levels reported on the Boring Logs represent the depth to the piezometric water surface measured at the conclusion of the drilling operation after a short wait, or in monitoring wells that were constructed within selected boreholes. Water levels are expected to show seasonal and long-term fluctuations consistent with historical trends in the area.

Field Sampling and Testing Procedures

Drilling was performed between April 27 and April 30, 1998, utilizing Mobile B-53 and B-61 truck-mounted rigs equipped with 8-inch-diameter, continuous-flight, hollow-stem augers. Trenches were excavated with a rubber tire mounted backhoe provided by the client.

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D 420 entitled "Standard Guide for Sampling Soil and Rock" and/or other relevant specifications. Soil samples were preserved and transported to our laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled "Standard Practice for Preserving and Transporting Soil Samples". Brief descriptions of the sampling and testing procedures are presented below:

Ring-Lined Barrel Sampling - (ASTM D 3550)

In this procedure, a barrel sampler constructed to receive a stack of 1-inch-high brass rings is used to collect soil samples for classification and laboratory testing. Ring samples were collected from closely spaced intervals in all of the hollow-stem auger borings. Each hollow-stem rig was equipped with a 140-pound wireline downhole hammer, manually operated to fall an approximate distance of 30 inches. An 18-inch or 24-inch-long barrel fitted with 2.5-inch-diameter rings was subsequently driven a distance of 18 inches or to practical refusal (considered to be 50 blows for 6 inches). The method provides relatively undisturbed samples that fit directly into laboratory test instruments without additional handling and disturbance.

Raw blow count data were recorded for each 6-inch increment of the 18-inch drive. The sum of blows required to drive the sampler the final 12 inches, or fraction thereof, is noted on the Field Logs, presented in this Appendix, as an uncorrected N-value. Penetration resistance of the initial 6-inch seating interval is not shown, except in the instance of total penetration of 6 inches or less. The raw blow count values, presented as $N=XX$, do not have exact equivalency with Standard Penetration Test "N-values" as determined by ASTM D 1586. However, it is commonly accepted that general correlations can be applied to obtain approximately equivalent (uncorrected) Standard Penetration Test N-values and their respective consistency and relative density classifications according to the following tables.



Table A-1
Blow Count/Density Relationships for Granular Soils

<i>Ring Sample Blow Count</i>	<i>SPT Blow Count</i>	<i>Description</i>
0 - 5	0 - 4	Very loose
5 - 13	4 - 10	Loose
13 - 38	10 - 30	Medium dense
38 - 63	30 - 50	Dense
> 63	> 50	Very dense

Table A-2
Blow Count/Consistency Relationships for Fine-Grained Soils

<i>Ring Sample Blow Count</i>	<i>SPT Blow Count</i>	<i>Description</i>
0 - 3	0 - 2	Very soft
3 - 5	2 - 4	Soft
5 - 10	4 - 8	Firm/Medium stiff
10 - 19	8 - 15	Stiff
19 - 38	15 - 30	Very stiff
>38	>30	Hard

Bulk Sample

A relatively large volume of soil is collected with a shovel or trowel. The sample is transported to the materials laboratory in a sealed plastic bag or bucket.

Classification of Samples

Excavated soils and discrete soil samples were visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D 2488-75). The classifications are reported on the field logs. Plasticity noted on the field logs reflects soil conditions at field moisture contents, and may not correlate with achievable plasticity at differing moisture contents.



FIELD LOG OF BORING B - 1P

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: 4/27/98	Logged By: M. Doerschlag
Drilled By: California-Pacific	Total Depth: 51.0 Ft.
Rig Make/Model: Mobile B-61	Hammer Type: Wireline downhole
Drilling Method: Hollow-stem Auger	Hammer Weight/Drop: 140 Lb./±30 In.
Hole Diameter: 8 In.	Surface Elevation: 50.4 Ft.

Comments: Located at south end of project alignment.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE TYPE, N (Blows/ft.)							
0	50				SC	Clayey Sand: Dense; yellowish brown; moist; fine to coarse grained. [Fill]				
					SM	Silty Sandstone: Very dense; pale yellow (5Y 8/3); moist; fine to medium grained; about 40% fines. [Delmar Fm.]				
5	45				SP-SM	Sandstone: Very dense; gray (N6); moist; fine to medium grained; slightly silty; very weakly cemented.	101.6	10.6		SHEAR
					ML, CL	Sandy Siltstone and Silty Claystone: Hard; dark gray (N4) with common dusky red (2.5YR 3/2) mottles; moist; trace to some fine to medium-grained sand; crumbly, friable, and non-plastic.	102.4	16.7		SHEAR
10	40			CL						
15										

Continued on next sheet.

FIG. A-1



FIELD LOG OF BORING B - 1P

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15	35	RING 83/6"			SM	Silty Sandstone and Siltstone: Very dense or hard; mostly gray (N6), with few small reddish FeO mottles; fine to medium grained sand; thinly bedded.	98.9	13.1		
					CL	Silty Claystone: Hard; dark gray (N4); moist; crumbly, friable, and non-plastic.				
20	30	RING 60/3"			SP-SM	Sandstone: Very dense; brownish yellow (10YR 6/6); moist; fine to coarse grained; uncemented. Much thinner than in adjacent bluff face.	99.5	9.8		SHEAR
					ML, CL	Sandy Siltstone and Silty Claystone: Hard; mostly gray (N5), with some reddish FeO mottles to 1" across; moist; sand proportion mostly fine-grained; faintly plane laminated.				
25	25	RING 76/6"			ML		98.3	14.4		
					ML					
30	20	RING 59/6"			CL	Silty claystone, as above; dark gray (N4).	101.9	17.5		SHEAR
35										

Continued on next sheet.

FIG. A-2



FIELD LOG OF BORING B - 1P

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35	15	RING 80/6"			ML	Sandy Siltstone and Silty Claystone: Hard; mostly gray (N5), with some reddish FeO mottles to 1" across; moist; sand proportion mostly fine-grained; faintly plane laminated.	101.2	12.7		
					SP-SM	Sandstone: Very dense; dark gray (N4); moist; fine to medium grained; very weakly cemented with trace of clay.				
40	10	RING 80/6"			CL	← Sandy claystone, dark gray (N4), texture of small slickensided granules. Local lens.	108.4	14.3		
					CL	Silty Claystone: Hard; dark gray (N4), abundantly mottled with dusky red (2.5YR 3/2) iron oxides; moist; very silty, with occasional trace of fine-grained sand; massive and non-plastic. Harder drilling.				
45	5	RING 80/6"			CL	← Silty claystone, as above.	N/R	N/R		
50	0	RING 80/6"			CL	← Silty claystone, as above.	102.8	15.3		SHEAR

Bottom of boring at 51.0 feet.
 No groundwater encountered.
 Piezometer installed as depicted in well completion column..

FIG. A-3



FIELD LOG OF BORING B - 2

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: 4/27/98	Logged By: M. Doerschlag
Drilled By: California-Pacific	Total Depth: 40.5 Ft.
Rig Make/Model: Mobile B-61	Hammer Type: Wireline downhole
Drilling Method: Hollow-stem Auger	Hammer Weight/Drop: 140 Lb./±30 In.
Hole Diameter: 8 In.	Surface Elevation: 51.4 Ft.

Comments: Located at Andersen Canyon embankment fill.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE TYPE, N (Blows/ft.)								
0					SM	Gravelly Sand with Silt: Dense; dark brown (7.5YR 4/2); moist; fine to coarse grained; estimated 20-25% fine to coarse-grained gravel ballast; trace of clay. [Fill]				
5		RING			SP-SC	Clayey Sand: Dense; dark yellowish brown (10YR 4/4); moist; mostly fine to medium grained, with trace of gravel and silt. [Fill]	100.3	7.4		
45		N=47								
10		RING			SP-SC	↓ Becomes medium dense; very moist.	108.6	13.0		CONS
40		N=14								
15										

Continued on next sheet.

FIG. A-4



FIELD LOG OF BORING B - 2

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15		RING			SP-SC	Clayey Sand: Medium dense; dark yellowish brown (10YR 4/4); very moist; fine to medium grained; trace of silt. [Fill] — Trace FeO mottling.	114.6	12.9		CONS
35		N=13								
20		RING			SP-SC	Becomes wet; slightly sticky.				
30		N=18					115.0	14.5		
25		RING			SP-SC	Contains few yellowish siltstone fragments; moist.				CONS
25		N=17					114.1	10.2		
30		RING			ML, CL	Clayey Siltstone and Sandy Claystone: Very stiff; mottled pale yellow, dark brown, and dark gray; wet; consists mostly of small intact sedimentary fragments in clayey silt matrix. [Fill]				
20		N=23			ML, CL		94.6	24.2		
35					SP-SM	Abrupt contact. Sandstone: Very dense; pale brownish yellow (10YR 6/6); wet; fine to medium grained; massively bedded. [Delmar Fm.]				

Continued on next sheet.

FIG. A-5



FIELD LOG OF BORING B - 2

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35		RING 62/6"			SP-SM	Sandstone: Very dense; pale brownish yellow (10YR 6/6); wet; fine to medium grained; massively bedded. [Delmar Fm.] Clayey Silt: Hard; mottled dark gray (N4) and dusky red (2.5YR 2/3); moist; crumbly, friable, and non-plastic.	113.6	17.5		
15				ML						
40		RING 53/6"			ML		98.9	12.6		

*Bottom of boring at 40.5 feet.
Perched groundwater encountered in zone from approximately 33.0 to 38.0 feet.
No groundwater encountered below 38.0 feet.
Boring backfilled with soil cuttings.*

FIG. A-6



FIELD LOG OF BORING B - 3

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/27/98**
 Drilled By: **California-Pacific**
 Rig Make/Model: **Mobile B-61**
 Drilling Method: **Hollow-stem Auger**
 Hole Diameter: **8 In.**
 Logged By: **M. Doerschlag**
 Total Depth: **35.5 Ft.**
 Hammer Type: **Wireline downhole**
 Hammer Weight/Drop: **140 Lb./±30 In.**
 Surface Elevation: **54.0 Ft.**

Comments: Located north of Andersen Canyon.

DEPTH (FL.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
0										
50		RING	N=23		SP-SC	Clayey Sand: Medium dense; dark yellowish brown (10YR 4/4); moist; fine to medium grained; trace of silt. [Fill]	105.3	7.3		
5					SP	Sand: Medium dense; pale yellow; moist; fine to coarse grained, with trace of silt. [Fill]				
45		RING	N=18		SP, ML, CL	Clayey Silt and Sand: Medium dense or stiff mottled mixture of yellowish sand and grayish clayey silt; moist; common fragmentary silty claystone. [Fill]	94.7	13.9		
10					ML, SM	Sandy Siltstone and Silty Sandstone: Hard or very dense; mostly yellowish brown (2.5YR 6/4); moist; sand component predominantly fine-grained; thinly bedded and closely fractured; fine-grained strata are non-plastic. [Delmar Fm.]	N/R	N/R		
40		RING	N=55							
15										

Continued on next sheet.



FIELD LOG OF BORING B - 3

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15					ML, SM	Sandy Siltstone and Silty Sandstone: Hard or very dense; yellowish brown abruptly becoming dark gray (N4) at 16 feet; moist; sand mostly fine-grained; thinly bedded; fine-grained strata are non-plastic.				
		RING 55/6"			SM	Silty sandstone, fine to medium grained, very silty.	108.2	13.2		
35										
20										
		RING 56/6"			ML	Clayey siltstone, gray (5Y 6/1), trace of fine-grained sand, friable and non-plastic. Grades increasingly clayey.	98.6	16.0		
30										
25										
		RING 65/6"			ML	Clayey siltstone, dark gray (N4), trace of sand. Becomes harder drilling.	105.4	16.1		
25										
30										
		RING 62/6"			ML	Siltstone, lacks clay. Trace of coal.	98.4	15.1		
20										
35										

Continued on next sheet.

FIG. A-8



FIELD LOG OF BORING B - 3

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							

35

 SP

Sandstone: Very dense; color and moisture undetermined; well-cemented with calcium carbonate. Bluff exposure is erosion-resistant, lenticular ledge about 14" thick. Very hard drilling.

*Refusal encountered at 35.5 feet.
No groundwater encountered.
Boring backfilled with soil cuttings.*



FIELD LOG OF BORING B - 4P

Sheet 1 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/27/98**

Drilled By: **California-Pacific**

Rig Make/Model: **Mobile B-61**

Drilling Method: **Hollow-stem Auger**

Hole Diameter: **8 In.**

Logged By: **M. Doerschlag**

Total Depth: **55.5 Ft.**

Hammer Type: **Wireline downhole**

Hammer Weight/Drop: **140 Lb./±30 In.**

Surface Elevation: **60.5 Ft.**

Comments: **Groundwater seepage noted along nearby bluff face.**

DEPTH (FL.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
0	60				SP-SC	Clayey Sand: Dense; dark reddish brown (5YR 3/4); moist; fine to medium grained, with occasional trace of gravel to ~1". [Bay Point Fm.]				
						Sharp contact.				
5	55	RING	N=51		ML, SC, CL	Sandy Siltstone: Hard; olive yellow (2.5Y 6/6); moist; fine-grained sand. Includes few thin clayey sand lenses, and occasional olive silty clay rip-up clasts. [Delmar Fm.]	94.0	23.3		
					CL	Silty Claystone: Hard; pale yellow (2.5YR 7/4); moist; slightly plastic.				
10	50	RING	68/12"		SP-SC	Clayey Sandstone: Very dense; mottled pale yellow (2.5Y 8/4) to olive yellow (5Y 6/8); moist; fine to medium grained; massively bedded; very weakly cemented.	107.3	21.3		SHEAR
15										

Continued on next sheet.

FIG. A-10



FIELD LOG OF BORING B - 4P

Sheet 2 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15	45	RING 80/9"			ML, SP	Sandy Siltstone and Sandstone: Hard or very dense; siltstone light gray (2.5Y 7/2), and sandstone yellow (2.5Y 8/6); moist; fine to medium-grained sand; fine-grained strata contain trace of clay and are non-plastic.	100.5	18.0		SHEAR
20	40	RING 50/6"			CL	<p>Abrupt contact.</p> <p>Silty Claystone: Hard; very dark gray (5YR 3/1); moist; friable and non-plastic, with granular texture.</p>	105.8	16.9		SHEAR
25	35	RING 66/6"			ML, SM	<p>Grades less clay; color lightens.</p> <p>Siltstone and Silty Sandstone: Hard or very dense; mostly light gray (2.5Y 8/1) to gray (N6), with local orange mottling; moist; sands fine to medium grained.</p>	102.4	13.1		
30	30	RING 50/3"			SM	Very silty fine to medium-grained sandstone; gray (N5).	110.0	11.5		
35					CL, ML	Silty Claystone: Hard; gray (N5); moist; very silty; non-plastic and friable.				

Continued on next sheet.

FIG. A-11



FIELD LOG OF BORING B - 4P

Sheet 3 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35	25	RING 85/6"			CL	Silty Claystone: Hard; gray (N5); moist; very silty; non-plastic; becomes commonly mottled with dusky red iron oxide staining and small hematitic concretions.	92.0	18.6		SHEAR
40	20	RING 56/6"			CL	Silty claystone, as above.	105.2	19.3		
45	15	RING 100/6"			ML	Sandy Siltstone: Hard; gray (N6); moist; mostly fine-grained sand; generally massive in recovered samples.				
					ML	Sandy siltstone, as above.	116.2	10.3		
50	10	RING 50/3"			ML	Sandy siltstone, as above.	107.3	13.7		
55										

Continued on next sheet.

FIG. A-12




FIELD LOG OF BORING B - 4P

Sheet 4 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
55	5	57/6"			CL	Silty Claystone: Hard; dark gray (N4), abundantly mottled with dusky red (2.5YR 3/2) iron oxides; moist; very silty; massive and non-plastic.	102.1	17.5		SHEAR

*Bottom of boring at 55.0 feet.
 No groundwater encountered.
 Piezometer installed as depicted in well completion column..*

FIG. A-13



FIELD LOG OF BORING B - 5

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: 4/28/98	Logged By: M. Doerschlag
Drilled By: California-Pacific	Total Depth: 51.0 Ft.
Rig Make/Model: Mobile B-61	Hammer Type: Wireline downhole
Drilling Method: Hollow-stem Auger	Hammer Weight/Drop: 140 Lb./±30 In.
Hole Diameter: 8 In.	Surface Elevation: 59.5 Ft.

Comments:

DEPTH (FL.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
0					SP-SC	Clayey Sand: Dense; dark reddish brown (5YR 3/2); moist; fine to coarse grained, with trace of gravel to ~2" diameter. [Bay Point Fm.]					
						Sharp contact.					
55					ML, CL	Clayey Siltstone and Silty Claystone: Hard; dark to very dark gray (N4-N3), locally becoming black (N2), moist; friable and non-plastic, non-cemented. Bluff outcroppings contain common coal-bearing lenses to ~6" thick. [Delmar Fm.]					
5					ML	← Clayey siltstone, as above.	106.7	14.1			
50					CL	← Silty claystone, black (N2).	104.7	16.1			
45					SP-SM	Silty Sandstone: Very dense; dark gray (N5) apparently mottled with shades of yellow; moist to locally very moist; fine to coarse grained. Interval inferred from bluff exposure.					
15											

Continued on next sheet.



FIELD LOG OF BORING B - 5

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (FL.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15		RING 70/6"			SP-SM	Silty Sandstone: Very dense; dark gray (N5); moist to locally very moist; fine to coarse grained. Locally contains sandy siltstone drapes and partings.	107.3	14.1		
40		RING 55/6"			ML	Sandy Siltstone: Hard; gray (N5); moist; sand component fine to medium grained; apparently massively bedded; non-plastic and mostly lacks clay. Sample @ 20 ft. found to have plane and convolute lamination, with estimated 30-40% sand. Increasingly sandy with depth.	111.2	12.2		
25		RING 67/6"			ML	Color becomes 10YR 5/1, possibly grading to silty sandstone. Sandy siltstone, mottled with reddish brown (2.5YR 3/4) oxidation color.	101.9	15.0		
30		RING 62/6"			ML	Clayey Siltstone: Hard; mottled gray (10YR 6/1) and yellow (10YR 7/6); moist; trace of fine-grained sand; non-plastic. Harder drilling.				
35					ML	Sandy siltstone, as above.	110.7	15.8		

Continued on next sheet.

FIG. A-15



FIELD LOG OF BORING B - 5

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35		RING 58/6"			ML	Clayey Siltstone: Hard; color mostly olive gray (5Y 5/2); moist.	96.6	17.1		
40	20	RING 80/6"			ML	Sandy Siltstone: Hard; dark gray (N5); moist; contains estimated 20-30% fine to medium-grained sand. Little or no clay; non-plastic.	117.4	10.6		
45	15	RING 55/6"			ML	Siltstone, trace of fine-grained sand.	102.0	17.2		
50	10	RING 112/12"			ML	Siltstone, as above.	108.8	18.6		

Bottom of boring at 51.0 feet.

Groundwater seepage reported by driller somewhere in upper 20 feet of boring; interpreted to be from basal portion of sandstone interval located from 13 to 19 feet.

Boring backfilled with soil cuttings.

FIG. A-16



FIELD LOG OF BORING B - 6P

Sheet 1 of 2

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA** Project No. **3650-SF**

Dates(s) Drilled: **4/28/98** Logged By: **M. Doerschlag**

Drilled By: **California-Pacific** Total Depth: **28.0 Ft.**

Rig Make/Model: **Mobile B-61** Hammer Type: **Wireline downhole**

Drilling Method: **Hollow-stem Auger** Hammer Weight/Drop: **140 Lb./±30 In.**

Hole Diameter: **8 In.** Surface Elevation: **64.3 Ft.**

Comments: Groundwater seepage apparent from nearby bluff.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
0											
5	60	RING	N=36		SP	Sand: Dense; dark yellowish brown (10YR 4/4); moist; fine to medium grained, with occasional trace of gravel; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]	114.3	6.9			
						<p>↳ Becomes wet.</p> <p>↳ Becomes medium to coarse grained, some fine gravel.</p>					
10	55	RING	N=54		CL	Silty Claystone: Hard; pale olive (5Y 6/3); moist; very silty; slightly plastic to non-plastic. [Delmar Fm.]	102.0	18.8			
15	50	RING	70/12"		SC-SP, SP	Clayey Sandstone and Sandstone: Very dense; pale olive(5Y 6/4) becoming olive yellow (5Y 6/8); moist; fine to medium grained.	114.6	11.3			

Continued on next sheet.

FIG. A-17



FIELD LOG OF BORING B - 6P

Sheet 2 of 2

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15					SP	Clayey Sandstone and Sandstone: As before; grades primarily SP classification.				
45		RING 50/6"			ML	Sandy Siltstone: Hard; mostly gray (5Y 5/1); moist; fine to medium grained sand, and trace of clay; apparently massively bedded.	110.7	16.6		
20					ML	← Becomes harder drilling.				
40		RING 76/6"			ML, SM	Sandy siltstone with clay, and some thinly bedded silty fine to medium-grained sandstone; color dark gray (N6) with abundant dusky red mottles; slightly sticky when wet.	117.7	14.3		
25		RING 82/6"			ML	← Sandy siltstone with clay.	110.9	15.4		

*Boring terminated at 28.0 feet due to very slow progress.
Perched groundwater encountered in zone from approximately
6.0 to 8.0 feet (base of Bay Point Fm.).
Piezometer installed as depicted in well completion column..*

FIG. A-18



FIELD LOG OF BORING B - 7

Sheet 1 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/28/98**

Drilled By: **California-Pacific**

Rig Make/Model: **Mobile B-61**

Drilling Method: **Hollow-stem Auger**

Hole Diameter: **8 in.**

Logged By: **M. Doerschlag**

Total Depth: **56.0 Ft.**

Hammer Type: **Wireline downhole**

Hammer Weight/Drop: **140 Lb./±30 in.**

Surface Elevation: **61.3 Ft.**

Comments:

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE TYPE, N (Blows/ft.)								
0										
60										
5										
55		RING N=70		SP-SC	SP-SC	Clayey Sand: Dense becoming locally very dense; dark reddish brown (5YR 3/4); moist, becoming very moist by ~2 ft.; fine to medium grained, with trace of gravel to ~2" diameter; very weakly cemented with clay and Fe-oxides. [Bay Point Fm.] Becomes very moist to wet. Trace of coarse-grained sand.	114.4	10.8		SHEAR
10										
50		RING N=52		CL	CL	Silty Claystone: Hard; pale olive (5Y 6/3); moist; up to several percent fine-grained sand; non-plastic and non-cemented; massive appearance. [Delmar Fm.]	105.1	17.2		SHEAR
15										
				ML	ML	Clayey Siltstone: Hard; dark gray (N4); moist; trace of fine to medium-grained sand.				

Continued on next sheet.



FIELD LOG OF BORING B - 7

Sheet 2 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
15											
45						ML	Clayey Siltstone: Hard; dark gray (N4); moist; trace of fine to medium-grained sand; texture locally comprises small granules somewhat loosely bound together; non-plastic.	106.5	21.2		
20						ML	Sandy Siltstone: Hard; gray (N5); moist; sand component fine to medium grained; apparently massively bedded; non-plastic and mostly lacks clay. Increasingly sandy with depth.	108.1	12.8		SHEAR
40							Unit contains subordinate thin layers of silty, fine to medium-grained sandstone.	111.8	12.9		
25							Very fine-grained silty sandstone.	105.9	12.1		SHEAR
35							6-inch-thick well-cemented layer, hard drilling.				
30						SP	Sandstone: Very dense; very pale brown (10YR 7/4); wet; fine to coarse grained.				
30											
35											

Continued on next sheet.

FIG. A-20



FIELD LOG OF BORING B - 7

Sheet 3 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35		RING 100/5"			SP	Sandstone: Very dense; very pale brown (10YR 7/4); wet; fine to coarse grained; massively bedded.	104.7	9.9		SHEAR
25										
40		RING 90/6"			SP, SP-SM		N/R	N/R		
20										
		RING 70/6"			SP-SM	← Color gray (N6). Abrupt lower contact.				
45					ML	Clayey Siltstone: Hard; gray (N5), with few dusky red mottles to about 1/2" across; moist; trace of fine-grained sand; non-plastic.	102.4	23.2		
15		RING 66/6"					109.7	17.7		SHEAR
50										
10		RING 90/10"			ML, SC	← Sample with some clayey sandstone layer(s) to 6-8" thick.	106.3	15.1		
55										

Continued on next sheet.

FIG. A-21



FIELD LOG OF BORING B - 7

Sheet 4 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
55		RING 55/6"			ML, CL	Clayey Siltstone: As before; grading to silty claystone.	105.9	19.2		SHEAR

*Bottom of boring at 56.0 feet.
Perched groundwater encountered in zone from approximately 6.0 to 9.0 feet (base of Bay Point Fm.); also, sandstone aquifer encountered from 34 to 43 feet.
Boring backfilled with soil cuttings.*

FIG. A-22



FIELD LOG OF BORING B - 8

Sheet 1 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/29/98**
 Drilled By: **California-Pacific**
 Rig Make/Model: **Mobile B-53**
 Drilling Method: **Hollow-stem Auger**
 Hole Diameter: **8 In.**

Logged By: **M. Doerschlag**
 Total Depth: **61.0 Ft.**
 Hammer Type: **Wireline downhole**
 Hammer Weight/Drop: **140 Lb./±30 In.**
 Surface Elevation: **60.5 Ft.**

Comments:

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
0	60										
5	55		RING 61/12"		SP	Sand: Dense; strong brown (7.5YR 4/6); moist, becoming very moist by ~2 ft.; fine to medium grained; estimated 3-5% clay and Fe-oxide binder. [Bay Point Fm.] Becomes wet.					
					CL	Silty Claystone: Hard; pale olive (5Y 6/4) to yellow (2.5Y 7/6); moist; up to several percent fine-grained sand; non-plastic and non-cemented; granulated appearance. [Delmar Fm.]	106.1	17.0			
10	50		RING 50/6"		SP-SM, ML	Silty Sandstone and Siltstone: Very dense or hard; mostly yellow (2.5Y 8/6); moist; apparently thinly bedded; siltstone beds with trace of clay; fine to medium-grained sandstone.	100.3	11.5			
15											

Continued on next sheet.



FIELD LOG OF BORING B - 8

Sheet 2 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15	45	RING 55/6"			ML	Clayey Siltstone: Hard; gray (N5); moist; trace of fine-grained sand; non-plastic; massively bedded.	112.7	12.4		
20	40	RING 62/6"			ML, SM ML	Sandy Siltstone: Hard; gray (N5); moist; sand component fine to medium grained; apparently massively bedded; non-plastic and mostly lacks clay. Increasingly sandy with depth. Sample @ 15 ft. classified as clayey siltstone with sand.	102.9	9.5		
25	35	RING 54/3"			ML	← Very sandy siltstone, trace of clay.	110.4	12.0		
30	30	RING 62/6"			SM	Silty Sandstone: Very dense; dark gray (N4), with some small dusky red mottles; moist; fine to coarse grained. Inferred upper contact from harder drilling performance.				
35					ML, CL	Sandy Siltstone and Silty Claystone: Hard; dark gray (N4); moist; typically 5-10% fine to medium-grained sand; spotted with reddish Fe oxides along discontinuities. Mostly crumbly, friable, non-plastic, and often with granulated appearance.	102.3	9.2		

Continued on next sheet.

FIG. A-24



FIELD LOG OF BORING B - 8

Sheet 3 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35	25	RING 50/5"		ML, CL		Sandy Siltstone and Silty Claystone: Hard; dark gray (N4), frequently spotted with reddish Fe oxides along discontinuities; moist; trace of mostly fine-grained sand; non-plastic, granulated appearance.	104.1	15.4		
40	20	RING 80/9"		CL		Silty claystone, color very dark gray (5Y 3/1), crumbly texture.	102.3	16.2		
45	15	RING 50/6"		CL		Silty claystone.	104.7	16.9		
50	10	RING 55/6"		CL		Silty Claystone: Hard; gray (5Y 5/1); moist; non-plastic. Near 50-ft. depth, contains some very thin (~1") layers of silty sandstone. Not mottled.	107.1	11.0		
55										

Continued on next sheet.

FIG. A-25



FIELD LOG OF BORING B - 8

Sheet 4 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
55	5	RING 85/7"			CL	Silty Claystone: Hard; gray (5Y 5/1); moist; non-plastic. Sample @ 55 ft. intensely fractured, with marble-size granules bounded by random slicks.	114.6	10.2		
60	0	RING 62/6"				Trace of reddish FeO mottling; few traces of carbonized organic matter.	95.8	13.8		

*Bottom of boring at 61.0 feet.
Perched groundwater encountered in zone from approximately 4.0 to 5.5 feet (base of Bay Point Fm.).
Boring backfilled with soil cuttings.*

FIG. A-26



FIELD LOG OF BORING B - 9P

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/29/98**

Drilled By: **California-Pacific**

Rig Make/Model: **Mobile B-53**

Drilling Method: **Hollow-stem Auger**

Hole Diameter: **8 In.**

Logged By: **M. Doerschlag**

Total Depth: **45.5 Ft.**

Hammer Type: **Wireline downhole**

Hammer Weight/Drop: **140 Lb./±30 In.**

Surface Elevation: **59.3 Ft.**

Comments: Groundwater seepage and dense arundo cane at nearby bluff.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
0										
55		RING	N=45		SP	Sand: Dense; mostly yellowish red (5YR 5/8); moist becoming very moist at 1-2 ft.; fine to medium grained; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]	109.5	10.0		
5						Becomes wet.				SHEAR
50		RING	N=35		SP-SC	Becomes medium to coarse grained; some highly weathered black volcanic clasts; slightly increased clay. Gravel lag deposit at base of formation; sharp contact.	113.4	14.3		
10										SHEAR
45		RING	70/12"		CL	Silty Claystone: Hard; pale olive (5Y 6/3); moist; very silty; non-plastic; apparently massively bedded. [Delmar Fm.]	107.3	19.7		
15						Silty claystone, with trace of fine to coarse-grained sand.				SHEAR

Continued on next sheet.

FIG. A-27



FIELD LOG OF BORING B - 9P

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15					CL	Silty Claystone: Hard; pale olive (5Y 6/3); moist; very silty; non-plastic. Trace of fine to coarse-grained sand.				
40		RING 73/12"			ML, CL	Clayey Siltstone and Silty Claystone: Hard; pale yellow (5Y 7/4) and olive (5Y 6/3), with yellow (5Y 7/8) mottles and laminae; moist; non-plastic.	115.2	11.9		SHEAR
20					ML	Clayey siltstone, with 1" wide, vertical clay-filled fracture (?) in sample. Abruptly becomes dark gray (N5 to 5Y 5/1).	117.4	10.4		
25		RING 75/12"			ML					
30		RING 50/6"			SM	Silty Sandstone: Very dense; dark gray (N4); moist; fine to medium grained, with trace of clay; uncemented.	114.5	7.6		SHEAR
35					ML	Clayey Siltstone: Hard; dark gray (10YR 4/1); moist; non-plastic; texture of loosely bound granules. Hard drilling.	108.0	12.9		SHEAR
35		RING N=45								

Continued on next sheet.

FIG. A-28



FIELD LOG OF BORING B - 10

Sheet 1 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: 4/29/98	Logged By: M. Doerschlag
Drilled By: California-Pacific	Total Depth: 56.0 Ft.
Rig Make/Model: Mobile B-53	Hammer Type: Wireline downhole
Drilling Method: Hollow-stem Auger	Hammer Weight/Drop: 140 Lb./±30 In.
Hole Diameter: 8 In.	Surface Elevation: 62.0 Ft.

Comments: Groundwater seepage from nearby bluff exposures.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
0										
60					SP-SC	Clayey Sand with Gravel: Medium dense; brown (7.5YR 4/4); moist; fine to medium grained, with gravel and cobble-size rocks to ~4" diameter. [Fill]	106.5	6.6		
						Approximate contact.				
5					SP	Sand: Dense; yellowish red (5YR 5/8); moist becoming very moist near 8 ft.; fine to medium grained; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
55						Sharp contact.				
10					SP	Sandstone: Very dense; yellow (5Y 7/8); very moist; fine to medium grained; uncemented; apparently massively bedded. [Delmar Fm.]	104.9	14.4		SHEAR
50										
15					ML, CL	Clayey Siltstone and Silty Claystone: Hard; olive brown (2.5Y 4/4); moist; generally trace of fine-grained sand.				

Continued on next sheet.



FIELD LOG OF BORING B - 10

Sheet 2 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15										
45					ML, CL	Clayey Siltstone and Silty Claystone: Hard; pale olive (5Y 6/3); moist; non-plastic. Trace of fine-grained sand. — Cuttings dusky red (2.5YR 3/2) from about 17-18 ft.				
20		RING 73/6"			SP-SM	Silty Sandstone: Very dense; dark reddish brown (5YR 2.5/2); wet; fine-grained. Thinly bedded in bluff exposures.	105.8	19.2		
40					ML	Siltstone and Silty Sandstone: Hard or very dense; dark gray (N4); moist; fine to medium grained sand; siltstones commonly with trace of clay; uncemented.				
25					SM	— Fine-grained, very silty sandstone.	107.6	11.9		
30		RING 60/6"								
35										

Continued on next sheet.

FIG. A-31



FIELD LOG OF BORING B - 10

Sheet 3 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35					ML	Clayey Siltstone: Hard; mostly gray (5Y 5/1), occasionally mottled with dusky red Fe-oxide staining; moist; non-plastic.				
25					ML					
40		RING 40/6"			ML	Sandy siltstone, gray (5Y 5/1), slight granulated texture, some Fe-oxide mottling.	111.0	12.9		
20										
45										
15										
50		RING 65/6"			ML	Clayey siltstone with trace of sand, slight granulated texture, non-plastic.	103.1	15.5		
10										
55										

Continued on next sheet.

FIG. A-32



FIELD LOG OF BORING B - 10

Sheet 4 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
55		RING 52/6"		ML		Sandy Siltstone: Hard; gray (N5); moist; fine-grained sand.	111.8	15.5		SHEAR

*Bottom of boring at 56.0 feet.
Perched groundwater encountered in sandstone member from approximately 19.0 to 25.0 feet.
Boring backfilled with soil cuttings.*



FIELD LOG OF BORING B - 11P

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/29/98**

Drilled By: **California-Pacific**

Rig Make/Model: **Mobile B-53**

Drilling Method: **Hollow-stem Auger**

Hole Diameter: **8 In.**

Logged By: **M. Doerschlag**

Total Depth: **51.0 Ft.**

Hammer Type: **Wireline downhole**

Hammer Weight/Drop: **140 Lb./±30 In.**

Surface Elevation: **60.2 Ft.**

Comments: **Surface water in adjacent drainage.**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE TYPE, N (Blows/ft.)								
0	60									
			RING N=34		SP	Sand: Mostly dense; mostly strong brown (7.5YR 4/6); moist; fine to medium grained, with trace of gravel; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
5	55				SP		117.1	7.4		
			RING N=40		SP	← Color 10YR 5/6; includes some coarse-grained sand.				
10	50				SP	Sharp contact.	109.3	4.4		
			RING 67/12"		SP	Sandstone: Very dense; yellow (5Y 7/8); very moist becoming wet; fine to medium grained, with trace of silt; uncemented; massively bedded. [Delmar Fm.]				
15							106.8	10.0		

Continued on next sheet.



FIELD LOG OF BORING B - 11P

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (FL)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15	45				SP	Sandstone: Very dense; yellow (5Y 7/8); wet; fine to medium grained, with trace of silt; uncemented; massively bedded.				
		RING 72/6"			SP	Sandstone, little or no fines.	103.3	21.4		
20	40				ML	Slightly cemented from 20-21 ft.; harder drilling.				
		RING 55/6"			ML	Sandy Siltstone: Hard; very dark gray (N3); moist; fine to medium-grained sand; massive and non-plastic.	110.9	15.6		
25	35				ML	Siltstone, as above.	113.1	14.0		
		RING 50/6"								
30	30									
35										

Continued on next sheet.

FIG. A-35



FIELD LOG OF BORING B - 11P

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**
 Location: **DEL MAR, CALIFORNIA** Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35	25	RING 53/6"		ML, SM SP-SM		<p>Sandy Siltstone: As before; some very silty sandstone.</p> <p>Silty Sandstone: Very dense; gray (N5); moist; fine to coarse grained; apparently massively bedded. Slightly cemented from 36 to 37 ft., and hard drilling. Becomes siltier with depth.</p>	103.5	13.5		
40	20			SM		<p>Becomes easier drilling; interpreted silty sandstone.</p> <p>Approximate contact.</p>				
45	15	RING 56/6"		ML		<p>Clayey Siltstone: Hard; olive gray (5Y 4/2); moist; trace of sand; non-plastic, with some granulated textures.</p> <p>← Clayey siltstone, as above.</p>	107.4	15.8		
50	10	RING 58/6"		ML, SM		<p>← Mixed clayey siltstone and thin silty sandstone, with common dusky red mottles</p>	109.0	10.9		

*Bottom of boring at 51.0 feet.
 Perched groundwater encountered in zone from approximately 14.0 to 21.0 feet, measured depth of 15.1 feet after well installation. No groundwater encountered below 21.0 feet.
 Piezometer installed as depicted in well completion column..*

FIG. A-36



FIELD LOG OF BORING B - 12

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/30/98**
 Drilled By: **California-Pacific**
 Rig Make/Model: **Mobile B-53**
 Drilling Method: **Hollow-stem Auger**
 Hole Diameter: **8 In.**

Logged By: **M. Doerschlag**
 Total Depth: **50.0 Ft.**
 Hammer Type: **Wireline downhole**
 Hammer Weight/Drop: **140 Lb./±30 In.**
 Surface Elevation: **60.5 Ft.**

Comments: Boring located in rail cut.

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)								
0	60										
5	55										
10	50	RING 59/12"				SP	Sand: Dense; yellowish red (5YR 4/6); moist becoming very moist near 5 ft.; fine to medium grained; trace of clay and Fe-oxide binding agents. [Bay Point Fm.]				
							Lightens to strong brown (7.5YR 5/6).	98.5	10.7		
							Becomes wet.				
							Sharp contact.				
15						CL	Silty Claystone: Hard; light yellowish brown (2.5Y 6/4); moist; trace of fine to medium-grained sand; slightly plastic. [Delmar Fm.]				

Continued on next sheet.



FIELD LOG OF BORING B - 12

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
15	45					CL	Silty Claystone: Hard; light yellowish brown (2.5Y 6/4); moist; trace of fine to medium-grained sand; slightly plastic.				
						SM	Silty Sandstone: Very dense; dark gray (5YR 4/1); moist; fine to medium grained and very silty. Apparently massively bedded.				
20	40						← Silty sandstone, as above.	104.7	12.3		
						ML, CL	Clayey Siltstone and Silty Claystone: Hard; dark gray (N4); moist; occasional trace of fine to medium-grained sand; non-plastic. Increasing sand content with depth.				
25	35										
30	30					SM	← Local very fine-grained, very silty sandstone, light gray (5YR 6/1).	113.5	8.8		
							↳ Very clayey from about 33 to 35 feet.				
35											

Continued on next sheet.

FIG. A-38



FIELD LOG OF BORING B - 12

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35	25				SM, SP-SM	Silty Sandstone: Very dense; gray (N5); moist; fine to medium grained. Inferred from cuttings.				
40	20				ML	← Sandy siltstone, gray (N5), trace of clay, massive texture. Thin, local layer.	95.3	9.2		
45	15				CL	Silty Claystone: Hard; dark gray (N4) and dusky red (10R 3/3); moist; non-plastic and friable, with pronounced granulated texture. Hard drilling.				
50					ML	← Grades to clayey siltstone, olive gray, slight granulated texture.	102.3	14.4		

Bottom of boring at 50.0 feet.
 Slight groundwater seepage inferred to originate from approximately 13.0 to 14.0 feet (base of Bay Point Fm.).
 Boring backfilled with soil cuttings.

FIG. A-39



FIELD LOG OF BORING B - 13

Sheet 2 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15		RING 55/6"			SP	Sandstone: Very dense; very pale brown (10YR 7/4); moist to very moist; fine to coarse grained; massively bedded.	118.4	11.9		SHEAR
40					SP	← Sandstone, as above.	111.3	11.8		
20		RING 57/6"			ML	Clayey Silt: Hard; very pale brown (10YR 7/4); moist; non-plastic.				
35					SP	Sandstone: Very dense; very pale brown (10YR 7/4); moist; fine to coarse grained; uncemented.				
25		RING 65/6"			SP	← Sandstone, as above.	107.8	19.2		SHEAR
30					CL	Silty Claystone: Hard; dark gray (10YR 4/1); moist; trace of fine-grained sand; non-plastic.				
30		RING 70/6"			CL	← Silty claystone, as above.	111.9	16.9		SHEAR
25										
35										

Continued on next sheet.

FIG. A-41



FIELD LOG OF BORING B - 13

Sheet 3 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
35		RING 60/6"			ML, CL	Clayey Siltstone and Silty Claystone: Hard; gray (10YR 6/1) at 35 feet becoming mostly dark gray (N4) at greater depths; moist; non-plastic. Variably granulated textures, ranging from massive to intensely fractured.	116.4	12.8		SHEAR
20										
40		RING 59/9"			ML	← Clayey siltstone, dark gray (N4) with some dusky red Fe oxide mottling, trace of sand, granulated texture.	106.2	15.7		
15										
45		RING 50/6"			ML	← Clayey siltstone, less clay than above, and only slightly granulated texture.	111.8	17.2		SHEAR
10										
50		RING 65/6"			ML	← Very clayey siltstone, abundant dusky red mottles, intensely fractured.	107.7	19.9		
5										
55										

Continued on next sheet.

FIG. A-42



FIELD LOG OF BORING B - 13

Sheet 4 of 4

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
55		RING 56/6"			ML	Clayey Siltstone and Silty Claystone: As before at 50 ft.	112.6	18.1		SHEAR

*Bottom of boring at 56.0 feet.
Perched groundwater encountered in sandstone unit from approximately 23.0 to 28.0 feet; no groundwater encountered below 28.0 feet.
Boring backfilled with soil cuttings.*



FIELD LOG OF BORING B - 14P

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled:	4/30/98	Logged By:	M. Doerschlag
Drilled By:	California-Pacific	Total Depth:	51.0 Ft.
Rig Make/Model:	Mobile B-53	Hammer Type:	Wireline downhole
Drilling Method:	Hollow-stem Auger	Hammer Weight/Drop:	140 Lb./±30 In.
Hole Diameter:	8 In.	Surface Elevation:	52.8 Ft.

Comments:

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
0											
5			RING 57/12"			SP-SC	Clayey Sand: Dense; red (2.5YR 3/6); moist; fine to medium grained, with rare gravel clasts to 1/2"; trace of Fe-oxide binding agent. [Bay Point Fm.]				
45						SP-SC	← Color locally pale brown (10YR 6/3).	113.1	9.9		
10			RING 55/6"			SP	Sharp contact. Sandstone: Very dense; yellow (10YR 7/6); moist to very moist; fine to coarse grained, with trace of silt; uncemented; massively bedded. [Delmar Fm.]	115.3	15.5		
40											
15											

Continued on next sheet.

FIG. A-44



FIELD LOG OF BORING B - 14P

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15		RING 56/6"			SP	Sandstone: Very dense; color becoming pale brown (10YR 8/3); becomes wet at 15 feet; mostly medium to coarse grained, with trace of silt; uncemented; massively bedded.	108.3	17.5		
35					SM	Grades silty, fine-grained.				
20		RING 50/6"			ML	Clayey Siltstone: Hard; dark gray (N4); moist; trace of fine to medium-grained sand; massive and non-plastic.	112.4	15.4		SHEAR
30					ML	← Clayey siltstone, as above.	99.3	17.6		
25		RING 43/6"			ML					
25					ML	← Siltstone, little to no clay, massively bedded.	111.8	15.5		SHEAR
30		RING 50/6"			ML					
35										

Continued on next sheet.

FIG. A-45



FIELD LOG OF BORING B - 14P

Sheet 3 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE TYPE, N (Blows/ft.)								
35			RING 60/6"		ML, SM	Siltstone and Silty Sandstone: Hard or very dense; dark to very dark gray (N3-N4); slightly moist to moist; sandy layers mostly fine to medium grained. Classified silty sandstone at 35 ft. depth.	99.3	11.6		SHEAR
15										
40			RING 55/6"		ML	Sandy siltstone, little to no clay, massive.	106.2	14.8		
10										
45			RING 72/6"		SM	Silty Sandstone: Very dense; dark gray (N4); moist; fine to medium grained; apparently massively bedded. Exposed at toe of bluffs.	102.5	10.5		SHEAR
5										
50			RING 42/6"		ML	Clayey Siltstone: Hard; dark gray (N5) with common dusky red mottles; moist; local trace of sand; non-plastic, locally with some granulated textures.				
						← Clayey siltstone, as above.	107.3	14.9		SHEAR

Bottom of boring at 51.0 feet.

Perched groundwater encountered in zone from approximately 15.0 to 17.0 feet, at base of sandstone member.

No groundwater encountered below 17.0 feet.

Piezometer installed as depicted in well completion column..



FIELD LOG OF BORING B - 15

Sheet 1 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: **4/30/98**
 Drilled By: **California-Pacific**
 Rig Make/Model: **Mobile B-53**
 Drilling Method: **Hollow-stem Auger**
 Hole Diameter: **8 In.**

Logged By: **M. Doerschlag**
 Total Depth: **43.0 Ft.**
 Hammer Type: **Wireline downhole**
 Hammer Weight/Drop: **140 Lb./±30 In.**
 Surface Elevation: **50.3 Ft.**

Comments:

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
0	50					SP-SC	Clayey Sand with Gravel: Dense; dark red (2.5YR 3/6); moist; fine to medium grained. [Fill]				
5	45					SP-SC	Clayey Sand: Dense; dark red (2.5YR 3/6); moist becoming very moist at about 4 ft.; fine to medium grained; very weakly cemented with clay and Fe oxides. [Bay Point Fm.] ↓ Becomes wet.				
10	40					CL	Sharp contact. Silty Claystone: Hard; yellow (10YR 8/6); moist to very moist; non-plastic. [Delmar Fm.]				
						ML	Sandy Siltstone: Hard; yellow (10YR 7/6); moist; fine-grained sand; non-plastic.	108.8	16.0		
15						SM	Silty Sandstone: Very dense; yellow (10YR 7/6); moist; fine to medium grained. Interval deduced from bluff face exposure.				

RING
55/12"

Continued on next sheet.

FIG. A-47



FIELD LOG OF BORING B - 15

Sheet 2 of 3

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
15	35					SM	Silty Sandstone: Very dense; yellow (10YR 7/6); moist; fine to medium grained. Interval deduced from bluff face exposure.				
			RING			ML	Clayey Siltstone: Hard; mostly dark gray (N4) with frequent dusky red mottles; moist; small amounts of fine to medium-grained sand; variably massive to intensely fractured or granulated.	104.6	17.7		
			74/12"								
20	30					ML	← Clayey siltstone, as above, granulated texture.	99.7	16.4		
			RING			ML	← Clayey siltstone with sand, olive gray (5Y 5/2) with red (10R 3/6) mottles.	97.6	18.8		
			74/12"								
25	25					ML	Siltstone: Hard; dark gray (5Y 4/1); moist; non-plastic; trace of clay and fine-grained sand. Mostly massive to lightly granular texture.				
			RING								
			N=27								
30	20										
35											

Continued on next sheet.

FIG. A-48



FIELD LOG OF BORING B - 16

Sheet 1 of 2

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

Dates(s) Drilled: 4/30/98 Drilled By: California-Pacific Rig Make/Model: Mobile B-53 Drilling Method: Hollow-stem Auger Hole Diameter: 8 In.	Logged By: M. Doerschlag Total Depth: 29.5 Ft. Hammer Type: Wireline downhole Hammer Weight/Drop: 140 Lb./±30 In. Surface Elevation: 46.5 Ft.
---	--

Comments: Located at north end of project alignment.

DEPTH (FL.)	ELEVATION (MSL)	SAMPLE INTERVALS			LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK	DRIVE	TYPE, N (Blows/ft.)							
0											
45					SP-SC	Clayey Sand with Gravel: Dense; dark red (2.5YR 3/6); moist; fine to coarse grained. [Fill]					
5					SP-SC	Clayey Sand: Dense; yellowish red (5YR 4/6); moist; fine to medium grained; very weakly cemented with clay and Fe oxides. [Bay Point Fm.]					
40					SP	Sandstone: Very dense; yellow (5Y 8/6); moist; fine to coarse grained; local trace of silt; uncemented; massively bedded. [Delmar Fm.]					
35						Sharp contact.					
10						Becomes yellow (5Y 7/7).					
15					CL, ML	Silty Claystone and Clayey Siltstone: Hard; yellow (10YR 8/6) to pale brown (10YR 7/3); moist; trace of fine to medium-grained sand; slightly plastic from 13-16 feet.					

Continued on next sheet.



FIELD LOG OF BORING B - 16

Sheet 2 of 2

Project: **NORTH COUNTY TRANSIT DISTRICT**

Location: **DEL MAR, CALIFORNIA**

Project No. **3650-SF**

DEPTH (Ft.)	ELEVATION (MSL)	SAMPLE INTERVALS		LITHOLOGY	USCS	GEOTECHNICAL DESCRIPTION	DRY DENSITY (Pcf)	MOISTURE CONTENT (%)	WELL COMPLETION	OTHER TESTS
		BULK DRIVE	TYPE, N (Blows/ft.)							
15					ML	Clayey Siltstone: Hard; yellow (10YR 8/6) to pale brown (10YR 7/3); moist; trace of fine to medium-grained sand; non-plastic below about 16 feet.				
30					ML	← Abruptly becomes gray (5Y 5/1).				
20					ML	← Clayey siltstone, non-plastic, slight granulated texture.	109.9	15.0		
25										
25										
20					ML	← Clayey siltstone, very pale brown (10YR 7/4) with dusky red mottles, massively bedded.	101.3	20.8		

RING
69/12"

RING
48/6"

*Bottom of boring at 29.5 feet.
No groundwater encountered.
Boring backfilled with soil cuttings.*

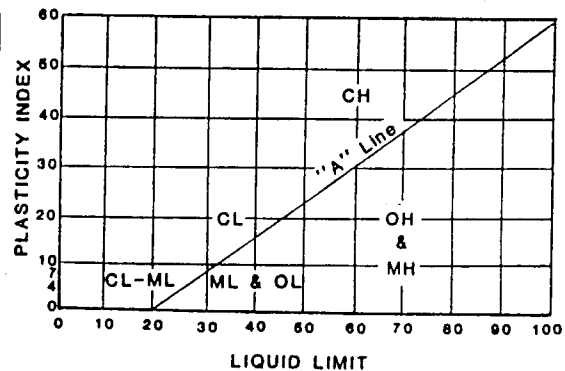
FIG. A-51

MAJOR DIVISIONS	SOIL CLASS.	TYPICAL NAMES
GRAVELS (More than 1/2 of coarse fraction > no. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures, little or no fines
	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
	SP	Poorly graded sands or gravelly sands, little or no fines
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
SILTS & CLAYS <u>LL < 50</u>	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 & CLAYS <u>LL > 50</u>	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils

CLASSIFICATION CHART
(Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
	coarse 3" to 3/4"	76.2 to 19.1
	fine 3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.074
	coarse No. 4 to No. 10	4.76 to 2.00
	medium No. 10 to No. 40	2.00 to 0.420
	fine No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

METHOD OF SOIL CLASSIFICATION

APPENDIX E

WAVE DATA

Appendix E Coastal Processes

The coastal processes that impact the bluffs include: tides, storms, climactic events, sea level rise, waves and wave runup. In this section of the report we provide general base data for the effects of coastal processes on the bluffs for future design and decision making. The following subsections on tides, storm surge, extreme water and waves, sea level rise and wave runup provides minimum coverage of coastal processes that impact the bluffs.

Tides and water levels:

The level of the ocean plays an important role in coastal processes and shoreline erosion. As the sea level rises, the shoreline moves inland and this enables the waves to erode the shoreline further back on the beach profile. The sea level is primarily influenced by the tides and secondarily by storms. The mean tide range is about 3.7 feet, with extreme water levels given in the following table.

Water Levels at Scripps Pier, La Jolla, California		
Occurrence	Feet from MLLW (feet)	Feet from NGVD (feet)
Highest Observed Water Level, Nov. 13, 1997	7.97	5.41
Mean High Water Level (MHWL)	4.62	2.06
Mean Sea Level (MSL)	2.75	0.19
National Geodetic Vertical Datum (NGVD)	2.56	0.00
Mean Low Water Level (MLW)	0.93	-1.63
Mean Lower Low Water Level (MLLW)	0.00	-2.56
Lowest Observed Water Level, Dec. 11, 1993	-2.60	-5.16

Source: USFWS, 2000

Sea levels also vary with El Nino and in 1982-83 the sea level was about 0.85 feet higher than normal for over a year.

Storm Surge:

Strong winds, high waves and low atmospheric pressure systems can elevate the sea level and these combined effects are termed the storm surge.

Storm Surge at Scripps Pier, La Jolla, California	
Return Period (years)	Storm Surge (feet)
5	2.0
10	2.1
25	2.2
50	2.3
100	2.4

Source: NOAA, 1980

Extreme water or storm surge still water levels:

When storm surge occurs at the same time as high tide, the combination results in a statistical extreme water elevation. This extreme water elevation is the storm surge still water level and is used to design coastal structures according to the return period of the design.

Extreme Still Water Level (SWL) at Scripps Pier La Jolla, California	
Return Period (years)	Extreme SWL (feet above MSL)
5	4.06
10	4.16
25	4.26
50	4.36
100	4.46

Source: NOAA, 1980

Sea Level Rise:

It has been reported that the sea level has risen 0.7 feet over the last 100 years according to Flick and Cayan, as reported in the Coast of California Storm and Tidal Waves Study Annual report 1983. The sea level is expected to rise about 0.2 feet over the next 25 years as a result of global warming. (USACE 1989, 1991)

Waves:

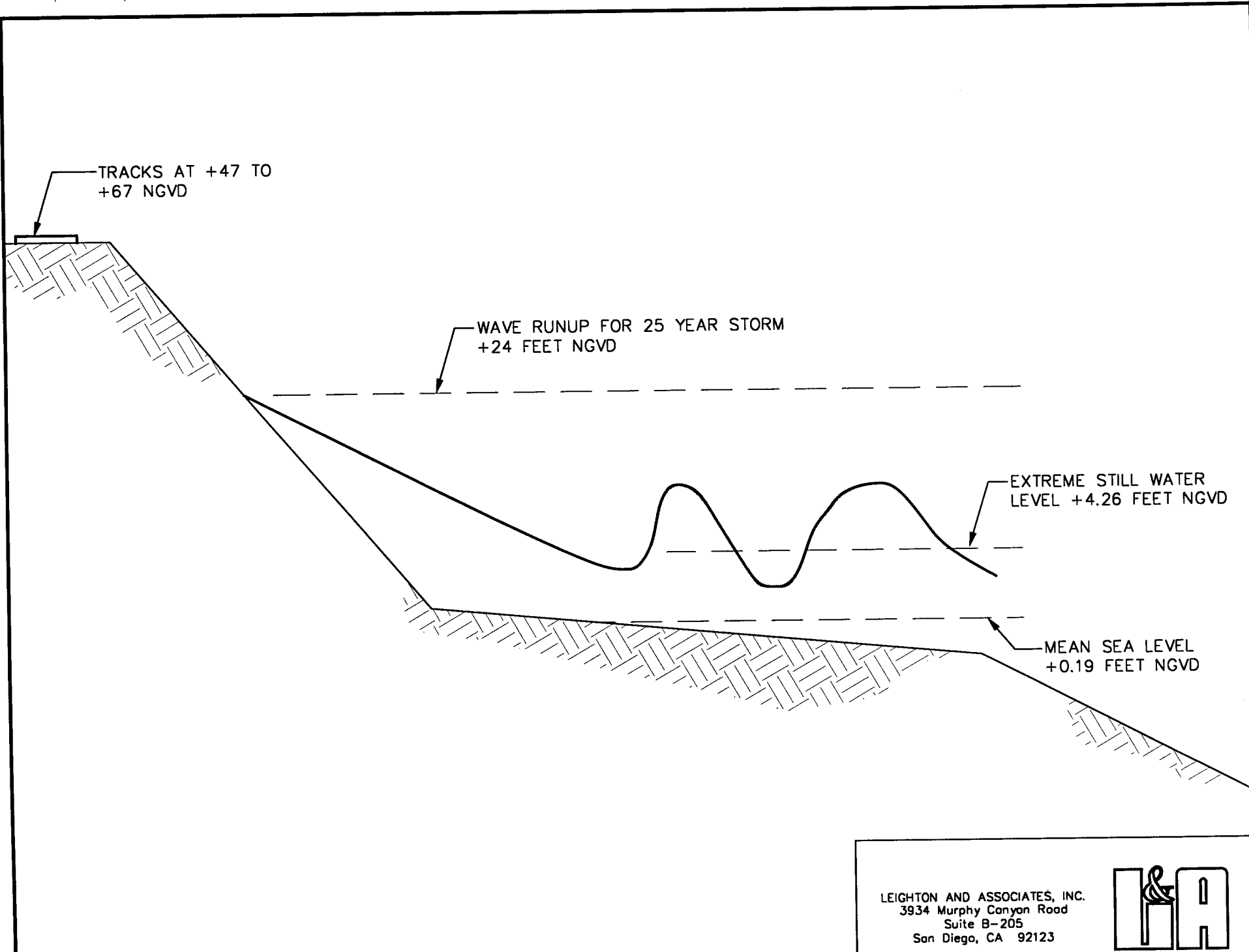
Significant waves now travel over this extreme water elevation and arrive at the coast line. The waves are pushed up by the sea bottom, break and then run up the beach and bluffs. The wave runup is calculated using the bottom profile and the significant wave height. The majority of shoreline erosion occurs during these infrequent storms as the large waves crash up the beach and into the bluffs, particularly at high tide.

Return Period (years)	Significant Wave Height (feet)
5	13.0
10	14.5
25	16.5
50	18.0
100	19.4

Source: USACE, 1991

Wave Runup:

The wave runup has been calculated using the USACE Shore Protection Manual 1984 using the following assumptions based on information from NCTD and Mr. Hany Elwany of Coastal Environments: A wave period of 16 seconds, a breaking wave height of 6 feet (this assumes that larger waves will break offshore with a lesser wave height at the bluff toe), and a still water level of +4.26 feet. Using these assumptions, the wave runup on the Del Mar Bluffs will be in the order of 14 to 24 feet above msl depending on the recurrence interval and the toe protection structure built. More detailed wave and sediment studies will be done as part of the final design stage.



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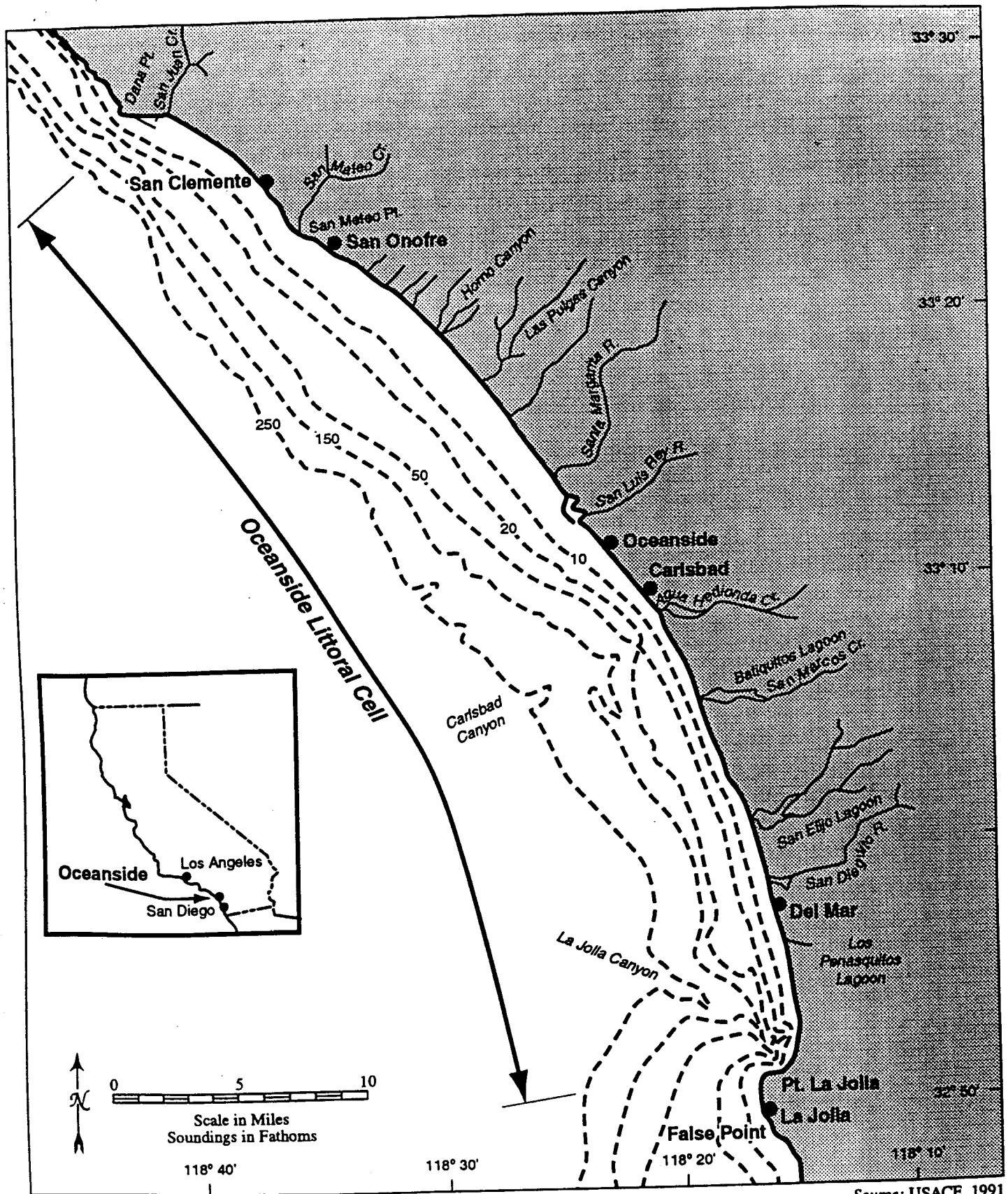


Figure 3.2-9. Oceanside Littoral Cell

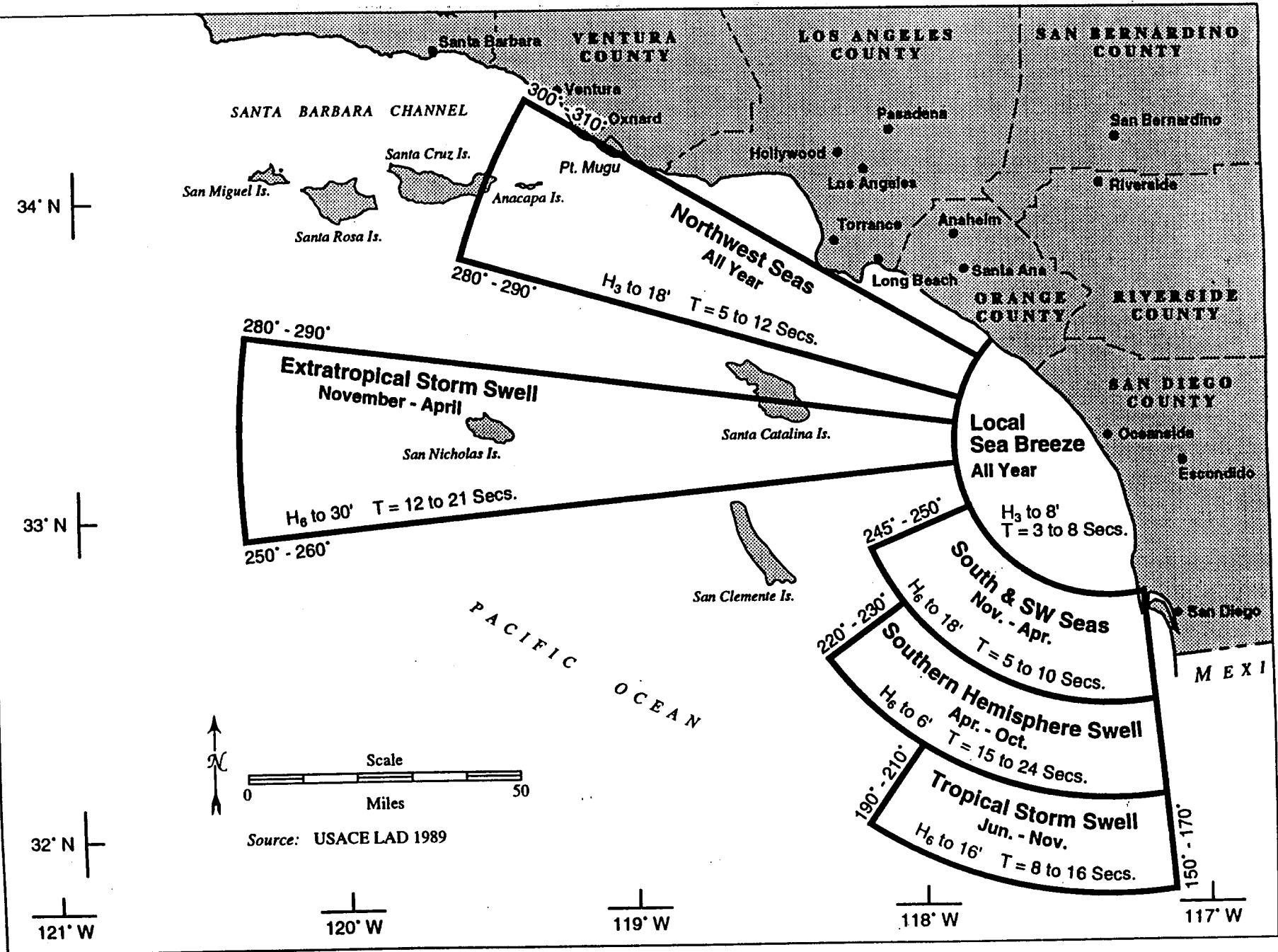


Figure 3.2-10. Wave Exposure for the San Diego Region

Historical Beach Profile Data in the Vicinity of Del Mar

FIGURE A-6: RANGE LINE LOCATION MAP

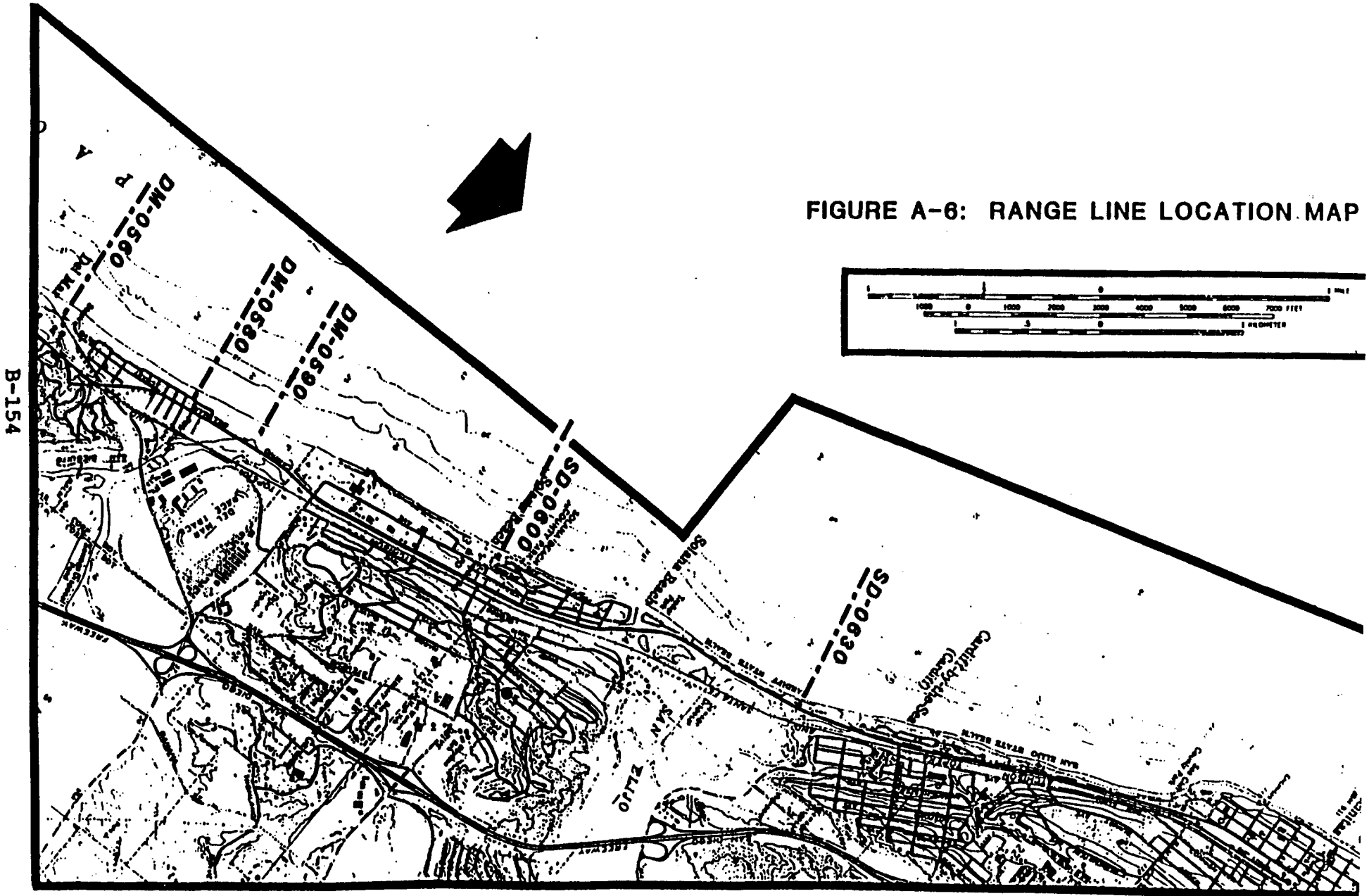
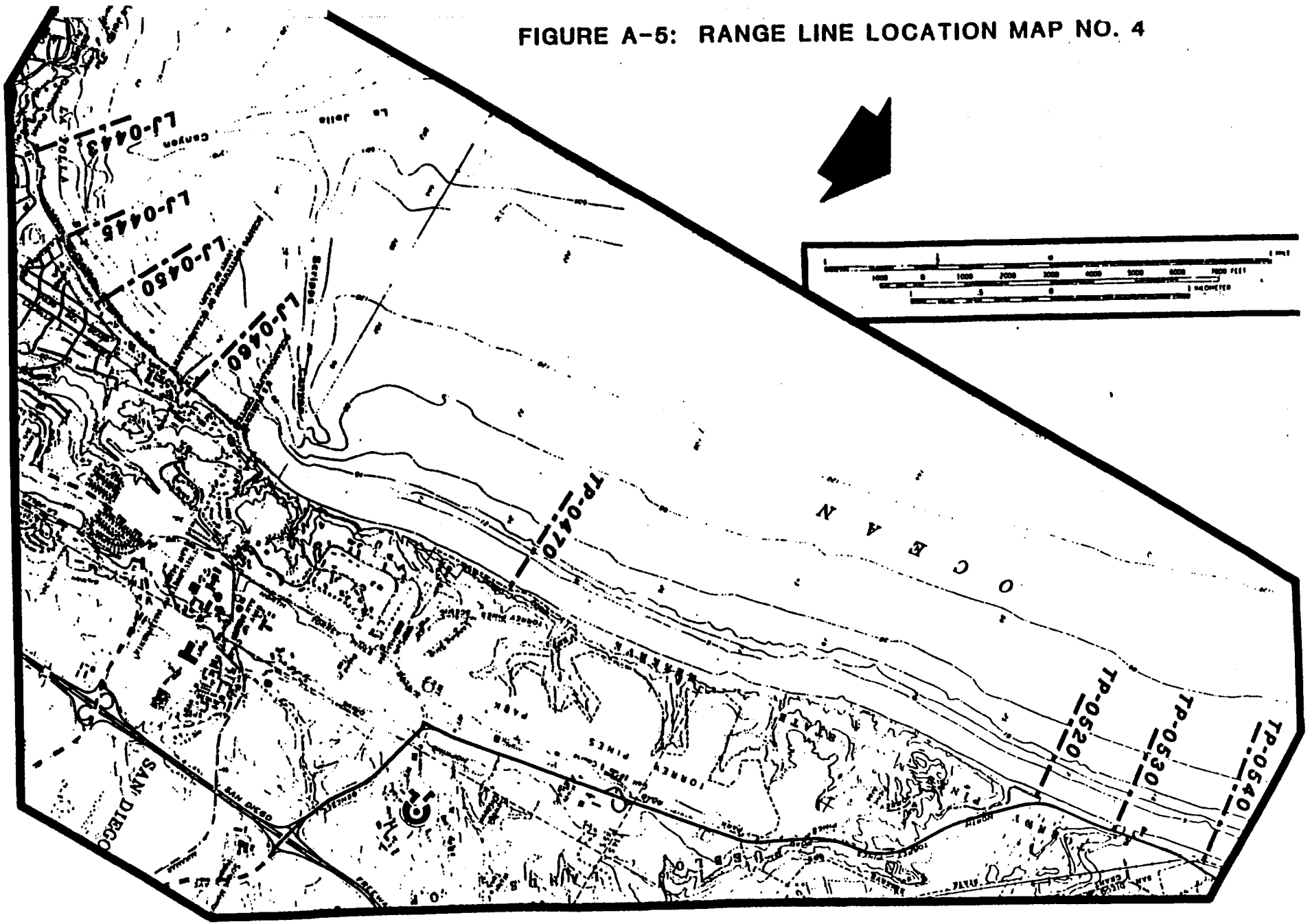
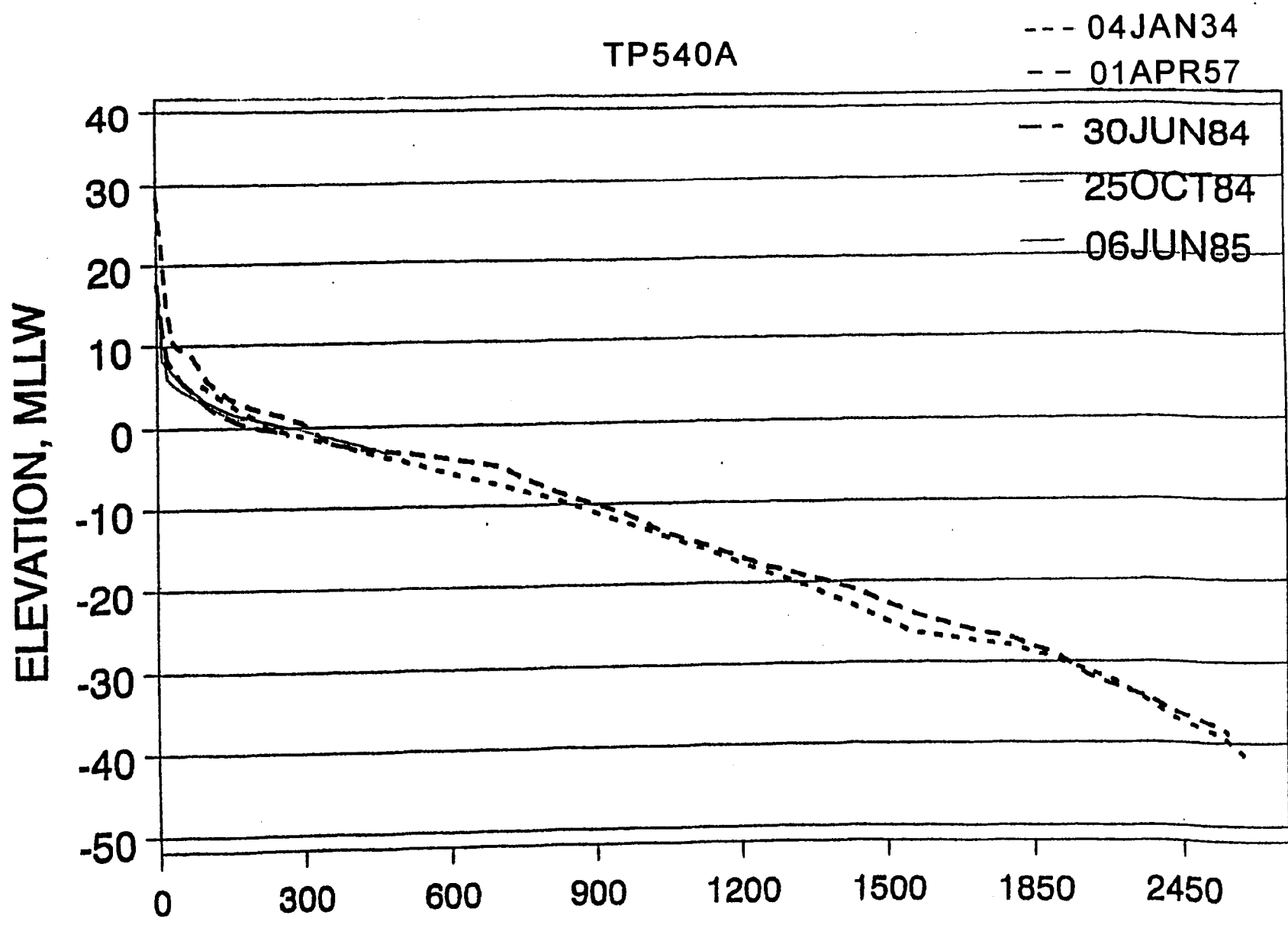


FIGURE A-5: RANGE LINE LOCATION MAP NO. 4

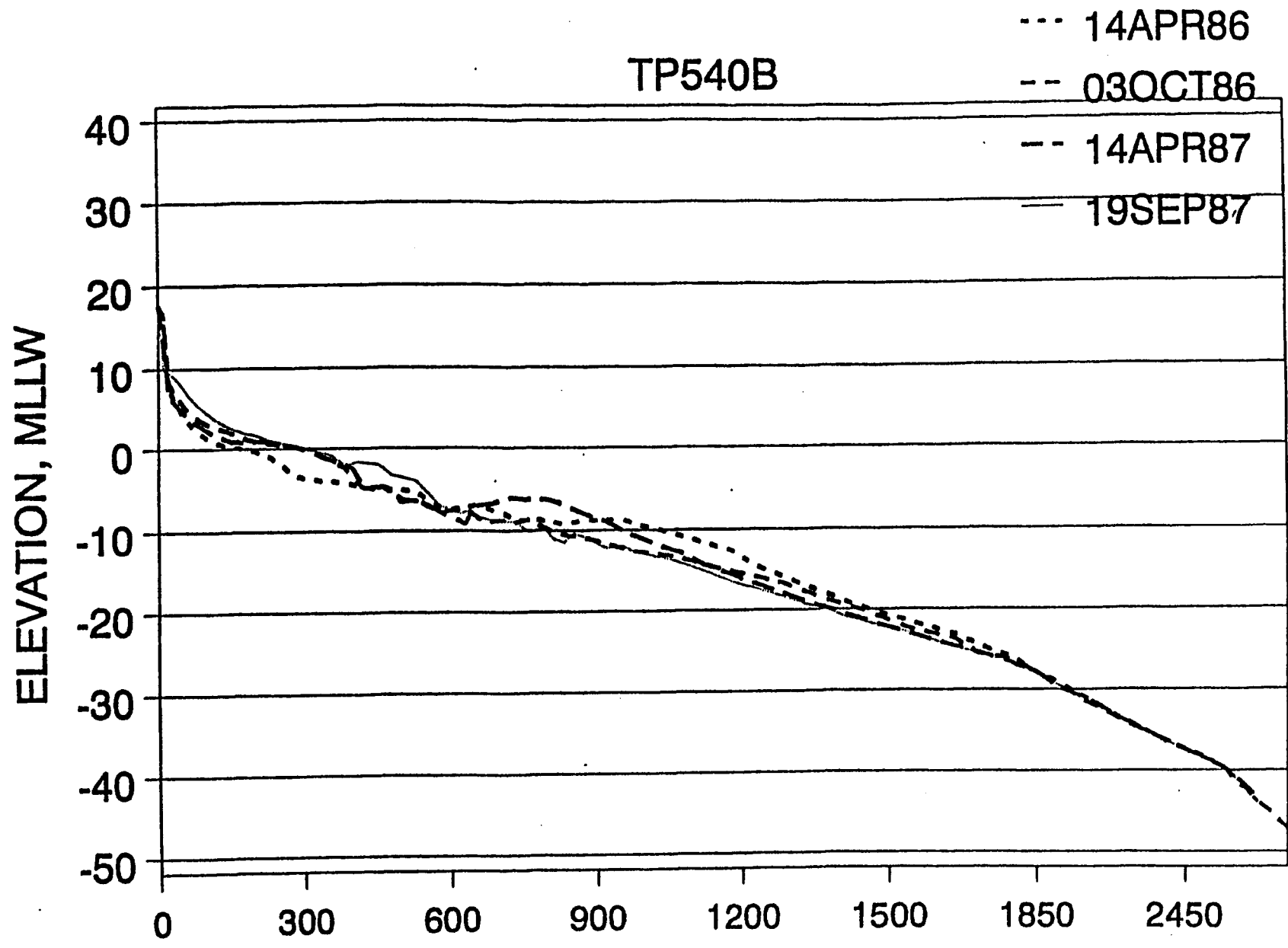


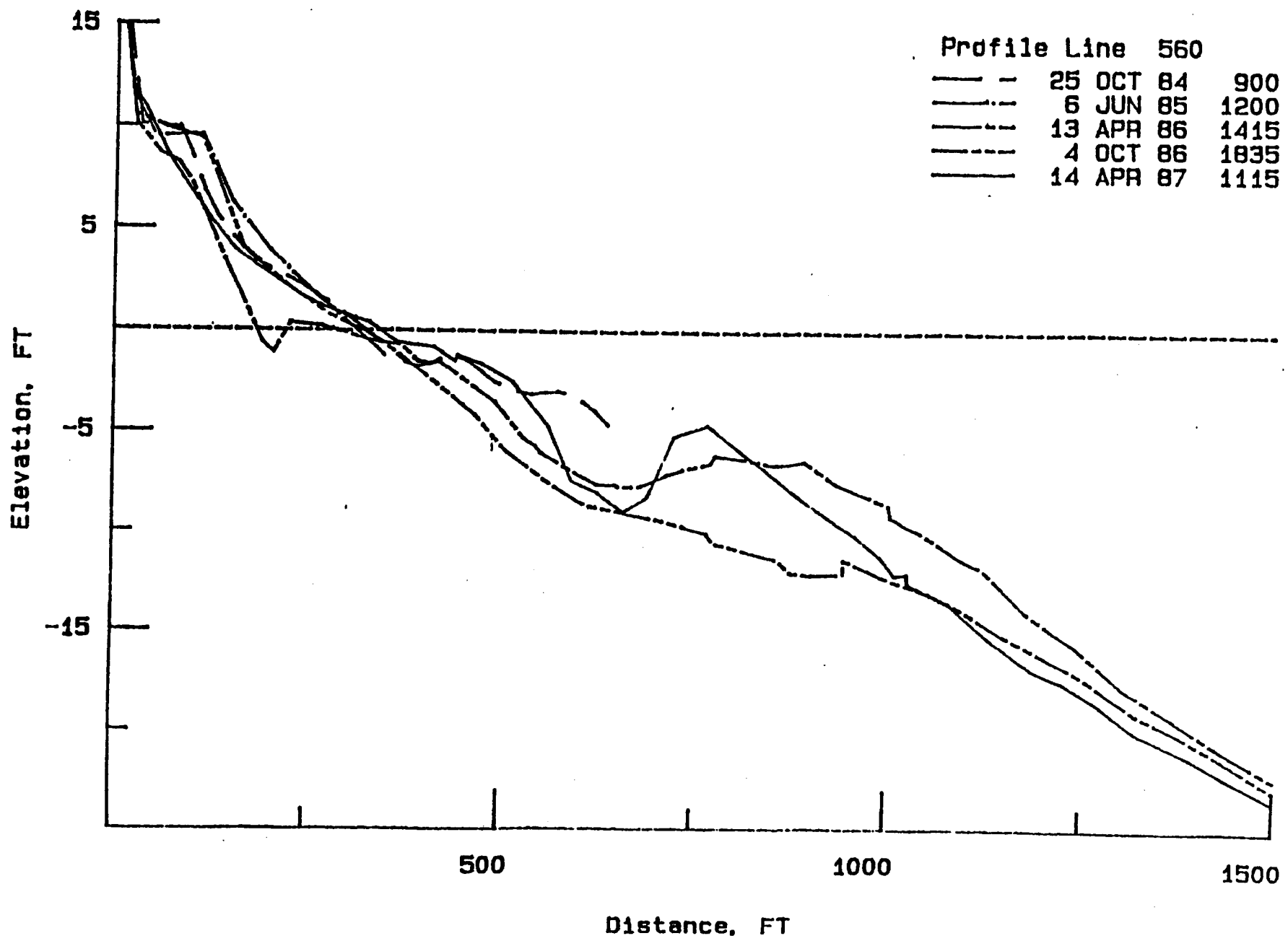
B-153

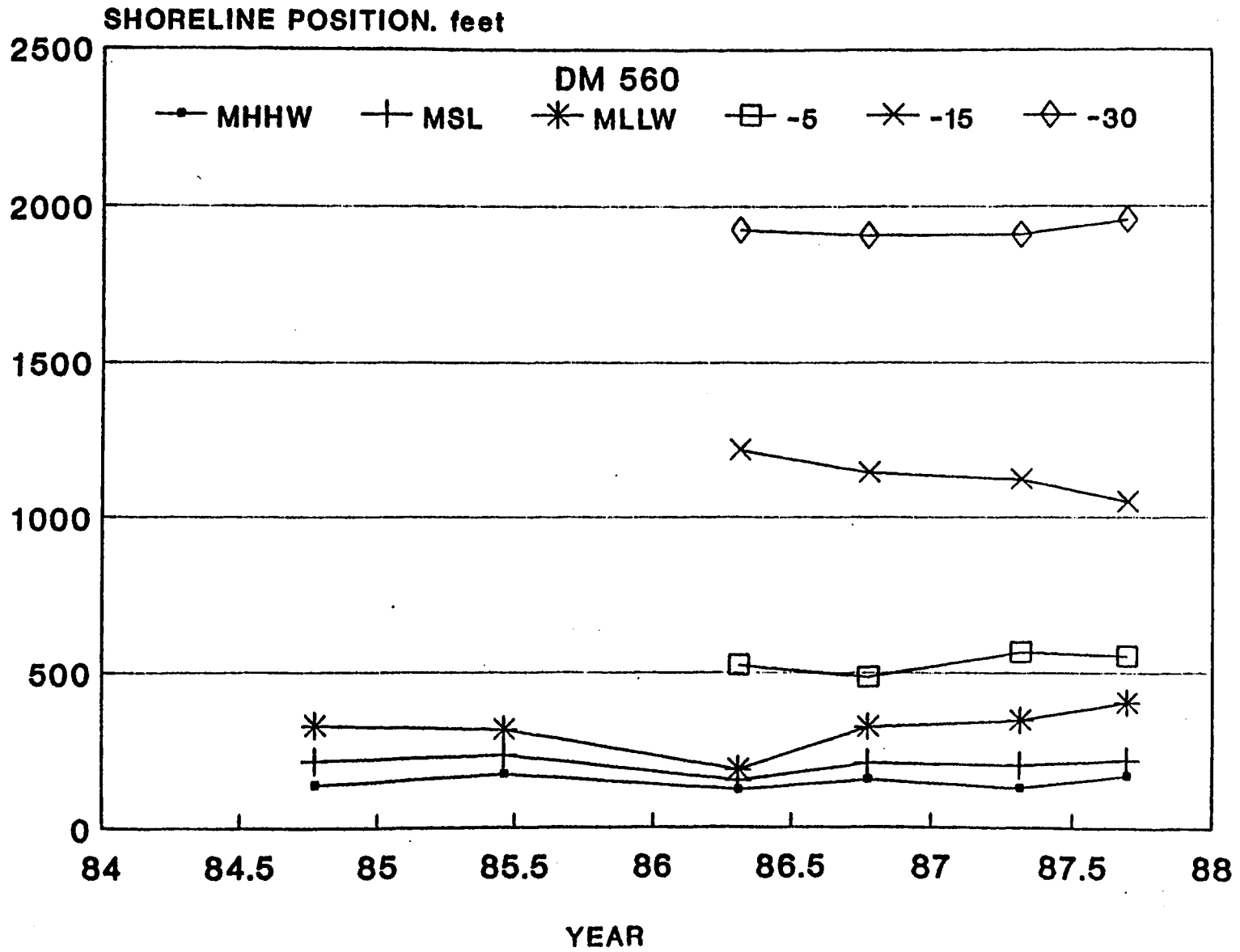
TP540A



TP540B







Storm Wave Data

**EXTREME WAVE EPISODES EXCEEDING 6 M.
1900 - 1984**

DATE	SIG.HT. (m)	MAX. PERIOD	DIRECTION
13 MAR 05	8.8	15	247
03 FEB 15	7.5	14	235
01 FEB 26	6.9	15	257
28 DEC 31	7.4	18	288
06 JAN 39	7.9	19	285
26 JAN 58	6.8	14	259
05 APR 58	7.7	18	289
09 FEB 60	8.1	19	295
17 FEB 80	6.1	18	249
28 JAN 81	7.0	17	262
01 DEC 82	6.4	14	295
18 DEC 82	6.4	20	288
25 JAN 83	6.1	17	278
27 JAN 83	7.3	22	279
10 FEB 83	6.7	25	281
01 MAR 83	8.2	20	258
03 DEC 83	7.0	17	285
25 FEB 84	6.4	17	300

Table B-1. Hindcast (1900-84) waves exceeding 6 m height near 35° N (Seymour et al, 1984).
From USACOE, 1986 (CCSTWS 86-1)

Scripps Institution of Oceanography
Recurrence Intervals

<u>Location</u>	<u>Mean H_s (feet)</u>	<u>Significant Wave Height (feet)</u>				
		<u>5 Yr</u>	<u>10 Yr</u>	<u>25 Yr</u>	<u>50 Yr</u>	<u>100 Yr</u>
Mission Bay Buoy	7.3	15.0	17.2	20.0	21.9	23.8
Begg Rock	11.9	22.6	25.1	28.6	31.0	33.1
Scripps Pier	4.9	9.3	10.5	12.1	13.2	14.3
Mission Bay Entrance	7.0	14.0	16.0	18.8	20.7	22.7
Del Mar	6.2	13.0	14.5	16.5	18.0	19.4
Oceanside Beach	5.1	9.3	10.3	11.7	12.4	13.6
San Clemente	5.1	11.0	12.3	14.3	15.8	17.0

Table B-2. Significant wave heights at Del Mar (shallow water), and other deep and shallow water stations, based on wave gauge data and hindcasting. . From USACOE, 1991 (CCSTWS 91)

APPENDIX F

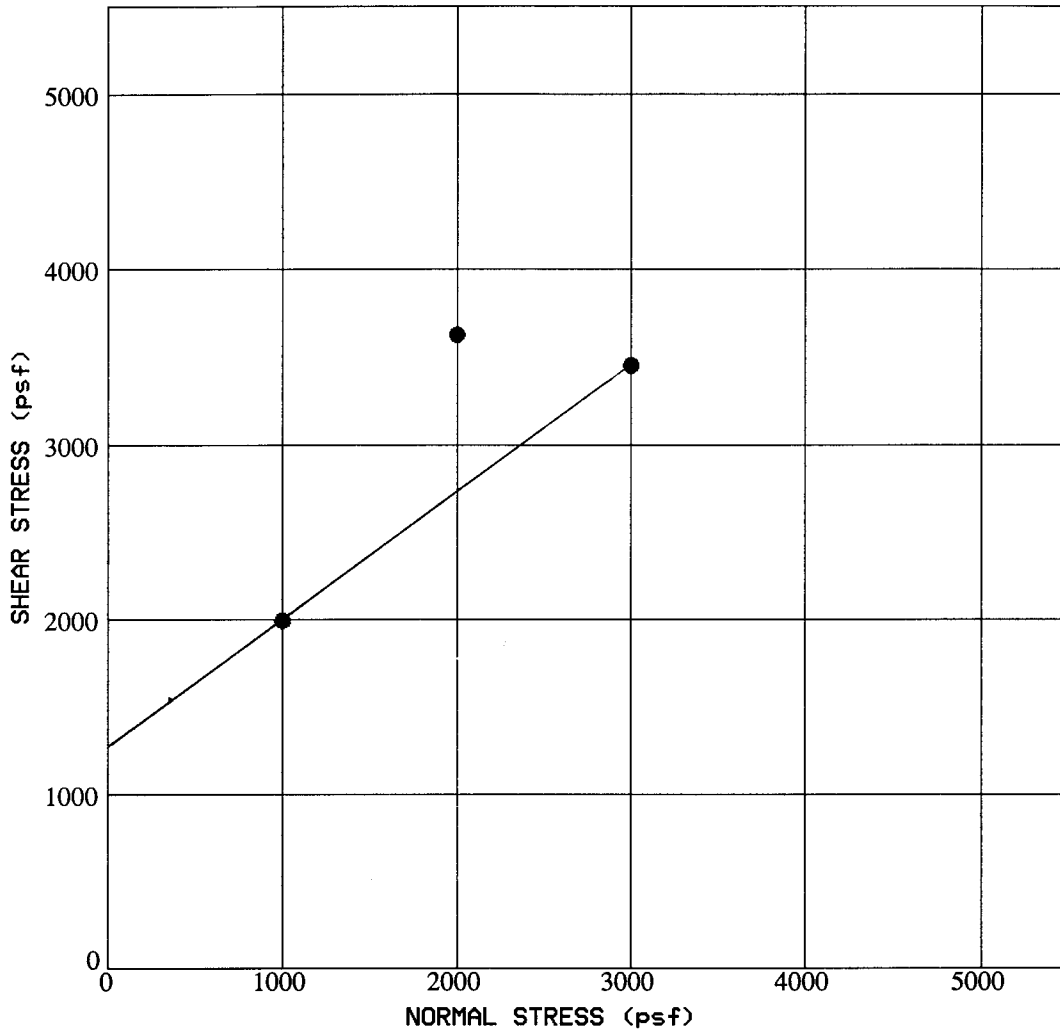
LABORATORY TESTING

APPENDIX F

Laboratory Testing Procedures and Test Results

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Shear Tests: Direct shear tests were performed on selected undisturbed samples that were soaked under a surcharge equal to the applied normal force during testing. The samples were tested under various normal loads, a motor-driven, stain-controlled, direct-shear testing apparatus at a strain rate of 0.001 to 0.012 inches per minute. The "peak" shear resistance was obtained from the maximum recorded shear resistance.



Boring No.	<u>LB-1</u>	Depth (ft)	<u>10.5</u>
Sample No.	<u>R-1</u>	Soil Type	<u>Siltst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>36</u>		
Cohesion (psf)	<u>1250</u>		

**DIRECT SHEAR
TEST RESULTS**

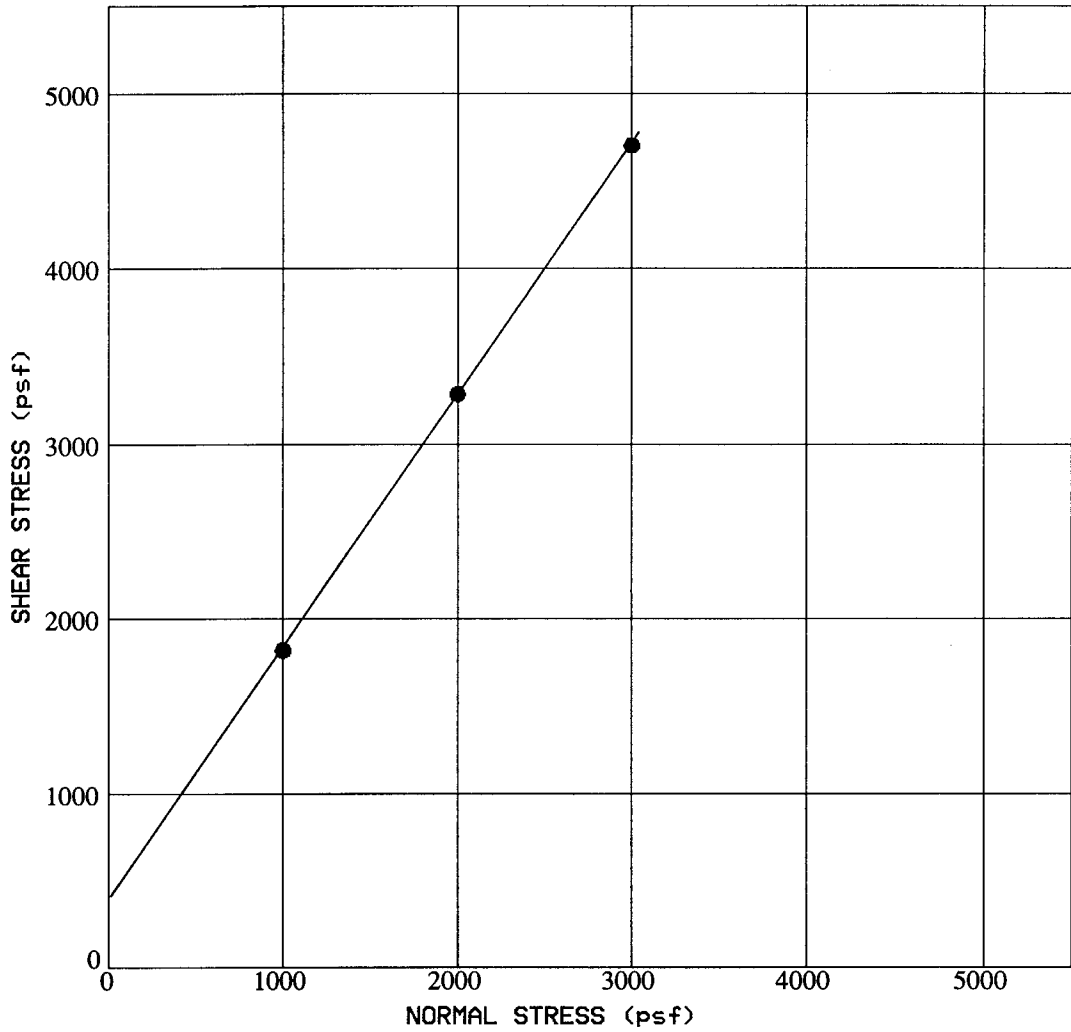
Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00

Figure No. D-1





Boring No.	<u>LB-1</u>	Depth (ft)	<u>20.5</u>
Sample No.	<u>R-2</u>	Soil Type	<u>Sandst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>55.5</u>		
Cohesion (psf)	<u>350</u>		

**DIRECT SHEAR
TEST RESULTS**

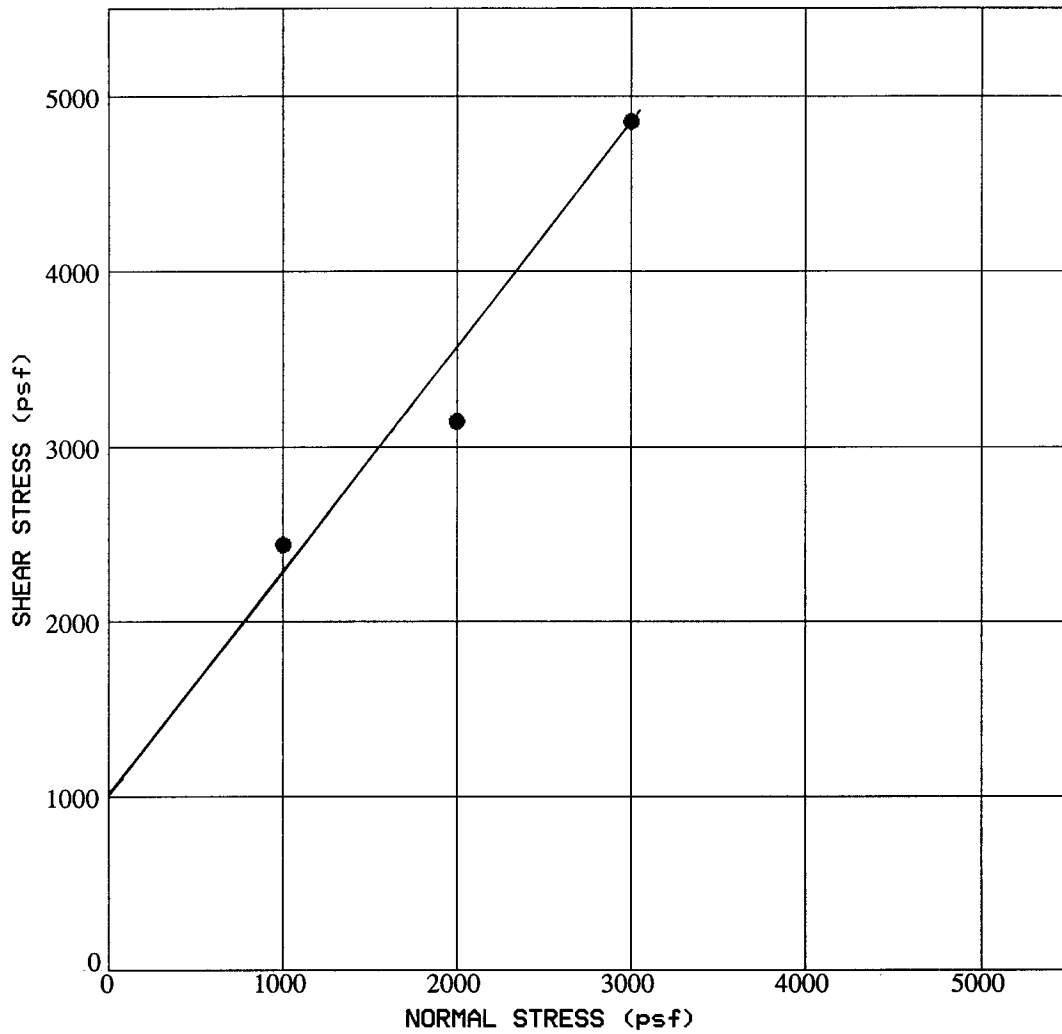
Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00

Figure No. D-2



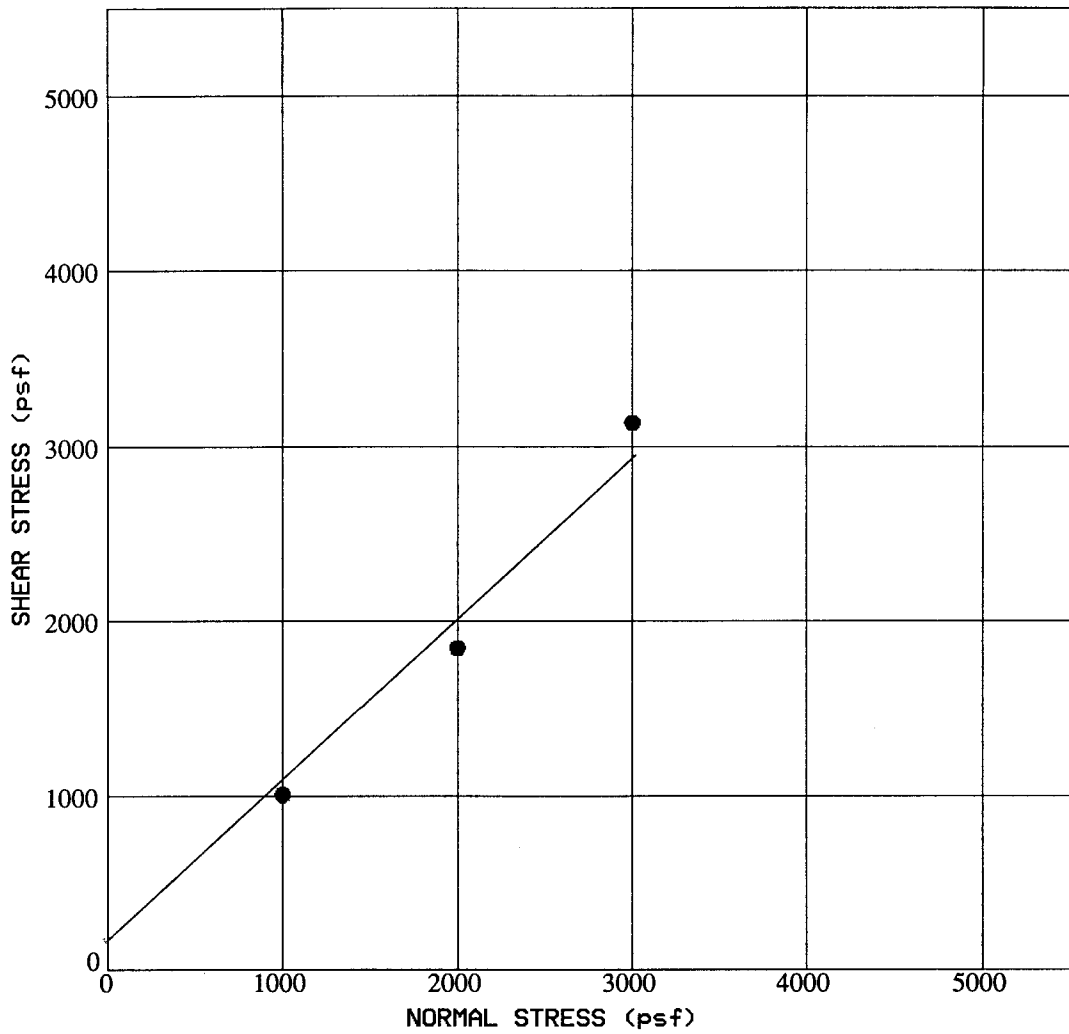


Boring No.	<u>LB-1</u>	Depth (ft)	<u>30.5</u>
Sample No.	<u>R-3</u>	Soil Type	<u>Sandst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>51</u>		
Cohesion (psf)	<u>1000</u>		

**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001
 Project Name HDR/Del Mar
 Date 7/17/00 Figure No. D-3





Boring No.	<u>LB-1</u>	Depth (ft)	<u>40.5</u>
Sample No.	<u>R-4</u>	Soil Type	<u>Clayst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>42</u>		
Cohesion (psf)	<u>100</u>		

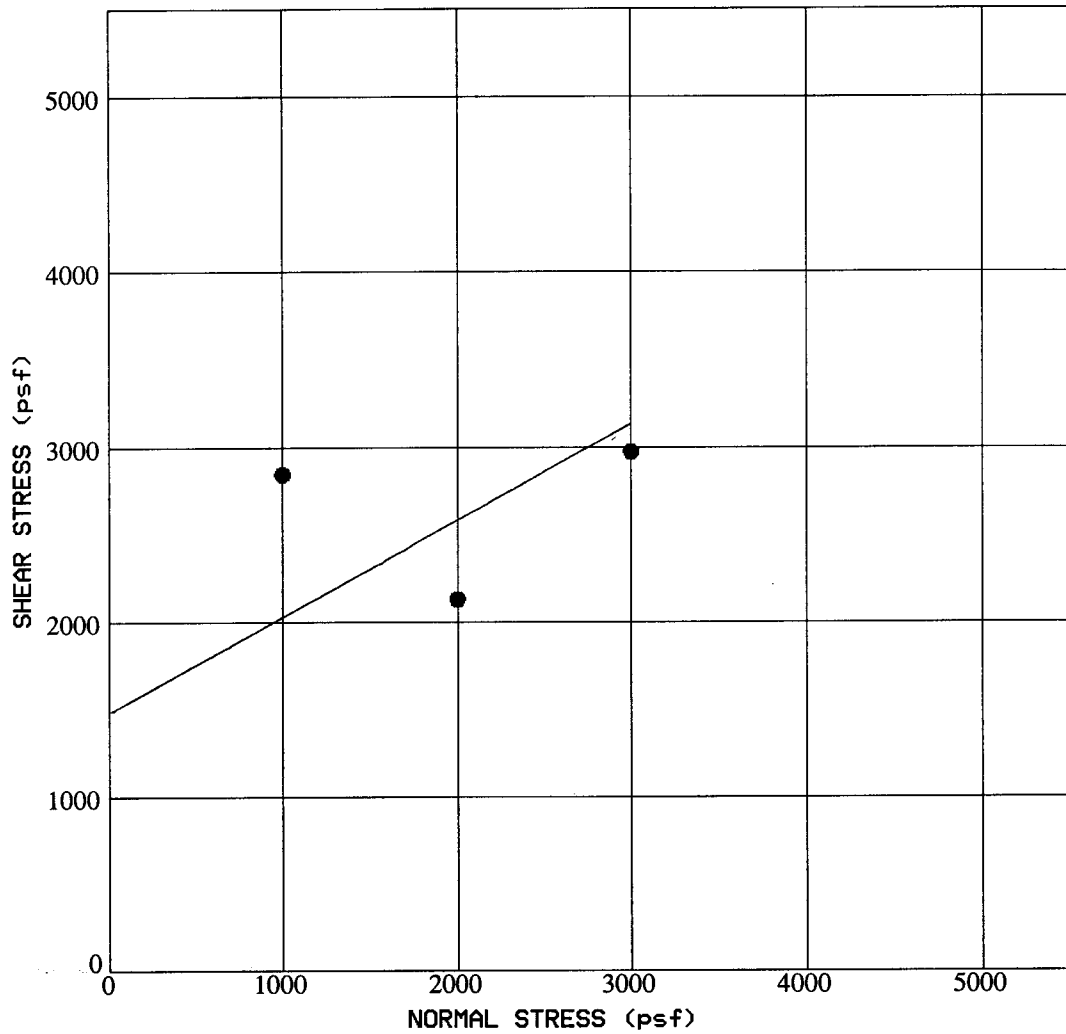
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-4





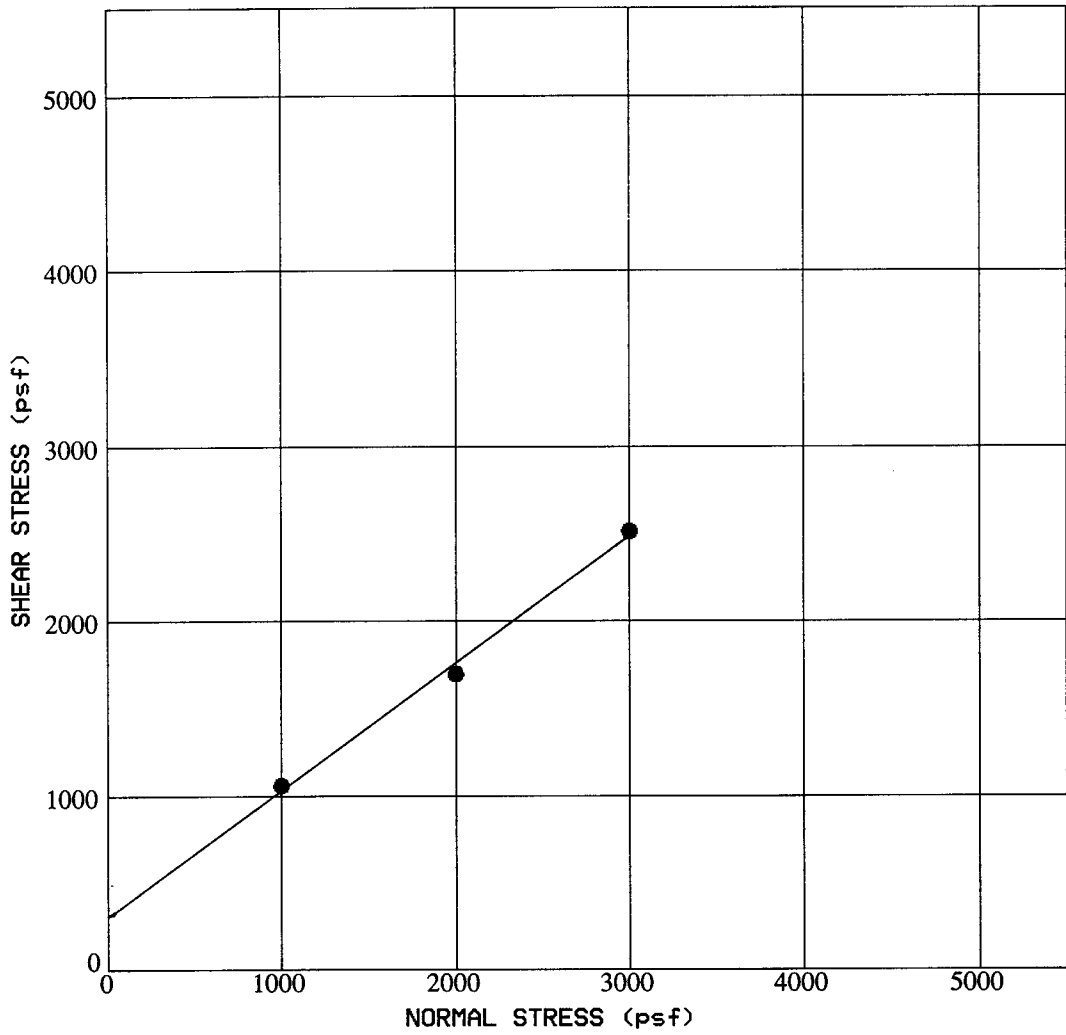
Boring No. LB-1 Depth (ft) 60.5
 Sample No. R-6 Soil Type Sandst.
 Type of Sample Ring

Friction Angle (deg.) 28
 Cohesion (psf) 1500

**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001
 Project Name HDR/Del Mar
 Date 7/17/00 Figure No. D-5





Boring No.	<u>LB-2</u>	Depth (ft)	<u>5.5</u>
Sample No.	<u>R-1</u>	Soil Type	<u>SP-SM</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>36</u>		
Cohesion (psf)	<u>300</u>		

**DIRECT SHEAR
TEST RESULTS**

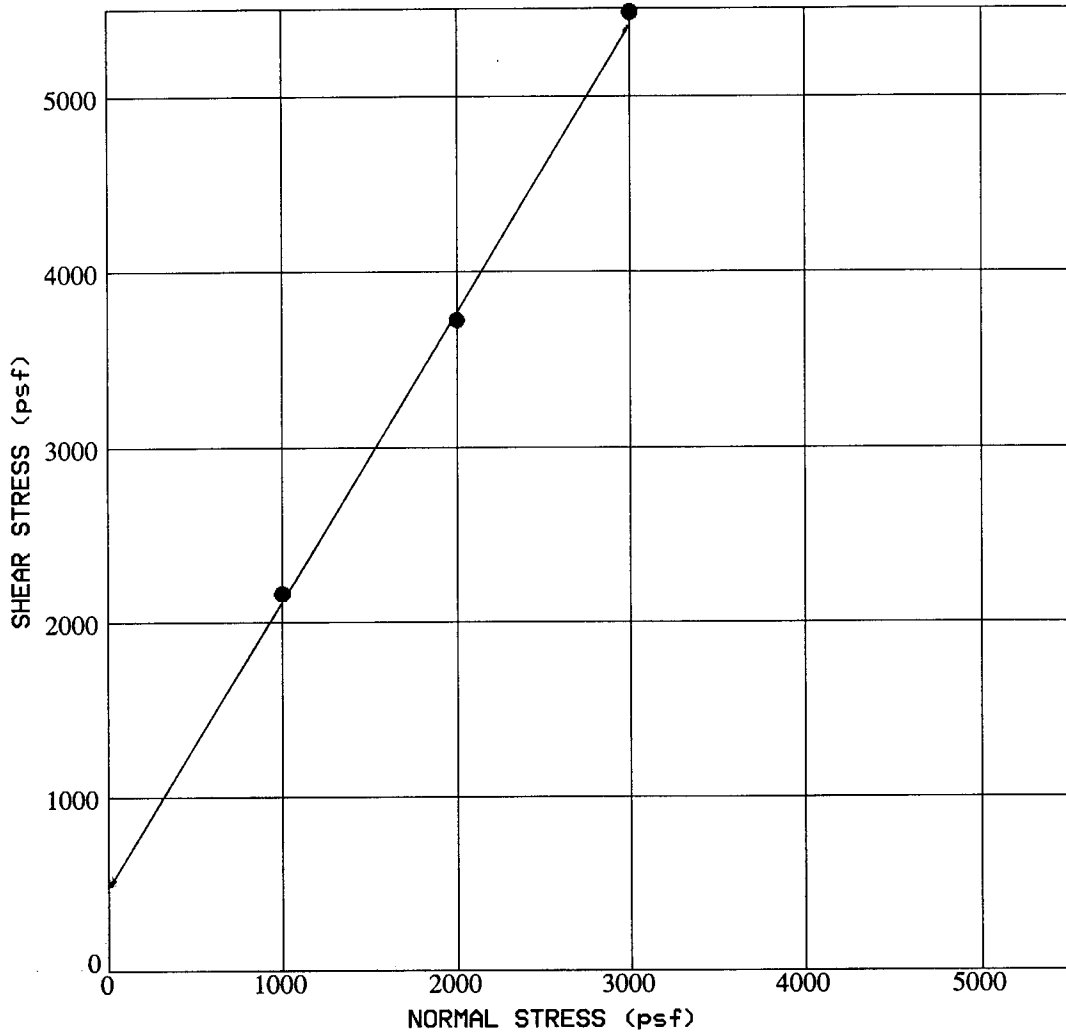
Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00

Figure No. D-6





Boring No.	<u>LB-2</u>	Depth (ft)	<u>22.5</u>
Sample No.	<u>R-2</u>	Soil Type	<u>Sandst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>58.5</u>		
Cohesion (psf)	<u>500</u>		

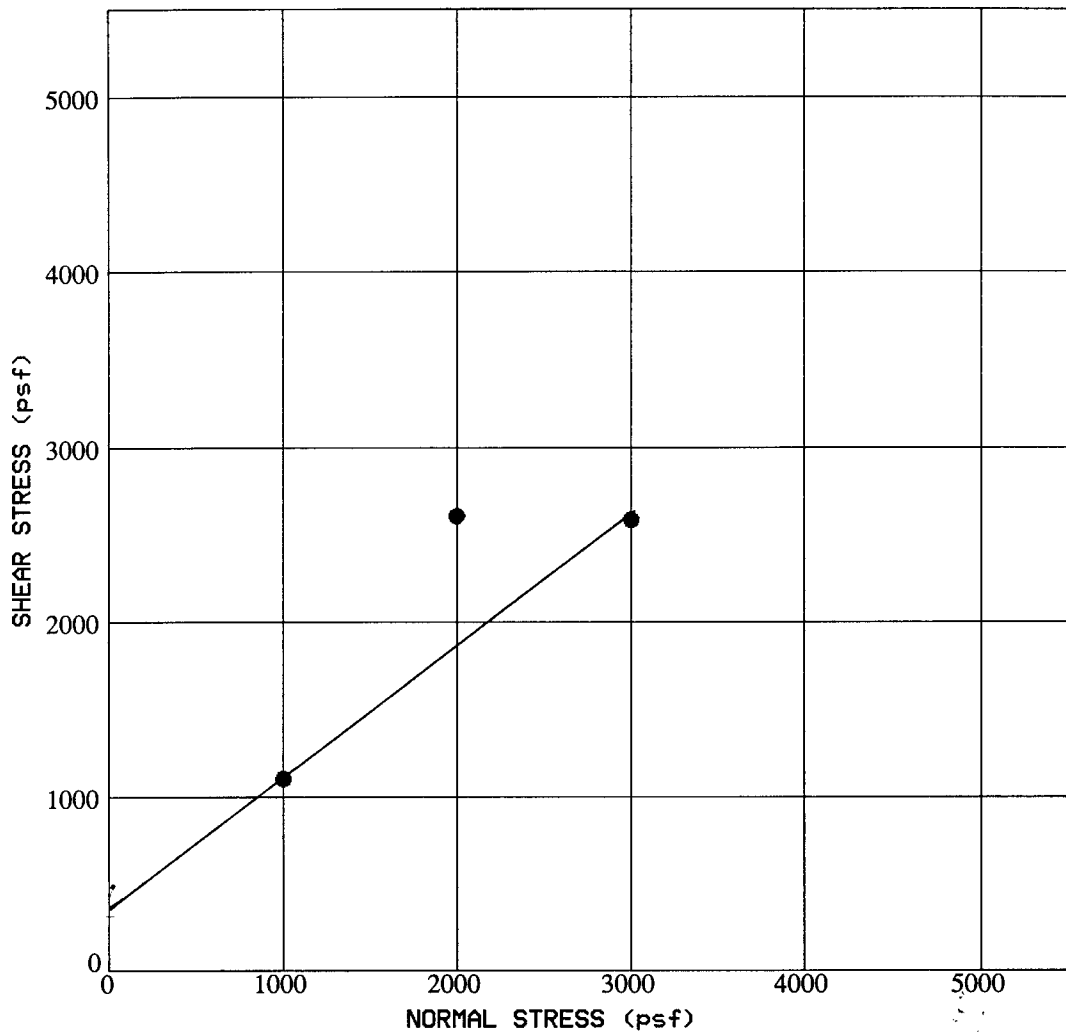
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-7





Boring No.	<u>LB-2</u>	Depth (ft)	<u>45.5</u>
Sample No.	<u>R-3</u>	Soil Type	<u>Siltst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>37.5</u>		
Cohesion (psf)	<u>400</u>		

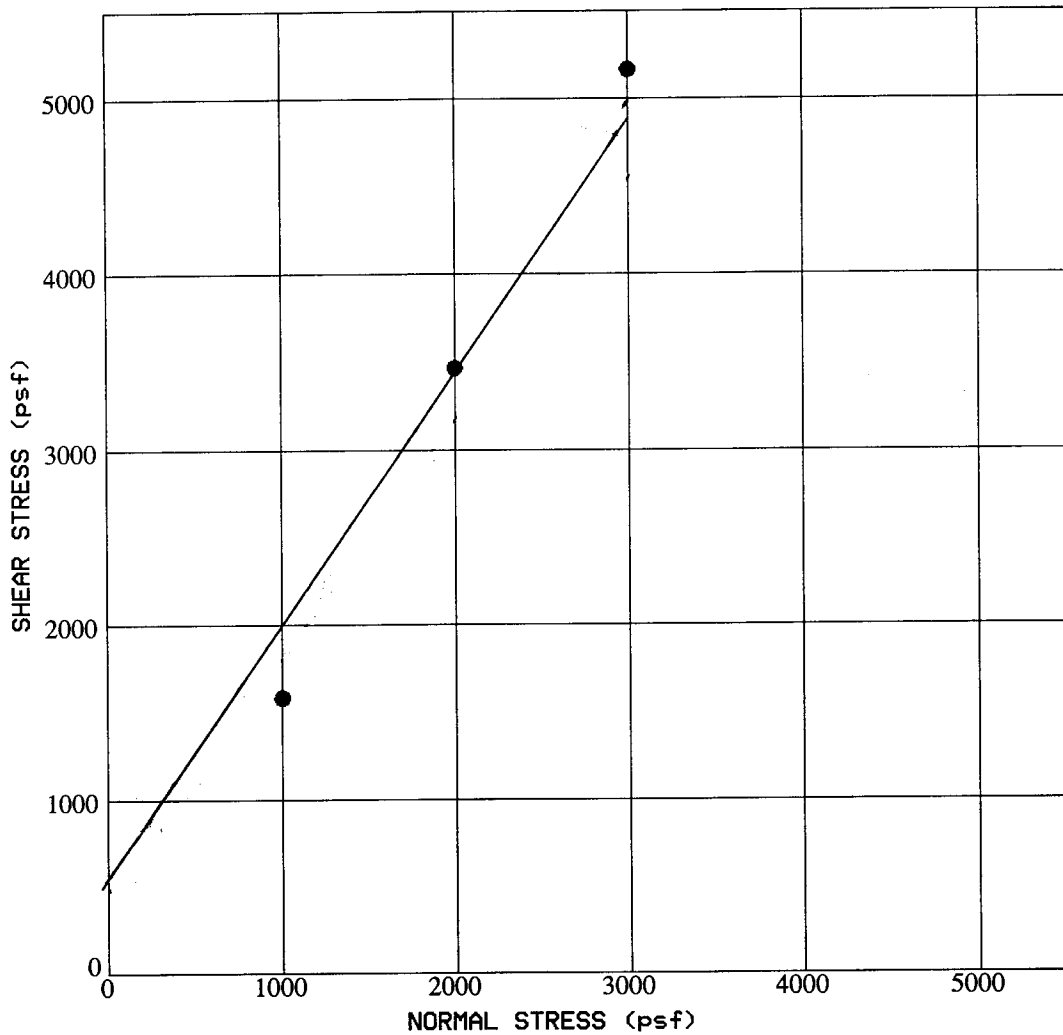
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-8





Boring No.	<u>LB-4</u>	Depth (ft)	<u>20.5</u>
Sample No.	<u>R-1</u>	Soil Type	<u>Sandst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>54</u>		
Cohesion (psf)	<u>500</u>		

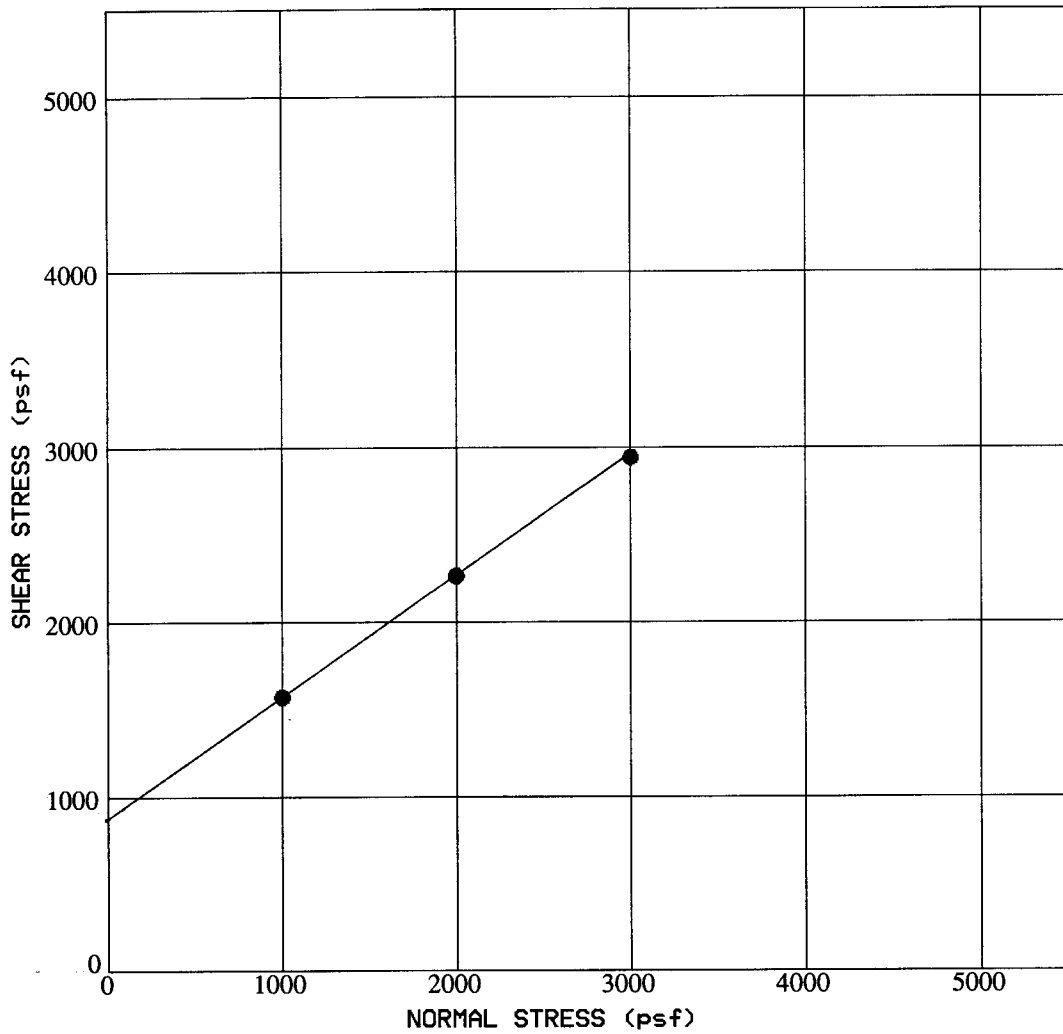
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-9





Boring No.	<u>LB-4</u>	Depth (ft)	<u>40.5</u>
Sample No.	<u>R-2</u>	Soil Type	<u>Clayst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>34</u>		
Cohesion (psf)	<u>900</u>		

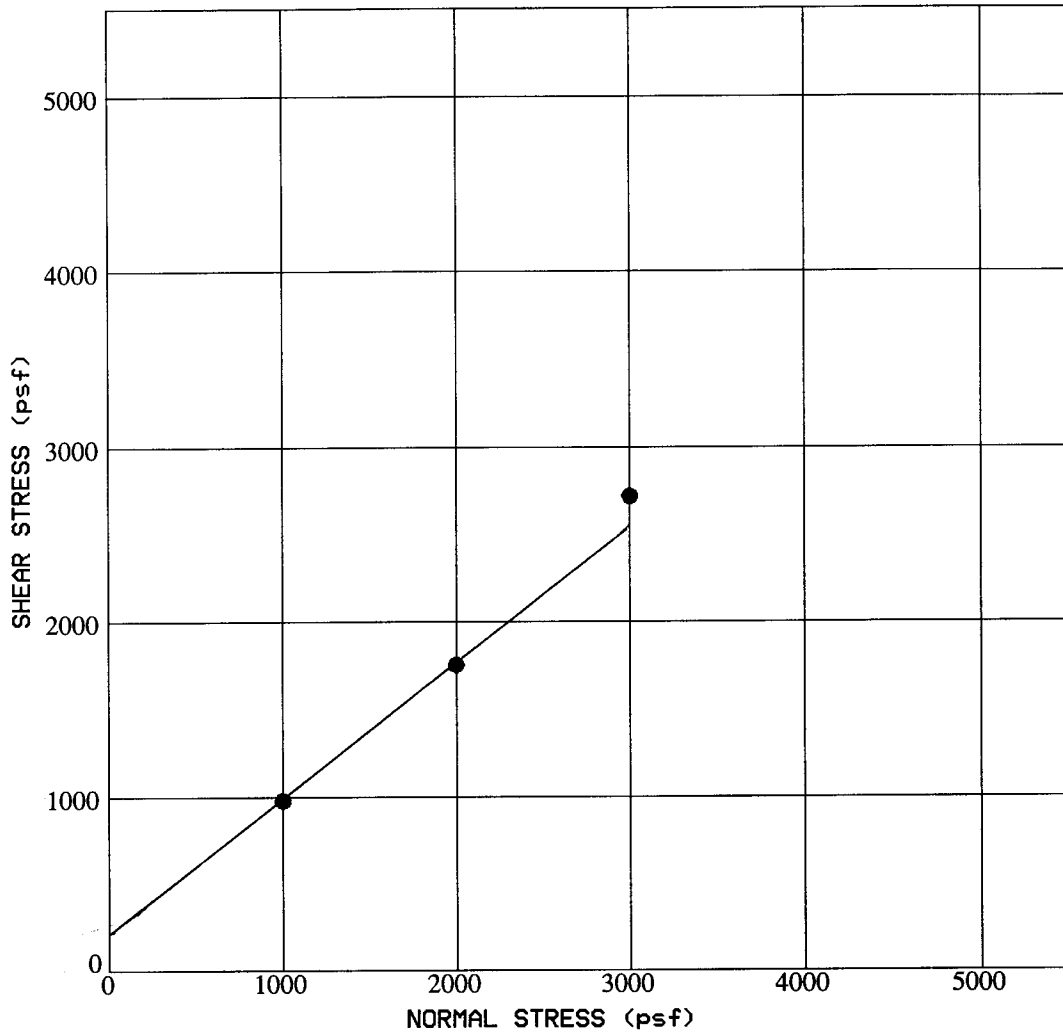
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-10





Boring No.	<u>LB-4</u>	Depth (ft)	<u>60.5</u>
Sample No.	<u>R-3</u>	Soil Type	<u>Clayst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>38</u>		
Cohesion (psf)	<u>200</u>		

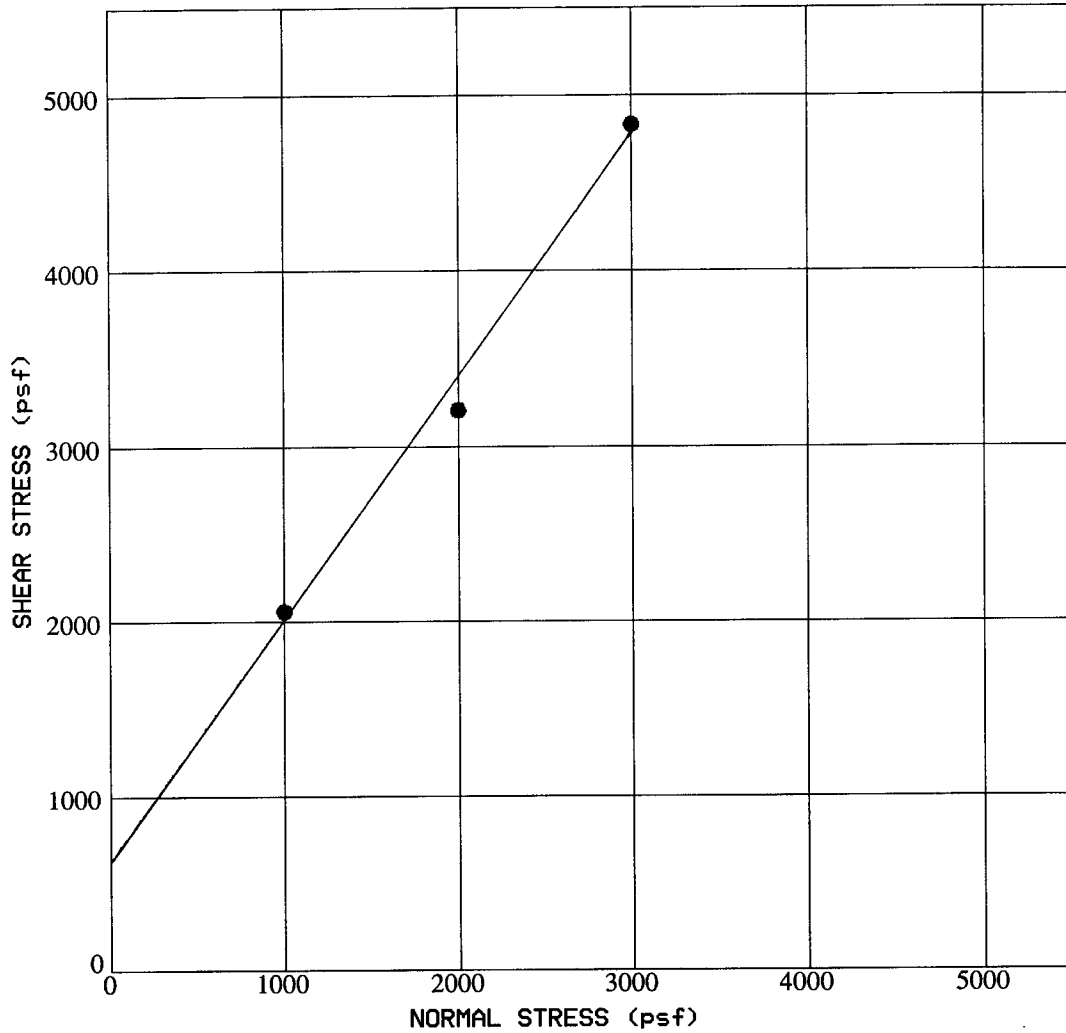
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-11



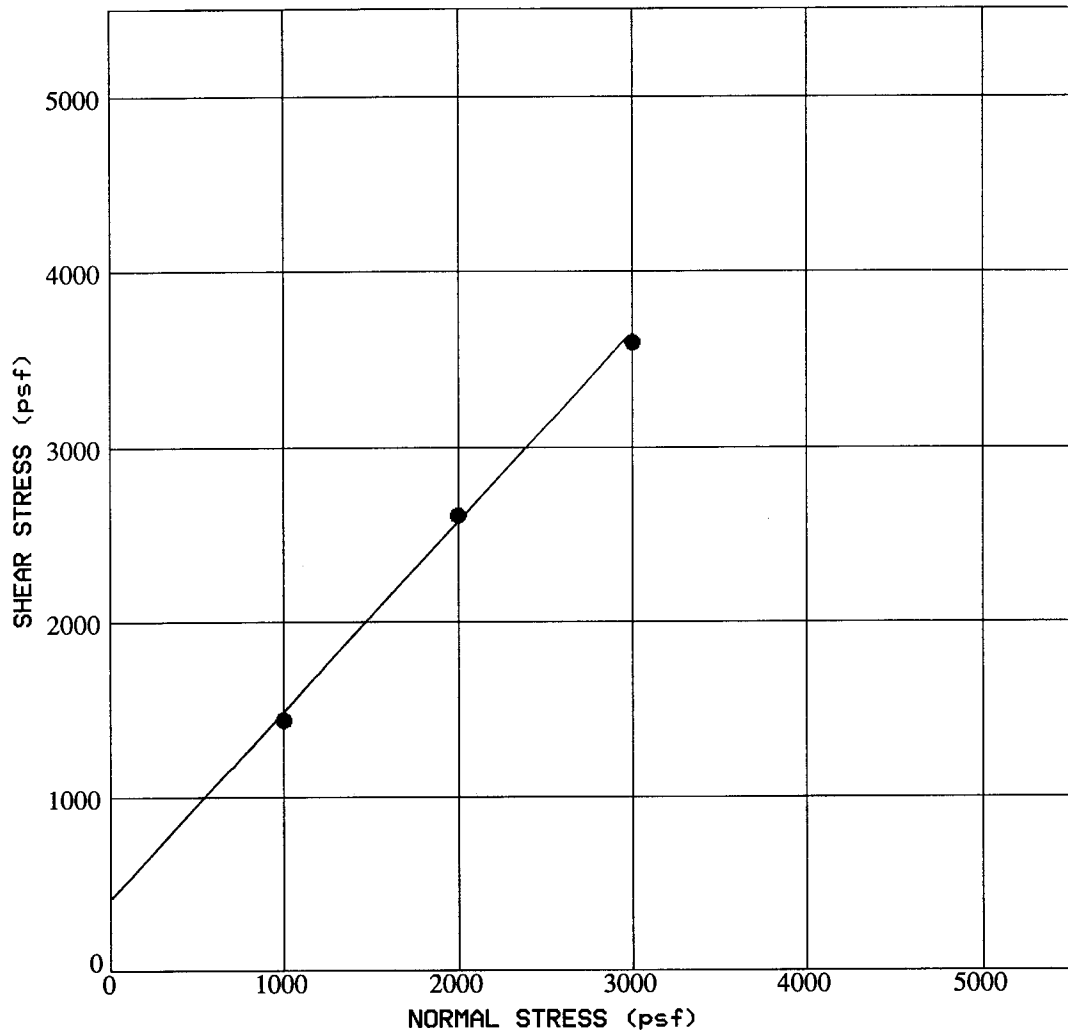


Boring No.	<u>LB-6</u>	Depth (ft)	<u>20.5</u>
Sample No.	<u>R-1</u>	Soil Type	<u>Sandst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>54</u>		
Cohesion (psf)	<u>600</u>		

**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001
 Project Name HDR/Del Mar
 Date 7/17/00 Figure No. D12





Boring No.	<u>LB-6</u>	Depth (ft)	<u>60.5</u>
Sample No.	<u>R-3</u>	Soil Type	<u>Sandst.</u>
Type of Sample	<u>Ring</u>		
Friction Angle (deg.)	<u>46.5</u>		
Cohesion (psf)	<u>400</u>		

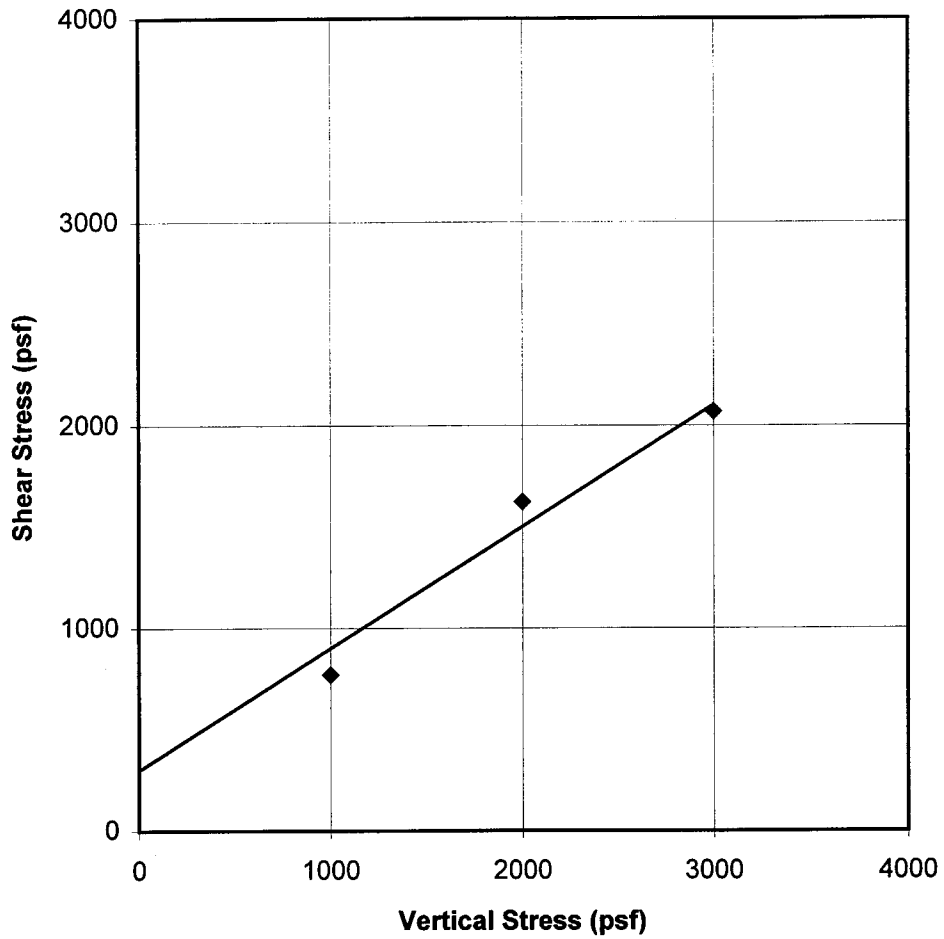
**DIRECT SHEAR
TEST RESULTS**

Project No. 040151-001

Project Name HDR/Del Mar

Date 7/17/00 Figure No. D-13





Boring Location LB-1

Sample Depth (feet) 10

Average Ultimate Strength Values

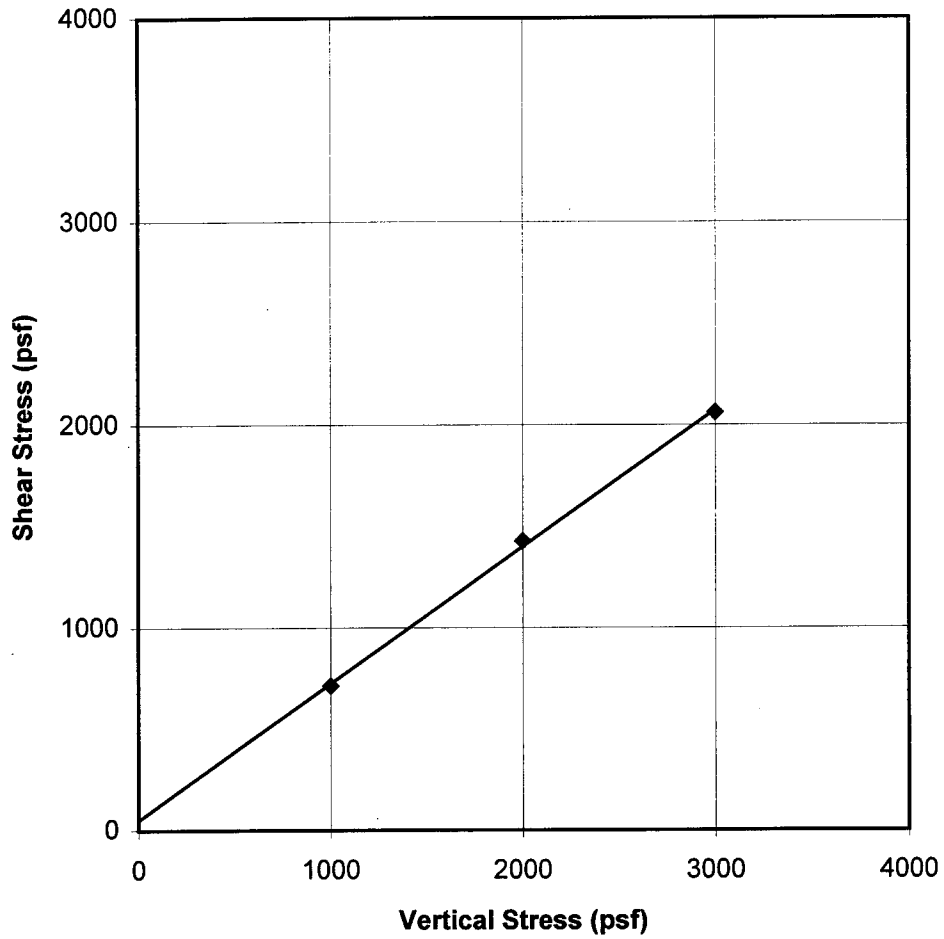
Friction Angle, ϕ_{ult} (deg) 31

Cohesion, c_{ult} (psf) 300

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-14





Boring Location LB-1

Sample Depth (feet) 20

Average Ultimate Strength Values

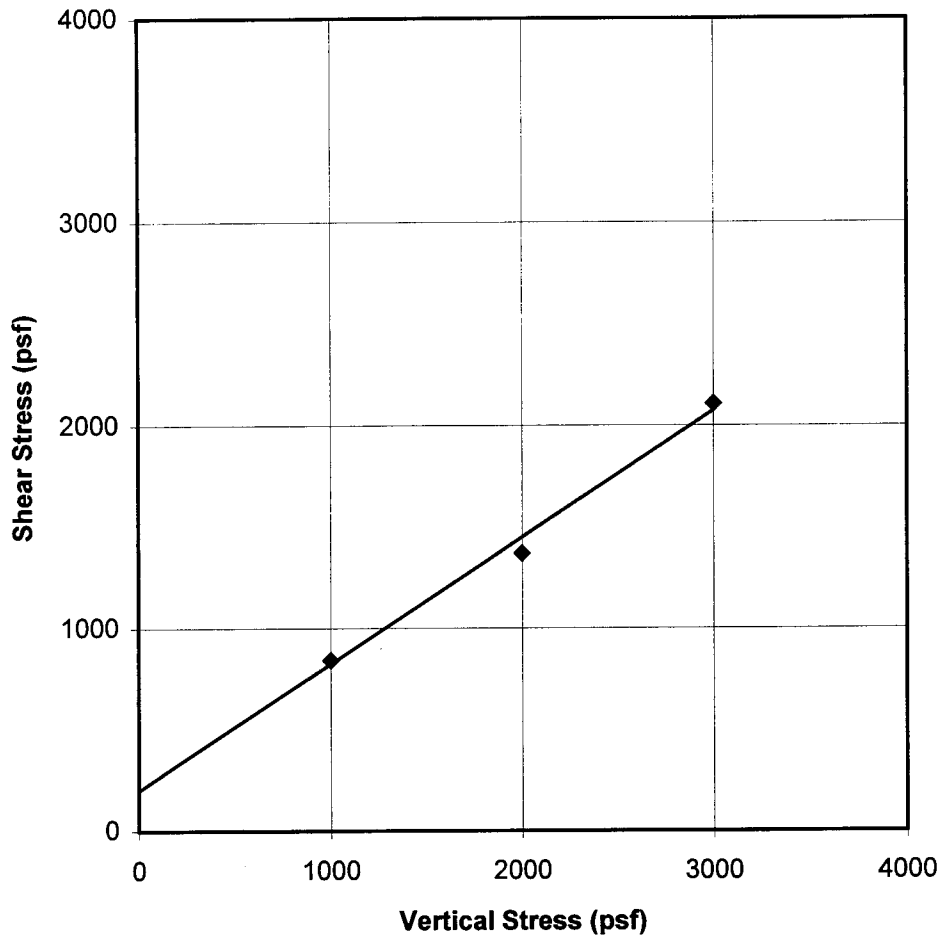
Friction Angle, ϕ_{ult} (deg) 34

Cohesion, c_{ult} (psf) 50

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-15





Boring Location LB-1

Sample Depth (feet) 30

Average Ultimate Strength Values

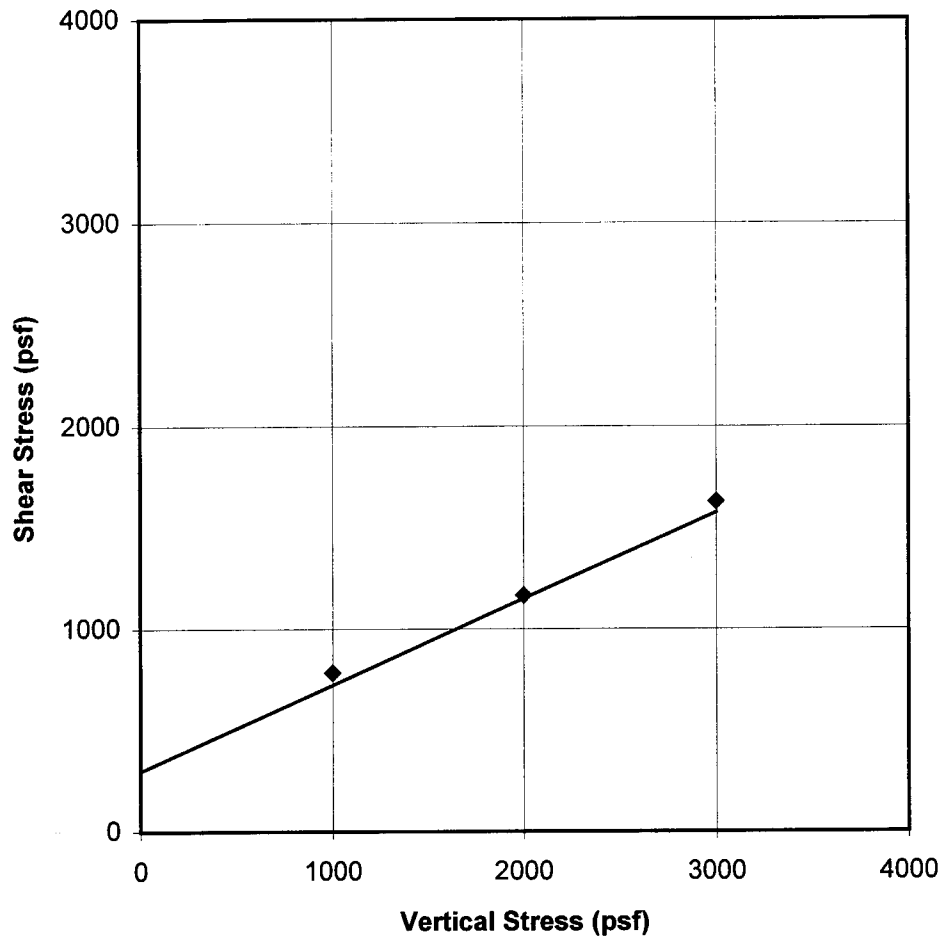
Friction Angle, ϕ_{ult} (deg) 32

Cohesion, c_{ult} (psf) 200

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-16





Boring Location LB-1

Sample Depth (feet) 40

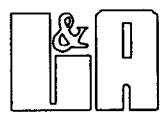
Average Ultimate Strength Values

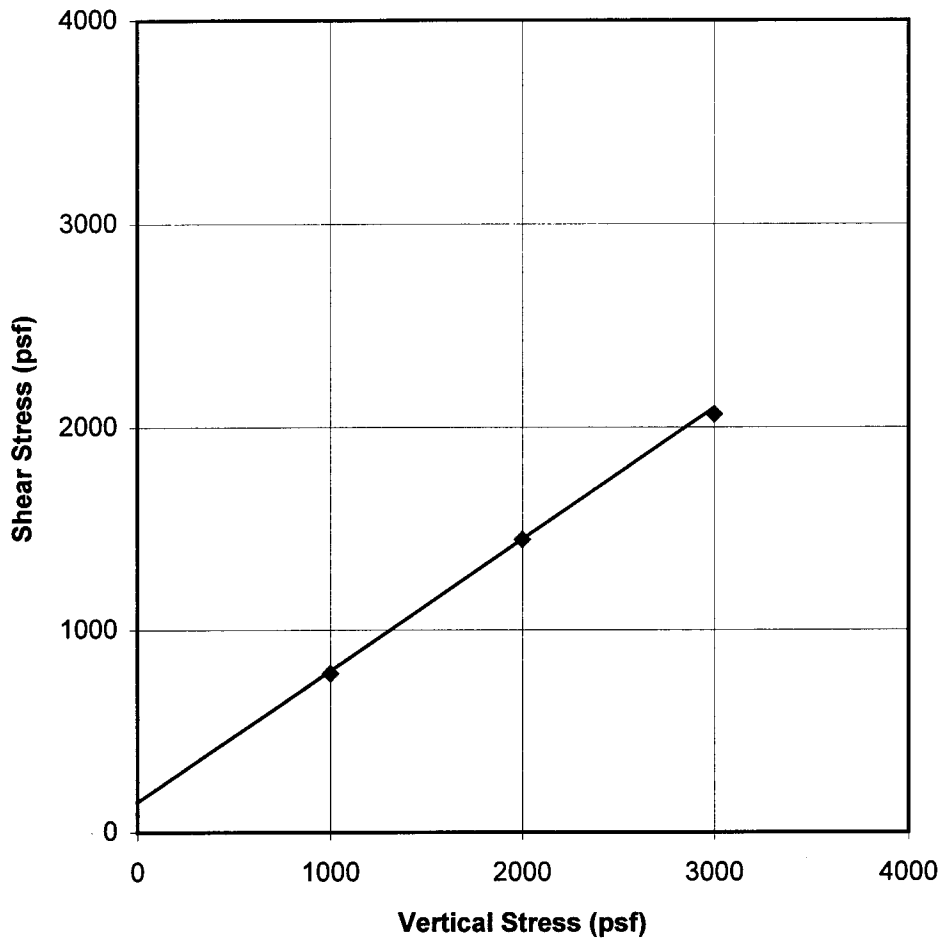
Friction Angle, ϕ_{ult} (deg) 23

Cohesion, c_{ult} (psf) 300

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-17





Boring Location LB-1

Sample Depth (feet) 60

Average Ultimate Strength Values

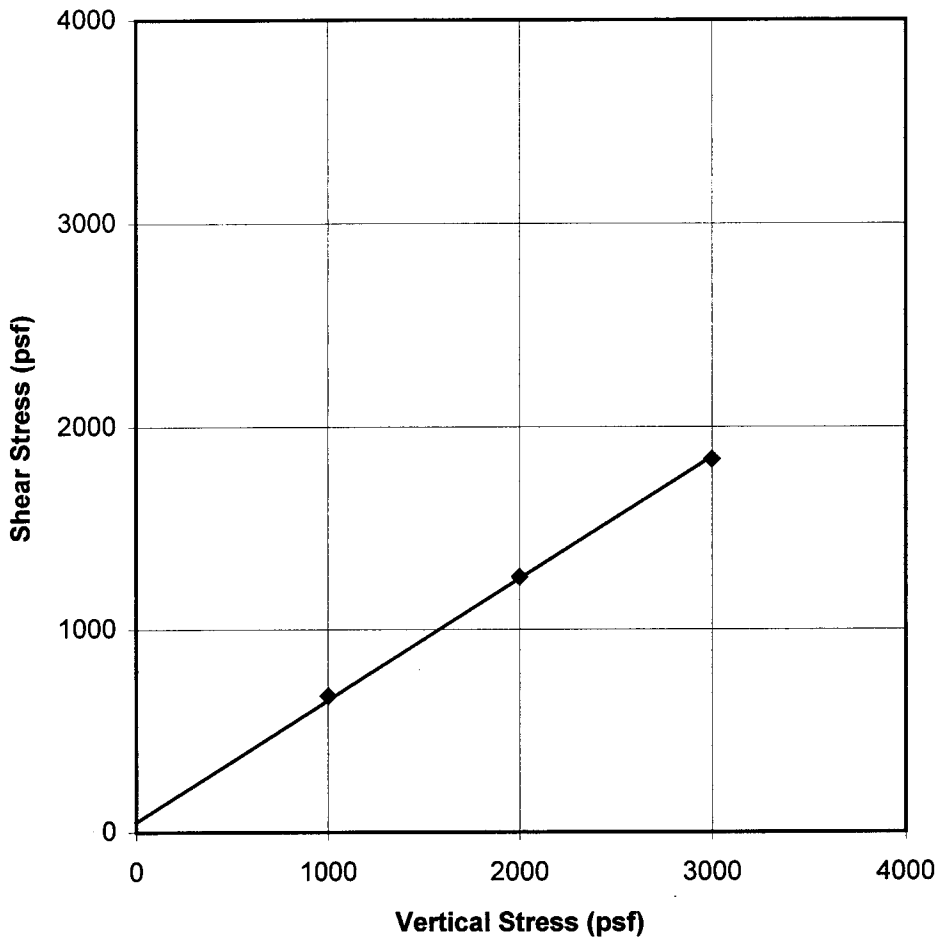
Friction Angle, ϕ_{ult} (deg) 33

Cohesion, c_{ult} (psf) 150

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-18





Boring Location LB-2

Sample Depth (feet) 5

Average Ultimate Strength Values

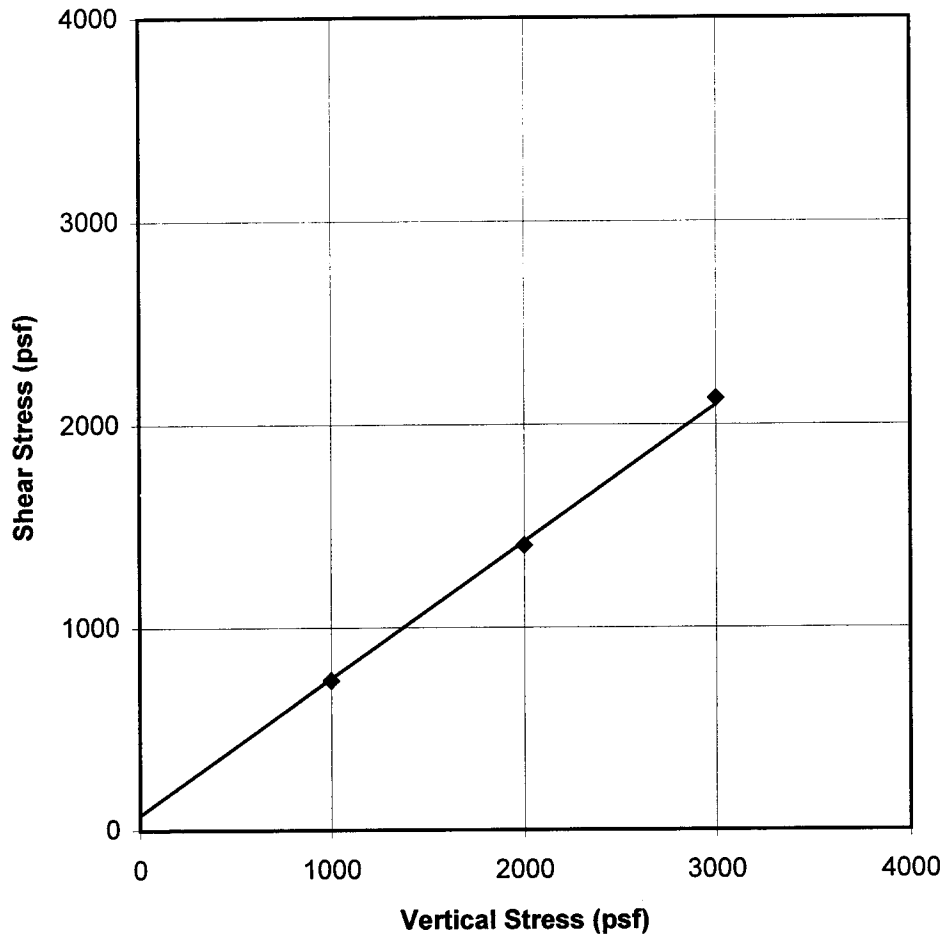
Friction Angle, ϕ_{ult} (deg) 31

Cohesion, c_{ult} (psf) 50

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-19





Boring Location LB-2

Sample Depth (feet) 22

Average Ultimate Strength Values

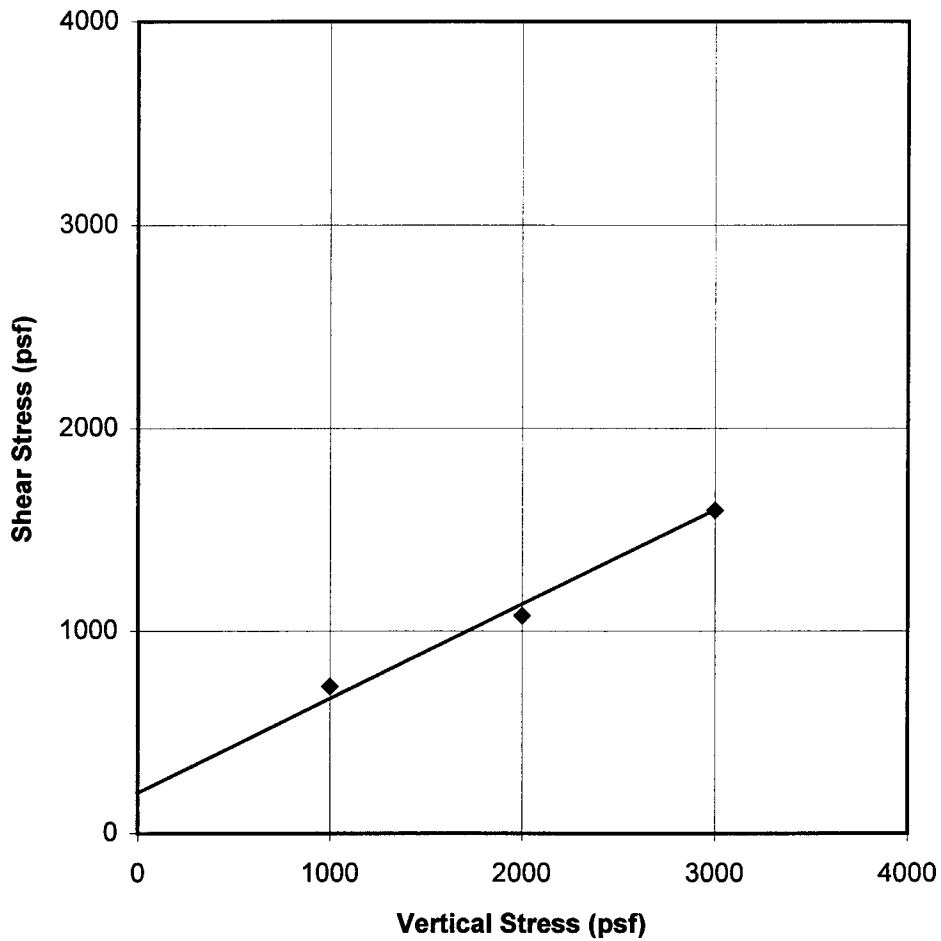
Friction Angle, ϕ_{ult} (deg) 34

Cohesion, c_{ult} (psf) 75

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-20





Boring Location LB-2

Sample Depth (feet) 45

Average Ultimate Strength Values

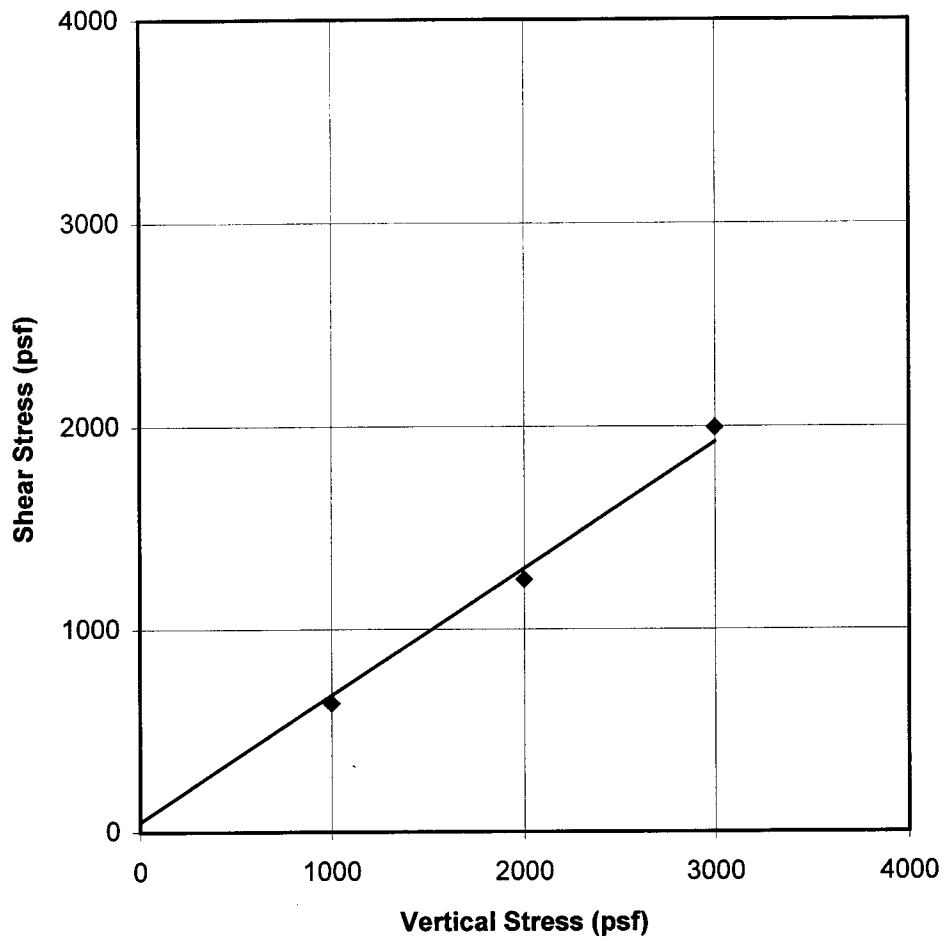
Friction Angle, ϕ_{ult} (deg) 25

Cohesion, c_{ult} (psf) 200

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-21





Boring Location LB-4

Sample Depth (feet) 20

Average Ultimate Strength Values

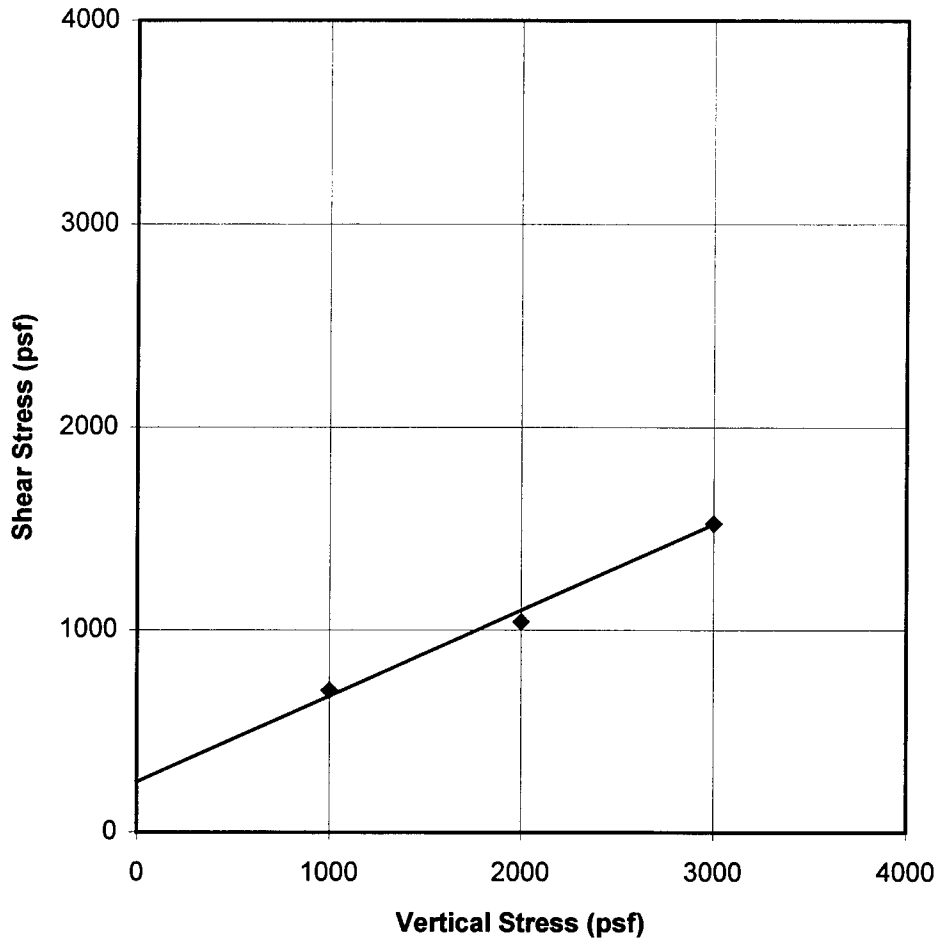
Friction Angle, ϕ_{ult} (deg) 32

Cohesion, c_{ult} (psf) 50

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-22





Boring Location LB-4

Sample Depth (feet) 40

Average Ultimate Strength Values

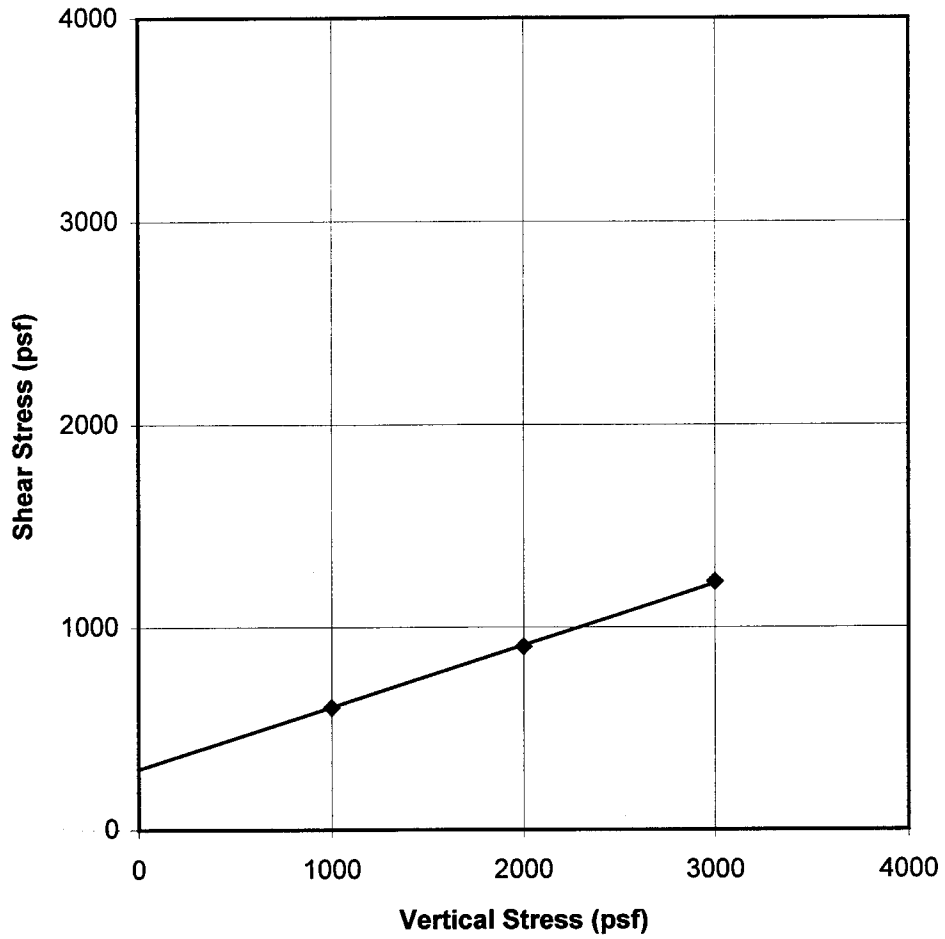
Friction Angle, ϕ_{ult} (deg) 23

Cohesion, c_{ult} (psf) 250

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-23





Boring Location LB-4

Sample Depth (feet) 60

Average Ultimate Strength Values

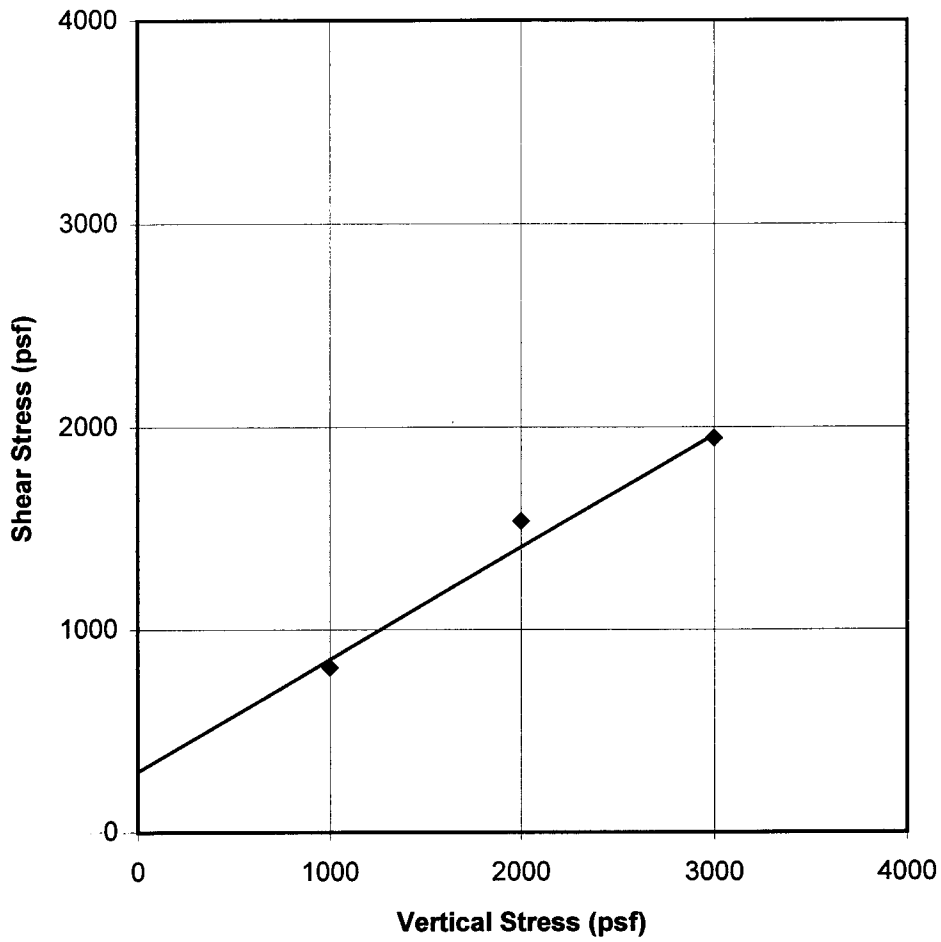
Friction Angle, ϕ_{ult} (deg) 17

Cohesion, c_{ult} (psf) 300

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-24





Boring Location LB-6

Sample Depth (feet) 20

Average Ultimate Strength Values

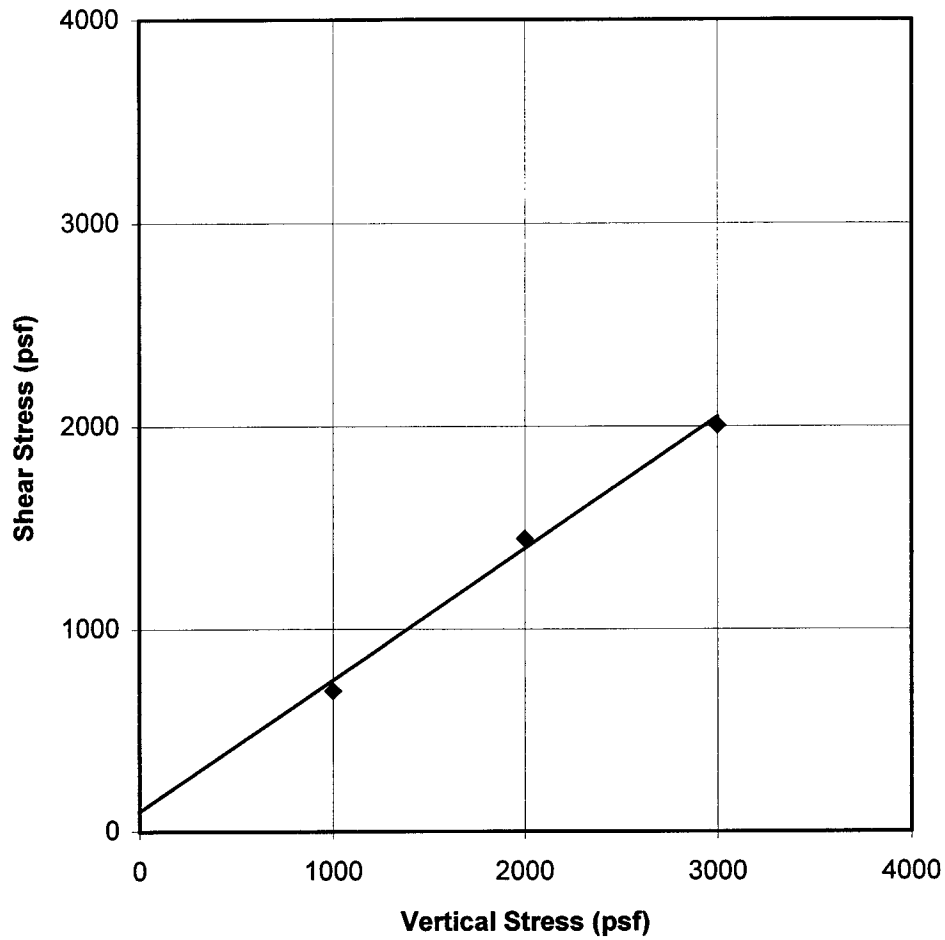
Friction Angle, ϕ_{ult} (deg) 29

Cohesion, c_{ult} (psf) 300

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-25





Boring Location LB-6

Sample Depth (feet) 60

Average Ultimate Strength Values

Friction Angle, ϕ_{ult} (deg) 33

Cohesion, c_{ult} (psf) 100

DIRECT SHEAR SUMMARY

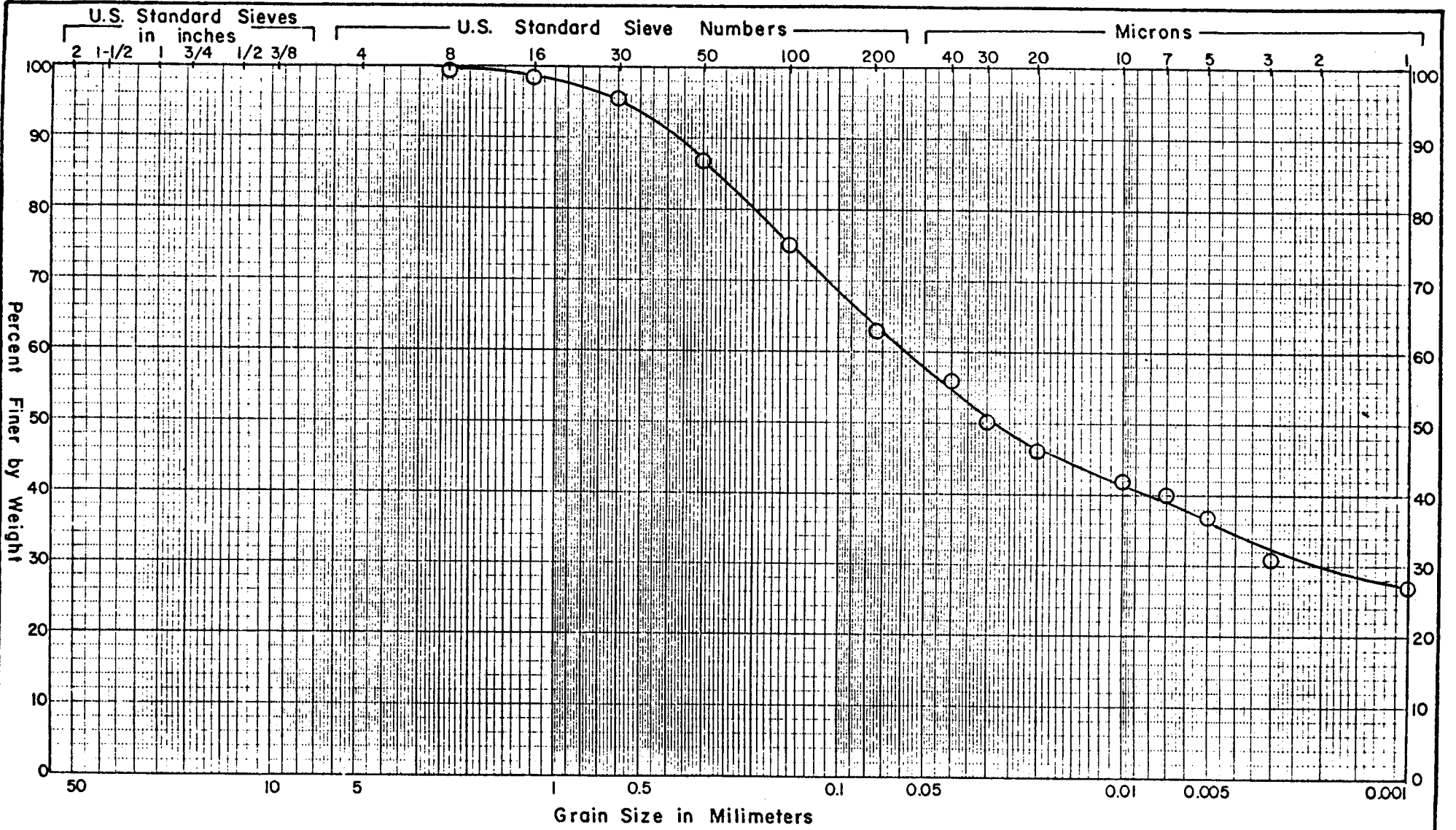
Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. D-26



PREVIOUS LABORATORY
TESTING BY LEIGHTON AND
ASSOCIATES

Project No.: 478008-1

B-1
Lighthouse & Accretion



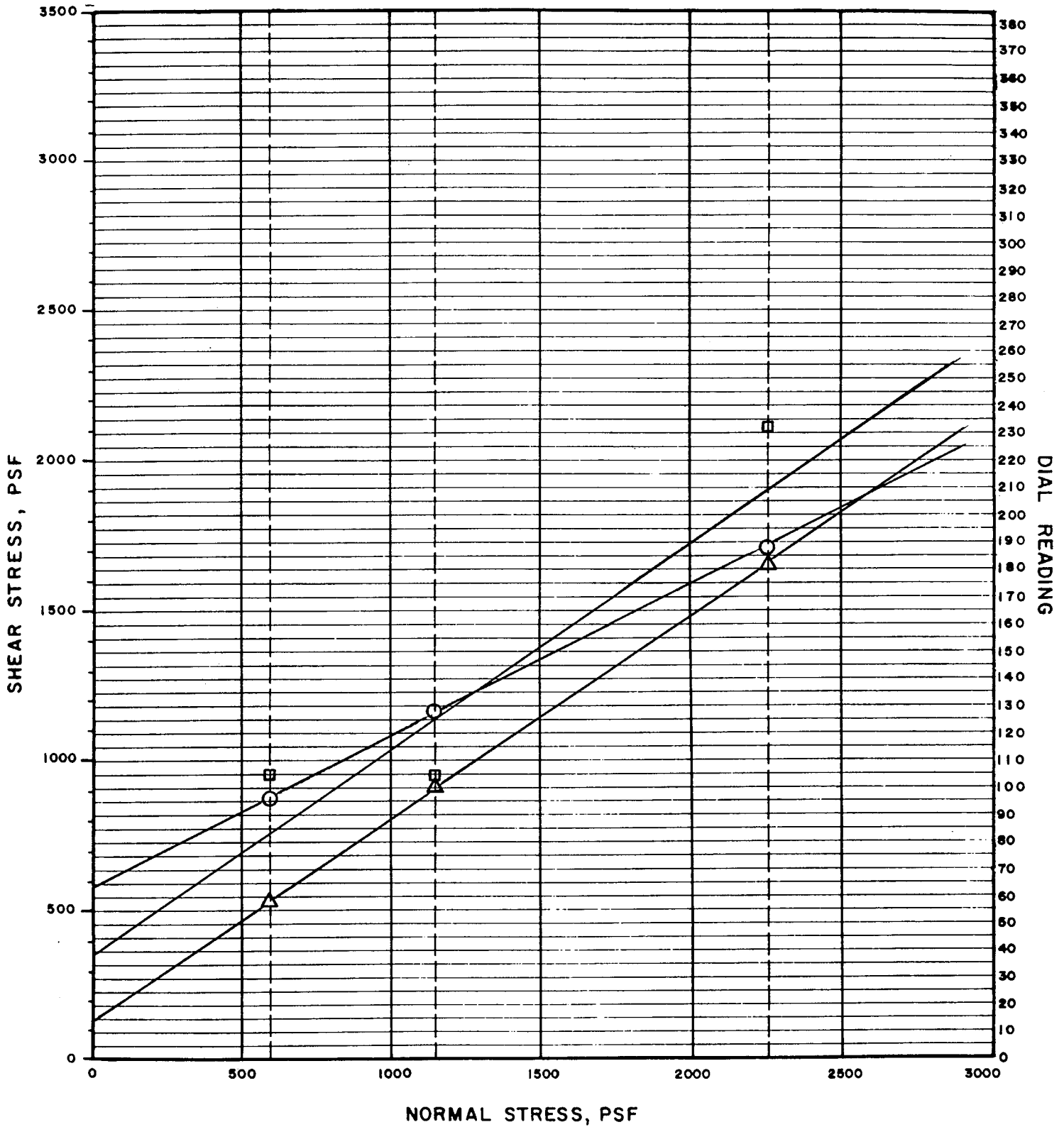
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Symbol	Hole No.	Sample No.	Depth or Elev.	Field Moisture (%)	LL (%)	PI (%)	Activity PI/2μ	Cu D ₆₀ /D ₁₀	Cc (D ₃₀) ² / (D ₁₀ × D ₆₀)	Percent Passing No. 200	Percent Passing 2μ	U.S.C.S.
○	1	1	35'		41	23						CL
	CLAY @ TOE OF SLOPE				47	15						ML

**GRADATION
TEST
RESULTS**

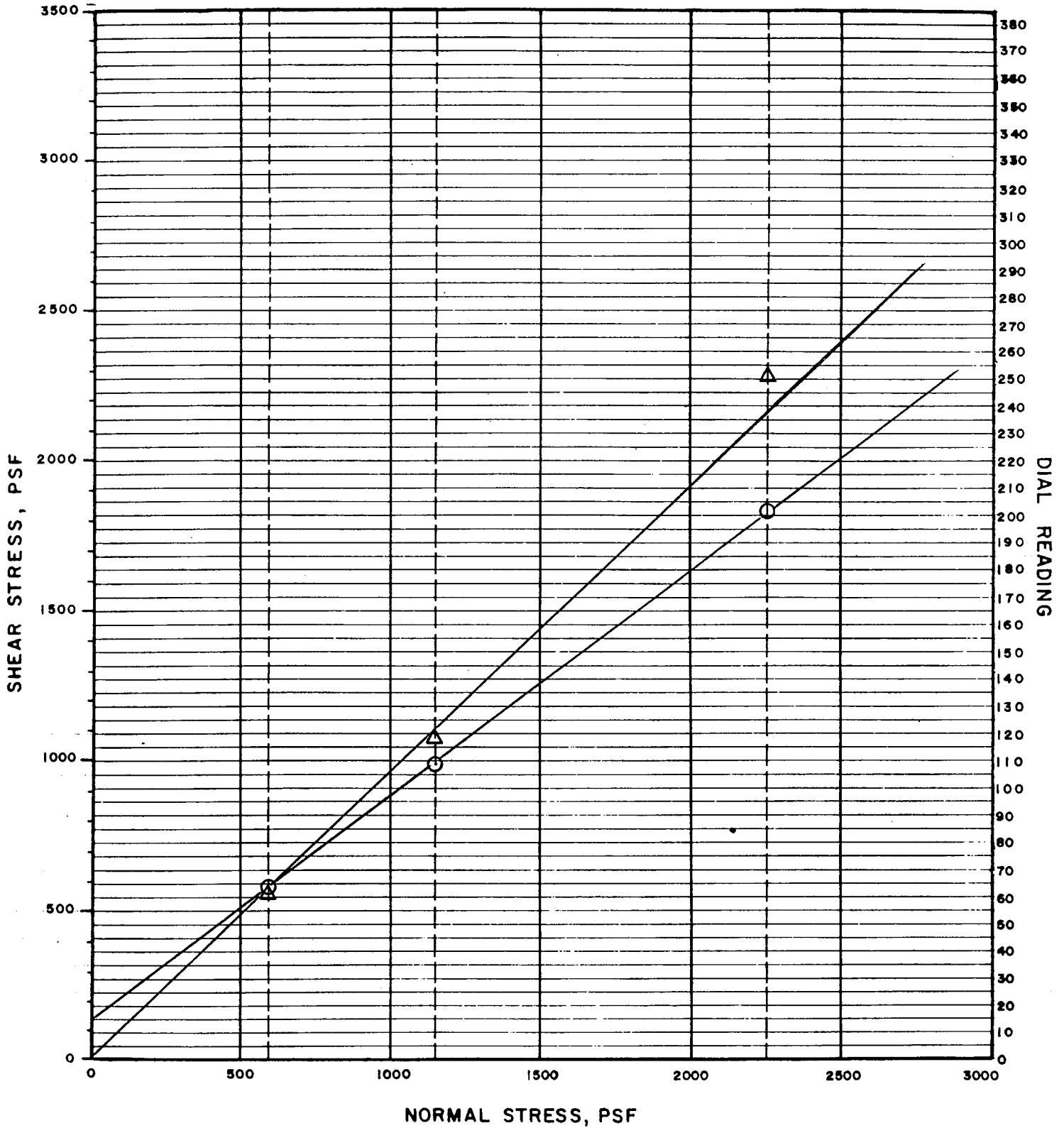
Plate No.:

DIRECT SHEAR SUMMARY



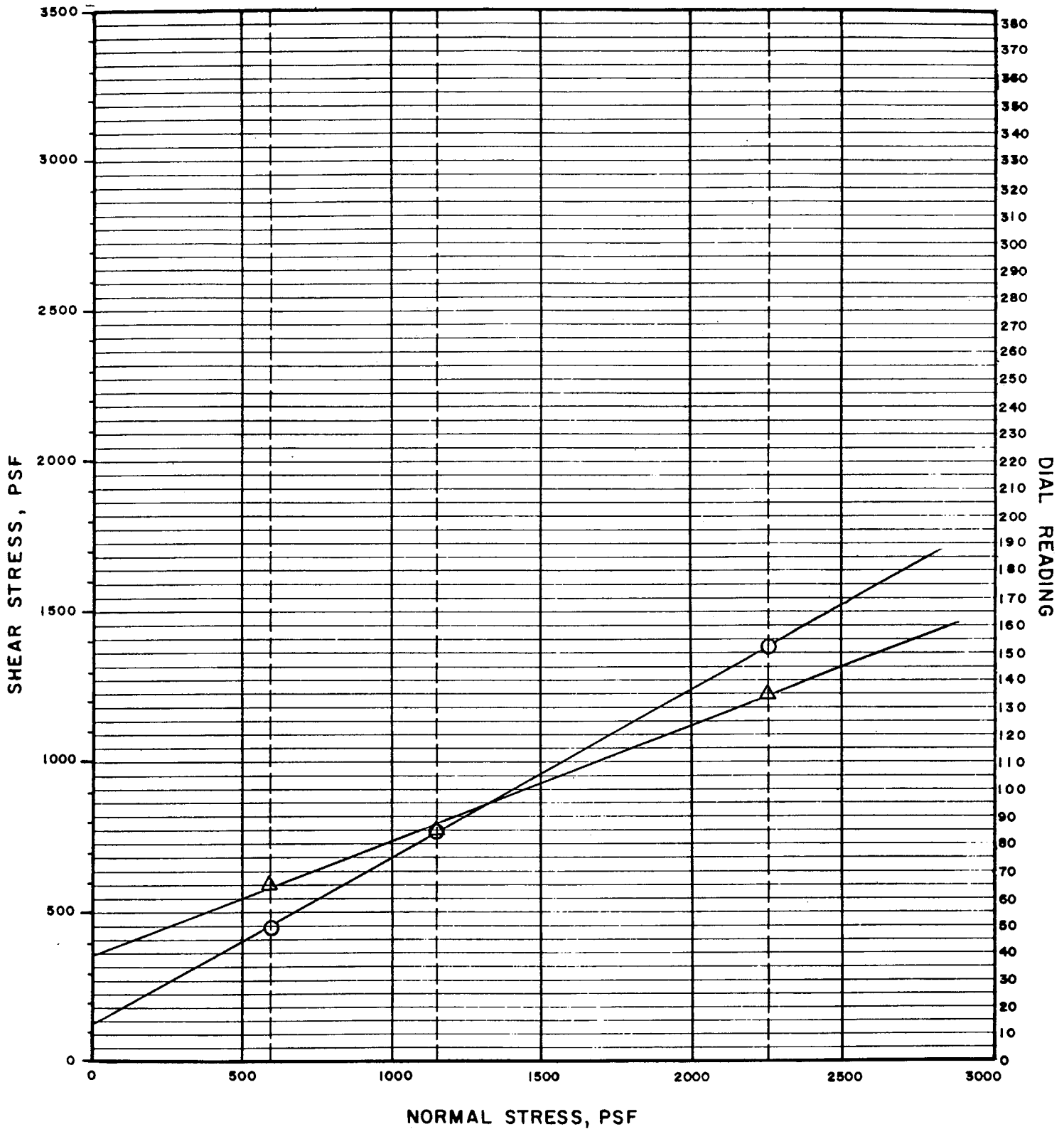
Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
1	6'	△	34°	140 psf	
1	12'	○	27°	580 psf	
1	17½'	□	35°	360 psf	

DIRECT SHEAR SUMMARY



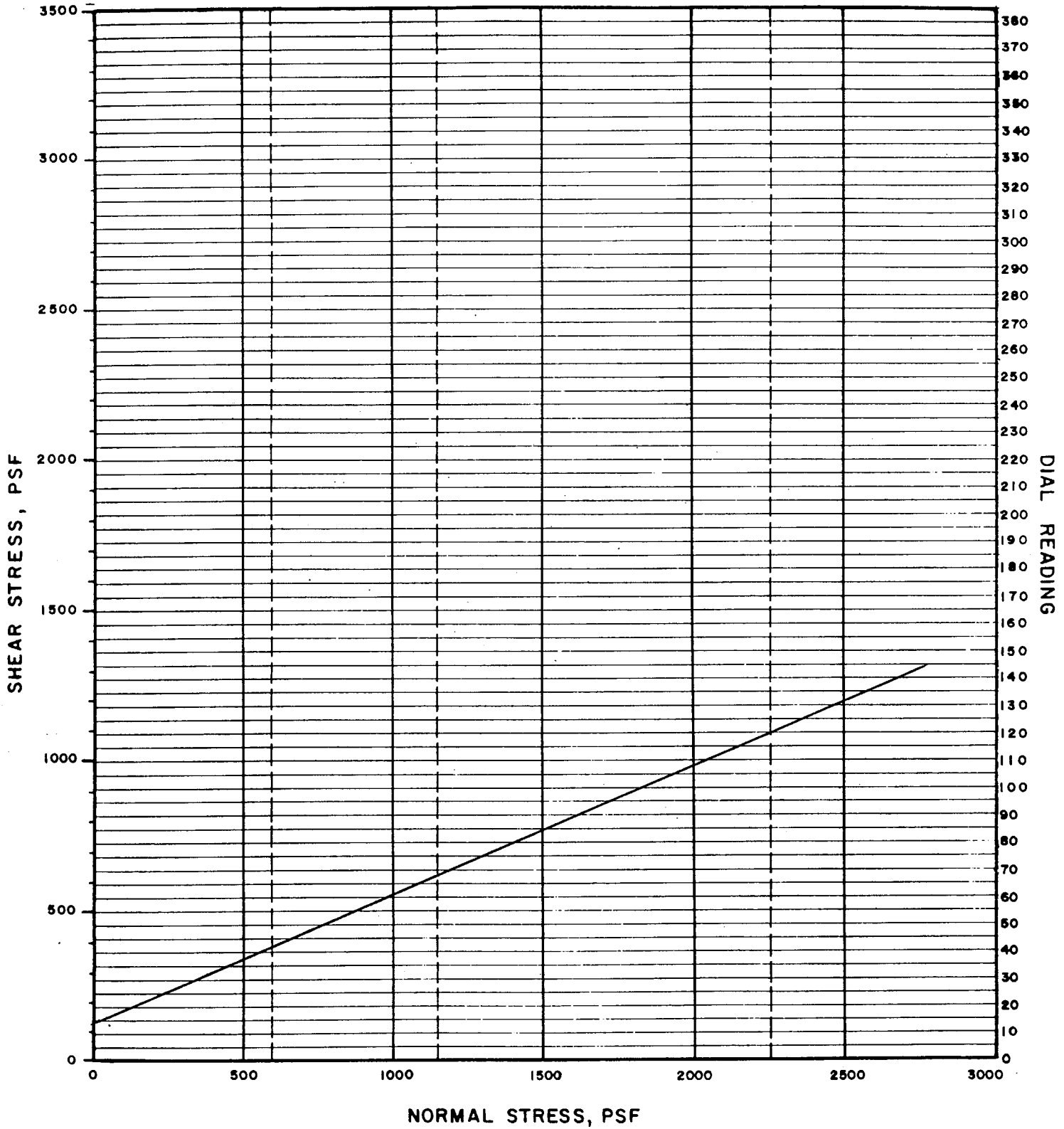
Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
1	33'	△	43°	0 psf	
2	8'	○	37°	140 psf	

DIRECT SHEAR SUMMARY



Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
1	35'	△	21°	350 psf	REMOLDED TO 90%
SURFACE SAMPLE	SURFACE	○	29°	130 psf	REMOLDED TO 90%

DIRECT SHEAR SUMMARY



Boring	Depth	Symbol	Friction Angle	Cohesion	Remarks
2	16°		23°	125 psf	RESIDUAL

PREVIOUS LABORATORY
TESTING BY OTHERS



APPENDIX B

Laboratory Testing

Moisture-Density Determinations

The dry unit weight and field moisture content were determined for each of the recovered barrel samples. The moisture-density information provides a gross indication of soil consistency and can assist in delineating local variations. The information can also be used to correlate soils or weakly lithified bedrock found on this site with soils on other sites in the general area. Sample locations and the corresponding test results are illustrated on the Boring Logs in Appendix A.

Compaction Tests

Representative bulk soil samples were tested to determine their maximum dry densities and optimum moisture contents per the ASTM D 1557-91 (Method A) procedure. The test method uses 25 blows of a 10-pound hammer falling 18 inches on each of 5 soil layers in a 1/30 cubic foot cylinder. Soil samples are tested at varying moisture contents to create a curve illustrating achieved dry density as a function of moisture content. The table in the following page presents the test results.

Table B-1
Maximum Density - Optimum Moisture Content Determinations

<i>Soil Classification</i>	<i>Location</i>	<i>Maximum Dry Density (pcf)</i>	<i>Optimum Moisture Content (%)</i>
Sandy Silt (ML)	B - 1P 20-30 ft.	120.5	10.0
Clayey Sand (SP-SC)	B - 2 5-10 ft.	130.0	8.5
Silty Clay (CL)	B - 6P 9-12½ ft.	119.5	13.0
Sandy Silt (ML)	B - 7 20-25 ft.	118.0	16.0
Silty Clay (CL)	B - 9P 12½-17½ ft	112.5	17.0
Sand (SP)	B - 11P	127.0	10.0



Soil Classification	Location	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
Clayey Sand (SP-SC)	0-5 ft.	123.5	10.0
	B - 14P 5-10 ft.		

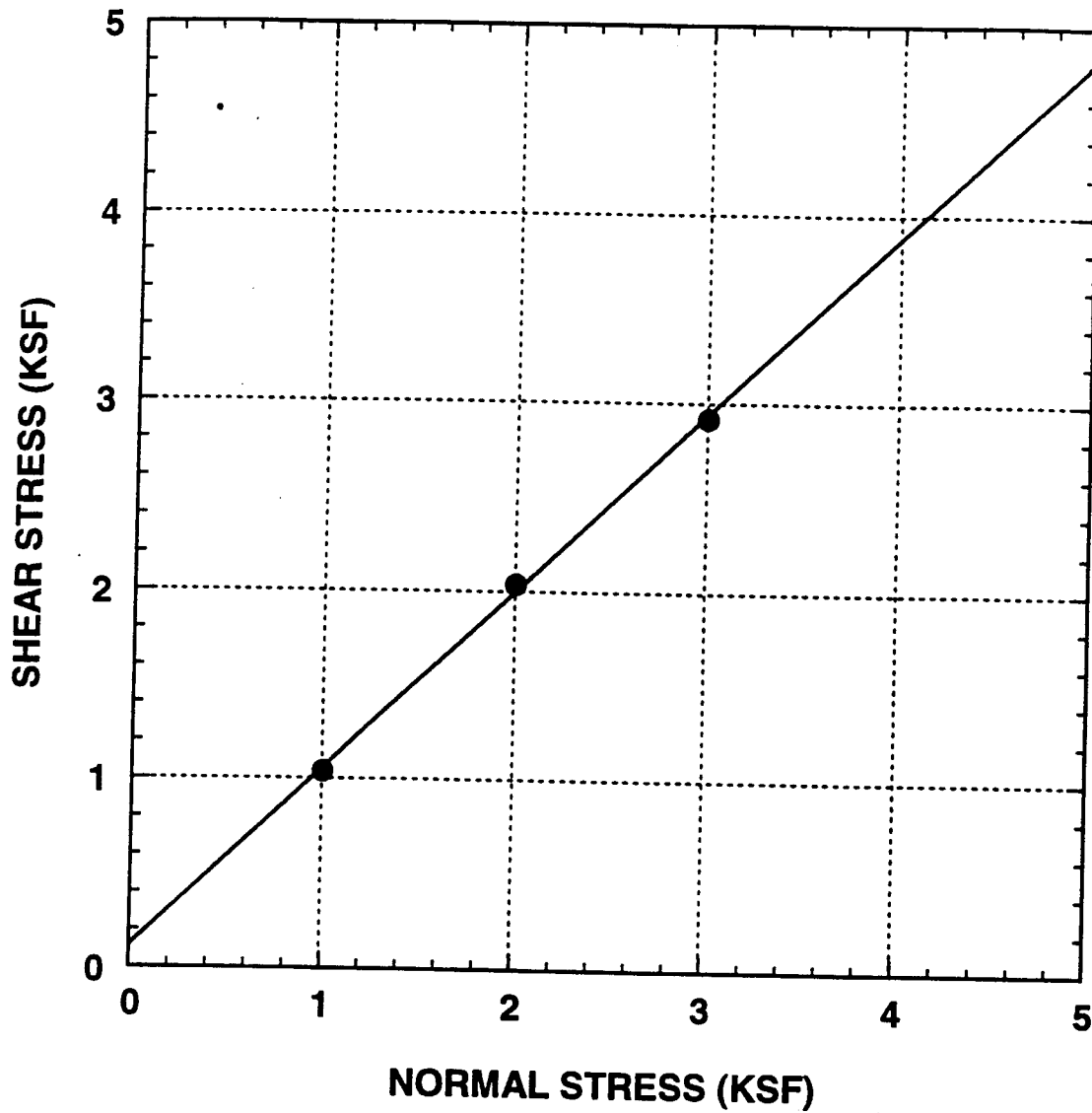
Strength Tests

Direct shear tests were performed on undisturbed samples collected from varying depths within representative Borings. The samples were tested at field moisture contents, and tested in a direct shear machine of the strain control type. Test samples are retained within standard one-inch-high brass rings. Samples were tested at increasing normal loads to determine the Mohr-Coulomb shear strength parameters presented on Figures B-1 through B-39.

Consolidation Tests - (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, laterally confined soil sample. The apparatus is designed to accept a one-inch-high brass ring containing an undisturbed or remolded soil sample. During each load increment, vertical compression (consolidation) of the sample is measured and recorded at selected time intervals. Porous stones are placed in contact with both sides of the specimen to permit the ready addition or release of water. Undisturbed samples were initially at field moisture content, and were subsequently inundated at a load near the existing overburden pressure to determine soil behavior under saturated conditions. The test results are plotted graphically on Figures B-40 through B-42.

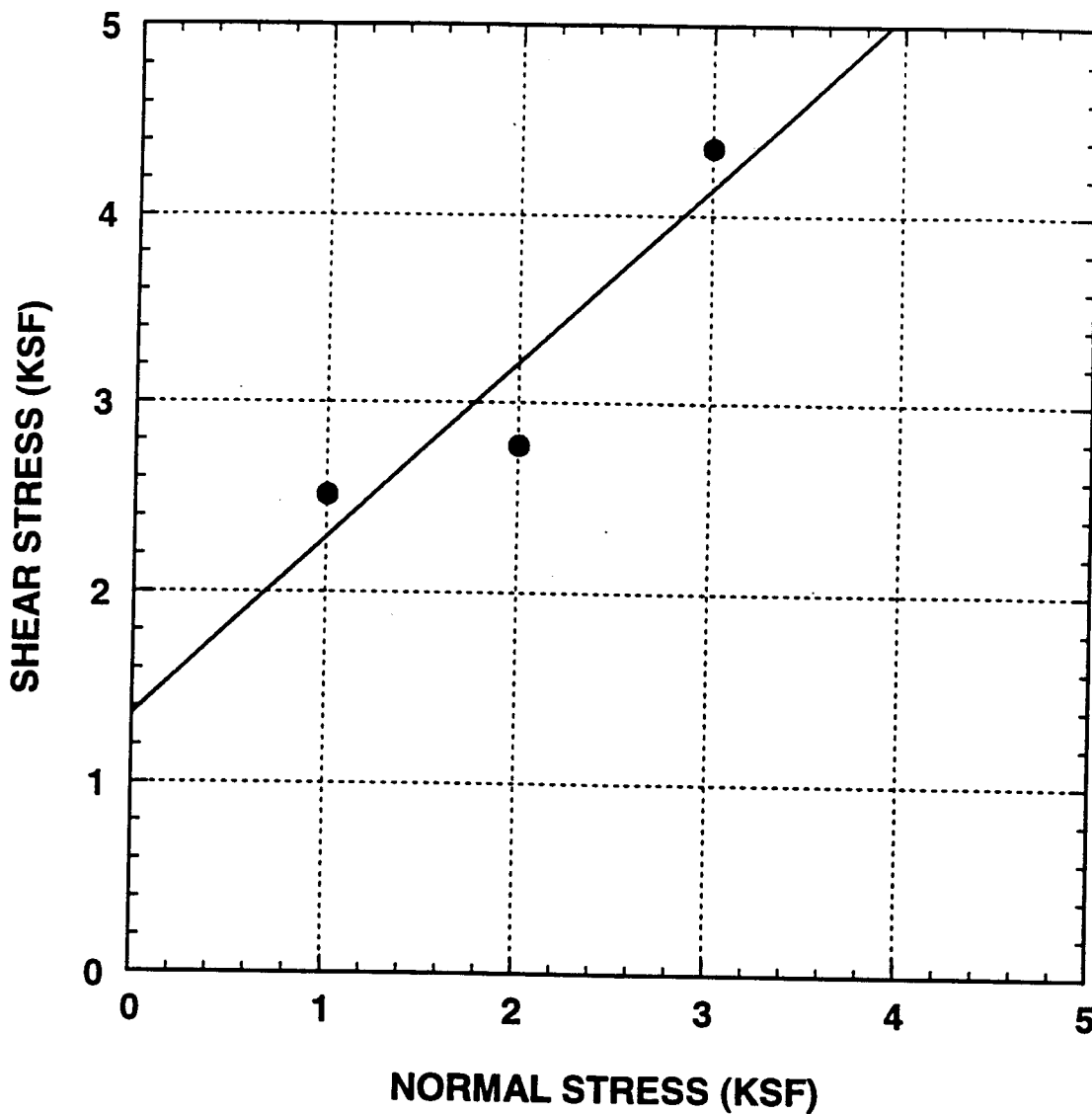
DIRECT SHEAR TEST DIAGRAM



$C = 100 \text{ psf} \quad \phi = 43^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 1	

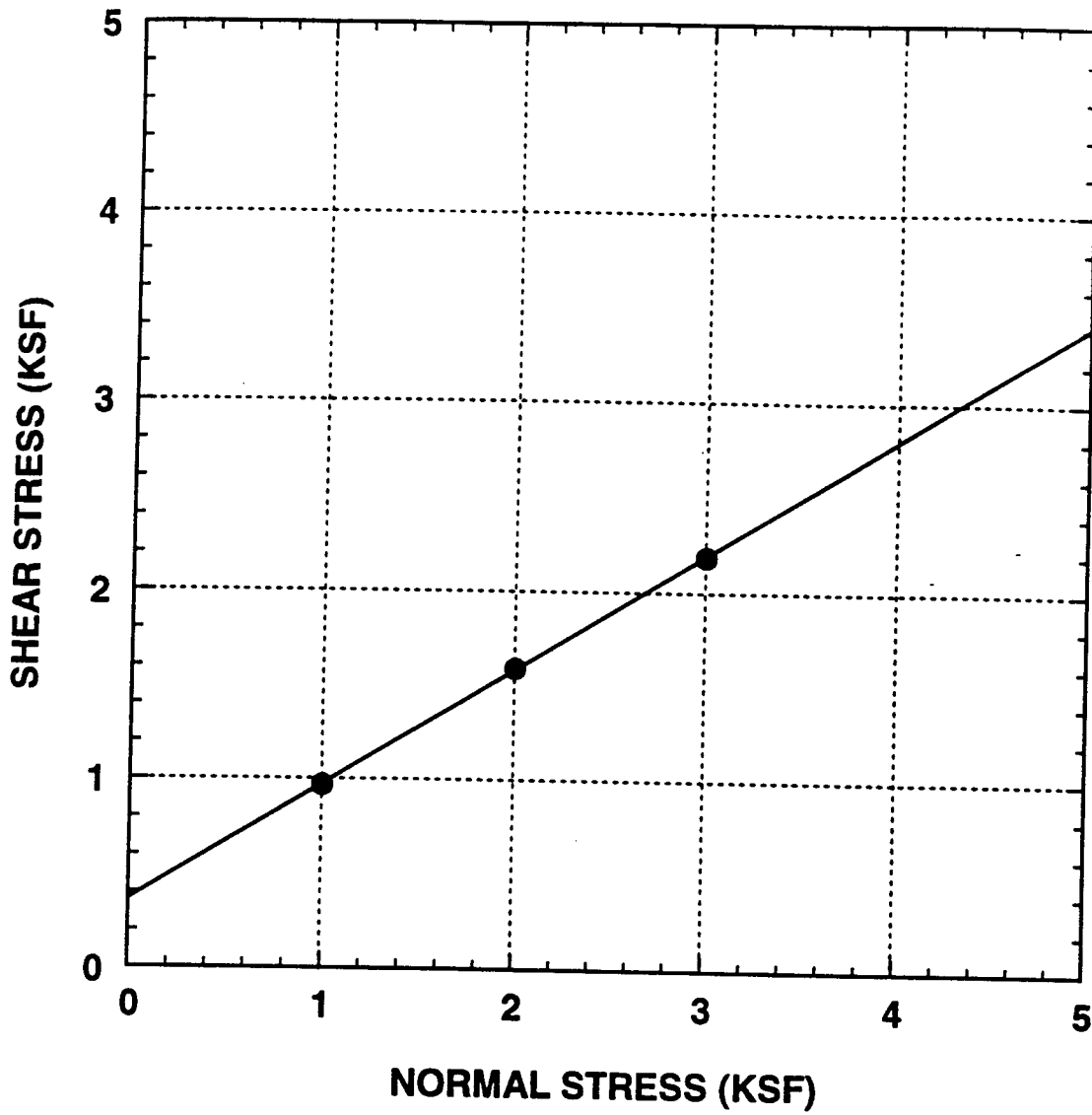
DIRECT SHEAR TEST DIAGRAM



$C = 1400 \text{ psf} \quad \phi = 42^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 2	

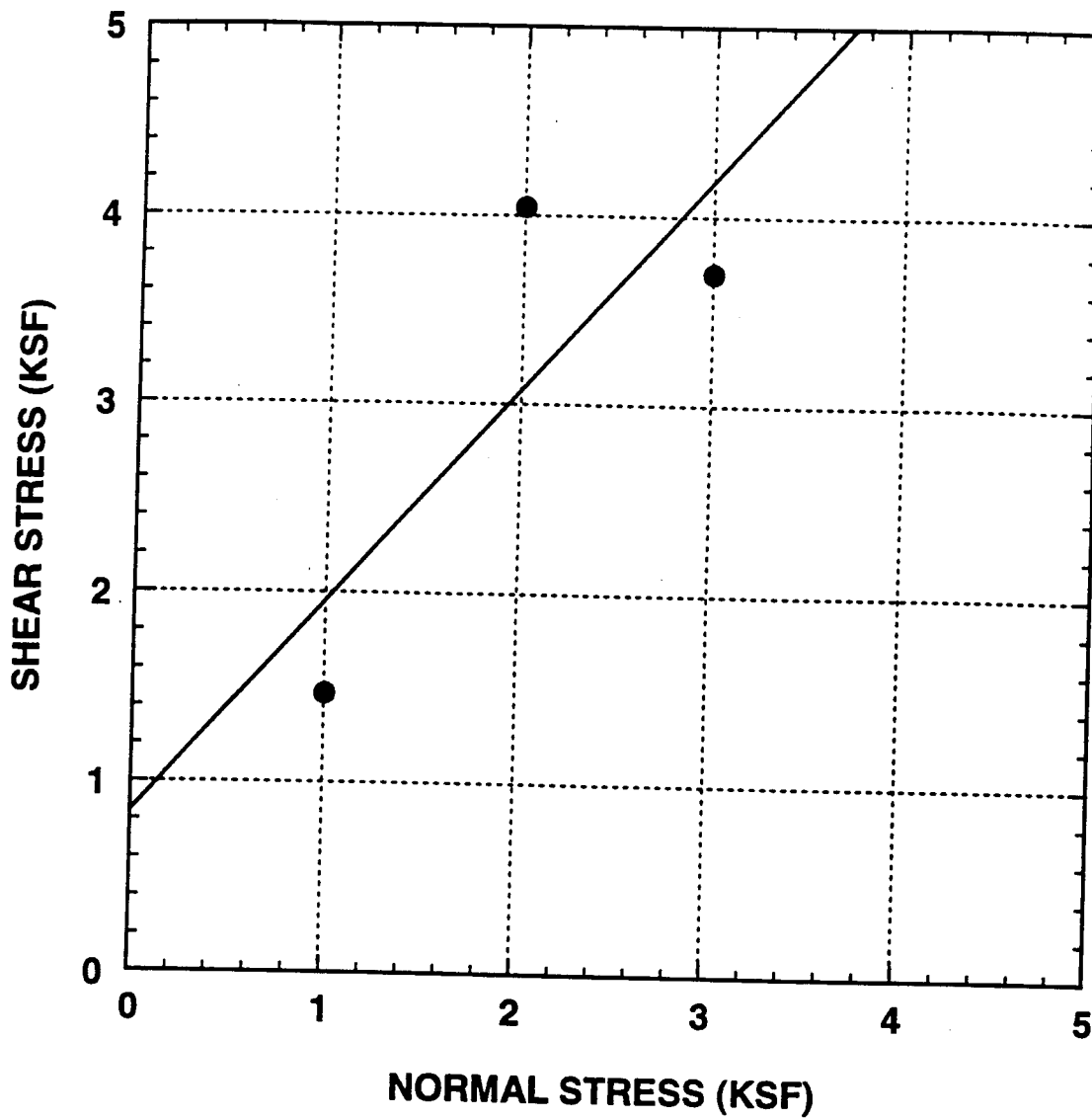
DIRECT SHEAR TEST DIAGRAM



$C = 375 \text{ psf} \quad \phi = 31^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 3	

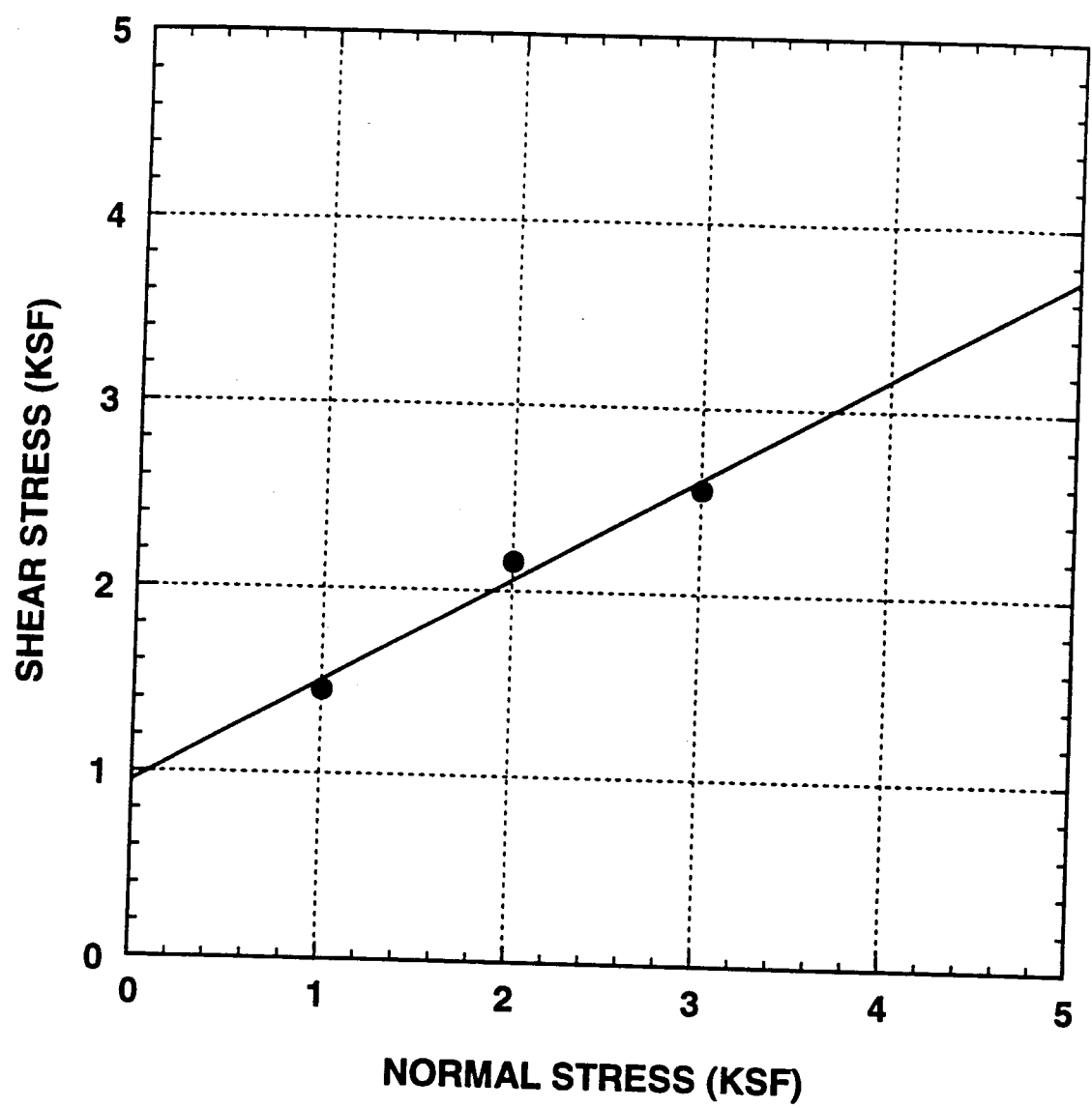
DIRECT SHEAR TEST DIAGRAM



$C = 850 \text{ psf} \quad \phi = 48^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 4	

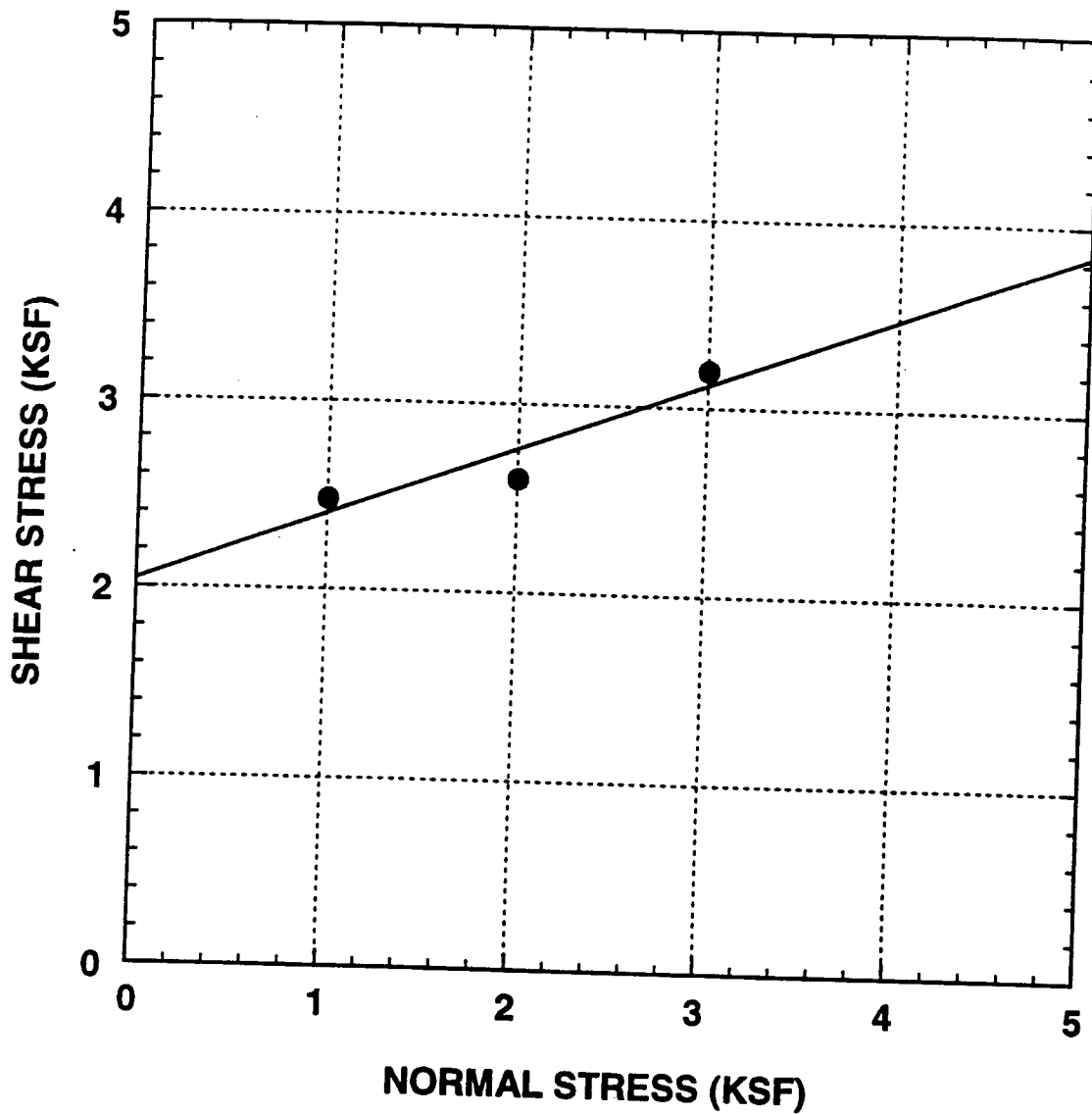
DIRECT SHEAR TEST DIAGRAM



$C = 950 \text{ psf} \quad \phi = 29^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 1P	Depth: 50'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 5	

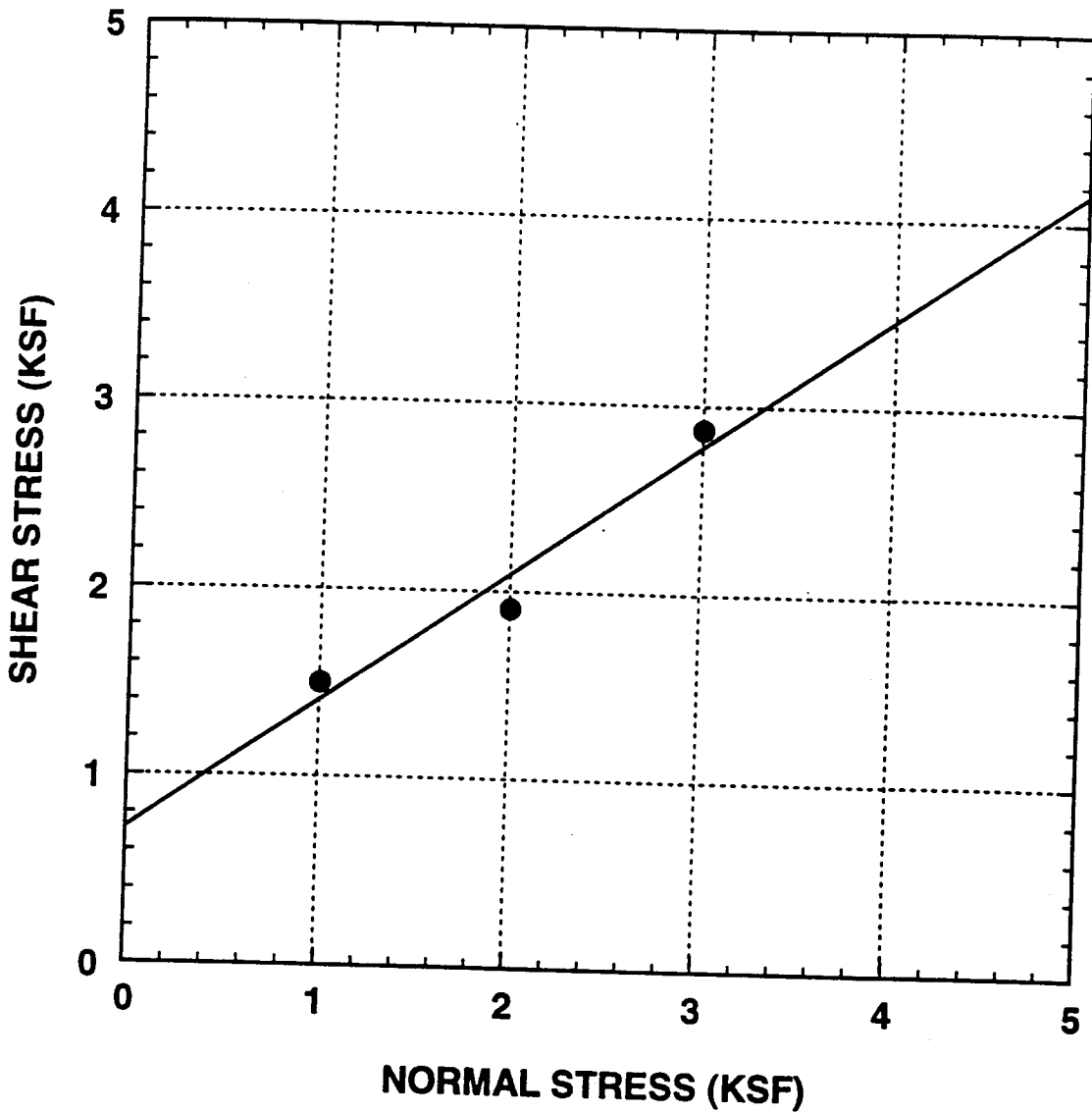
DIRECT SHEAR TEST DIAGRAM



$C = 2050 \text{ psf} \quad \phi = 20^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 6	

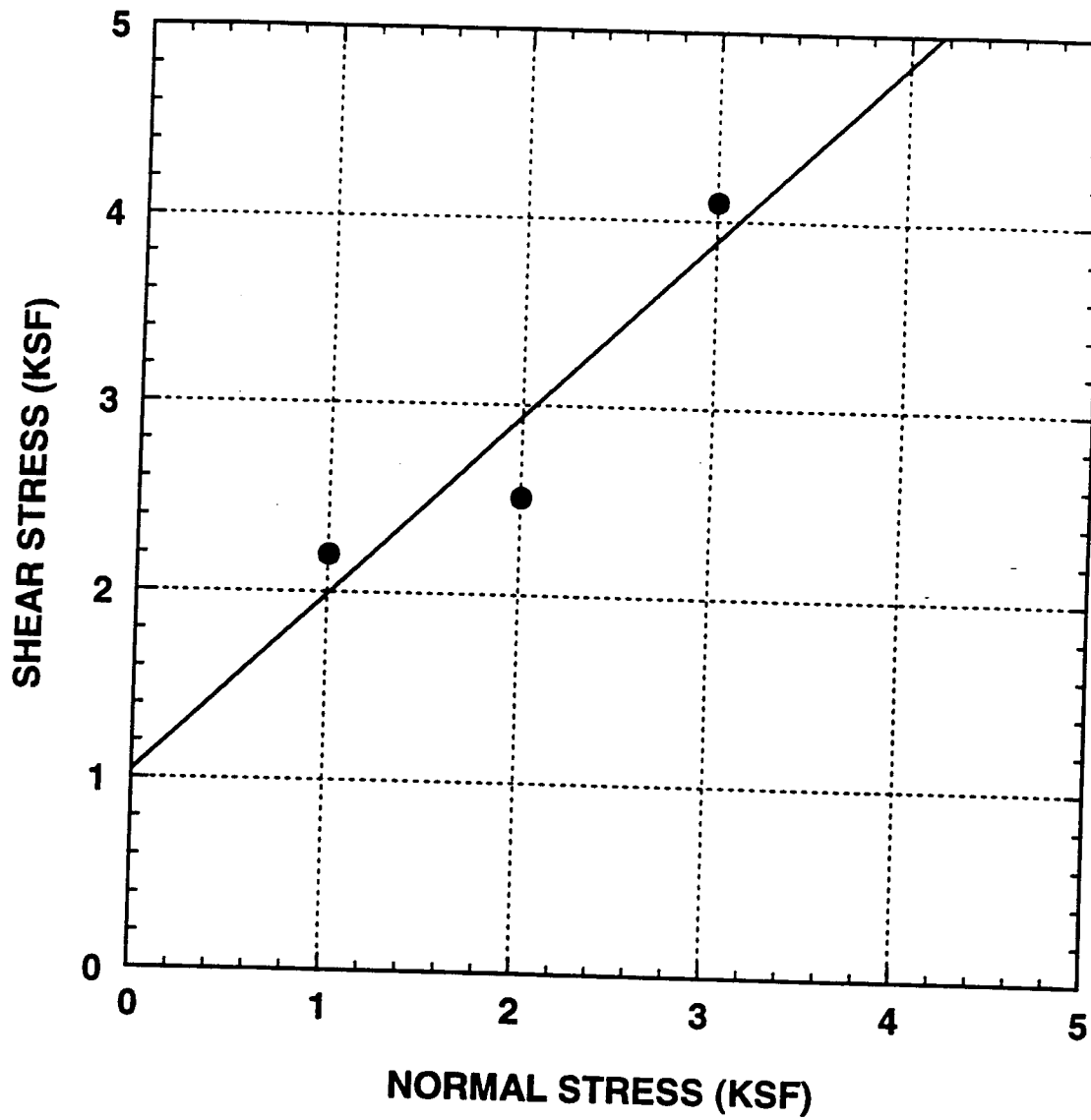
DIRECT SHEAR TEST DIAGRAM



$C = 700 \text{ psf} \quad \phi = 34^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 4P	Depth: 15'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 7	

DIRECT SHEAR TEST DIAGRAM



$C = 1050 \text{ psf} \quad \phi = 43^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 4P

Depth: 20'

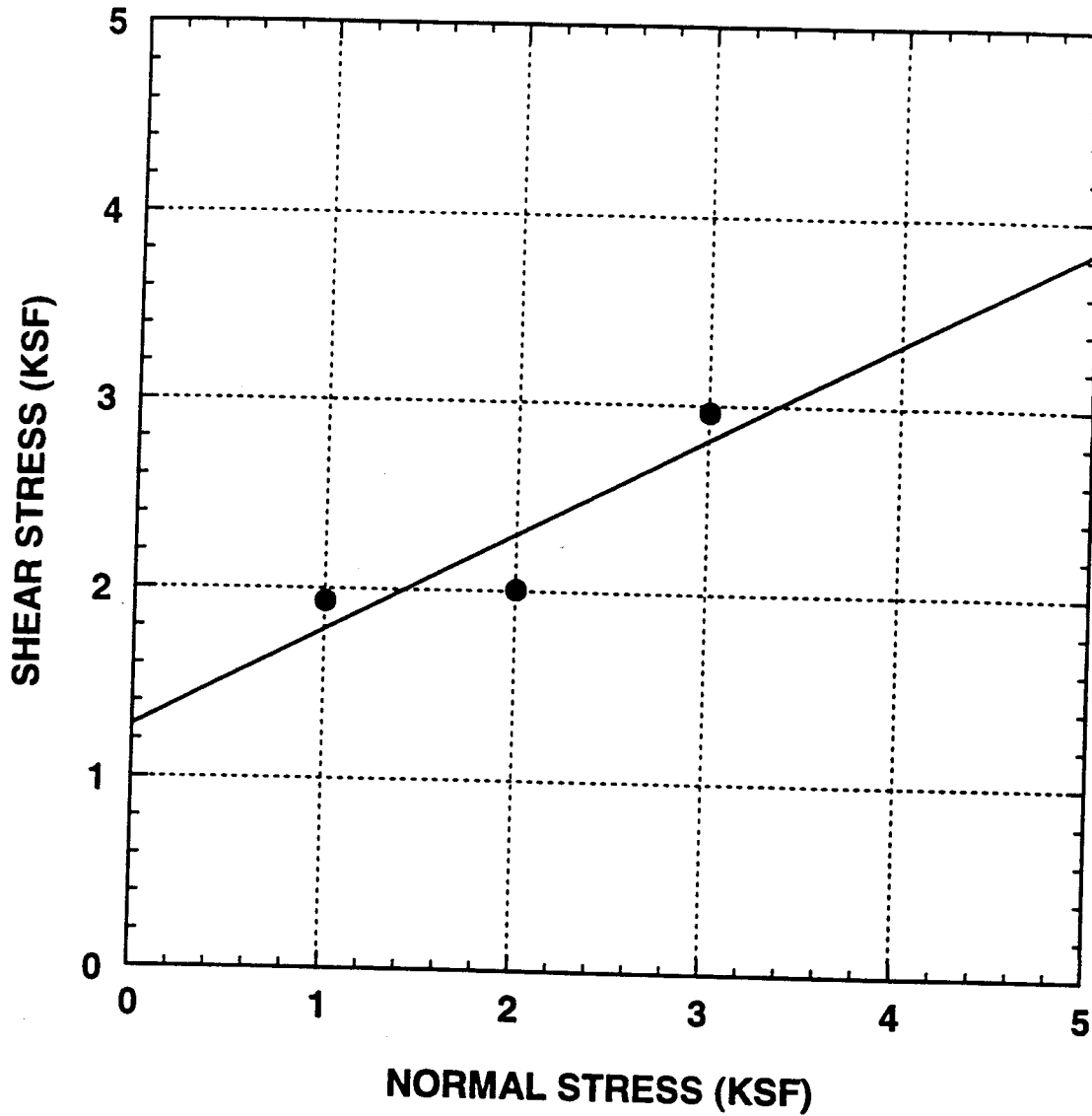
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 8

DIRECT SHEAR TEST DIAGRAM



$$C = 1250 \text{ psf} \quad \phi = 27^\circ$$

Test Condition: Undisturbed at Field Moisture

Location: B - 4P

Depth: 35'

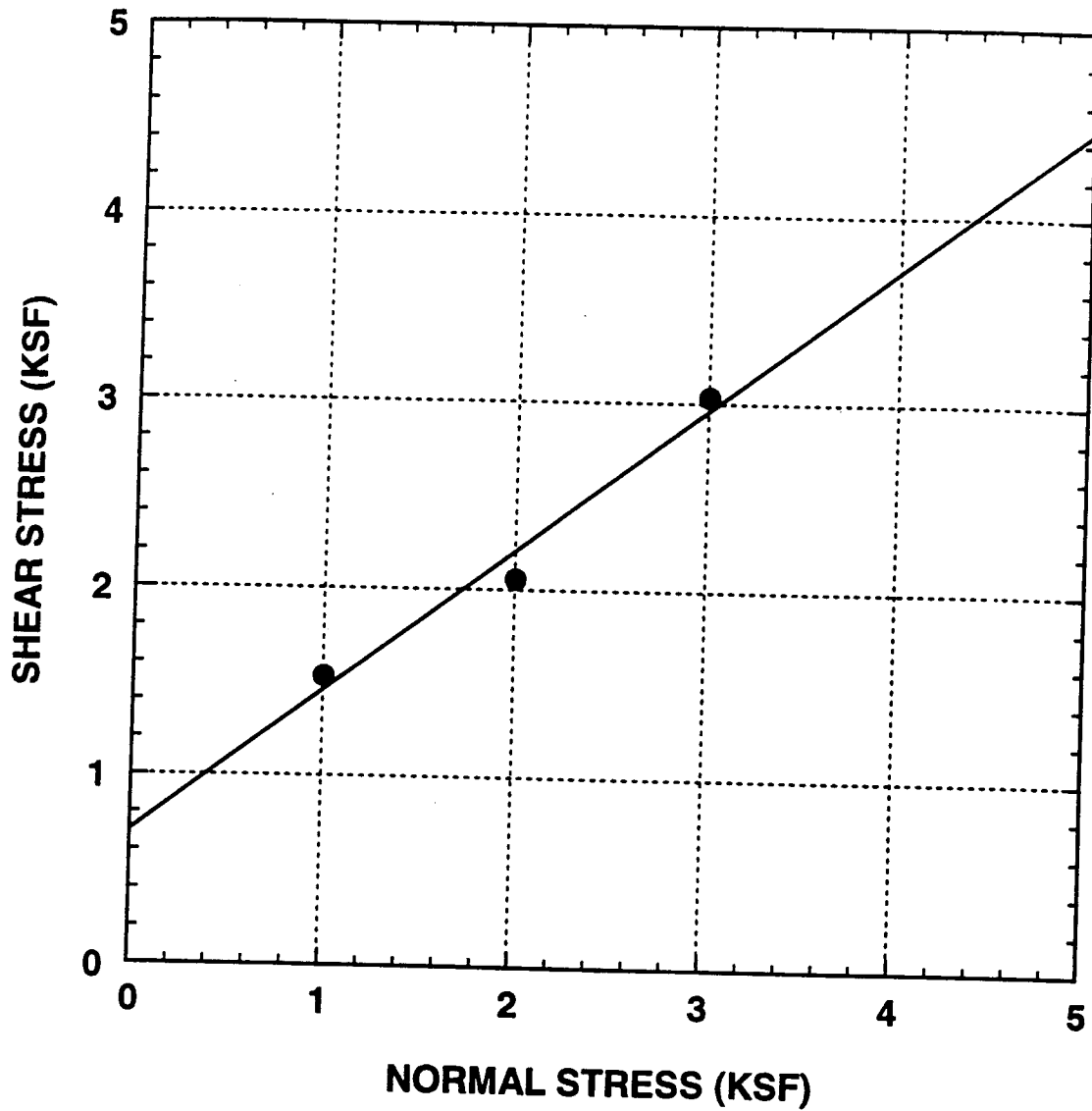
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 9

DIRECT SHEAR TEST DIAGRAM



$C = 750 \text{ psf} \quad \phi = 35^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 4P

Depth: 55'

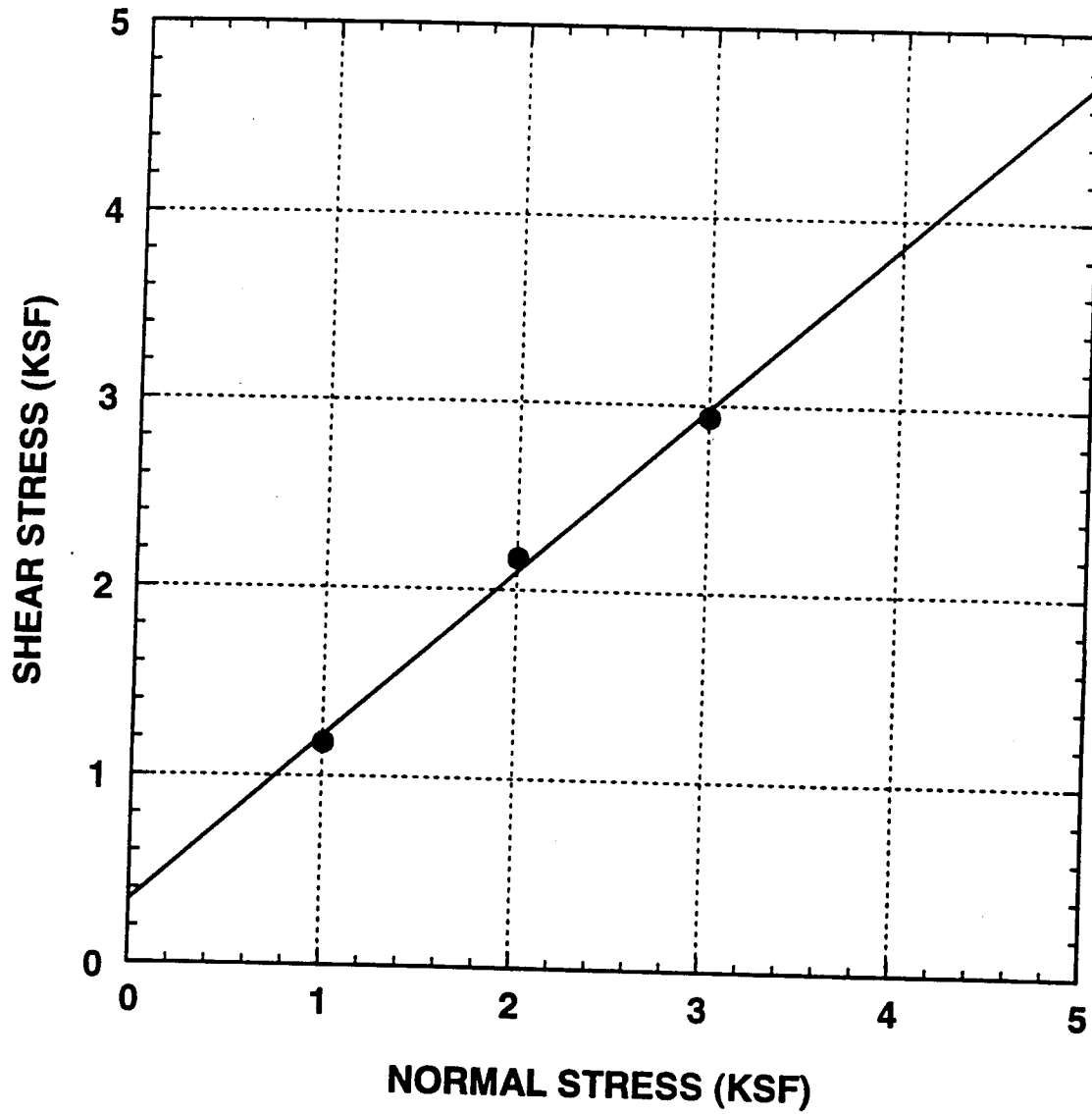
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 10

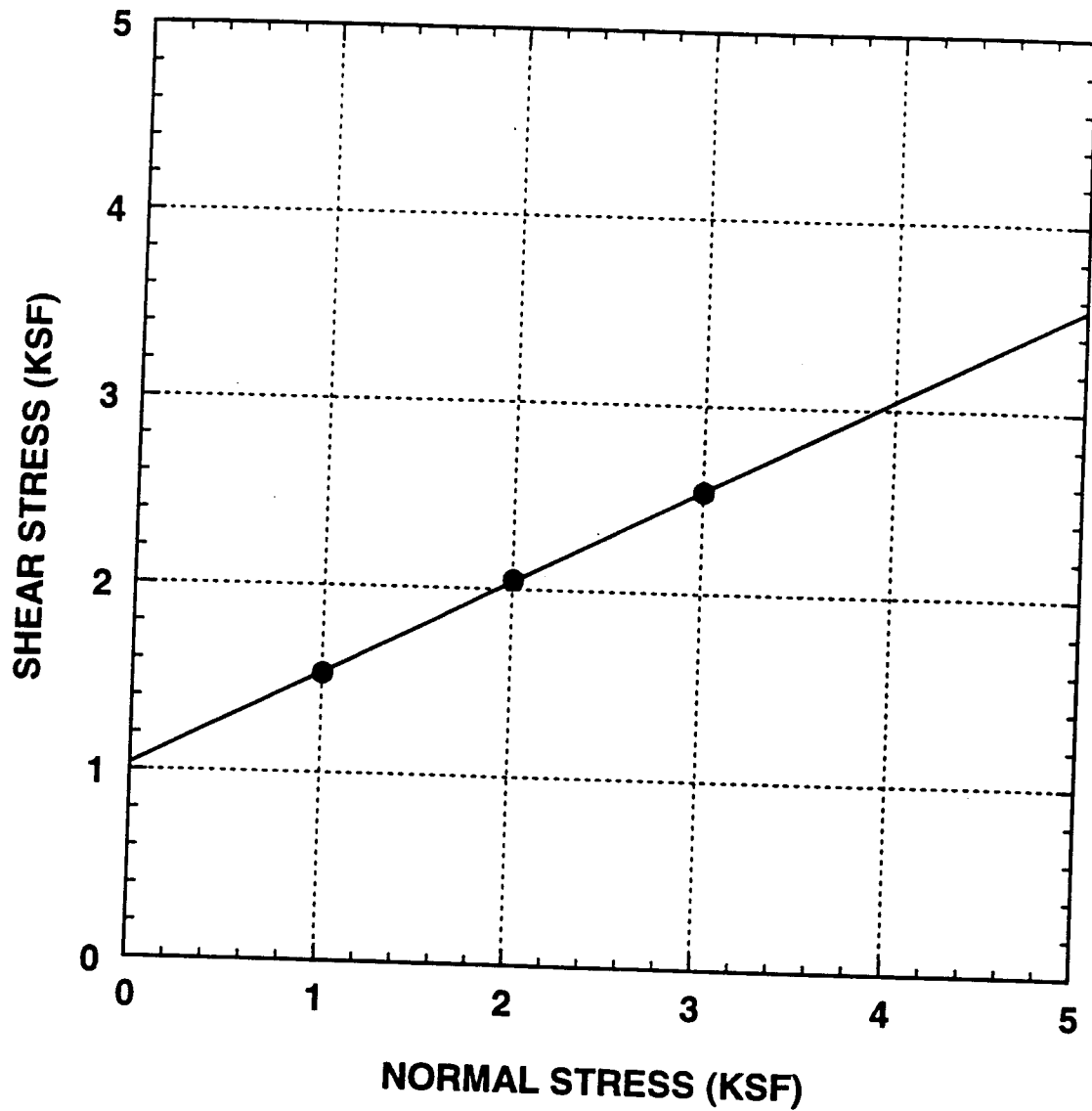
DIRECT SHEAR TEST DIAGRAM



$C = 350 \text{ psf} \quad \phi = 41^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 11	

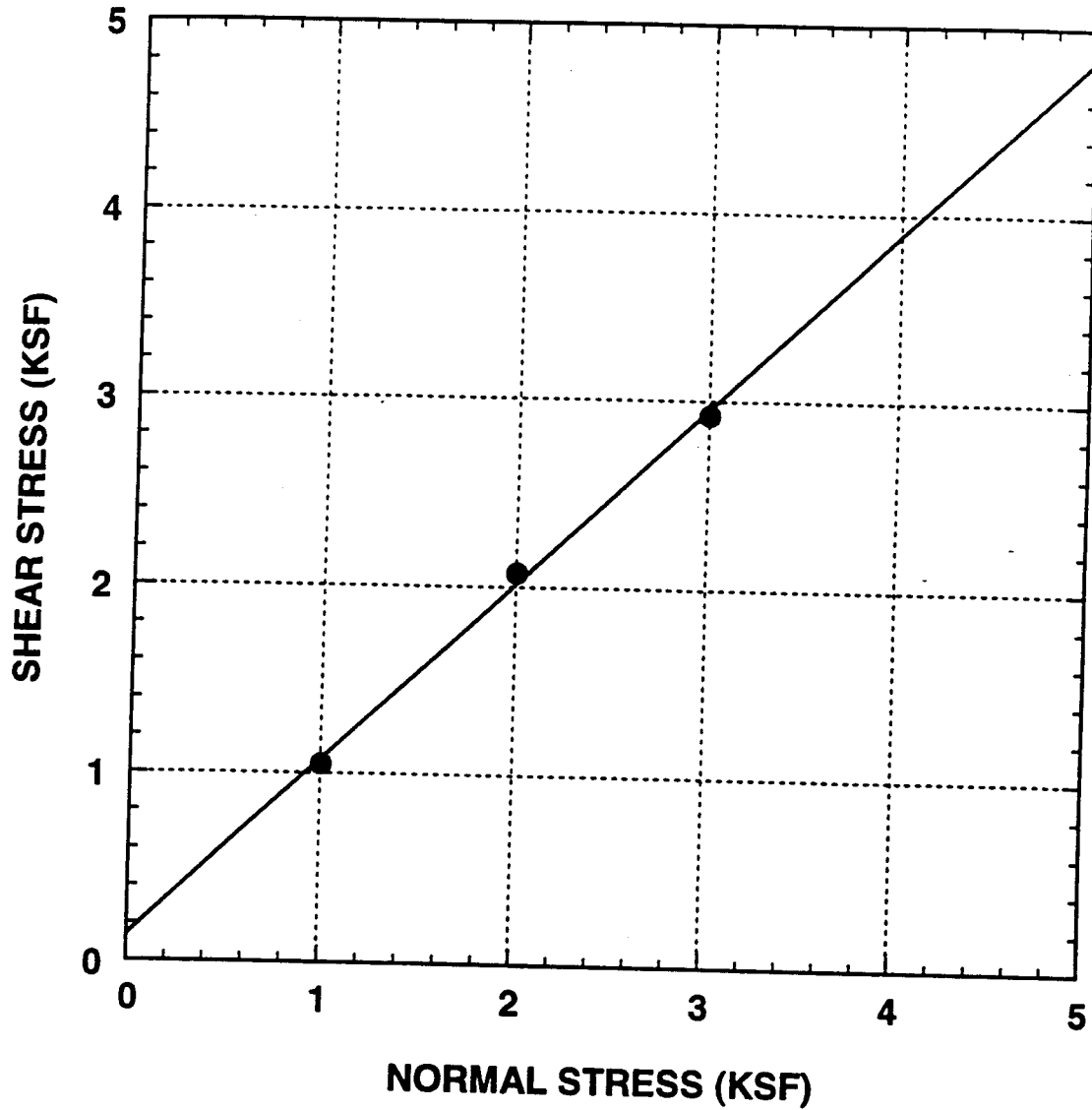
DIRECT SHEAR TEST DIAGRAM



$C = 1025 \text{ psf} \quad \phi = 27^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 12	

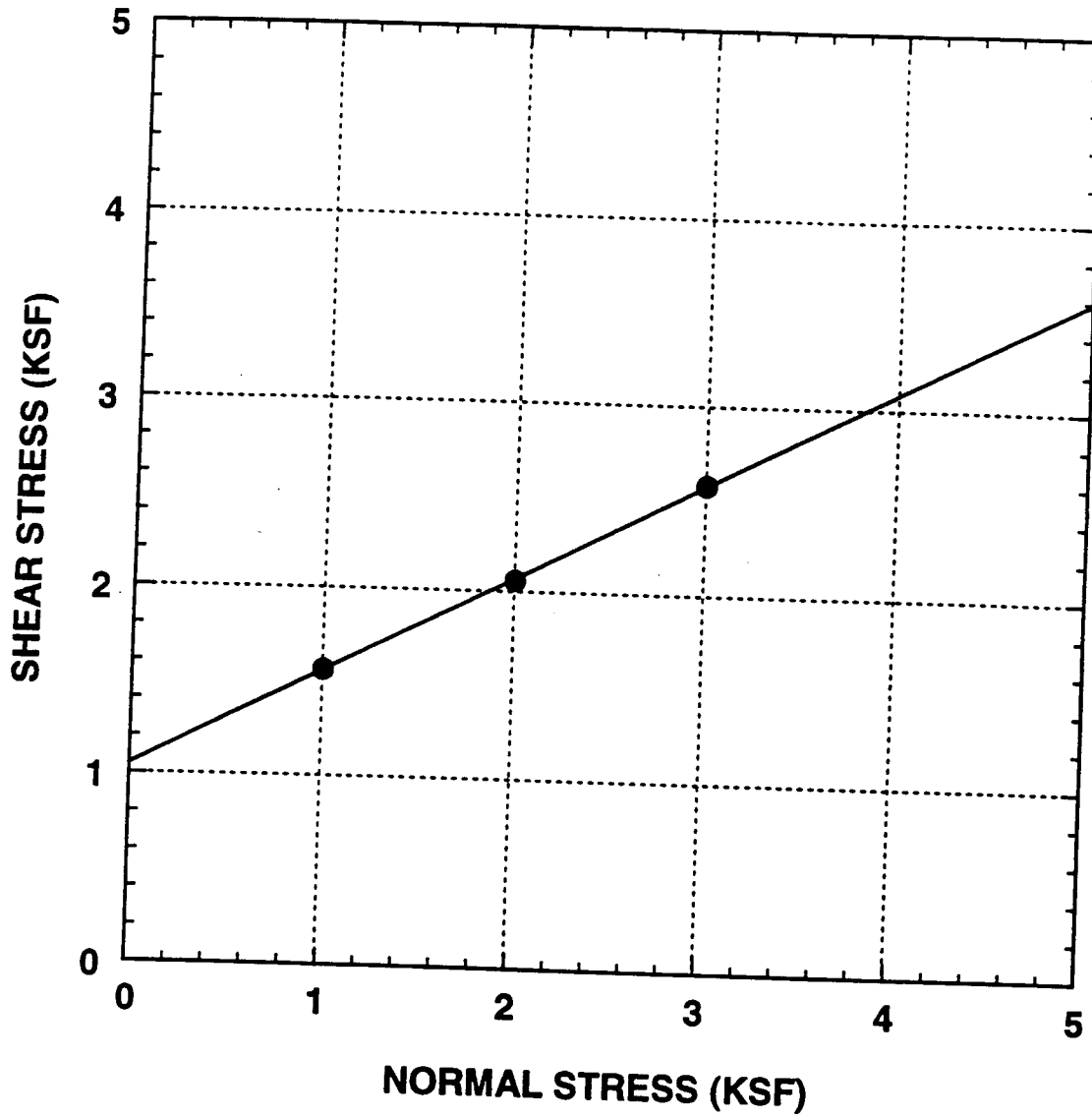
DIRECT SHEAR TEST DIAGRAM



$C = 125 \text{ psf} \quad \phi = 43^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 13	

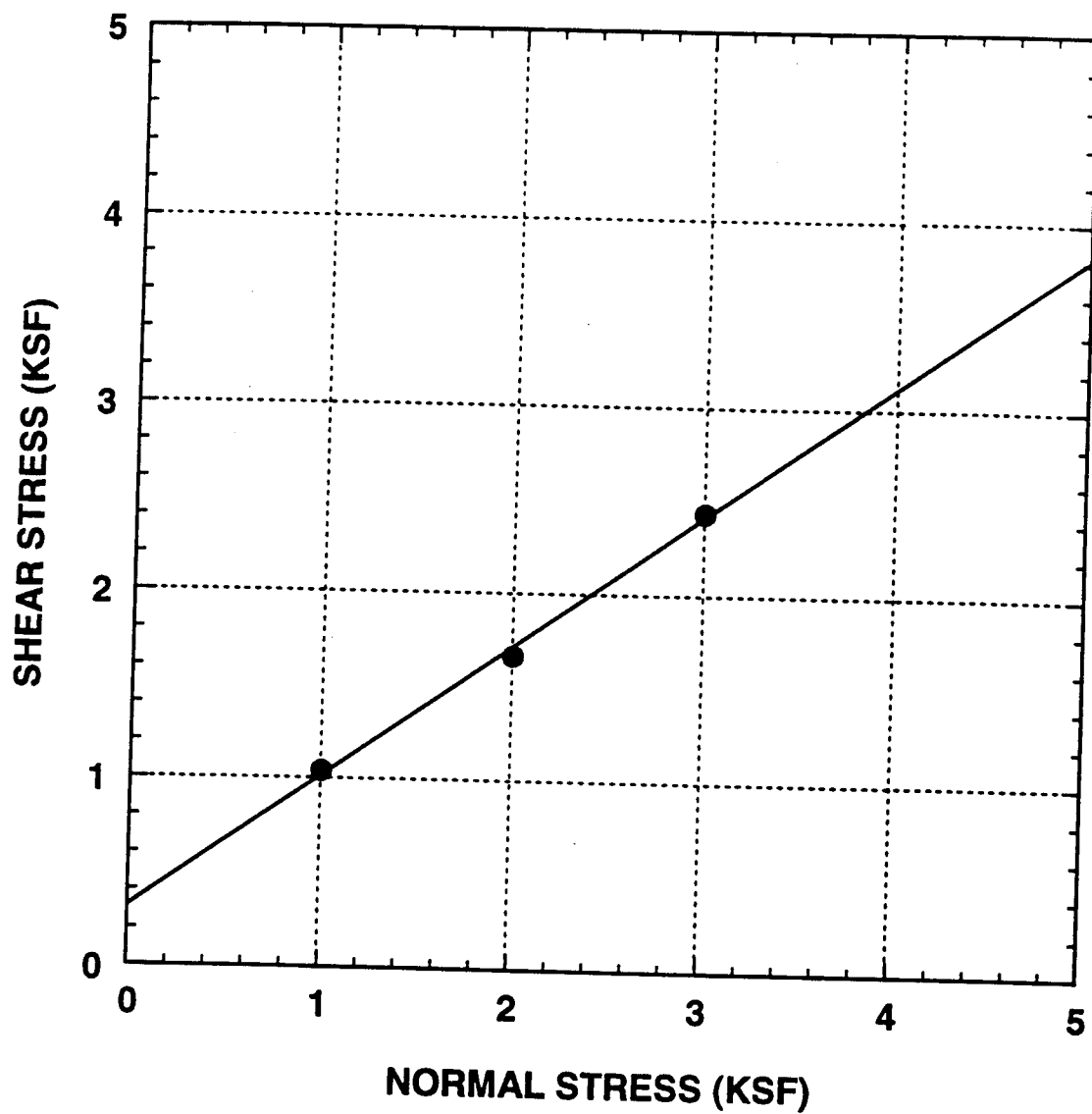
DIRECT SHEAR TEST DIAGRAM



$C = 1050 \text{ psf} \quad \phi = 27^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 14	

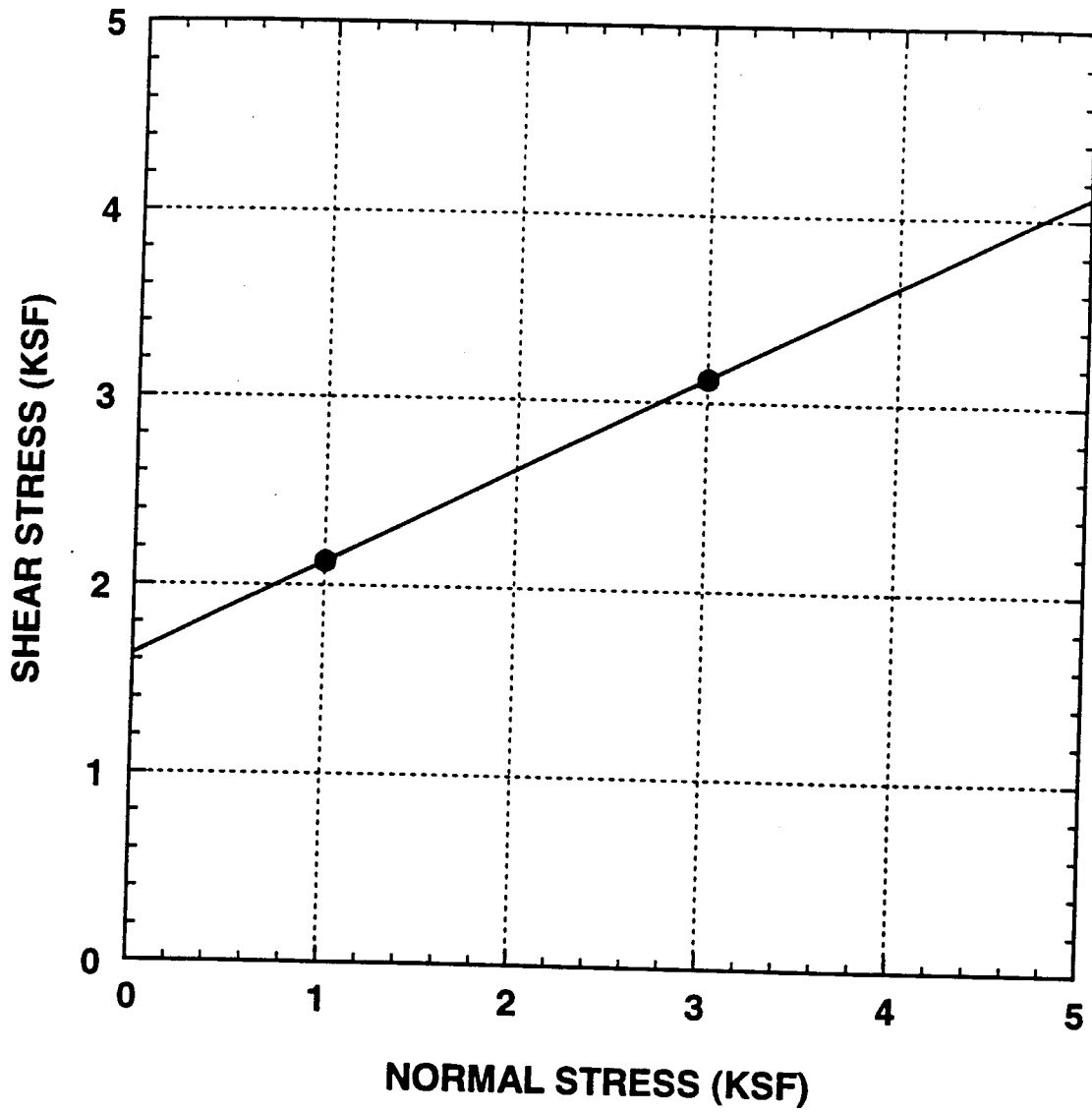
DIRECT SHEAR TEST DIAGRAM



$C = 300 \text{ psf} \quad \phi = 35^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 35'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 15	

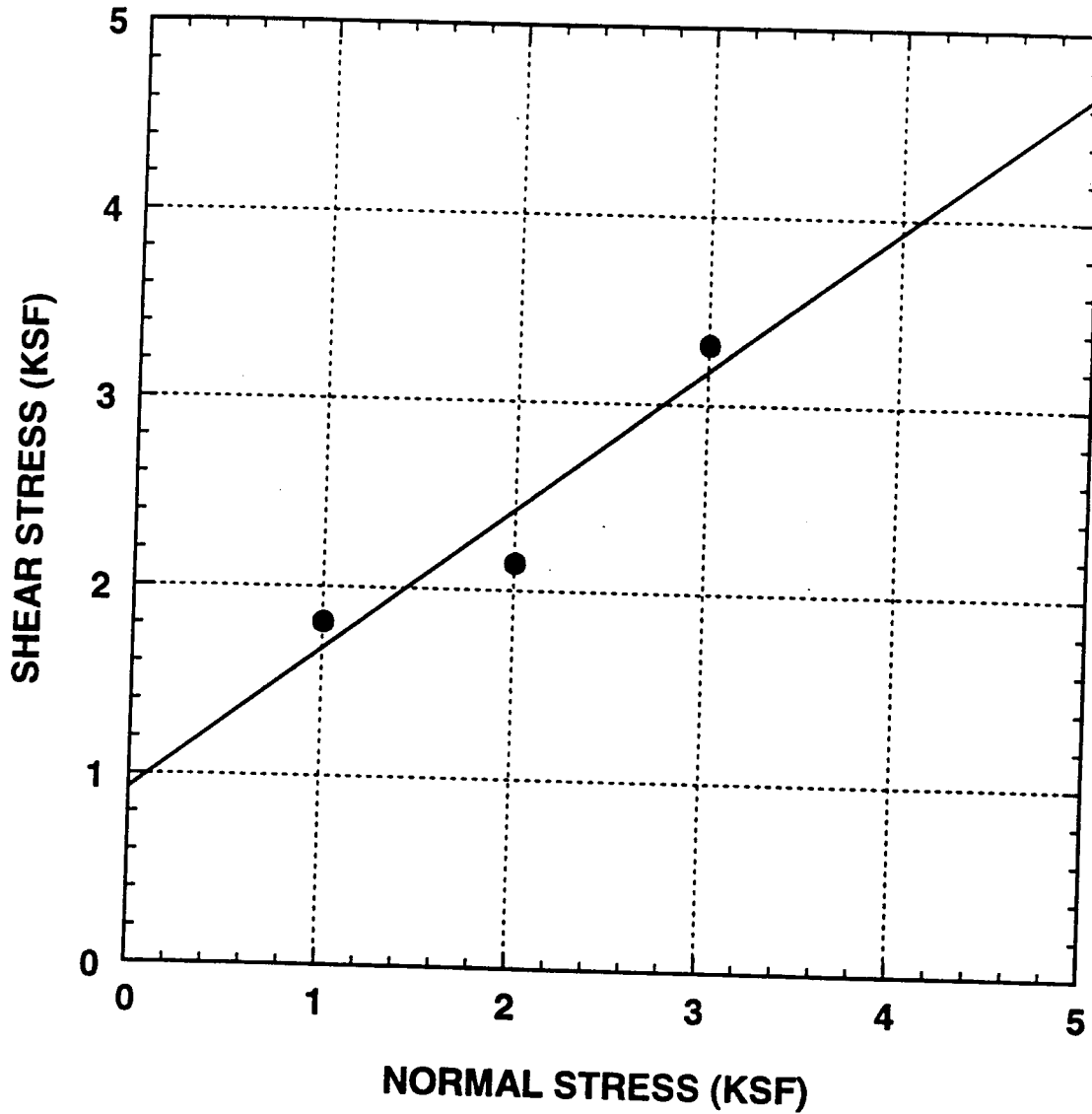
DIRECT SHEAR TEST DIAGRAM



$C = 1625 \text{ psf} \quad \phi = 26^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 7	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 16	

DIRECT SHEAR TEST DIAGRAM



$C = 925 \text{ psf} \quad \phi = 37^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 7

Depth: 55'

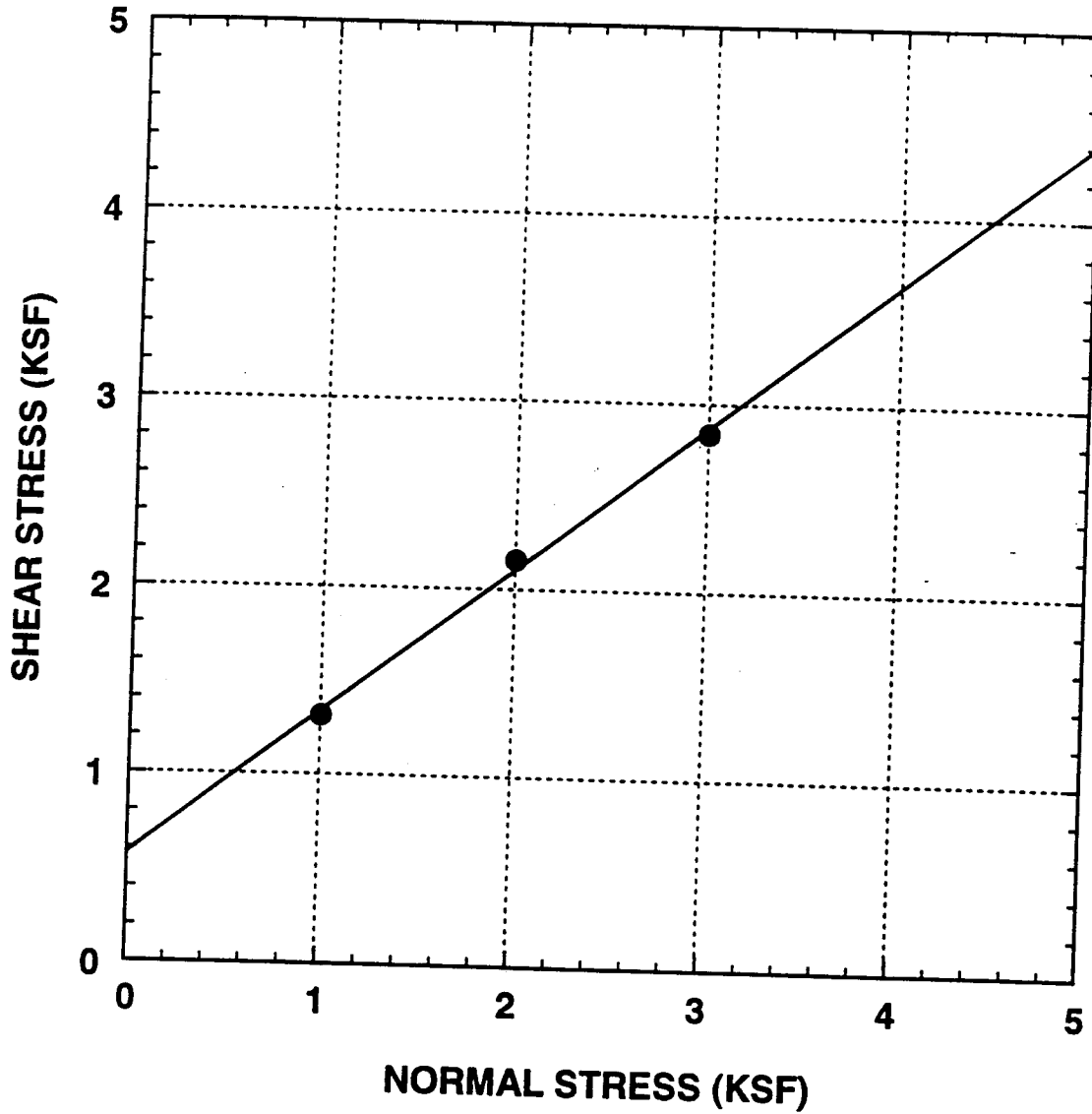
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 17

DIRECT SHEAR TEST DIAGRAM



$C = 575 \text{ psf} \quad \phi = 37^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 9P

Depth: 2.5'

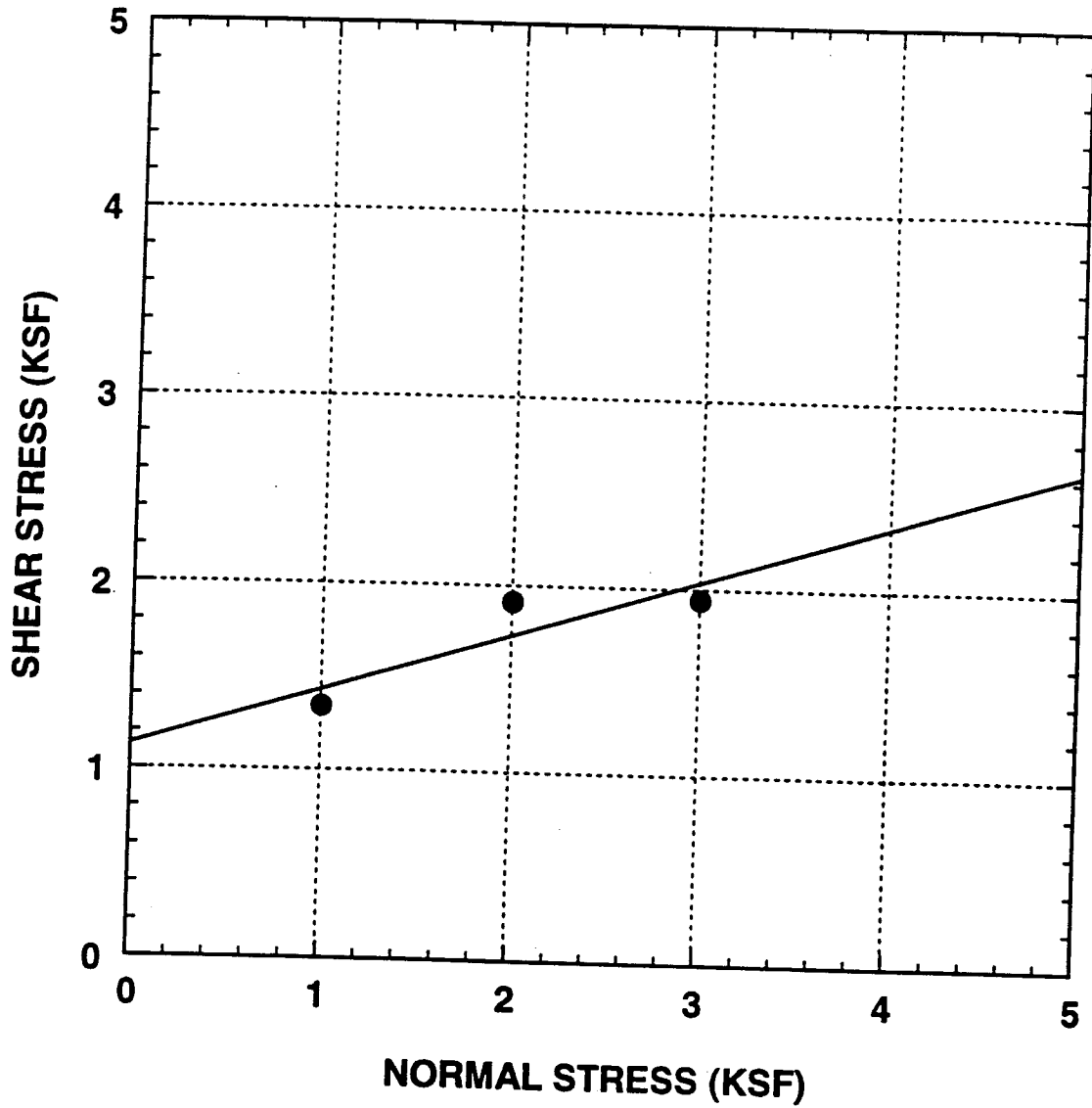
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 18

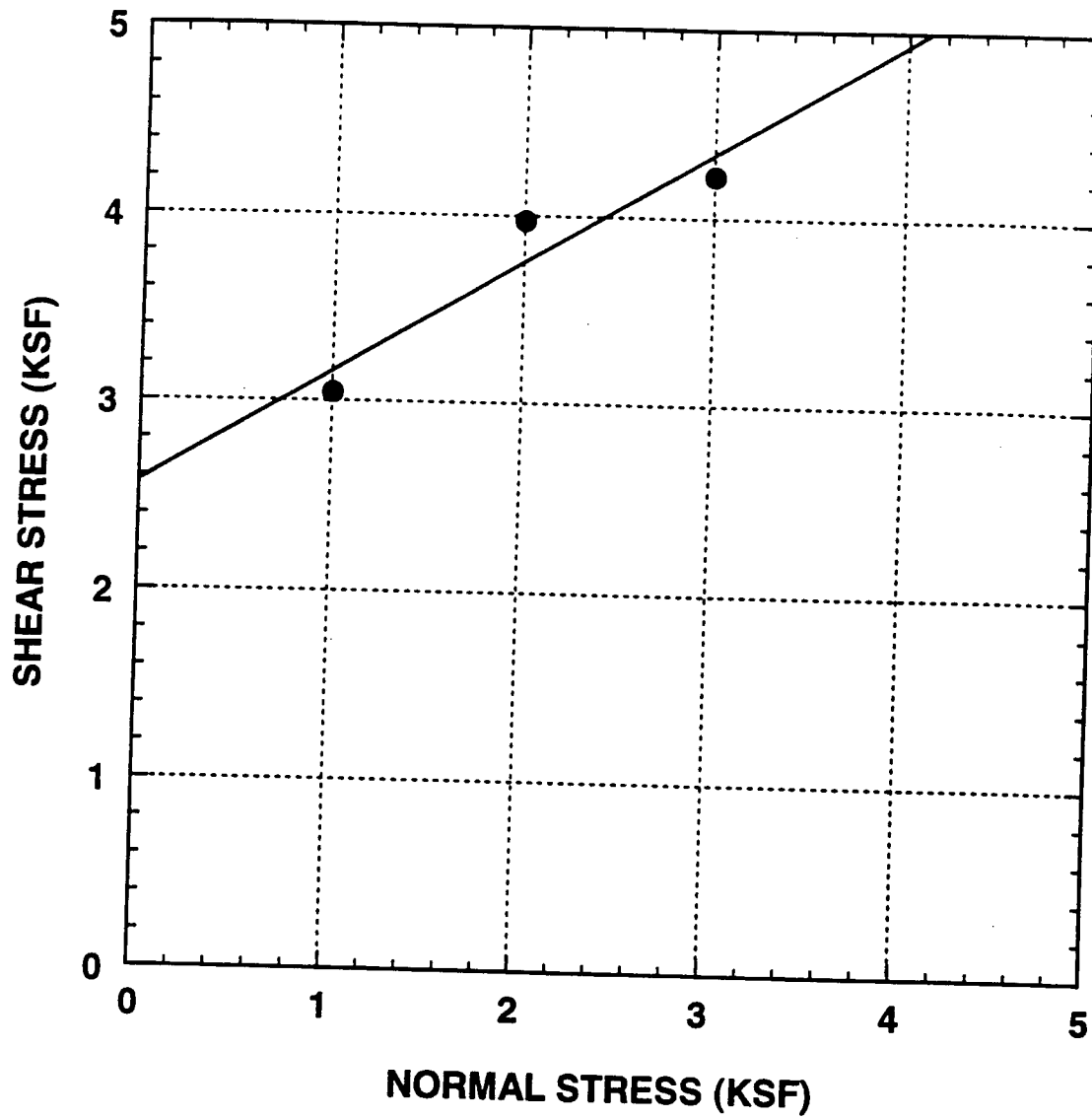
DIRECT SHEAR TEST DIAGRAM



$C = 1125 \text{ psf} \quad \phi = 17^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 7.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 19	

DIRECT SHEAR TEST DIAGRAM



$C = 2575 \text{ psf} \quad \phi = 30^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 9P

Depth: 12.5'

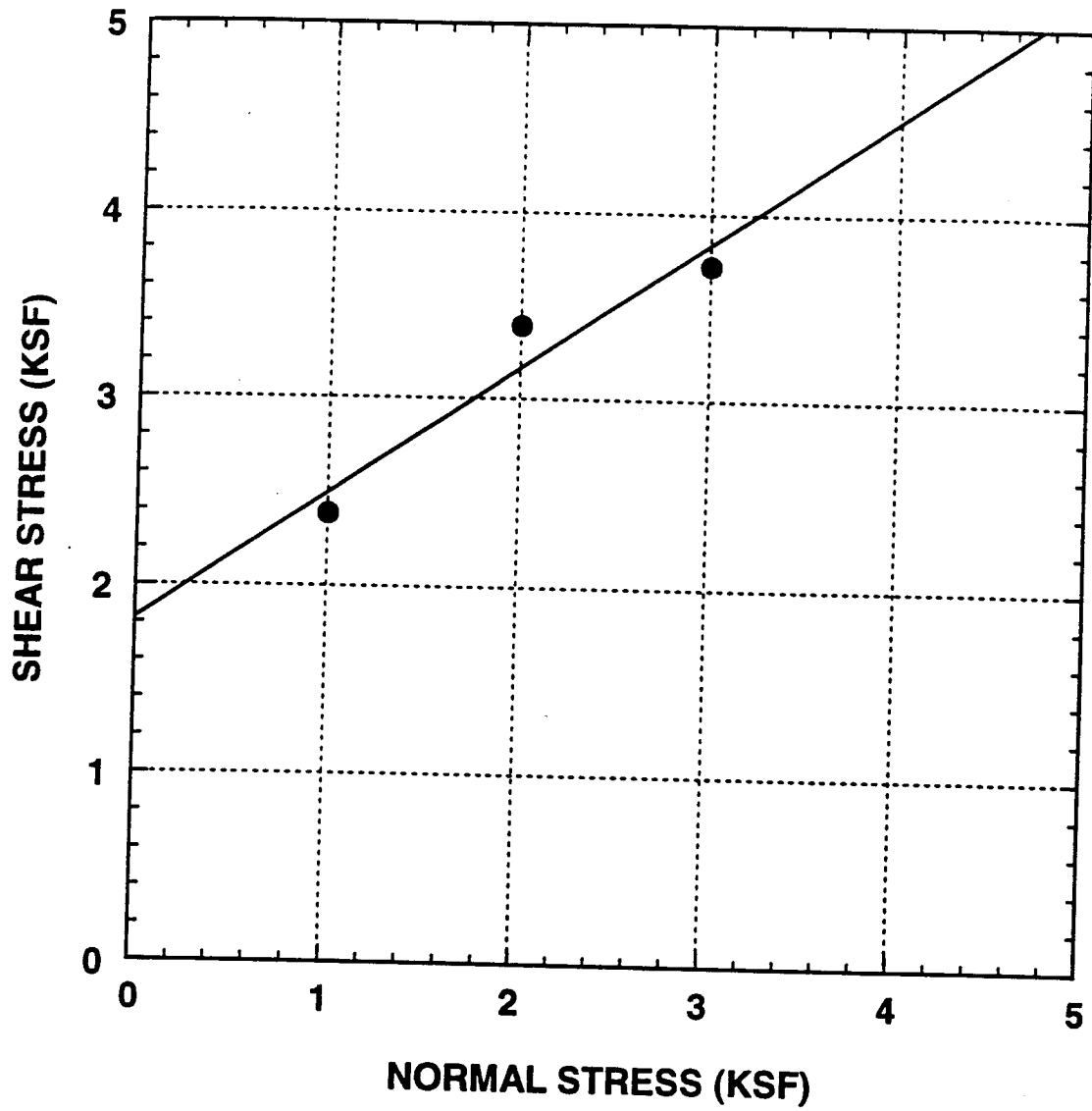
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 20

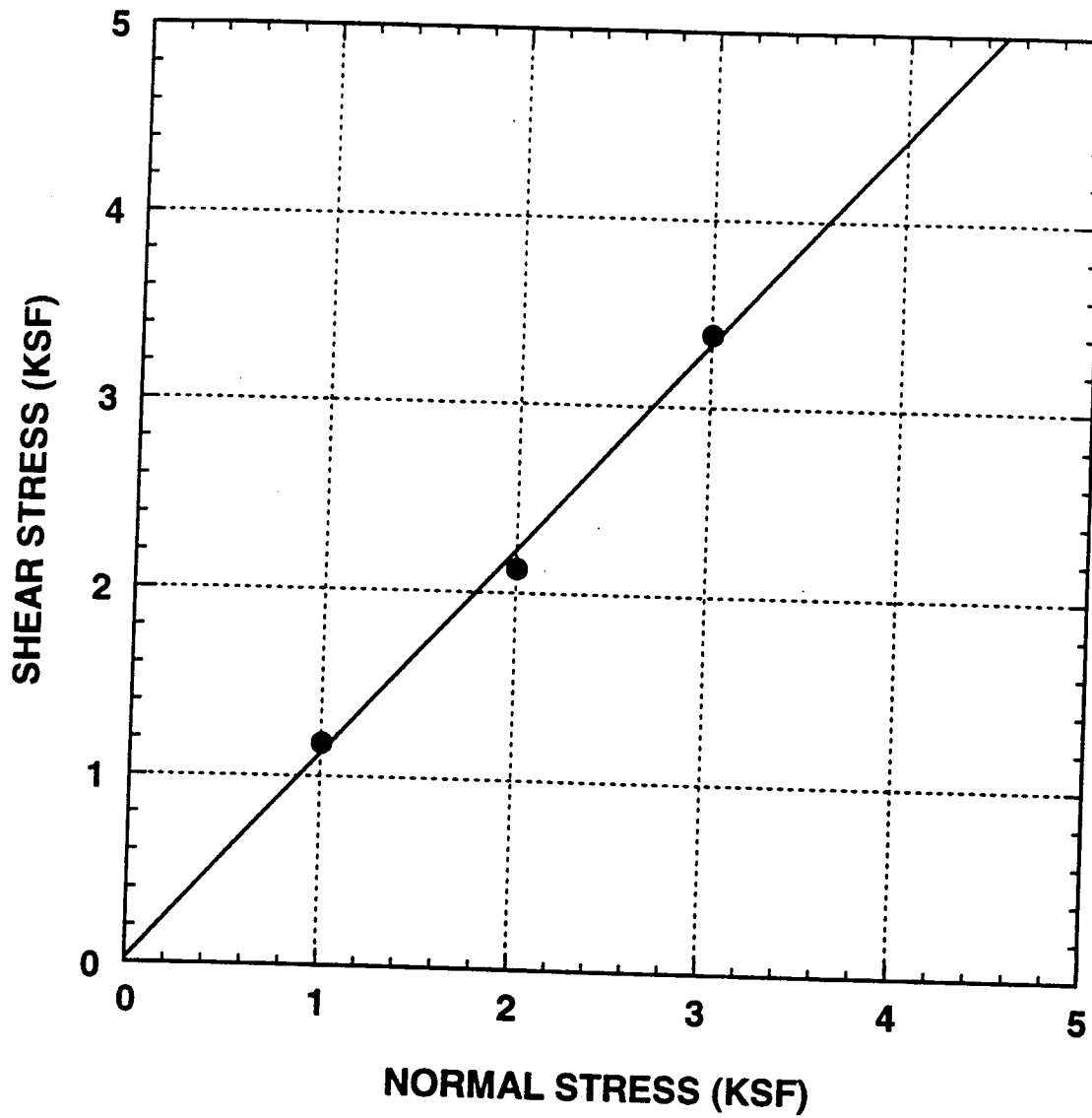
DIRECT SHEAR TEST DIAGRAM



$C = 1825 \text{ psf} \quad \phi = 34^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 17.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 21	

DIRECT SHEAR TEST DIAGRAM



$C = 0 \text{ psf} \quad \phi = 48^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 9P

Depth: 27.5'

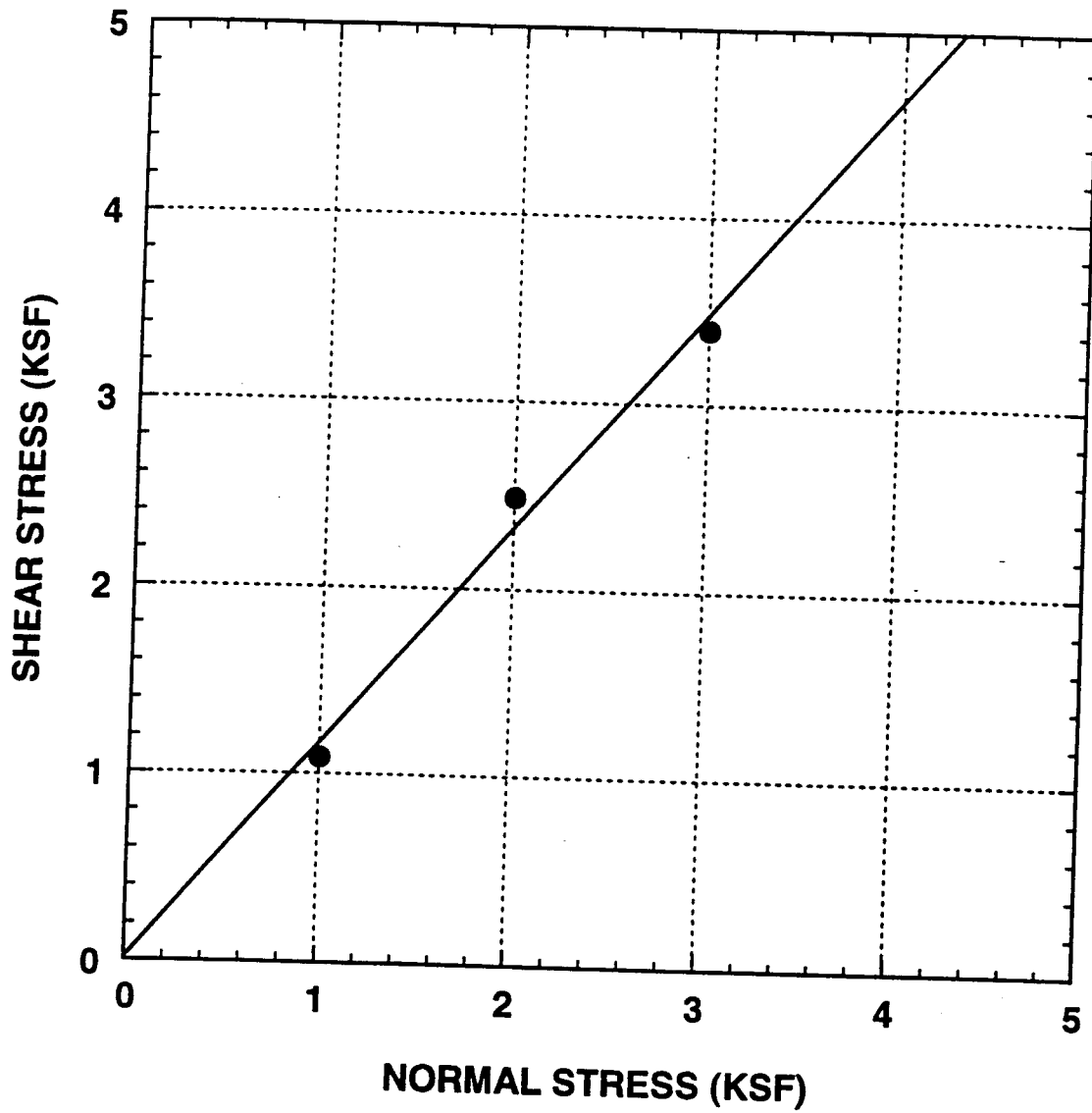
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 22

DIRECT SHEAR TEST DIAGRAM



$C = 0 \text{ psf} \quad \phi = 49^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 9P

Depth: 32.5'

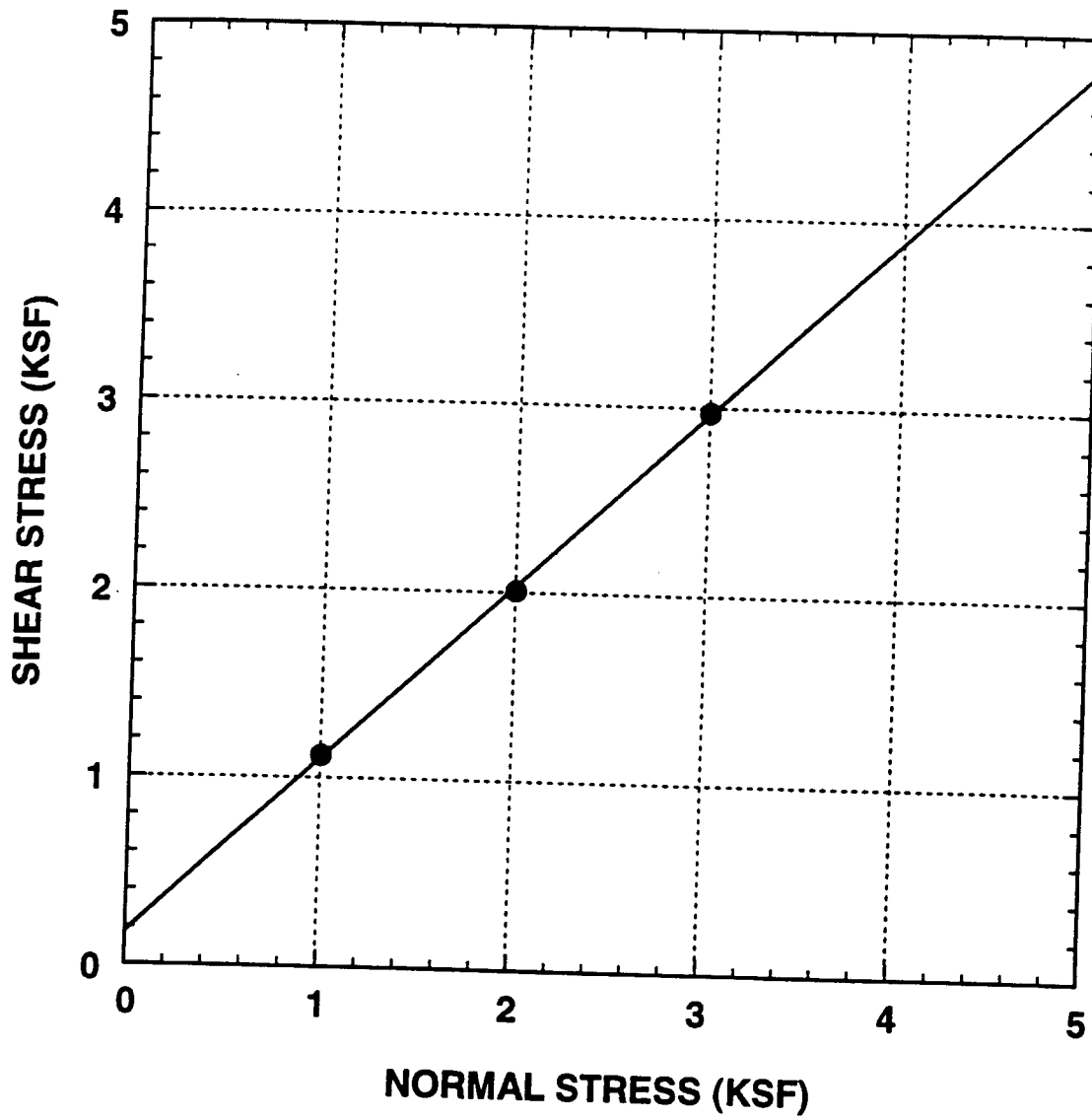
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 23

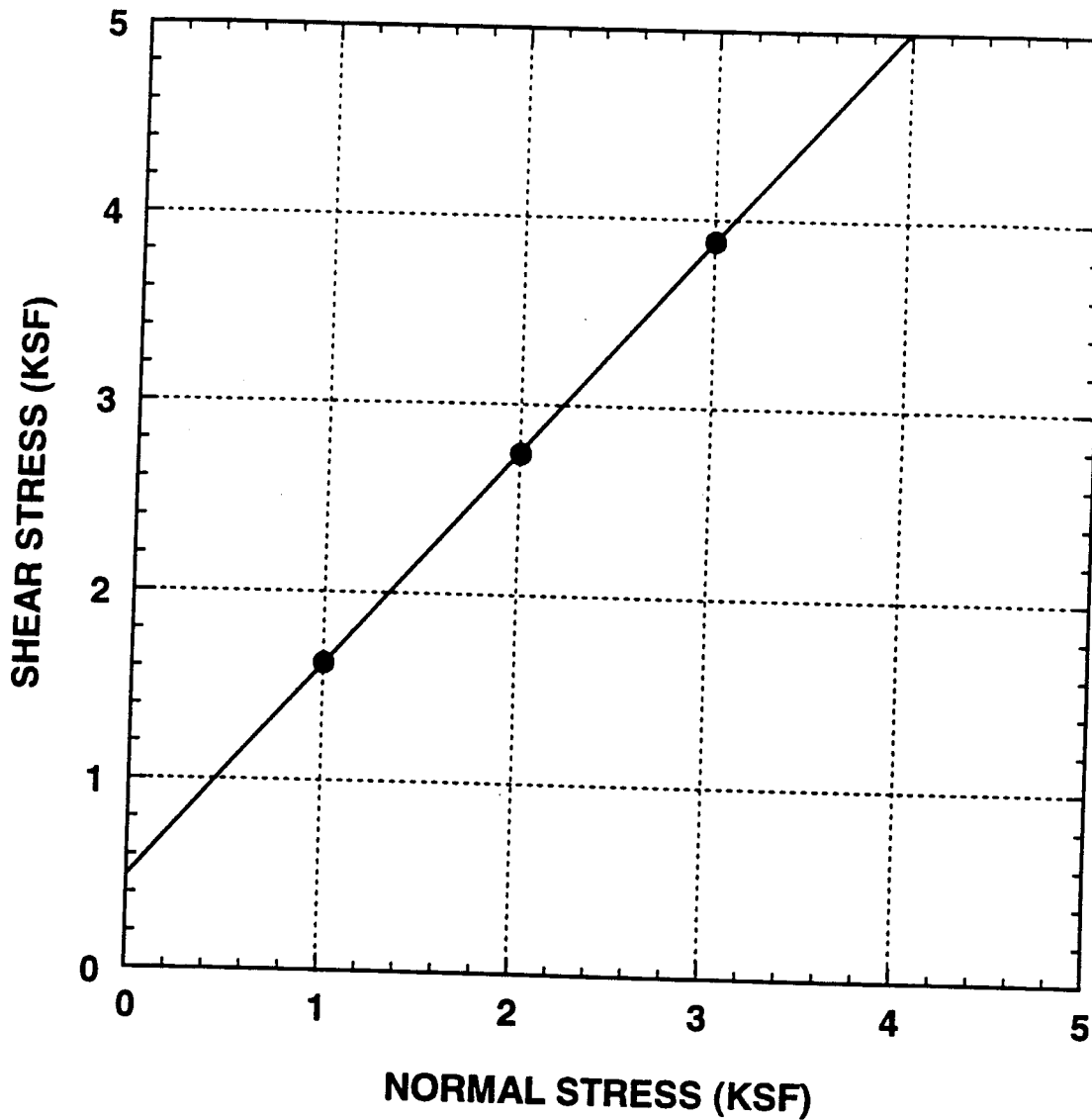
DIRECT SHEAR TEST DIAGRAM



$C = 175 \text{ psf} \quad \phi = 43^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 9P	Depth: 37.5'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 24	

DIRECT SHEAR TEST DIAGRAM



$C = 500 \text{ psf} \quad \phi = 48^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 9P

Depth: 45'

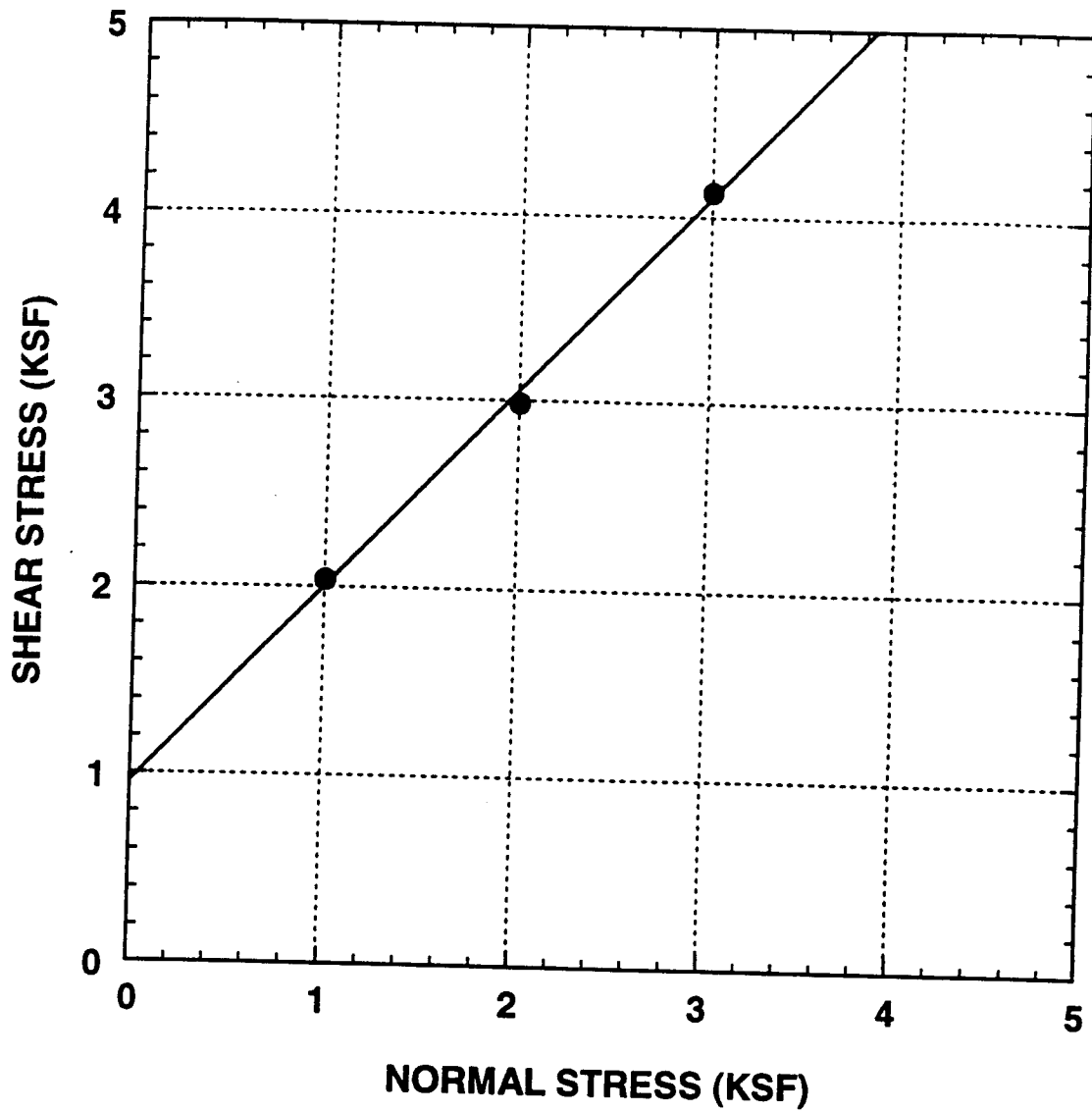
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 25

DIRECT SHEAR TEST DIAGRAM



$C = 950 \text{ psf} \quad \phi = 46^\circ$

Test Condition: Undisturbed at Field Moisture

Location: B - 10

Depth: 10'

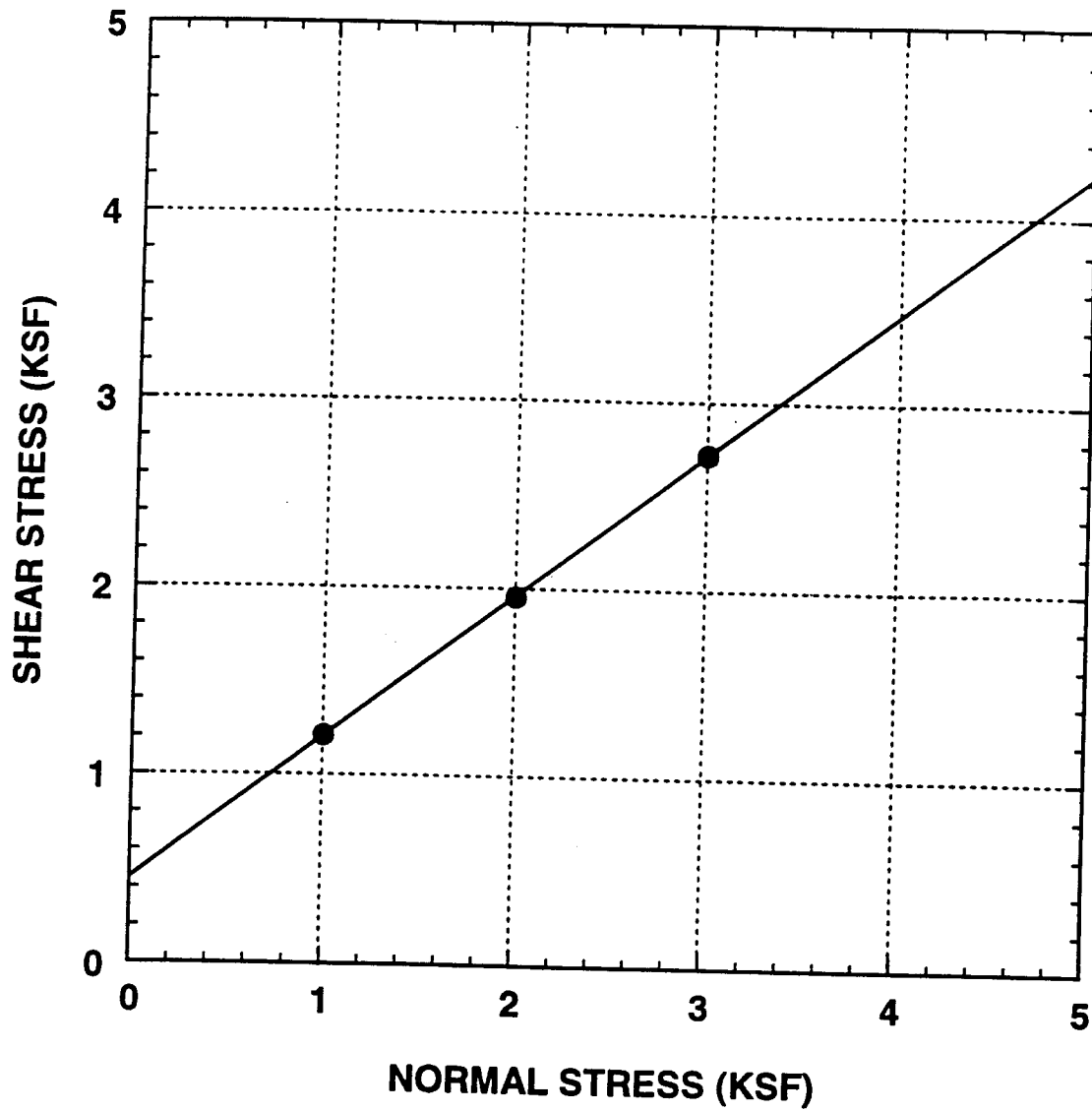
Project Name: North County Transit District - Del Mar

Project No.: 3650 - SF

Medall, Aragón, Higley, Geotechnical, Inc.

Figure: B - 26

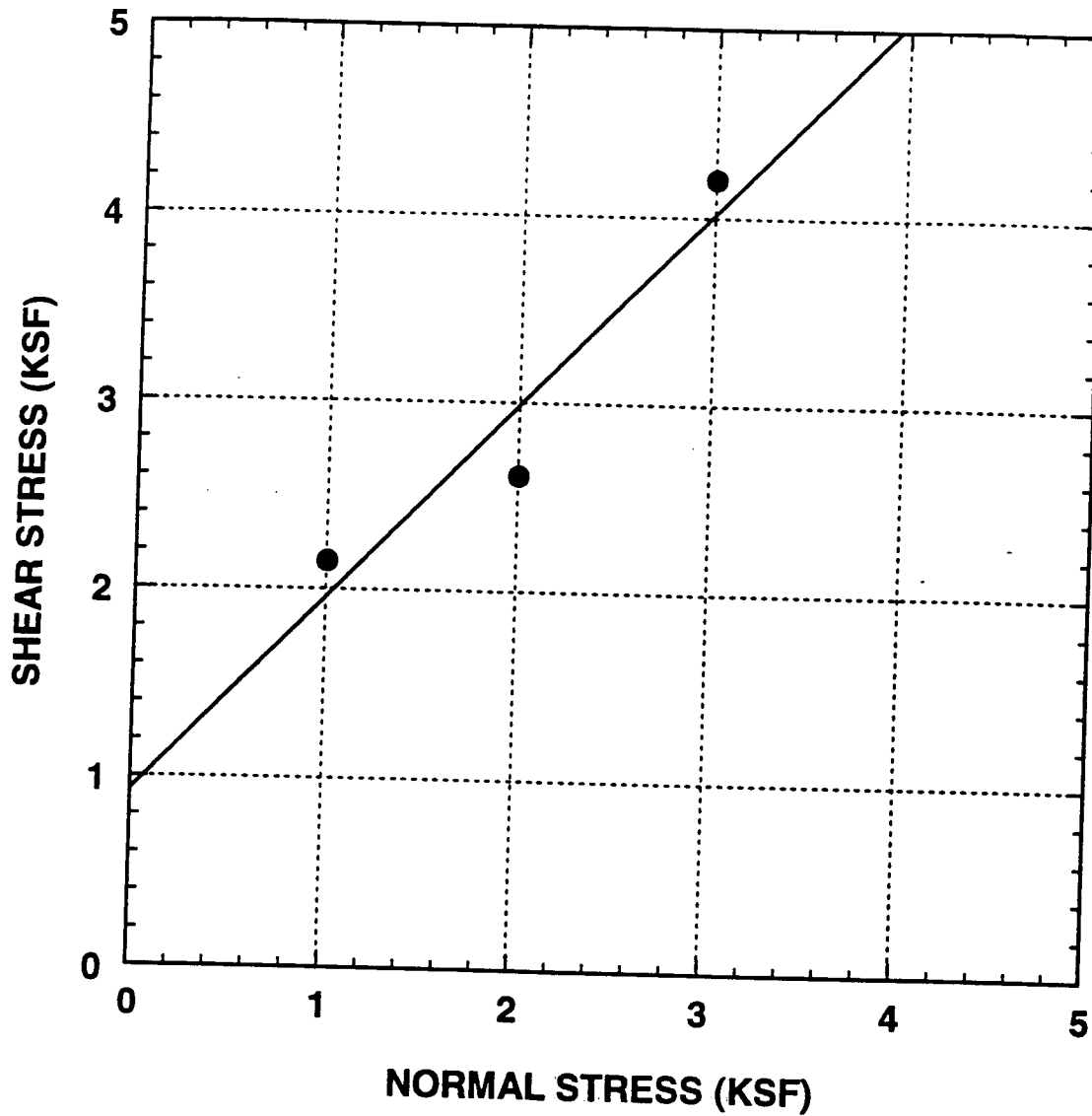
DIRECT SHEAR TEST DIAGRAM



$C = 450 \text{ psf} \quad \phi = 37^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 10'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 27	

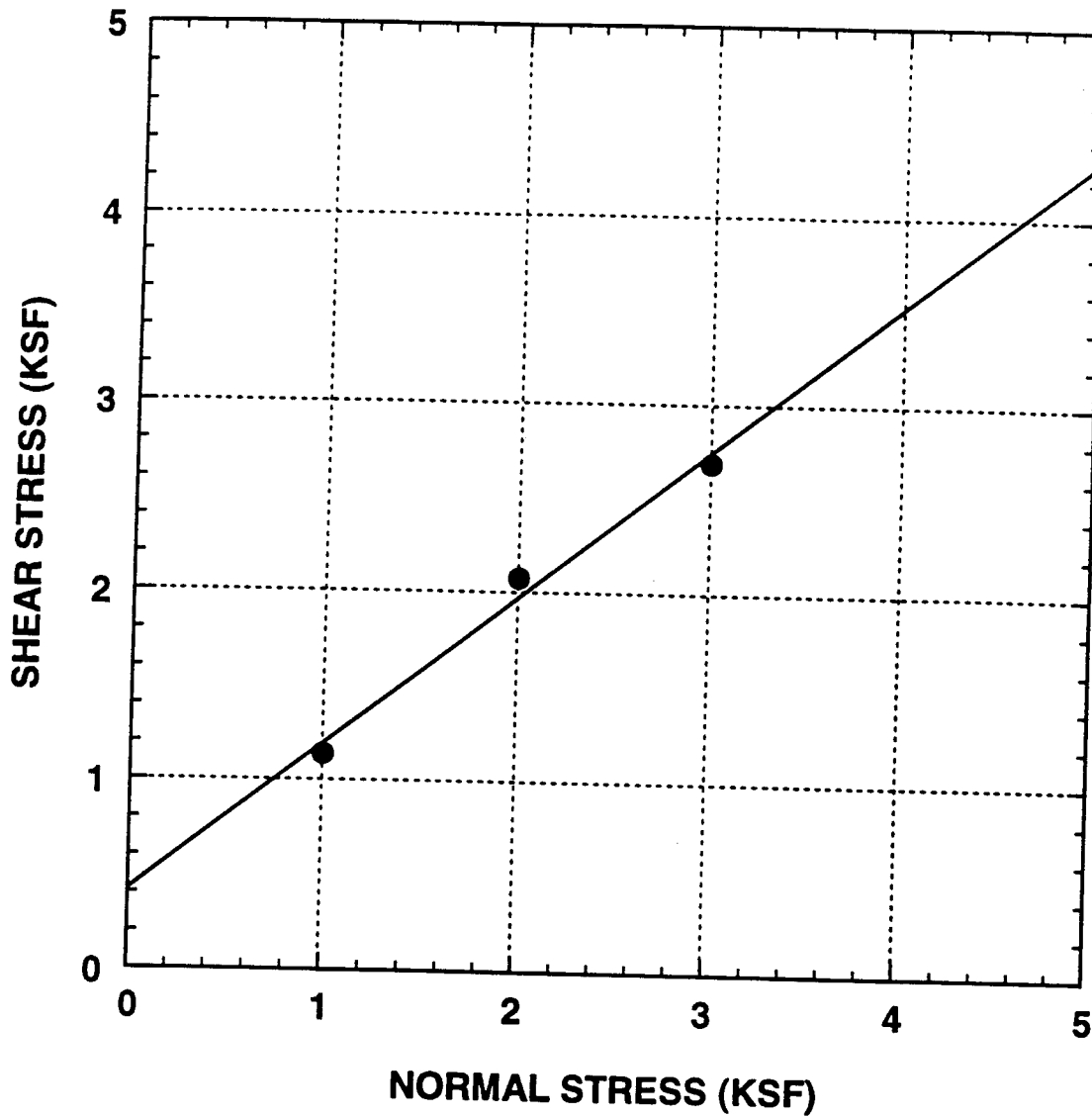
DIRECT SHEAR TEST DIAGRAM



$C = 925 \text{ psf} \quad \phi = 46^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 15'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 28	

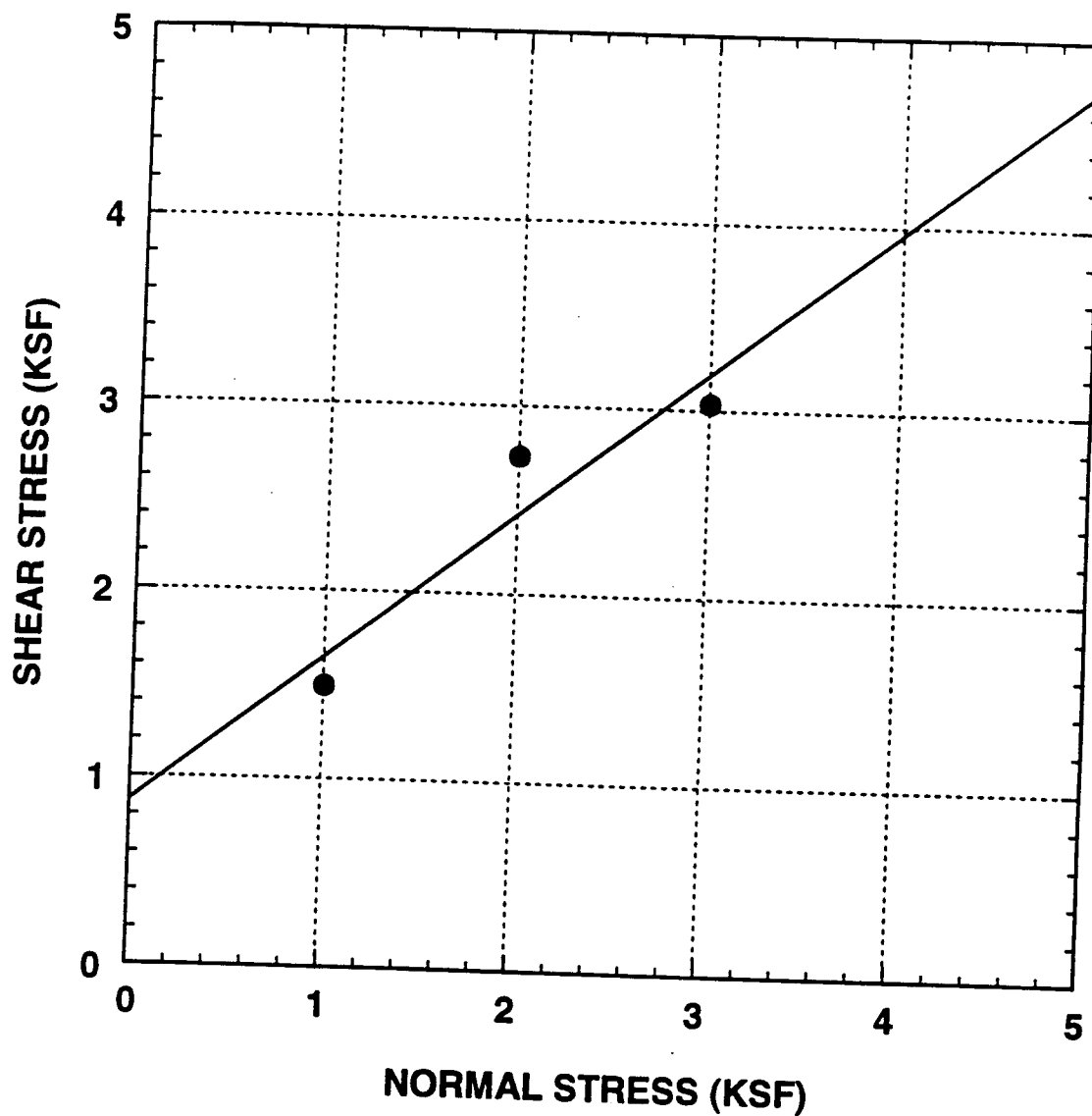
DIRECT SHEAR TEST DIAGRAM



$C = 400 \text{ psf} \quad \phi = 38^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 25'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 29	

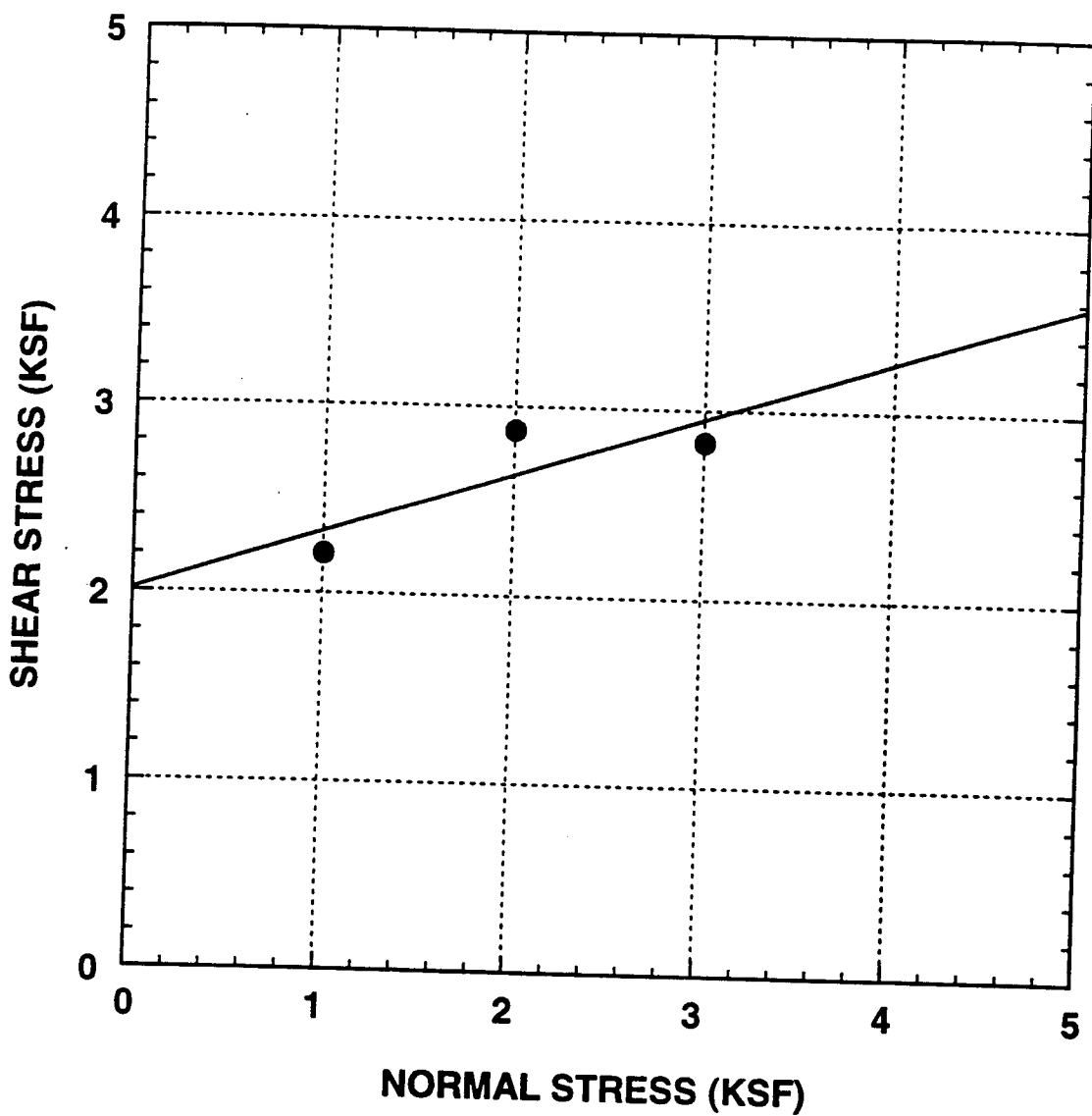
DIRECT SHEAR TEST DIAGRAM



$C = 875 \text{ psf} \quad \phi = 38^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 30	

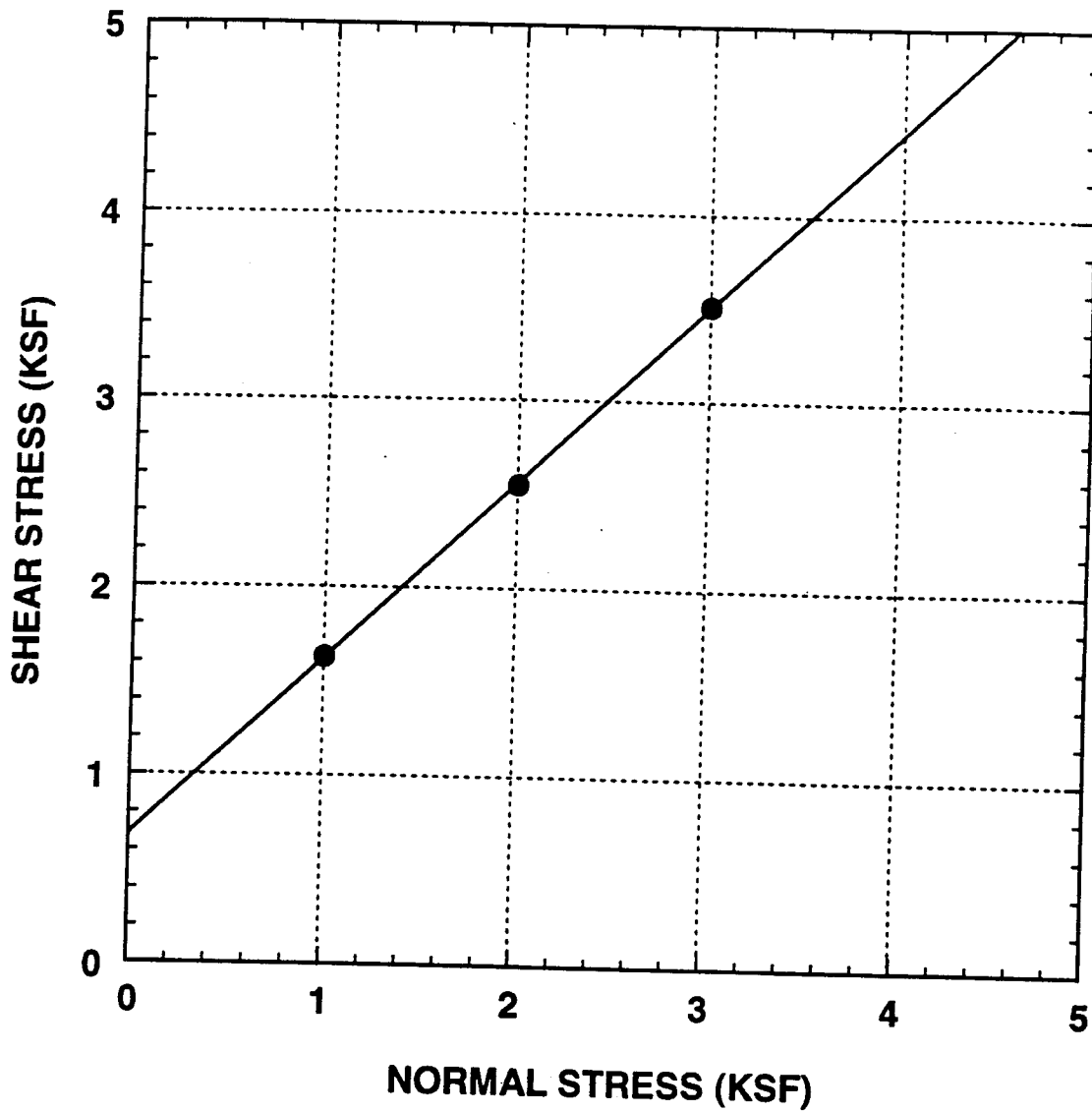
DIRECT SHEAR TEST DIAGRAM



$C = 2000 \text{ psf} \quad \phi = 17^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 35'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 31	

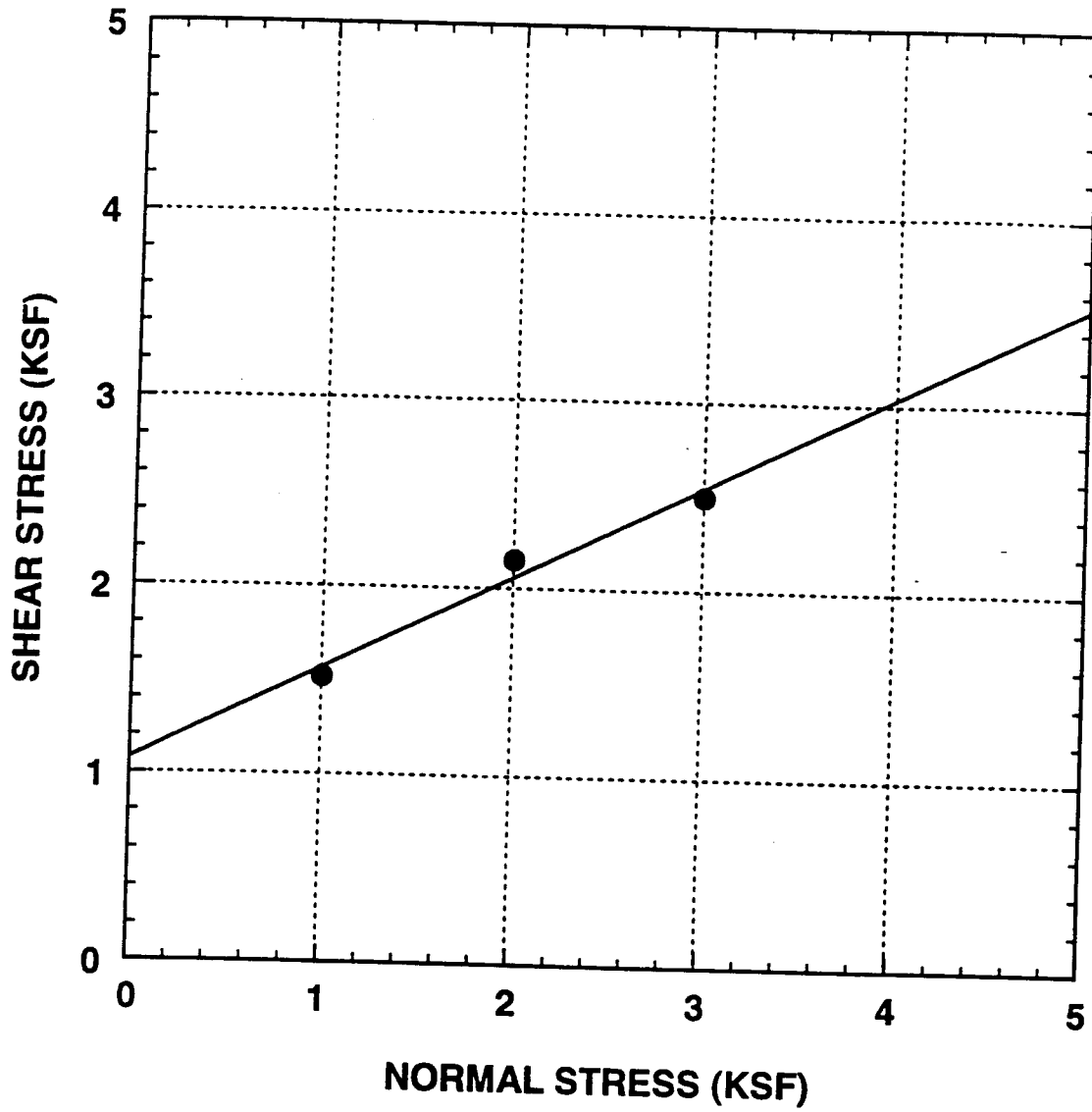
DIRECT SHEAR TEST DIAGRAM



$C = 675 \text{ psf} \quad \phi = 43^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 32	

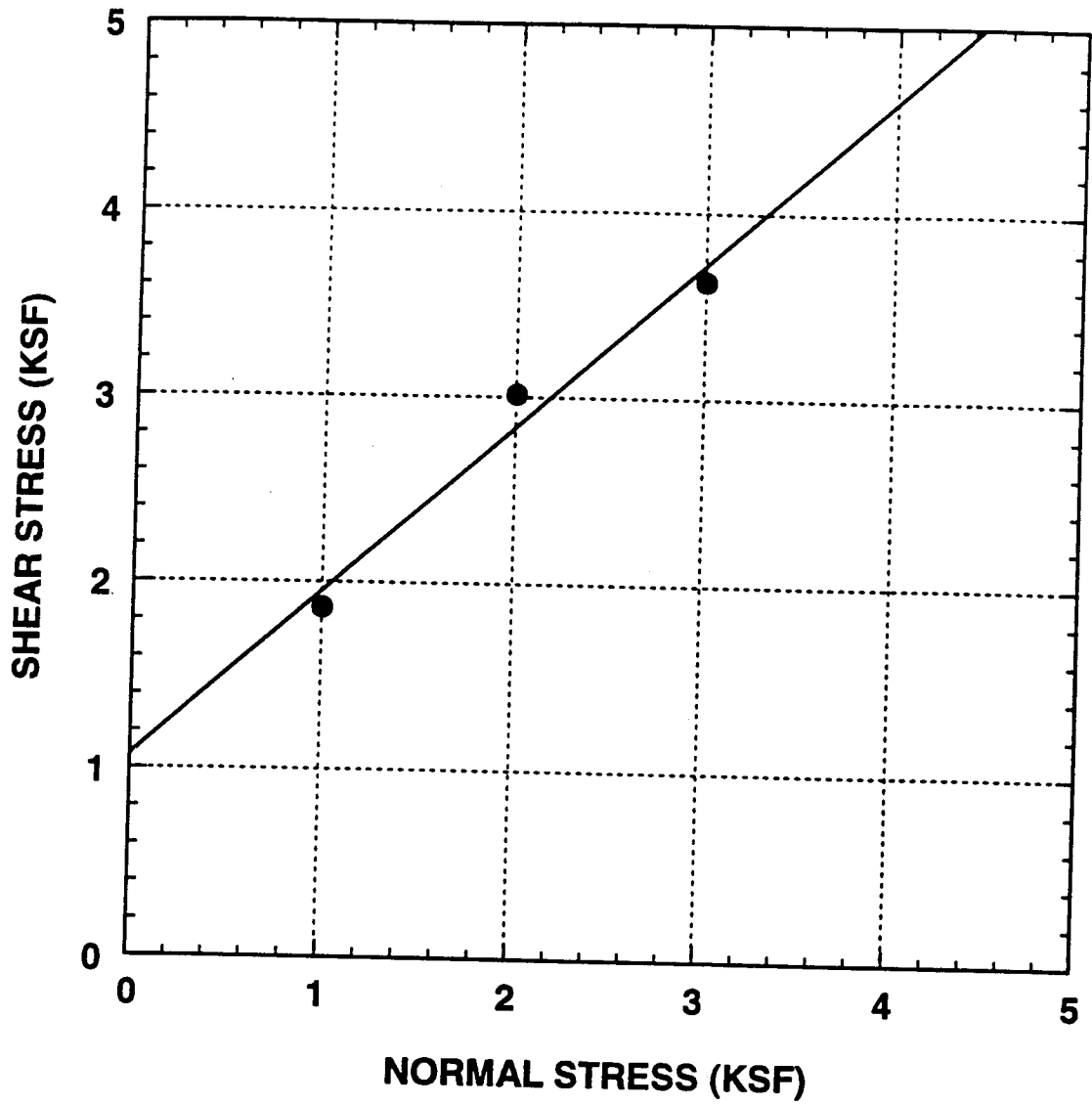
DIRECT SHEAR TEST DIAGRAM



$C = 1075 \text{ psf} \quad \phi = 26^\circ$

Test Condition: Undisturbed at Field Moisture - Residual	Location: B - 13	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 33	

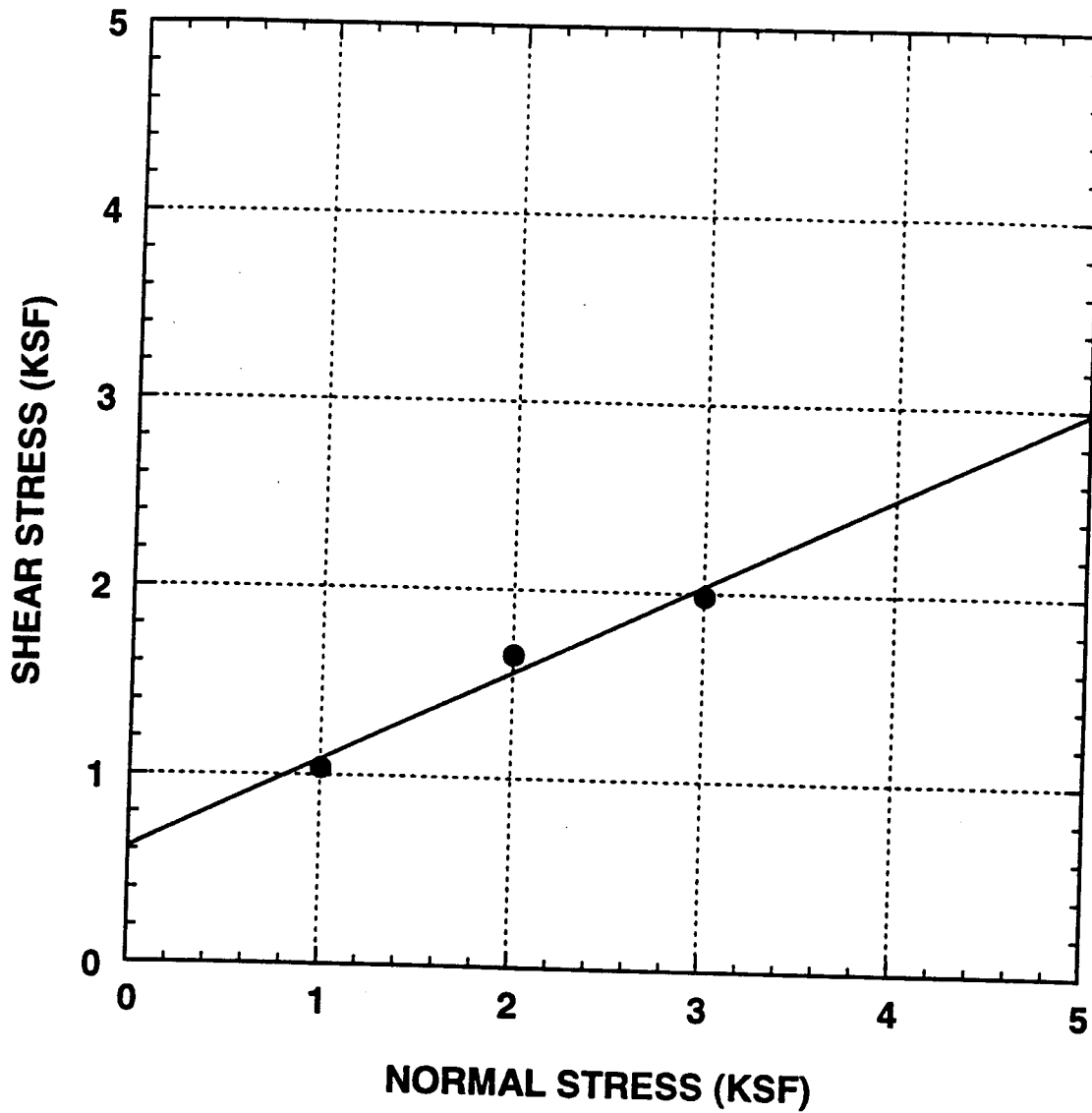
DIRECT SHEAR TEST DIAGRAM



$C = 1075 \text{ psf} \quad \phi = 41^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 13	Depth: 55'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 34	

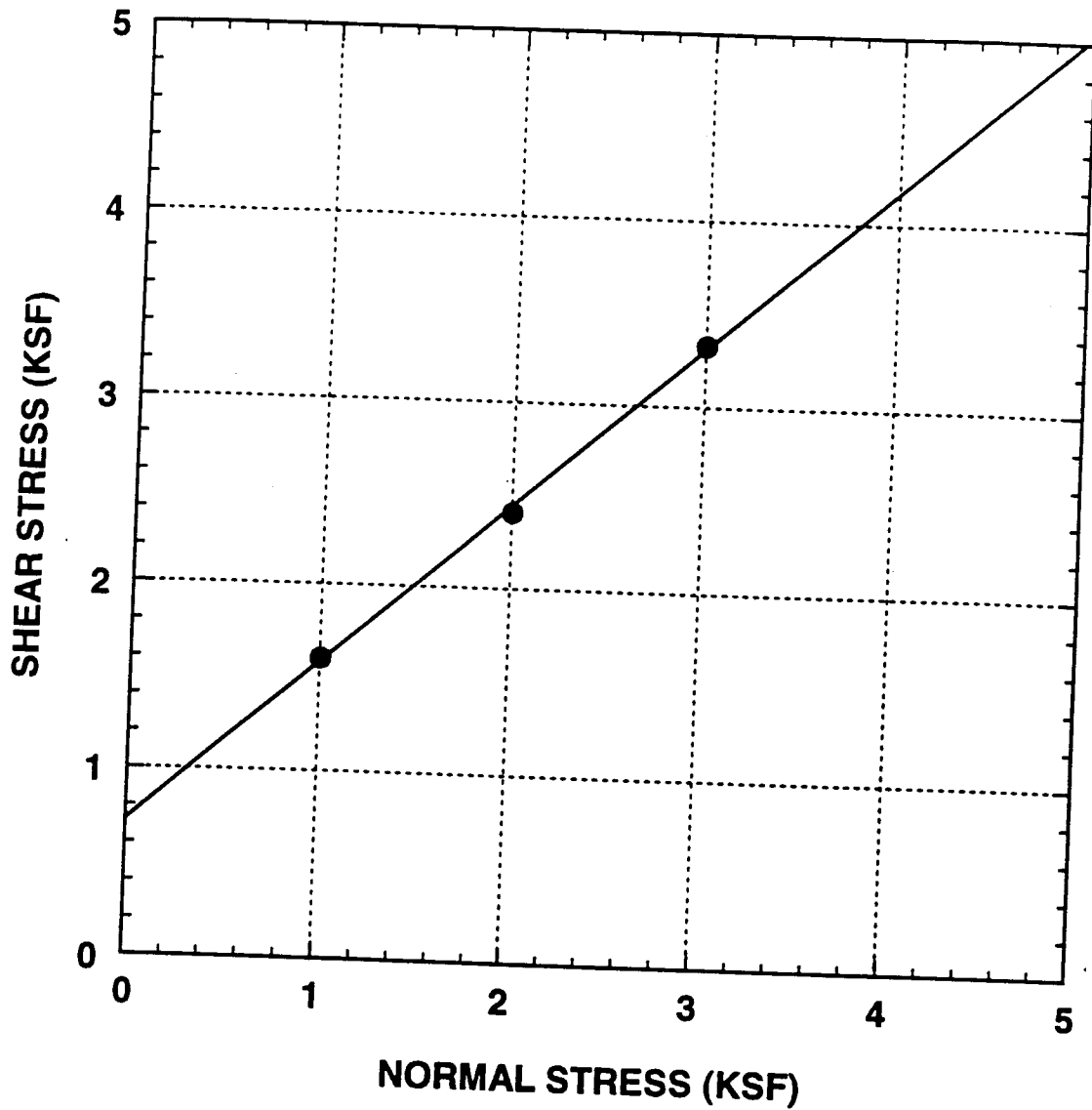
DIRECT SHEAR TEST DIAGRAM



$C = 600 \text{ psf} \quad \phi = 25^\circ$

Test Condition: Undisturbed at Field Moisture - Residual	Location: B - 13	Depth: 55'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 35	

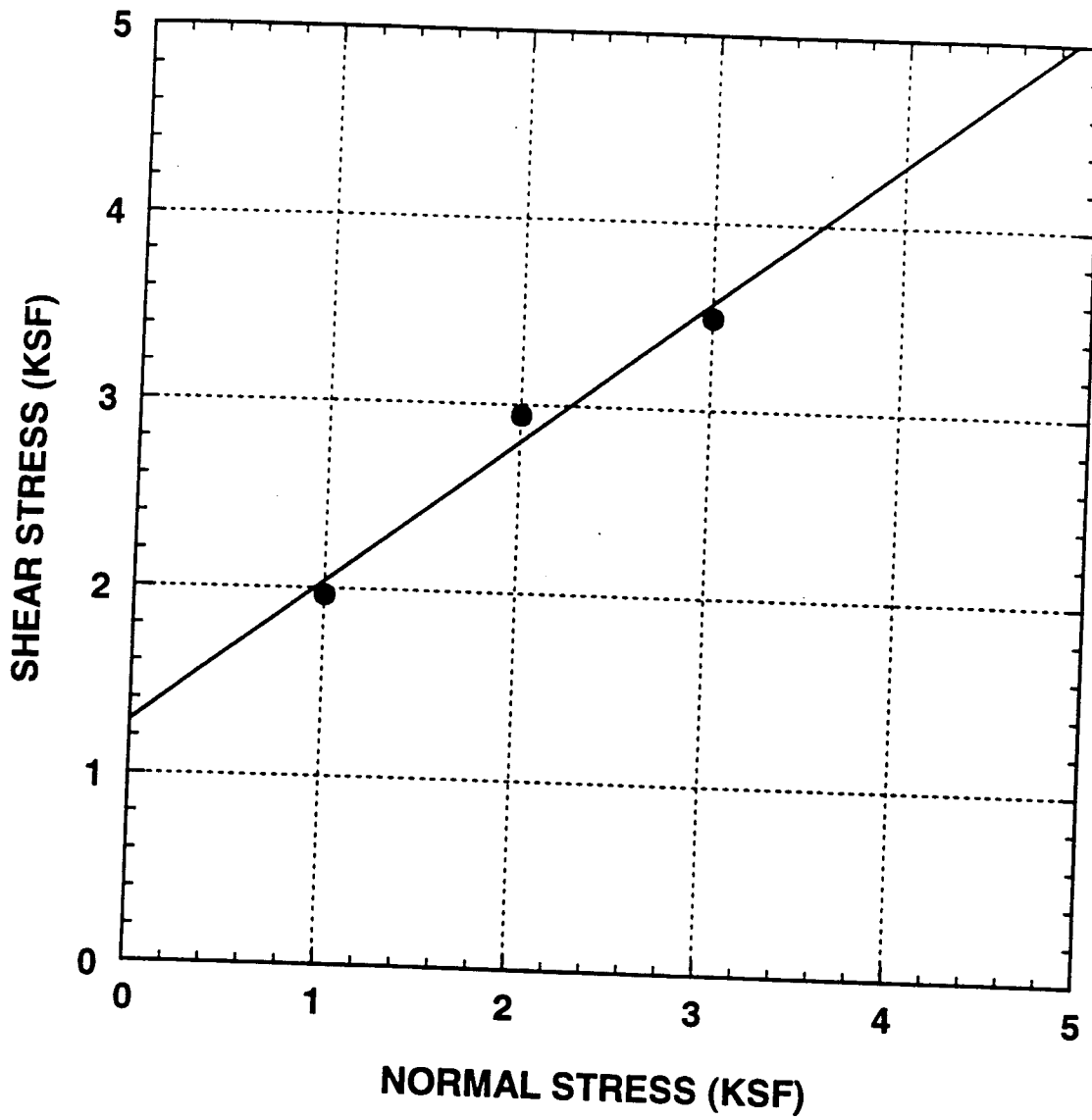
DIRECT SHEAR TEST DIAGRAM



$C = 725 \text{ psf} \quad \phi = 40^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 20'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 36	

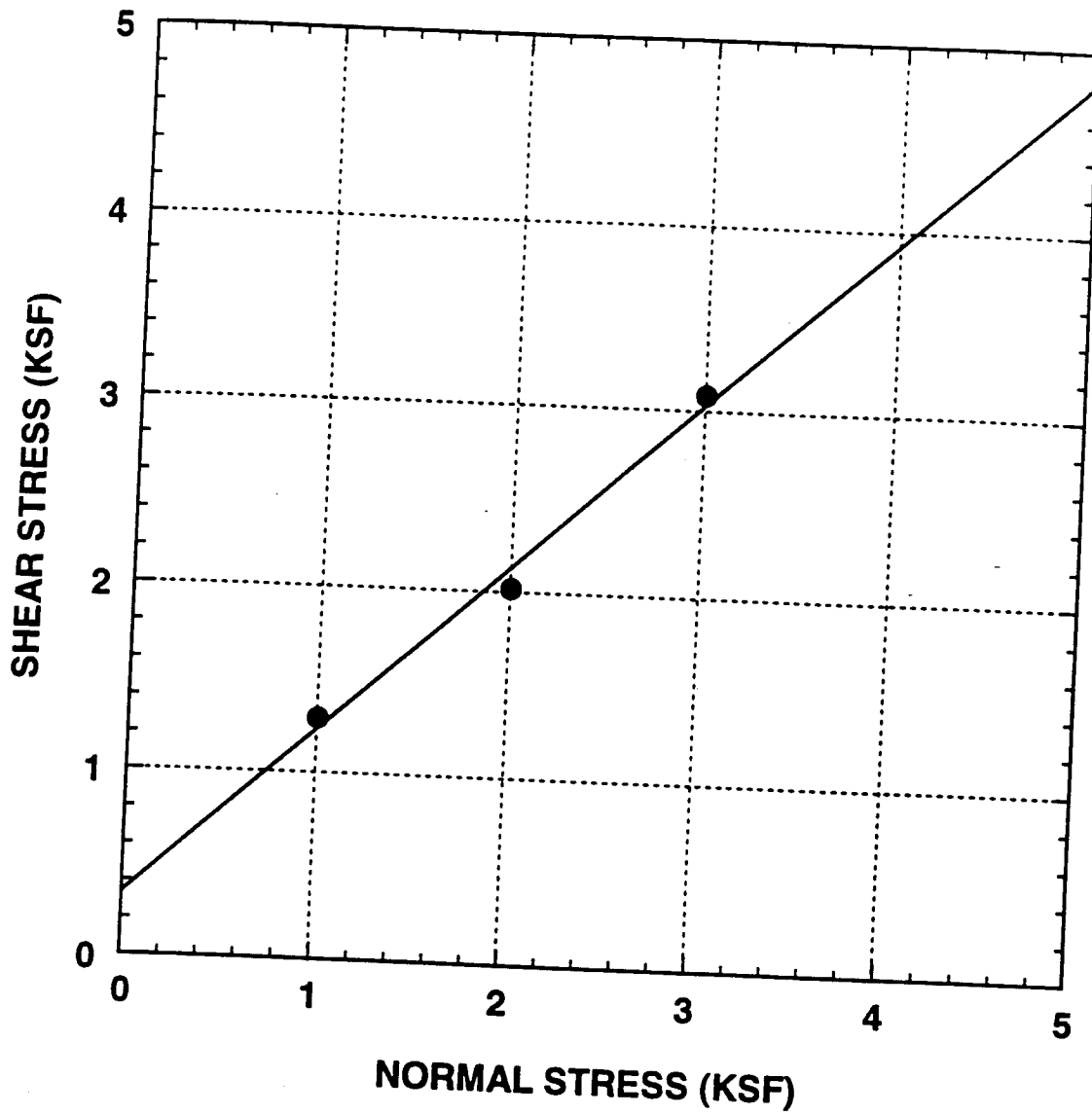
DIRECT SHEAR TEST DIAGRAM



$C = 1275 \text{ psf} \quad \phi = 37^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 30'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 37	

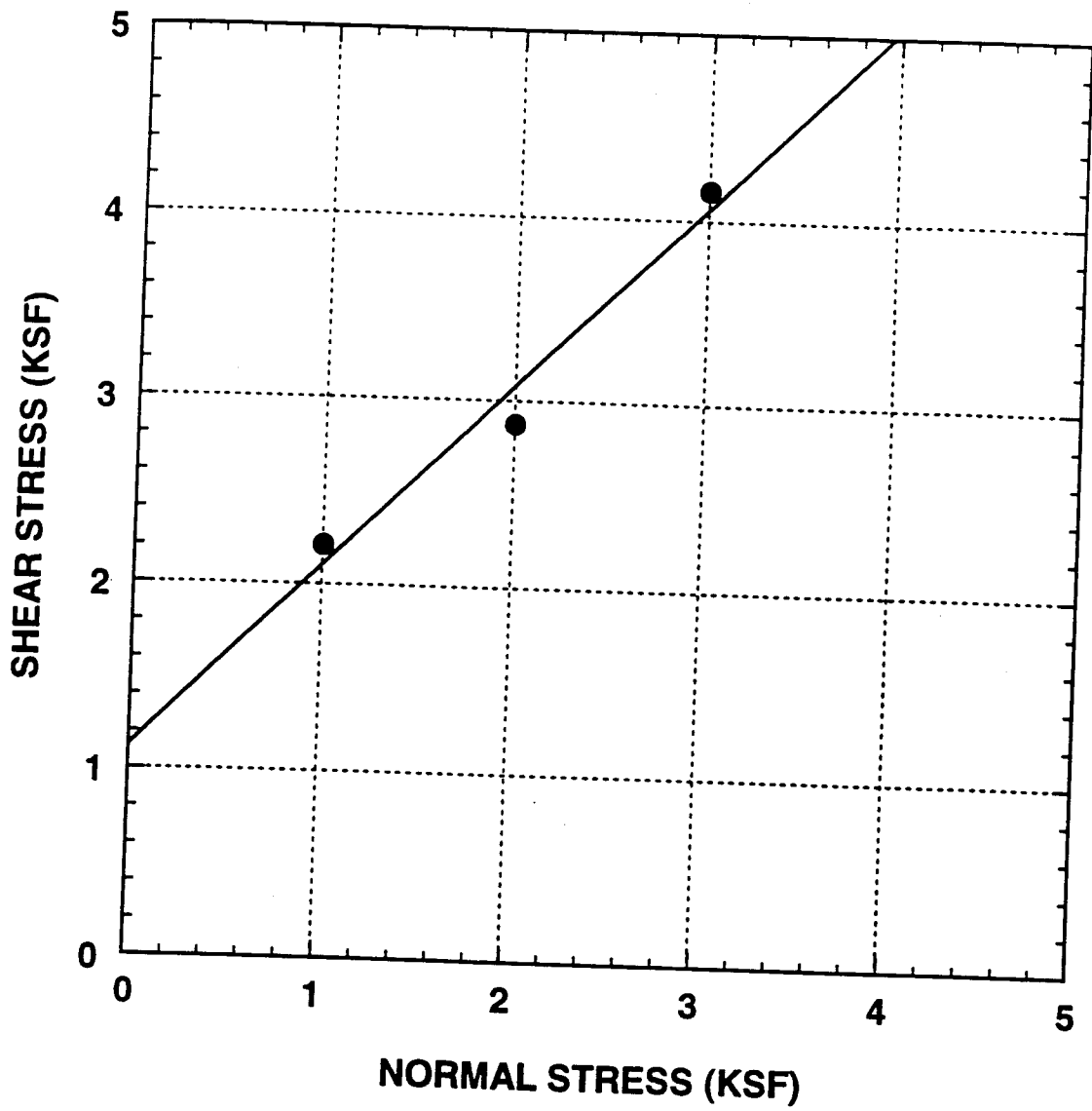
DIRECT SHEAR TEST DIAGRAM



$C = 350 \text{ psf} \quad \phi = 42^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 45'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 38	

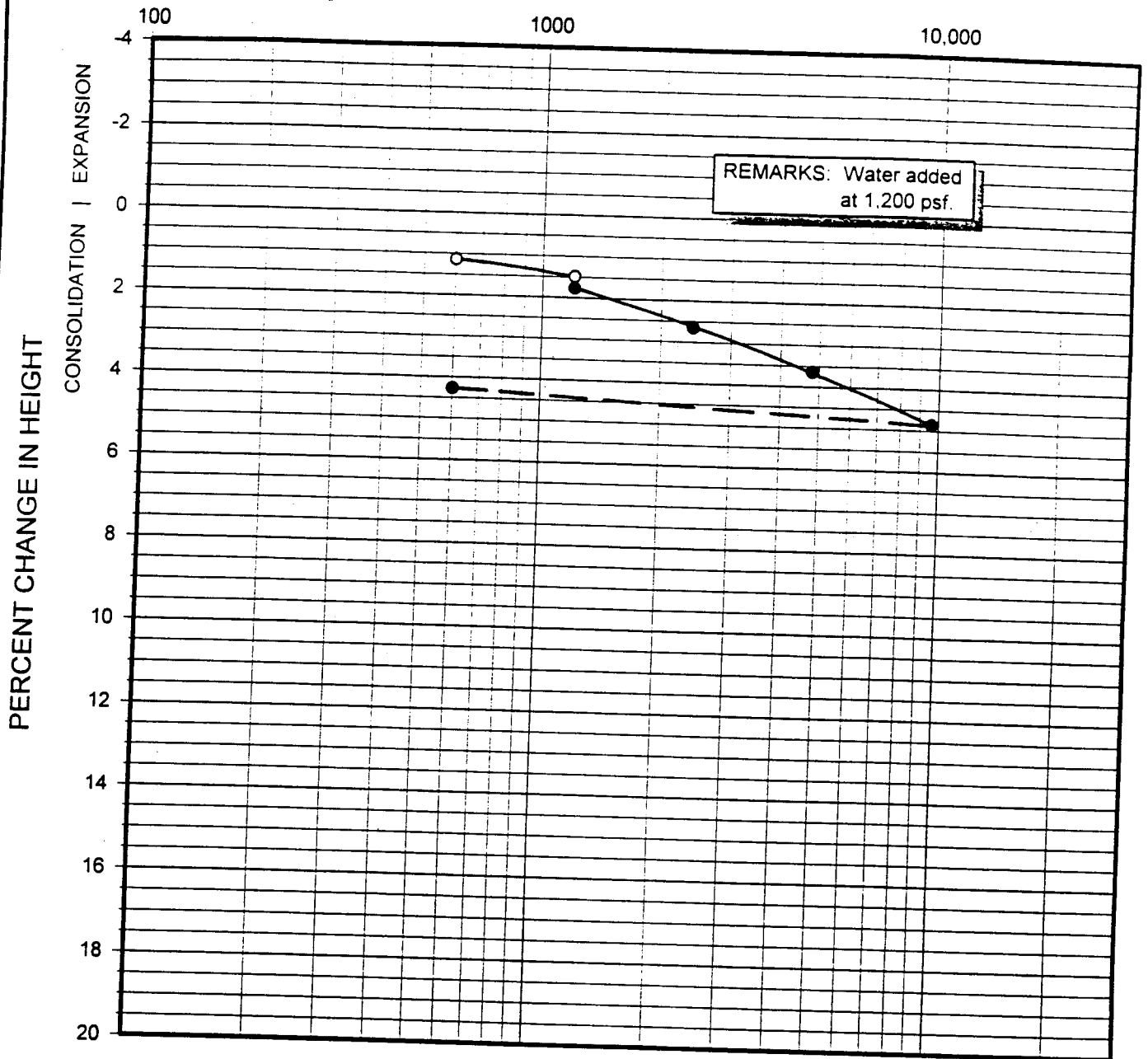
DIRECT SHEAR TEST DIAGRAM



$C = 1125 \text{ psf} \quad \phi = 44^\circ$

Test Condition: Undisturbed at Field Moisture	Location: B - 14	Depth: 50'
Project Name: North County Transit District - Del Mar	Project No.: 3650 - SF	
Medall, Aragón, Higley, Geotechnical, Inc.	Figure: B - 39	

COMPRESSIVE STRESS (psf)



Boring: B - 2	Depth (ft.): 10.0	Dry Density (pcf): 108.6	Moisture (%): 13.0	Saturation (%): 66
Sample Description: Clayey Sand (SP-SC), fine to medium grained. [Fill]				



CONSOLIDATION CURVE

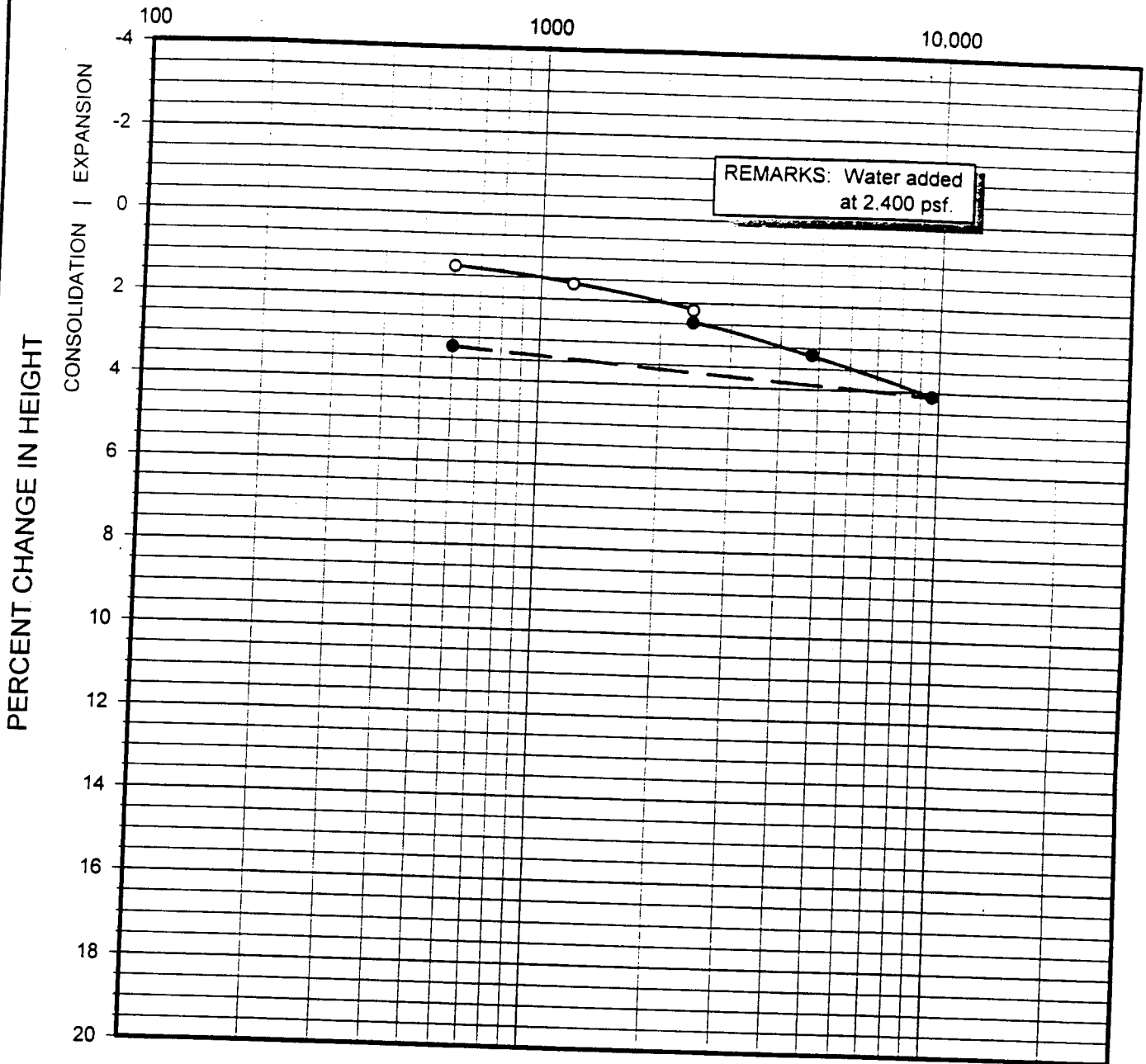
NORTH COUNTY TRANSIT DISTRICT, DEL MAR RAIL LINE

PROJECT NO. 3650-SF

DATE: 6/18/98

FIG. B-40

COMPRESSIVE STRESS (psf)



Boring: B - 2	Depth (ft.): 15.0	Dry Density (pcf): 114.6	Moisture (%): 12.9	Saturation (%): 77
Sample Description: Clayey Sand (SP-SC), fine to medium grained. [Fill]				



CONSOLIDATION CURVE

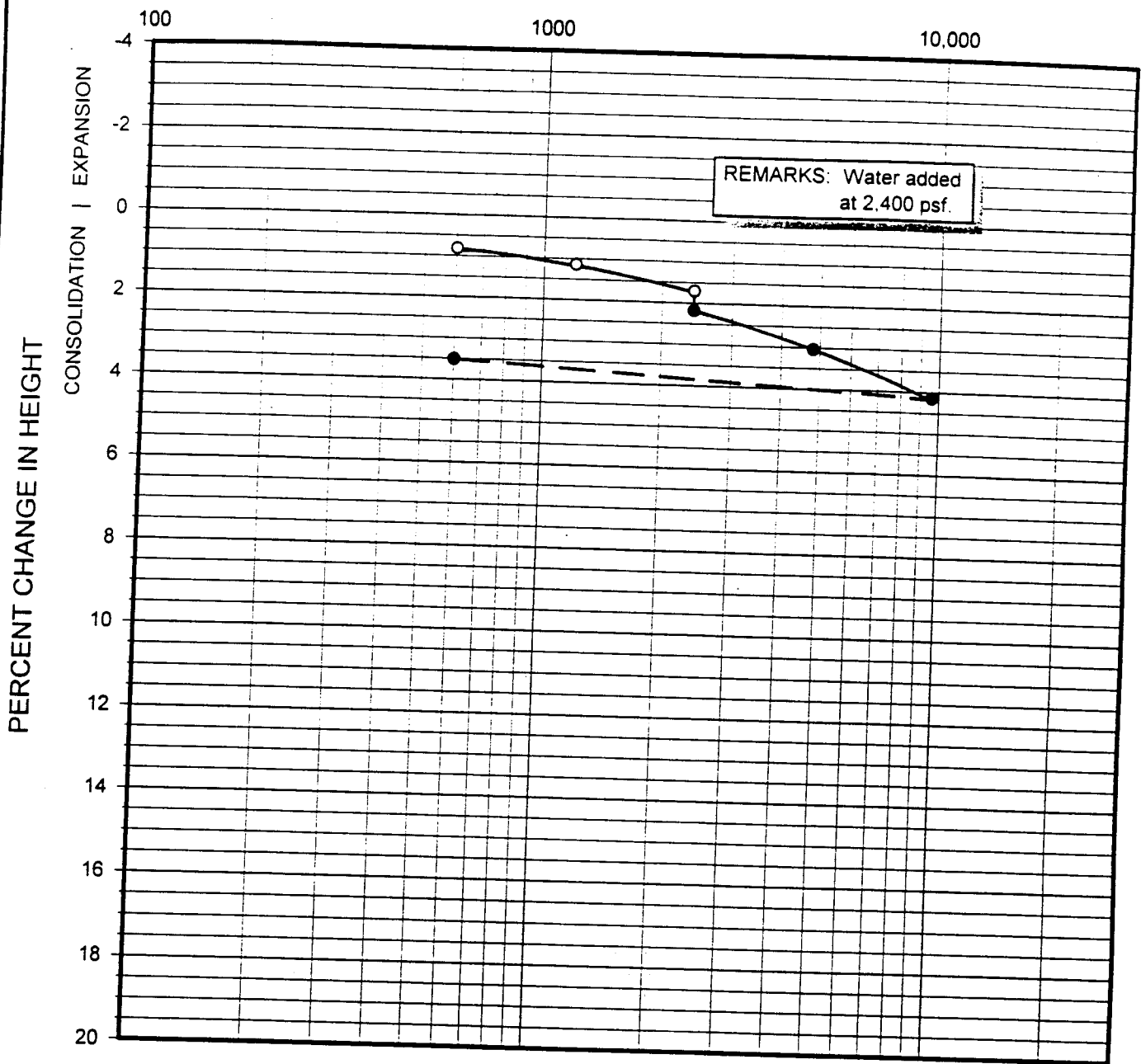
NORTH COUNTY TRANSIT DISTRICT, DEL MAR RAIL LINE

PROJECT NO. 3650-SF

DATE: 6/18/98

FIG. B-41

COMPRESSIVE STRESS (psf)



Boring: B - 2	Depth (ft.): 25.0	Dry Density (pcf): 114.1	Moisture (%): 10.2	Saturation (%): 60
Sample Description: Clayey Sand (SP-SC), fine to medium grained. [Fill]				



CONSOLIDATION CURVE

NORTH COUNTY TRANSIT DISTRICT, DEL MAR RAIL LINE

PROJECT NO. 3650-SF

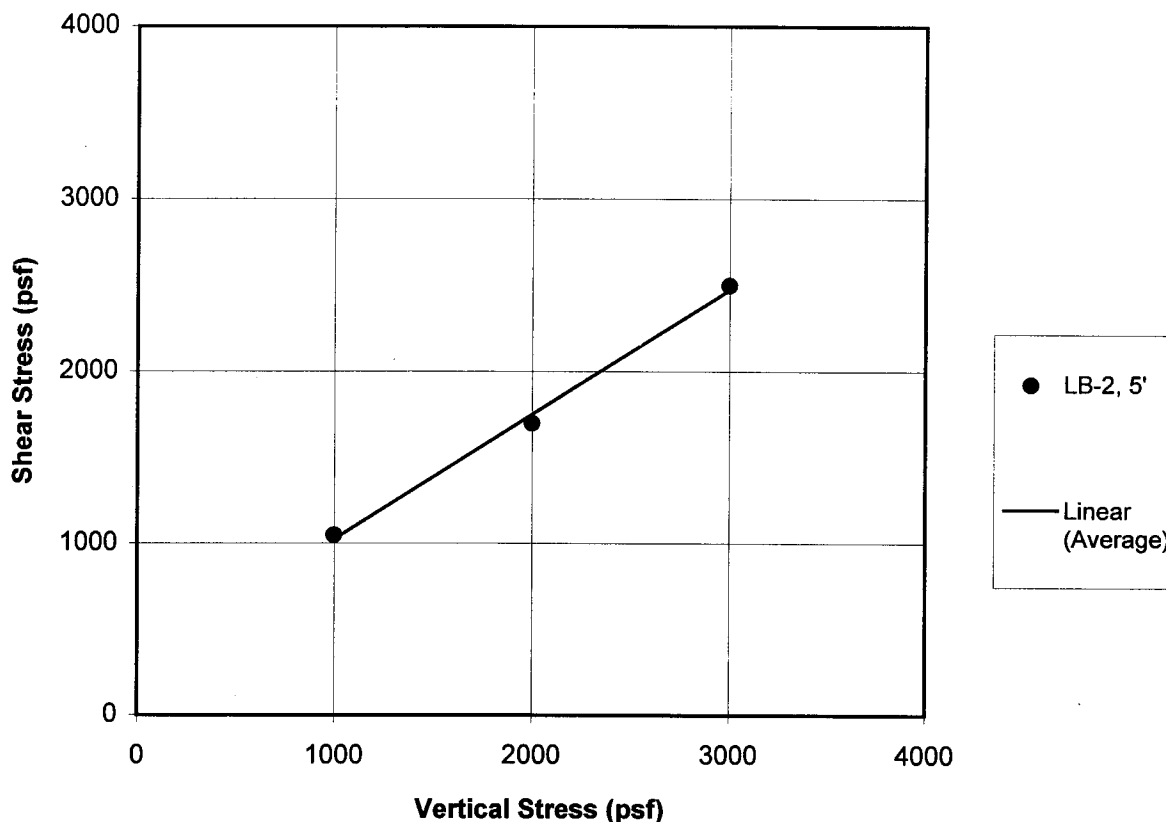
DATE: 6/18/98

FIG. B-42

APPENDIX G

SLOPE STABILITY

**Peak Direct Shear on Bay Point Samples
by Leighton & Associates 2000**



Average Strength Values

Friction Angle, ϕ (degrees) 36

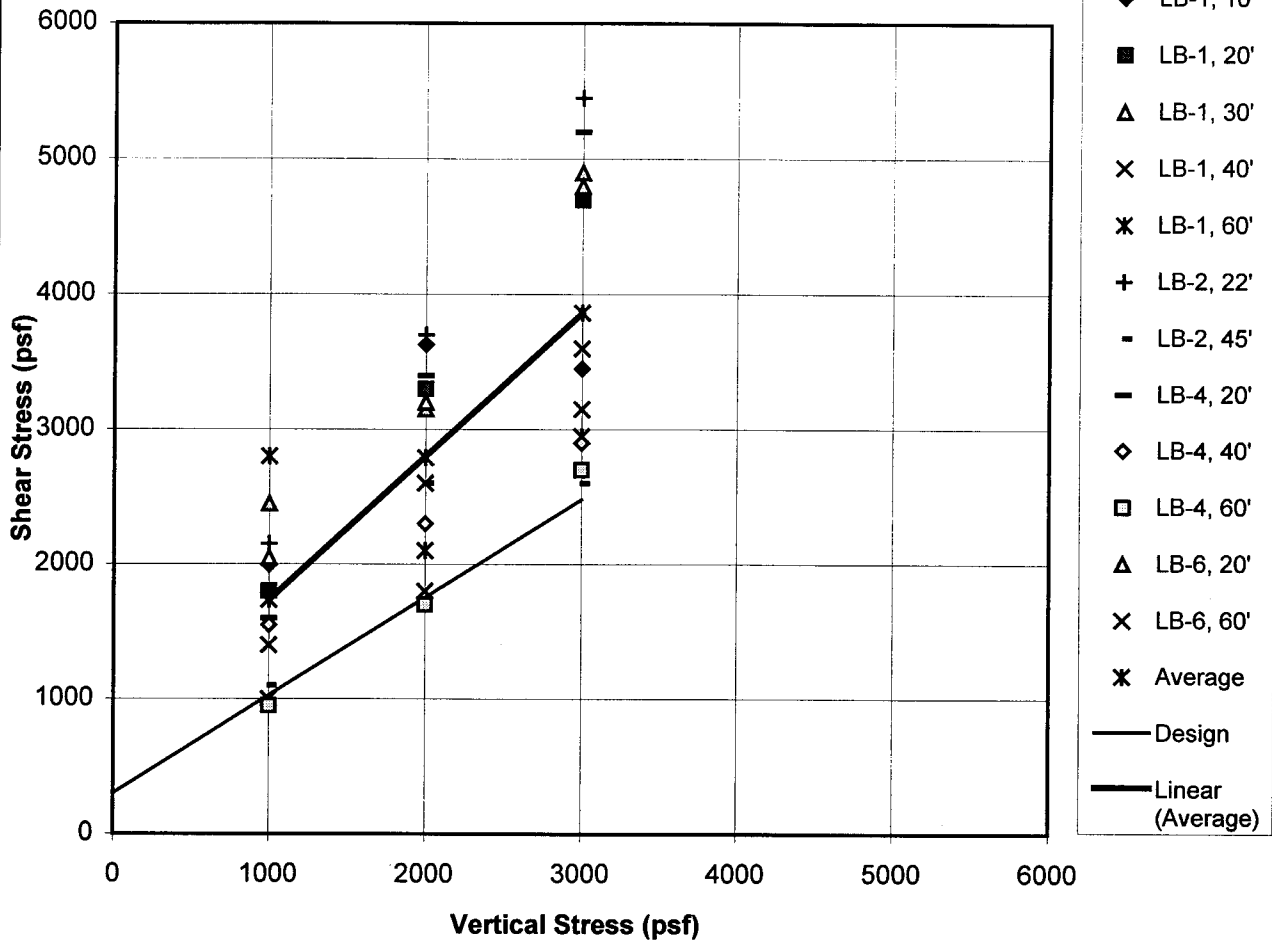
Cohesion, c (psf) 300

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-1



**Peak Direct Shear on Delmar Formation Samples
by Leighton & Associates 2000**



Average Strength Values

Friction Angle, ϕ (degrees) 47

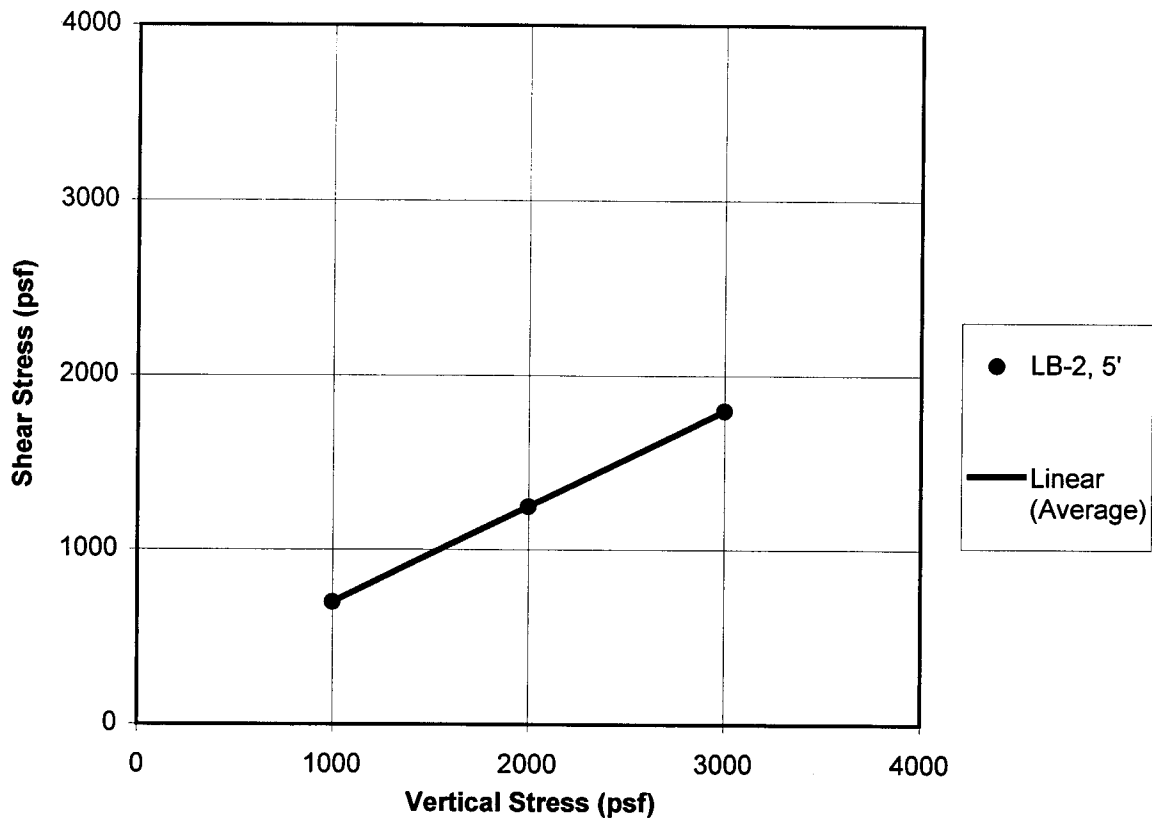
Cohesion, c (psf) 650

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-2



Ultimate Direct Shear on Bay Point by Leighton & Associates 2000



Average Strength Values

Friction Angle, ϕ (degrees) 29

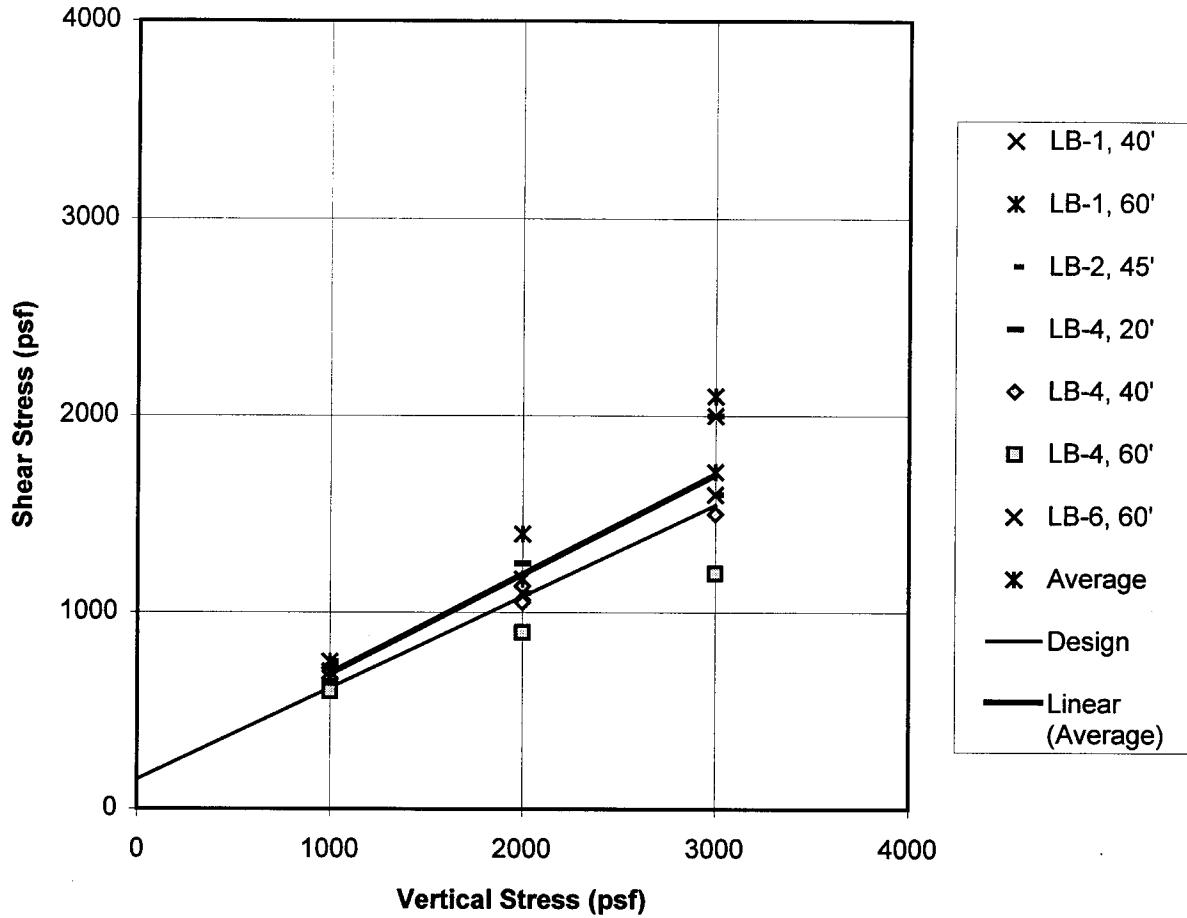
Cohesion, c (psf) 150

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-3



**Composite of Ultimate Direct Shear on Fine-Grained Samples of
Delmar Formation by Leighton & Associates 2000**



Average Strength Values

Friction Angle, ϕ (degrees) 27

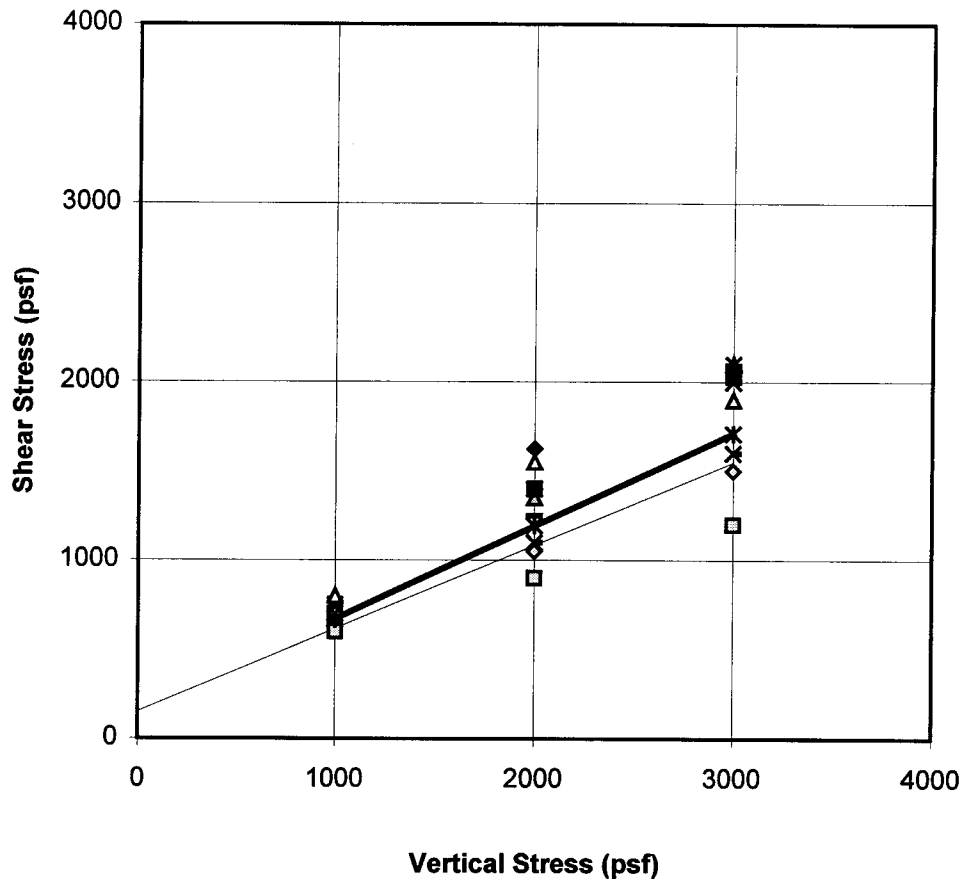
Cohesion, c (psf) 170

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-4a



**Composite of Ultimate Direct Shear on Delmar Formation
by Leighton & Associates 2000**



- ◆ LB-1, 10'
- LB-1, 20'
- △ LB-1, 30'
- × LB-1, 40'
- ✱ LB-1, 60'
- + LB-2, 22'
- LB-2, 45'
- LB-4, 20'
- ◇ LB-4, 40'
- LB-4, 60'
- △ LB-6, 20'
- × LB-6, 60'
- ✱ Average
- Design
- Linear (Average)

Average Strength Values

Friction Angle, ϕ (degrees) 29

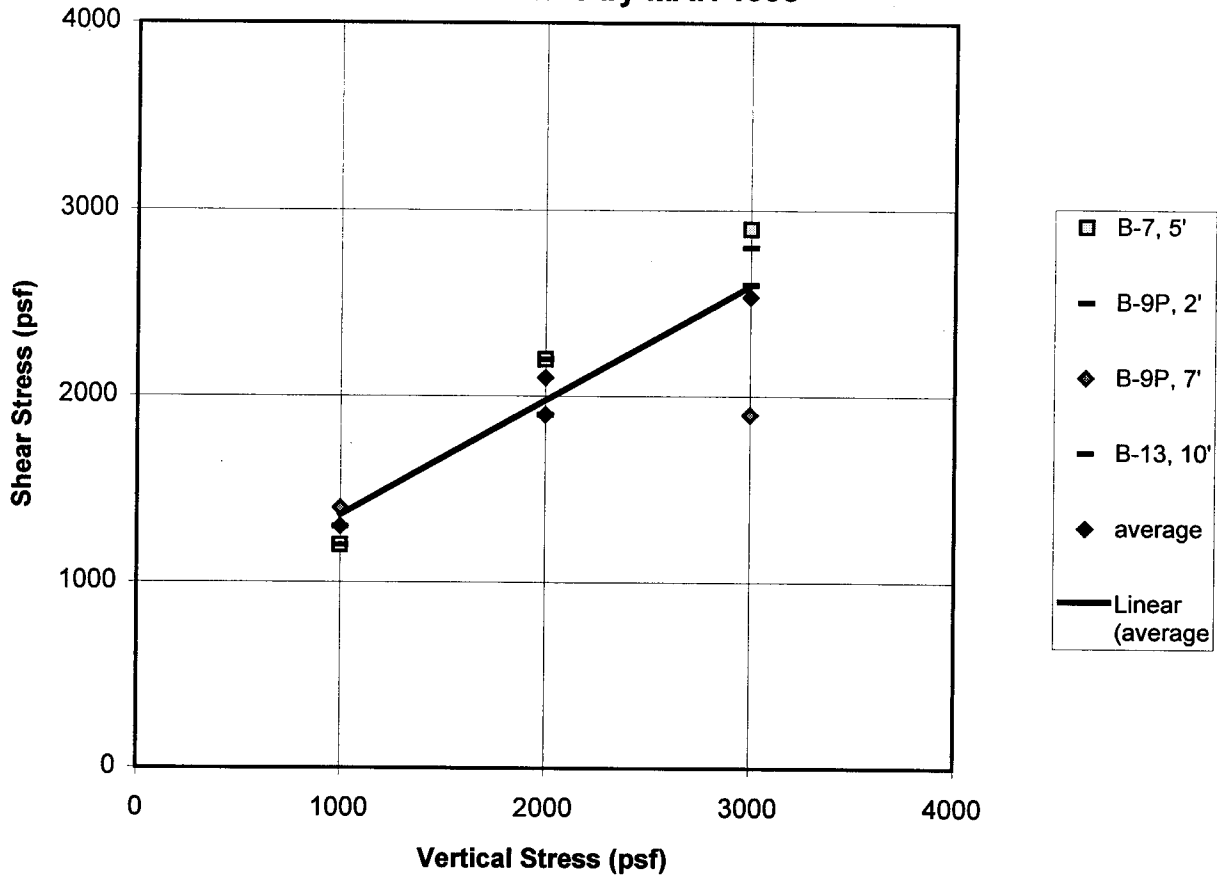
Cohesion, c (psf) 150

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-4



**Composite of Peak Direct Shear Results Tested on Bay Point Formation
at Field Moisture by MAH 1998**



Average Strength Values

Friction Angle, ϕ (degrees) 32

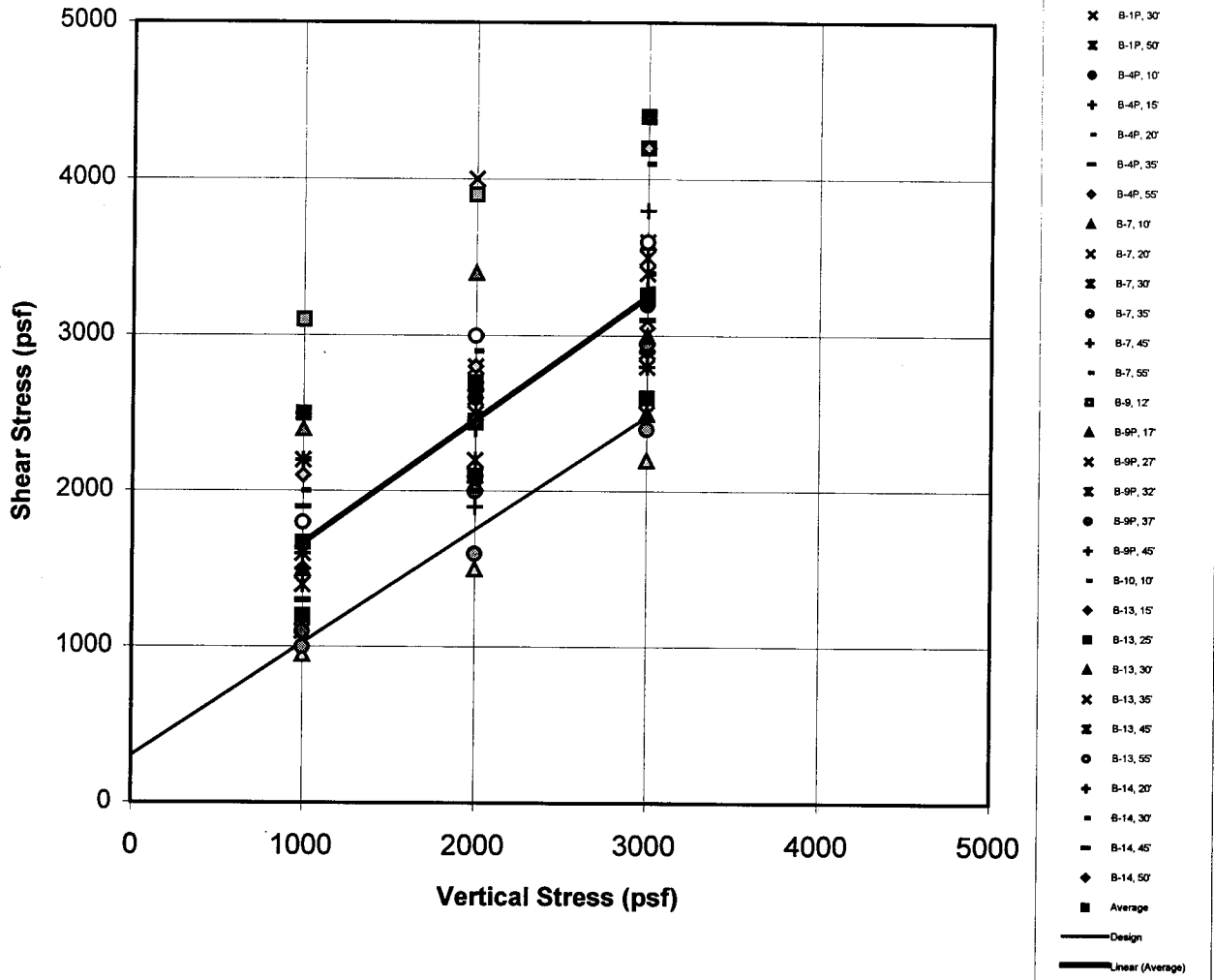
Cohesion, c (psf) 700

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-5



**Composite of Peak Direct Shear Results on Delmar Formation
Tested at Field Moisture by MAH 1998**



Average Strength Values

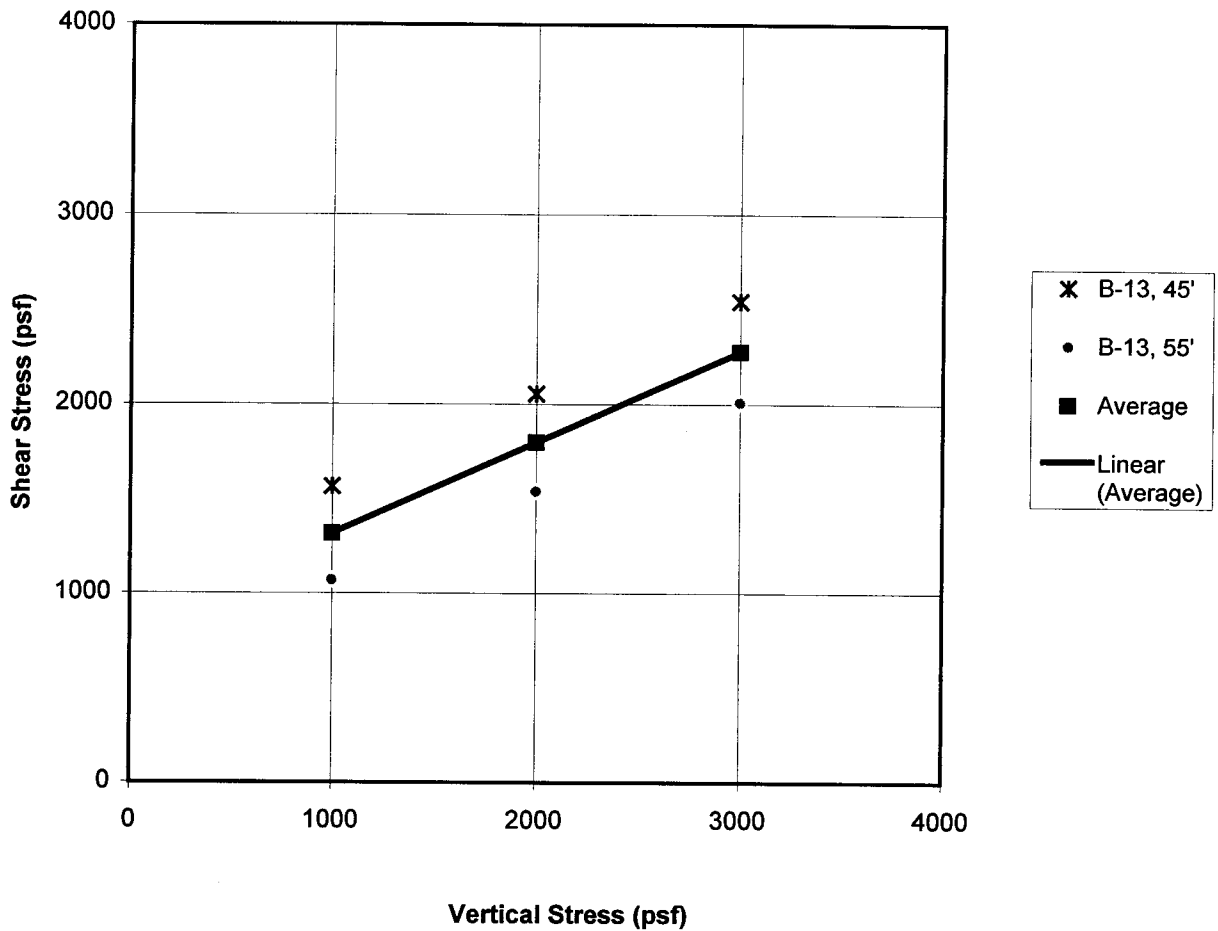
Friction Angle, ϕ (degrees)	<u>38</u>
Cohesion, c (psf)	<u>900</u>

DIRECT SHEAR SUMMARY

Project No.	<u>040151-001</u>
Project Name	<u>HDR/Del Mar</u>
Figure No.	<u>G-6</u>



**Composite of Residual Direct Shear Results on Delmar Formation
Tested at Field Moisture by MAH 1998**



Average Strength Values

Friction Angle, ϕ (degrees) 26

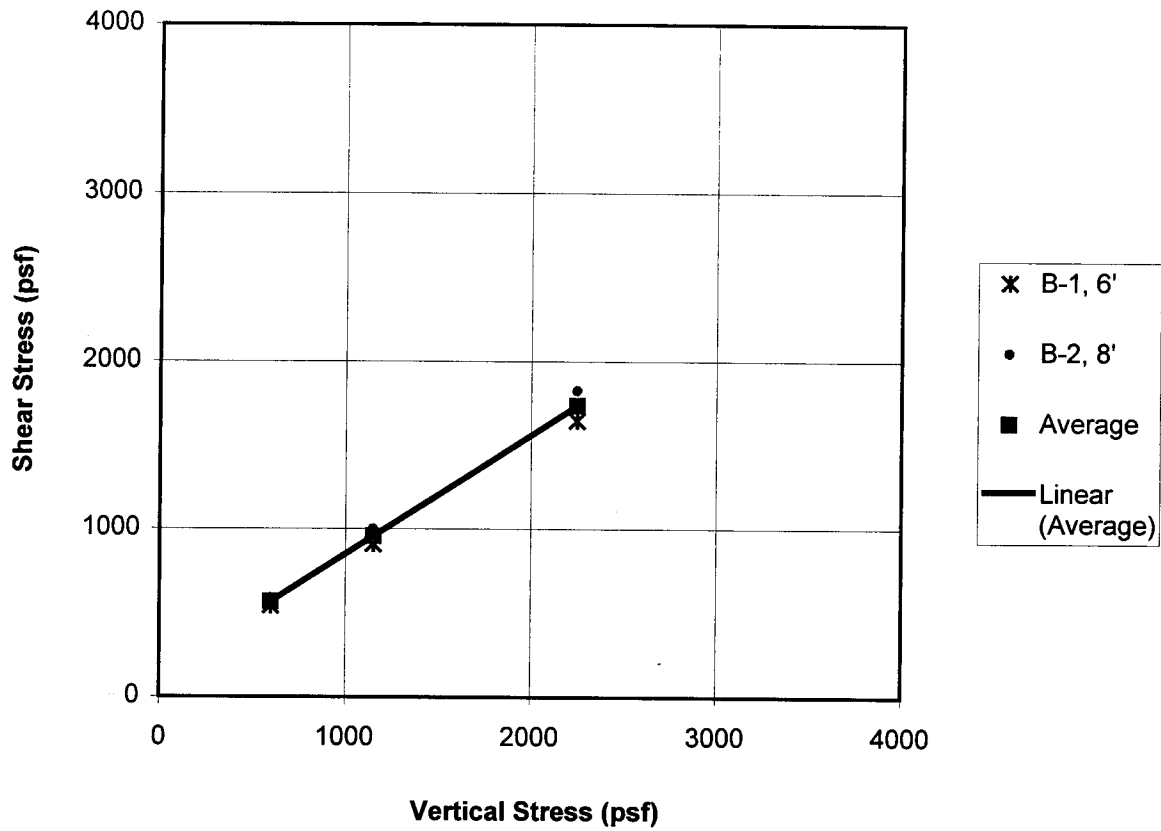
Cohesion, c (psf) 800

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-7



**Composite of Peak Direct Shear Results on Bay Point Formation Tested
by Leighton & Associates 1978**



Average Strength Values

Friction Angle, ϕ (degrees) 35

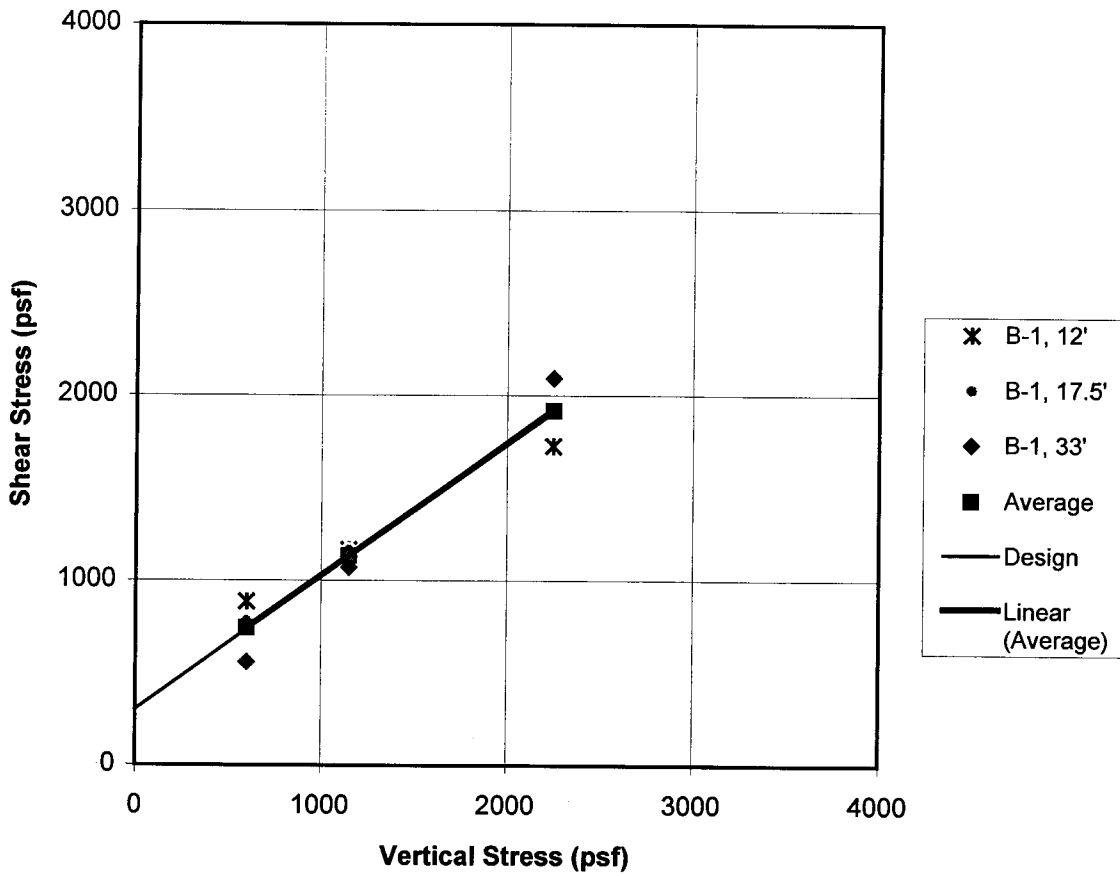
Cohesion, c (psf) 140

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-8



**Composite of Peak Direct Shear Results on Delmar Formation Tested
by Leighton & Associates 1978**



Average Strength Values

Friction Angle, ϕ (degrees) 36

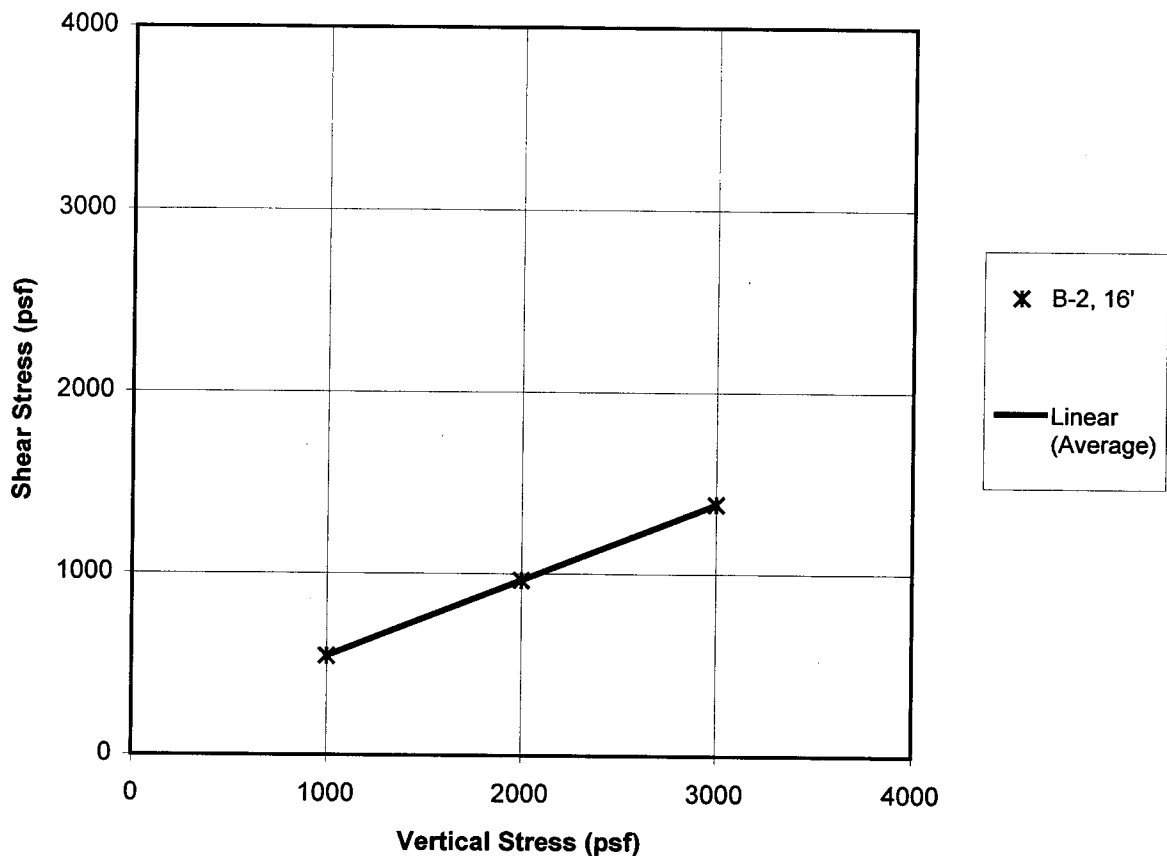
Cohesion, c (psf) 300

DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-9



**Residual Direct Shear Results on Delmar Formation Tested
by Leighton & Associates 1978**



Average Strength Values

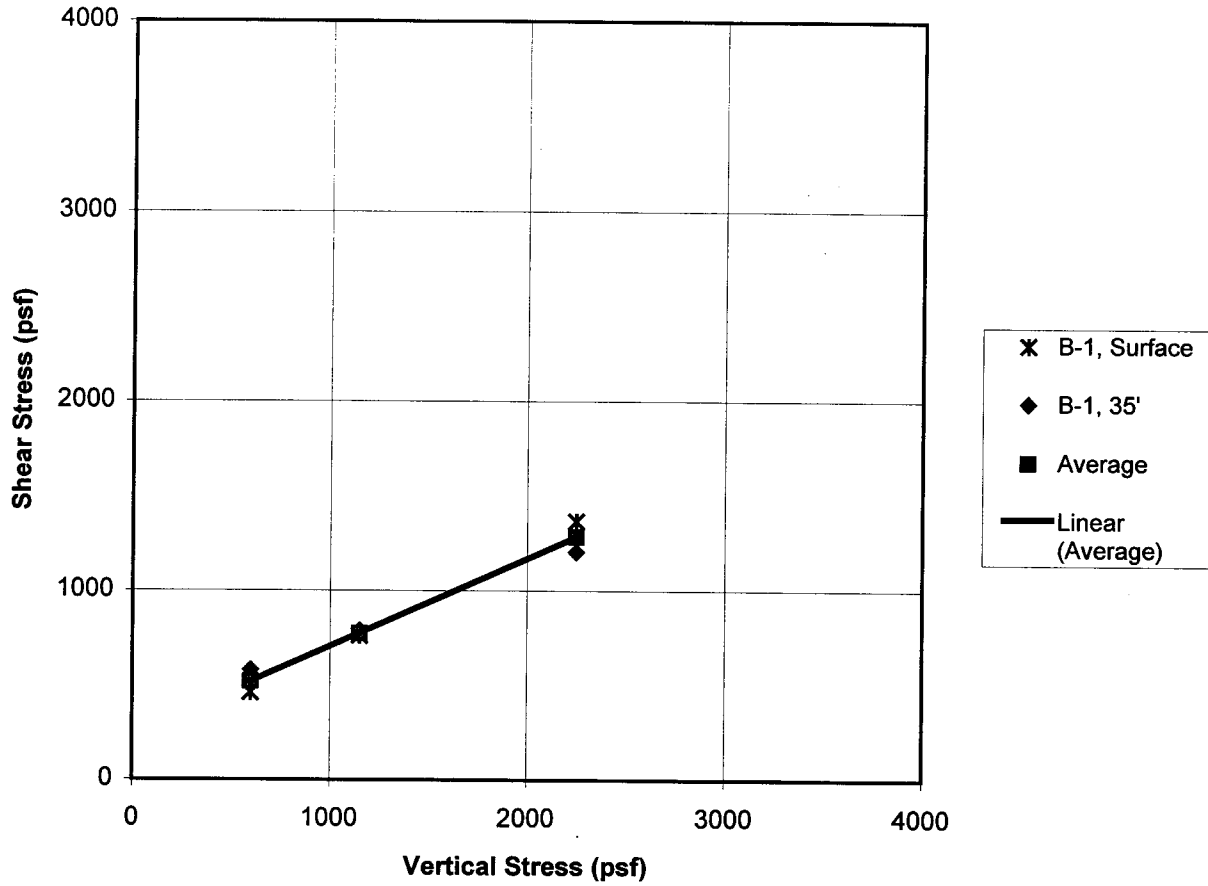
Friction Angle, ϕ (degrees)	<u>23</u>
Cohesion, c (psf)	<u>125</u>

DIRECT SHEAR SUMMARY

Project No.	<u>040151-001</u>
Project Name	<u>HDR/Del Mar</u>
Figure No.	<u>G-10</u>



**Peak Direct Shear Results on Remolded Samples Tested
by Leighton & Associates 1978**



Average Strength Values

Friction Angle, ϕ (degrees) 25

Cohesion, c (psf) 240

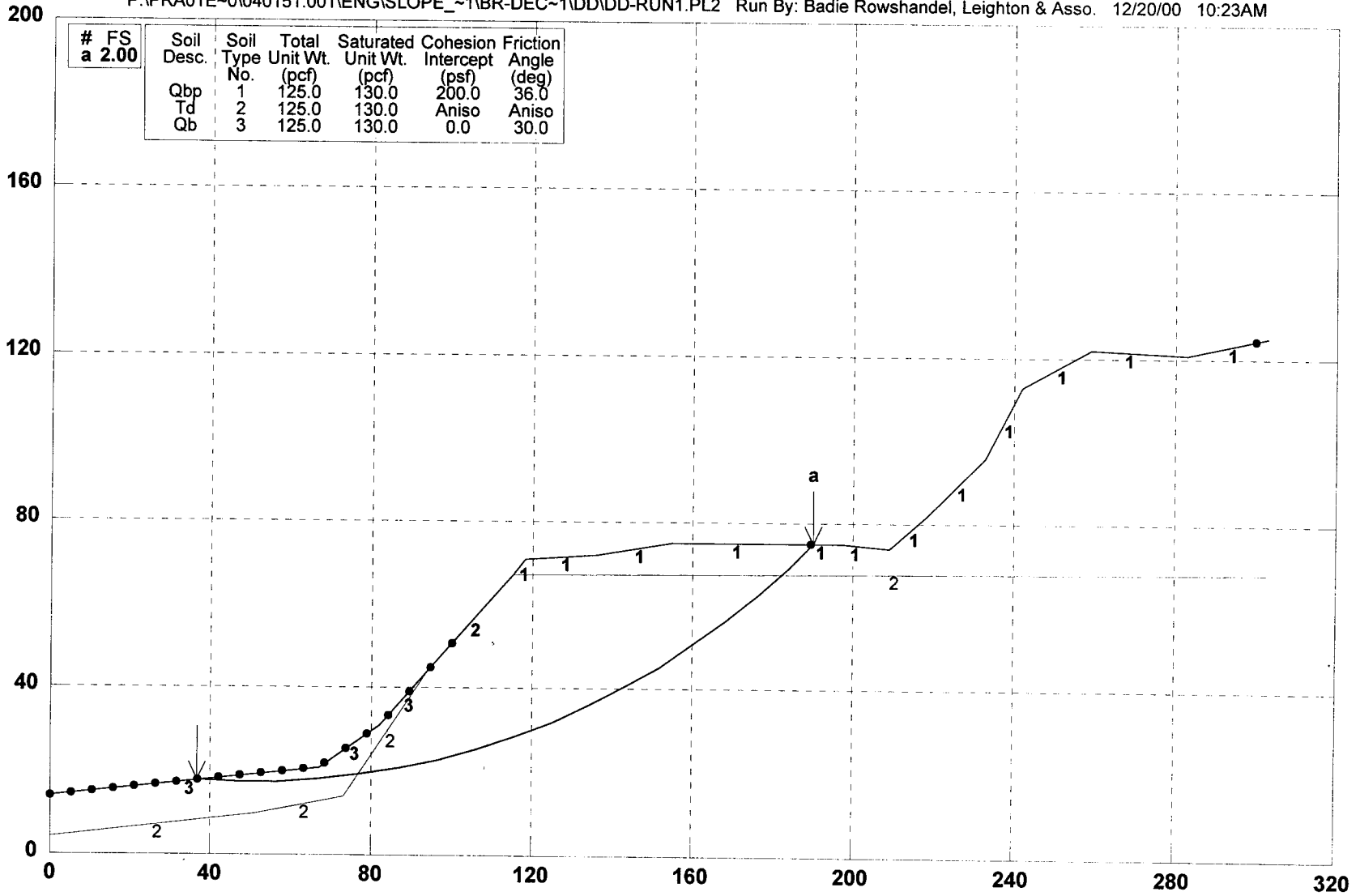
DIRECT SHEAR SUMMARY

Project No. 040151-001
 Project Name HDR/Del Mar
 Figure No. G-11



Cross Section (D-D'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\DD\DD-RUN1.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 10:23AM



GSTABL7 FSmin=2.00

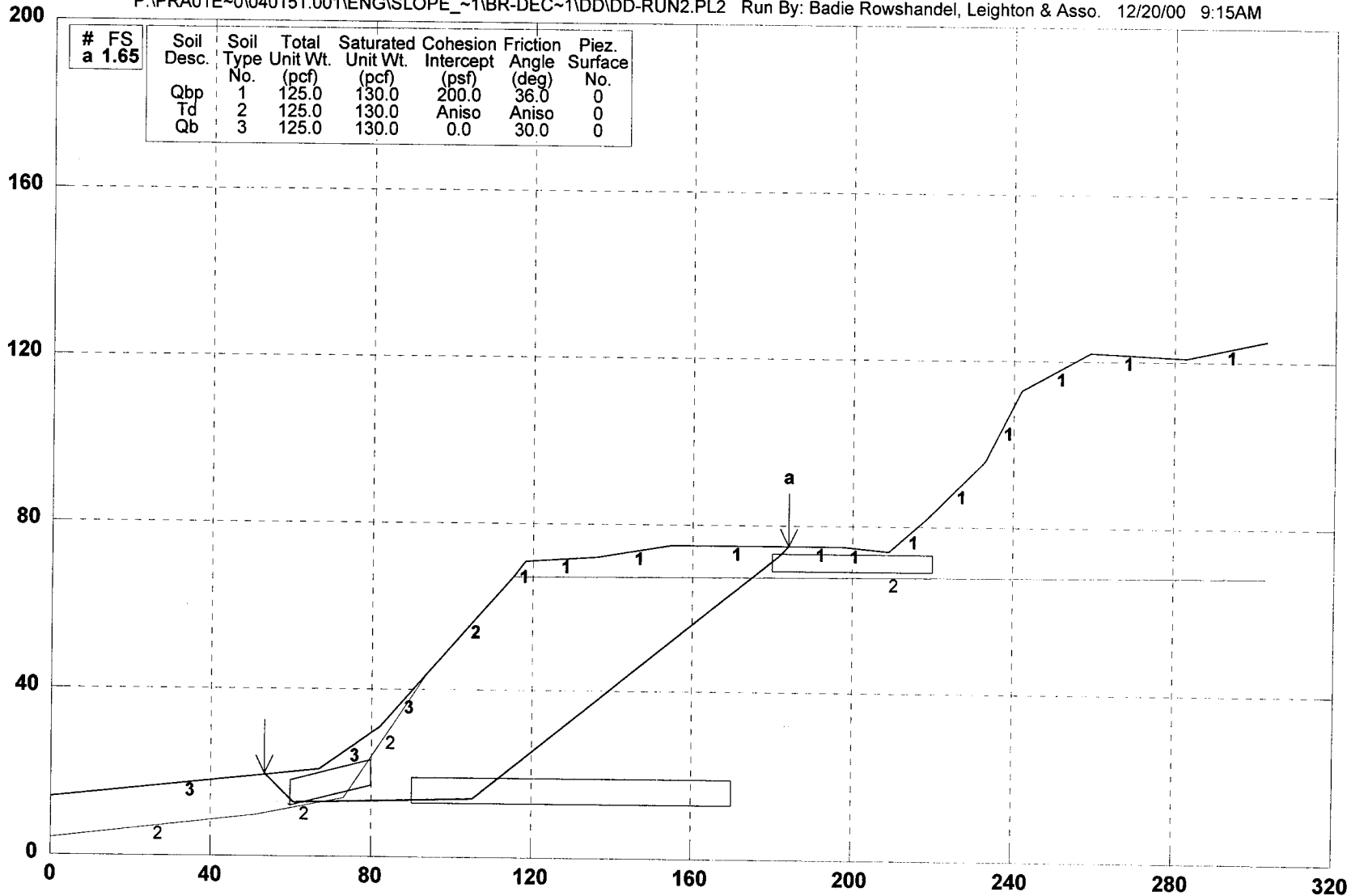
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (D-D'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\DD\DD-RUN2.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 9:15AM



GSTABL7 FSmin=1.65

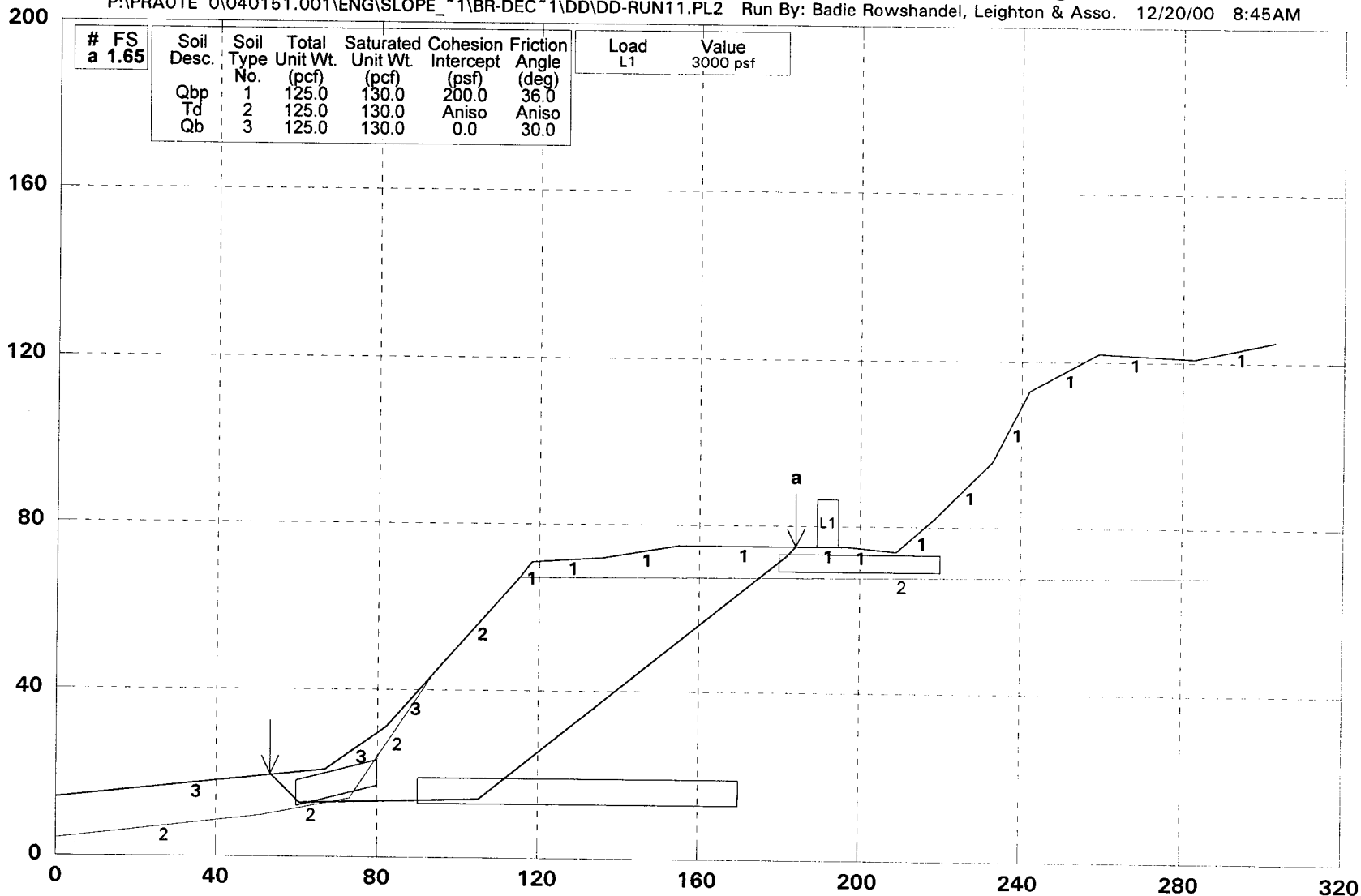
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (D-D'), Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E\0\040151.001\ENG\SLOPE_1\BR-DEC\1\DD\DD-RUN11.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 8:45AM



GSTABL7 FSmin=1.65

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

STED



Cross Section (D-D'), Del Mar Bluffs, Pseudostatic

C:\STEDWIN\DELMAR\DDMS.PL2 Run By: JLM 7/17/00 2:39PM

200

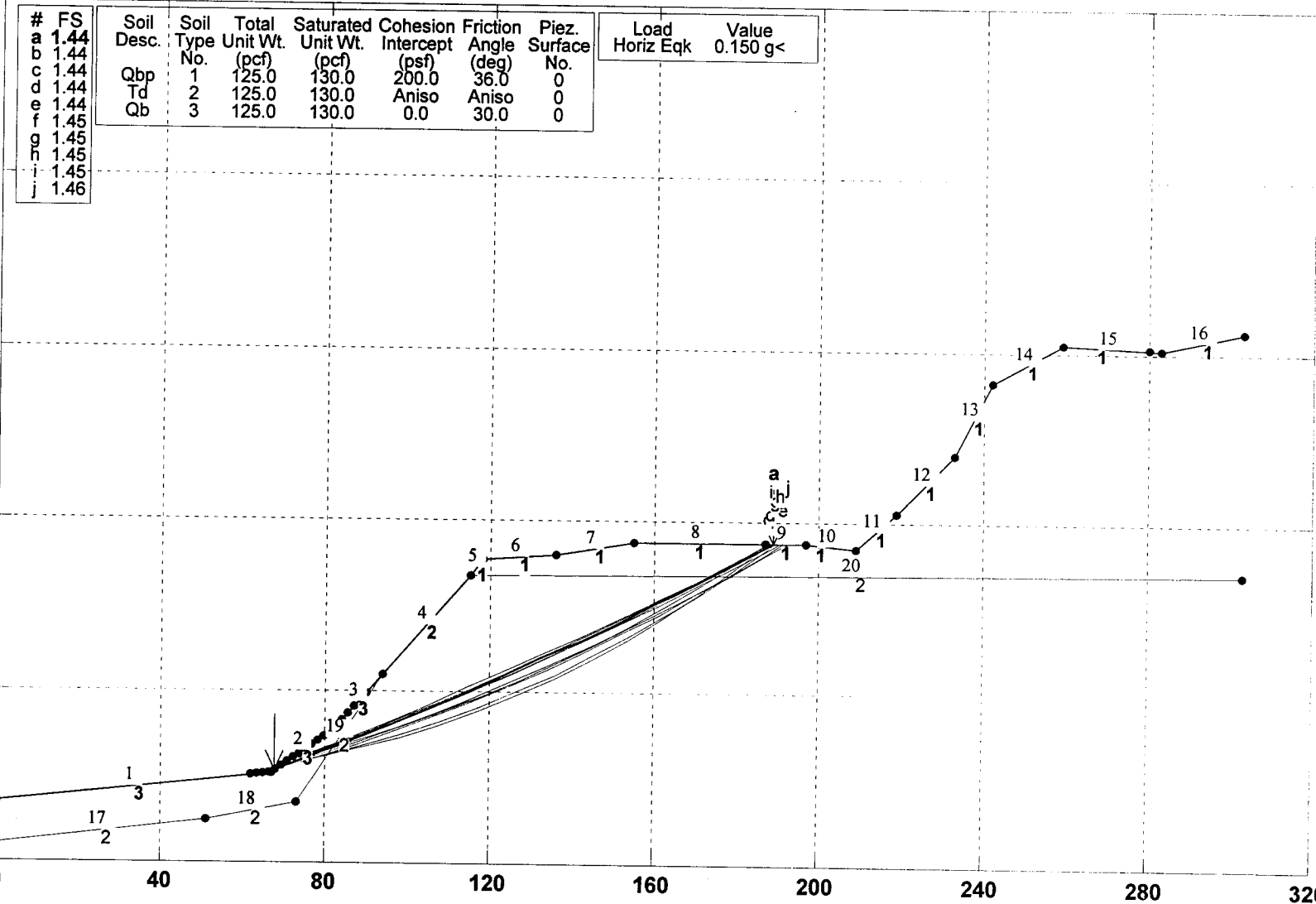
160

120

80

40

0



GSTABL7 FSmin=1.44

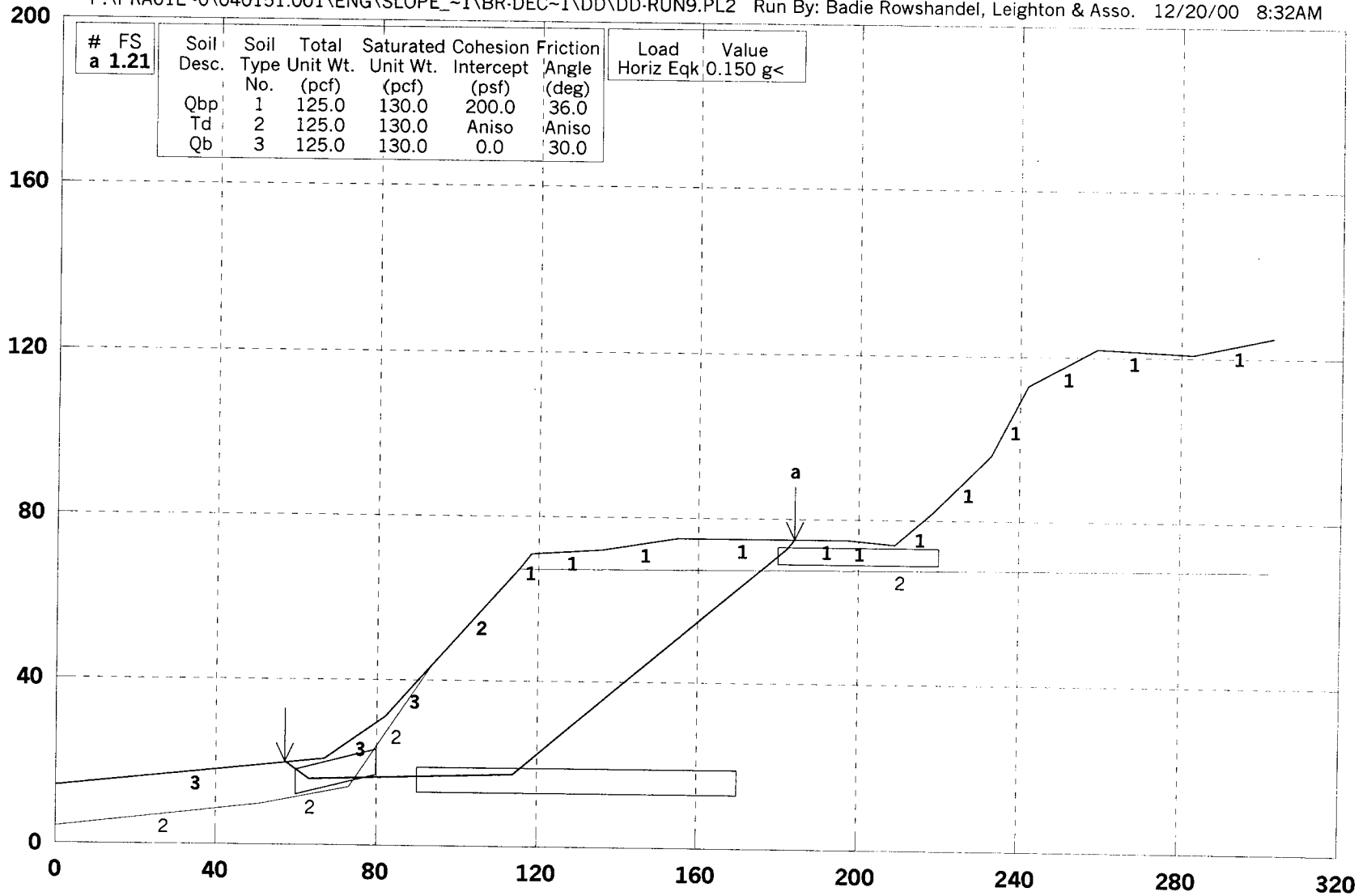
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (D-D'), Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\DD\DD-RUN9.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 8:32AM



#	FS	Soil Desc.	Soil Type	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load Horiz Eqk	Value
a	1.21								0.150 g<
		Qbp	1	125.0	130.0	200.0	36.0		
		Td	2	125.0	130.0	Aniso	Aniso		
		Qb	3	125.0	130.0	0.0	30.0		

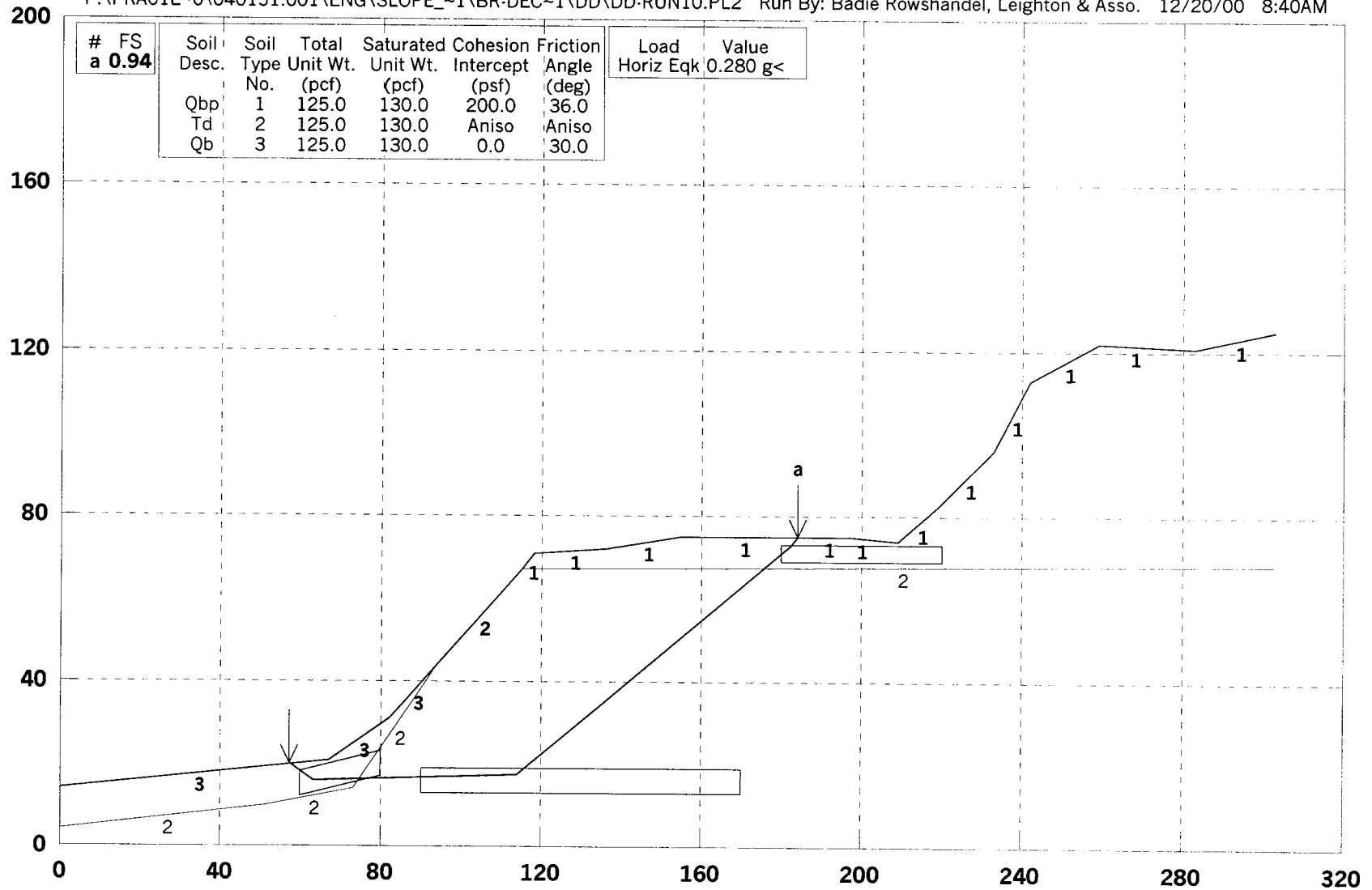
STED



GSTABL7 FSmin=1.21
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Cross Section (D-D'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\DD\DD-RUN10.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 8:40AM



GSTABL7 FSmin=0.94

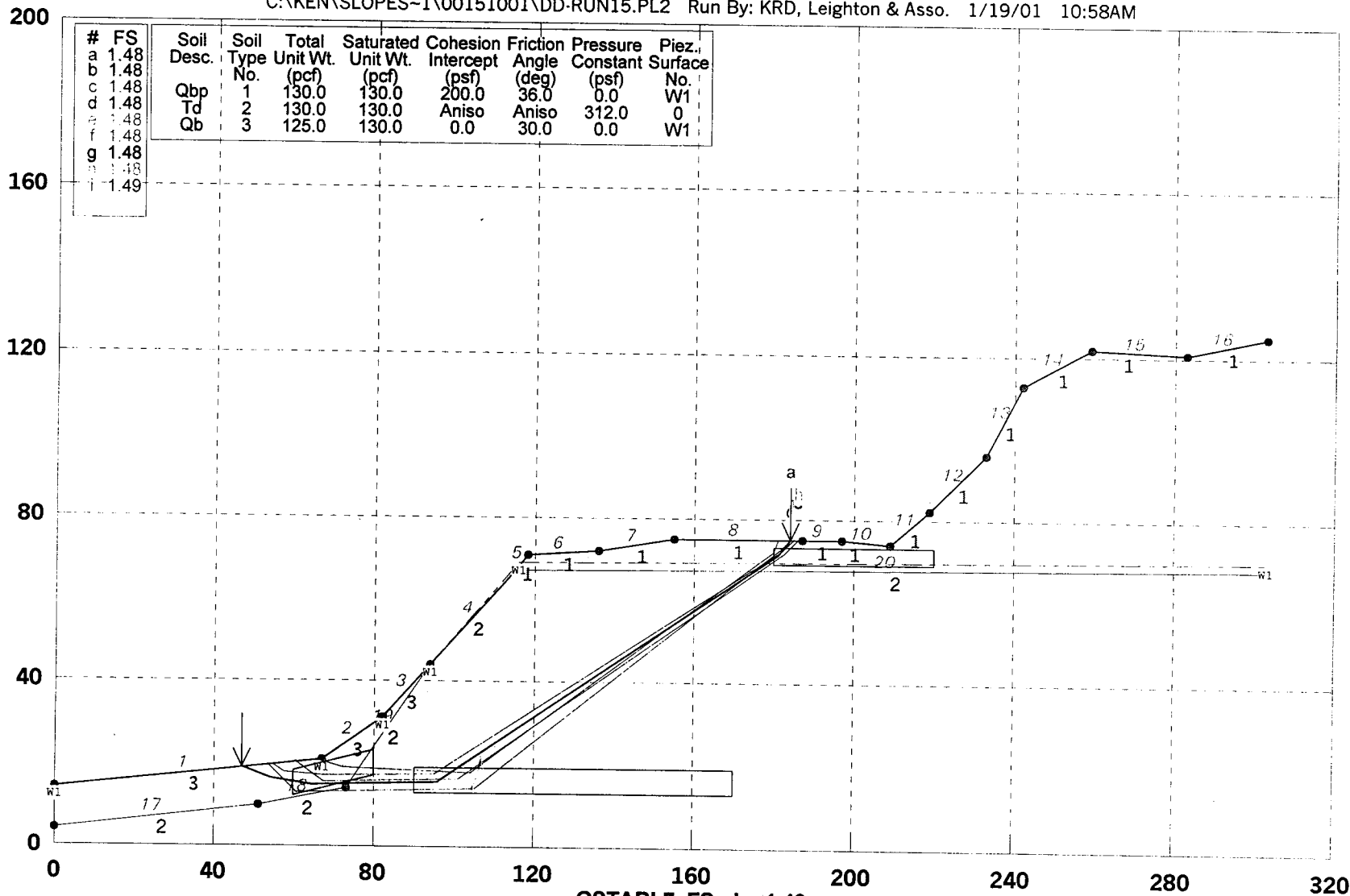
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (D-D'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES-1\00151001\DD-RUN15.PL2 Run By: KR D, Leighton & Asso. 1/19/01 10:58AM



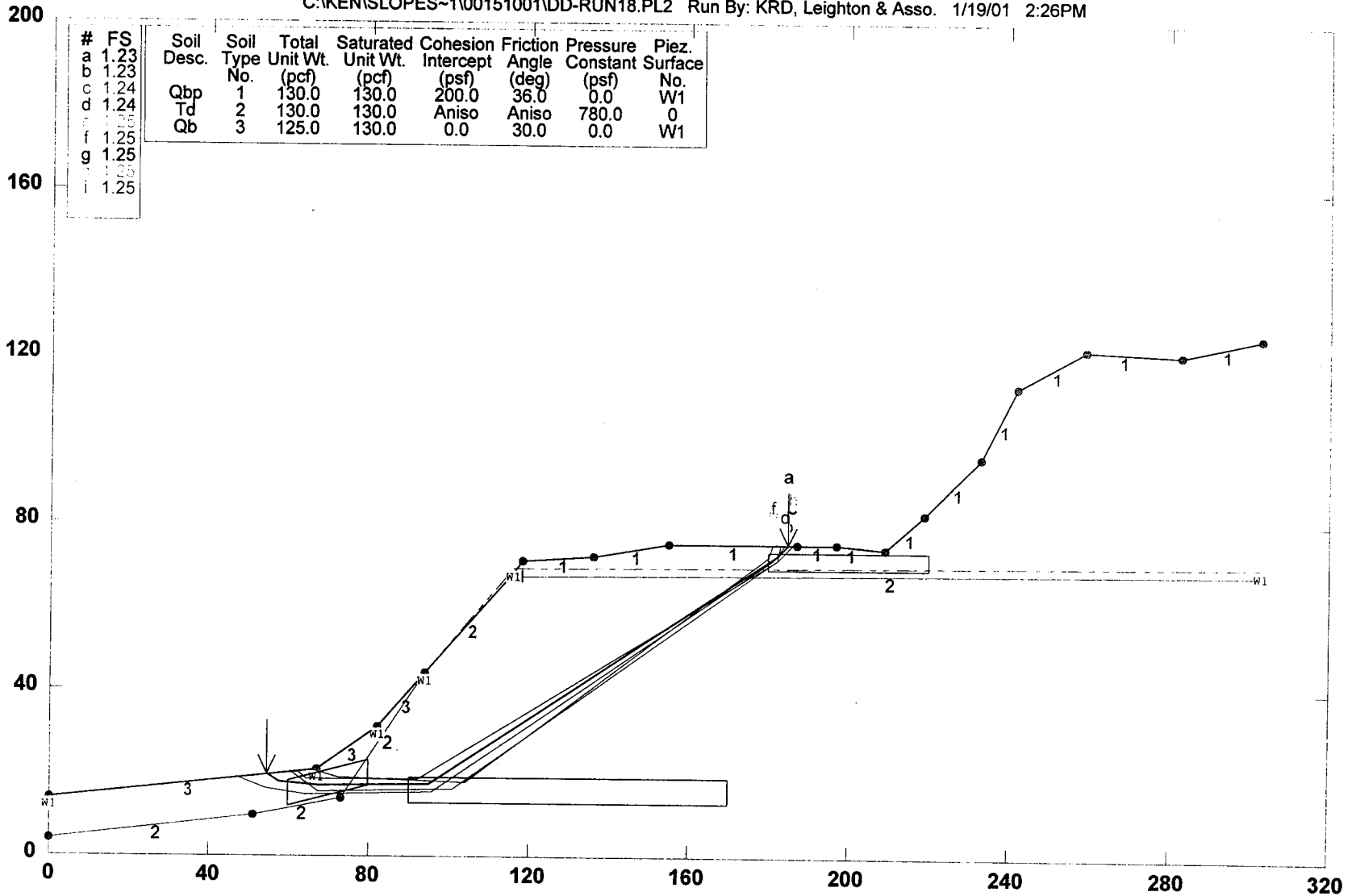
GSTABL7 FSmin=1.48
 Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (D-D'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\DD-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/19/01 2:26PM



GSTABL7 FSmin=1.23

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

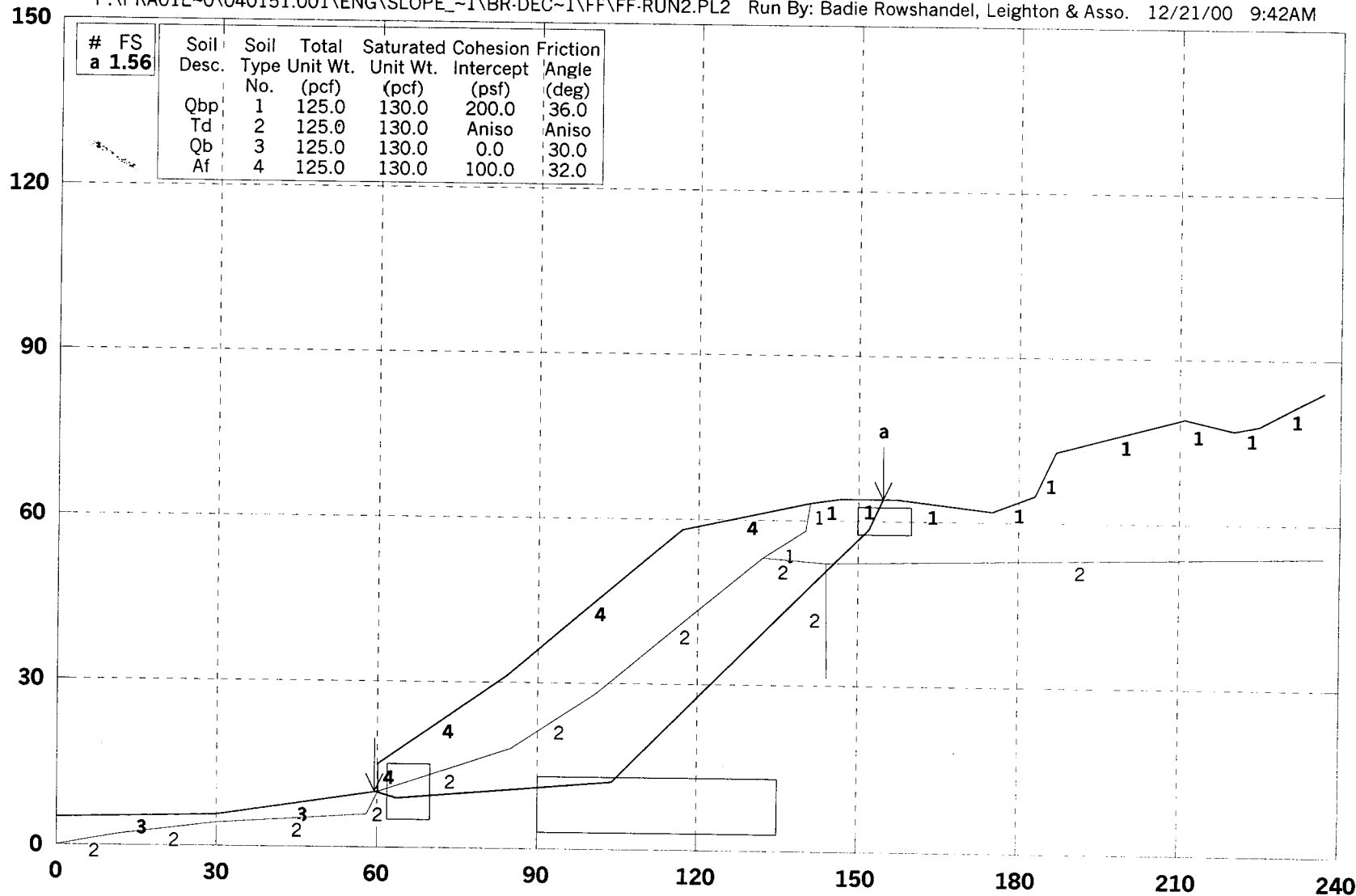
STED



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Cross Section (F-F'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\FF\FF-RUN2.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 9:42AM



GSTABL7 FSmin=1.56

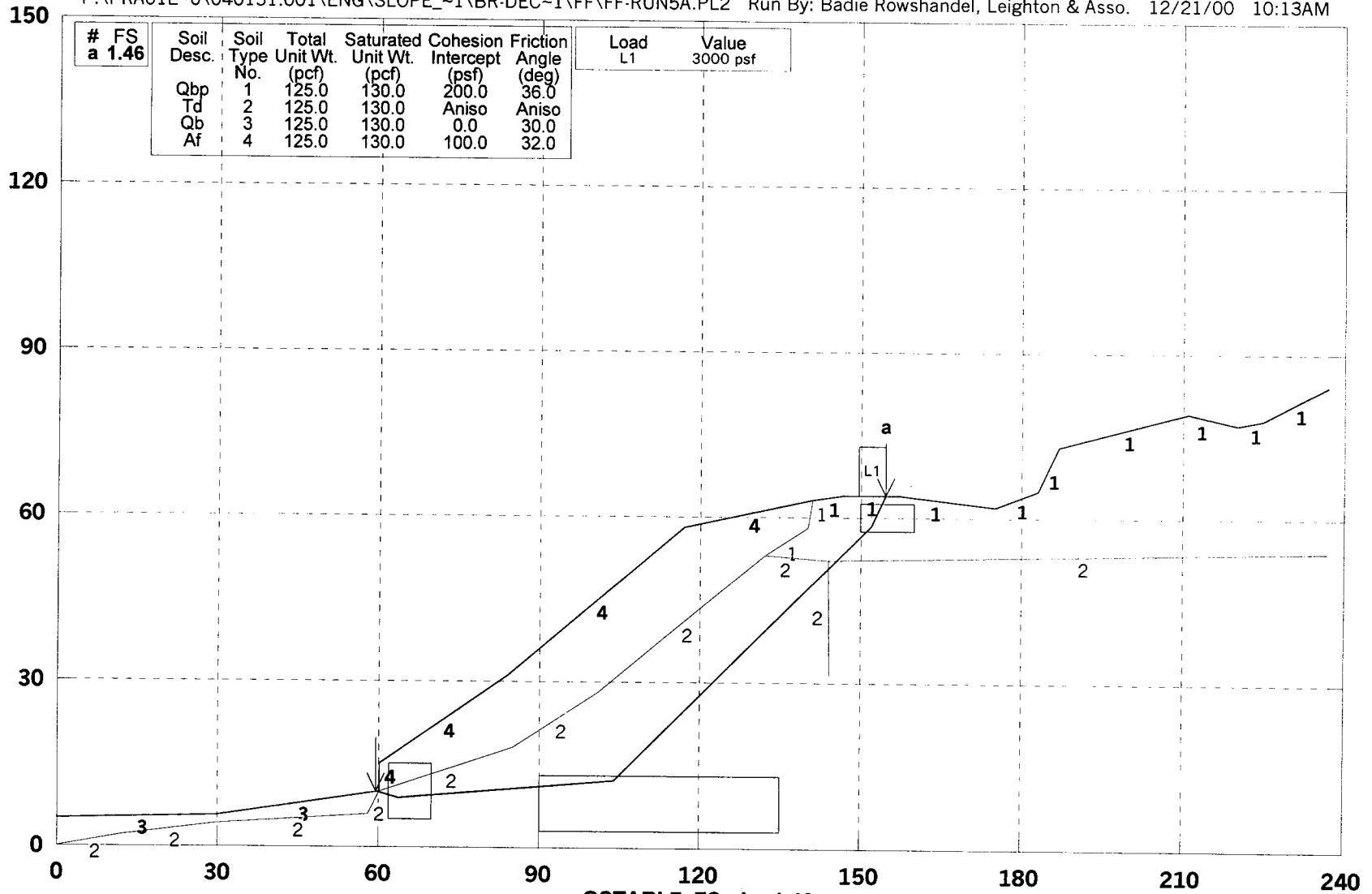
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (F-F'), Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\FF\FF-RUN5A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 10:13AM



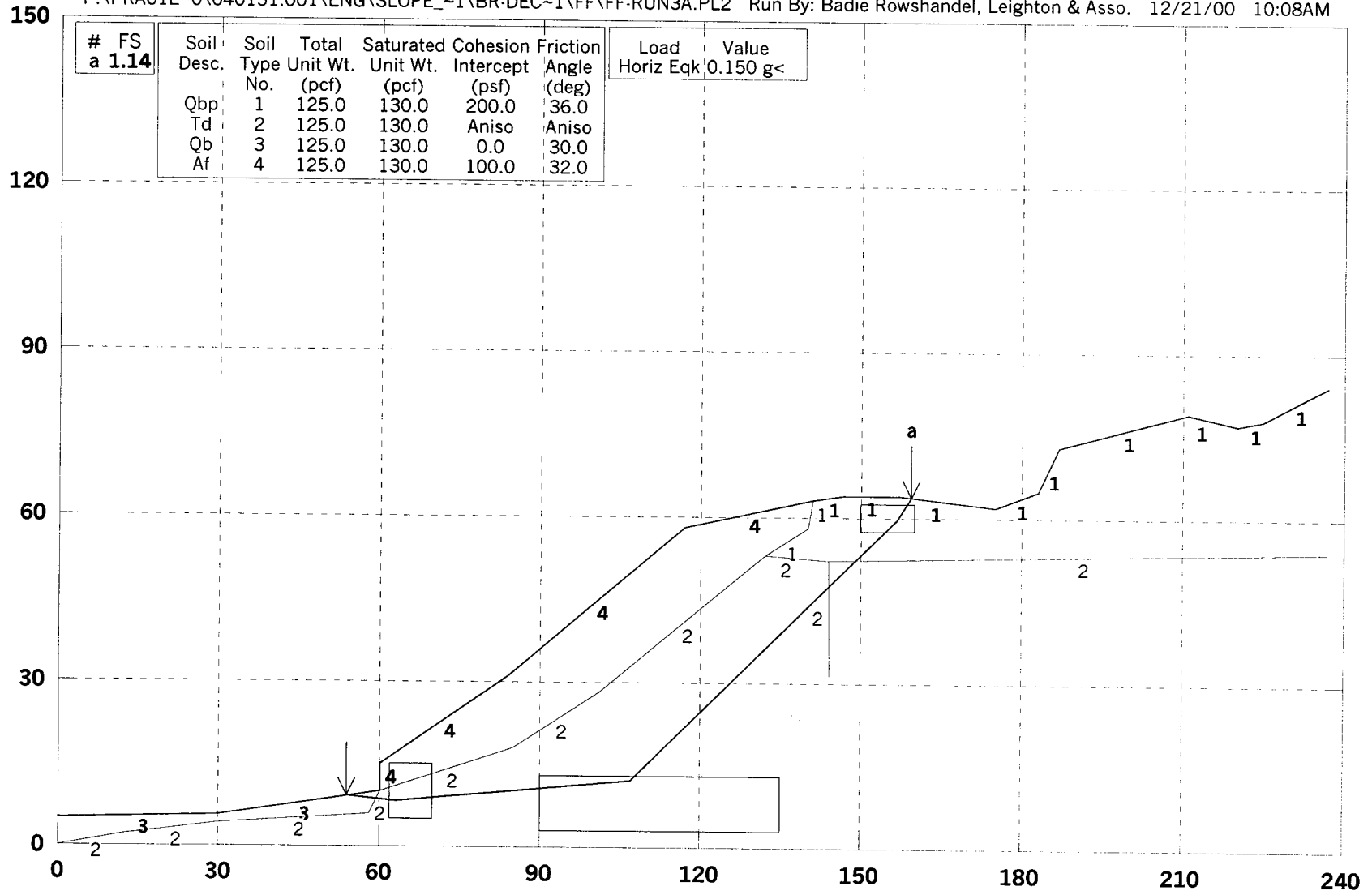
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (F-F'), Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E-0\040151.001\ENG\SLOPE_~1\BR-DEC~1\FF\FF-RUN3A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 10:08AM



GSTABL7 FSmin=1.14

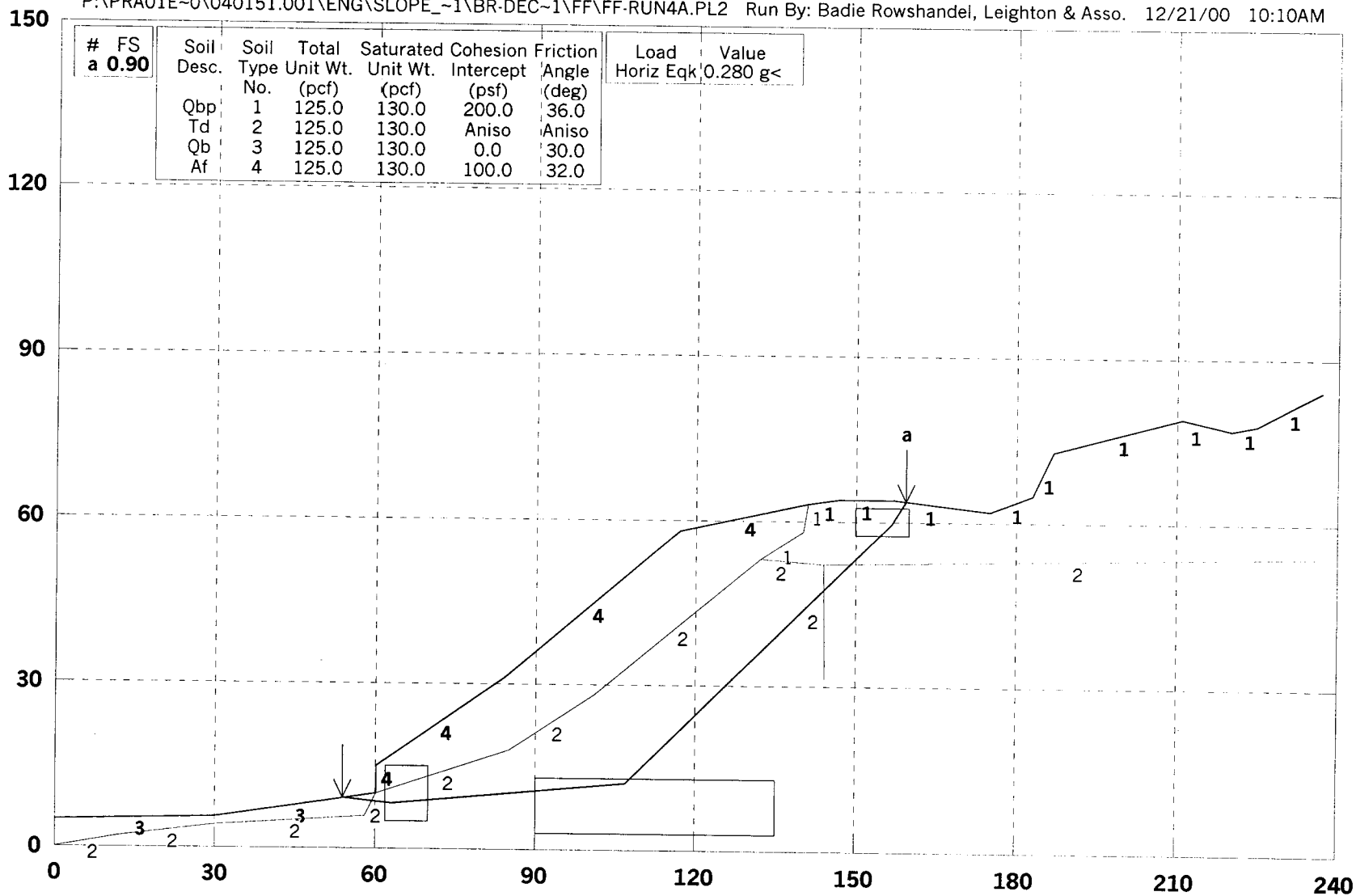
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (F-F'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\FF\FF-RUN4A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 10:10AM



GSTABL7 FSmin=0.90

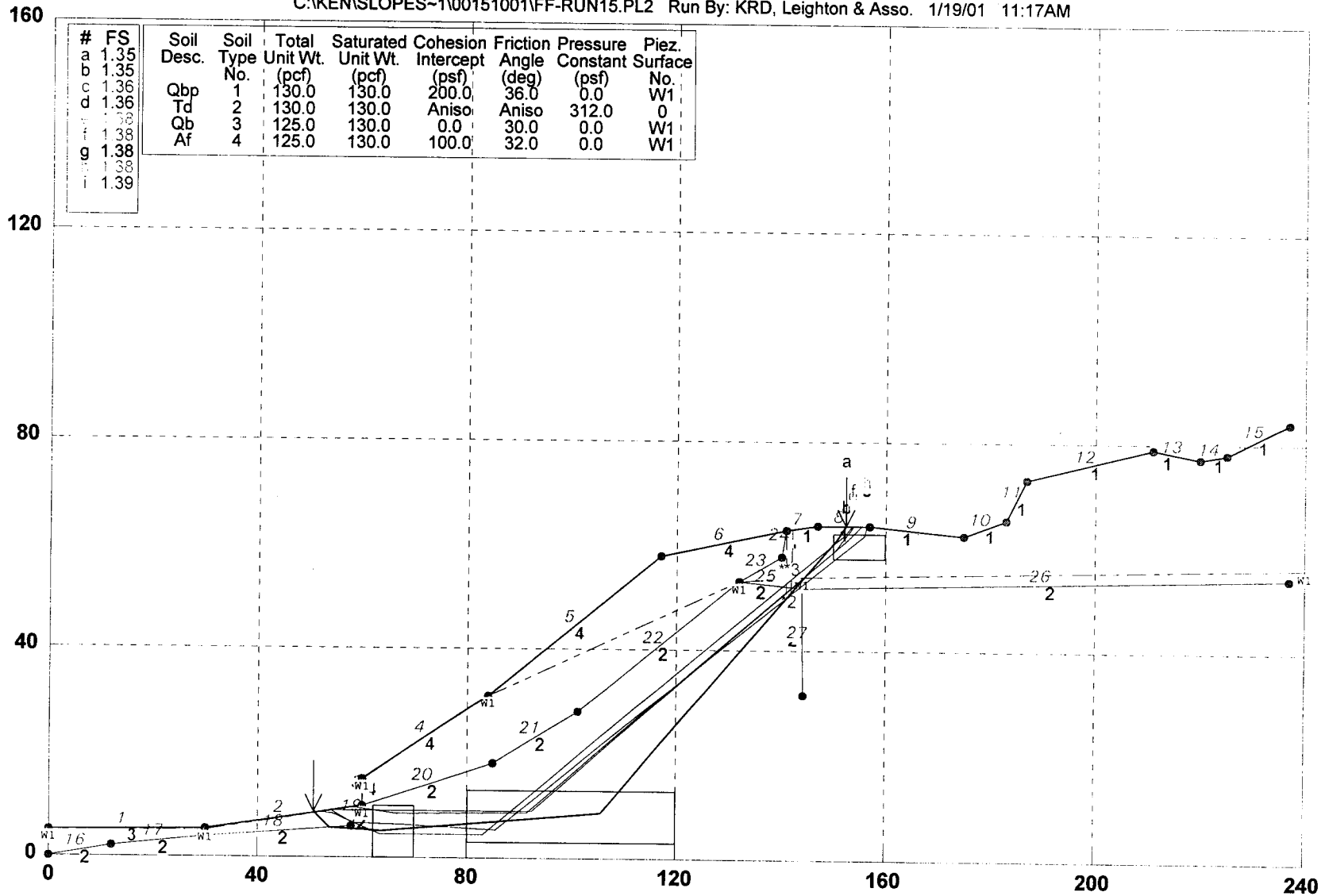
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (F-F'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\FF-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 11:17AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.35								
b	1.35								
c	1.36	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	1.36	Td	2	130.0	130.0	Aniso	Aniso	312.0	0
e	1.38	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	1.38	Af	4	125.0	130.0	100.0	32.0	0.0	W1
g	1.38								
h	1.38								
i	1.39								

GSTABL7 FSmin=1.35

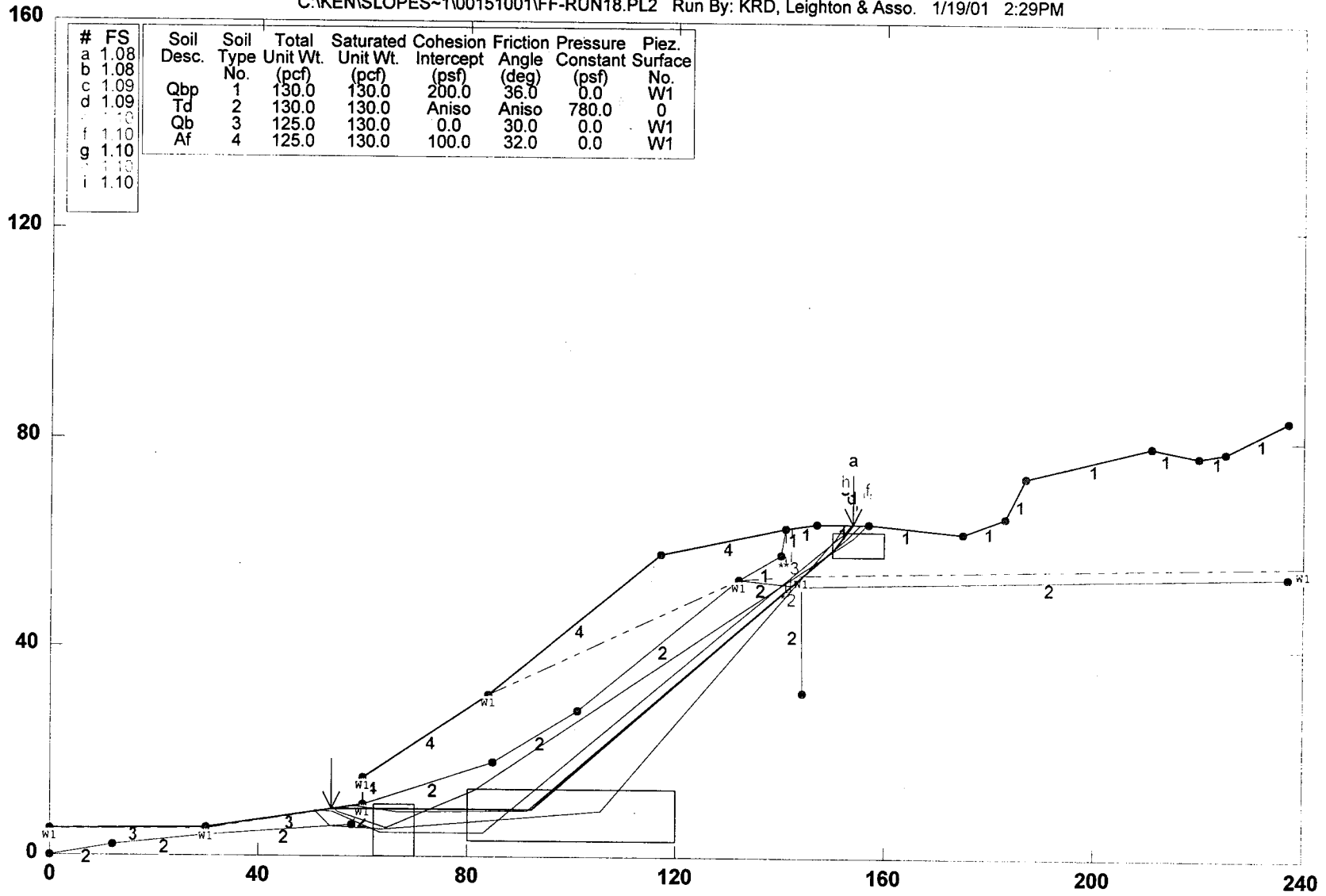
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (F-F'), Del Mar Bluffs, Static/Saturated

C:\KENSLOPES~1\00151001\FF-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/19/01 2:29PM



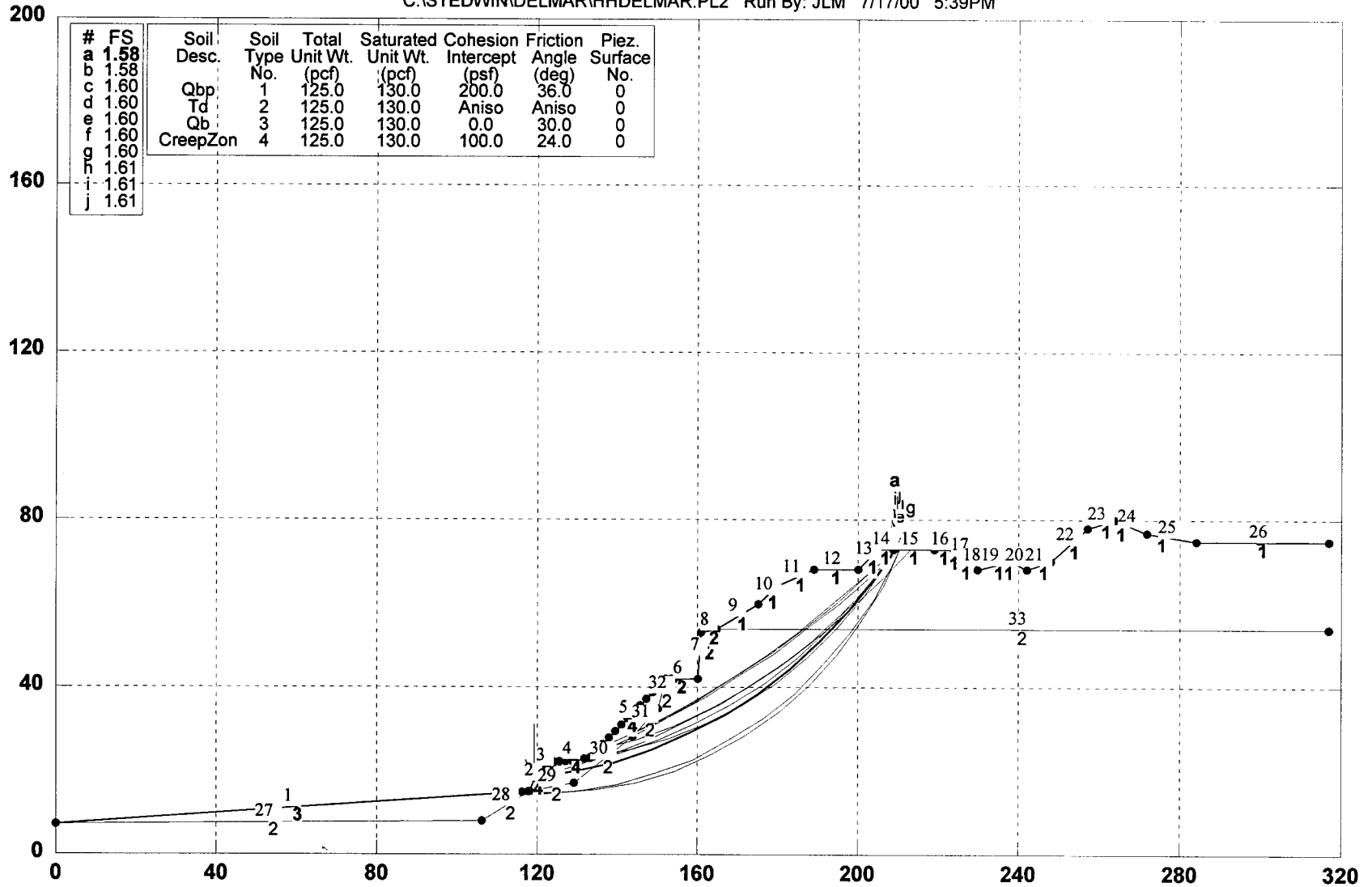
GSTABL7 FSmin=1.08
 Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (H-H'), Del Mar Bluffs

C:\STEDWIN\DELMAR\HHDELMAR.PL2 Run By: JLM 7/17/00 5:39PM



GSTABL7 FSmin=1.58

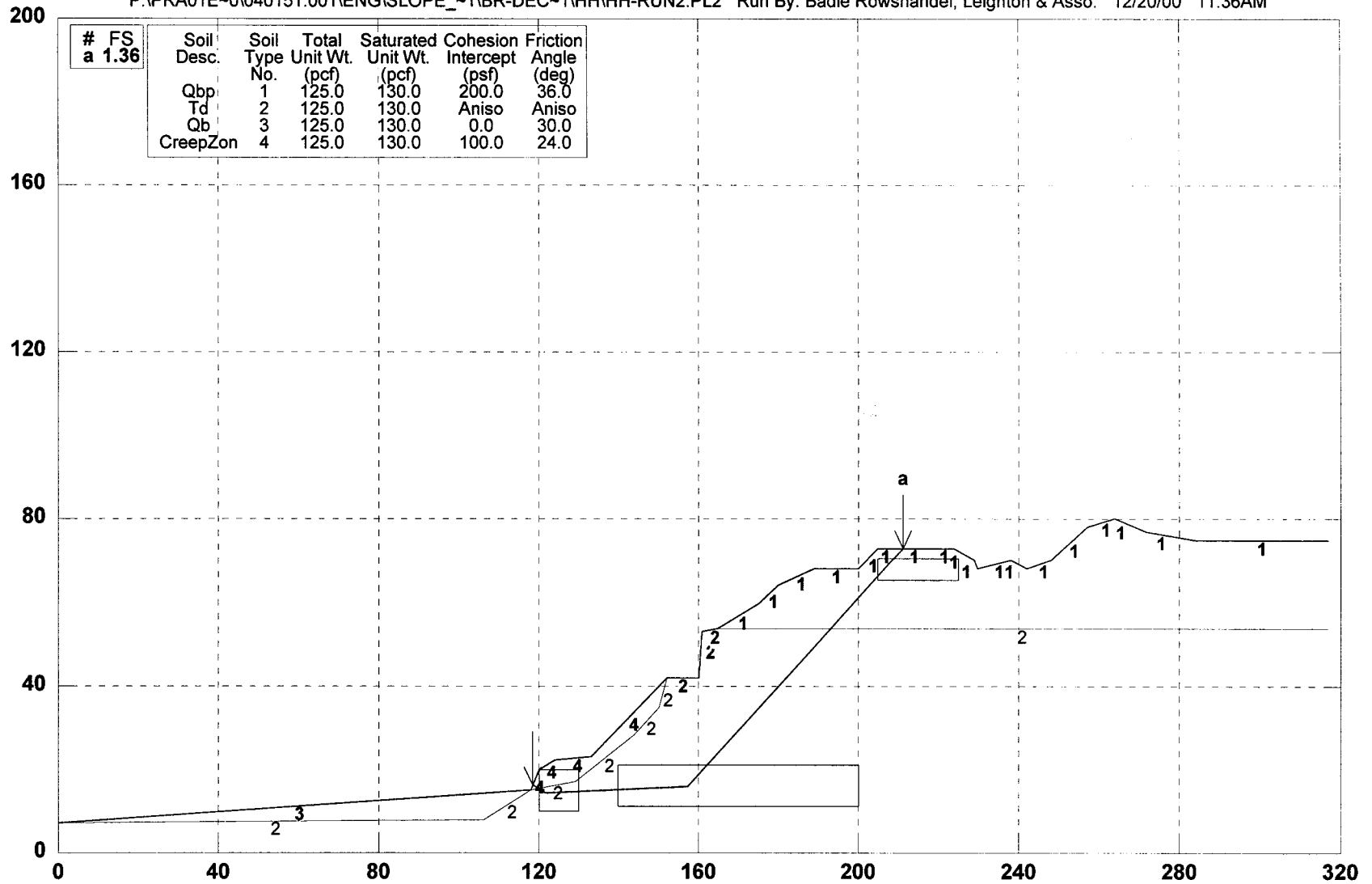
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (H-H'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\HH\HH-RUN2.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 11:36AM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)
a 1.36	Qbp	1	125.0	130.0	200.0	36.0
	Td	2	125.0	130.0	Aniso	Aniso
	Qb	3	125.0	130.0	0.0	30.0
	CreepZon	4	125.0	130.0	100.0	24.0

GSTABL7 FSmin=1.36

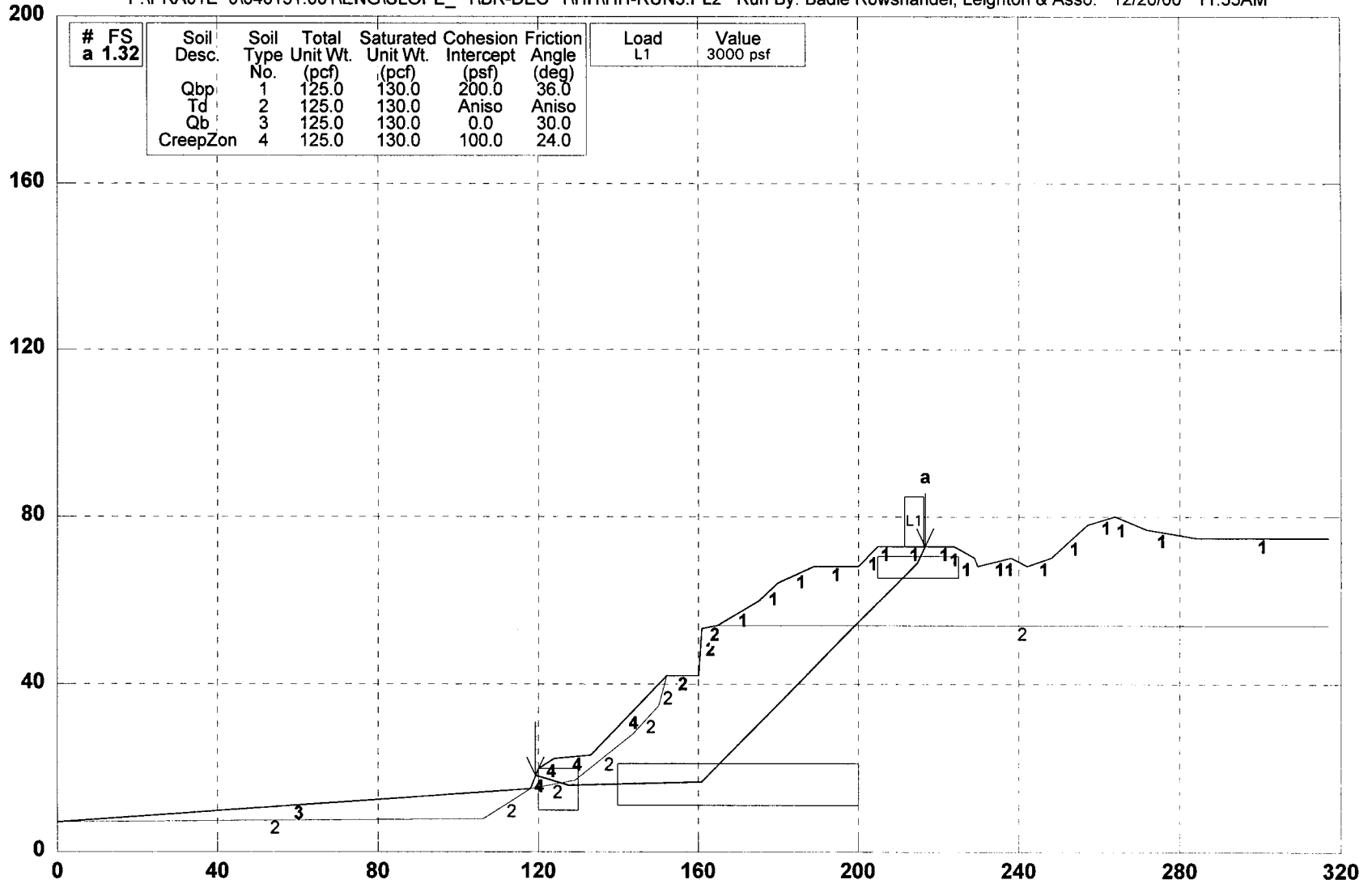
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (H-H'), Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\HH\HH-RUN5.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 11:55AM



GSTABL7 FSmin=1.32

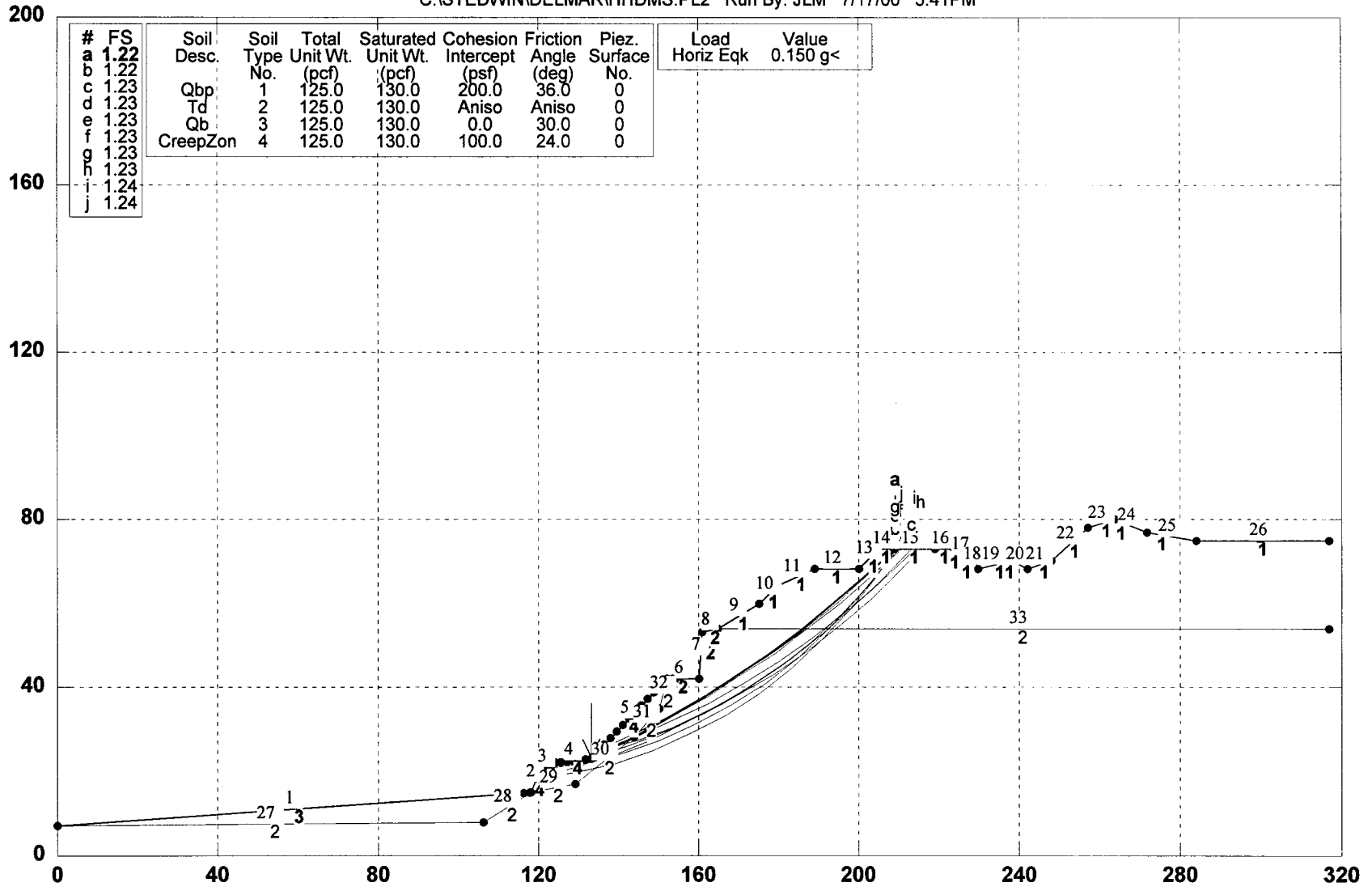
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (H-H'), Del Mar Bluffs, Pseudostatic

C:\STEDWIN\DELMAR\HHDMS.PL2 Run By: JLM 7/17/00 5:41PM



GSTABL7 FSmin=1.22

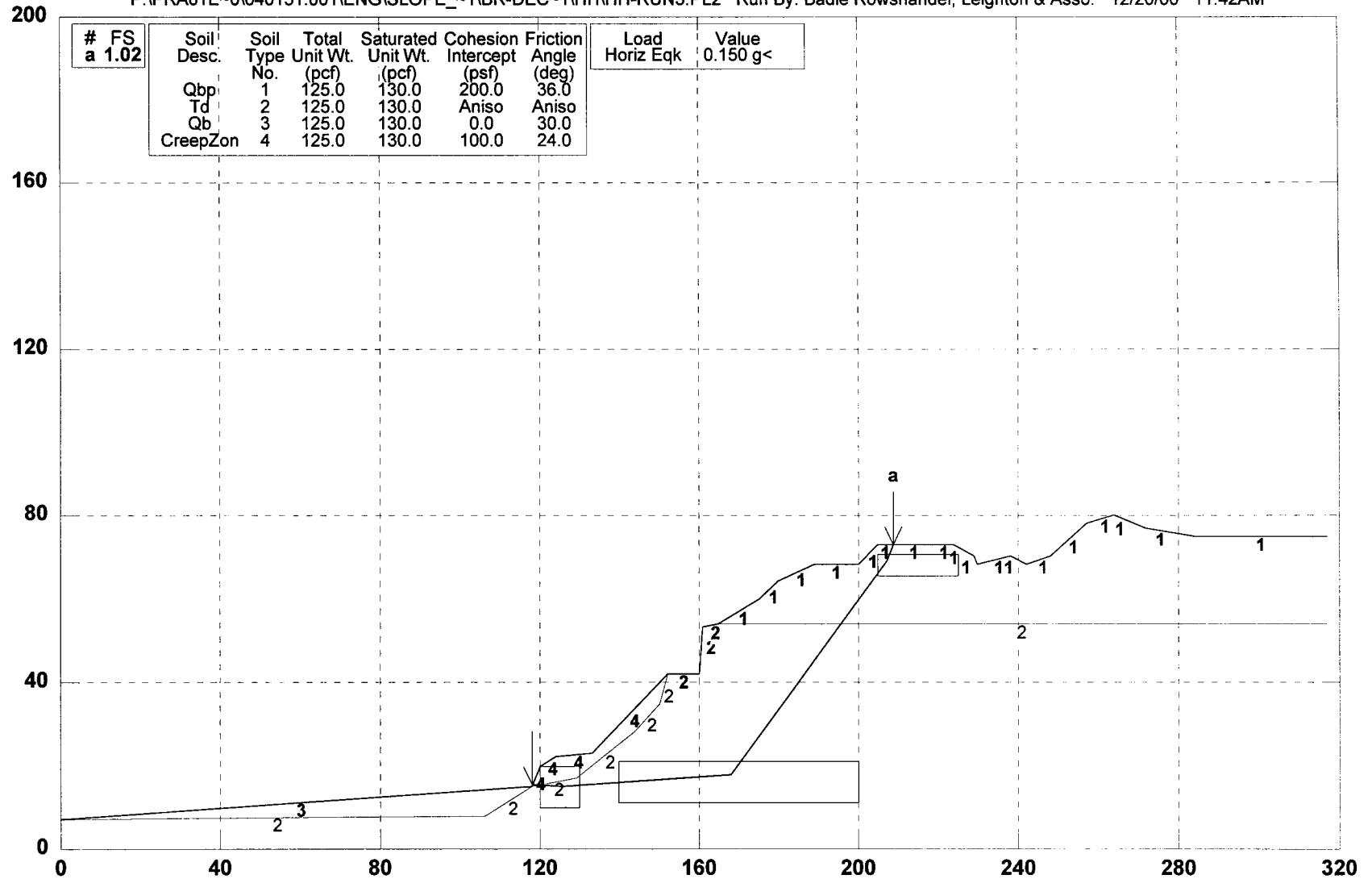
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (H-H'), Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\HH\HH-RUN3.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 11:42AM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load Horiz Eqk	Value
a 1.02	Qbp	1	125.0	130.0	200.0	36.0		0.150 g<
	Td	2	125.0	130.0	Aniso	Aniso		
	Qb	3	125.0	130.0	0.0	30.0		
	CreepZon	4	125.0	130.0	100.0	24.0		

GSTABL7 FSmin=1.02

Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (H-H'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\HH\HH-RUN4.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 11:45AM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load Horiz Eqk	Value
a 0.81	Qbp	1	125.0	130.0	200.0	36.0		0.280 g<
	Td	2	125.0	130.0	Aniso	Aniso		
	Qb	3	125.0	130.0	0.0	30.0		
	CreepZon	4	125.0	130.0	100.0	24.0		

GSTABL7 FSmin=0.81

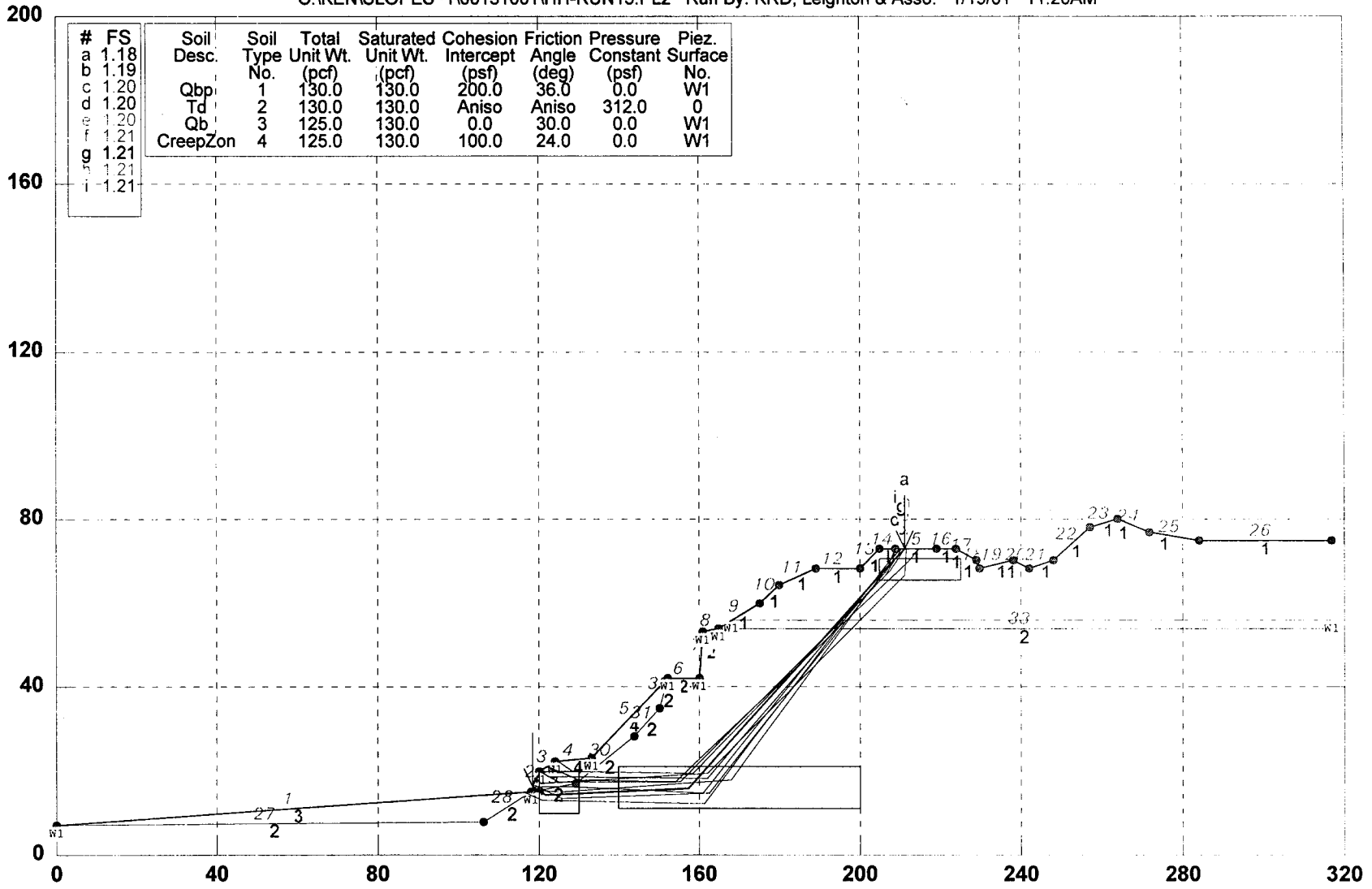
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (H-H'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\HH-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 11:20AM

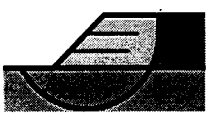


#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.18								
b	1.19								
c	1.20	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	1.20	Td	2	130.0	130.0	Aniso	Aniso	312.0	0
e	1.21	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	1.21	CreepZon	4	125.0	130.0	100.0	24.0	0.0	W1
g	1.21								
h	1.21								
i	1.21								

GSTABL7 FSmin=1.18

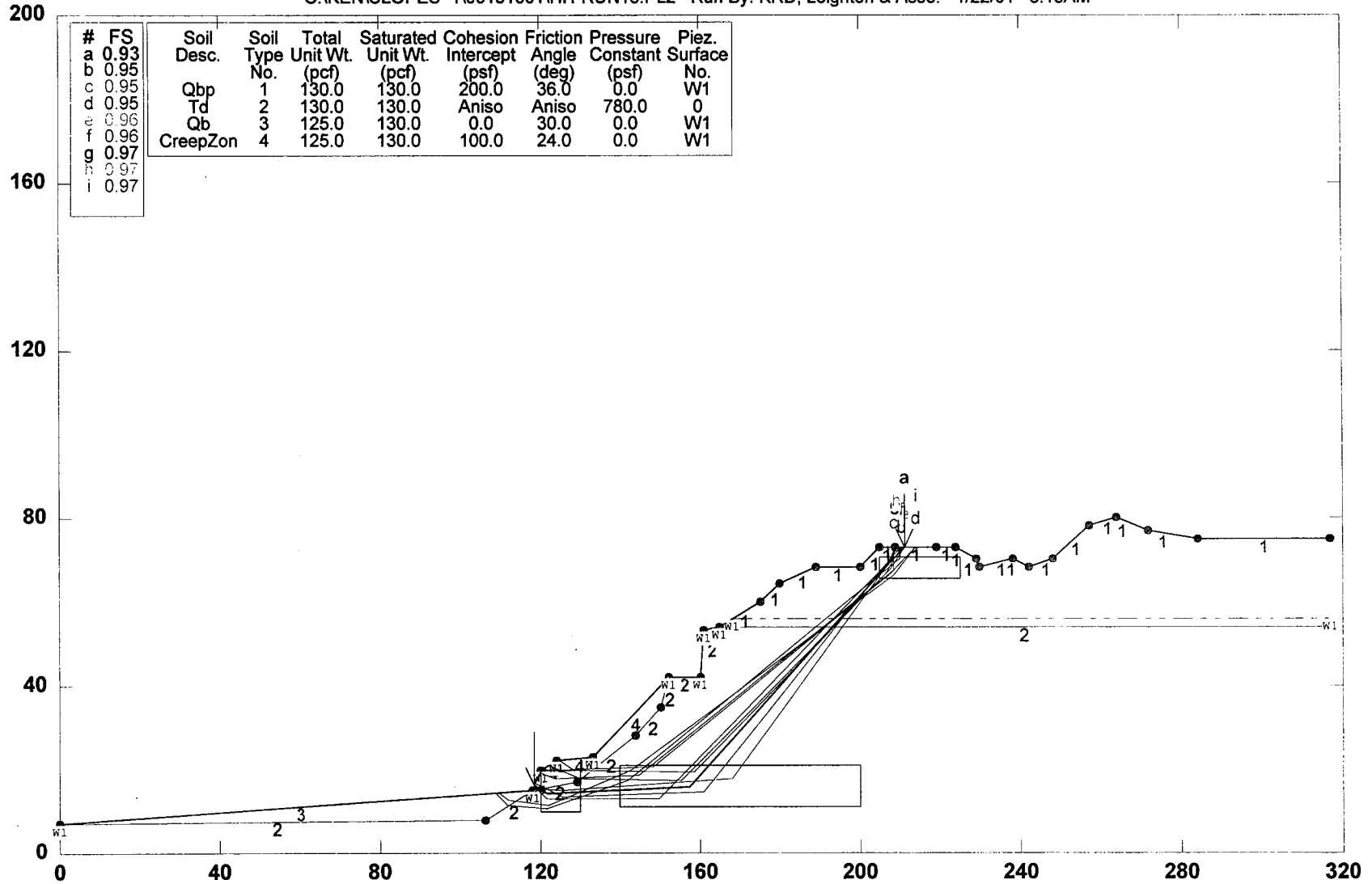
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (H-H'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\HH-RUN18.PL2 Run By: KRDL, Leighton & Asso. 1/22/01 8:15AM



GSTABL7 FSmin=0.93

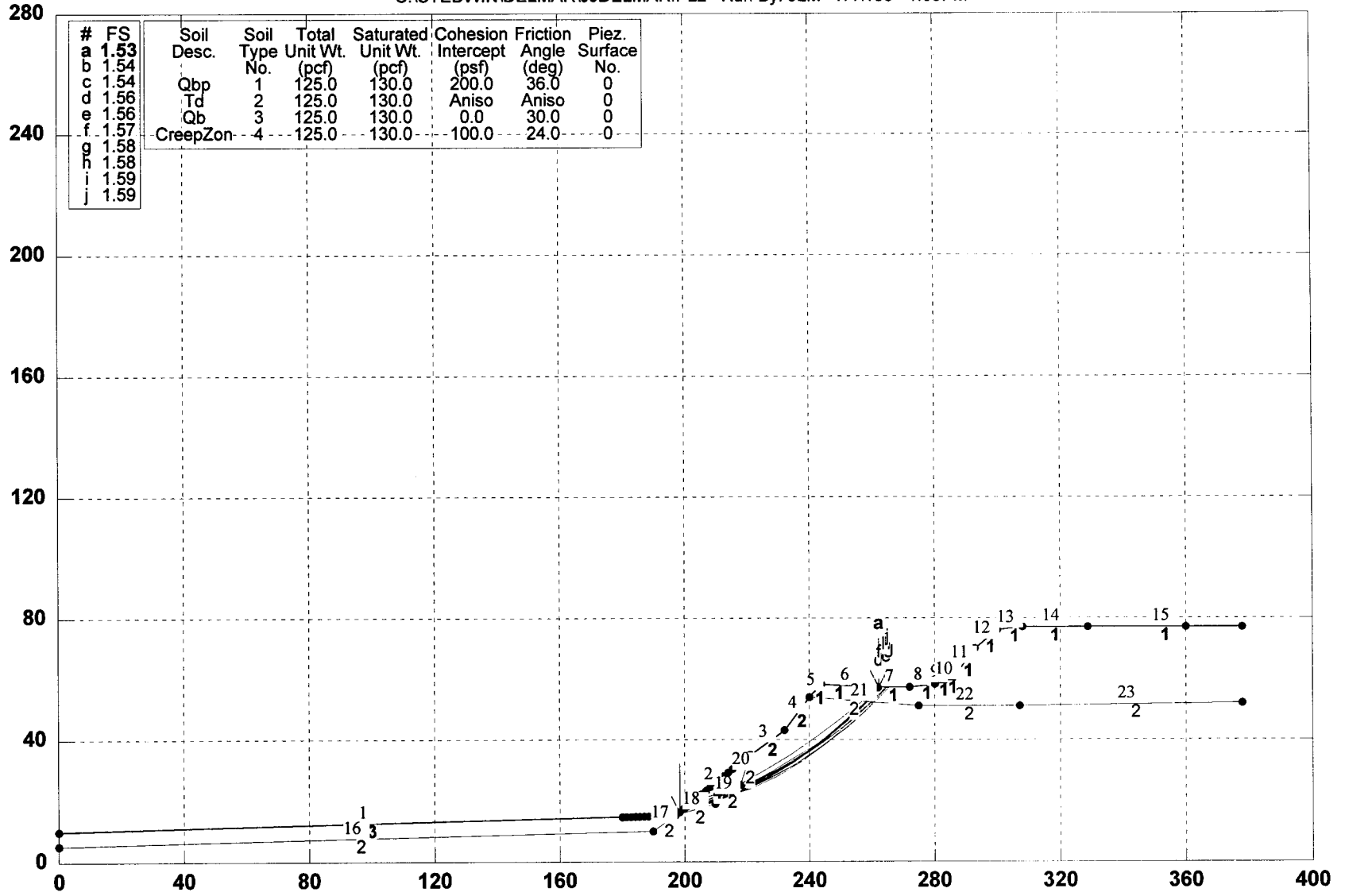
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (J-J'), Del Mar Bluffs

C:\STEDWIN\DELMAR\JJ\DELMAR.PL2 Run By: JLM 7/17/00 1:06PM



GSTABL7 FSmin=1.53

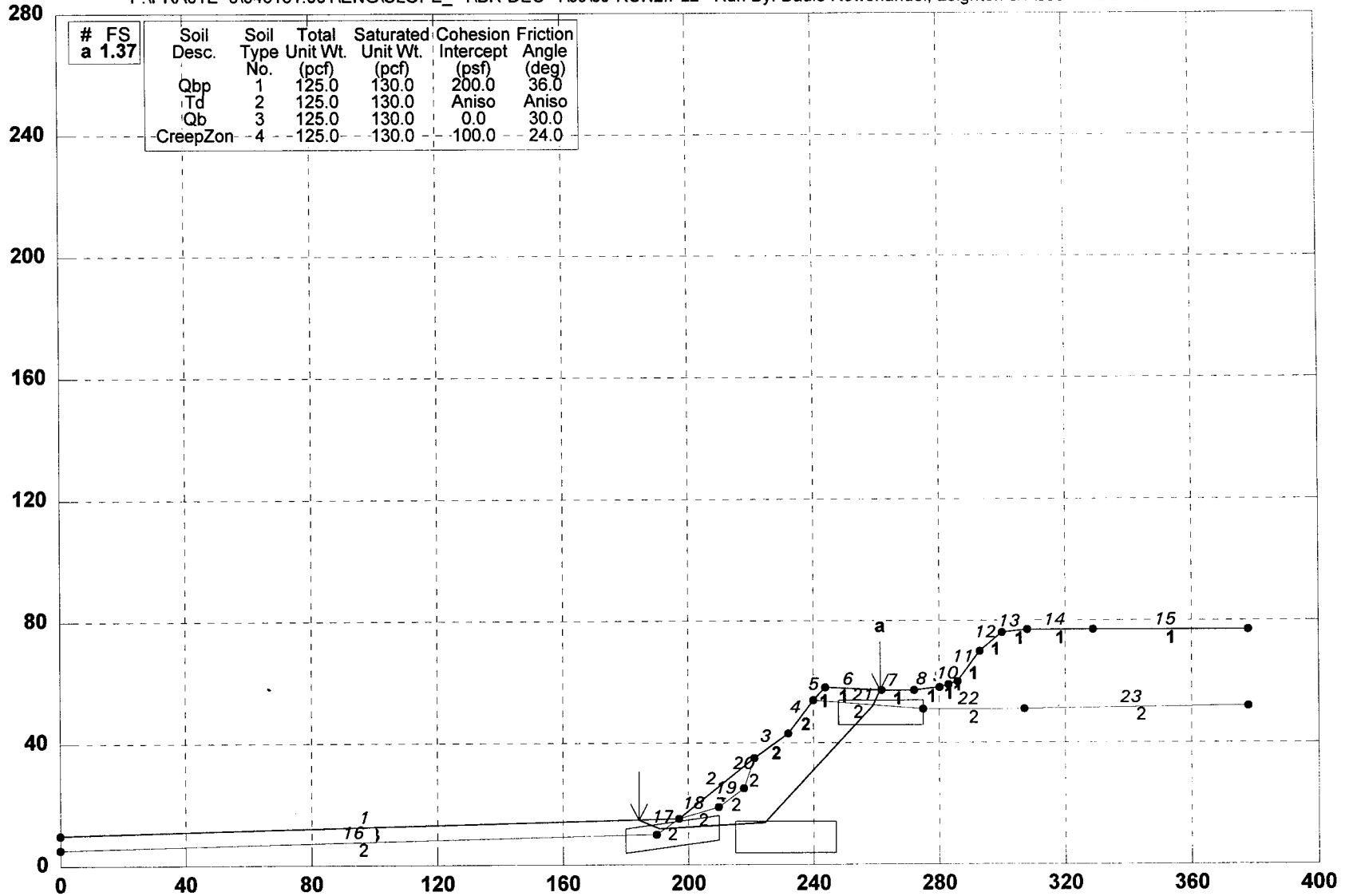
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (J-J'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\JJJJ-RUN2.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 12:55PM



GSTABL7 FSmin=1.37

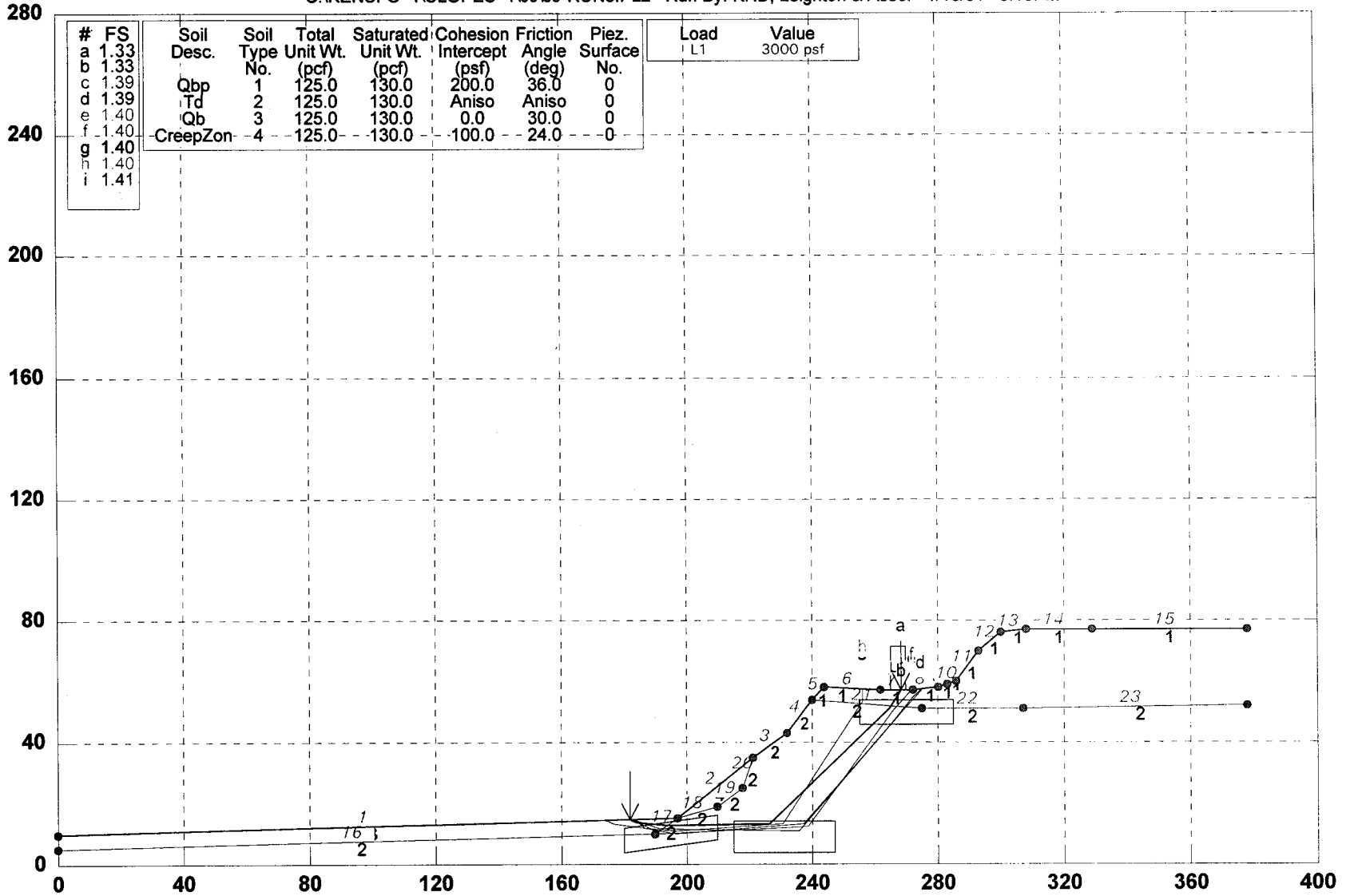
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (J-J'), Del Mar Bluffs, Static w/ Surcharge

C:\KENSFO~1\SLOPES~1\JJJJ-RUN5.PL2 Run By: KRD, Leighton & Asso. 1/10/01 3:13PM



GSTABL7 FSmin=1.33

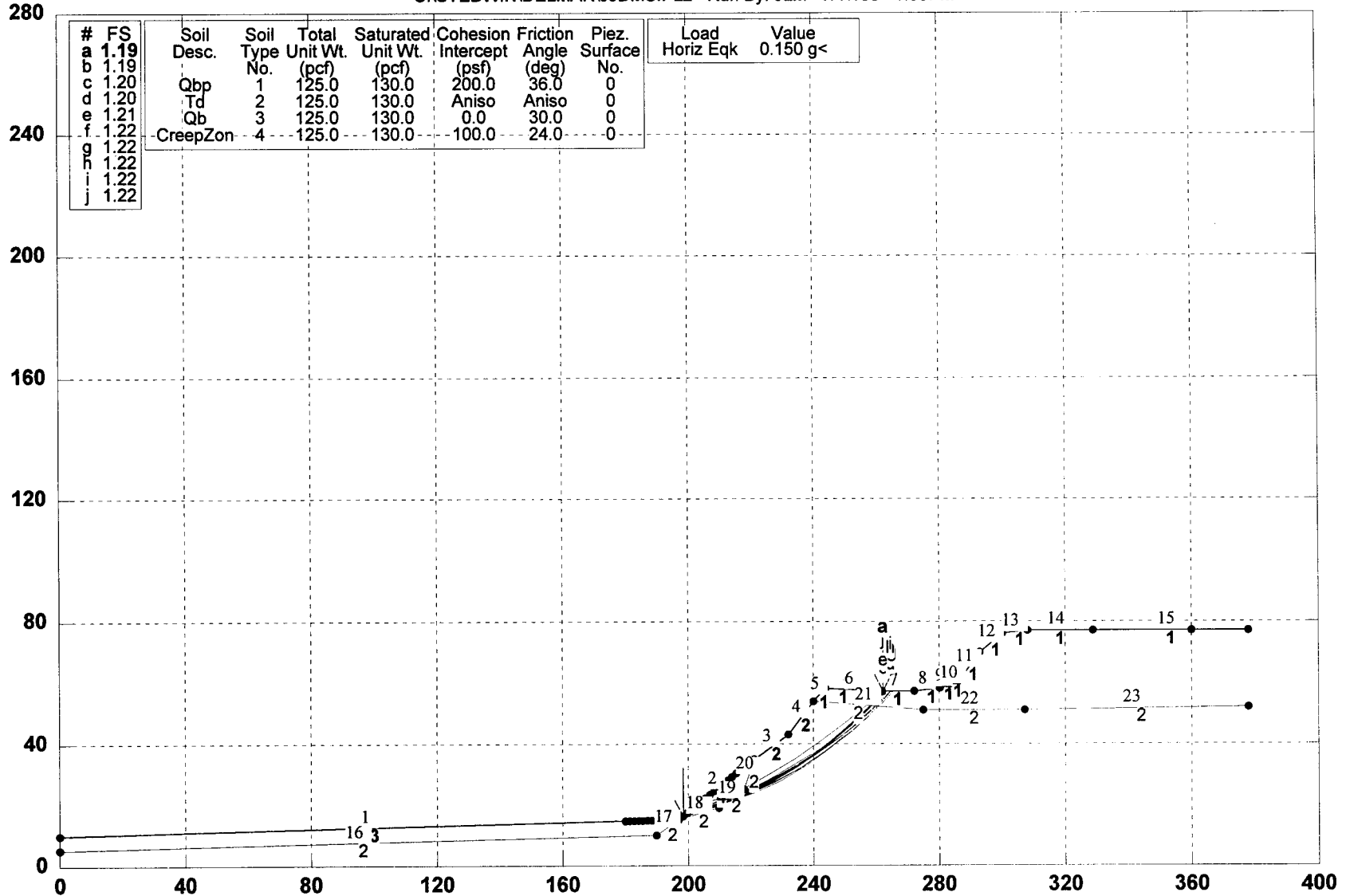
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (J-J'), Del Mar Bluffs, Pseudostatic

C:\STEDWIN\DELMAR\JJDMS.PL2 Run By: JLM 7/17/00 1:08PM



GSTABL7 FSmin=1.19

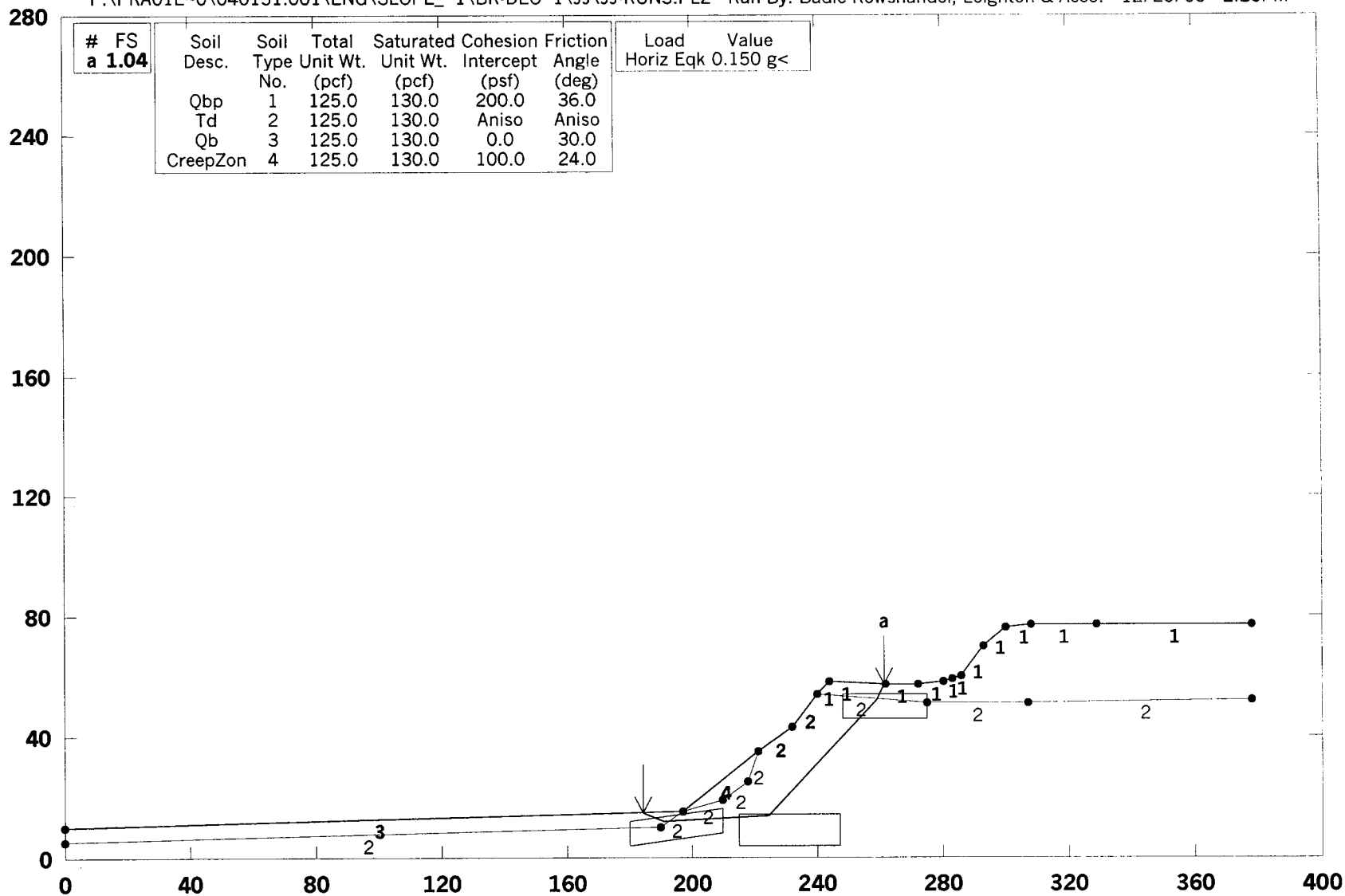
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (J-J'), Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E-0\040151.001\ENG\SLOPE_~1\BR-DEC~1\JJ\JJ-RUN3.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 2:26PM



GSTABL7 FSmin=1.04

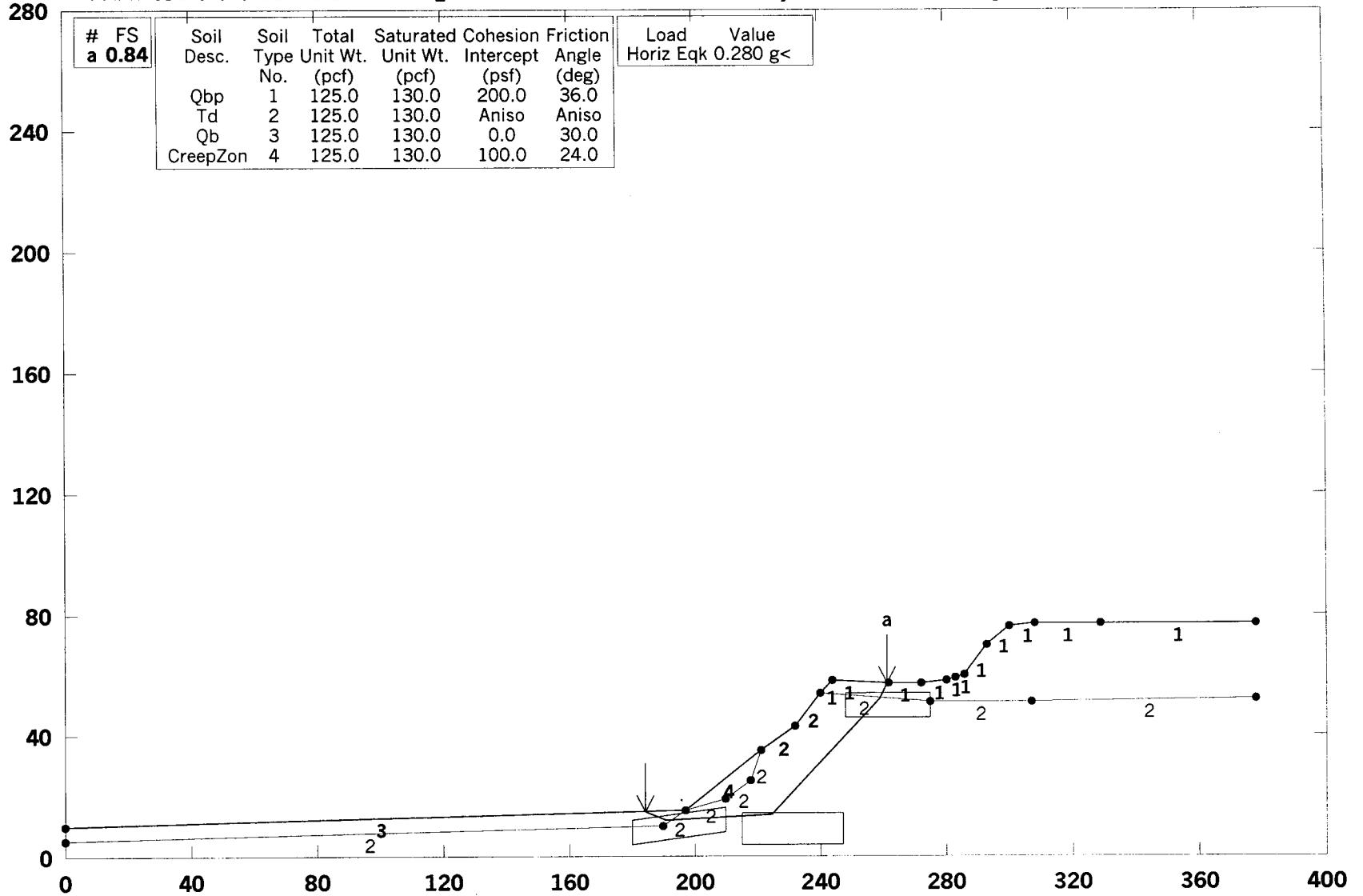
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (J-J'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E-0\040151.001\ENG\SLOPE_~1\BR-DEC~1\JJ\JJ-RUN4.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 2:21PM



GSTABL7 FSmin=0.84

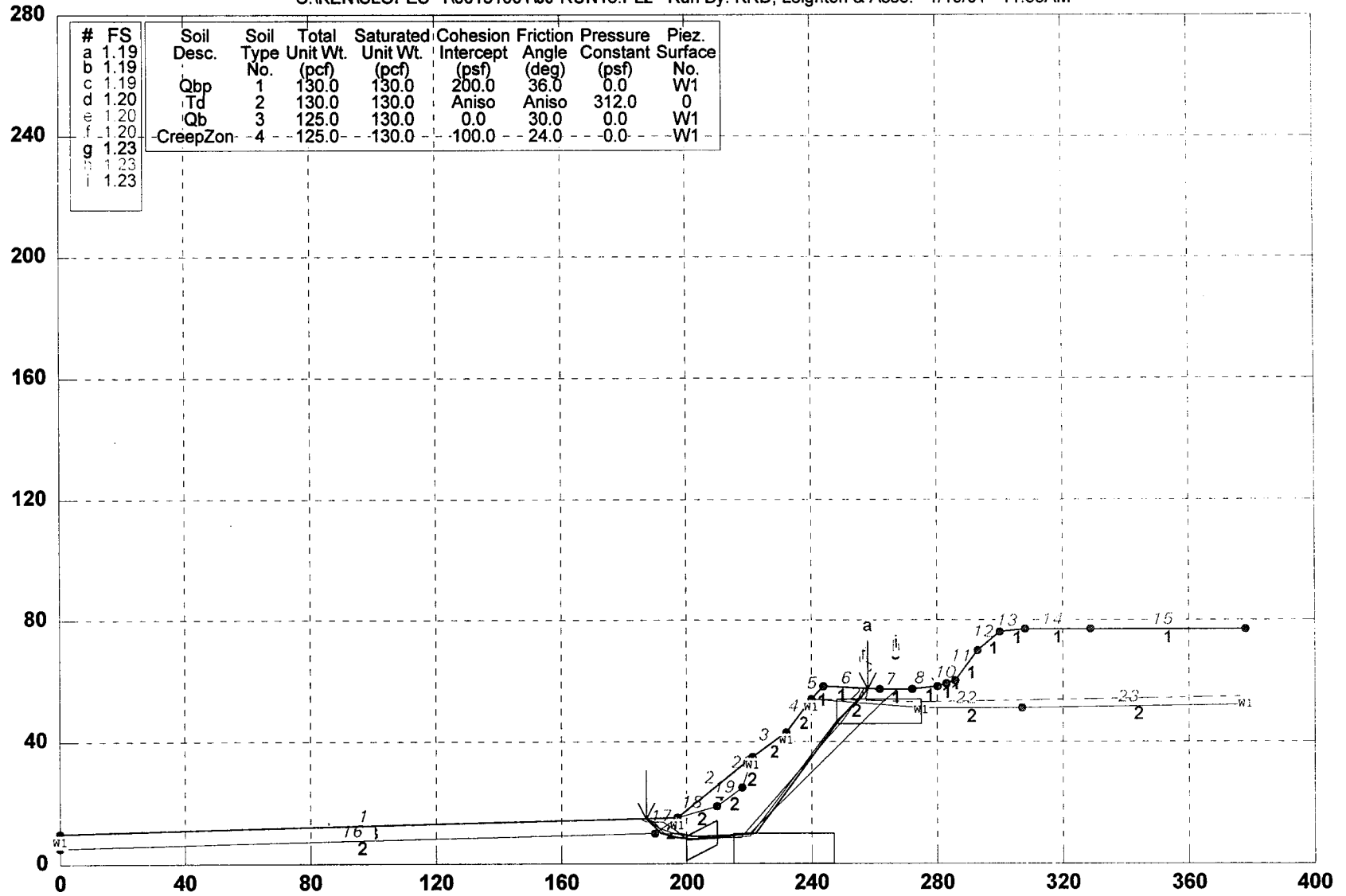
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (J-J'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\JJ-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 11:33AM



GSTABL7 FSmin=1.19

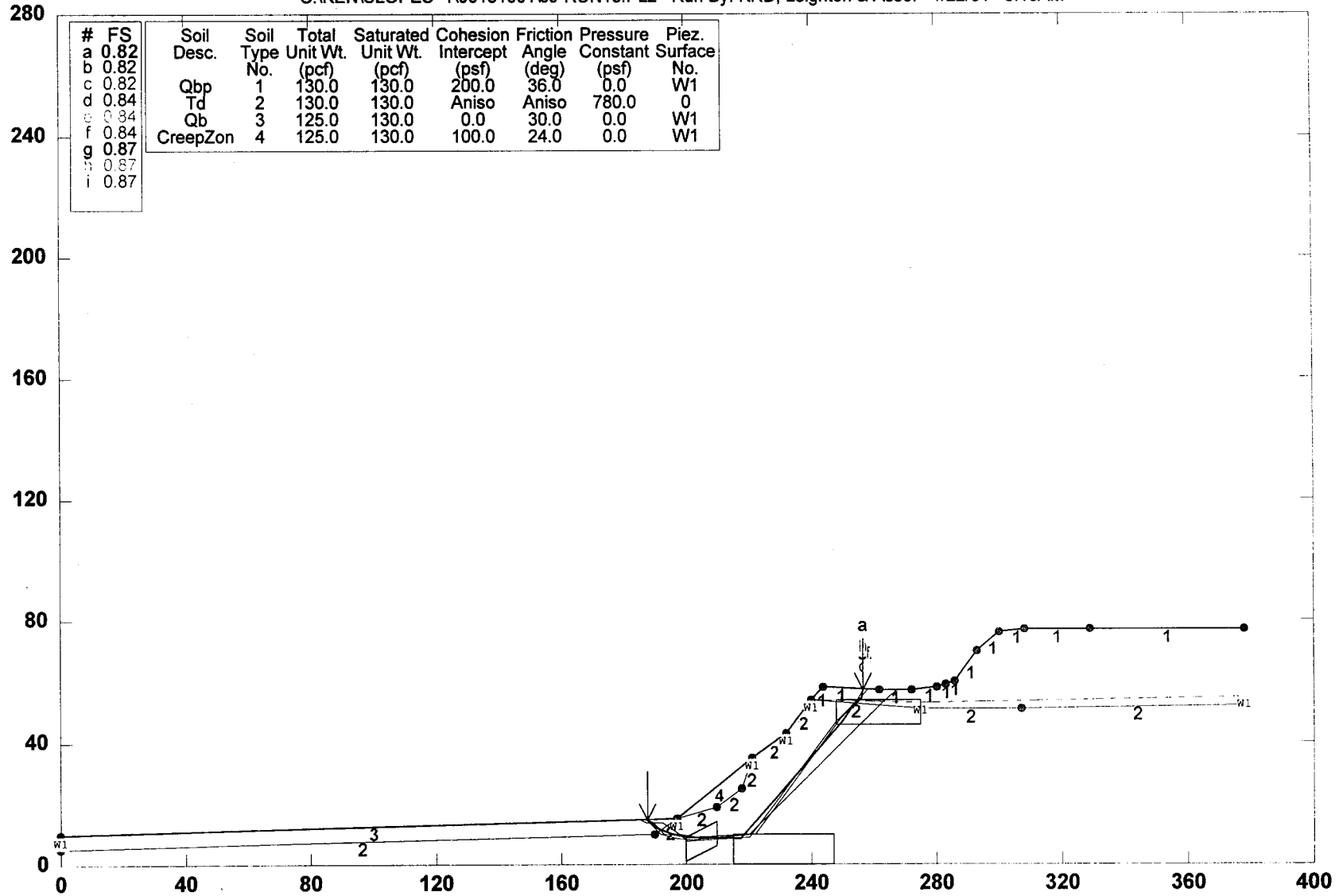
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (J-J'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\100151001\JJ-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/22/01 8:18AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	0.82								
b	0.82								
c	0.82	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	0.84	Td	2	130.0	130.0	Aniso	Aniso	780.0	0
e	0.84	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	0.84	CreepZon	4	125.0	130.0	100.0	24.0	0.0	W1
g	0.87								
h	0.87								
i	0.87								

GSTABL7 FSmin=0.82

Safety Factors Are Calculated By The Simplified Janbu Method

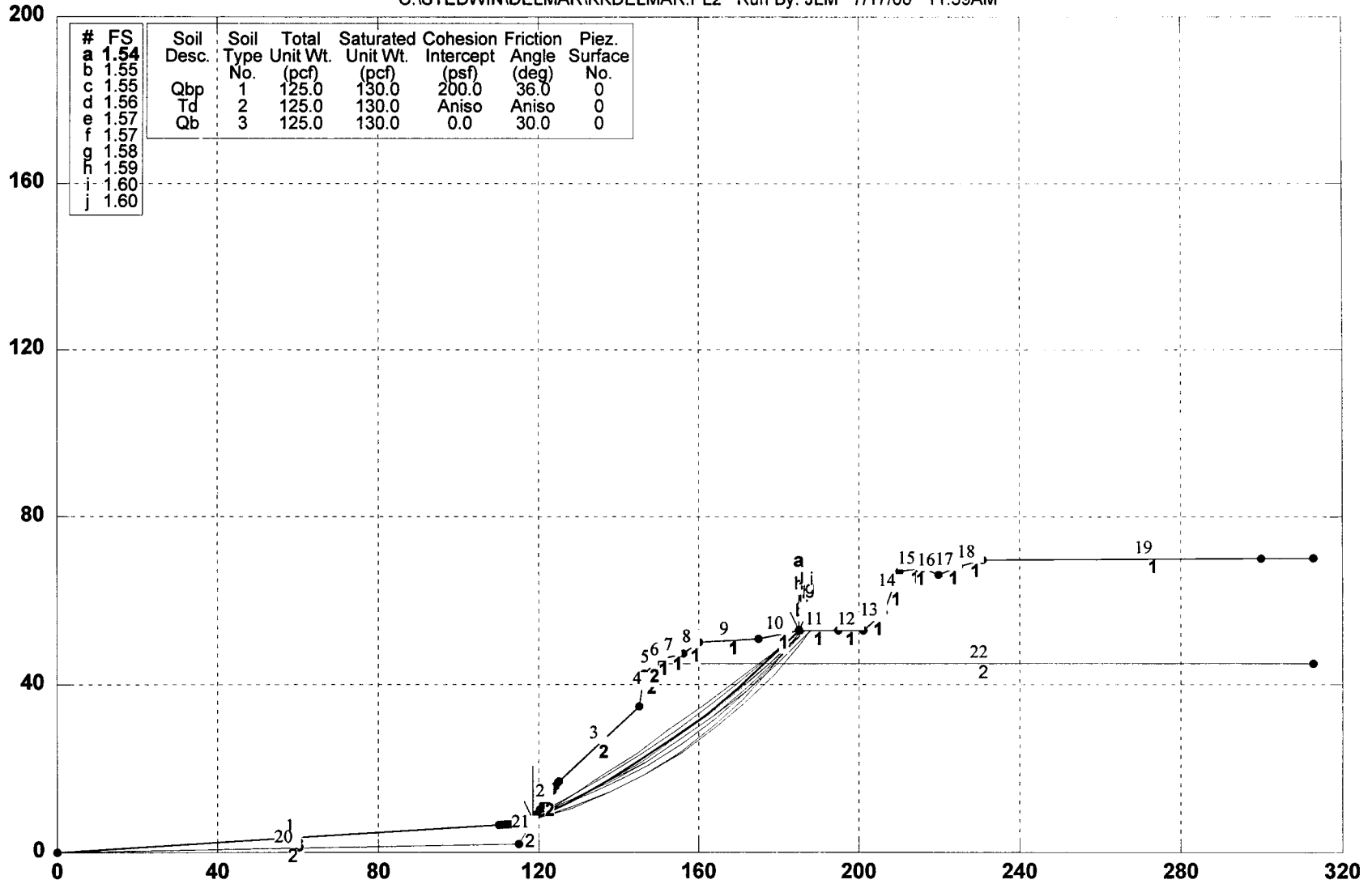
STED



| | | | | | | | | | | | | | | | | | | | | |

X section (K-K') Del Mar Bluffs

C:\STEDWIN\DELMAR\K\KDEL MAR.PL2 Run By: JLM 7/17/00 11:59AM



GSTABL7 FSmin=1.54

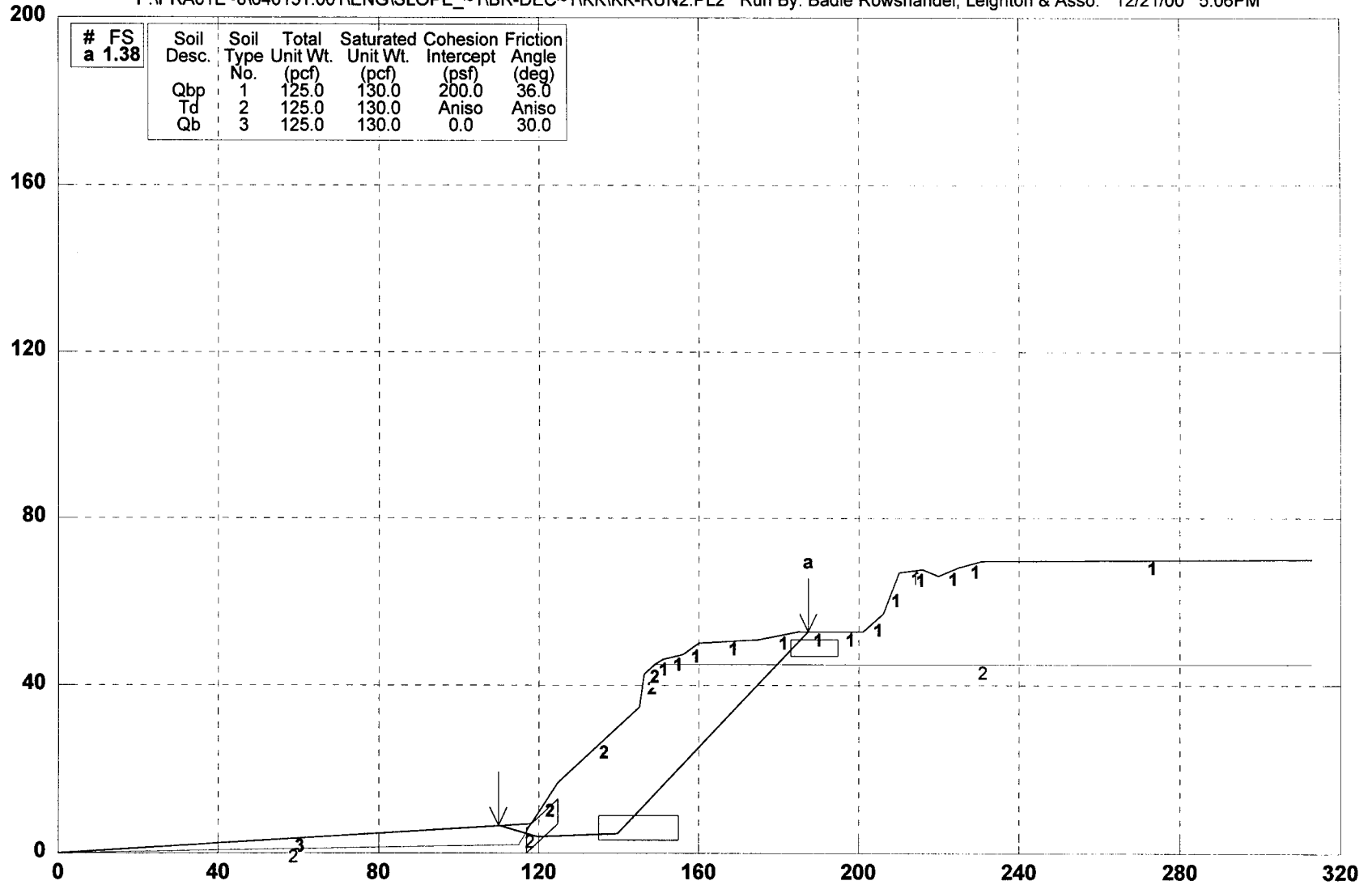
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (K-K') Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\K\K-K-RUN2.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 5:06PM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)
a 1.38	Qbp	1	125.0	130.0	200.0	36.0
	Td	2	125.0	130.0	Aniso	Aniso
	Qb	3	125.0	130.0	0.0	30.0

GSTABL7 FSmin=1.38

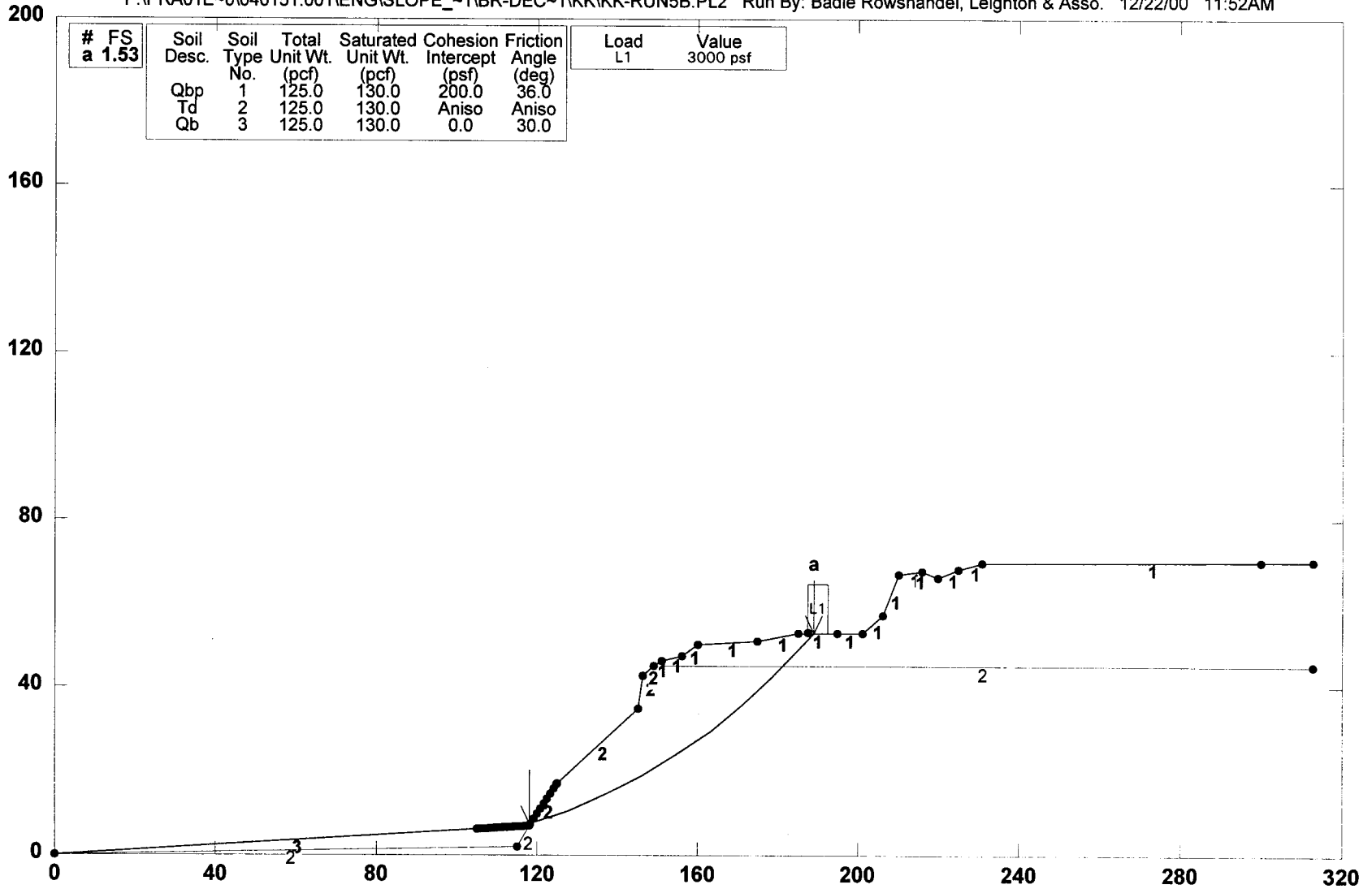
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (K-K') Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\KK\KK-RUN5B.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/22/00 11:52AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load L1	Value
a	1.53	Qbp	1	125.0	130.0	200.0	36.0		3000 psf
		Td	2	125.0	130.0	Aniso	Aniso		
		Qb	3	125.0	130.0	0.0	30.0		

GSTABL7 FSmin=1.53

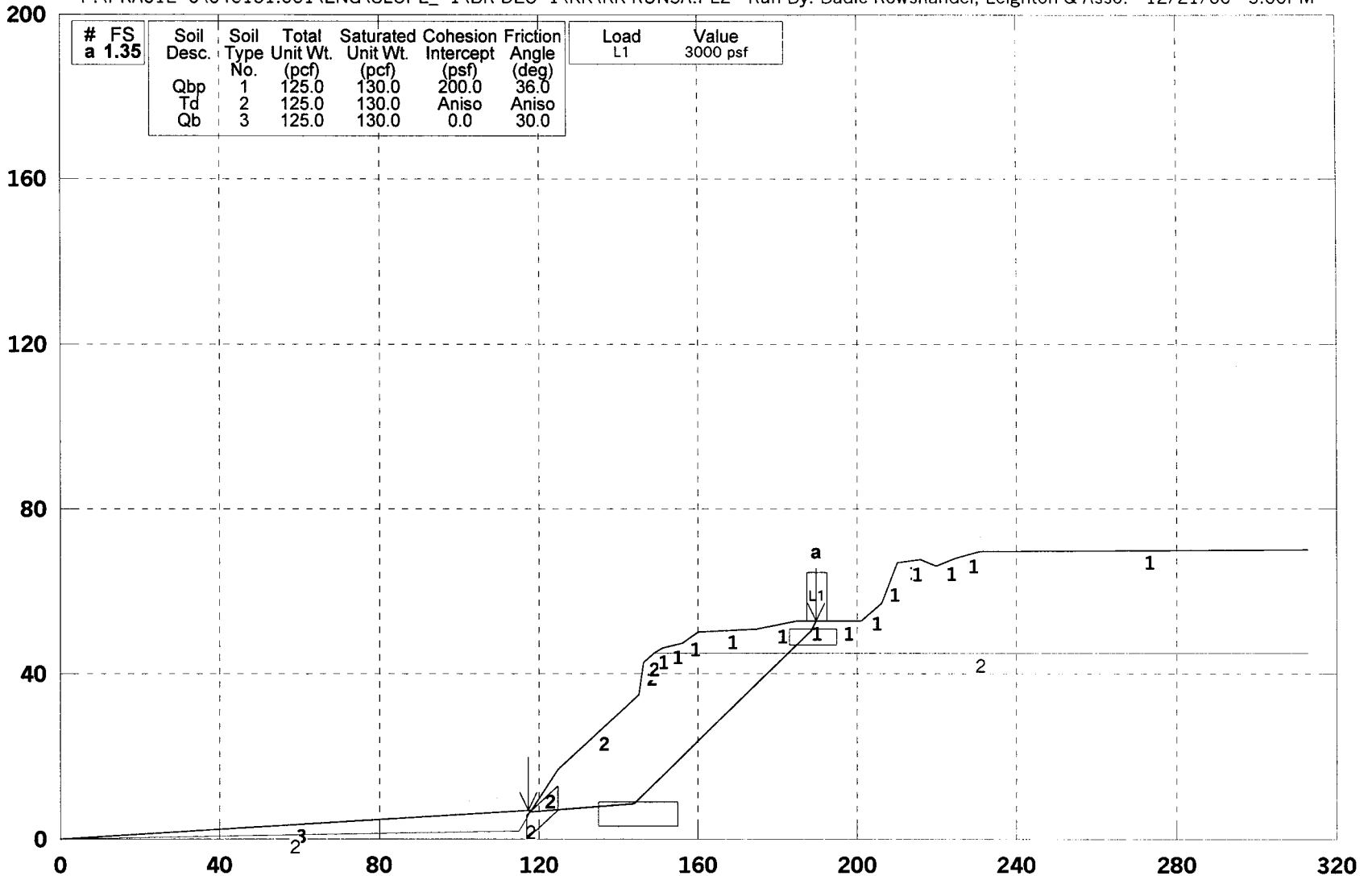
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (K-K') Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E-0\040151.001\ENG\SLOPE_~1\BR-DEC~1\KK\KK-RUN5A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 5:00PM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load L1	Value
a 1.35	Qbp	1	125.0	130.0	200.0	36.0		3000 psf
	Td	2	125.0	130.0	Aniso	Aniso		
	Qb	3	125.0	130.0	0.0	30.0		

GSTABL7 FSmin=1.35

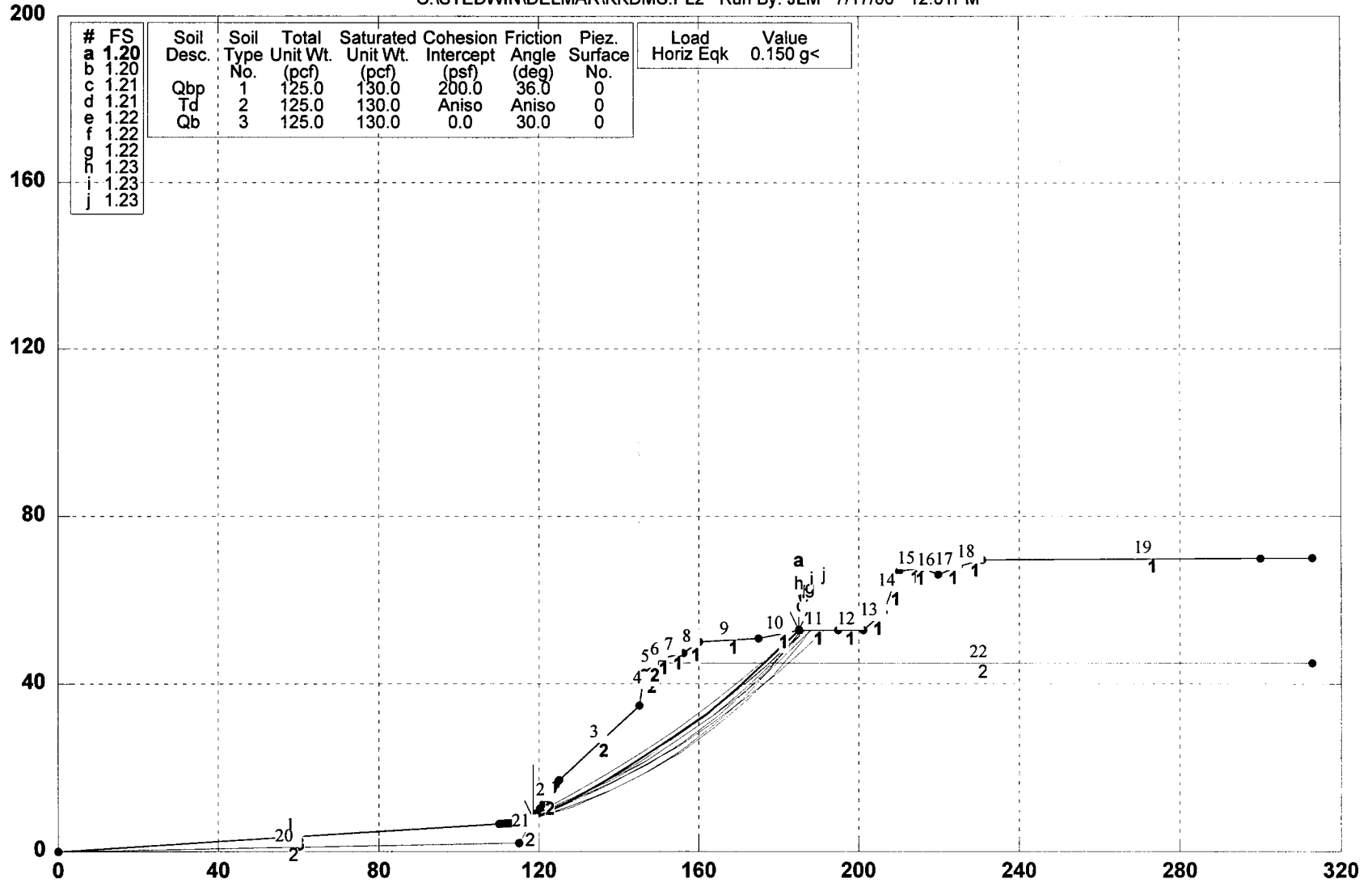
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



X section (K-K') Del Mar Bluffs, Pseudostatic

C:\STEDWIN\DELMAR\KKDMS.PL2 Run By: JLM 7/17/00 12:01PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.20									0.150 g<
b	1.20									
c	1.21	Qbp	1	125.0	130.0	200.0	36.0	0		
d	1.21	Td	2	125.0	130.0	Aniso	Aniso	0		
e	1.22	Qb	3	125.0	130.0	0.0	30.0	0		
f	1.22									
g	1.22									
h	1.23									
i	1.23									
j	1.23									

GSTABL7 FSmin=1.20

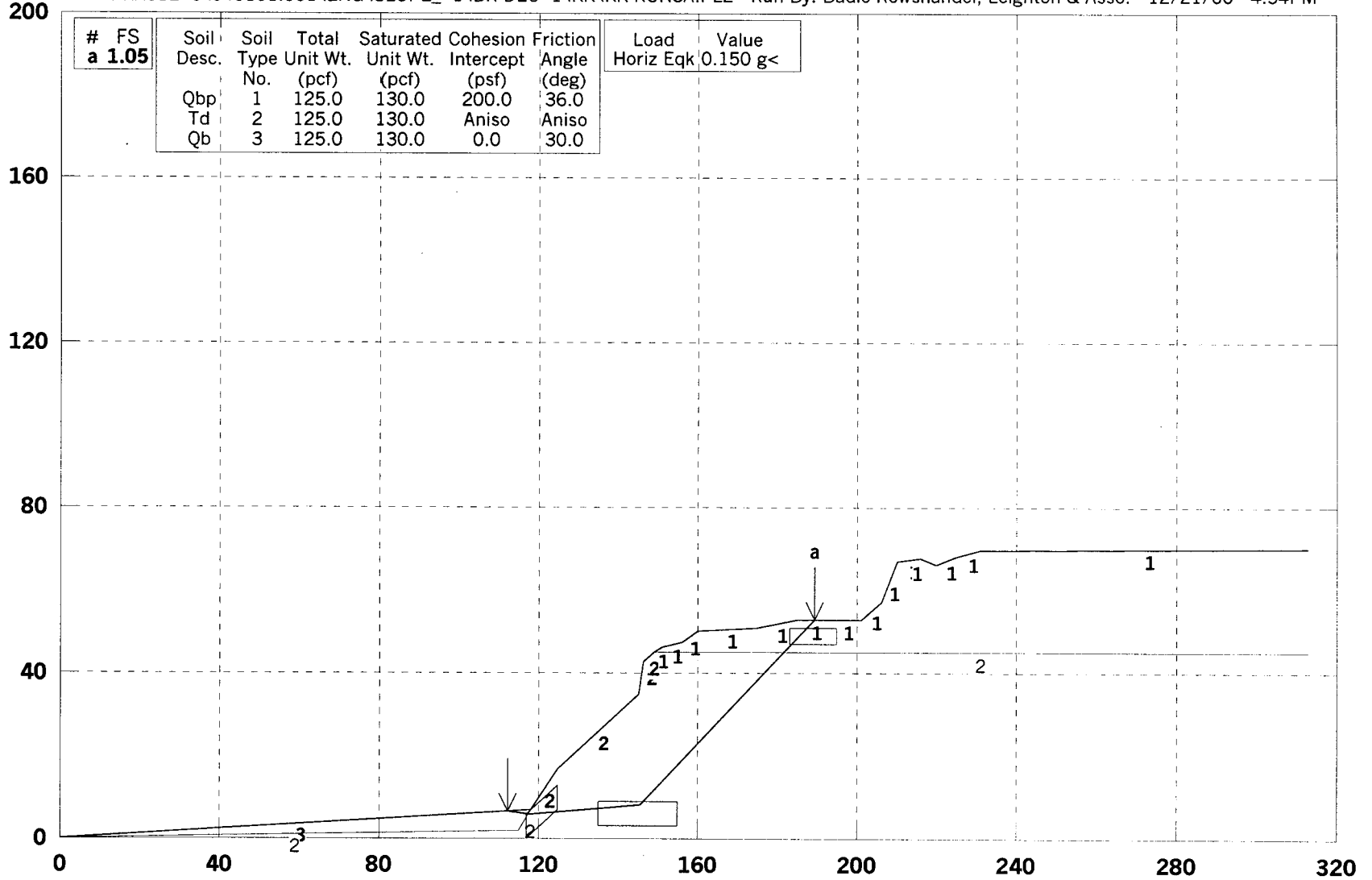
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (K-K') Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\KK\KK-RUN3A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 4:54PM



GSTABL7 FSmin=1.05

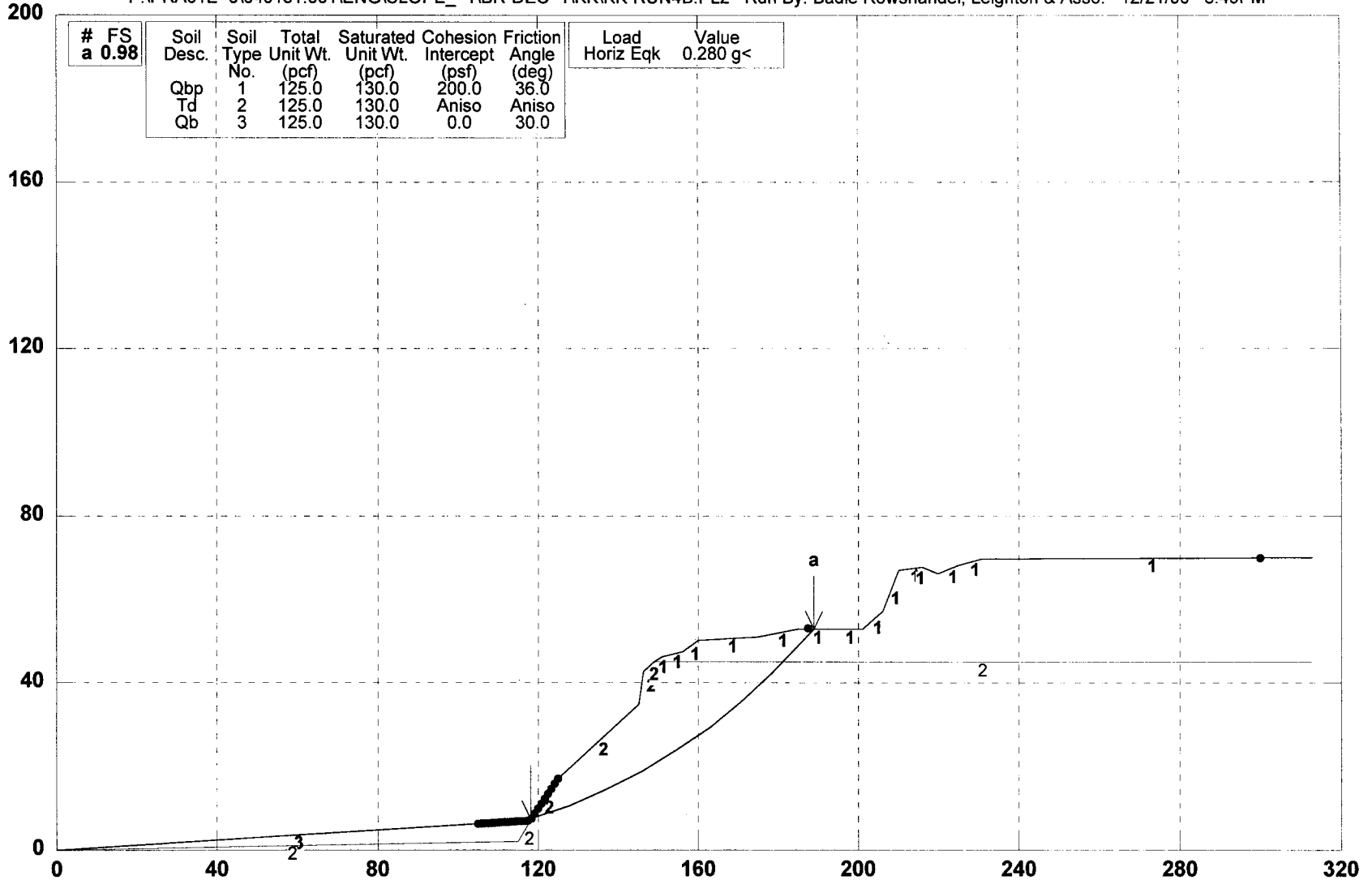
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (K-K') Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\KK\KK-RUN4B.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 5:49PM



GSTABL7 FSmin=0.98

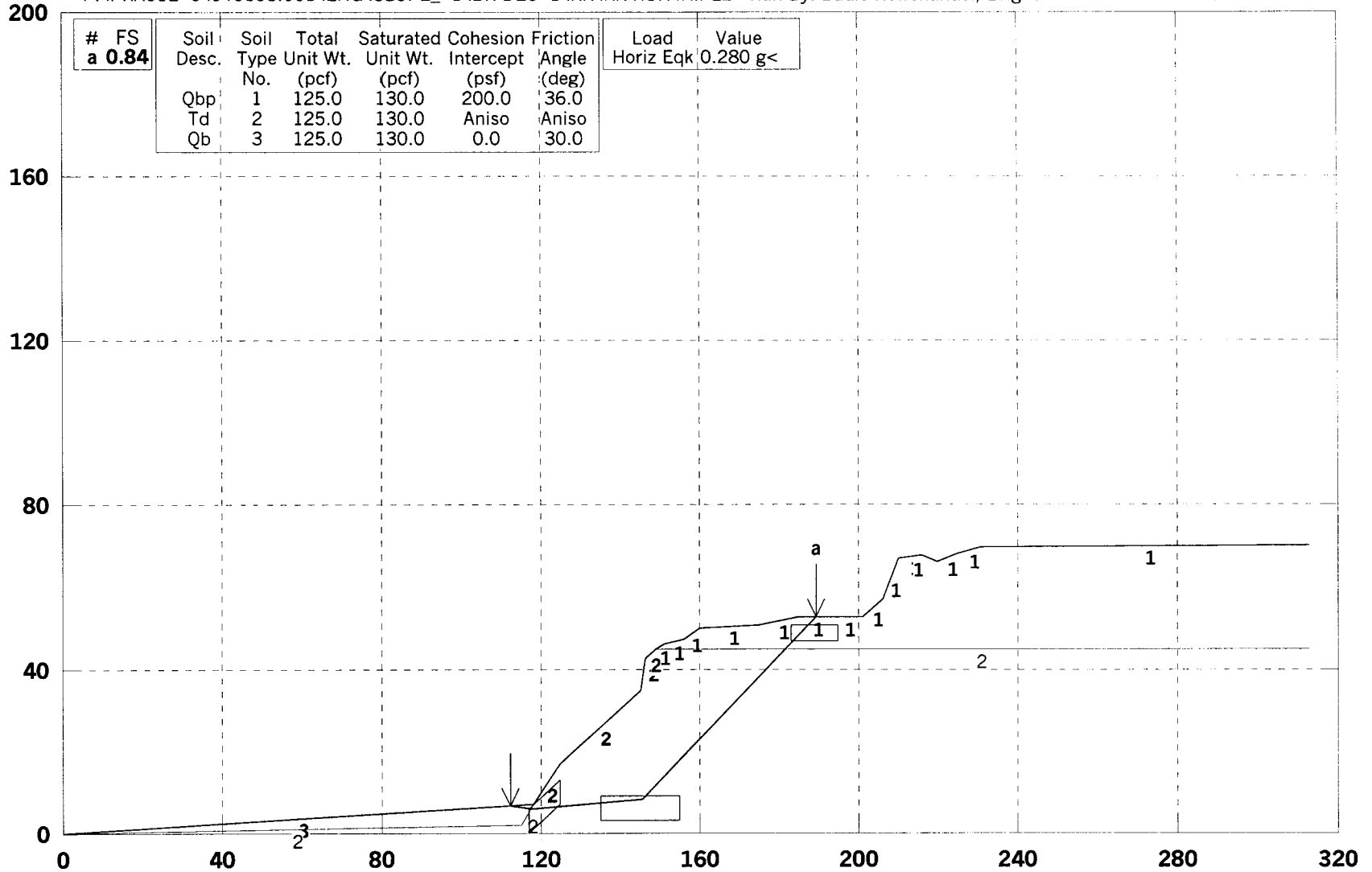
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (K-K') Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E-0\040151.001\ENG\SLOPE_~1\BR-DEC-1\KK\KK-RUN4A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/21/00 4:57PM



GSTABL7 FSmin=0.84

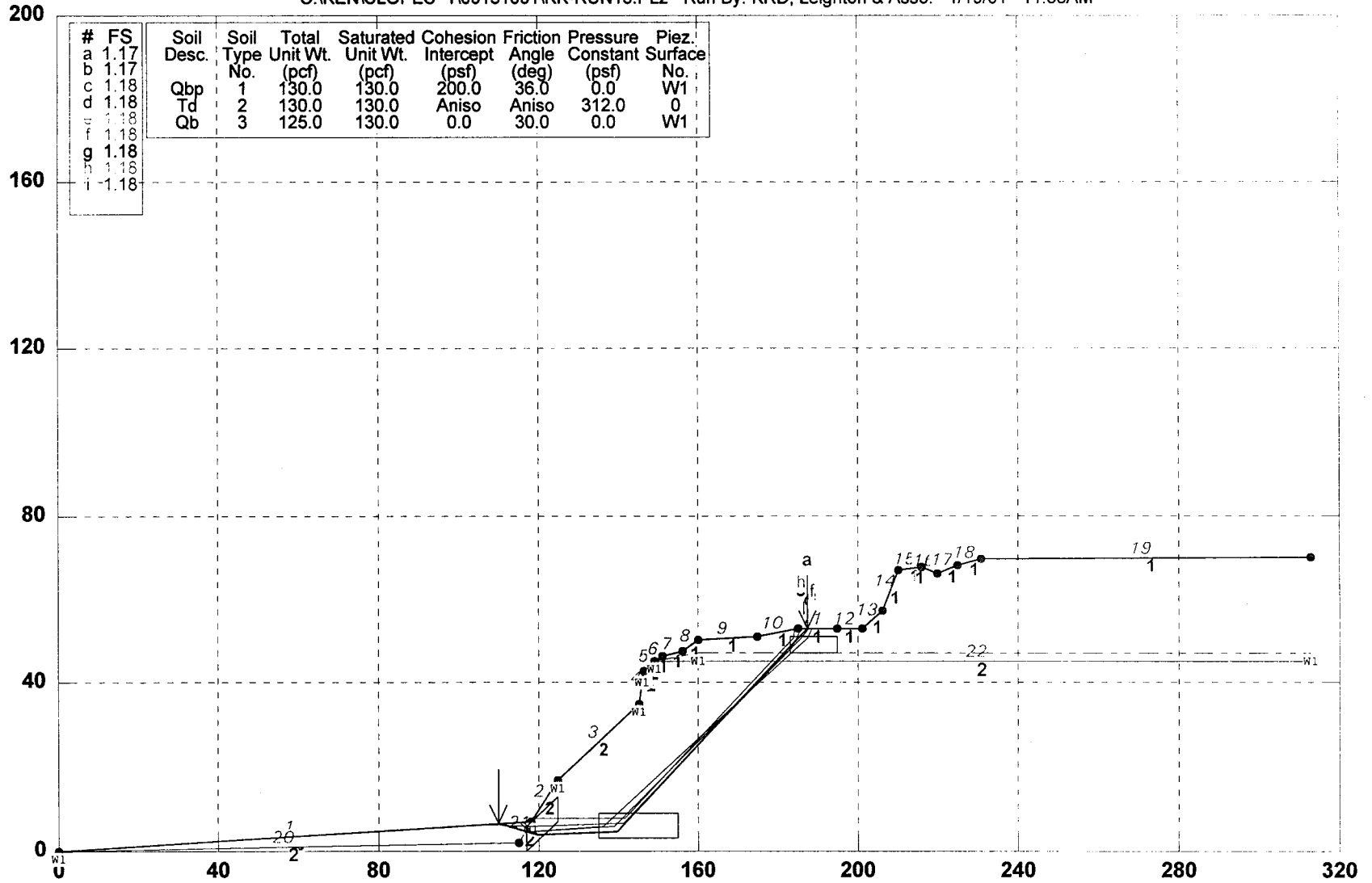
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (K-K') Del Mar Bluffs, Static/Saturated

C:\KENSLOPES~1\00151001\KK-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 11:38AM



GSTABL7 FSmin=1.17

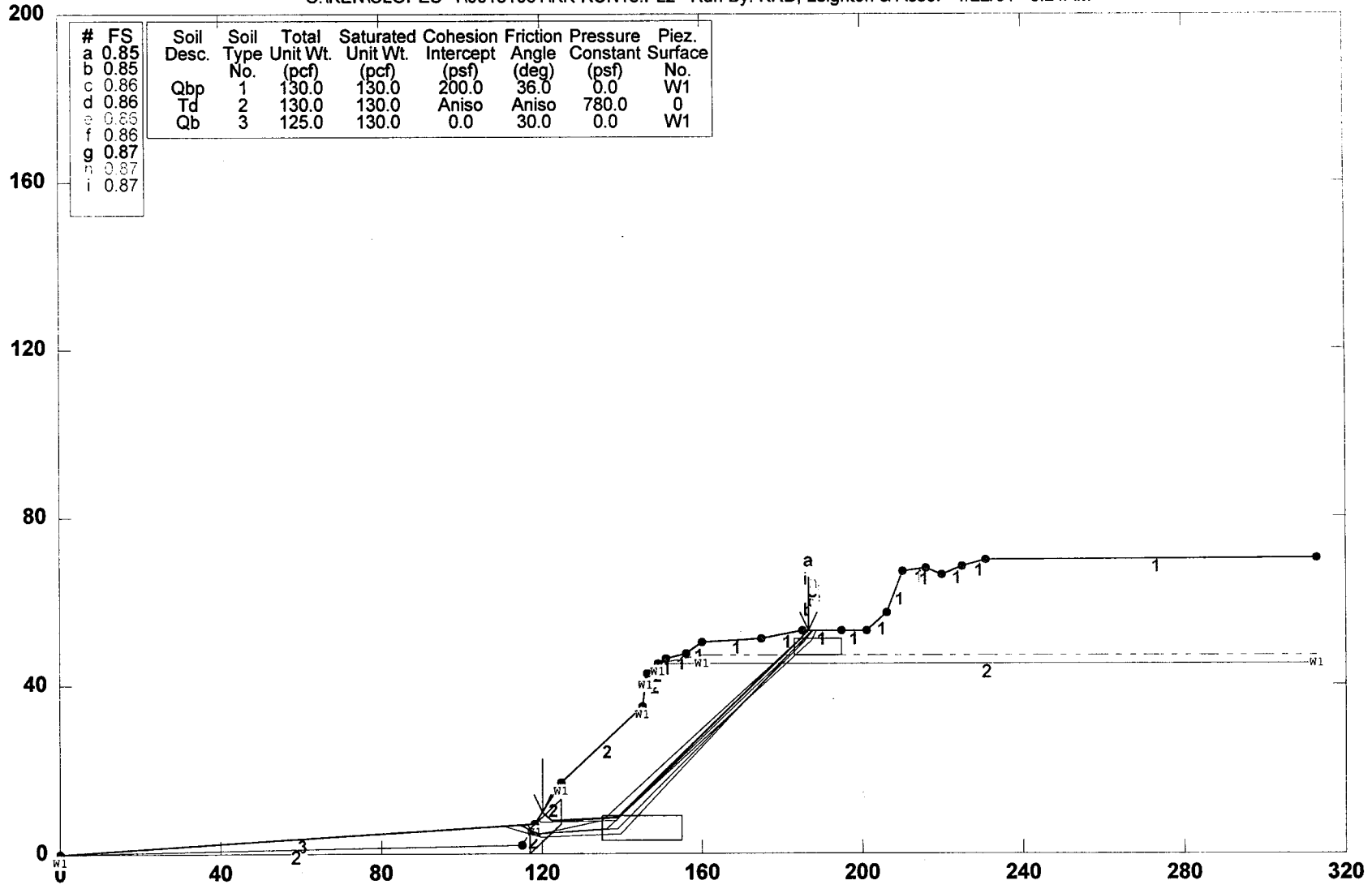
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (K-K') Del Mar Bluffs, Static/Saturated

C:\KENSLOPES~1\00151001\KK-RUN18.PL2 Run By: KR D, Leighton & Asso. 1/22/01 8:21AM



GSTABL7 FSmin=0.85

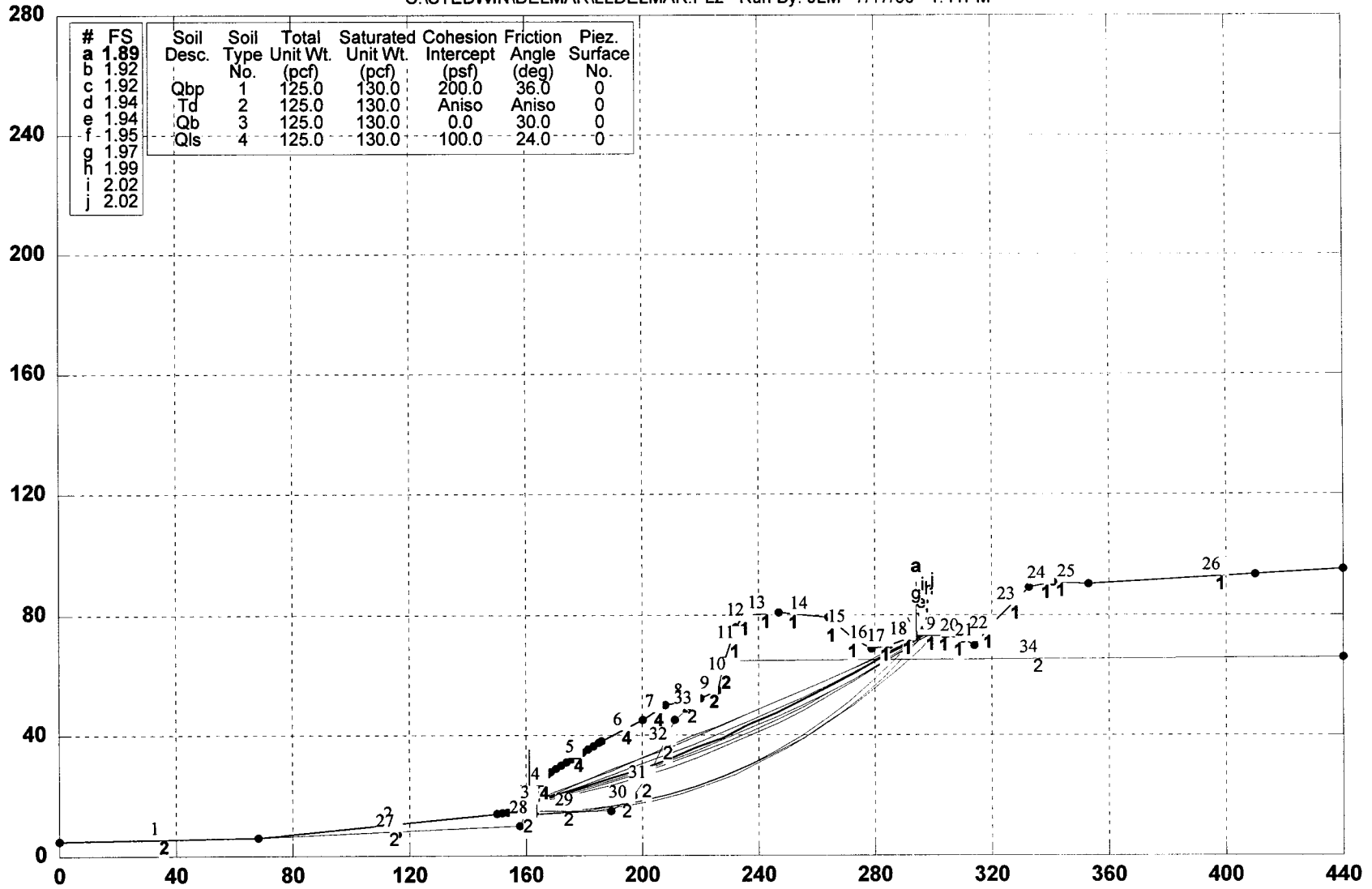
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross Section (L-L') Del Mar Bluffs

C:\STEDWIN\DELMAR\LLDELMAR.PL2 Run By: JLM 7/17/00 1:41PM



GSTABL7 FSmin=1.89

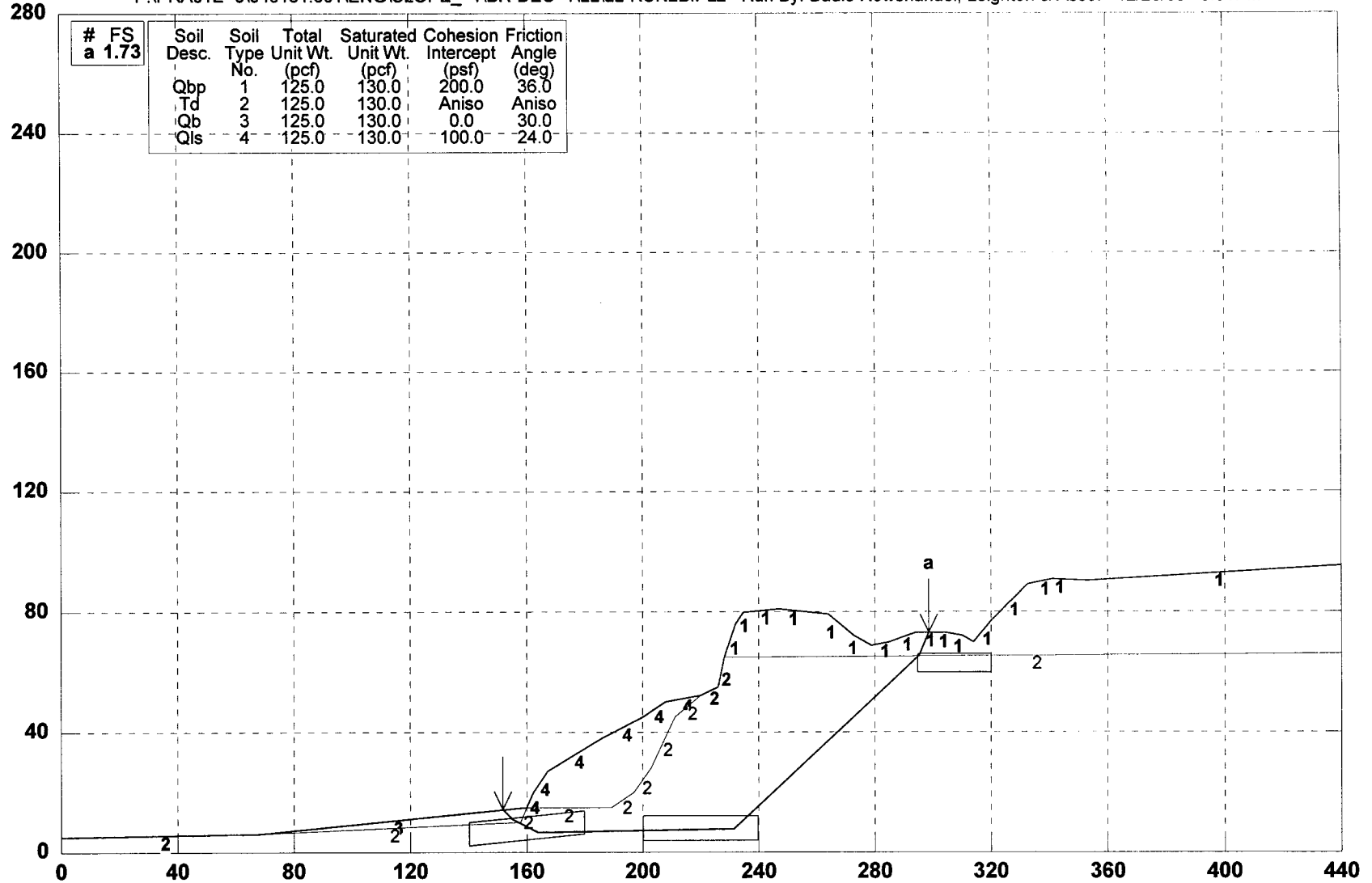
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (L-L') Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\LL\LL-RUN2B.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 5:31PM



GSTABL7 FSmin=1.73

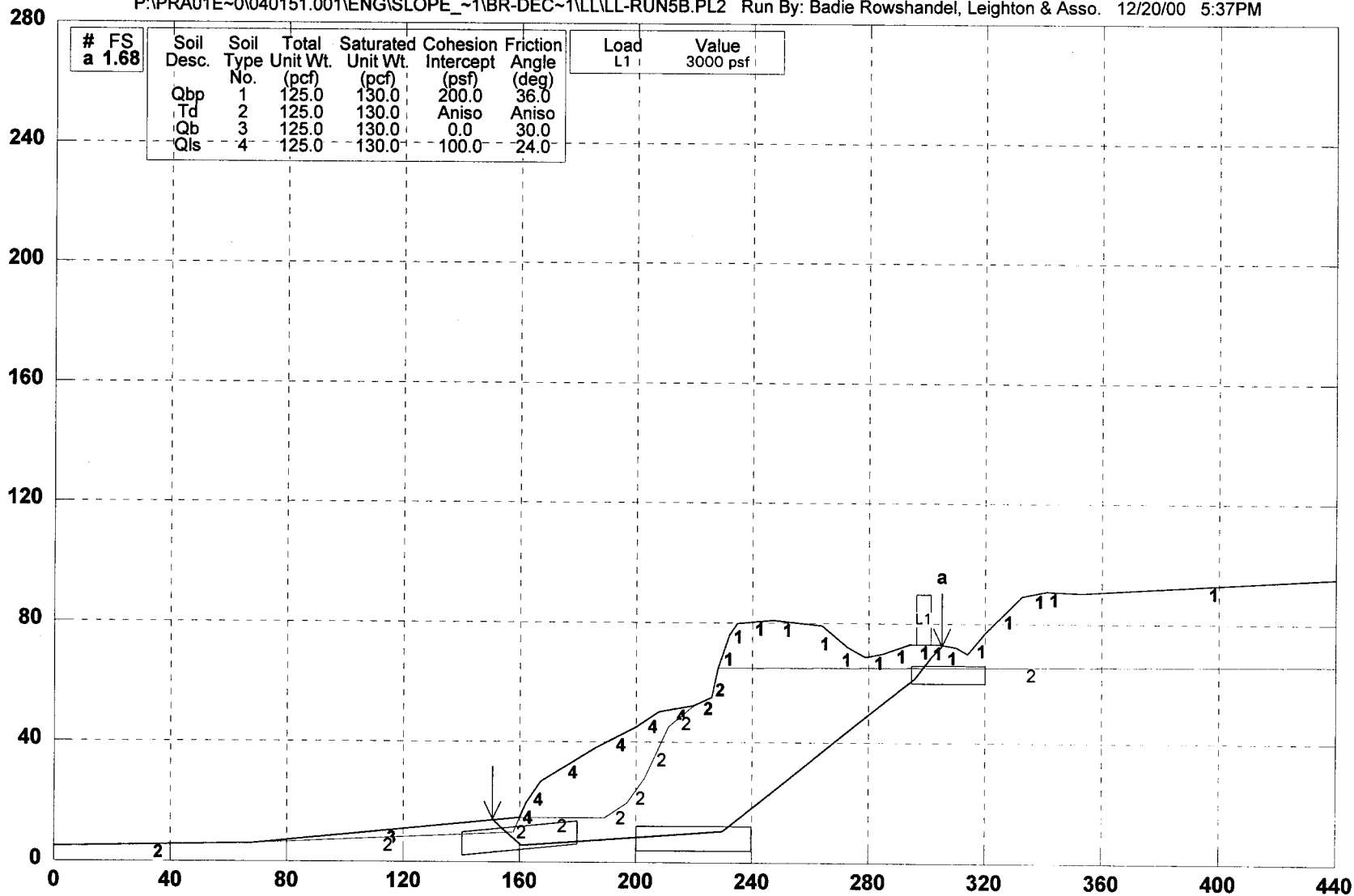
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (L-L') Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\LLLL-RUN5B.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 5:37PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load L1	Value 3000 psf
a	1.68	Qbp	1	125.0	130.0	200.0	36.0		
		Td	2	125.0	130.0	Aniso	Aniso		
		Qb	3	125.0	130.0	0.0	30.0		
		Qls	4	125.0	130.0	100.0	24.0		

GSTABL7 FSmin=1.68

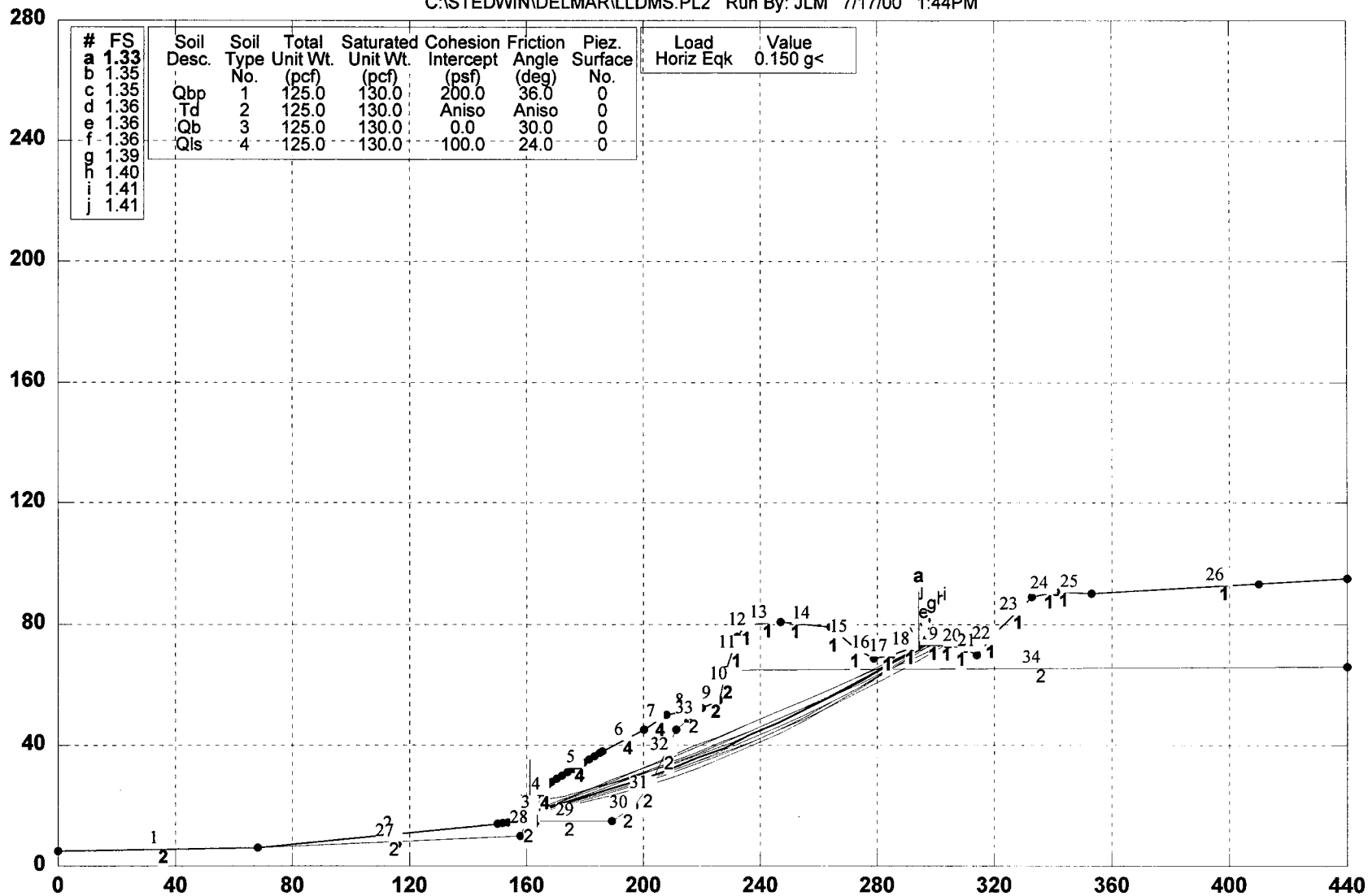
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (L-L') Del Mar Bluffs, Pseudostatic

C:\STEDWINDEL\MAR\LLDMS.PL2 Run By: JLM 7/17/00 1:44PM



GSTABL7 FSmin=1.33

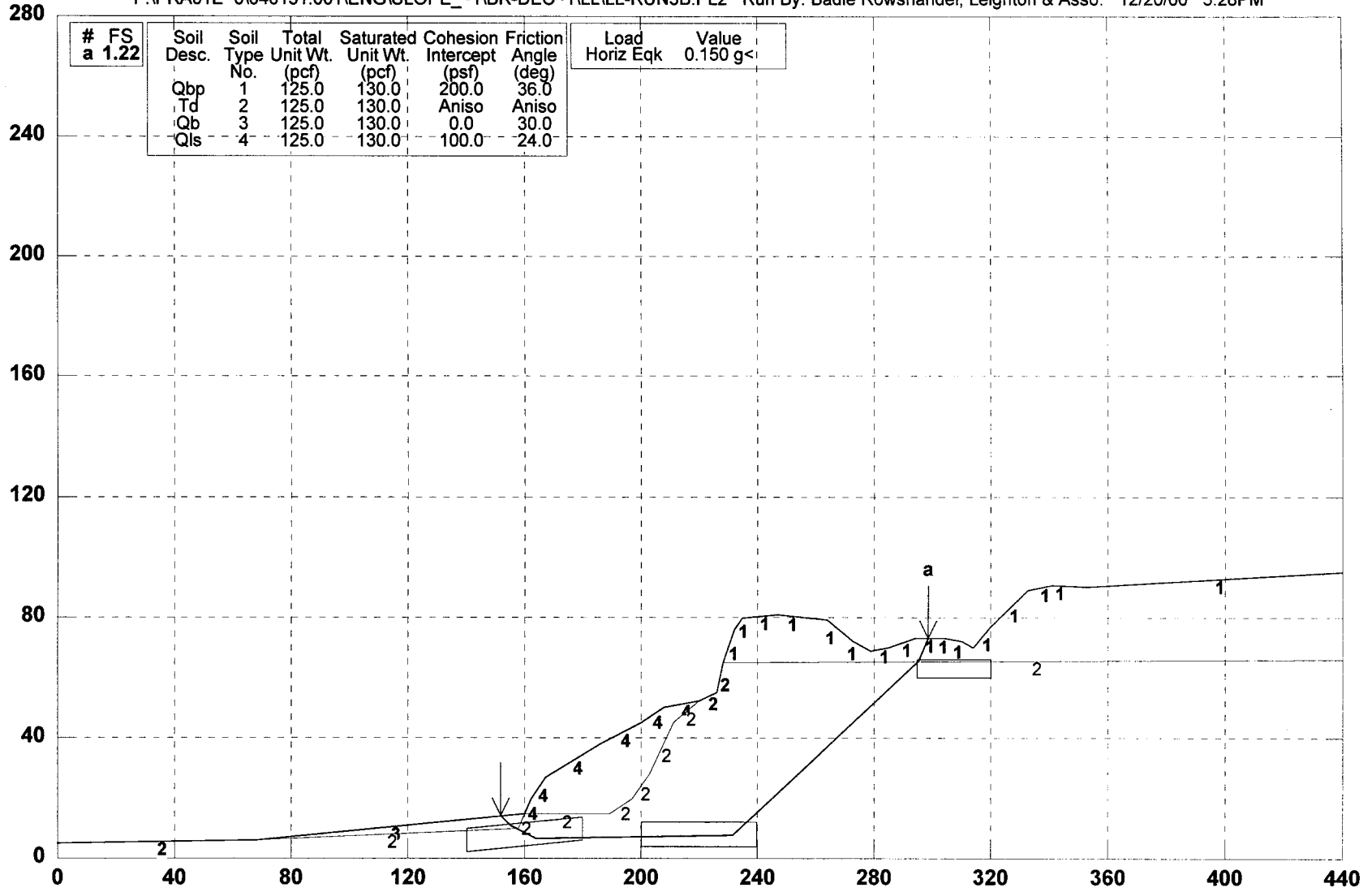
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross Section (L-L') Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\LL\LL-RUN3B.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 5:28PM



GSTABL7 FSmin=1.22

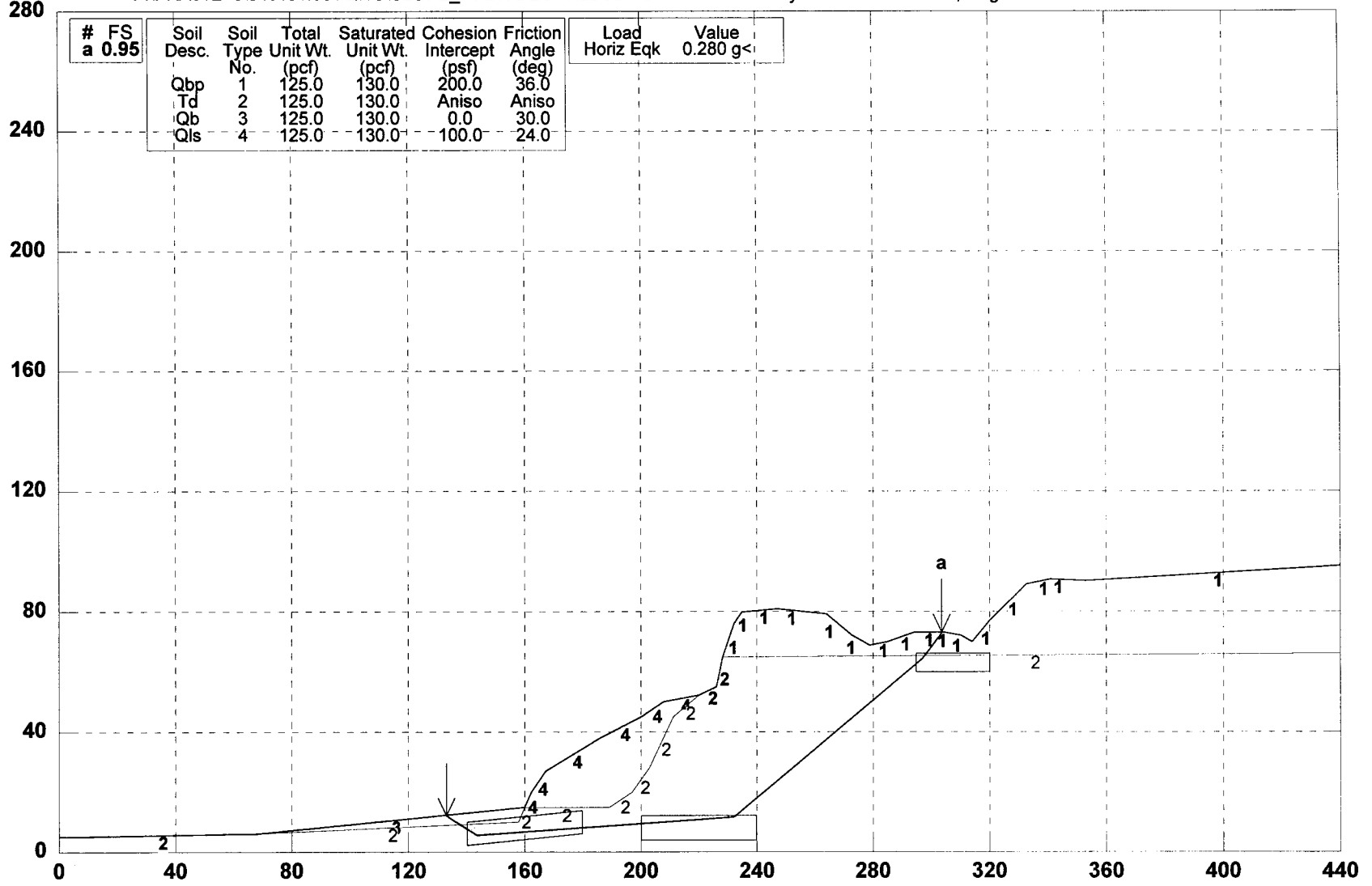
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (L-L') Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\LL\LL-RUN4B.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 5:29PM



GSTABL7 FSmin=0.95

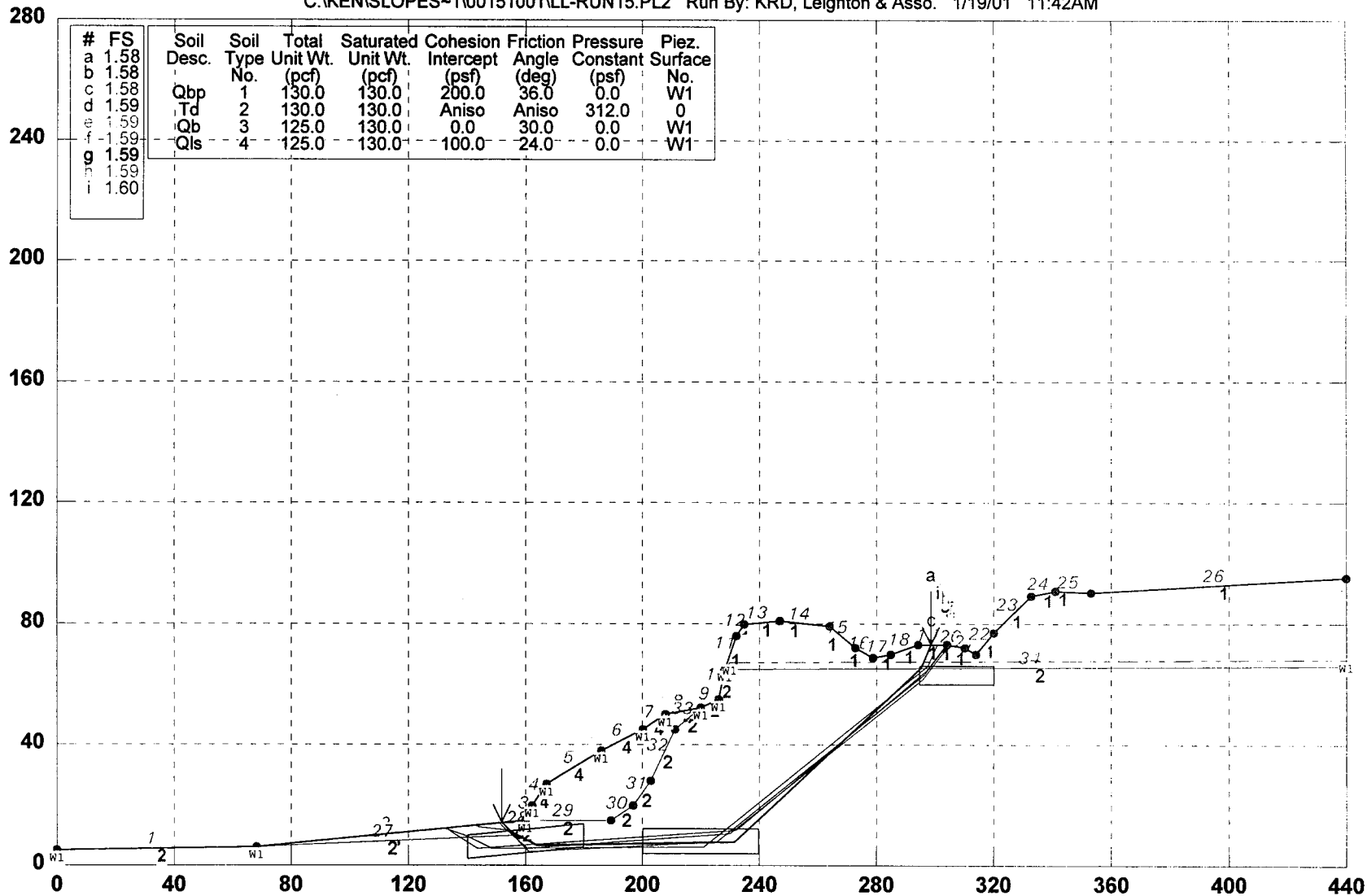
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (L-L') Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\LL-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 11:42AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.58								
b	1.58								
c	1.58								
d	1.59	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
e	1.59	Td	2	130.0	130.0	Aniso	Aniso	312.0	0
f	1.59	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
g	1.59	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
h	1.59								
i	1.60								

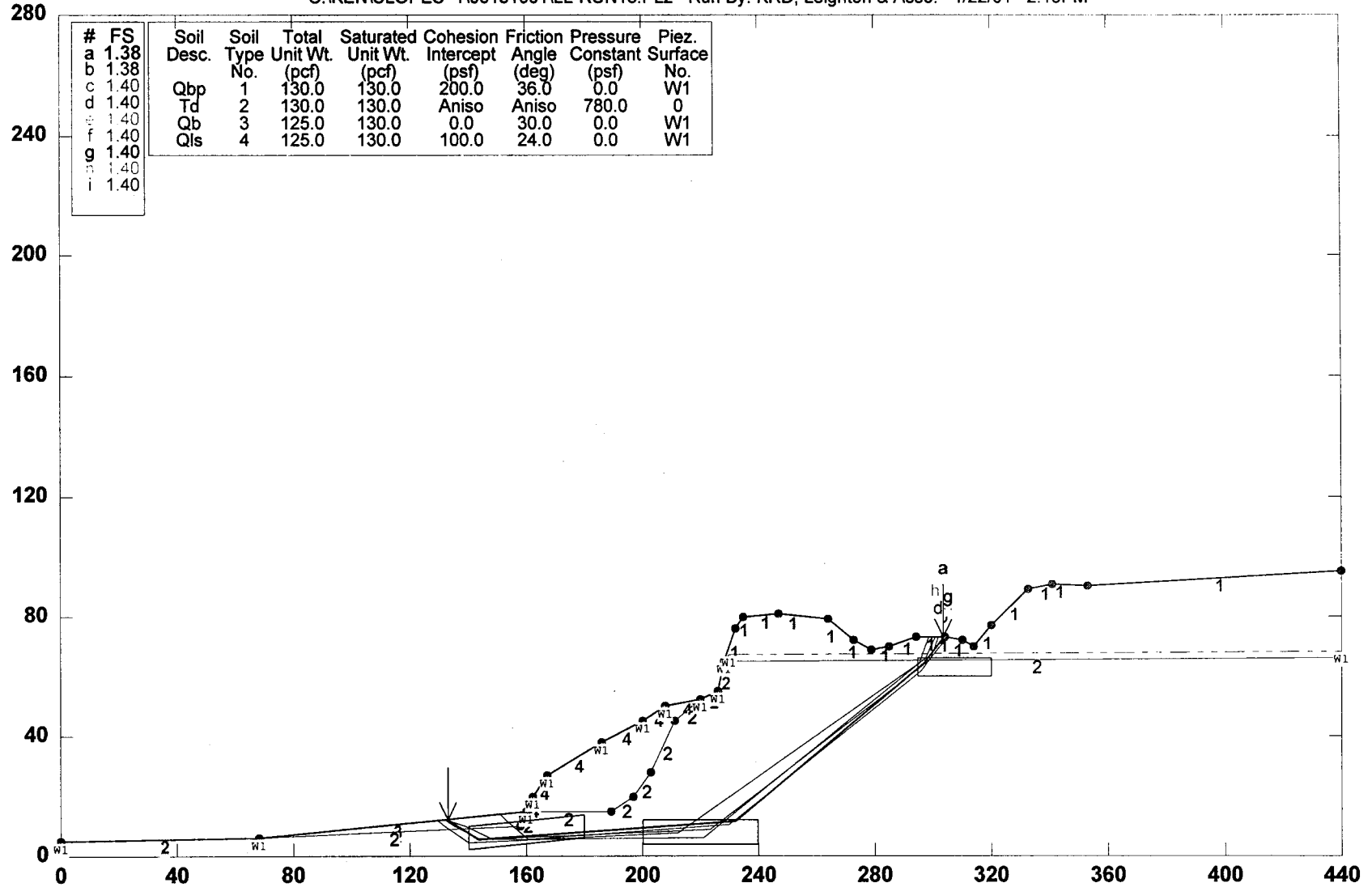
GSTABL7 FSmin=1.58
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross Section (L-L') Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\LL-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/22/01 2:15PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.38								
b	1.38								
c	1.40	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	1.40	Td	2	130.0	130.0	Aniso	Aniso	780.0	0
e	1.40	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	1.40	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
g	1.40								
h	1.40								
i	1.40								

GSTABL7 FSmin=1.38

Safety Factors Are Calculated By The Simplified Janbu Method

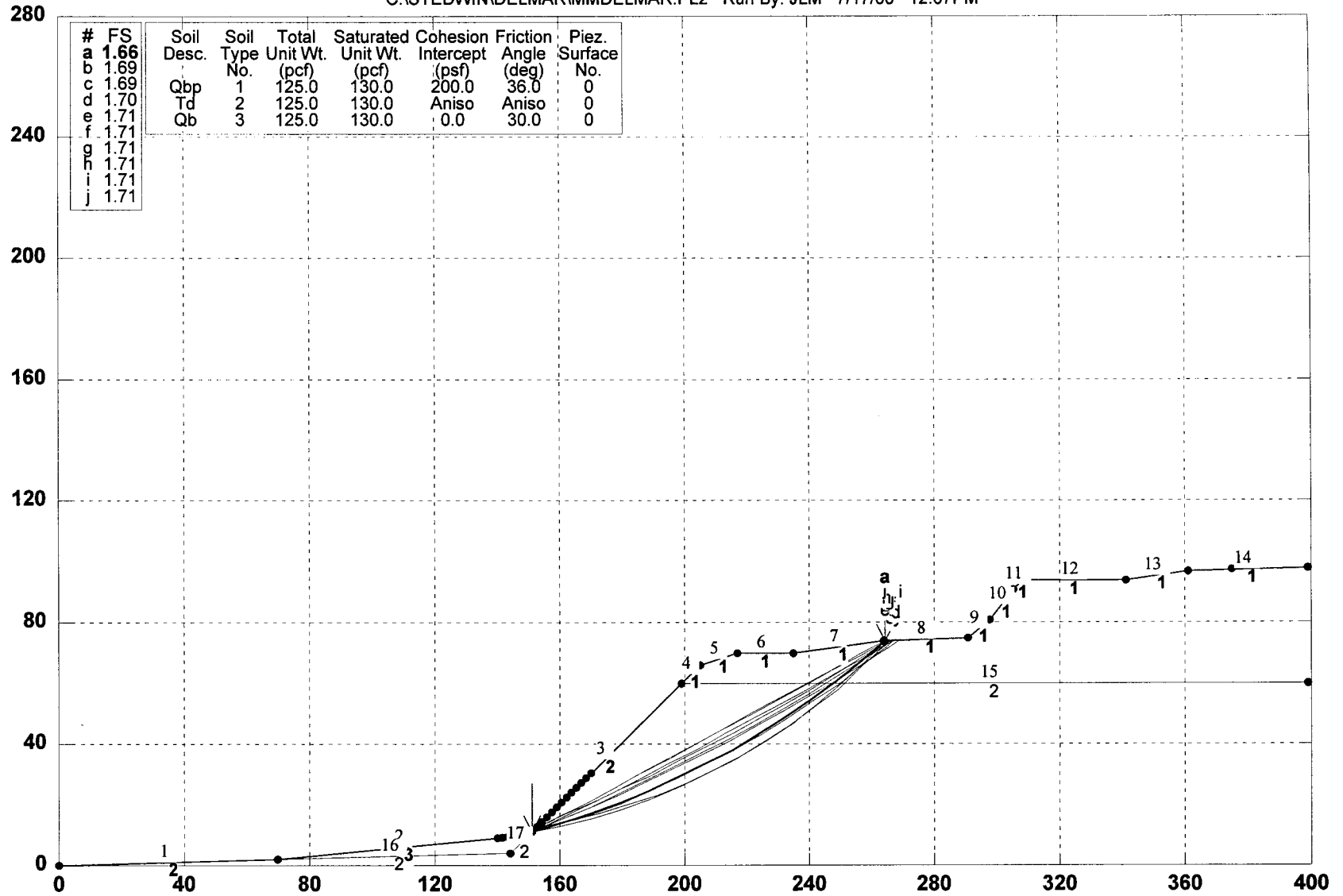
STED



| | | | | | | | | | | | | | | | | | | | | |

Cross-Section (M-M'), Del Mar Bluffs

C:\STEDWIN\DELMAR\MMDELMAR.PL2 Run By: JLM 7/17/00 12:07PM



GSTABL7 FSmin=1.66

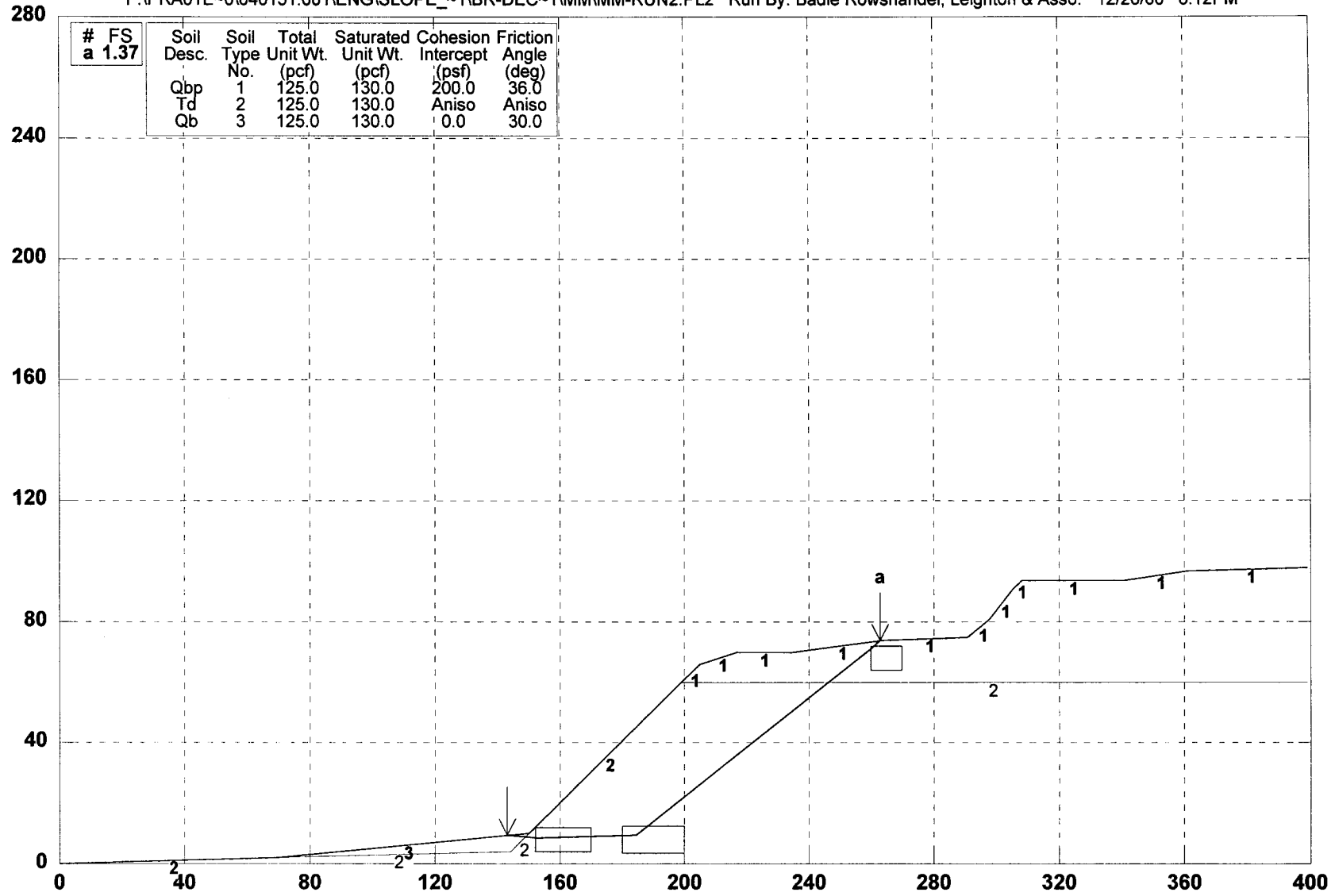
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (M-M'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\MMMM-RUN2.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 6:12PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)
a	1.37	Qbp	1	125.0	130.0	200.0	36.0
		Td	2	125.0	130.0	Aniso	Aniso
		Qb	3	125.0	130.0	0.0	30.0

GSTABL7 FSmin=1.37

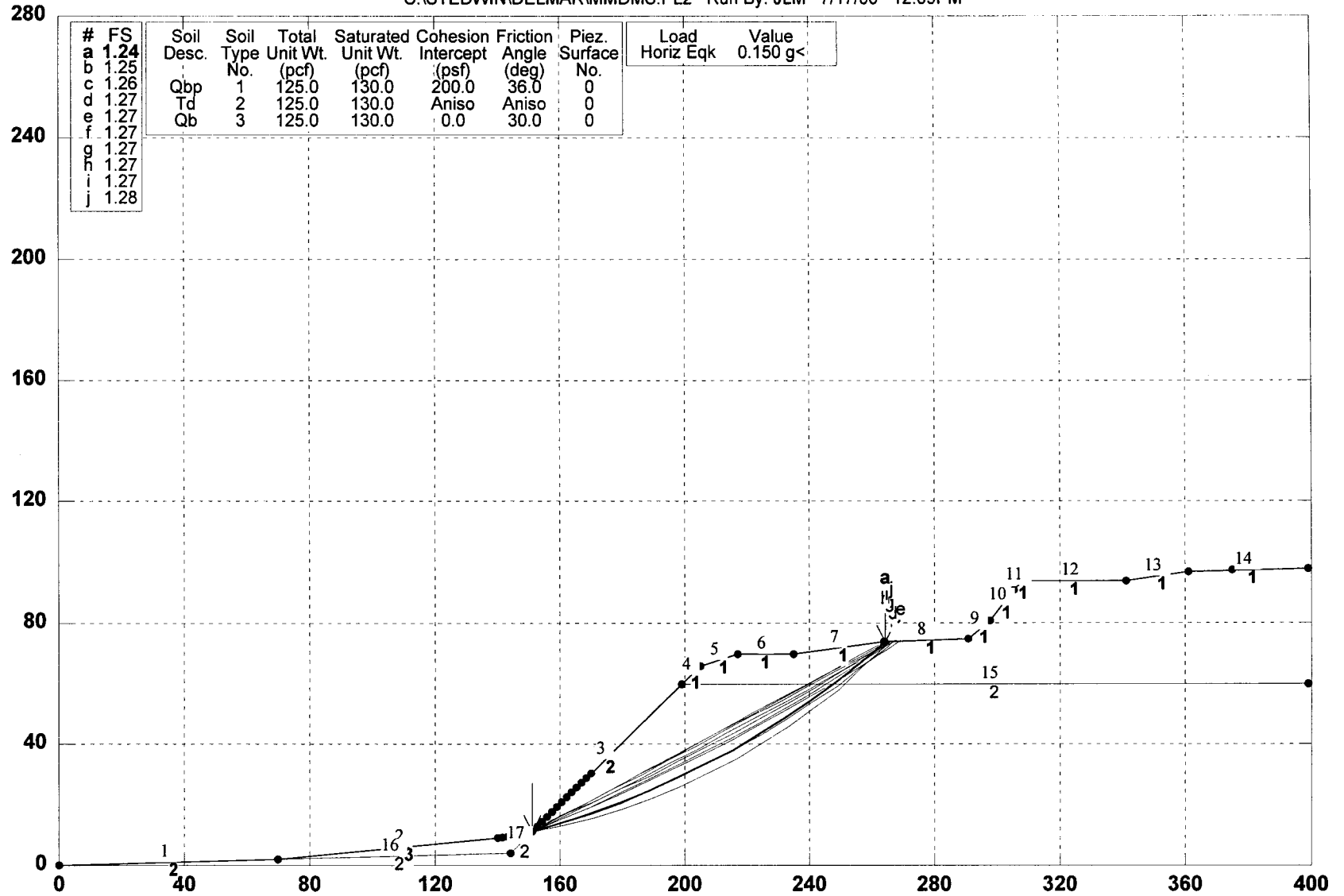
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (M-M'), Del Mar Bluffs, Pseudostatic

C:\STEDWIN\DELMAR\MMDS.PL2 Run By: JLM 7/17/00 12:09PM



GSTABL7 FSmin=1.24

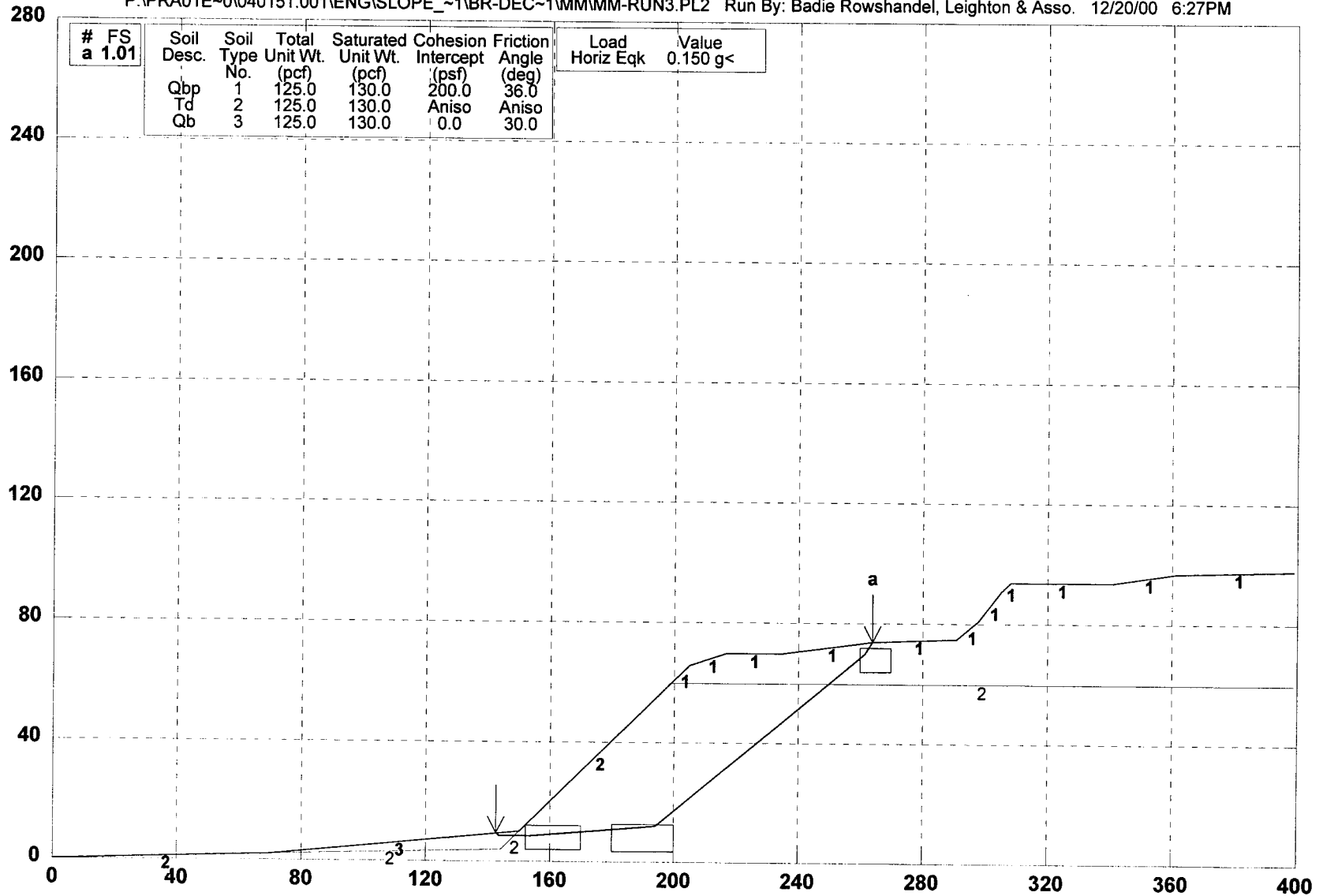
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (M-M'), Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E~0\040151.001\ENG\SLOPE~1\BR-DEC~1\MMMM-RUN3.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 6:27PM



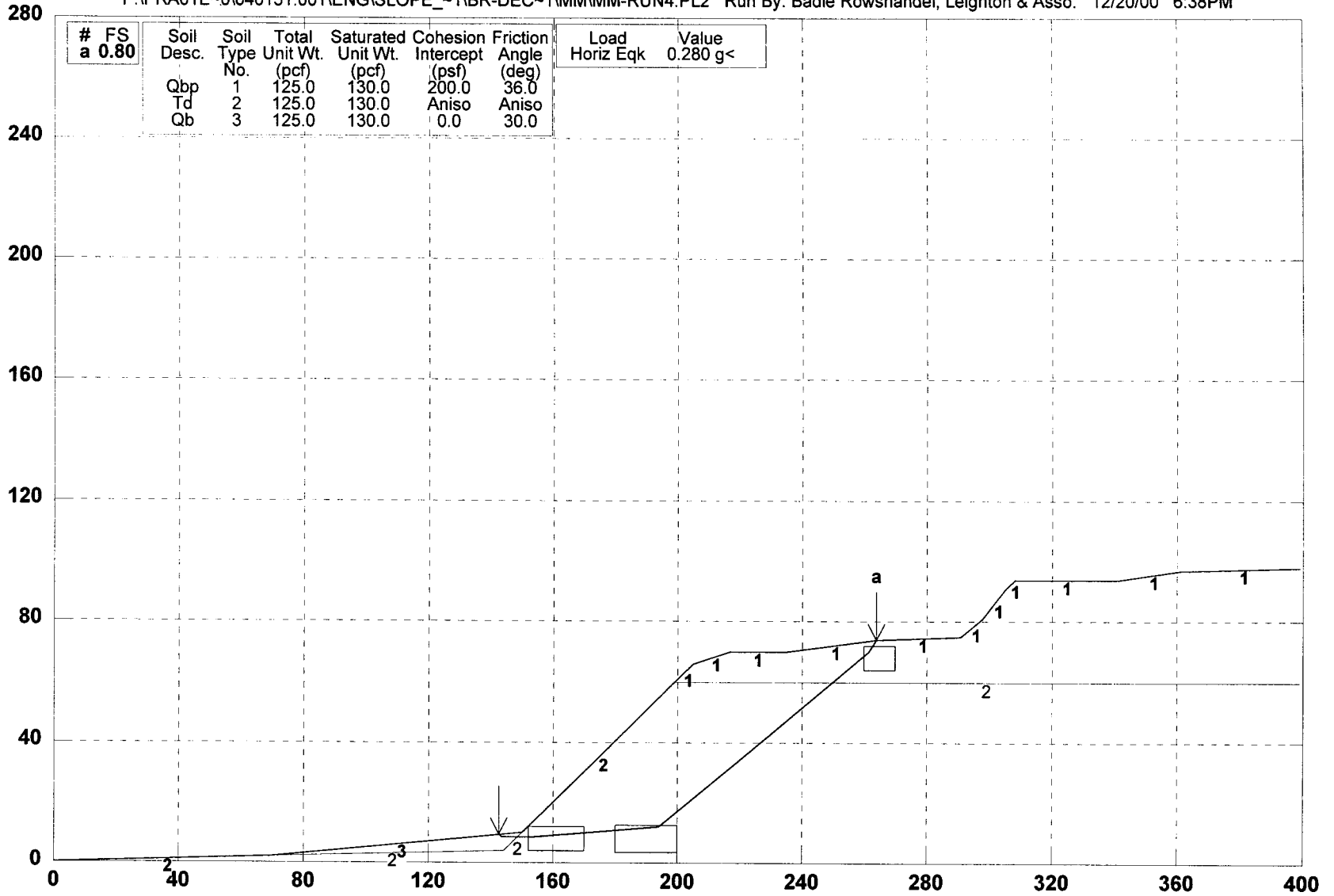
GSTABL7 FSmin=1.01
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (M-M'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\MMMM-RUN4.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/20/00 6:38PM



GSTABL7 FSmin=0.80

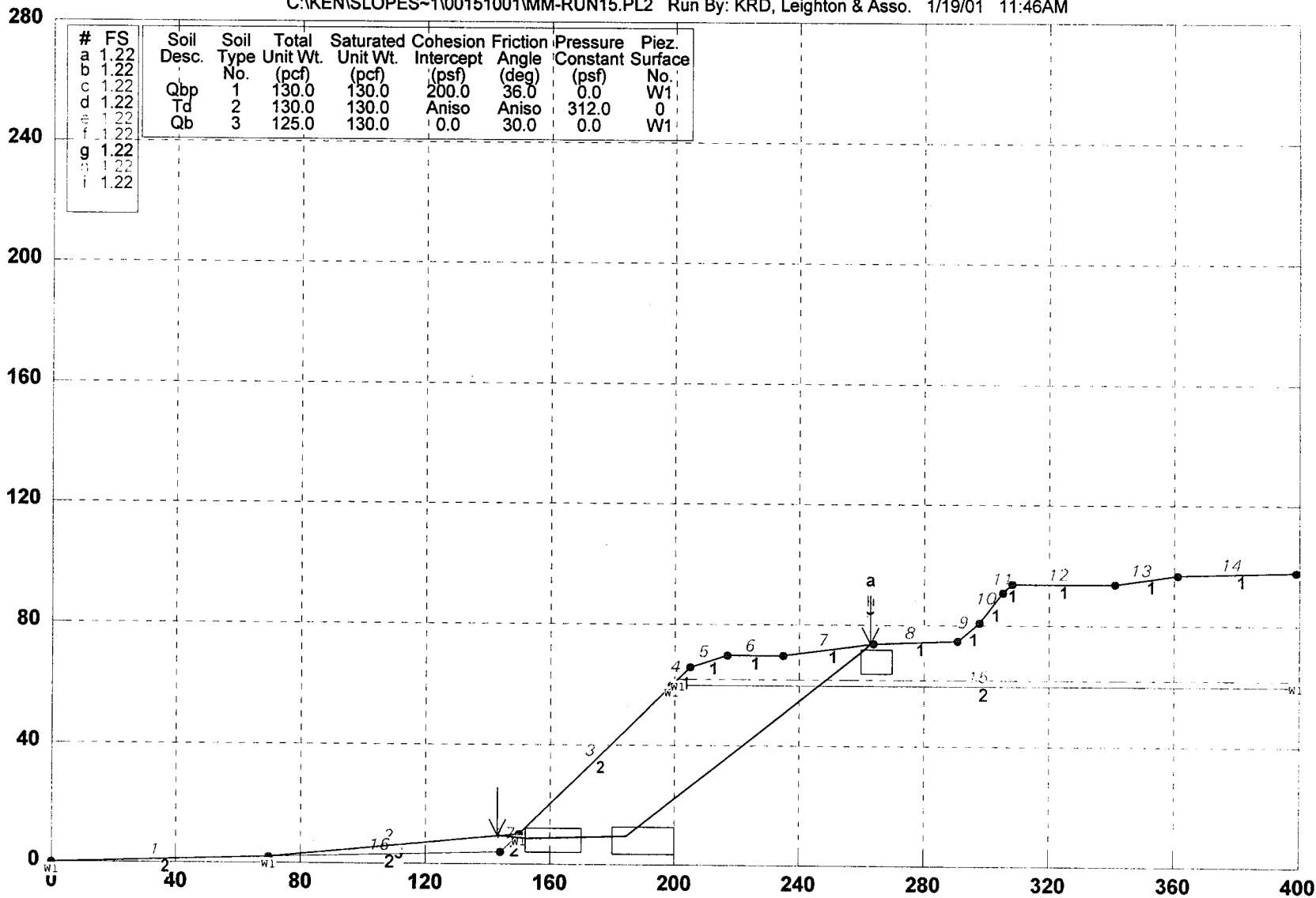
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (M-M'), Del Mar Bluffs, Static/Saturated

C:\KENISLOPES~1\00151001\MM-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 11:46AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.22								
b	1.22								
c	1.22	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	1.22	Td	2	130.0	130.0	Aniso	Aniso	312.0	0
e	1.22	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	1.22								
g	1.22								
h	1.22								
i	1.22								

GSTABL7 FSmin=1.22

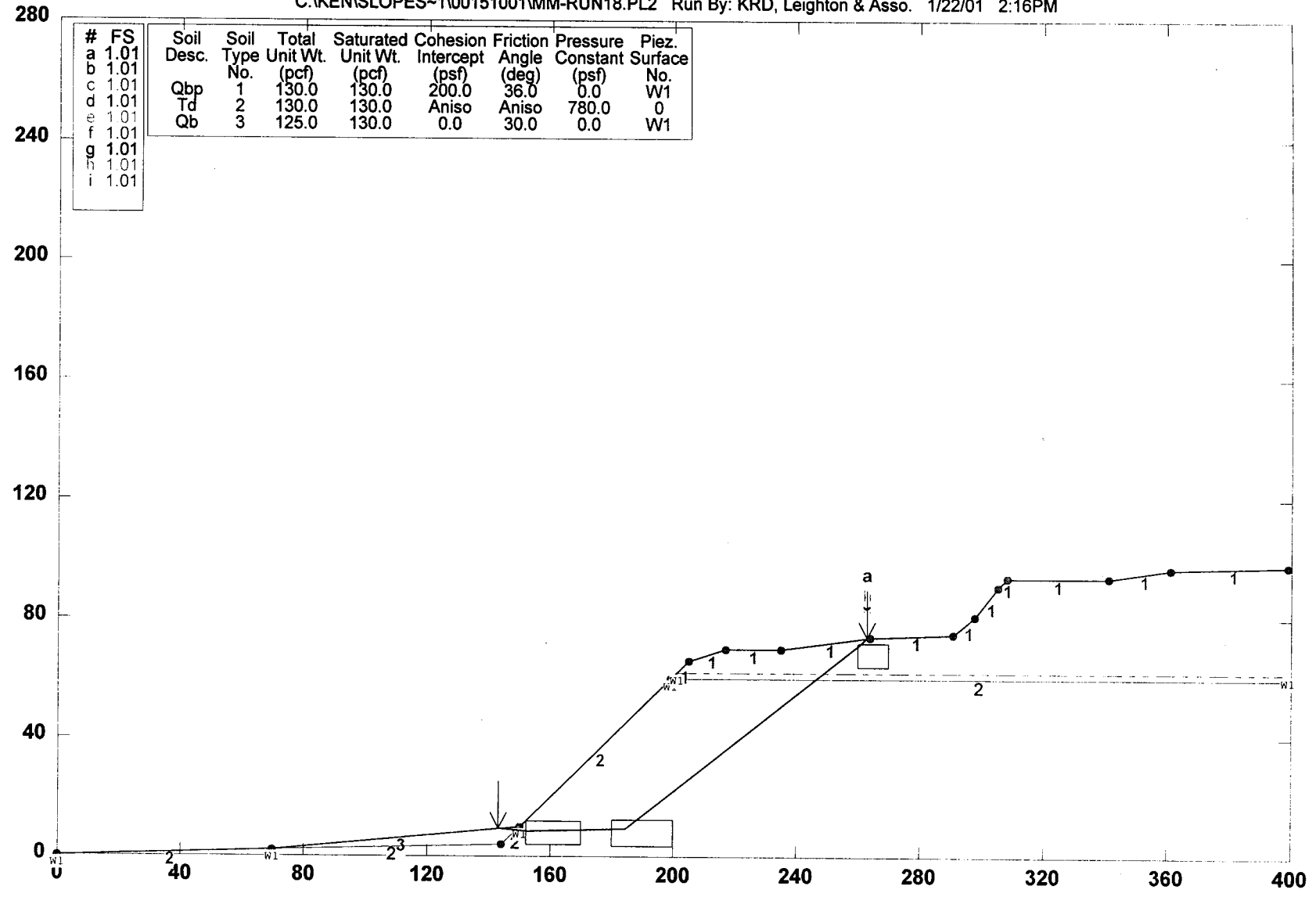
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (M-M'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\MM-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/22/01 2:16PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.01	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
b	1.01	Td	2	130.0	130.0	Aniso	Aniso	780.0	0
c	1.01	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
d	1.01								
e	1.01								
f	1.01								
g	1.01								
h	1.01								
i	1.01								

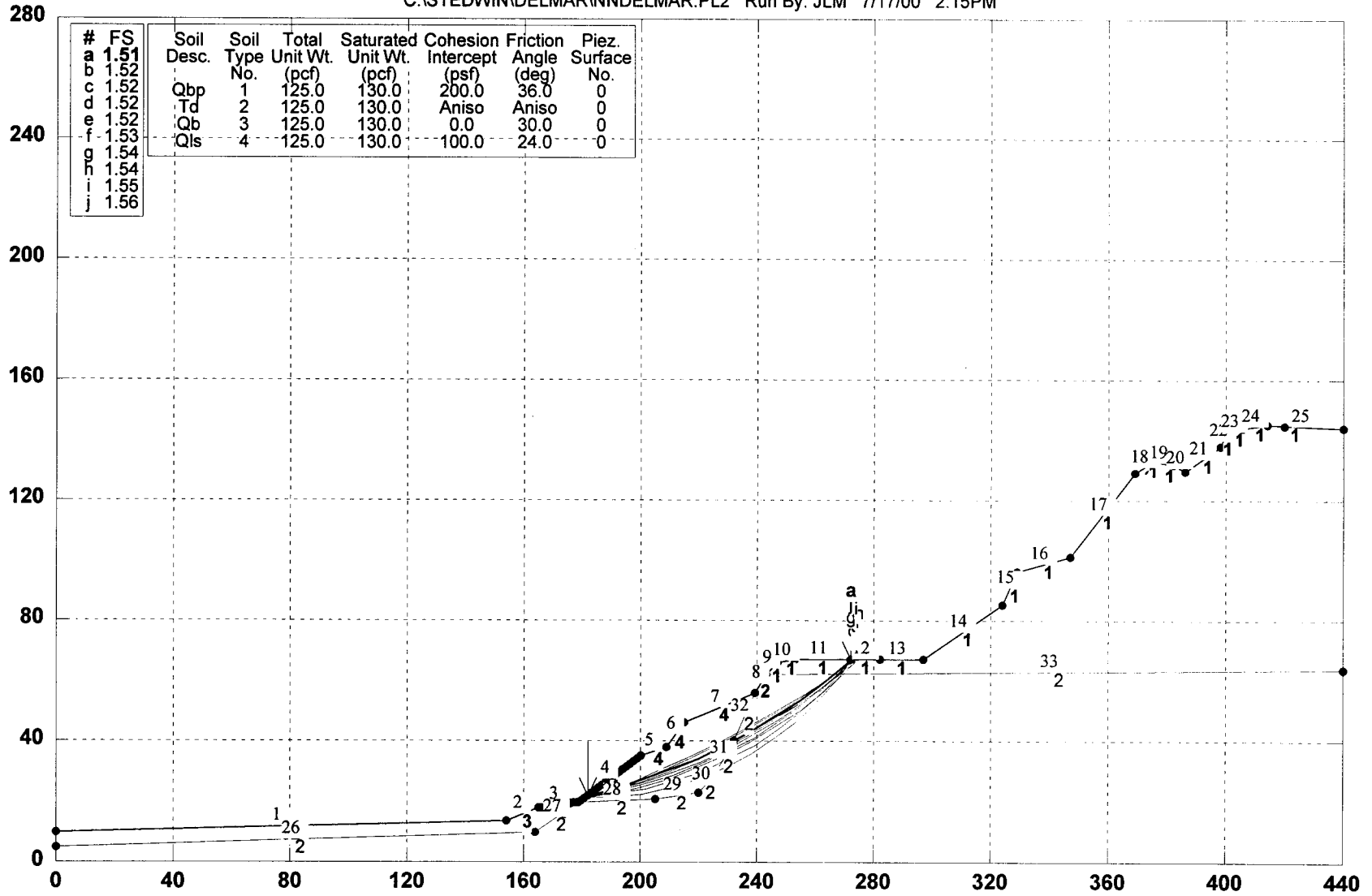
GSTABL7 FSmin=1.01
 Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (N-N'), Del Mar Bluffs

C:\STEDWIN\DELMAR\NDEL MAR.PL2 Run By: JLM 7/17/00 2:15PM



GSTABL7 FSmin=1.51

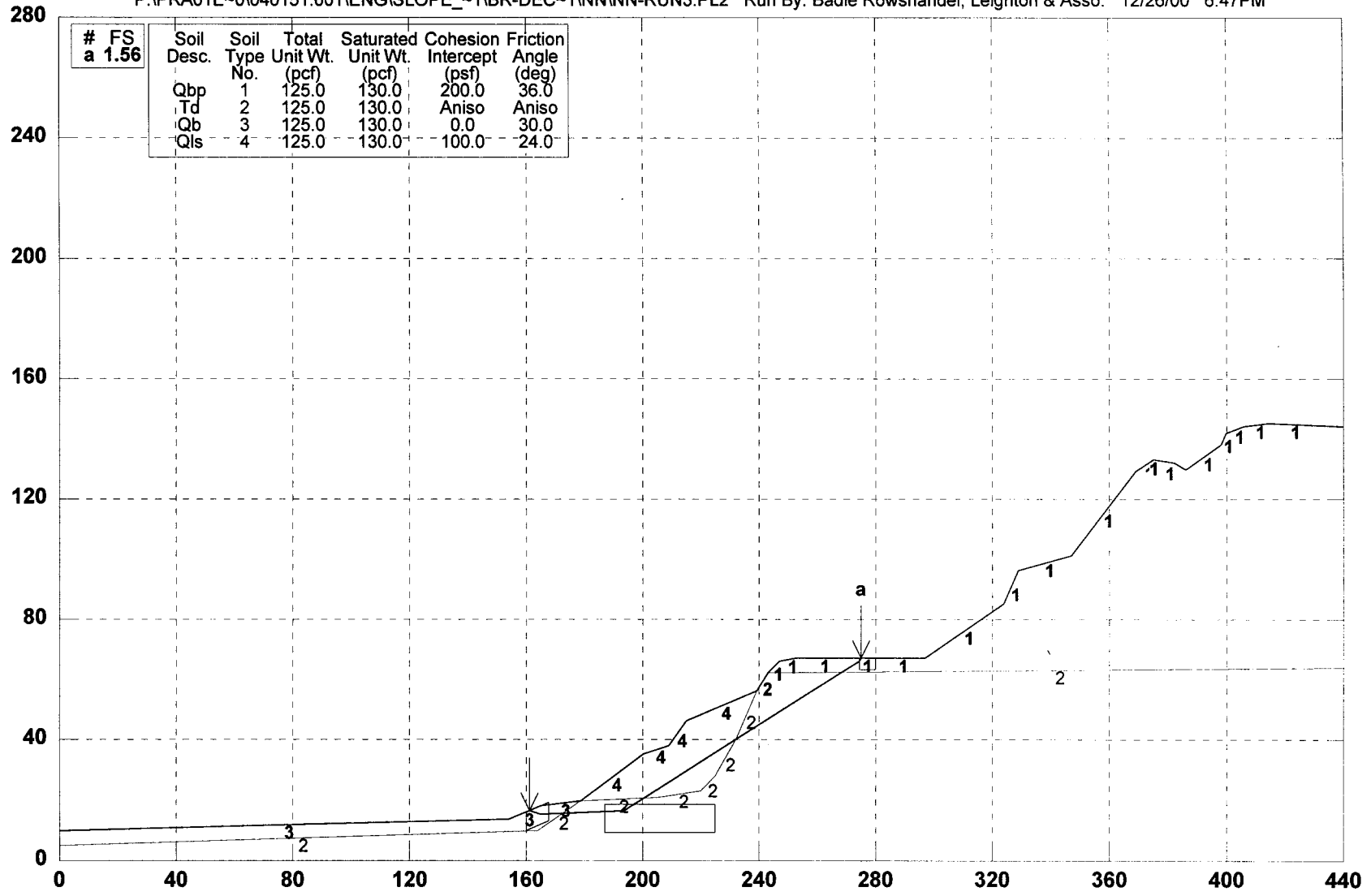
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (N-N'), Del Mar Bluffs, Static

P:\PRA01E~0\040151.001\ENGSLOPE_~1\BR-DEC~1\NN\NN-RUN3.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/26/00 6:47PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)
a	1.56	Qbp	1	125.0	130.0	200.0	36.0
		Td	2	125.0	130.0	Aniso	Aniso
		Qb	3	125.0	130.0	0.0	30.0
		Qls	4	125.0	130.0	100.0	24.0

GSTABL7 FSmin=1.56

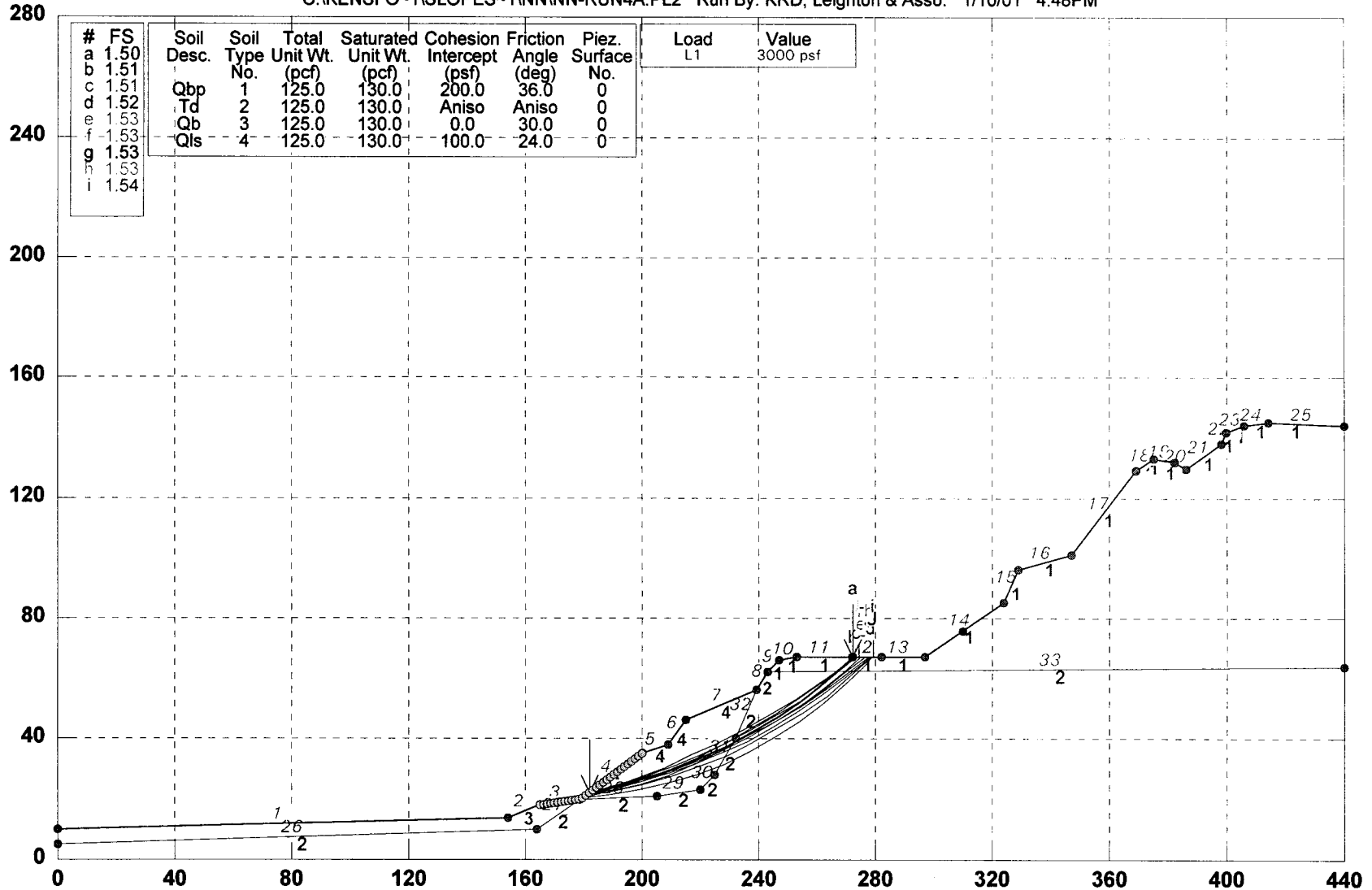
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross-Section (N-N'), Del Mar Bluffs, Static w/ Surcharge

C:\KENSFO~1\SLOPES~1\NN\NN-RUN4A.PL2 Run By: KRD, Leighton & Asso. 1/10/01 4:48PM



GSTABL7 FSmin=1.50

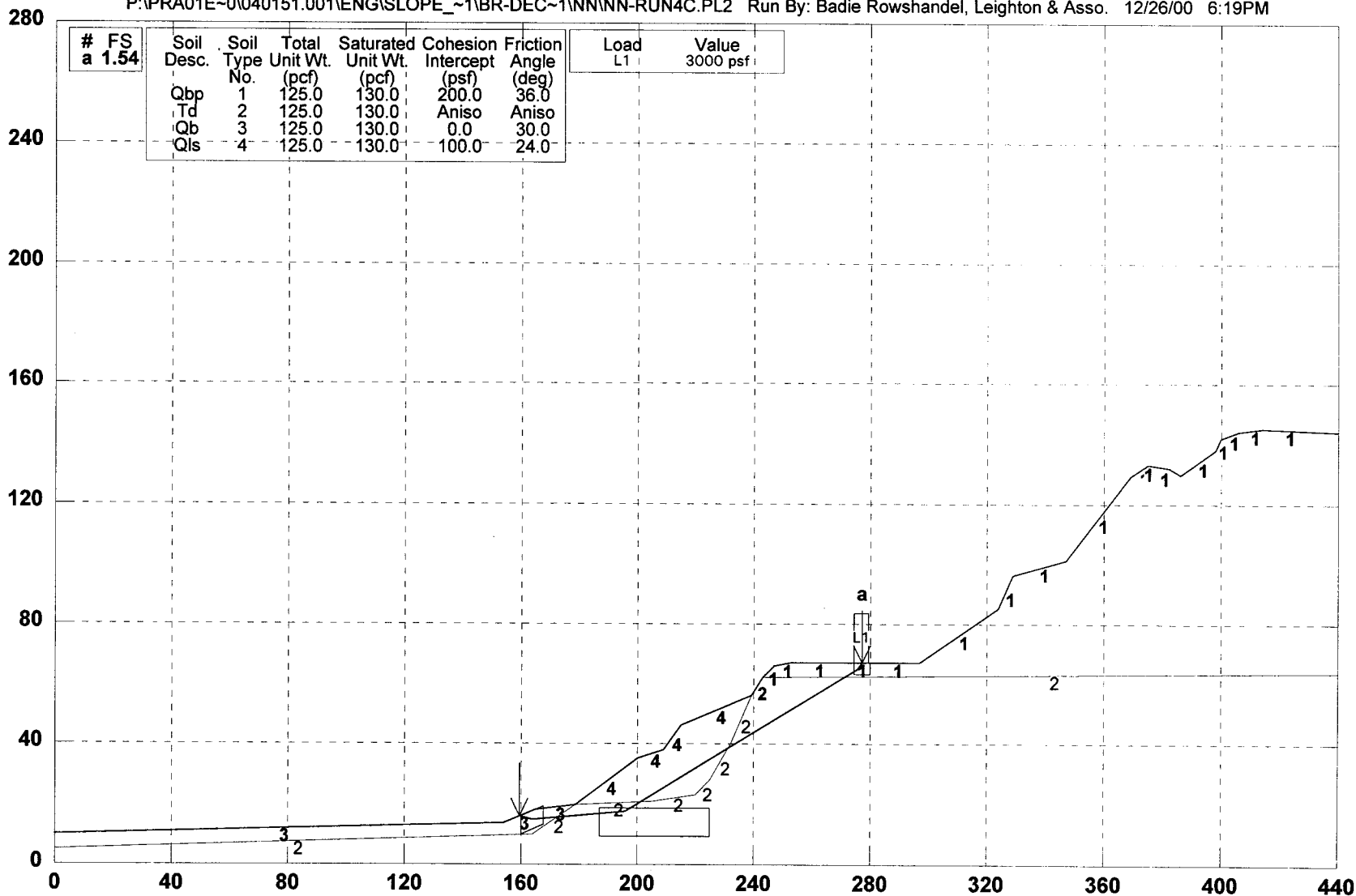
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (N-N'), Del Mar Bluffs, Static w/ Surcharge

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\NN\NN-RUN4C.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/26/00 6:19PM



GSTABL7 FSmin=1.54

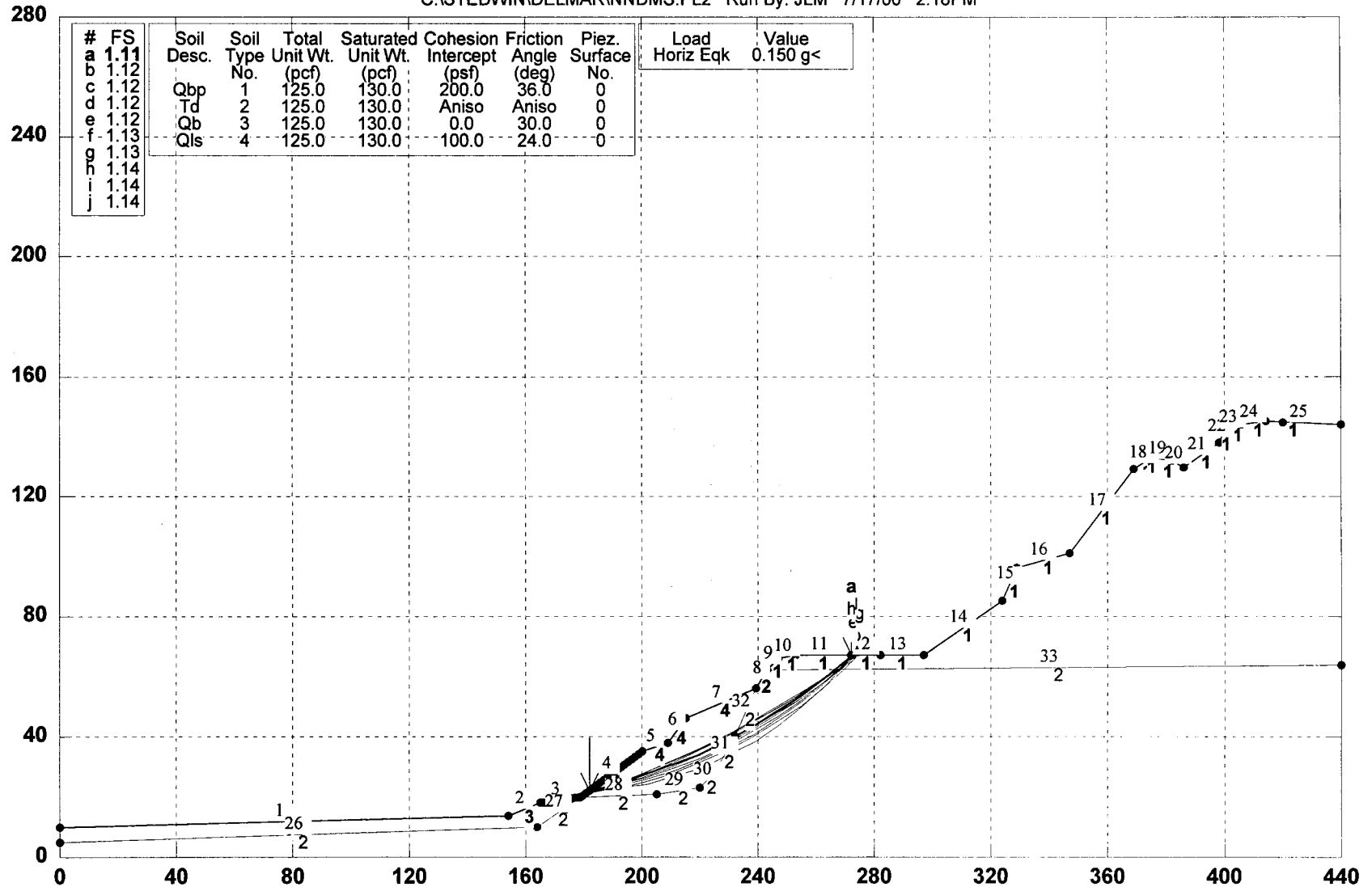
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross-Section (N-N'), Del Mar Bluffs, Pseudostatic

C:\STEDWIN\DELMAR\INDMS.PL2 Run By: JLM 7/17/00 2:18PM



GSTABL7 FSmin=1.11

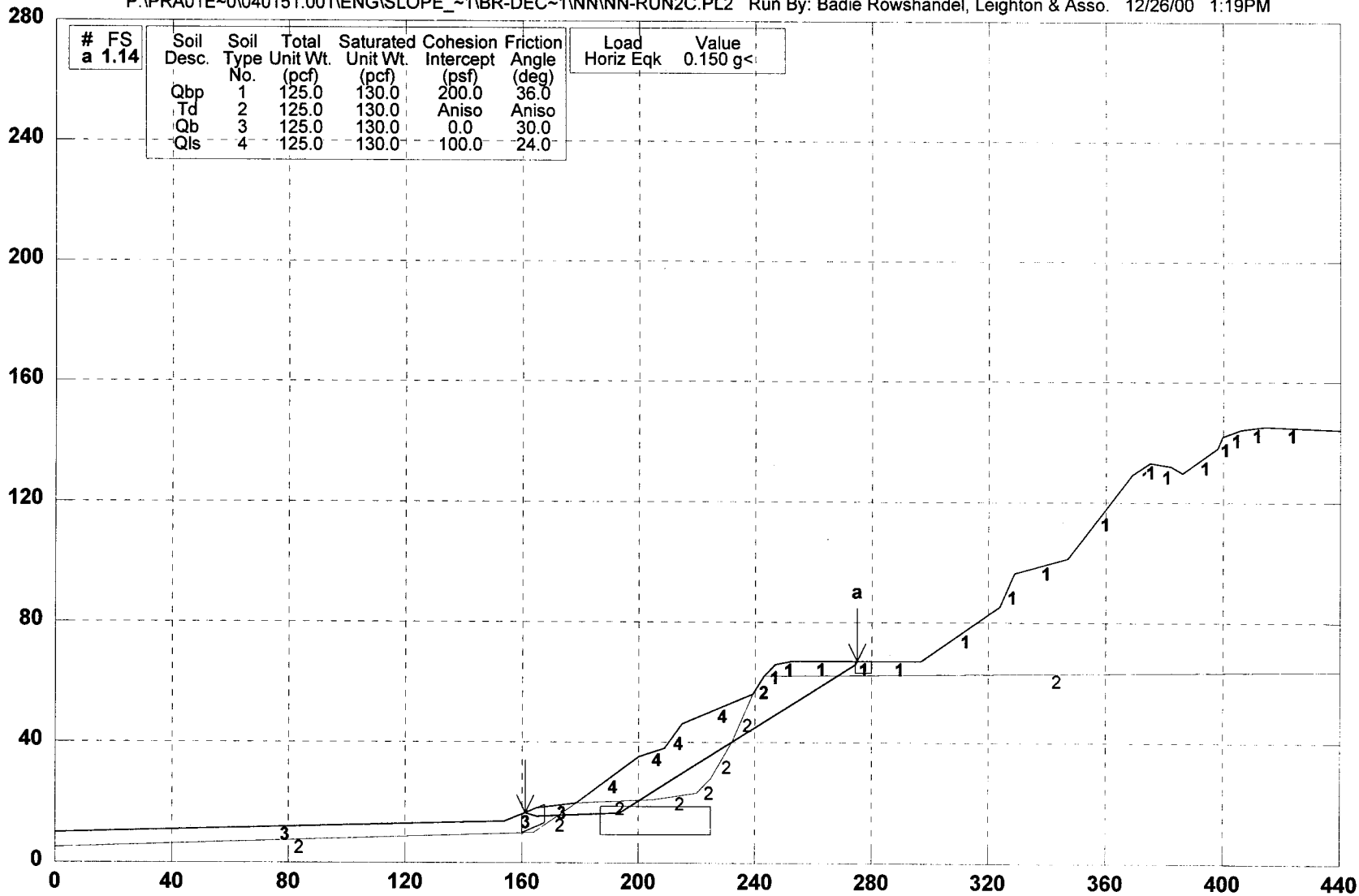
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (N-N'), Del Mar Bluffs, Pseudo-Static @ 0.15

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\NN\NN-RUN2C.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/26/00 1:19PM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load Horiz Eqs	Value
a 1.14	Qbp	1	125.0	130.0	200.0	36.0		0.150 g<
	Td	2	125.0	130.0	Aniso	Aniso		
	Qb	3	125.0	130.0	0.0	30.0		
	Qls	4	125.0	130.0	100.0	24.0		

GSTABL7 FSmin=1.14

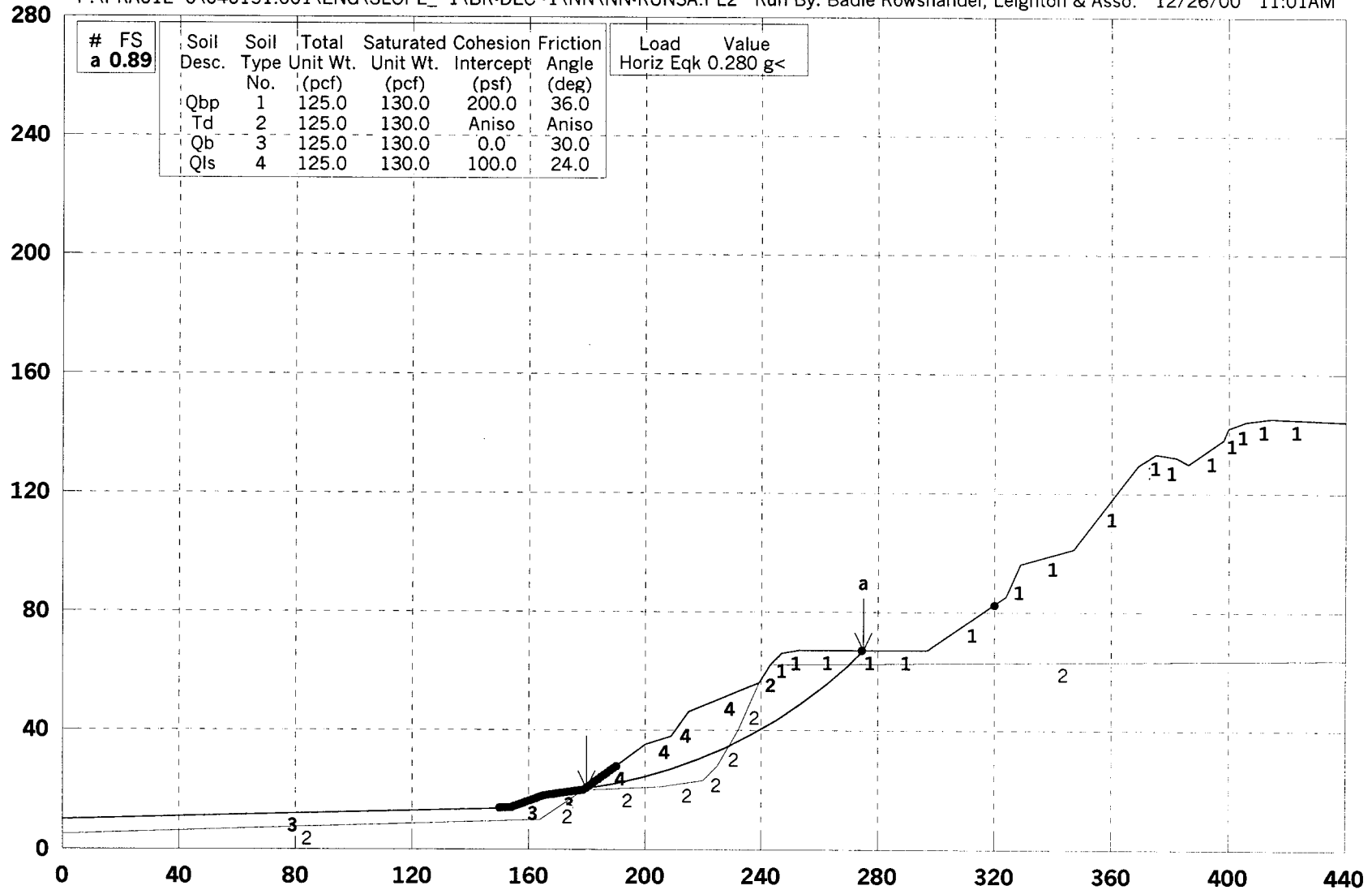
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross-Section (N-N'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\NN\NN-RUN3A.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/26/00 11:01AM



GSTABL7 FSmin=0.89

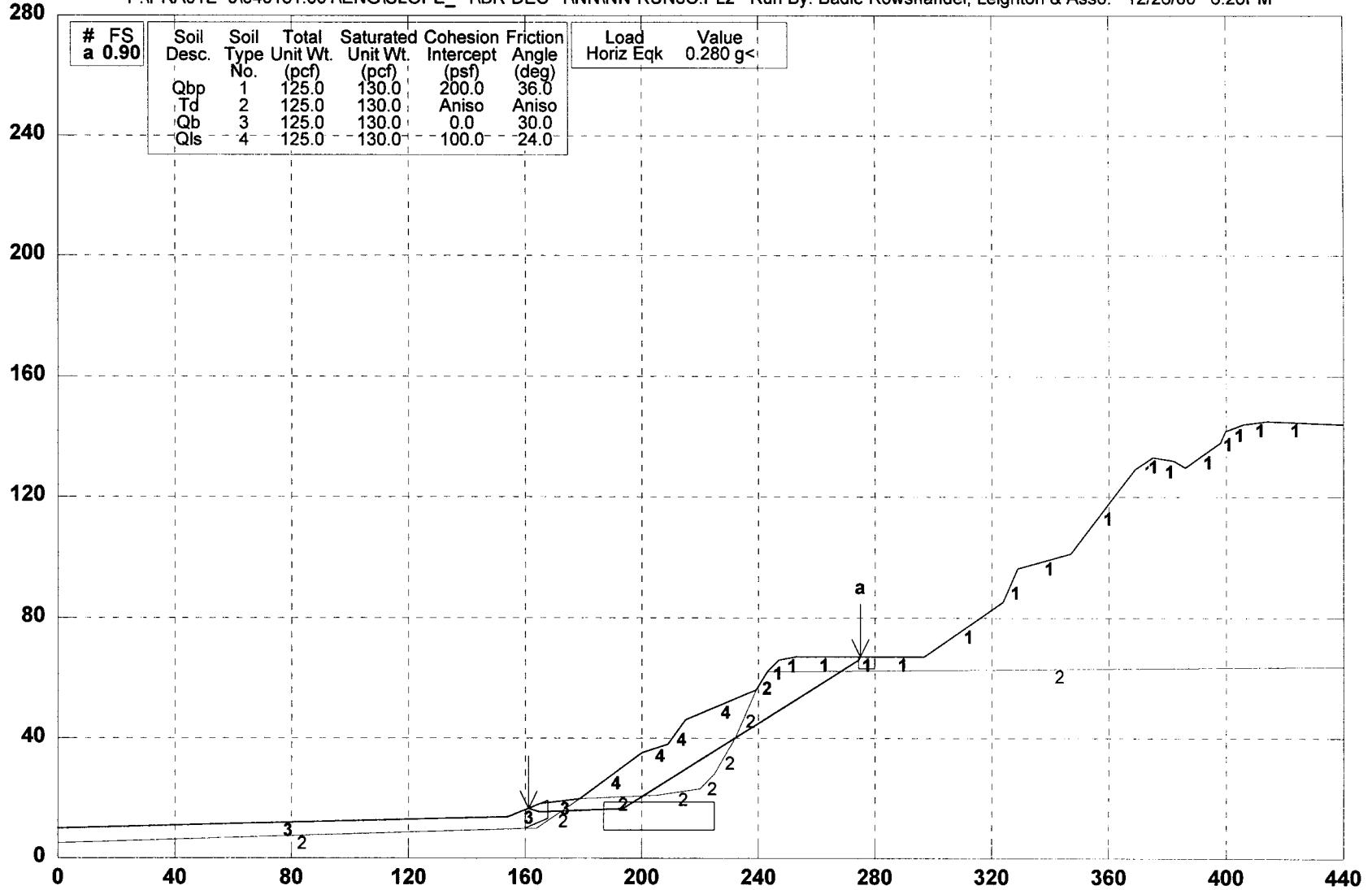
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (N-N'), Del Mar Bluffs, Pseudo-Static @ 0.28

P:\PRA01E~0\040151.001\ENG\SLOPE_~1\BR-DEC~1\NNNN-RUN3C.PL2 Run By: Badie Rowshandel, Leighton & Asso. 12/26/00 6:28PM



# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Load Horiz Eqk	Value
a 0.90	Qbp	1	125.0	130.0	200.0	36.0		0.280 g<
	Td	2	125.0	130.0	Aniso	Aniso		
	Qb	3	125.0	130.0	0.0	30.0		
	Qls	4	125.0	130.0	100.0	24.0		

GSTABL7 FSmin=0.90

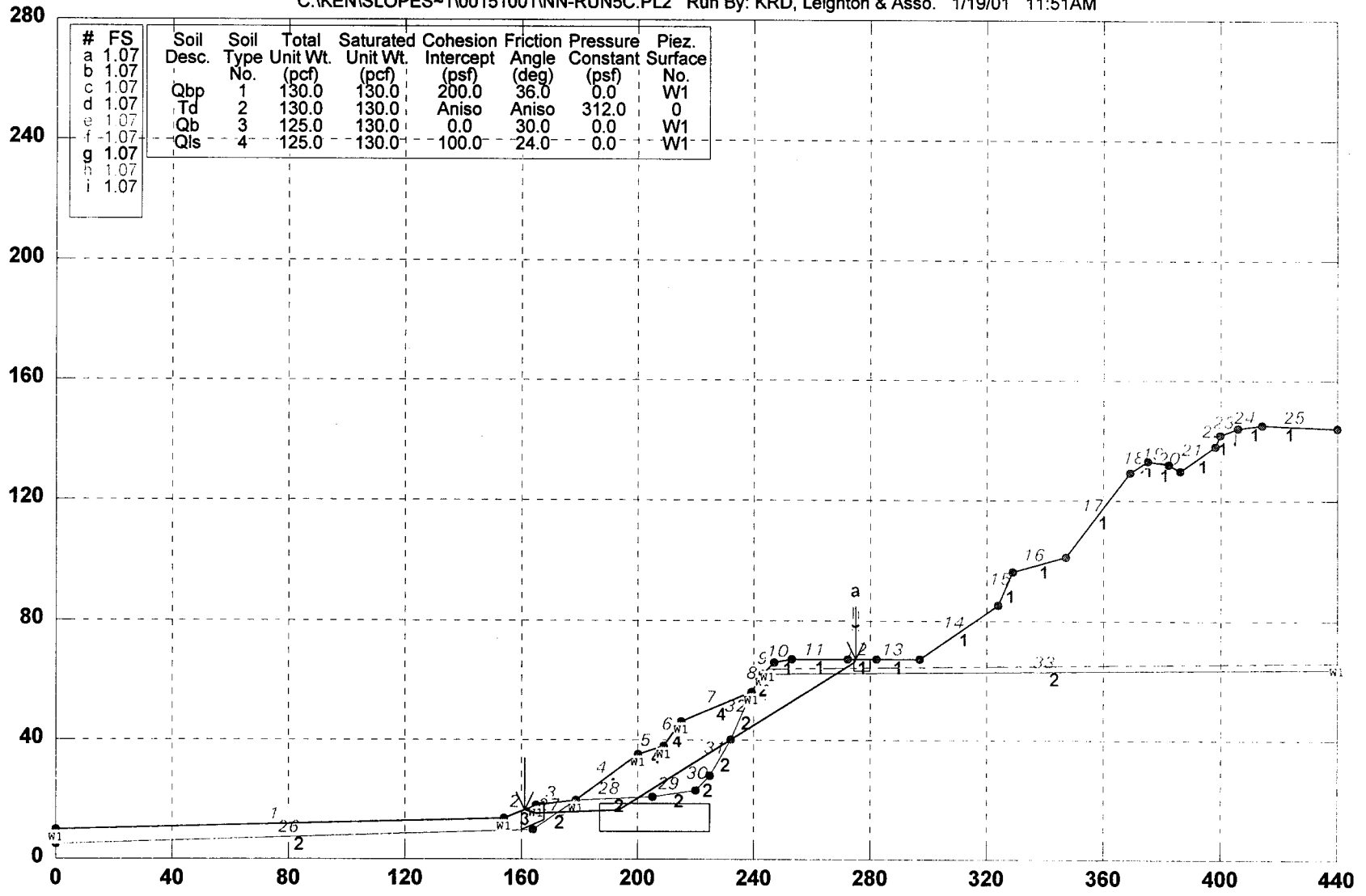
Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

STED



Cross-Section (N-N'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES-1\00151001\NN-RUN5C.PL2 Run By: KRDL, Leighton & Asso. 1/19/01 11:51AM



GSTABL7 FSmin=1.07

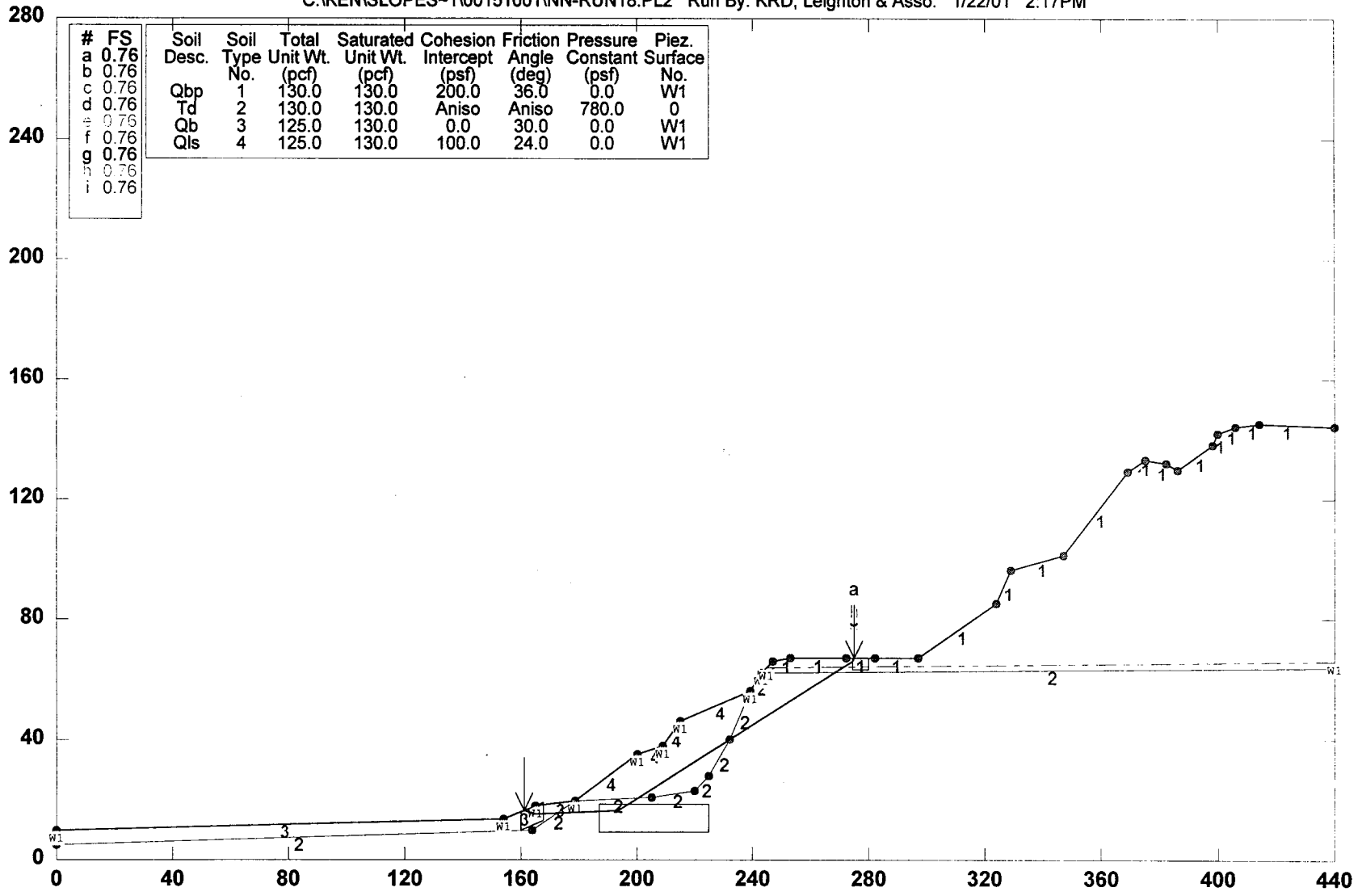
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (N-N'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\NN-RUN18.PL2 Run By: KRDL, Leighton & Asso. 1/22/01 2:17PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	0.76								
b	0.76								
c	0.76	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	0.76	Td	2	130.0	130.0	Aniso	Aniso	780.0	0
e	0.76	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	0.76	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
g	0.76								
h	0.76								
i	0.76								

GSTABL7 FSmin=0.76

Safety Factors Are Calculated By The Simplified Janbu Method

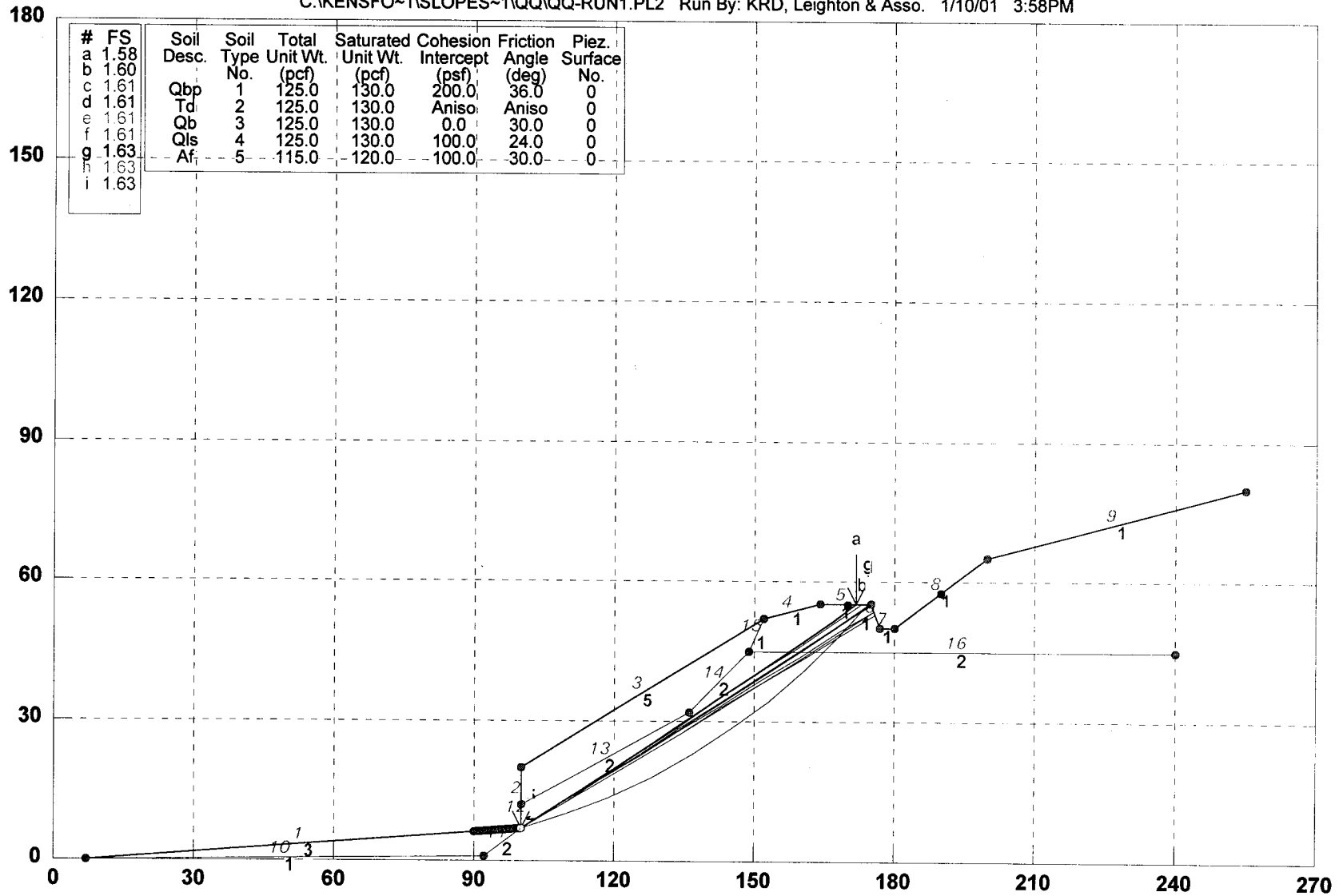
STED



| | | | | | | | | | | | | | | | | | | | | |

Cross-Section (Q-Q'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\QQ\QQ-RUN1.PL2 Run By: KRD, Leighton & Asso. 1/10/01 3:58PM



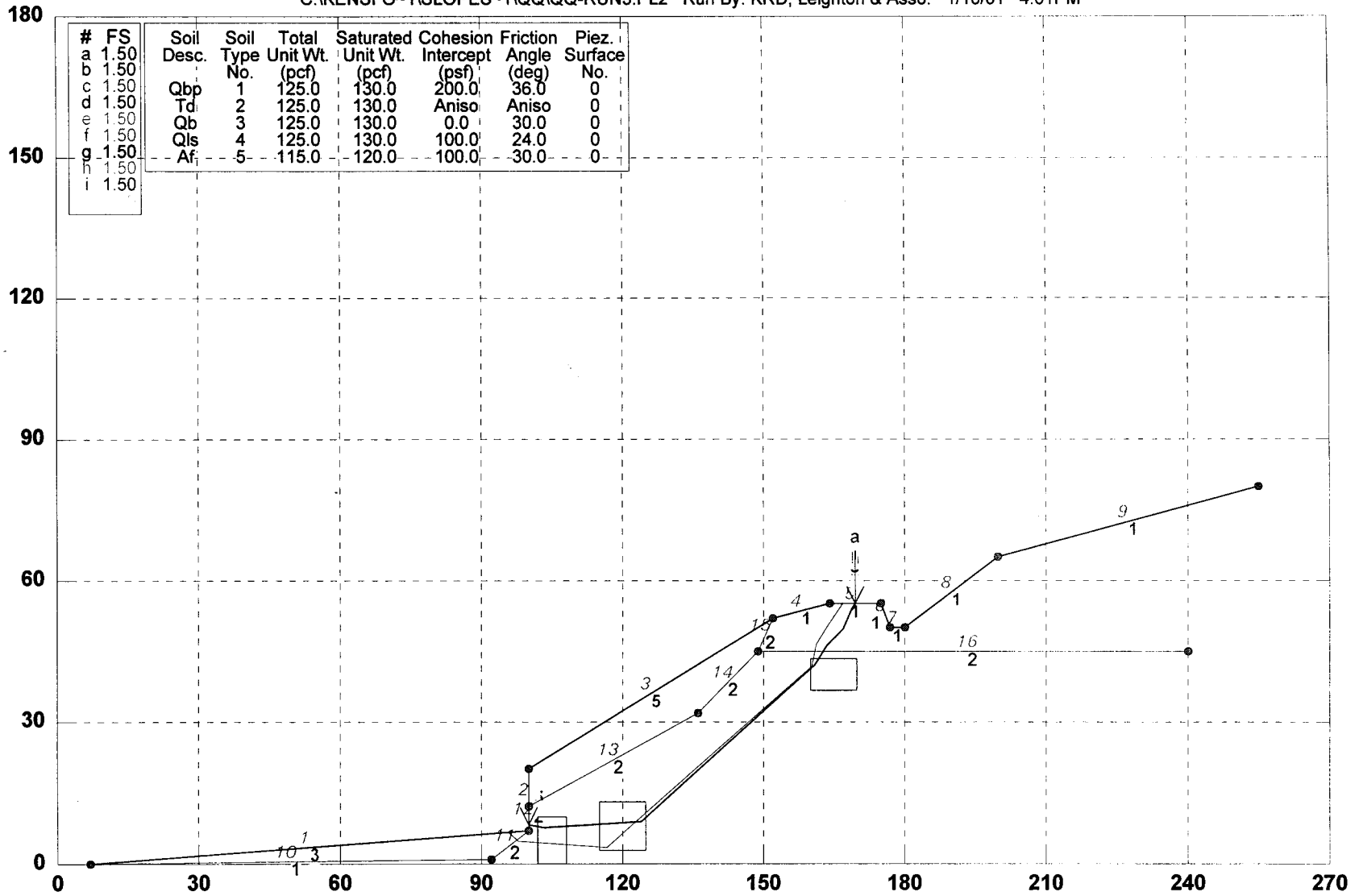
GSTABL7 FSmin=1.58
 Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (Q-Q'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\QQ\QQ-RUN3.PL2 Run By: KRD, Leighton & Asso. 1/10/01 4:01PM



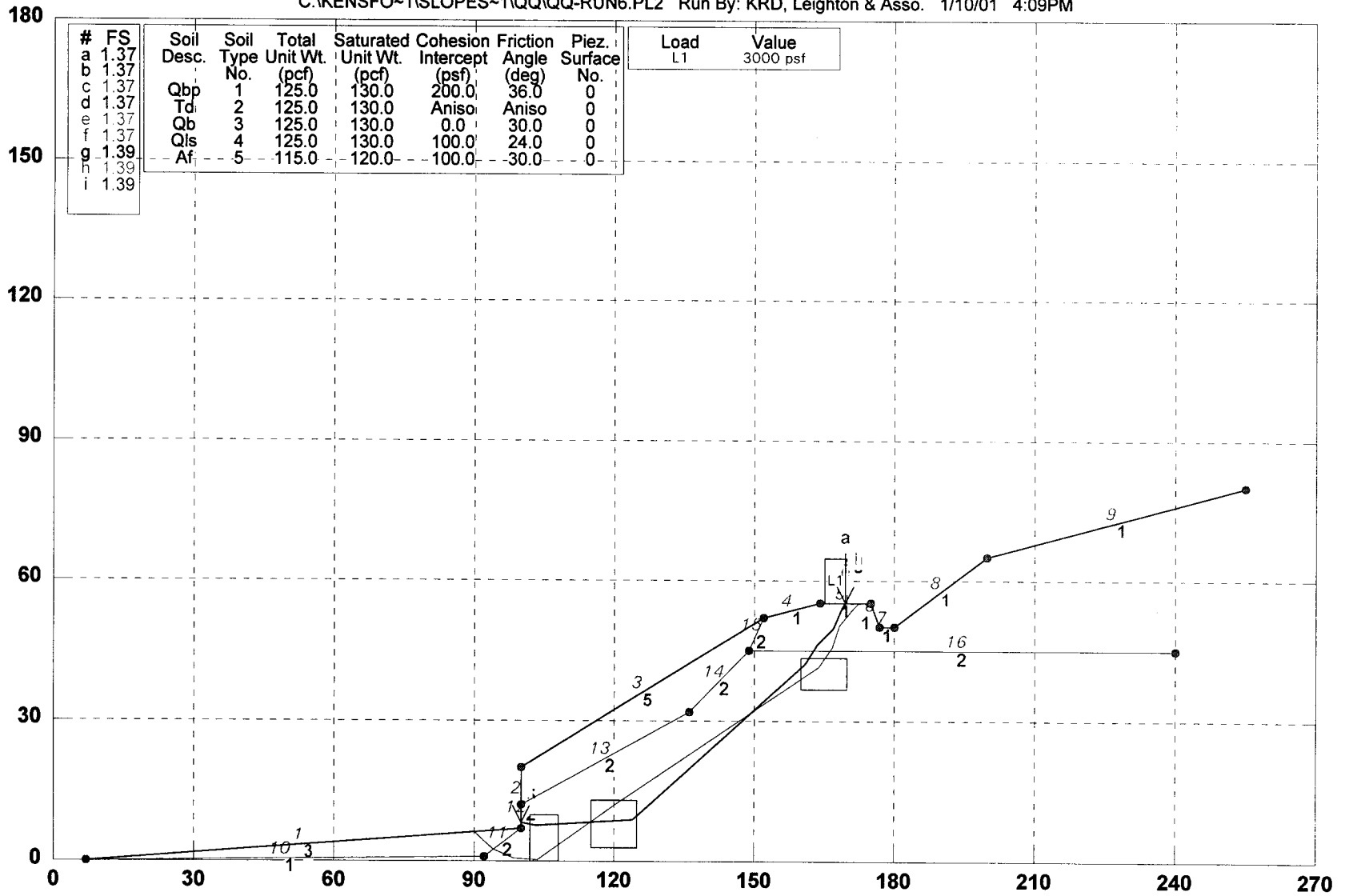
GSTABL7 FSmin=1.50
 Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (Q-Q'), Del Mar Bluffs, Static w/Surcharge

C:\KENSFO~1\SLOPES~1\QQ\QQ-RUN6.PL2 Run By: KRD, Leighton & Asso. 1/10/01 4:09PM



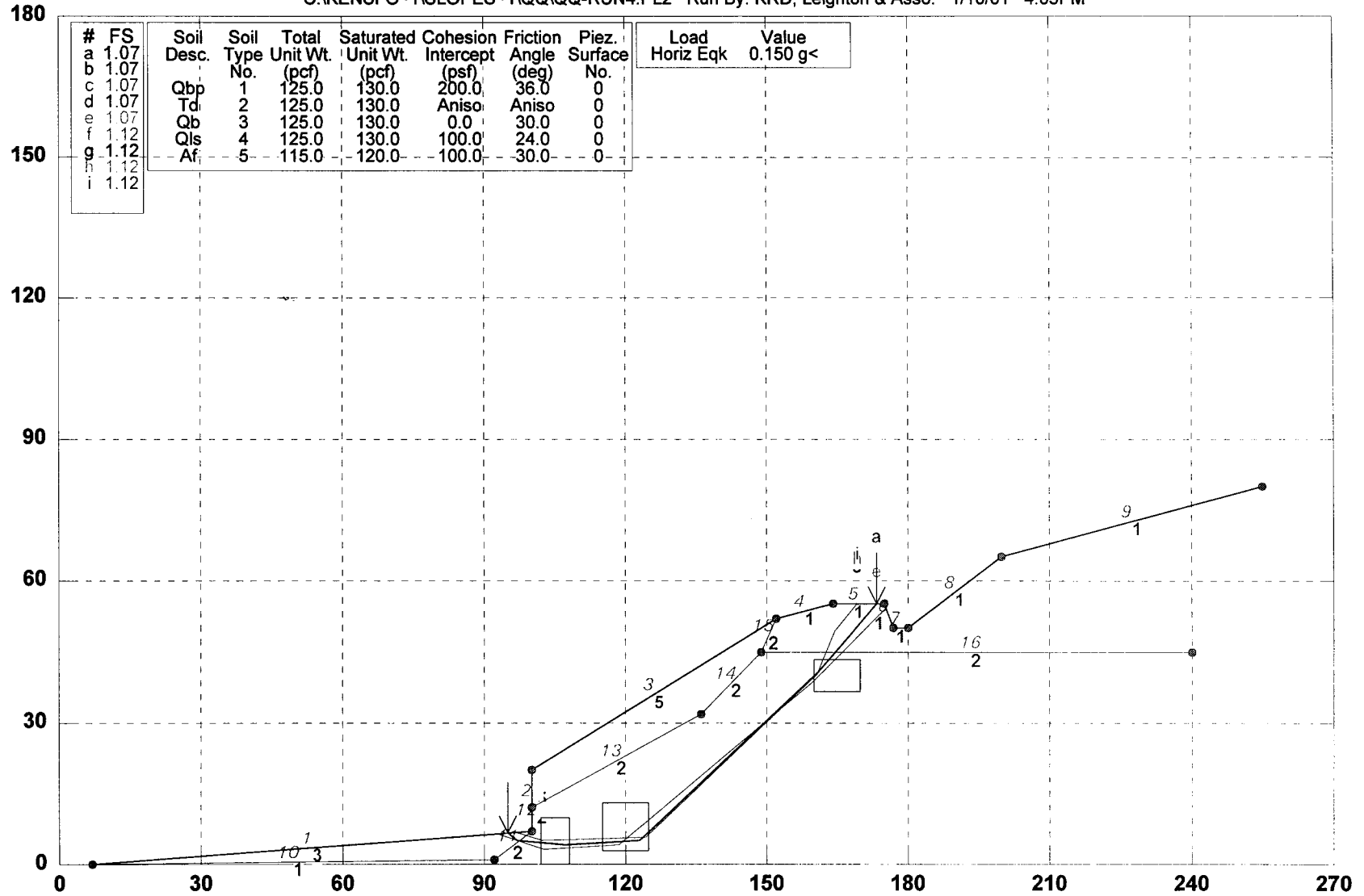
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (Q-Q'), Del Mar Bluffs, Pseudo-Static @ 0.15

C:\KENSFO~1\SLOPES~1\QQ\QQ-RUN4.PL2 Run By: KRD, Leighton & Asso. 1/10/01 4:05PM



GSTABL7 FSmin=1.07

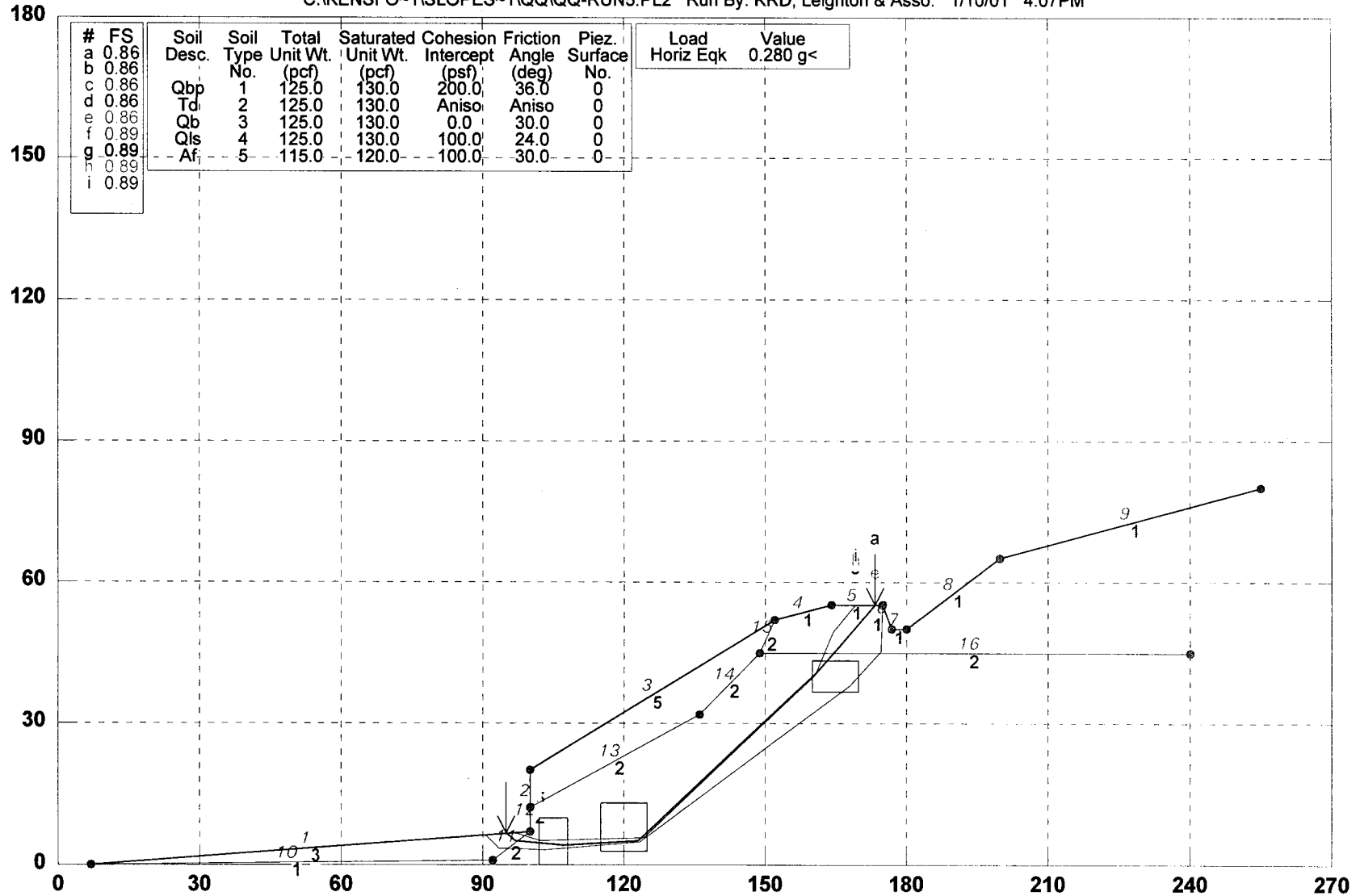
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (Q-Q'), Del Mar Bluffs, Pseudo-Static @ 0.28

C:\KENSFO~1\SLOPES~1\QQ\QQ-RUN5.PL2 Run By: KRD, Leighton & Asso. 1/10/01 4:07PM



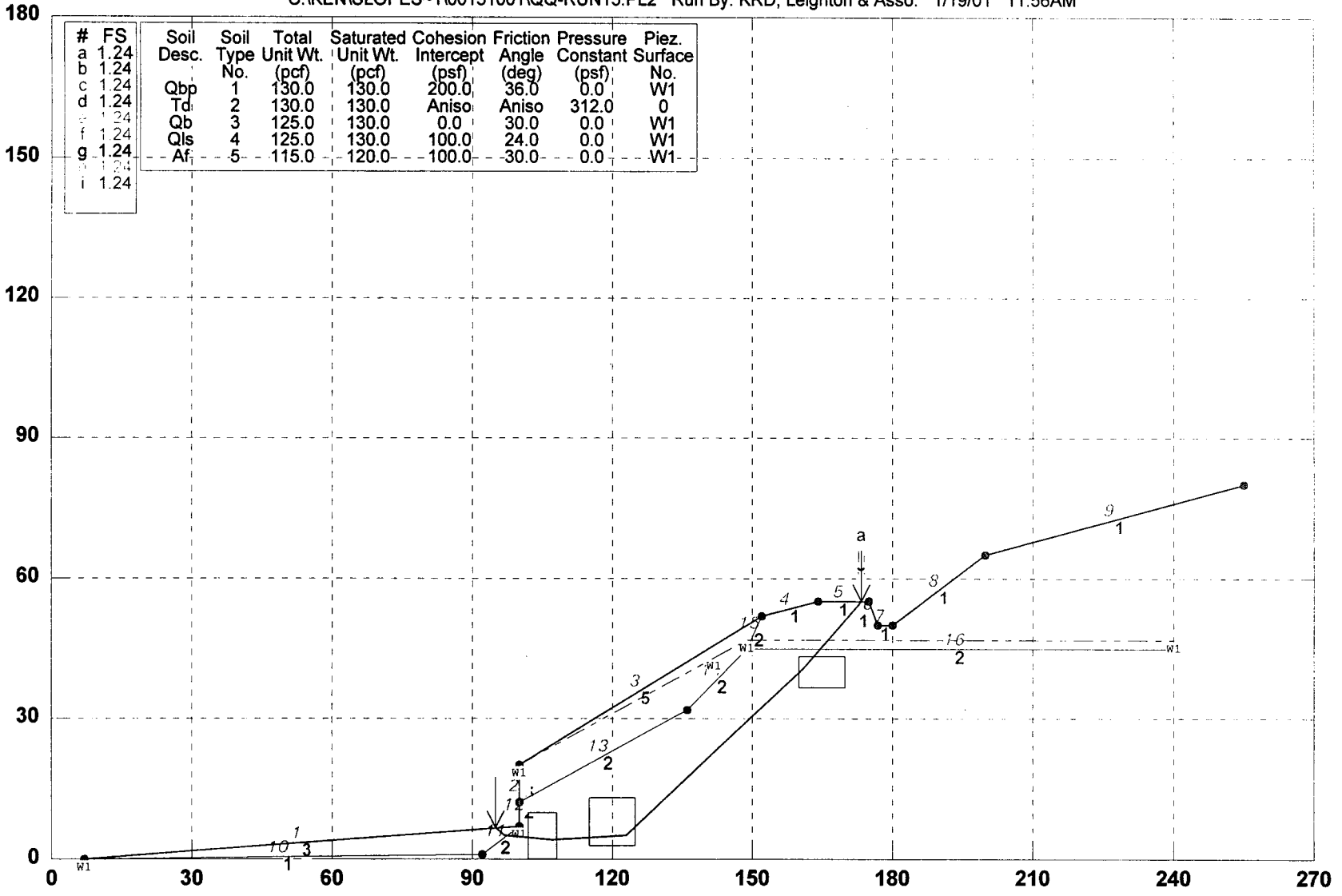
GSTABL7 FSmin=0.86
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (Q-Q'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\QQ-RUN15.PL2 Run By: KR D, Leighton & Asso. 1/19/01 11:56AM



#	FS	Soil Desc.	Soil Type	Soil Unit Wt. (pcf)	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.24									
b	1.24									
c	1.24	Qbp	1	130.0	130.0	200.0	36.0	0.0	0.0	W1
d	1.24	Td	2	130.0	130.0	Aniso	Aniso	312.0	0	0
e	1.24	Qb	3	125.0	130.0	0.0	30.0	0.0	0.0	W1
f	1.24	Qls	4	125.0	130.0	100.0	24.0	0.0	0.0	W1
g	1.24	Af	5	115.0	120.0	100.0	30.0	0.0	0.0	W1
h	1.24									
i	1.24									

GSTABL7 FSmin=1.24

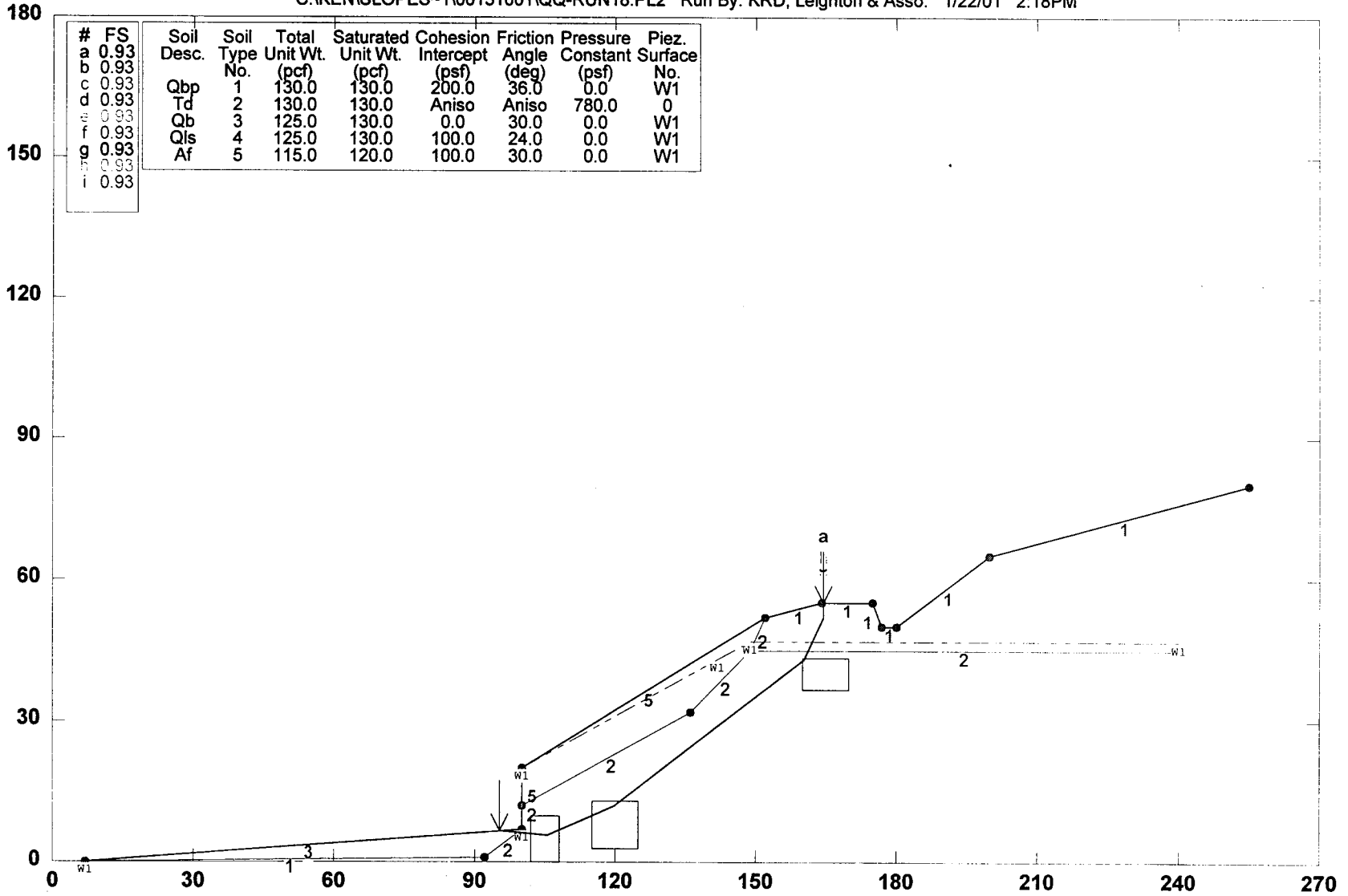
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (Q-Q'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES-1\00151001\QQ-RUN18.PL2 Run By: KR D, Leighton & Asso. 1/22/01 2:18PM



GSTABL7 FSmin=0.93

Safety Factors Are Calculated By The Simplified Janbu Method

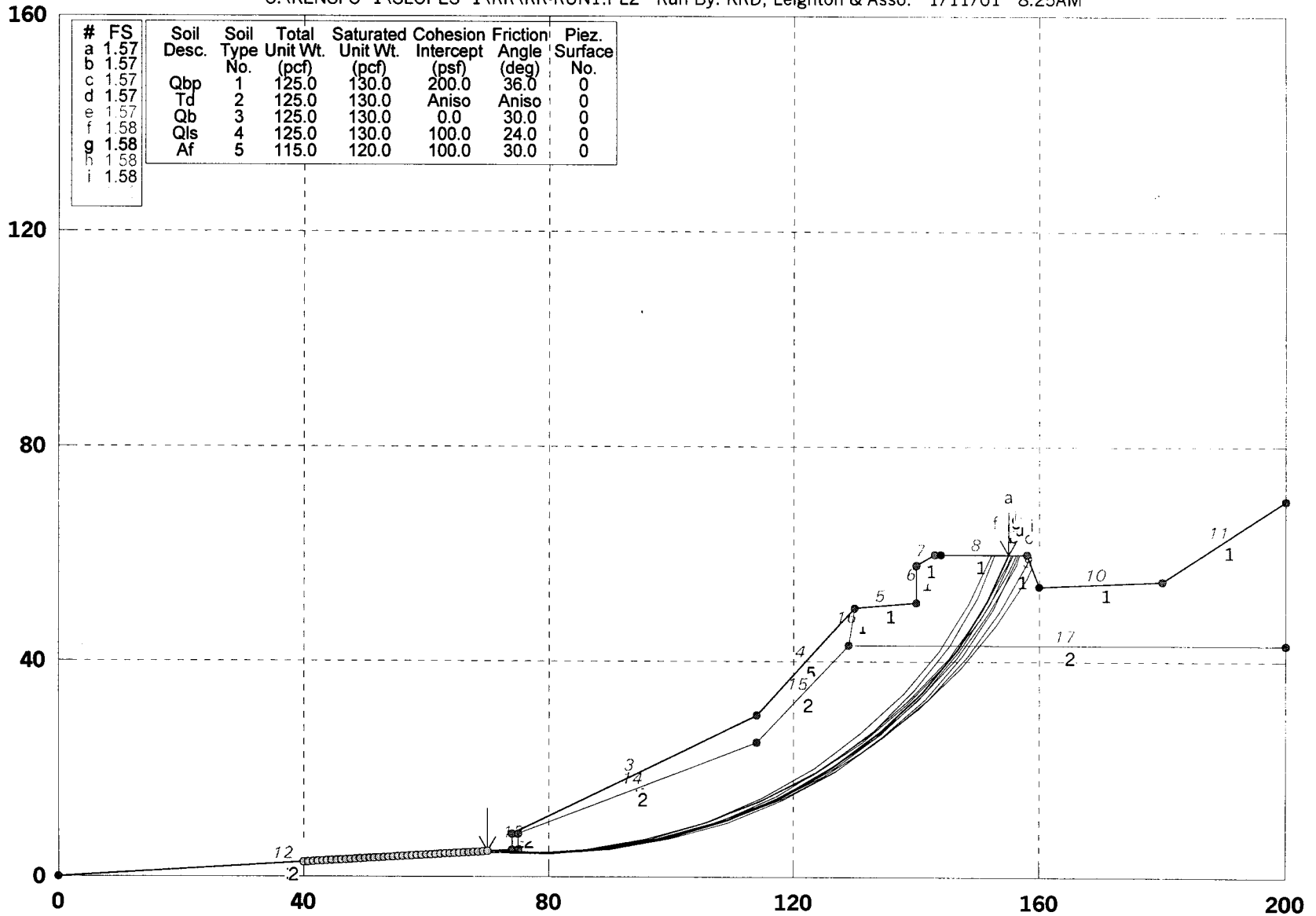
STED



| | | | | | | | | | | | | | | | | | | | | |

Cross-Section (R-R'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\RR\RR-RUN1.PL2 Run By: KR D, Leighton & Asso. 1/11/01 8:25AM



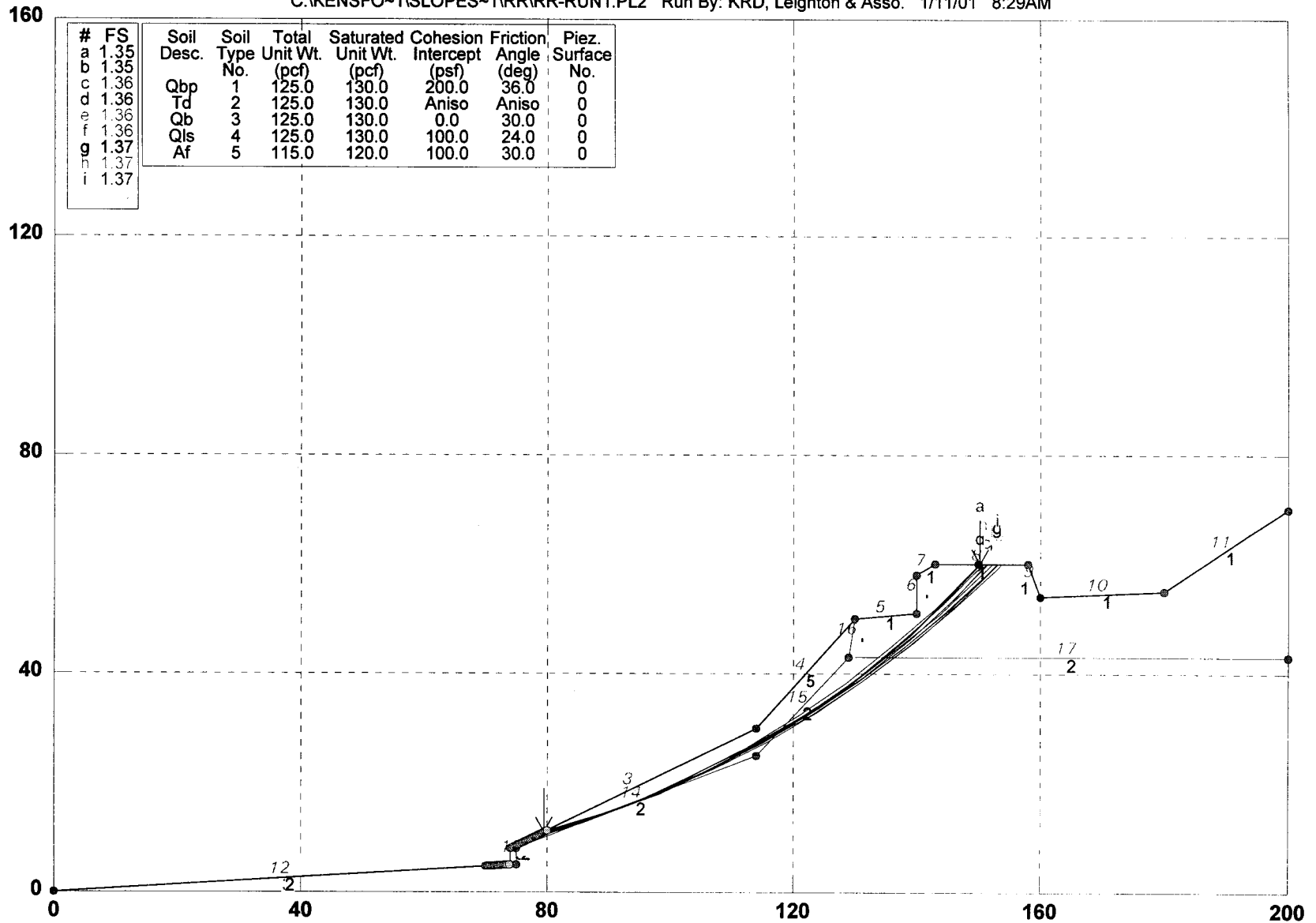
GSTABL7 FSmin=1.57
 Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\RR\RR-RUN1.PL2 Run By: KRD, Leighton & Asso. 1/11/01 8:29AM



GSTABL7 FSmin=1.35

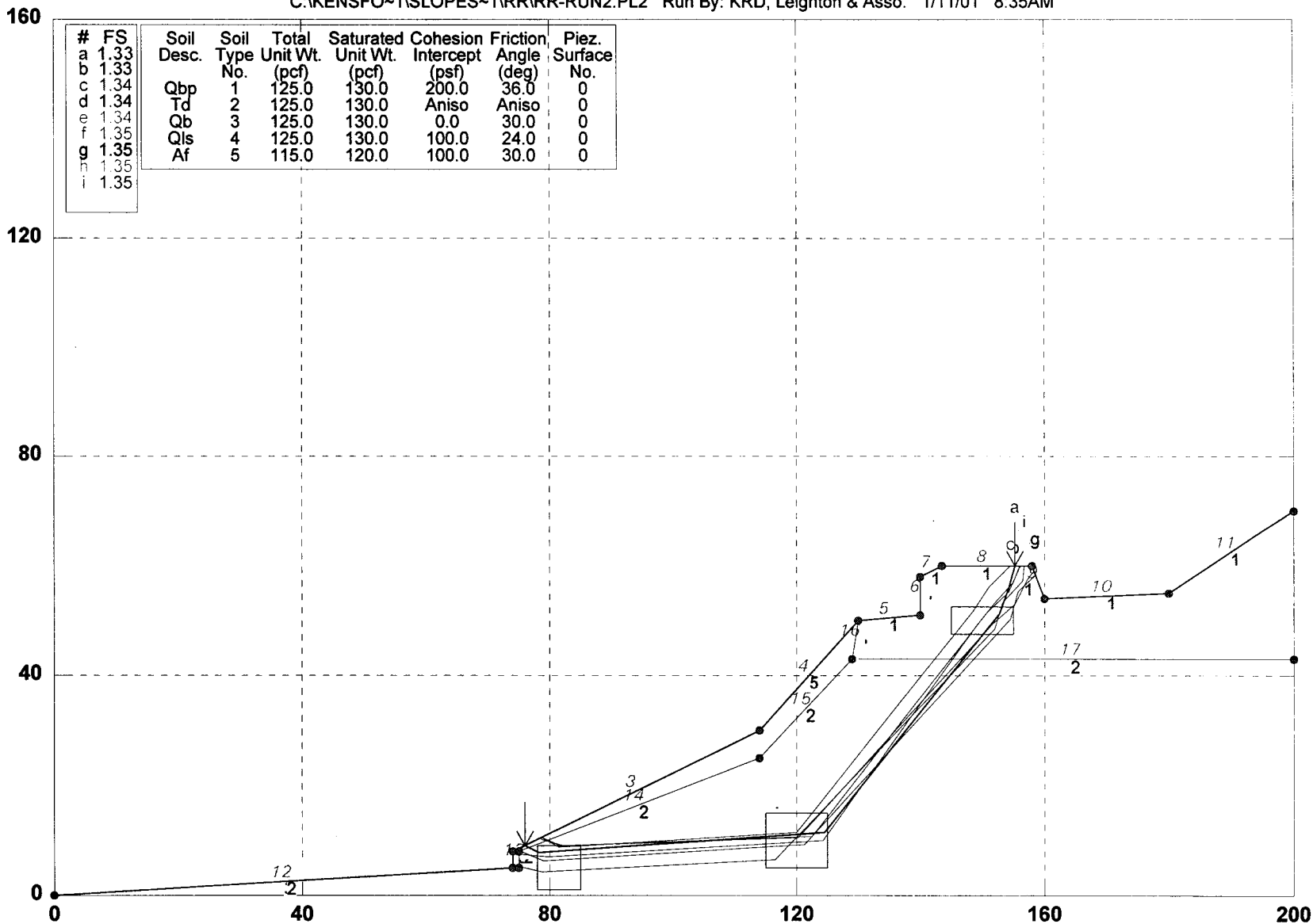
Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\RR\RR-RUN2.PL2 Run By: KRDL, Leighton & Asso. 1/11/01 8:35AM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.33							
b	1.33							
c	1.34	Qbp	1	125.0	130.0	200.0	36.0	0
d	1.34	Td	2	125.0	130.0	Aniso	Aniso	0
e	1.34	Qb	3	125.0	130.0	0.0	30.0	0
f	1.35	Qls	4	125.0	130.0	100.0	24.0	0
g	1.35	Af	5	115.0	120.0	100.0	30.0	0
h	1.35							
i	1.35							

GSTABL7 FSmin=1.33

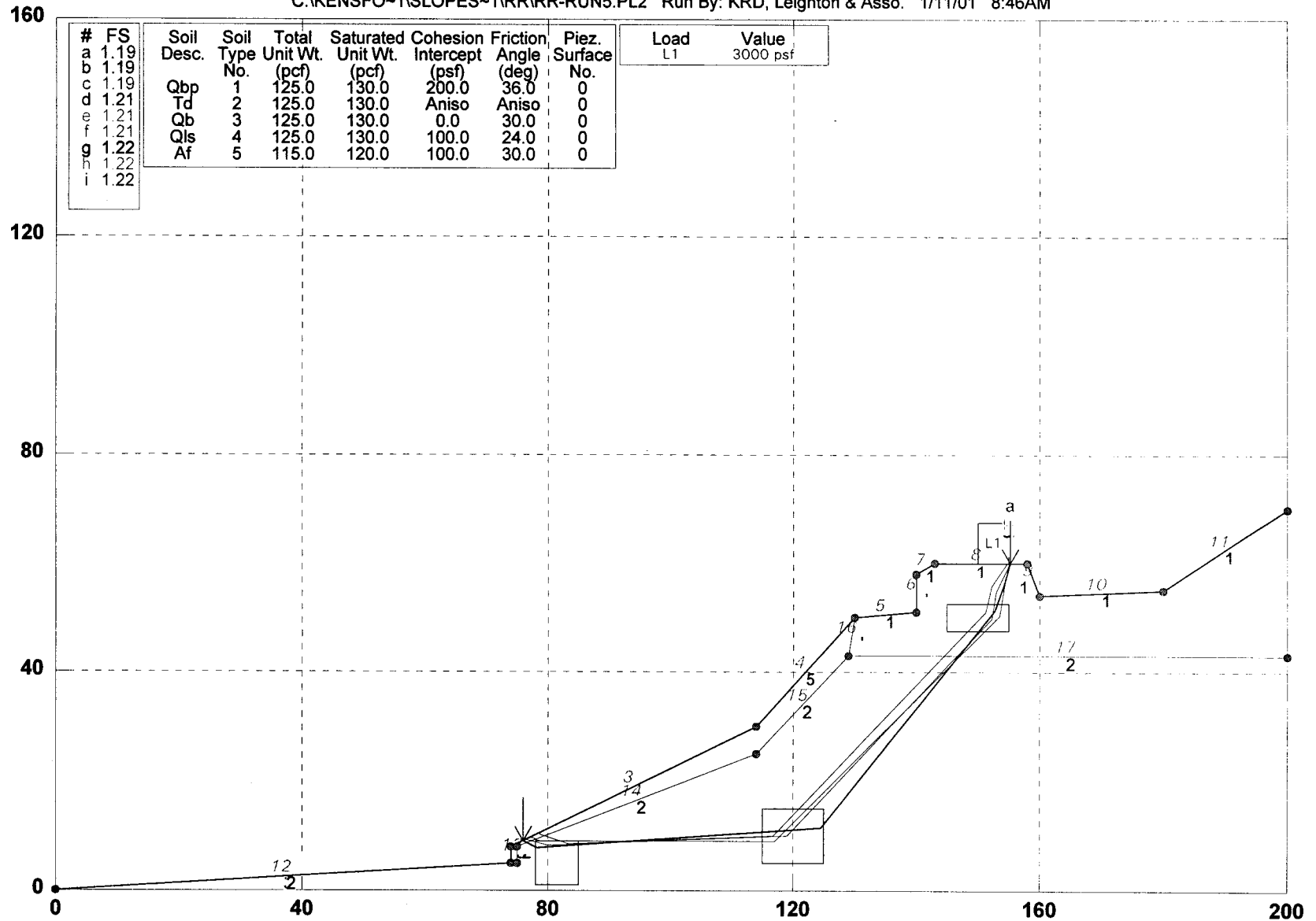
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Static w/Surcharge

C:\KENSFO~1\SLOPES~1\RR\RR-RUN5.PL2 Run By: KRD, Leighton & Asso. 1/11/01 8:46AM



GSTABL7 FSmin=1.19

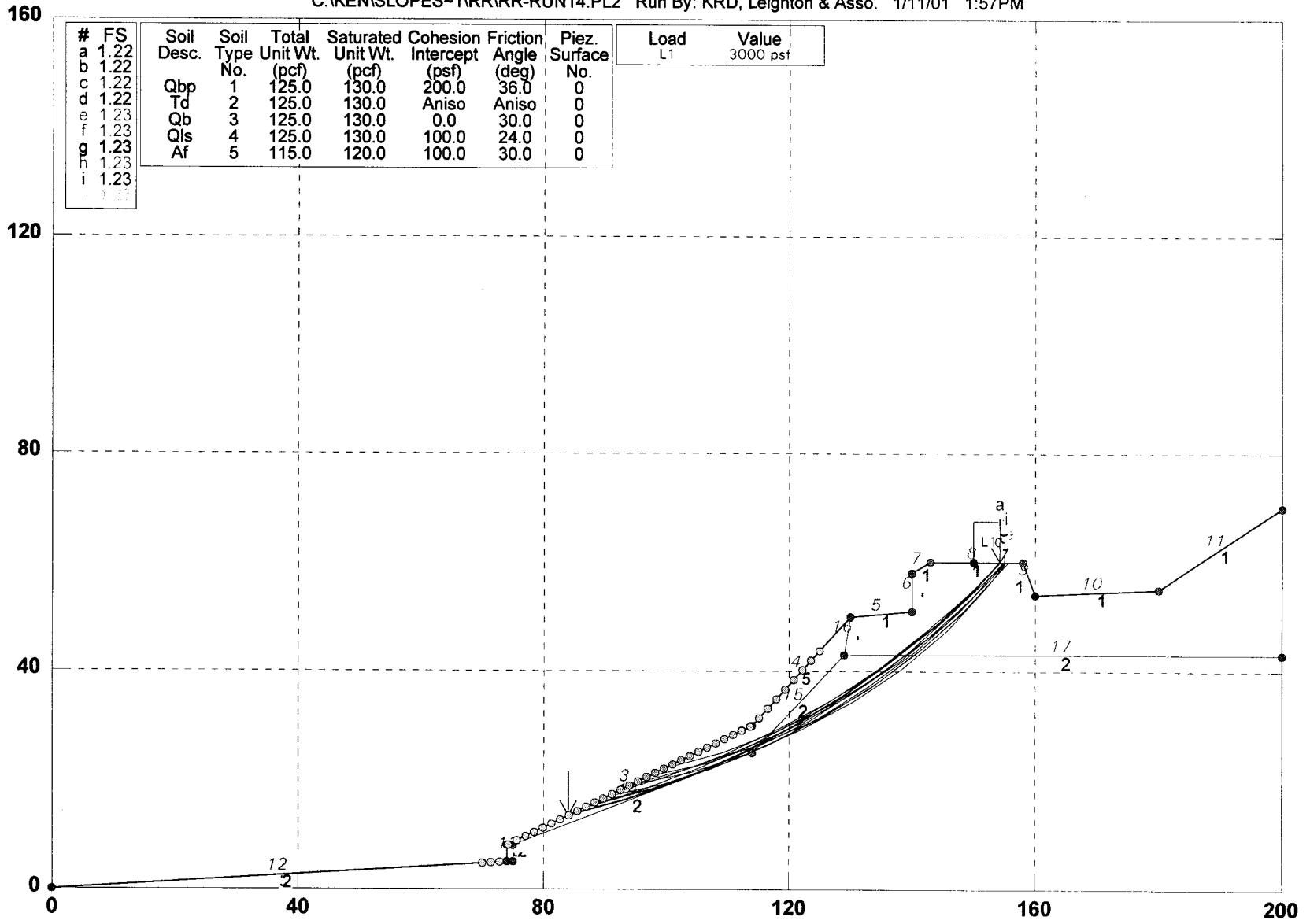
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Static/Surcharge

C:\KENSLOPES~1\RR\RR-RUN14.PL2 Run By: KRDL, Leighton & Asso. 1/11/01 1:57PM



GSTABL7 FSmin=1.22

Safety Factors Are Calculated By The Modified Bishop Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Pseudo-Static @ 0.15

C:\KENSFO~1\SLOPES~1\RR\RR-RUN3.PL2 Run By: KRDL, Leighton & Asso. 1/11/01 8:37AM

160

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value 0.150 g<
a	1.01									
b	1.01									
c	1.02	Qbp	1	125.0	130.0	200.0	36.0	0		
d	1.02	Td	2	125.0	130.0	Aniso	Aniso	0		
e	1.02	Qb	3	125.0	130.0	0.0	30.0	0		
f	1.02	Qls	4	125.0	130.0	100.0	24.0	0		
g	1.02	Af	5	115.0	120.0	100.0	30.0	0		
h	1.03									
i	1.03									

120

80

40

0

0

40

80

120

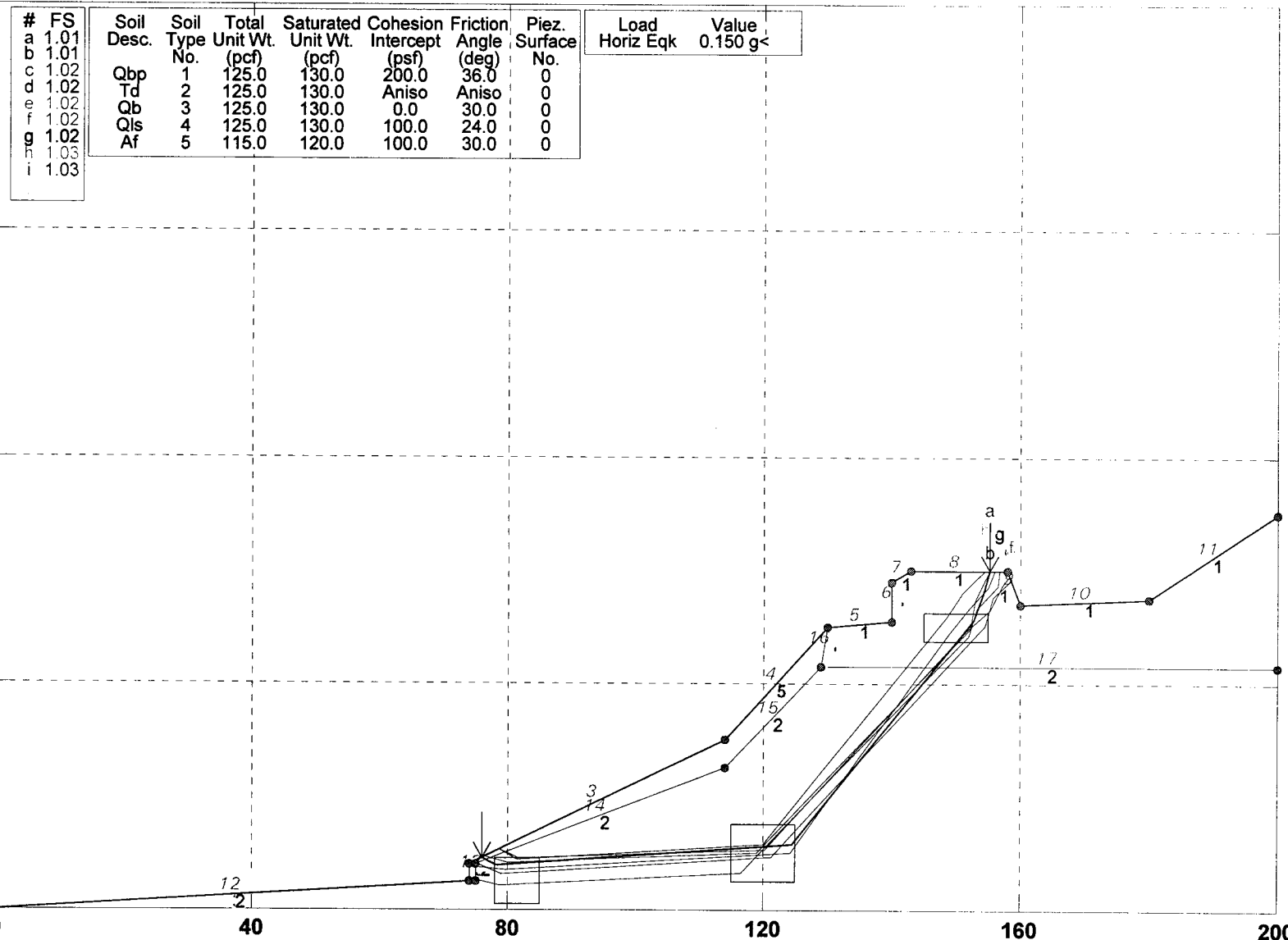
160

200

STED



GSTABL7 FSmin=1.01
Safety Factors Are Calculated By The Simplified Janbu Method



Cross-Section (R-R'), Del Mar Bluffs, Pseudo-Static @ 0.15

C:\KEN\SLOPES~1\RR\RR-RUN12.PL2 Run By: KRD, Leighton & Asso. 1/11/01 1:51PM

160

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.05								0.150	g<
b	1.06									
c	1.06	Qbp	1	125.0	130.0	200.0	36.0	0		
d	1.06	Td	2	125.0	130.0	Aniso	Aniso	0		
e	1.06	Qb	3	125.0	130.0	0.0	30.0	0		
f	1.06	Qls	4	125.0	130.0	100.0	24.0	0		
g	1.06	Af	5	115.0	120.0	100.0	30.0	0		
h	1.06									
i	1.06									

120

80

40

0

0

40

80

120

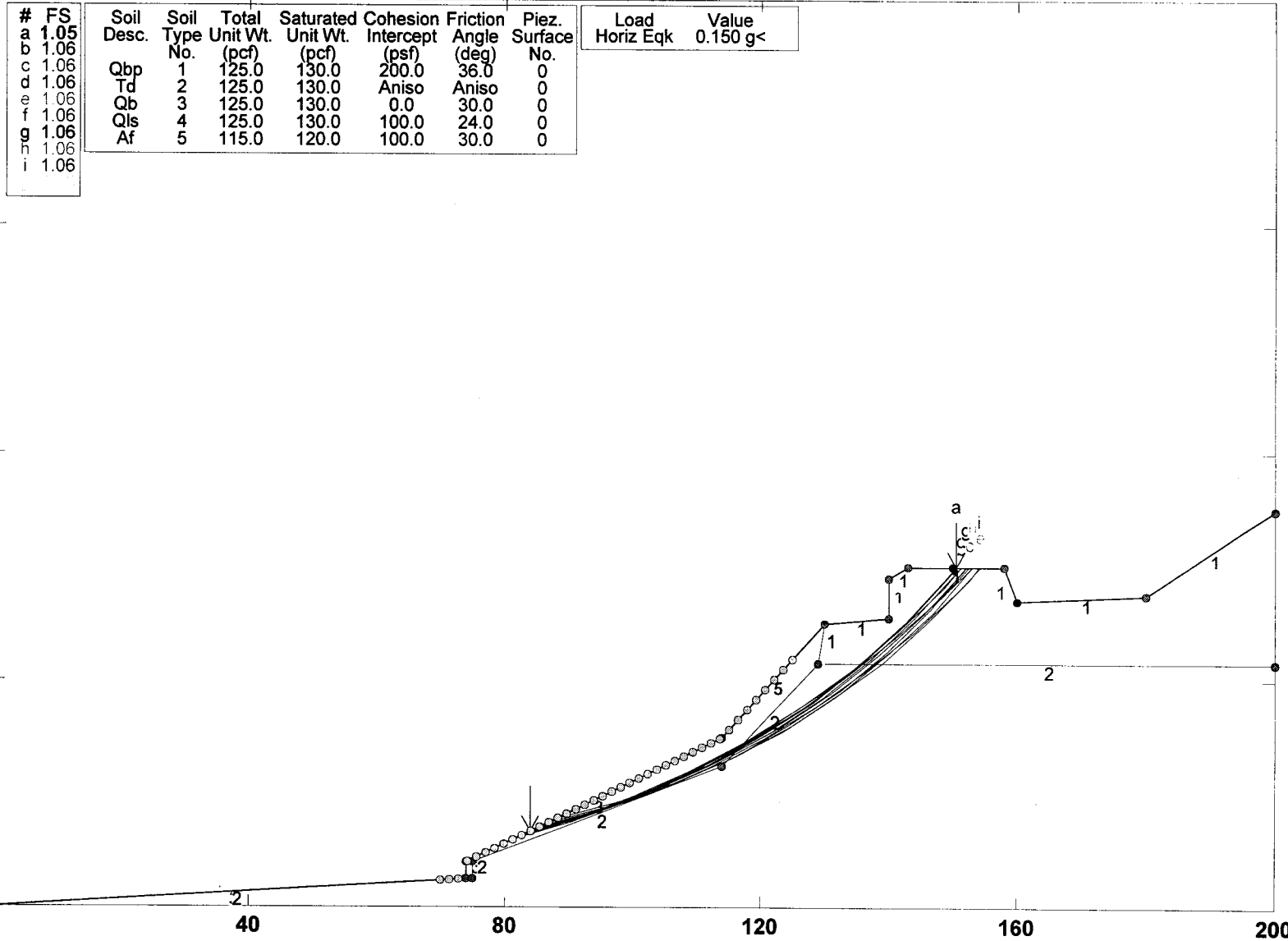
160

200

STED

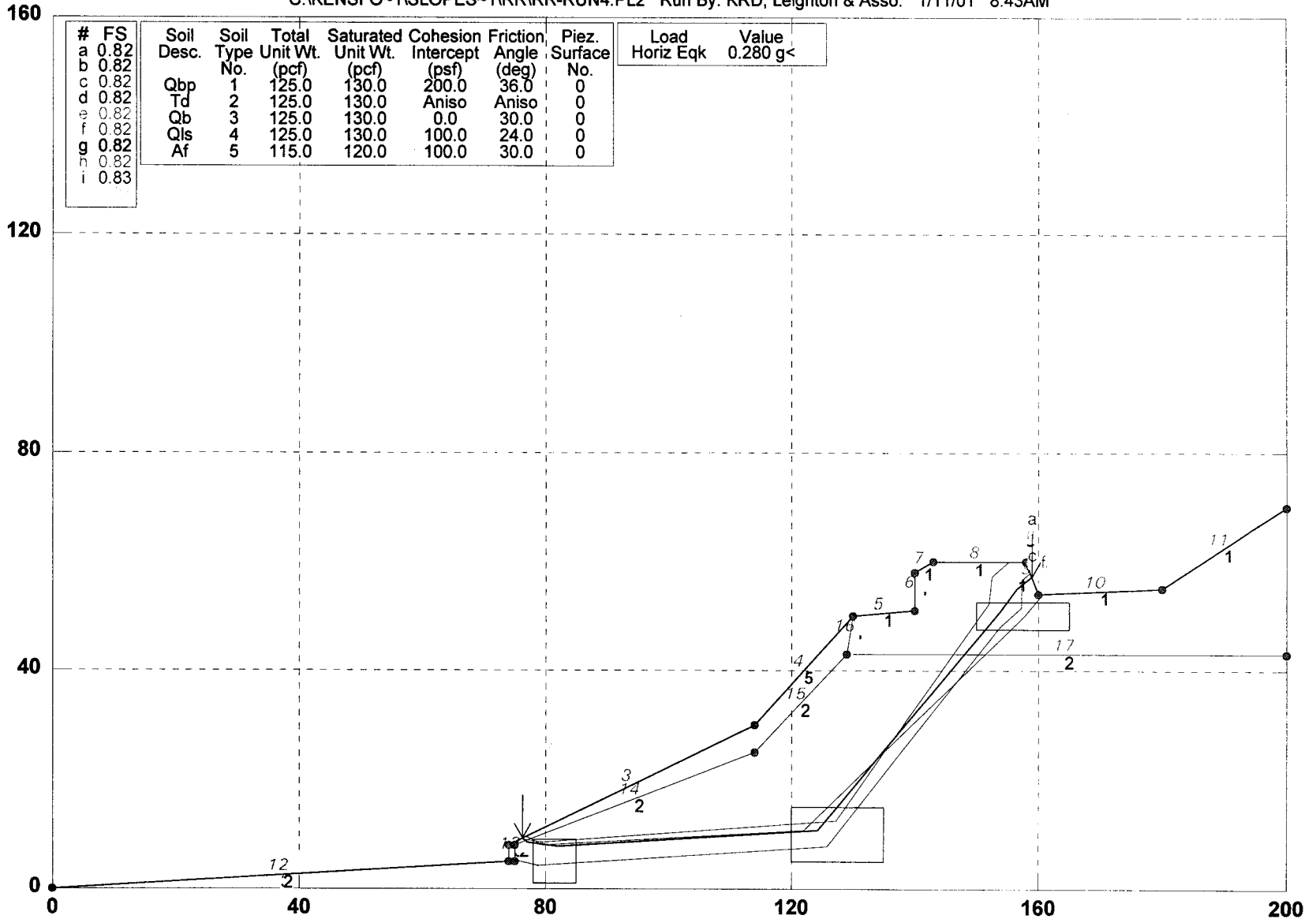


GSTABL7 FSmin=1.05
Safety Factors Are Calculated By The Modified Bishop Method



Cross-Section (R-R'), Del Mar Bluffs, Pseudo-Static @ 0.28

C:\KENSFO~1\SLOPES~1\RR\RR-RUN4.PL2 Run By: KRD, Leighton & Asso. 1/11/01 8:43AM



GSTABL7 FSmin=0.82

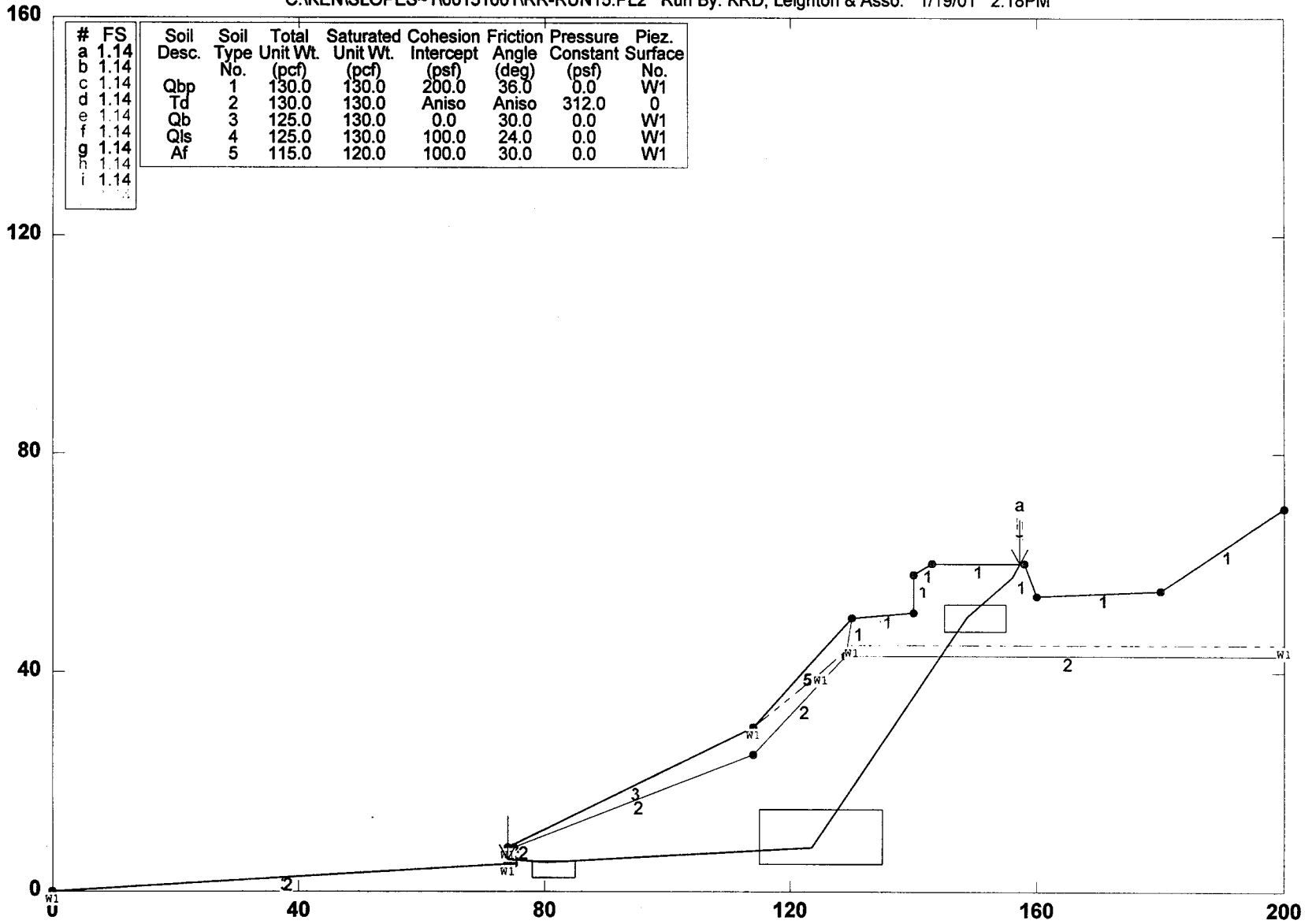
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\RR-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 2:18PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.14								
b	1.14								
c	1.14	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	1.14	Td	2	130.0	130.0	Aniso	Aniso	312.0	0
e	1.14	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	1.14	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
g	1.14	Af	5	115.0	120.0	100.0	30.0	0.0	W1
h	1.14								
i	1.14								

GSTABL7 FSmin=1.14

Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (R-R'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\RR-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/22/01 2:19PM

160

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	0.87								
b	0.87								
c	0.87	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	0.87	Td	2	130.0	130.0	Aniso	Aniso	780.0	0
e	0.87	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	0.87	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
g	0.87	Af	5	115.0	120.0	100.0	30.0	0.0	W1
h	0.87								
i	0.87								

120

80

40

0

0

40

GSTABL7 FSmin=0.87

Safety Factors Are Calculated By The Simplified Janbu Method

80

120

160

200

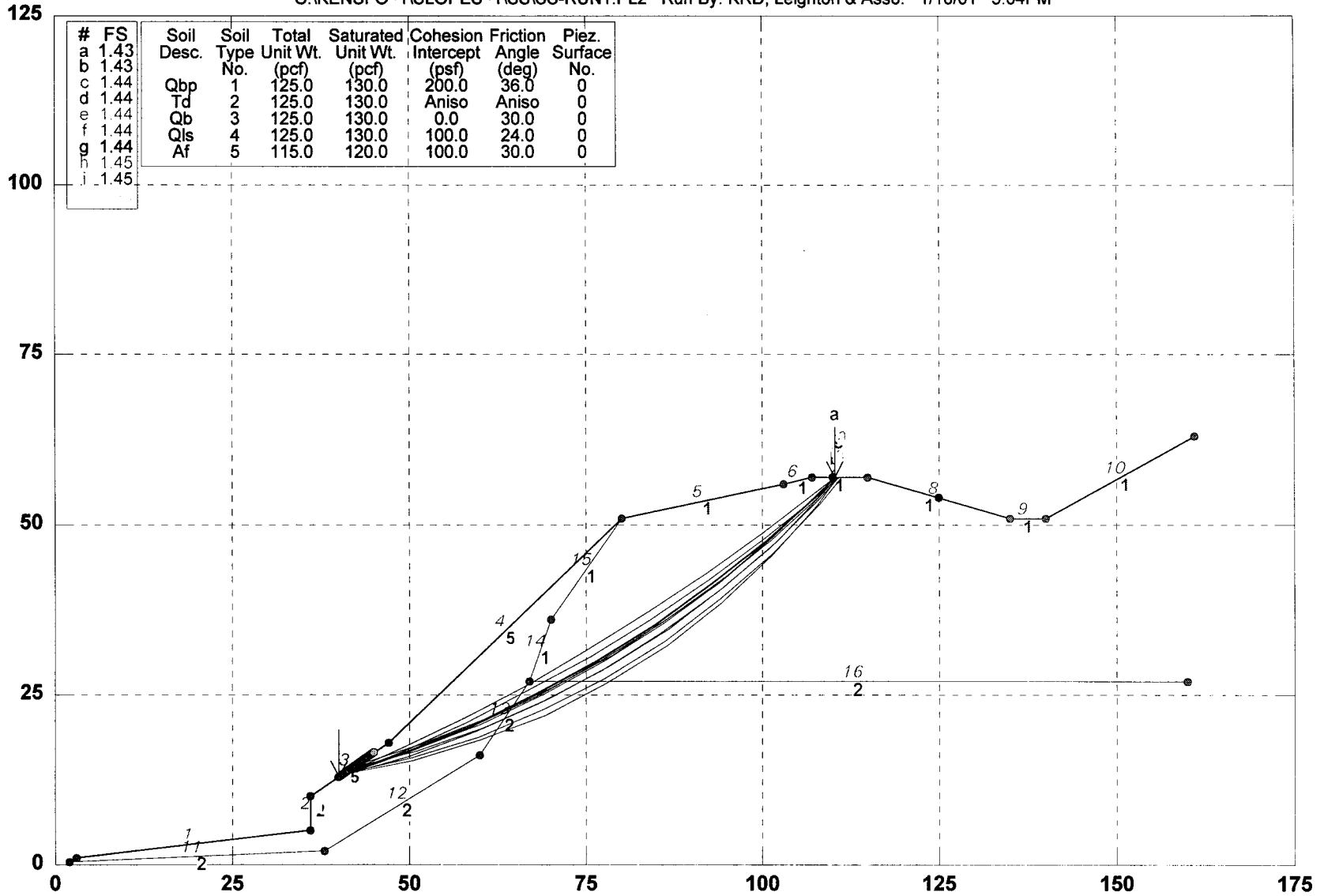
STED



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Cross-Section (S-S'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\SSISS-RUN1.PL2 Run By: KR D, Leighton & Asso. 1/10/01 5:04PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.43							
b	1.43							
c	1.44	Qbp	1	125.0	130.0	200.0	36.0	0
d	1.44	Td	2	125.0	130.0	Aniso	Aniso	0
e	1.44	Qb	3	125.0	130.0	0.0	30.0	0
f	1.44	Qls	4	125.0	130.0	100.0	24.0	0
g	1.44	Af	5	115.0	120.0	100.0	30.0	0
h	1.45							
i	1.45							

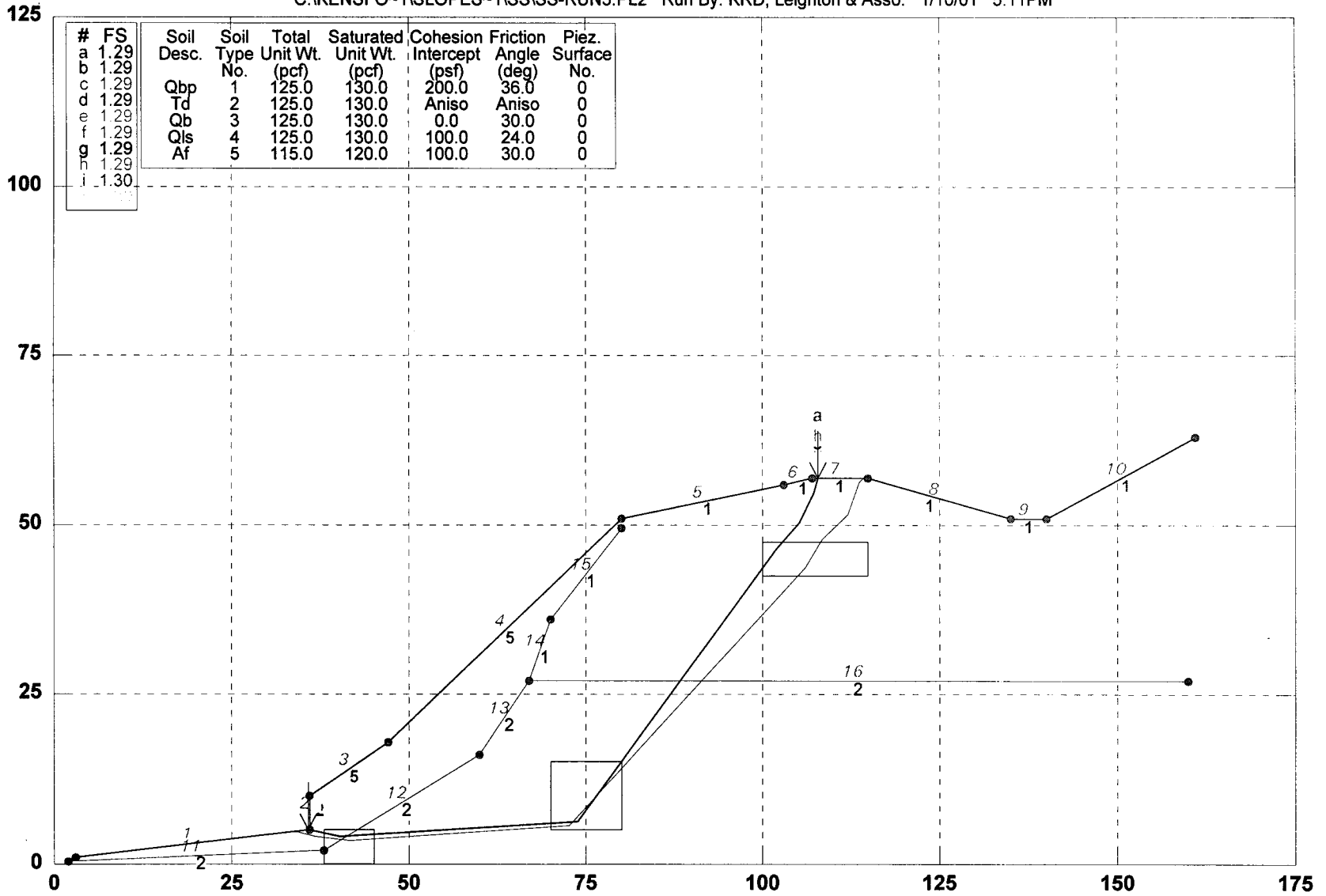
GSTABL7 FSmin=1.43
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (S-S'), Del Mar Bluffs, Static

C:\KENSFO~1\SLOPES~1\SSISS-RUN5.PL2 Run By: KR D, Leighton & Asso. 1/10/01 5:11PM



GSTABL7 FSmin=1.29

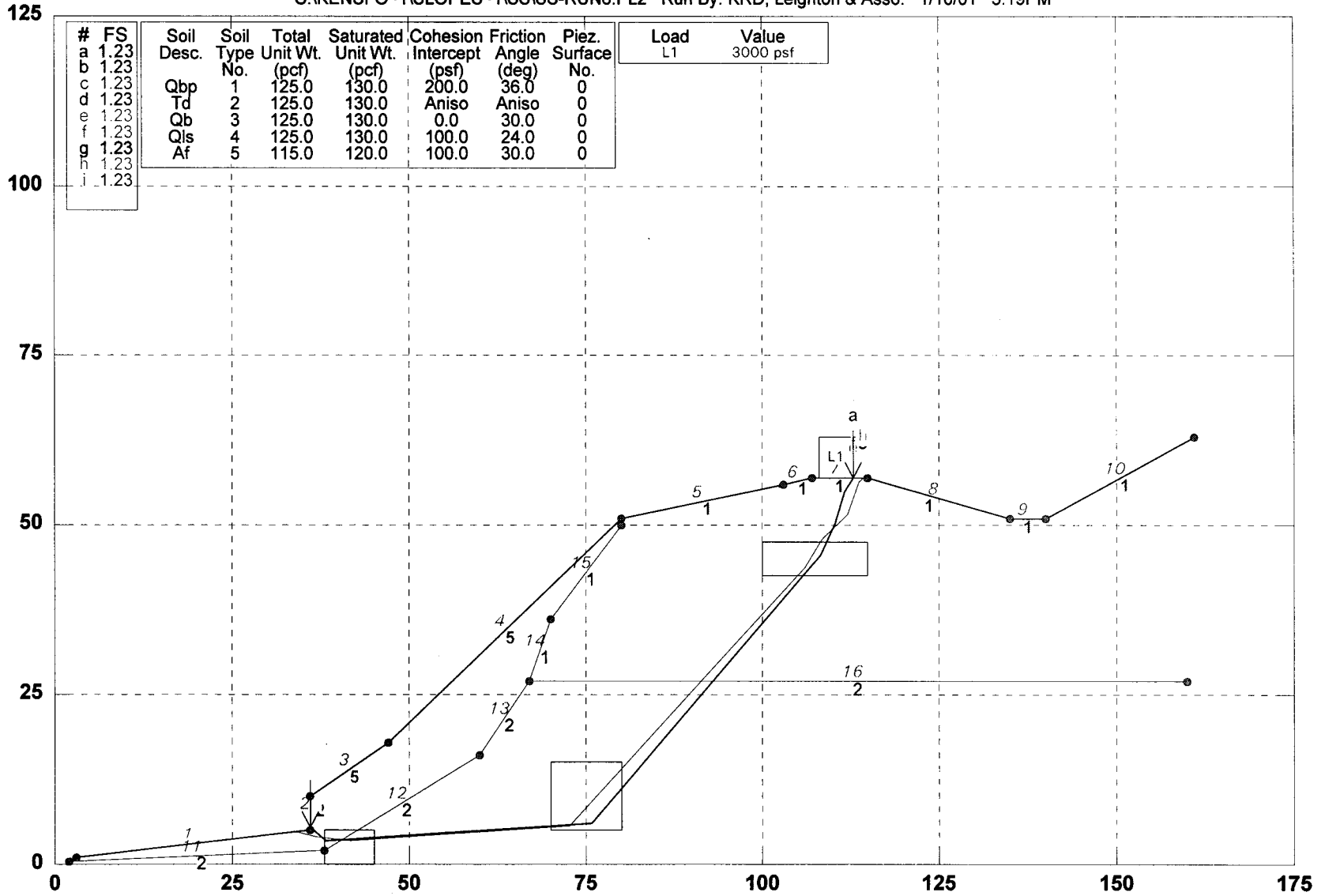
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (S-S'), Del Mar Bluffs, Static w/Surcharge

C:\KENSFO~1\SLOPES~1\SS\SS-RUN8.PL2 Run By: KRD, Leighton & Asso. 1/10/01 5:19PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
a	1.23							
b	1.23							
c	1.23	Qbp	1	125.0	130.0	200.0	36.0	0
d	1.23	Td	2	125.0	130.0	Aniso	Aniso	0
e	1.23	Qb	3	125.0	130.0	0.0	30.0	0
f	1.23	Qls	4	125.0	130.0	100.0	24.0	0
g	1.23	Af	5	115.0	120.0	100.0	30.0	0
h	1.23							
i	1.23							

Load L1	Value
L1	3000 psf

GSTABL7 FSmin=1.23

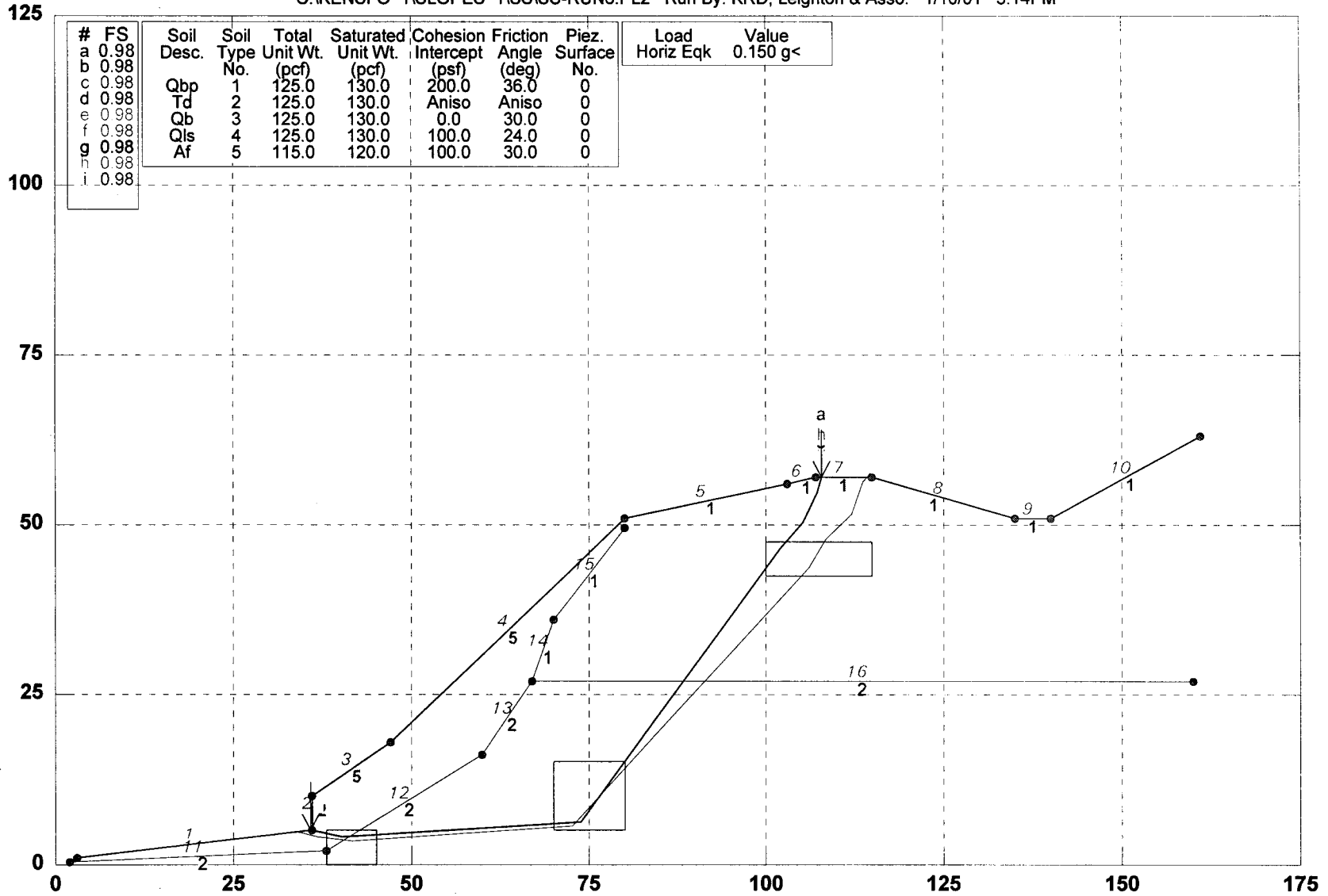
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (S-S'), Del Mar Bluffs, Pseudo-Static @ 0.15

C:\KENSFO~1\SLOPES~1\SSISS-RUN6.PL2 Run By: KRD, Leighton & Asso. 1/10/01 5:14PM



GSTABL7 FSmin=0.98

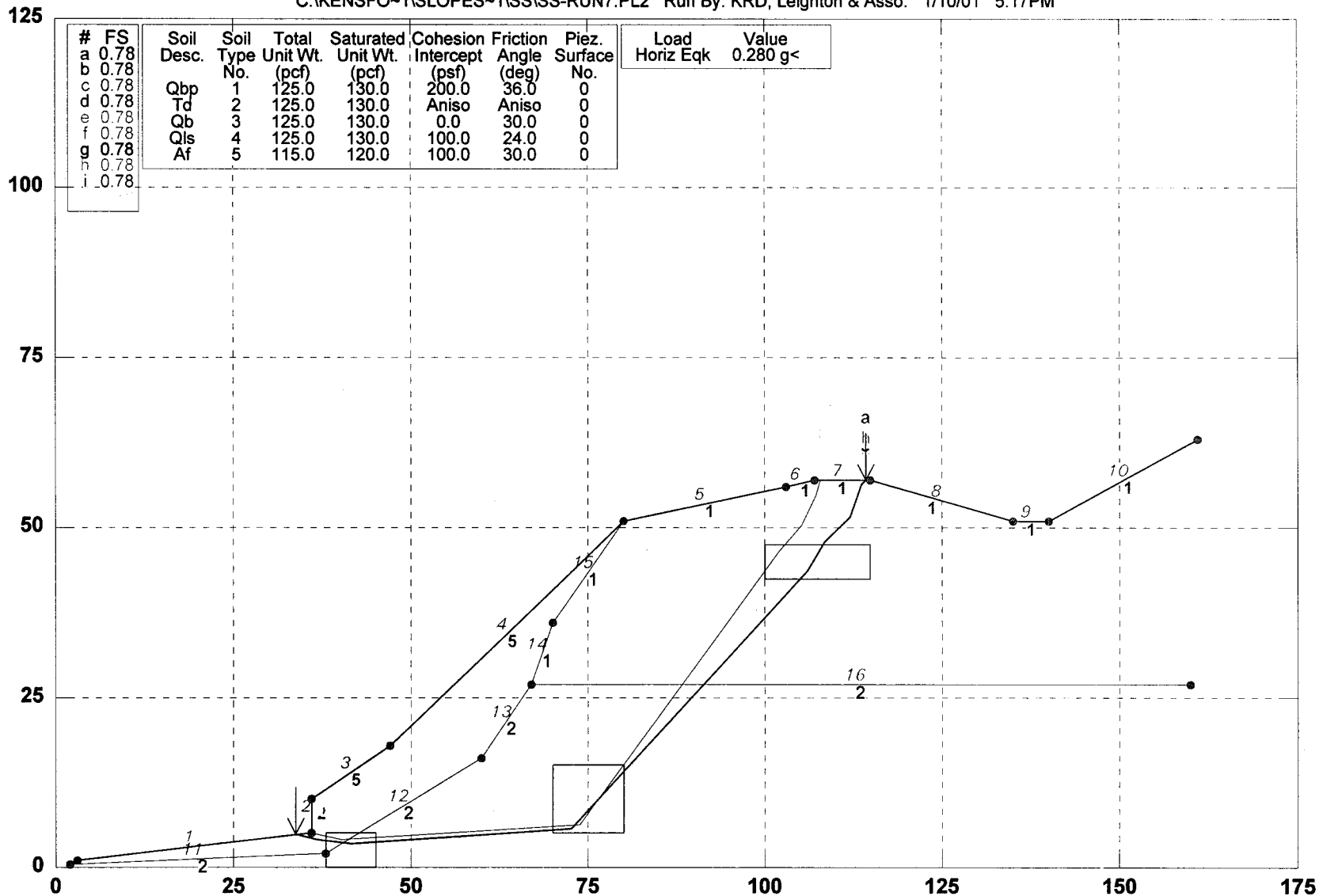
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (S-S'), Del Mar Bluffs, Pseudo-Static @ 0.28

C:\KENSFO~1\SLOPES~1\SSISS-RUN7.PL2 Run By: KRD, Leighton & Asso. 1/10/01 5:17PM



GSTABL7 FSmin=0.78

Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (S-S'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\SS-RUN15.PL2 Run By: KRD, Leighton & Asso. 1/19/01 2:23PM

125

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.16								
b	1.16								
c	1.16								
d	1.16	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
e	1.16	Td	2	130.0	130.0	Aniso	Aniso	312.0	0
f	1.16	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
g	1.16	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
h	1.16								
i	1.16	Af	5	115.0	120.0	100.0	30.0	0.0	W1

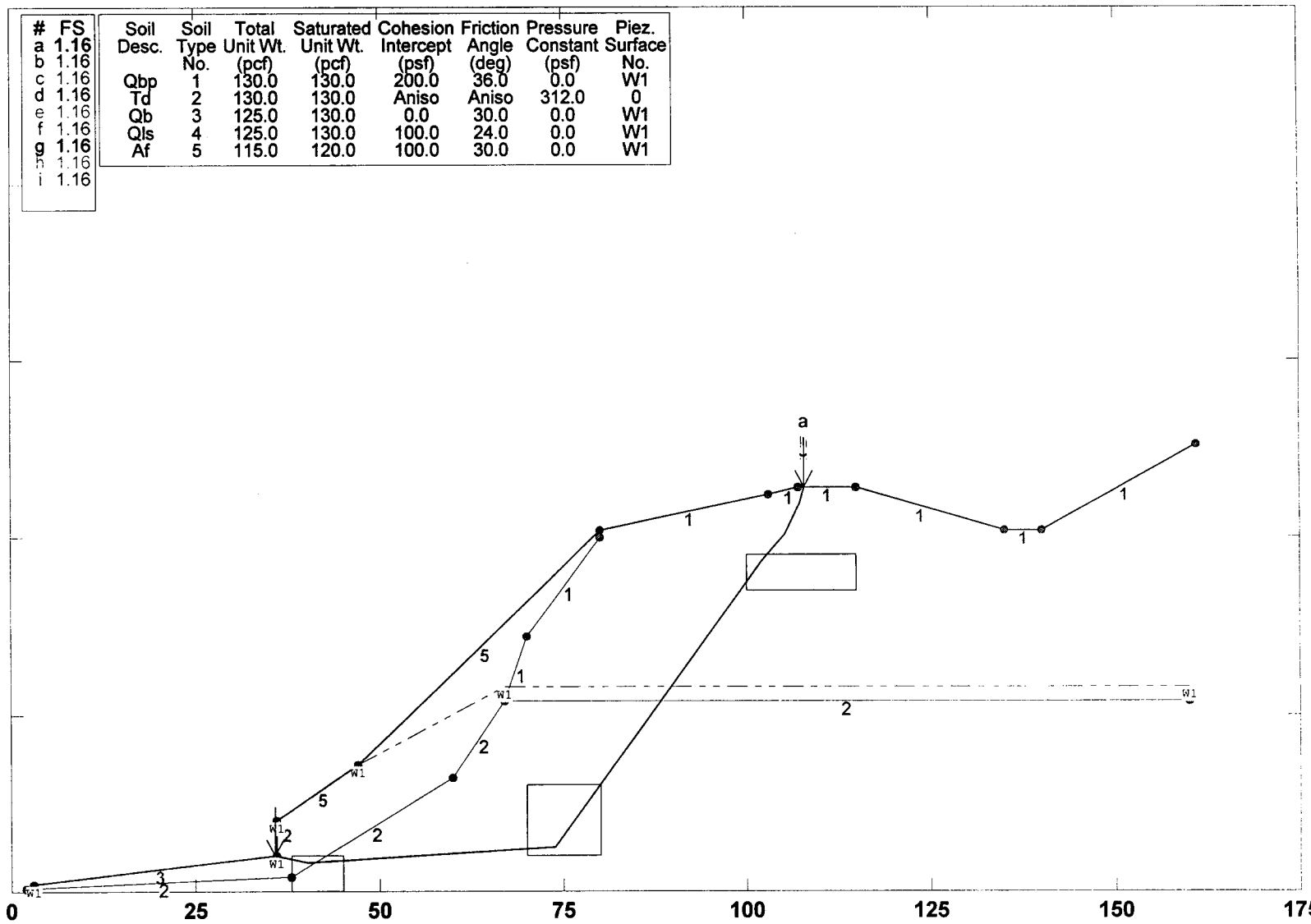
100

75

50

25

0



GSTABL7 FSmin=1.16

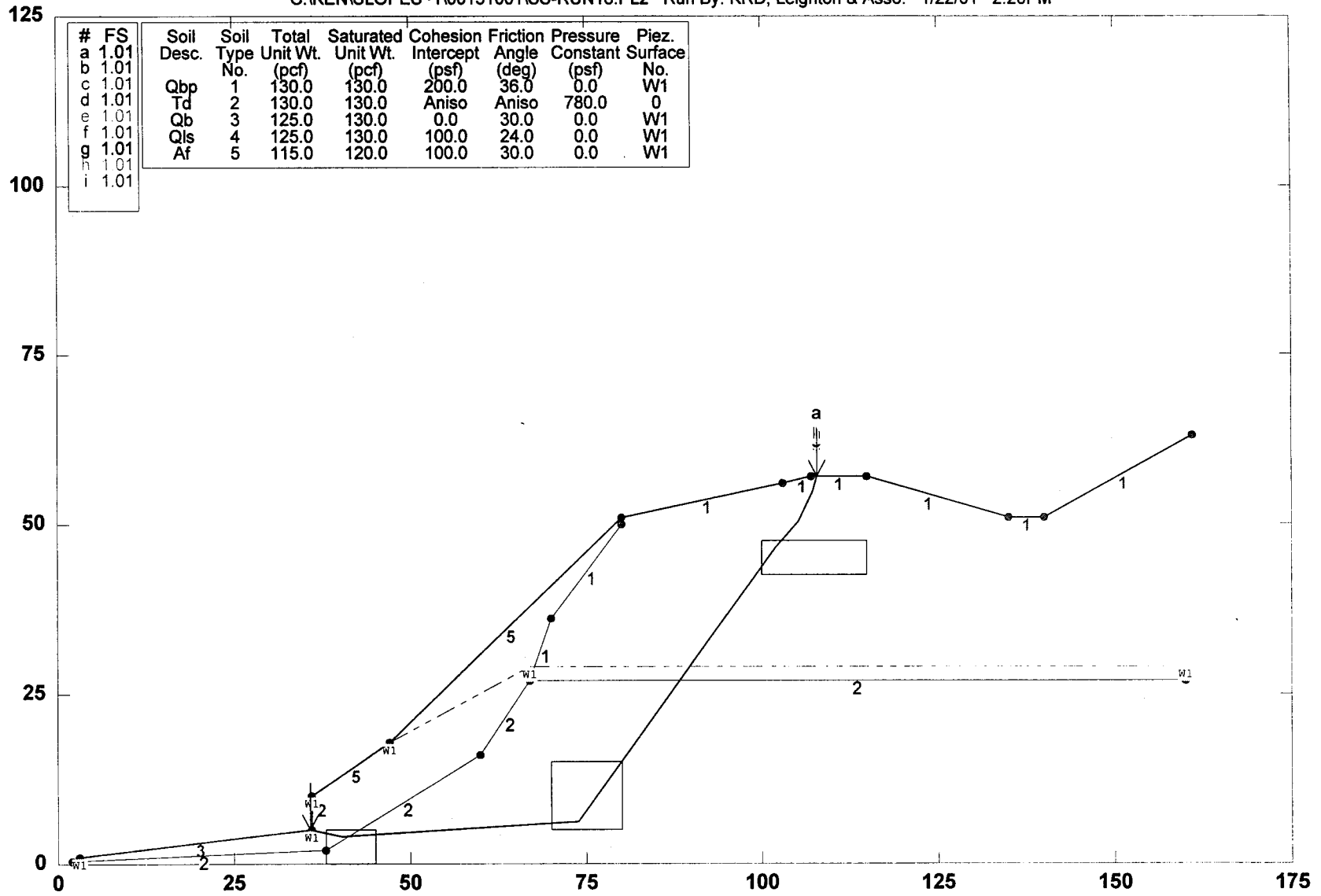
Safety Factors Are Calculated By The Simplified Janbu Method

STED



Cross-Section (S-S'), Del Mar Bluffs, Static/Saturated

C:\KEN\SLOPES~1\00151001\SS-RUN18.PL2 Run By: KRD, Leighton & Asso. 1/22/01 2:20PM



#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pressure Constant (psf)	Piez. Surface No.
a	1.01								
b	1.01								
c	1.01	Qbp	1	130.0	130.0	200.0	36.0	0.0	W1
d	1.01	Td	2	130.0	130.0	Aniso	Aniso	780.0	0
e	1.01	Qb	3	125.0	130.0	0.0	30.0	0.0	W1
f	1.01	Qls	4	125.0	130.0	100.0	24.0	0.0	W1
g	1.01	Af	5	115.0	120.0	100.0	30.0	0.0	W1
h	1.01								
i	1.01								

GSTABL7 FSmin=1.01
 Safety Factors Are Calculated By The Simplified Janbu Method

STED



APPENDIX H

HISTORICAL DATA

APPENDIX H

SURVEY DATA

<u>Date of Survey</u>	<u>Mile Post</u>	<u>Location</u>	<u>Event</u>
1889	244.1 to 245.6	Coast Blvd to Anderson Canyon	Survey Map
January 4th, 1941	244.79	7th Street	Landslide of December 31, 1940
April 21st, 1941	244.33	13th Street	Landslide of February 21, 1941
January 20th, 1958	244.76	Little Orphan Alley	Landslide survey
January 20th, 1961	244.44	11.5 Street	Landslide survey
February 15th, 1962	244.5	11th Street	Test holes in slide
February 7th, 1962	244.5	11th Street	New drains
March 14th, 1962	244.47	11.25 Street	Landslide
March 26th, 1962	244.47	11.25 Street	Landslide
November 12th, 1964	244.47	11.25 Street	Ret. Wall Survey
July 10th, 1962	244.47	11th Street	Ditch lining & subdrain
April 17th, 1975	244.78	7th Street	Slide Protection

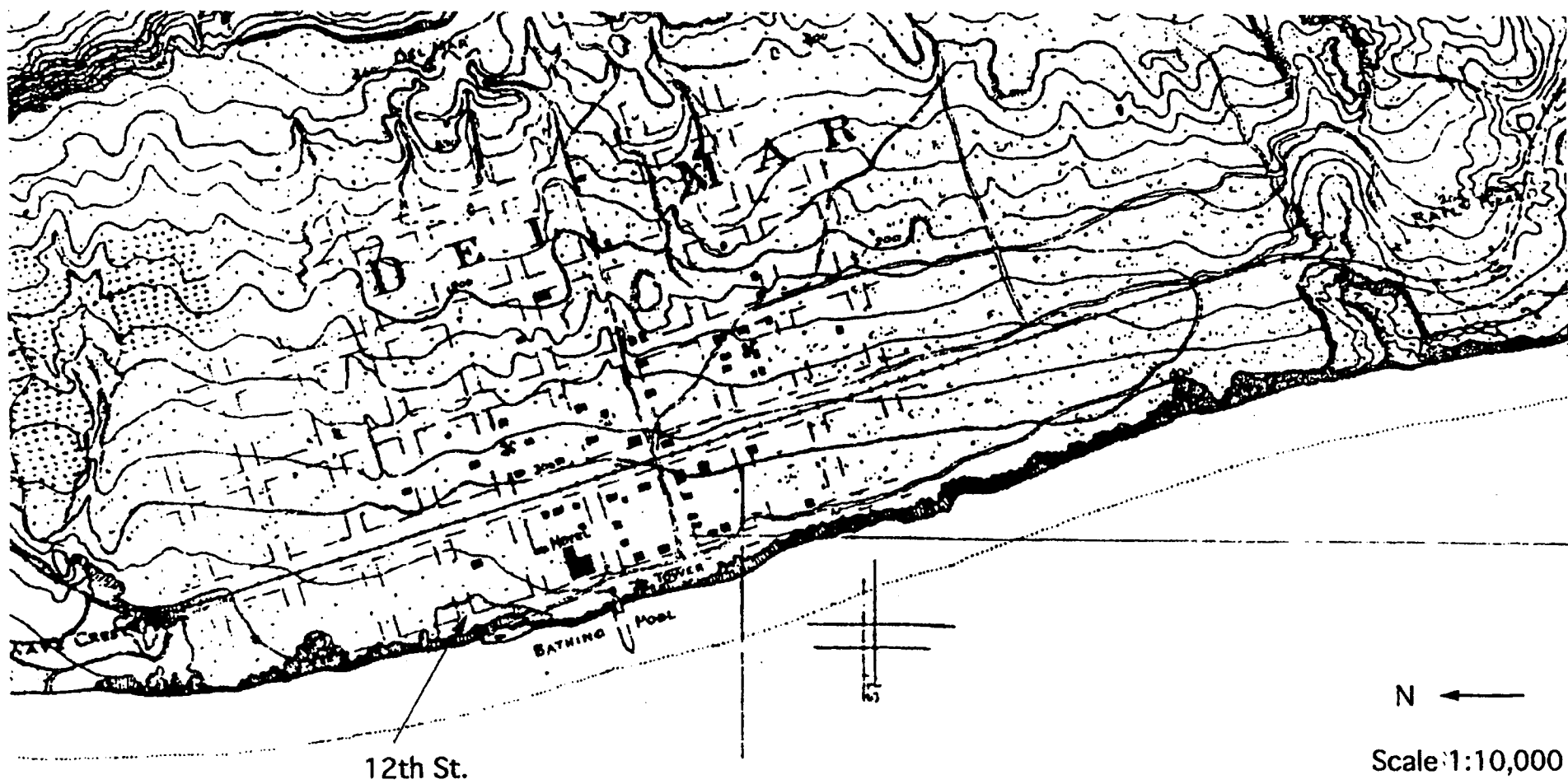


Figure 1 - U. S. Coast and Geodetic Survey Map, 1889

244-4170

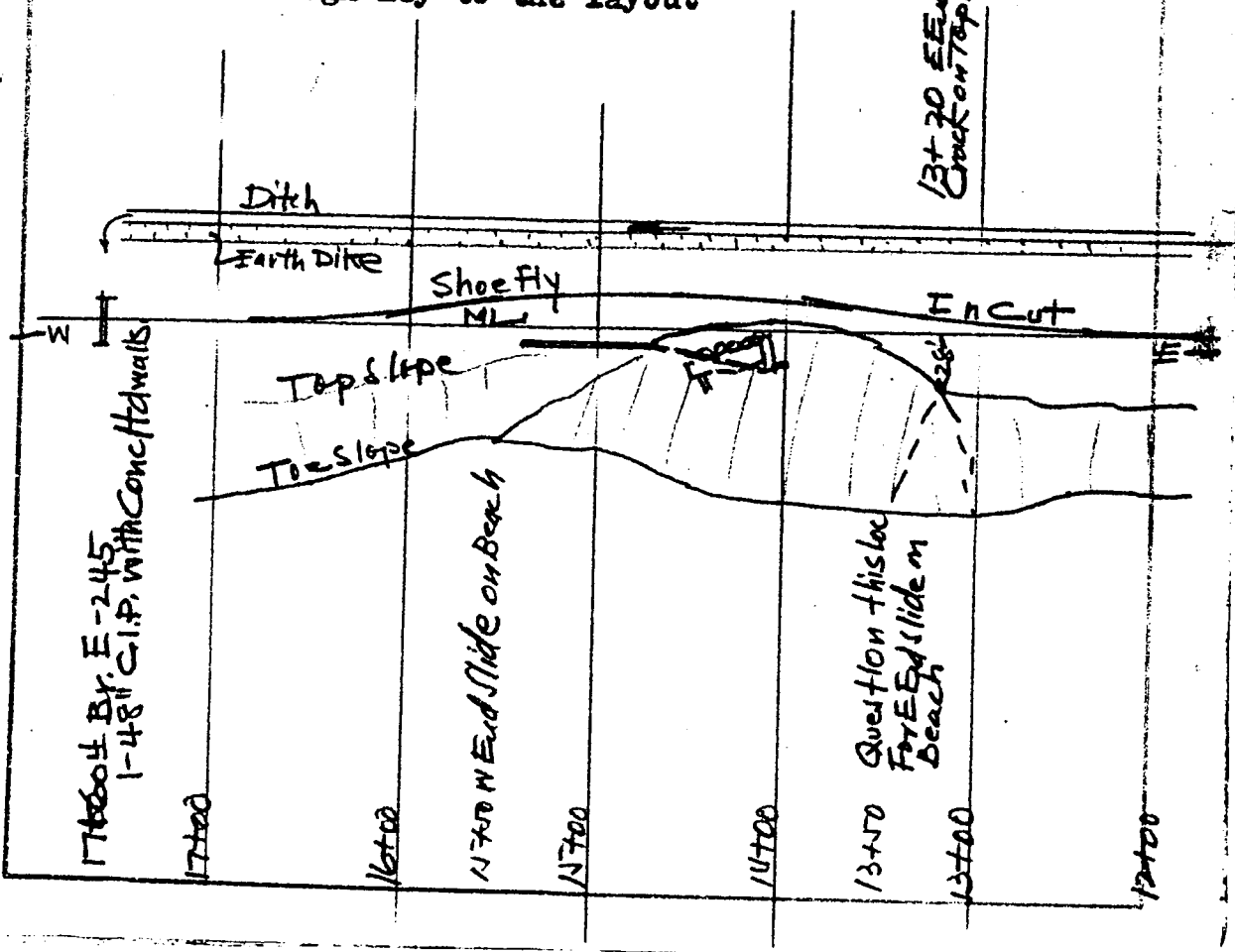
DATE 1-4-41 THE A. T. & S. F. RY. CO. SYSTEM PAGE 1 15
 DRAWING NO. L-26-13937 CORR. CARRON TO CIVIL ENGR.
 TRANSITMAN G. K. Haffly FOR COMPLETION REPORT STATION 1/2 Mile N Del Mar
 RODMAN W. H. Robinette AUTH. VAL. SEC. STATE Calif
 CHAINMAN R. A. Hall COMM. IN SERVICE 244-4170
 NOTES TAKEN BY GKH COMP L.A. 4th
 TITLE Topographic Survey Site of Wreck Ex 1676 W. 12-31-40.

The following series of notes consists principally of topographic cross-sections taken at even Engineer's Stas and plus 50's, extending about three hundred feet out on north side and down onto beach south side.

Some data on remaining portion of concrete retaining wall is given, also location of the fragments of same which lie on slope below engine.

The performance of this work was obstructed by work trains and crowd of sight-seers, and the various portions of the sections were taken as openings presented, continuity of sections was not possible, but that in no way affects the final results.

No sketch plan could be made in the available time, but any kind of plan can be made from these sections. The principal topographic features are noted in the sections. Below is a rough key to the layout



DATE 1-4-41 THE A. T. & S. F. RY CO SYSTEM PAGE 11 OF 15

DRAWING NO. _____ CORP. _____ CARBON TO CHIEF ENGR. _____

TRANSITMAN _____ FOR COMPLETION REPORT _____ STATION Near Del Mar

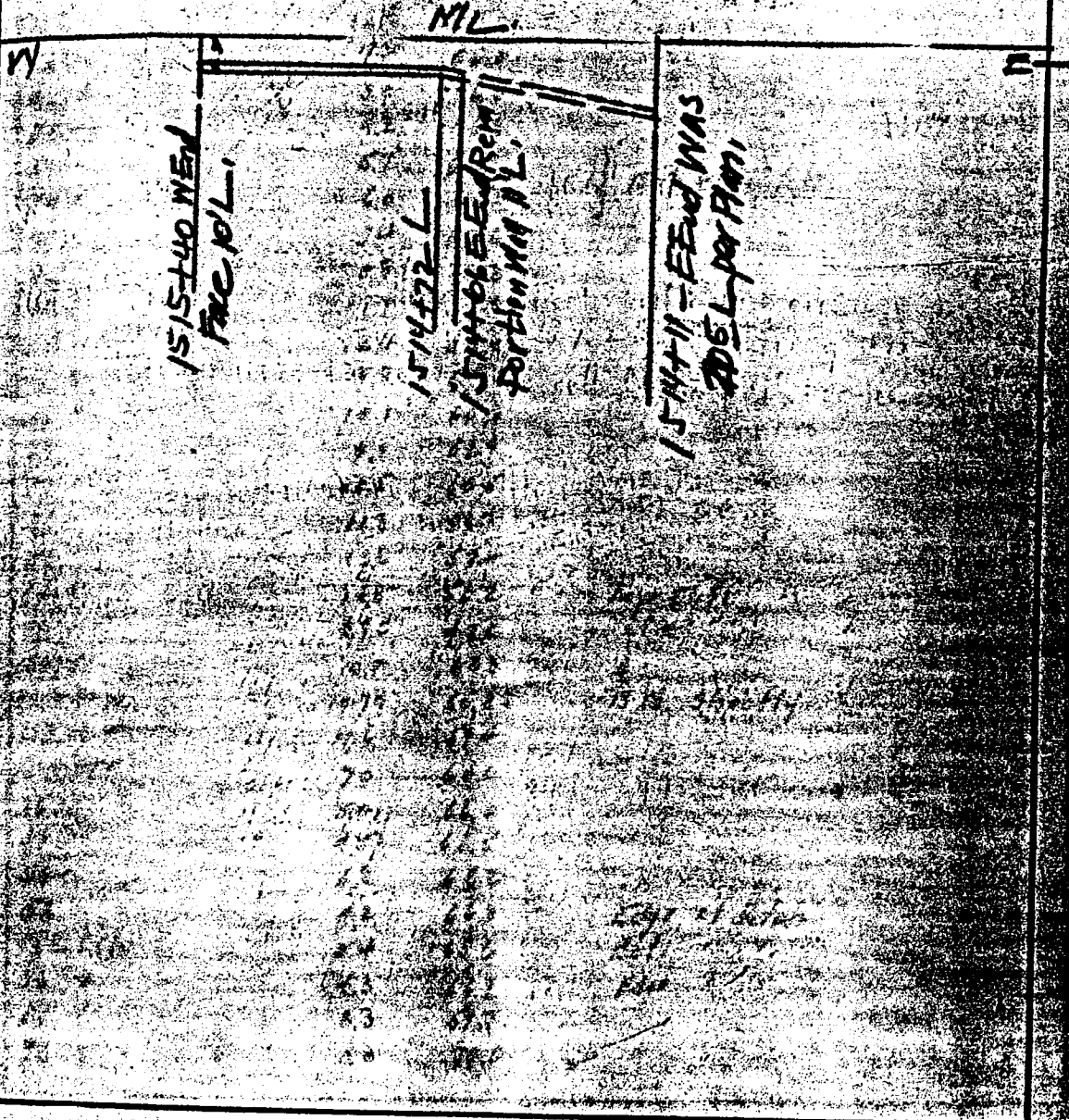
RODMAN _____ AUTH. _____ VAL. SEC. _____ STATE Calif

CHAINMAN _____ COMM. _____ IN SERVICE _____ M. P. 244-4170

NOTES TAKEN BY GKH DIVISION _____ DISTRICT _____

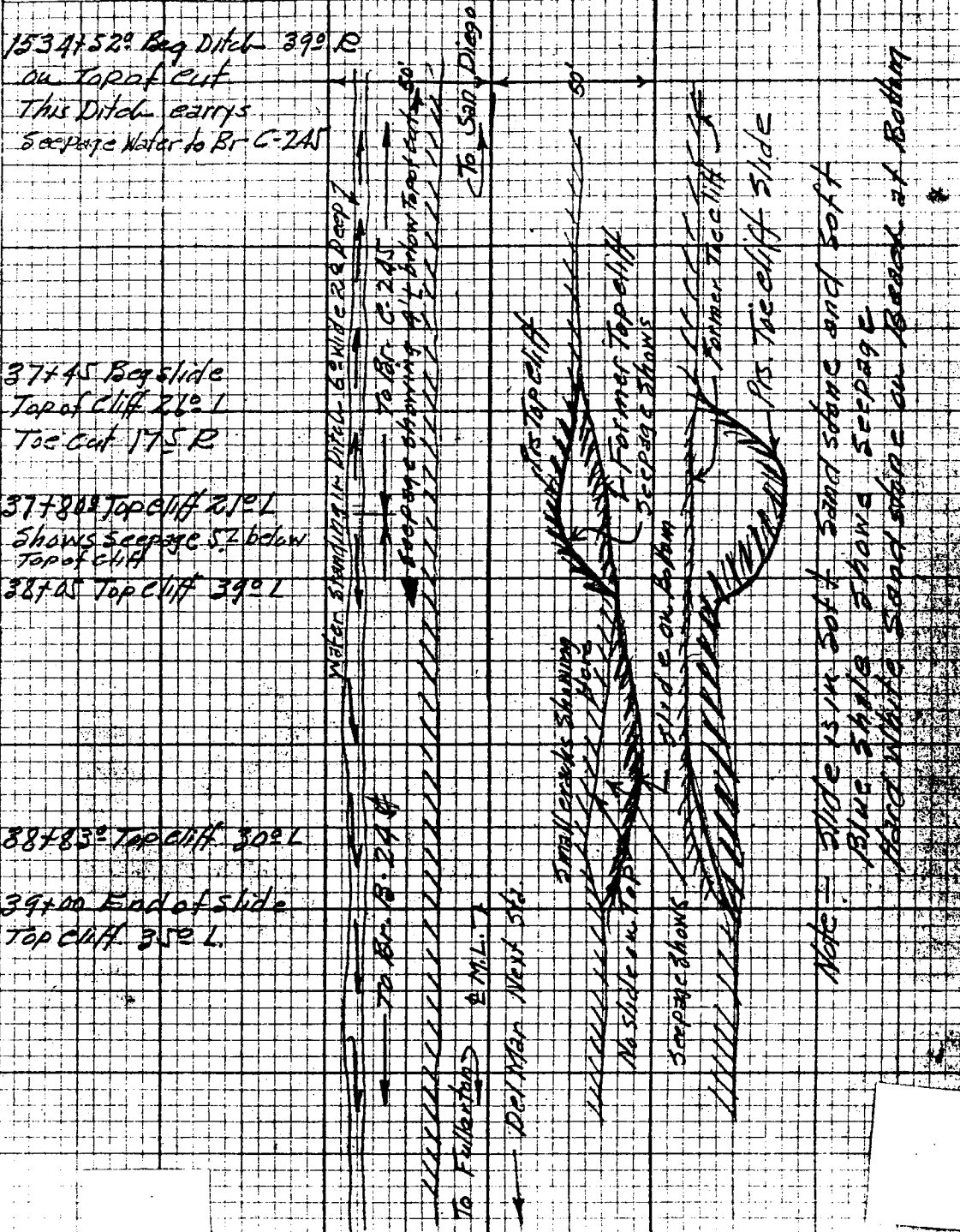
TITLE Topographic Survey Sta. of No. 12-31-40

Loc. Remaining Portion of Parallel Retaining Wall.
 Plan - Drwg F-3-8488.

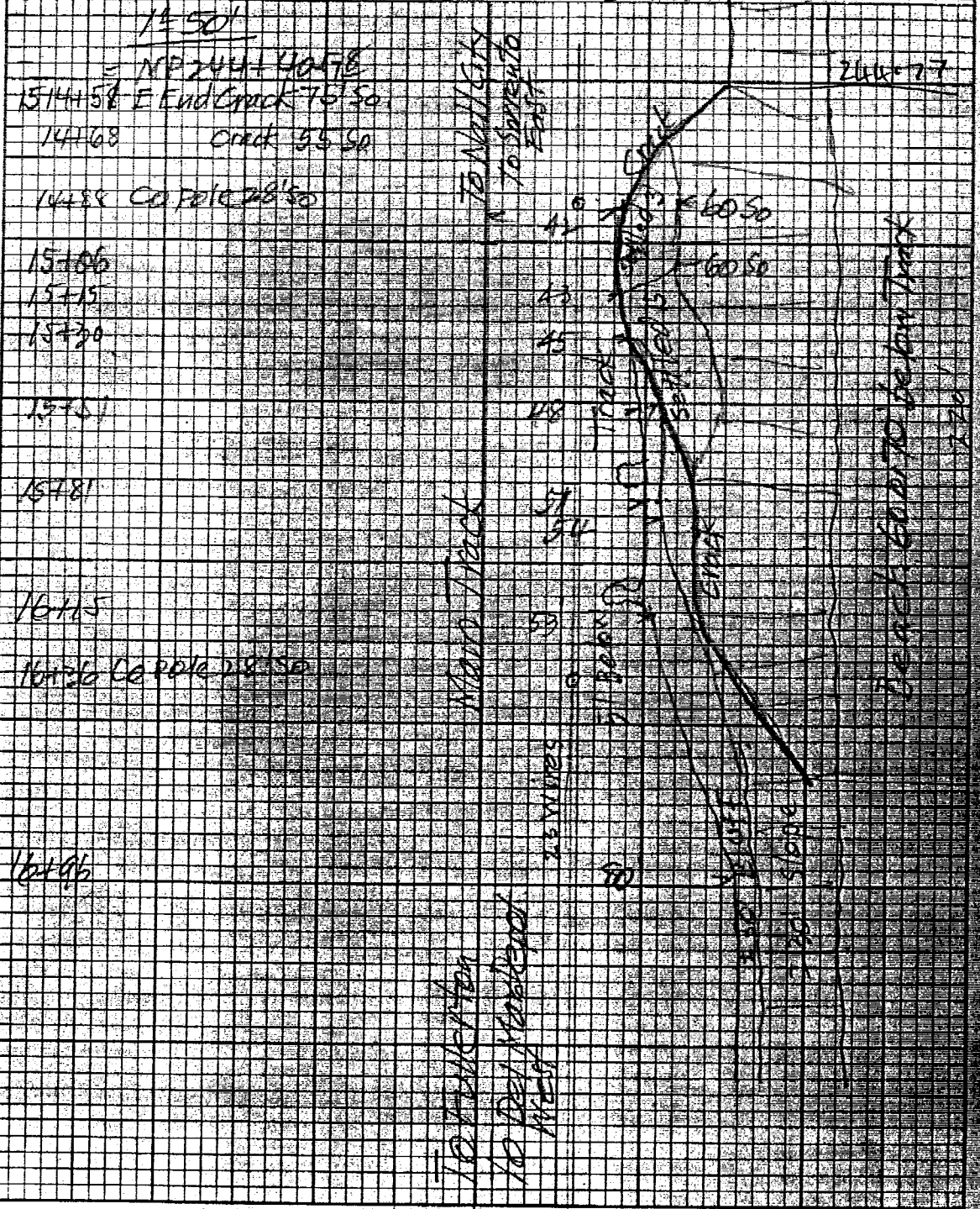


1901
 1212-130
 11-68
 00+213
 00+213
 00+213

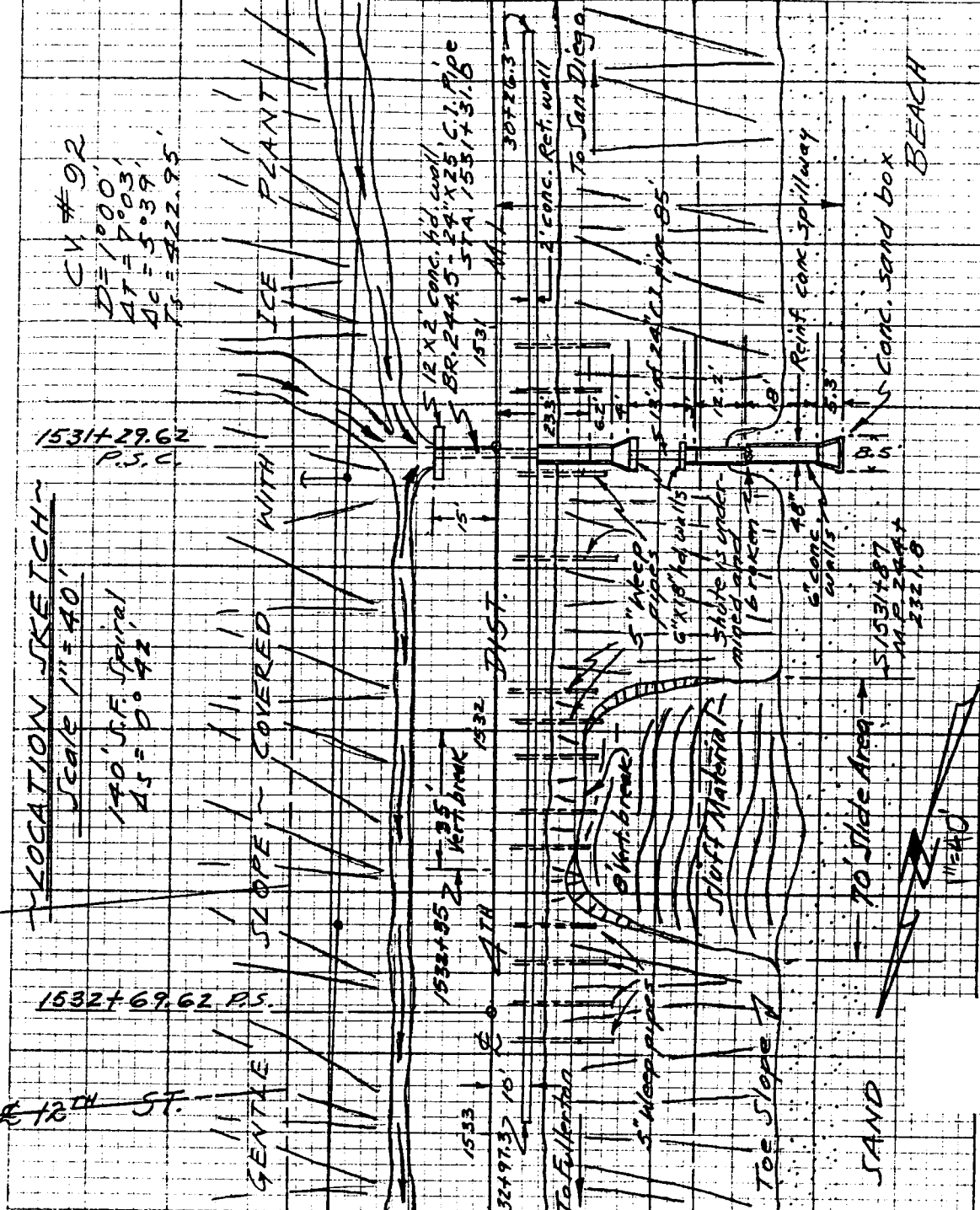
DATE 4-21-41 THE A. T. & S. F. RY. CO. SYSTEM PAGE 1 OF 3
 DRAWING NO. _____ CARBON TO CHIEF ENGR. 4122/41
 TRANSITMAN N. A. Richards FOR COMPLETION REPORT STATION Del Mar
 RODMAN K. C. Keene AUTH. _____ VAL. SEC. _____ STATE Calif.
 CHAINMAN T. V. Duly COMM. _____ IN SERVICE _____ M. P. 244+17638
 NOTES TAKEN BY R. COMP. _____ L. A. DIVISION 9th DISTRICT
 TITLE Slide at Del Mar on South Side of Track



DATE 1-20-58 THE A. T. & S. F. RY. CO. SYSTEM PAGE 1 OF 1
 DRAWING NO. _____ CORP. _____ CARBON TO CHIEF ENGR. _____
 TRANSITMAN G. K. Haffn AUTH. _____ FOR COMPLETION REPORT STATION Del Mar
 ROAMAN J. E. Boyd VAL. SEC. _____ STATE Calif
 CHAINMAN R. D. SanMiguel COMM. _____ IN SERVICE M.P. 20.44000' = 4.70
 NOTES TAKEN BY G. K. Haffn DIVISION _____ DISTRICT 244-76
 TITLE Location of Slide of Portion of Bluff



DATE 1-20-61 THE A. T. & S. F. RY. CO. SYSTEM PAGE 1 OF 10
 DRAWING NO. CORP. J.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN W. Westerson FOR COMPLETION REPORT STATION No. Del Mar
 RODMAN J. Krupp AUTH. VAL. SEC. Ar. Cal. 7-8 STATE Calif.
 CHAINMAN COMM. IN SERVICE M. P. 244+2321.8
 NOTES TAKEN BY W. COMP. L.A. DIVISION 4th DISTRICT
 TITLE LOCATION SURVEY - SLIDE AREA NEAR DEL MAR.



LOCATION SKETCH
 Scale 1" = 40'

140' J.F. Spiral
 15 = 50' 42'

1531+29.62
 P.S.C.

1532+69.62 P.S.

E 12th St.

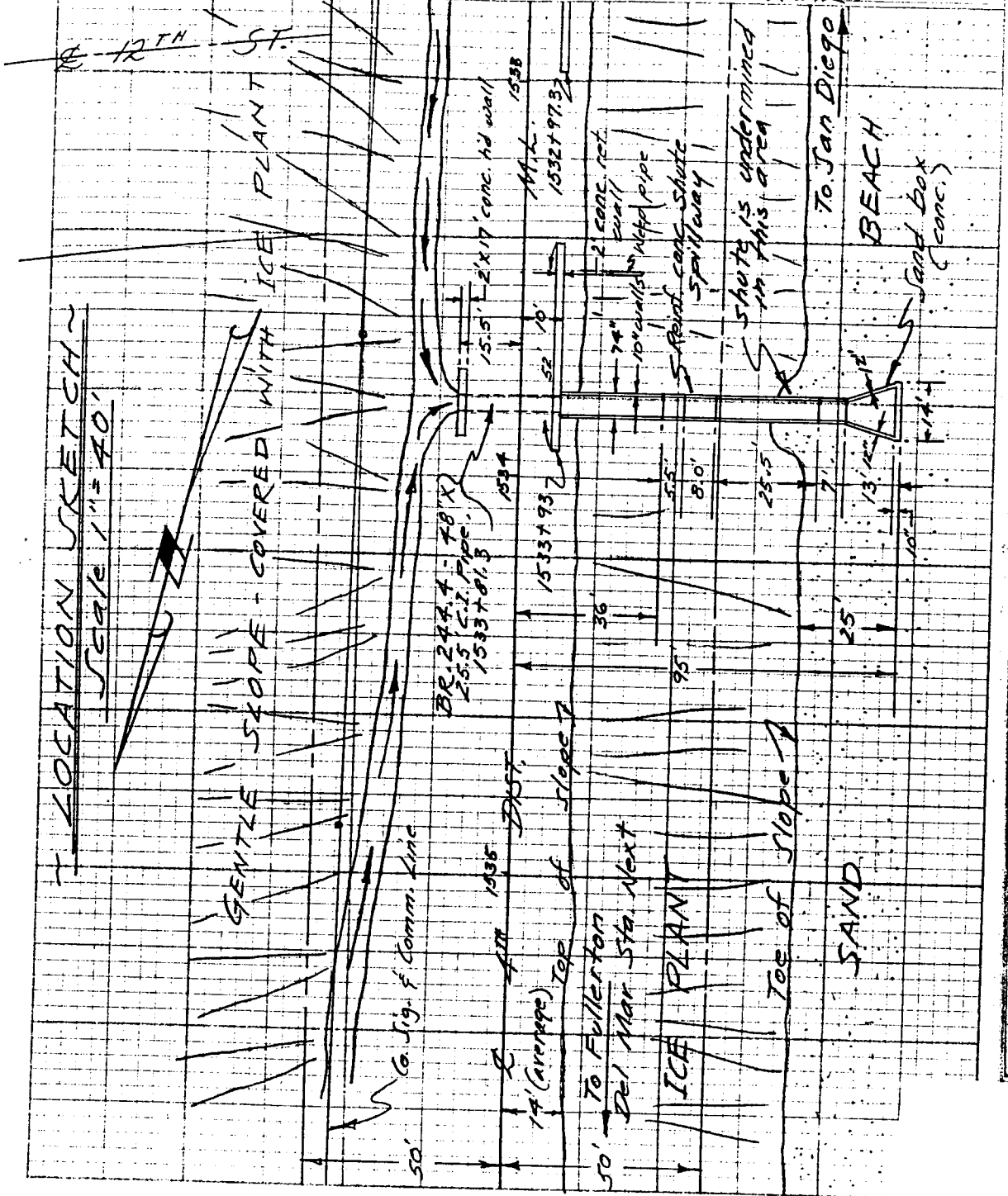
TO Slide Area

SAND

BEACH

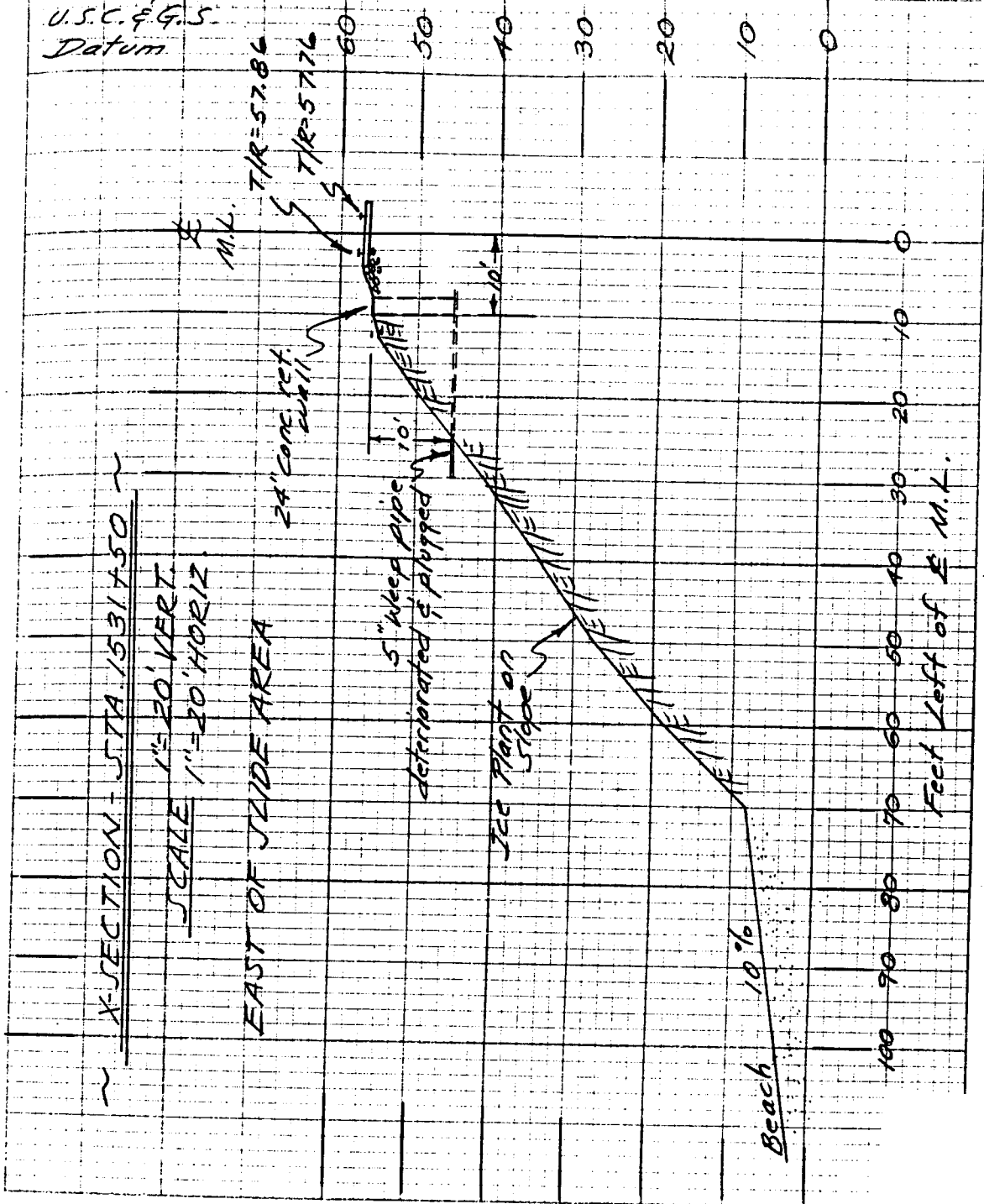
1" = 40'

DATE 1-20-61 THE A. T. & S. F. RY. CO. SYSTEM PAGE 2 OF 1.0
 DRAWING NO. _____ CORP. S.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN W. Westerson FOR COMPLETION REPORT STATION Near Del Mar
 RODMAN J. Krupp AUTH. VAL. SEC. Ar. Cal. 7-8 STATE Calif.
 CHAINMAN _____ COMM. _____ IN SERVICE M. P. 244+2321.8
 NOTES TAKEN BY W. COMP. _____ L.A. DIVISION 444 DISTRICT _____
 TITLE LOCATION SURVEY - SLIDE AREA NEAR DEL MAR



DATE 1-20-61 THE A. T. & S. F. RY. CO. SYSTEM PAGE 8 OF 10
 DRAWING NO. _____ CORP S.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN W. Westerson FOR COMPLETION REPORT STATION Nr. Del Mar
 RODMAN J. Krupp AUTH. _____ VAL. SEC Cal. 7-8 STATE Calif.
 CHAINMAN _____ COMM. _____ IN SERVICE M. P. 244+2321.8
 NOTES TAKEN BY W. COMP. _____ L.A. DIVISION 4TH DISTRICT
 TITLE LOCATION SURVEY - SLIDE AREA NEAR DEL MAR.

U.S.C. & G.S.
Datum



X-SECTION - STA 1531+50
 SCALE 1"=20' VERT
 1"=20' HORIZ

EAST OF SLIDE AREA

M.K. 7/R=57.86
 24" CONE RET. WALL
 7/R=57.76

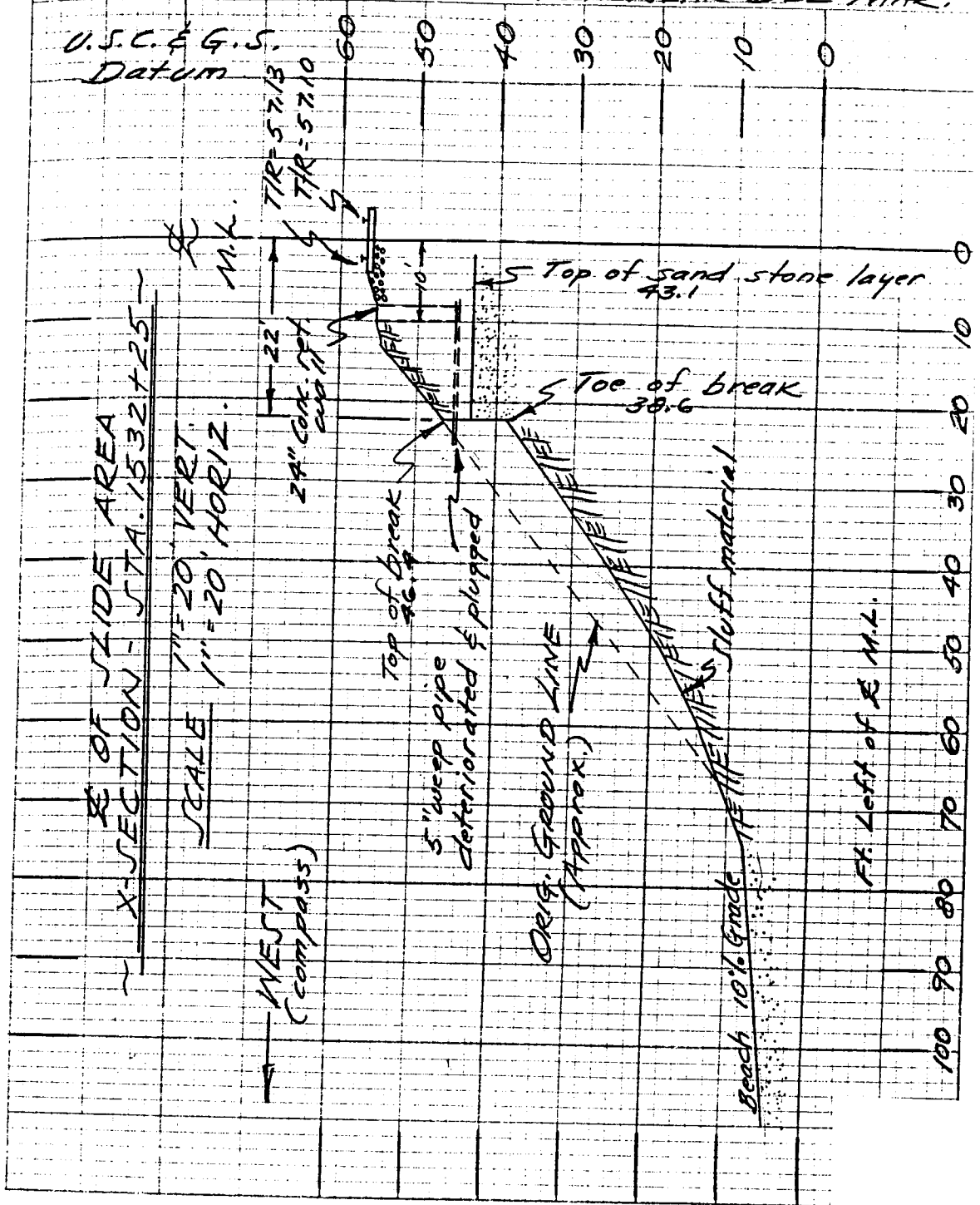
5" WEEP PIPE 10'
 deteriorated & plugged

ICE PLANT on Slope

Beach 10%

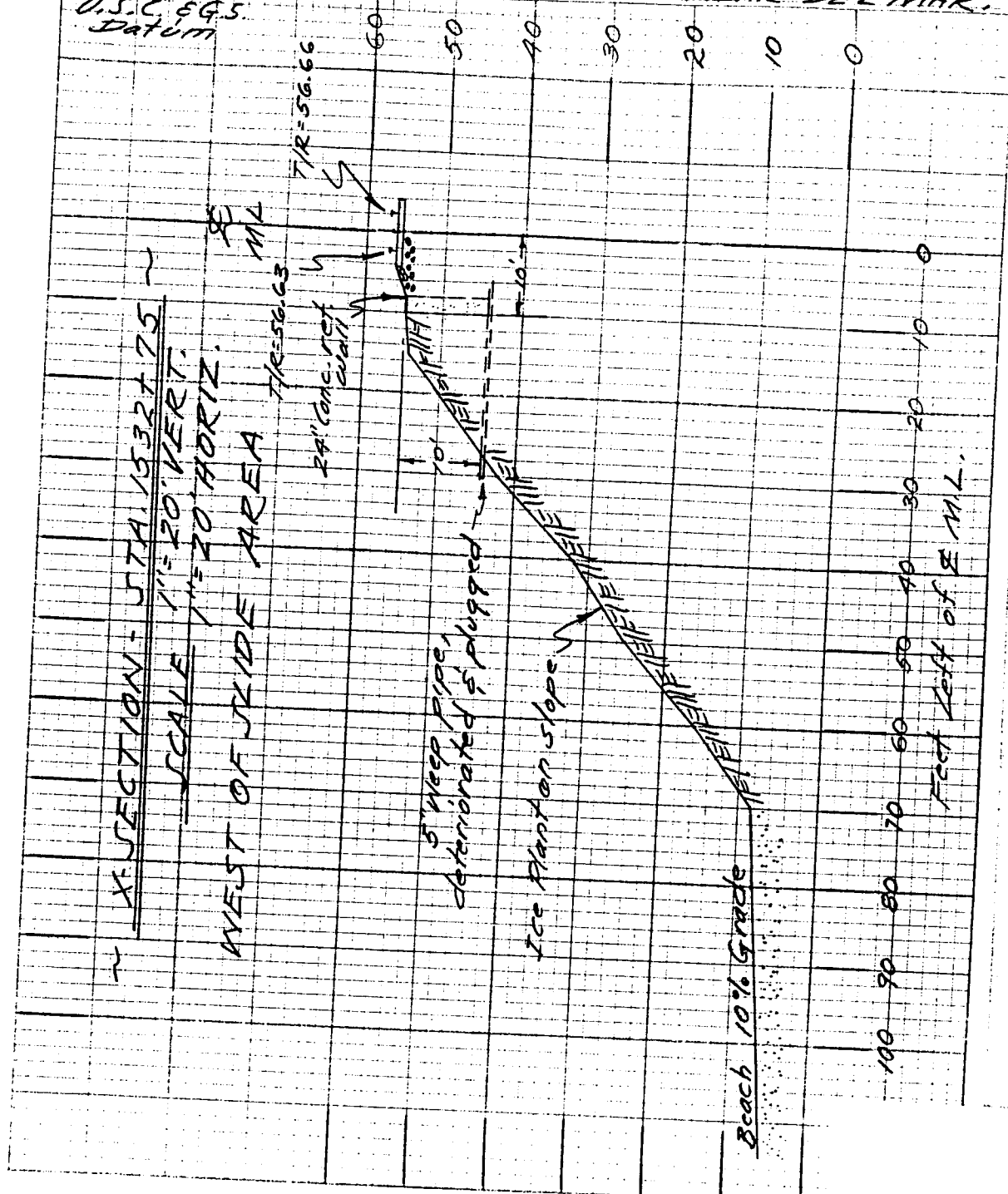
Feet Left of E.M.K.

DATE 1-20-61 THE A. T. & S. F. RY. CO. SYSTEM PAGE 9 OF 10
 DRAWING NO. _____ CORP. S.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN W. Westerson FOR COMPLETION REPORT STATION Nr. Del Mar
 RODMAN J. Krupp AUTH. _____ VAL. SEC. Ar. Cal. 7-8 STATE Calif.
 CHAINMAN _____ COMM. _____ IN SERVICE M. P. 244+2321.8
 NOTES TAKEN BY W. COMP. _____ L.H. DIVISION 4th DISTRICT _____
 TITLE LOCATION SURVEY - SLIDE AREA NEAR DEL MAR.



DATE 1-23-61 THE A. T. & S. F. RY. CO. SYSTEM PAGE 10 OF 10
 DRAWING NO. _____ CORP. JFCL CARBON TO CHIEF ENGR.
 TRANSITMAN W. Westerson FOR COMPLETION REPORT STATION Nr. Del Mar
 RODMAN J. Krupp AUTH. VAL. SEC. At. Cal. 7-8 STATE Calif.
 CHAINMAN _____ COMM. IN SERVICE M. P. 244+2321.8
 NOTES TAKEN BY W. COMP. L.A. DIVISION 4th DISTRICT
 TITLE LOCATION SURVEY - SLIDE AREA NEAR DEL MAR.

U.S.C. & G.S. Datum



X-SECTION - STA. 1532+75
 SCALE 1" = 20' VERT.
 1" = 20' HORIZ.

WEST OF SLIDE AREA
 MK
 T/R = 56.63

24" CONC. RET. WALL

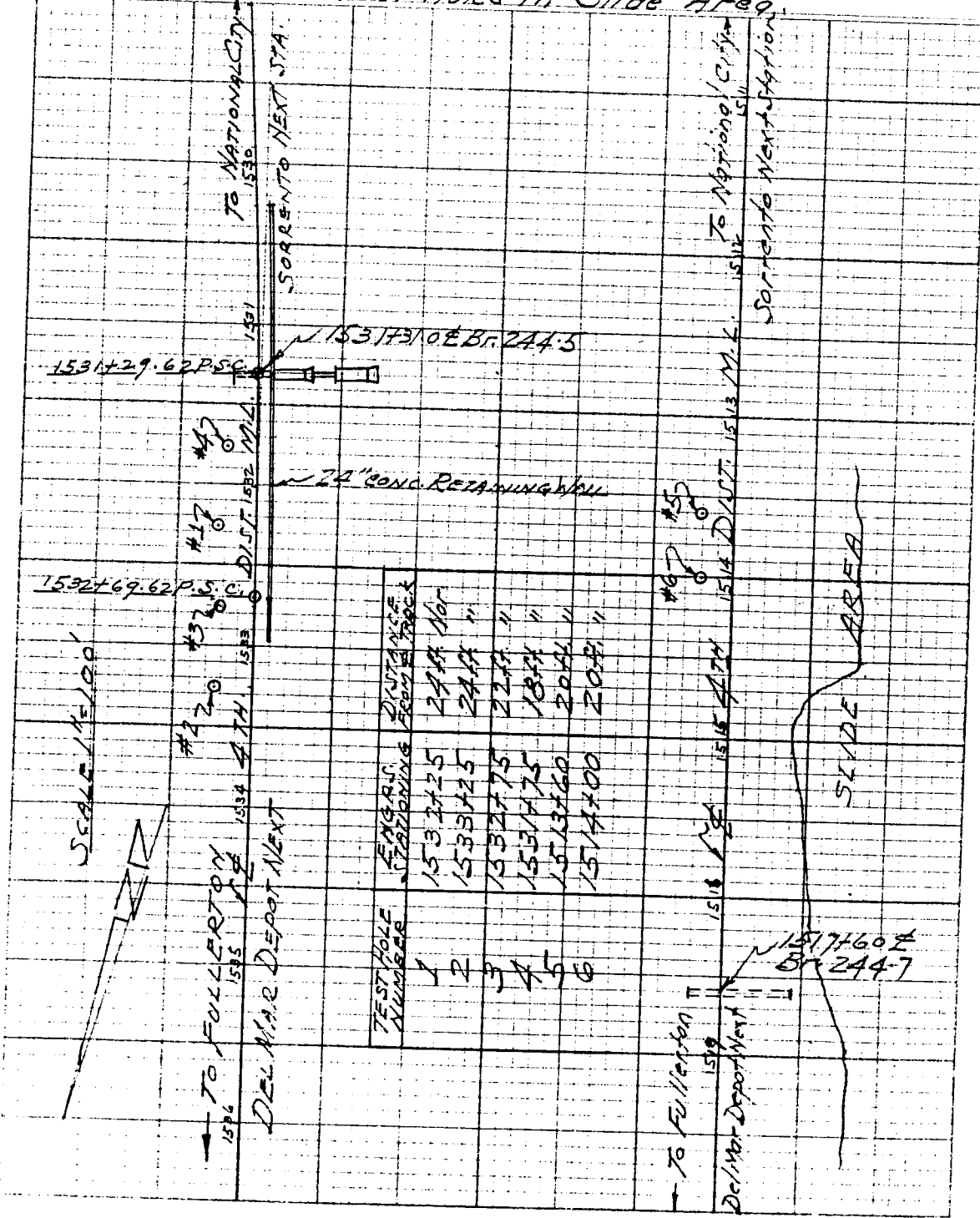
5" WEEP PIPE, deteriorated & plugged

Ice Plant on slope

Beach 10% Grade

FEET LEFT OF E.M.L.

DATE *2-15-61* THE A. T. & S. F. RY. CO. SYSTEM PAGE *1* OF *1*
 DRAWING NO. *Dr. 1111* CORP. CARBON TO CHIEF ENGR.
 TRANSMITTED BY *N.C. Bell* FOR COMPLETION REPORT STATION *Near Del Mar*
 RODMAN AUTH. VAL. SEC. STATE *Calif.*
 CHAINMAN COMM. IN SERVICE M. P. *244+2148.8 & 244+2333.8*
 NOTES TAKEN BY *W.L. Paul* L.A. DIVISION *Fourth* DISTRICT
 TITLE *Location of Test Holes in Slide Area*



TEST HOLE NUMBER	EMBARC. STATIONING	DISTANCE FROM TABLE
1	1532+25	24 FT Nor
2	1533+25	24 FT "
3	1532+75	22 FT "
4	1531+75	18 FT "
5	1513+60	20 FT "
6	1514+00	20 FT "

SCALE 1"=100'

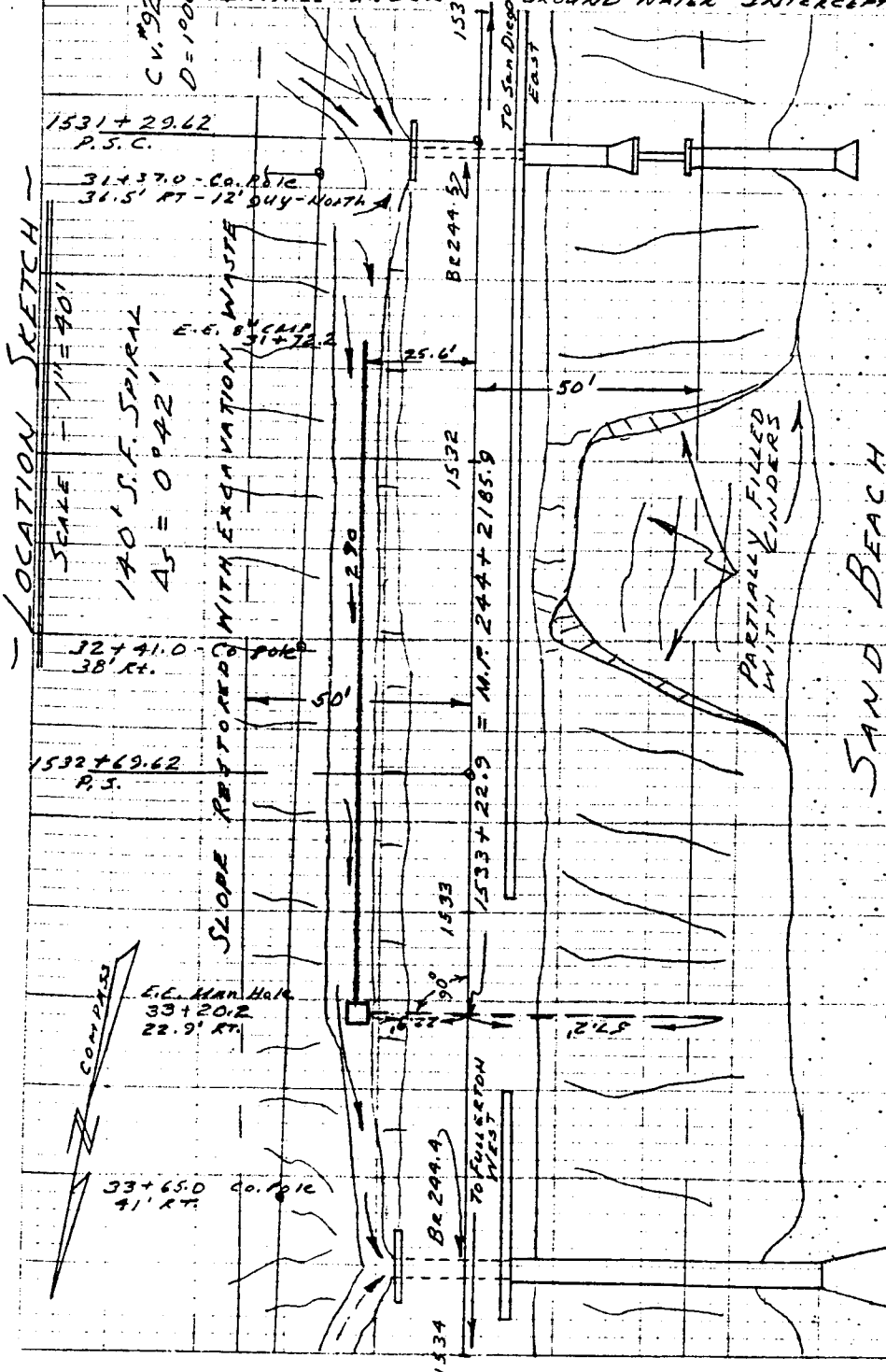


SLIDE AREA

10

DATE R-7-62 THE A. T. & S. F. RY. CO. SYSTEM PAGE 2 OF 5
 DRAWING NO. L-4-24594 CORP. S.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN W.E. WESTERSON FOR COMPLETION REPORT STATION NR. DEL MAR
 RODMAN J.L. KRUPP AUTH GMO-9037-6AL. SEC. 11-18-61 STATE CALIFORNIA
 CHAINMAN R.A. SCHULTZ COMM. 11-18-61 IN SERVICE 12-15-61 M. P. 244+2185.9
 NOTES TAKEN BY R.A. SCHULTZ FOR 12-15-61 C.A. DIVISION FOURTH DISTRICT
 TITLE INSTALL UNDERGROUND SAND BEACH GROUND WATER INTERCEPTOR SYSTEM

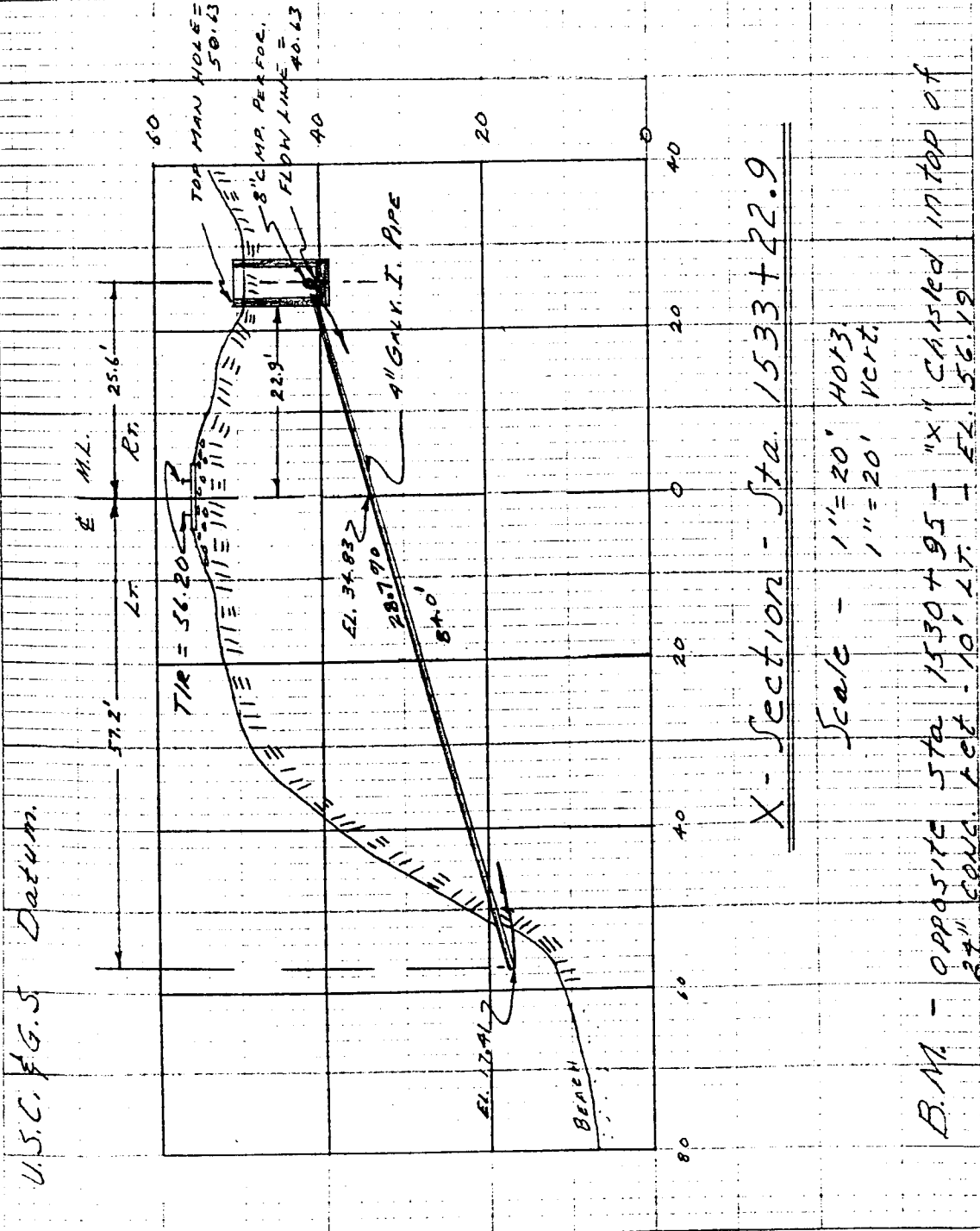
1" = 40'



LEGEND
 ○ 150' x 8" C.M.P. PERFORATED SHOWN SOLID RED.
 ⊙ 5.4' x 5.4' MAN HOLE SHOWN OUTLINED RED.
 ⊕ 2' GALV. I. PIPE, 84' LONG, SHOWN DASHED RED.

DATE 2-7-62 THE A. T. & S. F. RY. CO. SYSTEM PAGE 3 OF 5
 DRAWING NO. L-4-24594 CORP. S.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN W.E. Westerson FOR COMPLETION REPORT STATION Nr. Del Mar
 RODMAN J.L. Krupp AUTH. G.M.O 9037 SEC. AR CAL 748 STATE California
 CHAINMAN R.A. Schovity COMM. 11-18-11 IN SERVICE 12-15-61 M. P. 244 + 2185.9
 NOTES TAKEN BY R.A.S. COMP. 12-15-61 L.A. DIVISION Fourth DISTRICT
 TITLE elo Install Underground Water Interceptor System

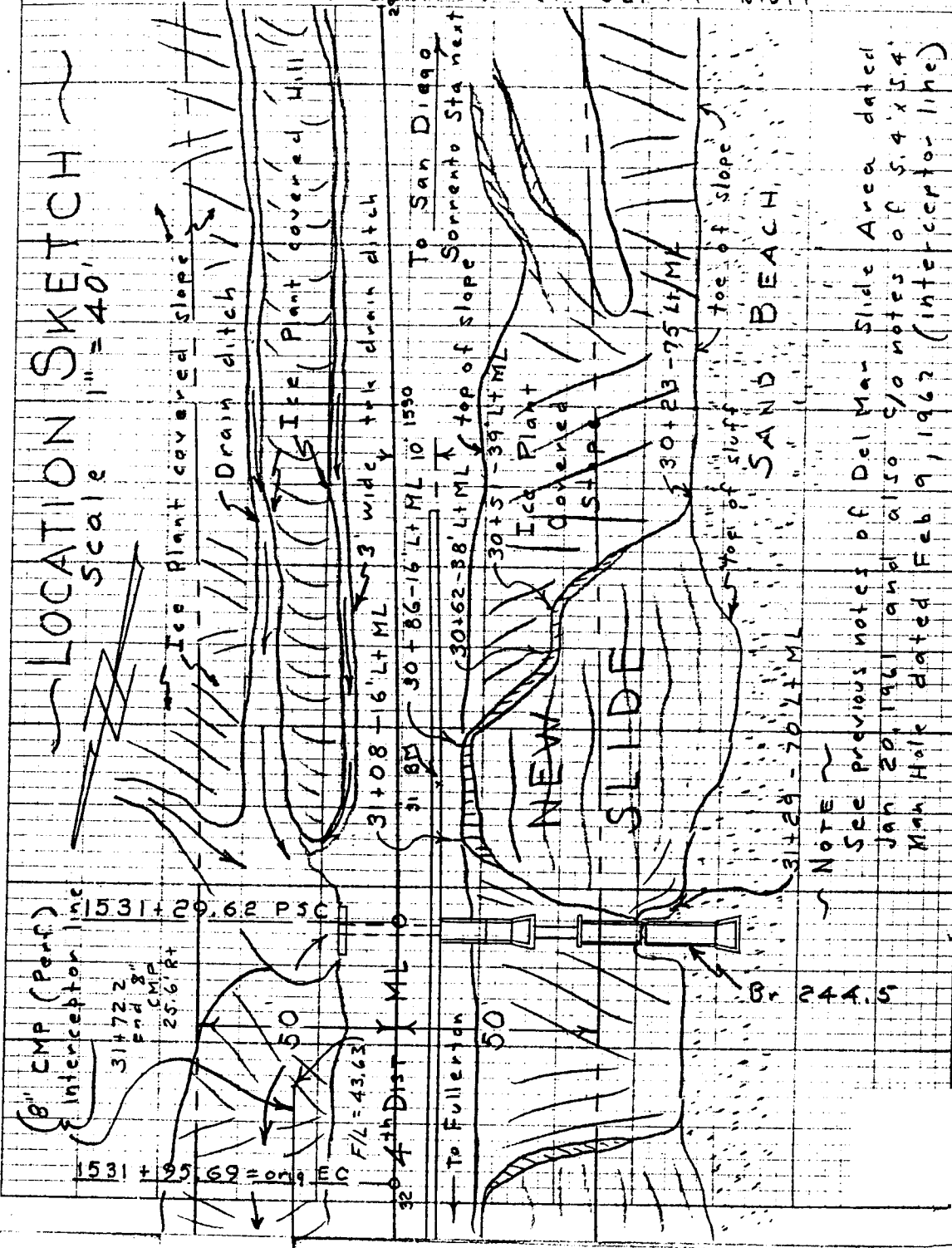
= 244.414 M.



244+248.6' Form 1958 Standard D-16001

DATE March 14, 1962 THE A. T. & S. F. RY. CO. SYSTEM PAGE 1 OF 5
 DRAWING NO. CORP. AT & SF CL CARBON TO CHIEF ENGR.
 TRANSITMAN WE Westerson FOR COMPLETION REPORT STATION Del Mar
 RODMAN JL Krupp AUTH. VAL. SEC. AT Cal 768 STATE California
 CHAIRMAN RA Schoultz COMM. IN SERVICE M. P. 244+248.5.8
 NOTES TAKEN BY JLK COMP. LA DIVISION 4th DISTRICT
 TITLE Survey of Slide Area at Del Mar Bluff

LOCATION SKETCH
 Scale 1" = 40'

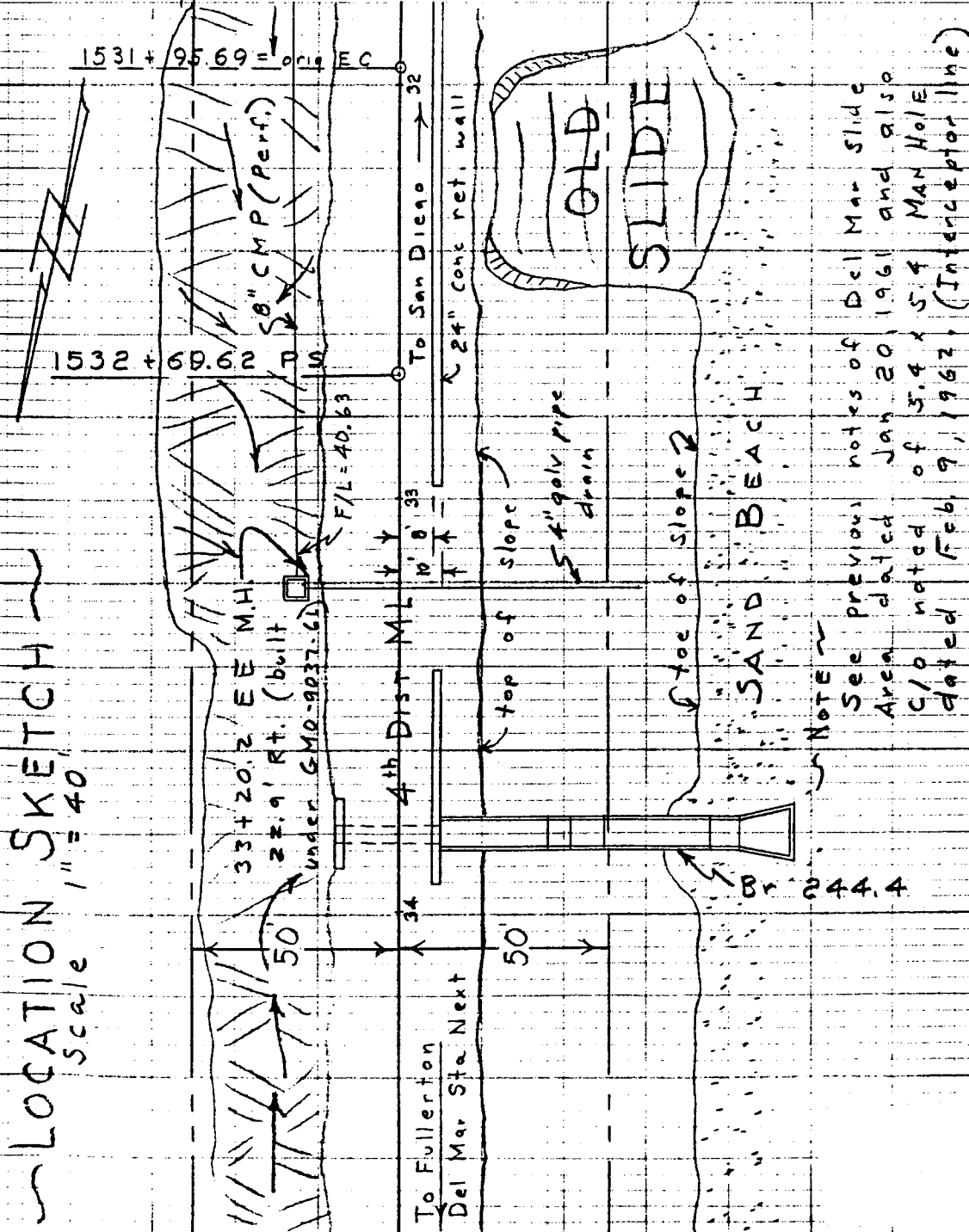


NOTE
 See previous notes of Del Mar Slide Area dated
 Jan 20, 1961 and also 5/0 notes of S.4 x S.4.
 Minn Holt dated Feb 9, 1962 (interceptor line)

8" CMP (Perf.)
 Interceptor line
 1531+09.62 PSC
 31+72.2
 End 8" CMP
 25.6 Ft
 50
 F/L = 43.63
 32.4th DIST X ML
 1531+95.69 = orig. E.C.
 30
 To Fullerton
 50

B. 244.5

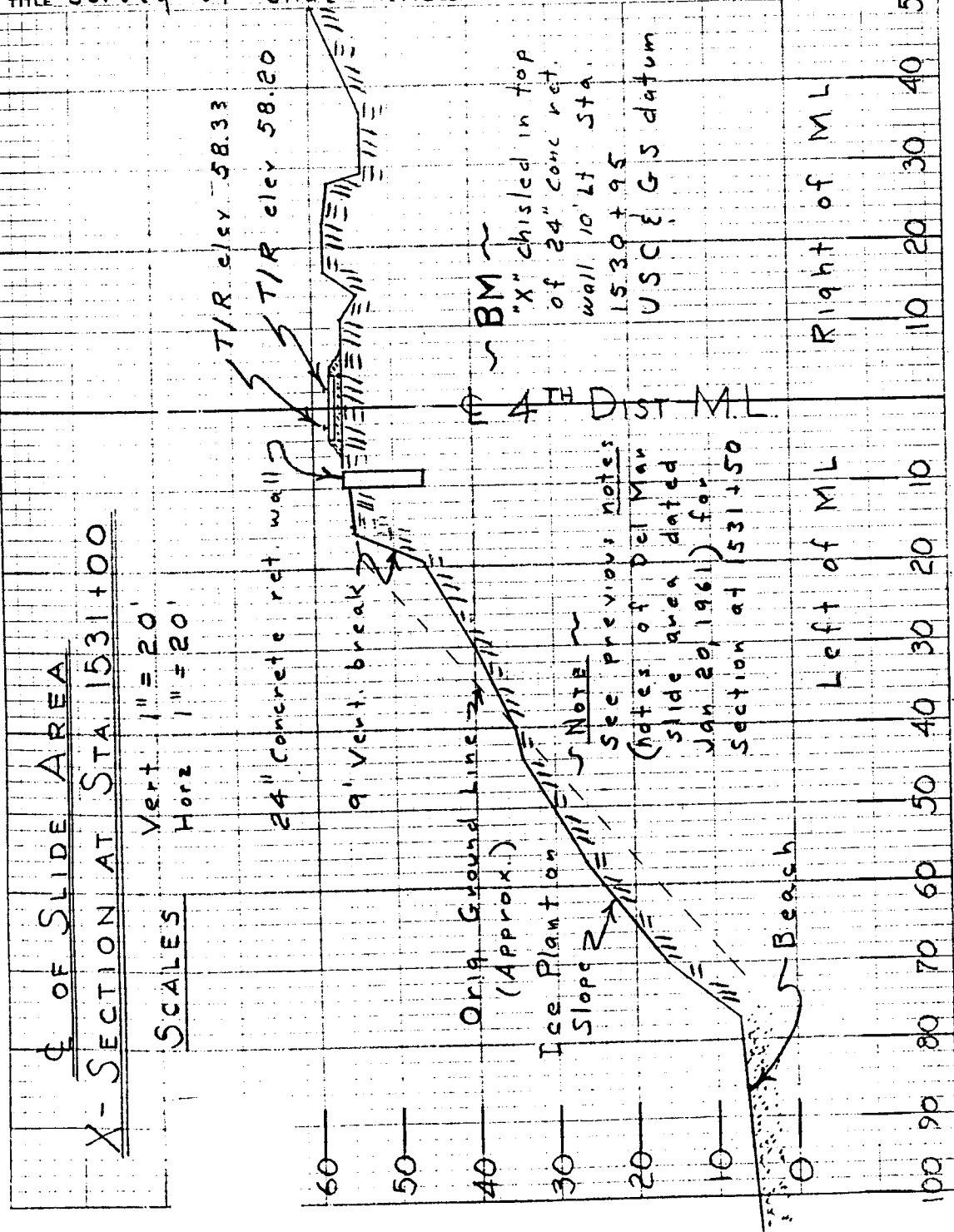
DATE March 14, 1962 THE A. T. & S. F. RY. CO. SYSTEM PAGE 2 OF 5
 DRAWING NO. _____ CORP. AT SE CL CARBON TO CHIEF ENGR.
 TRANSITMAN WE Westensan FOR COMPLETION REPORT STATION Del Mar
 RODMAN JL Krupp AUTH. VAL. SEC. AT Cal 7/8 STATE California
 CHAINMAN RA Schoults COMM. IN SERVICE M. P. 244 + 2485.B
 NOTES TAKEN BY JLK COMP. LA DIVISION 4th DISTRICT
 TITLE Survey of Slide Area at Del Mar Bluff



LOCATION SKETCH
 Scale 1" = 40'

NOTE
 See previous notes of Del Mar Slide Area dated Jan 20, 1961 and also C/O noted of 3.4 x 5.4 Man Hole dated Feb 9, 1962. (Interceptor line)

DATE March 14, 1962 THE A. T. & S. F. RY. CO. SYSTEM PAGE 3 OF 5
 DRAWING NO. _____ CORP. AT & SF CL CARBON TO CHIEF ENGR.
 TRANSITMAN WEX/extension FOR COMPLETION REPORT STATION Del Mar
 RODMAN JL Krupp AUTH. VAL. SEC. Atcal 728 STATE California
 CHAINMAN RA Schoultz COMM. IN SERVICE M. P. 244+2485.8
 NOTES TAKEN BY JLK COMP. LADIVISION 4th DISTRICT
 TITLE Survey of Slide area at Del Mar Bluff



C OF SLIDE AREA
X- SECTION AT STA. 1531+00

SCALES
 Vert. 1" = 20'
 Horz. 1" = 20'

24" concrete ret. wall

9' Vert. break

Orig. Ground Line (Approx.)

Ice Plant on Slope

Beach

4TH ST ML

BM "X" chisled in top of 24" conc ret. wall, 10' Lt Sta. 1530+95 USC & G S datum

NOTE: See previous notes (notes of Del Mar slide area dated Jan 20, 1961) for section at 1531+50

Left of ML

Right of ML

100 90 80 70 60 50 40 30 20 10 0

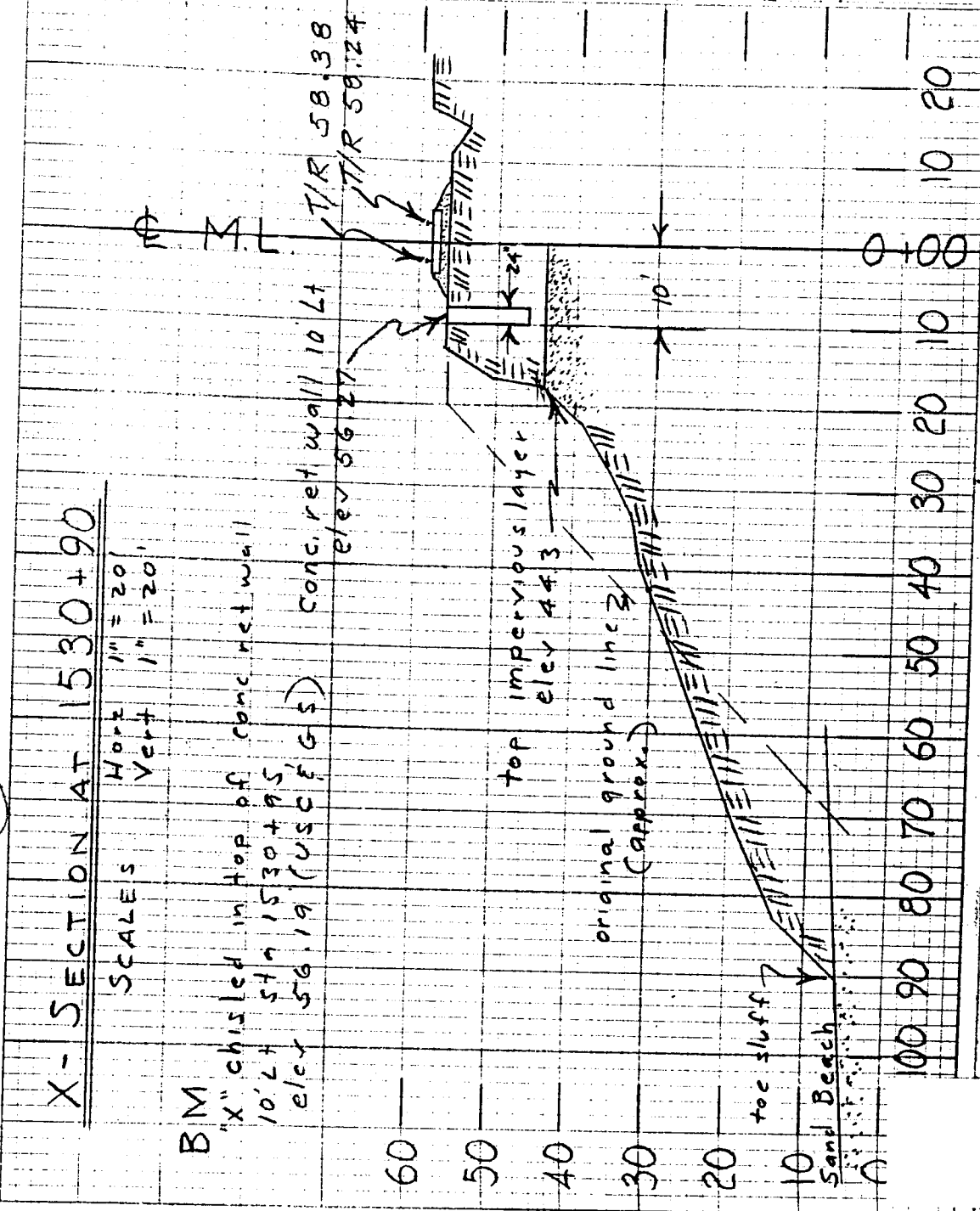
DATE March 26, 1962 THE A. T. & S. F. RY. CO. SYSTEM PAGE 2 OF 2
 DRAWING NO. _____ CORP. AT&SF 66 CARBON TO CHIEF ENGR.
 TRANSITMAN W Westerson FOR COMPLETION REPORT STATION Del Mar
 RODMAN JL Krupp AUTH. VAL. SEC. AT&SF 68 STATE California
 CHAINMAN RA Schoultz COMM. IN SERVICE M. P. 244 + 2485 Y
 NOTES TAKEN BY JLK COMP. LA DIVISION 444 DISTRICT
 TITLE Survey of Slide Area at Del Mar Bluff

USED FOR X-SEC, W-W

X-SECTION AT 1530+90

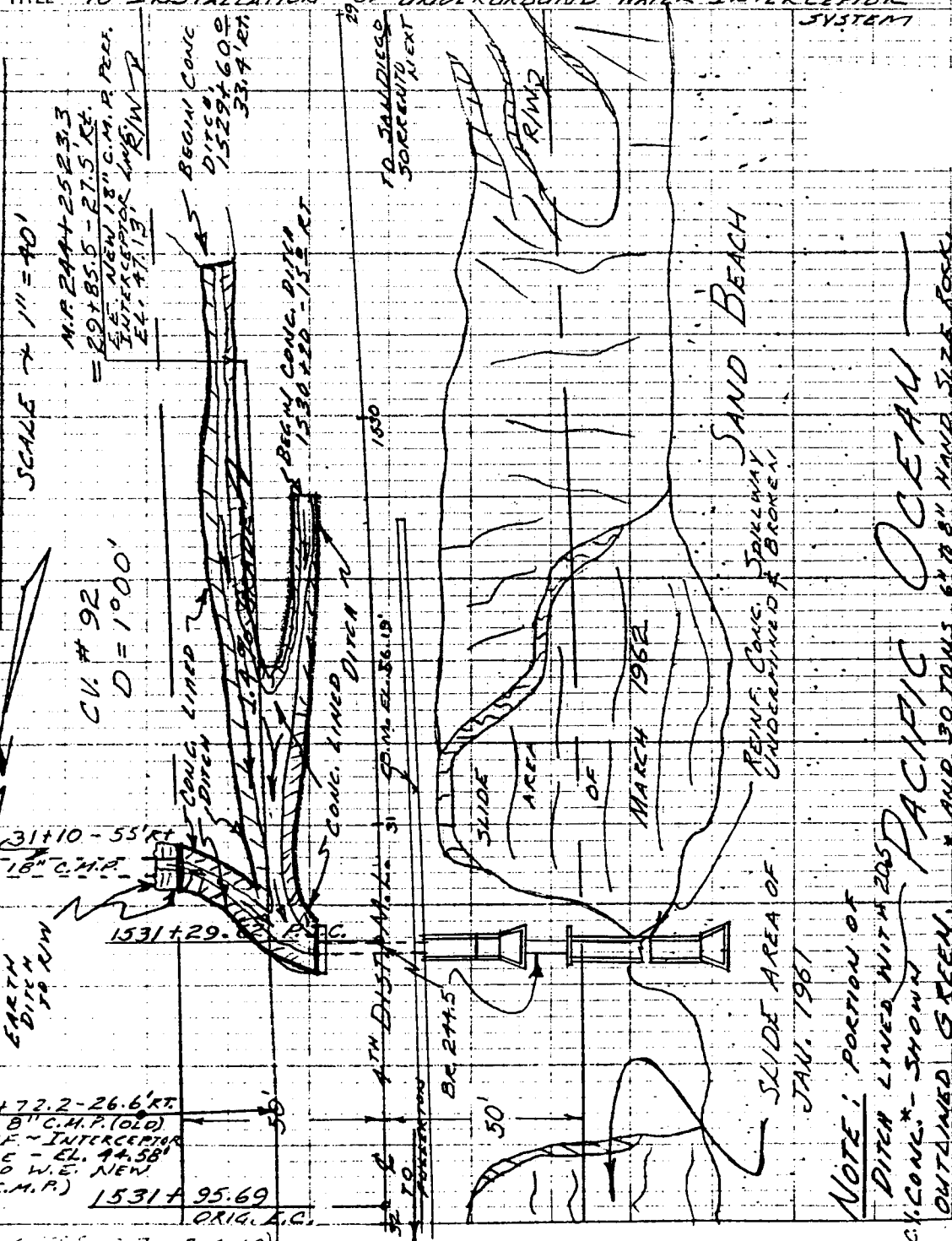
SCALES
 Horiz 1" = 20'
 Vert 1" = 20'

BM "X" chisled in top of conc ret wall
 10' Lt Sta 1530+95
 elev 56.19 (USC&GS)
 conc. ret wall 10' Lt
 elev 56.27
 T/R 58.38
 T/R 50.24



DATE JULY 10, 1962 THE A. T. & S. F. RY. CO. SYSTEM PAGE 2 OF 3
 DRAWING NO. L-6-25111 CORP. S.F.C.L. CARBON TO CHIEF ENGR.
 TRANSITMAN G.E. CAGLE FOR COMPLETION REPORT STATION DEL MAR
 RODMAN R.D. SAN MIGUEL AUTH. 640 9061-62 VAL. SEC. 7f8 STATE CALIFORNIA
 CHAINMAN R.A. SCHOLTZ COMM. 6-62 IN SERVICE M. P. 244+2523.3
 NOTES TAKEN BY R.A. SCHOLTZ COMP. 6-26-62 LOS ANGELES DIVISION FOURTH DISTRICT
 TITLE 410 INSTALLATION OF UNDERGROUND WATER INTERCEPTOR SYSTEM

LOCATION SKETCH



SCALE 1" = 40'

M.P. 244+2523.3
= 29+85.5 - 27.5 KT.

NEW 18" C.M.P. PERK. INTERCEPTOR LINE
EL. 94.58' R/W

BEGUN CONC. DITCH
1529+60.0
33.4' RT.

BEGUN CONC. DITCH
1530+20.0 - 15.2 RT.

1530

ATM. DUSTY M. L. 31 50 M. EL. 56.10'

BE 244.5

50'

SAND BEACH

SLIDE AREA OF MARCH 1962

SLIDE AREA OF JAN. 1961

NOTE: PORTION OF DITCH LINED WITH 205 C.I. CONC. - SHOWN OUTLINED GREEN.

PACIFIC OCEAN

AND 30 TONS 6" X 8" HAND SIZE ROCK

31+72.2-26.6' RT.
E.E. 8" C.M.P. (OLD) PERK. INTERCEPTOR LINE - EL. 94.58' (ALSO W.E. NEW 18" C.M.P.)
1531+95.69
ORIG. A.C.

2-9-62

MP
FILE 4/20
RS

1975

FILE D-16001

4/17/75

T.O. McDOUGALL
D.L. SMALLEN
R.R. SCHULTZ
D.L.S.

C.L.

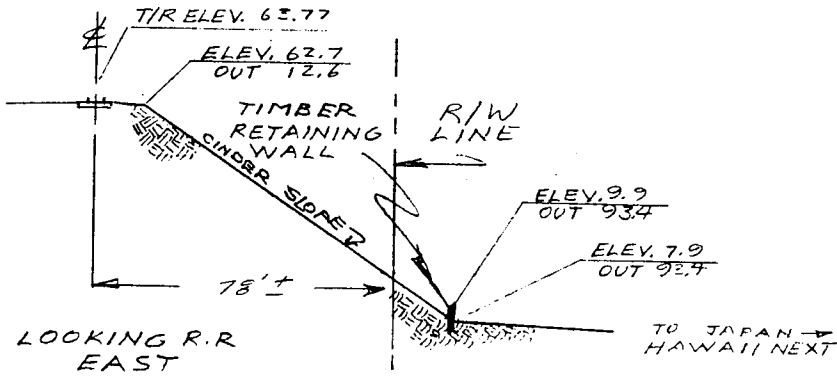
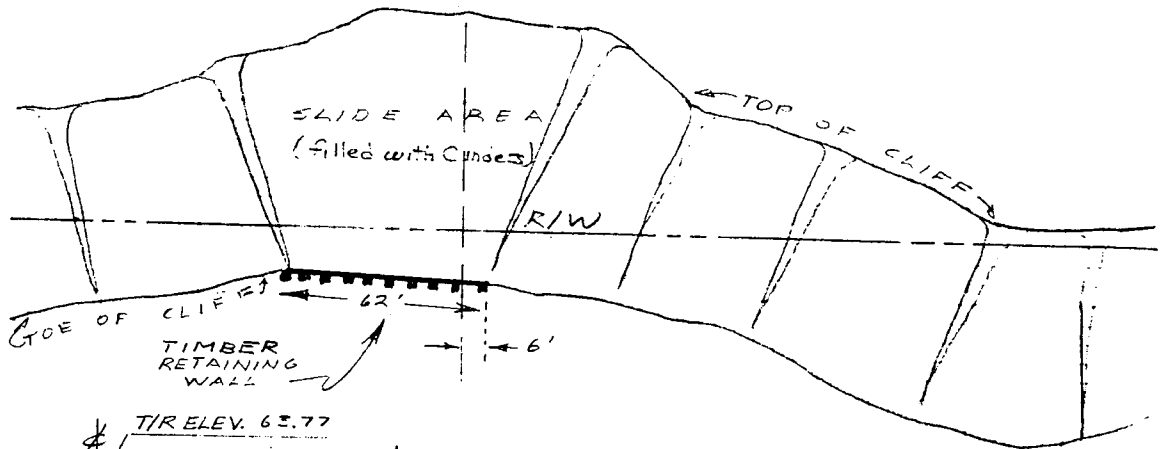
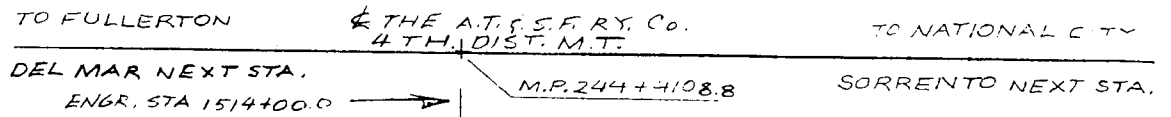
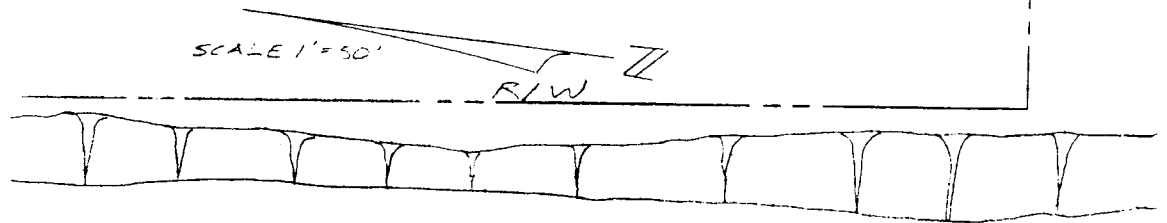
798

NR. DEL MAR
CALIF.
244+4108.8

L.A.

4TH

LOCATION OF RETAINING WALL, AT SLIDE AREA



CROSS SECTION TAKEN
AT ES. 1514+00.0
SCALE 1"=50' H&V

Note Retaining wall to be 4 ft. High