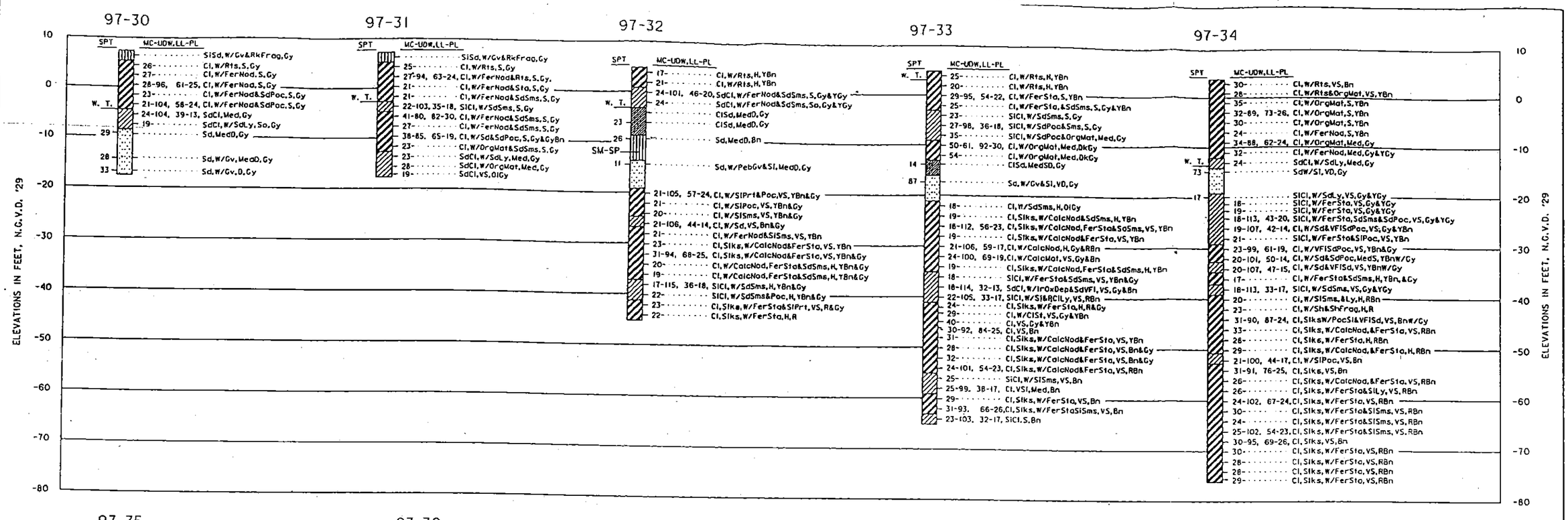

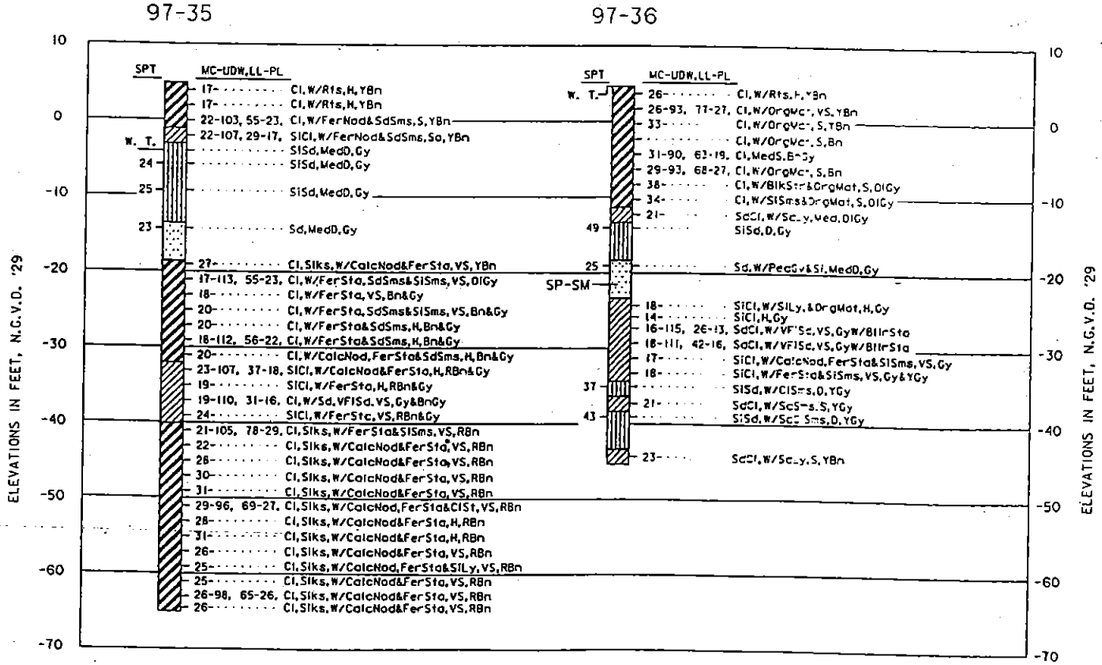

NOTES:

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LABORATORY CLASSIFICATIONS:

- CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
- CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
- SC CLAYEY SANDS, SAND-CLAY MIXTURES.
- SM SILTY SANDS, SAND-SILT MIXTURES.
- SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

VISUAL CLASSIFICATIONS:

Bl Black	Gv Gravel(ly)	Ox Oxide	Si Silty
Blk Blockey	Gy Gray(ish)	Pea Pea Gravel	Slks Slicken Sides
Bn Brown(ish)	H Hard	Peb Pebble(s)	St Shale
Calc Calcareous	Ir Iron	Prt Particle(s)	Sms Seams
Cl Clay(ey)	Ly Layer(s)	Poc Pocket(s)	So Soft
D Dense	Mat Material	R Red(dish)	Sta Stain(s)
Dep Deposit(s)	Med Medium	Rk Rock(s)	St Stone(s)
Dk Dark	Mot Mottled	Rts Root(s)	Str Structure
Fer Ferrous	Nod Nodules	S Stiff	V Very
Fi Fine(s)	Org Organic	Sd Sand(y)	W/ With
Frag Fragment(s)	Ol Olive	Sh Shell(y)	Y Yellow(ish)

NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER SALTWATER BARRIER

LOGS OF BORINGS

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY GENERAL REEVALUATION REPORT
DATED: DEC 1997

FIGURE 2-6

CADD
DESIGN FILE: BORE.1.DGN
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CREATED BY: brotman
ON: 07-NOV-1997
AT: 13:19

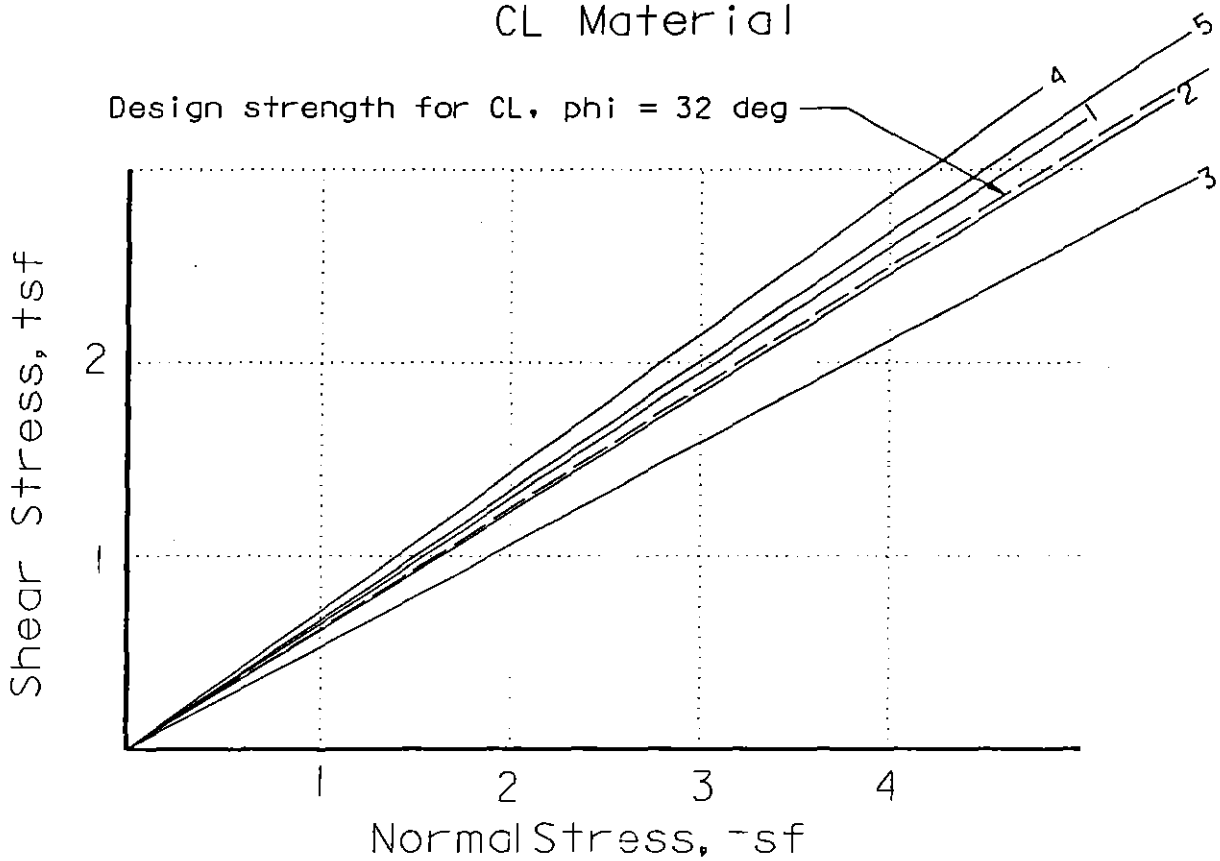
NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER SALTWATER BARRIER
SUMMARY OF UNDRAINED COMPRESSION TEST DATA

	Boring Number	Sample Elev NGVD	MC	UDW pcf	LL	PL	Gradation Gr	Gradation Sa	Gradation Fines	Shear Strength Su (psf)	Test Type	Classification
Medium	97-34	-9.1	34.4	87.7	62	24	0	1	99	620	UC	CH, w/ organic material, Medium, Gray
	97-36	-4.3	31	90	63	19	0	10	90	740	Q	CH, medium to stiff, brownish gray
Stiff	97-30	0.4	27.7	95.5	61	25	0	4	96	1290	UC	CH, w/ ferrous nodules, Stiff, Gray
	97-31	-5.7	40.5	80.3	82	30				1220	UC	CH, w/ ferrous nodules & sand seams, Stiff, Gray
	97-31	2.3	26.5	93.6	63	24	0	1	99	1320	UC	CH, w/ ferrous nodules & roots, Stiff, Gray
	97-32	-0.2	23.6	100.8	46	20	2	28	70	1270	UC	CL, w/ ferrous nodules & sand seams, Stiff, Gray & Yellowish Gray
	97-33	-6.1	27.3	98.2	36	18	0	4	96	1280	UC	CL, w/ sand pockets & sand seams, Stiff, Gray
	97-33	-0.1	29	94.7	54	22	0	2	98	1050	UC	CH, w/ferrous stains, Stiff, Yellowish Brown
	97-34	-3.1	32.1	88.8	73	26	0	2	98	1210	UC	CH, w/ organic material. Stiff, Yellowish Brown
	97-35	-0.1	21.7	102.6	55	23	0	4	96	1270	UC	CH, w/ fer nod & sand sms, Stiff, Yellowish Brown
	97-36	-6.3	29	92.6	68	27	0	1	99	1110	UC	CH, w/ Organic Material, Stiff, Brown
Very Stiff	97-32	-20.2	20.7	104.7	57	24	0	1	99	2300	UC	CL, w/ silt partings & silt pockets, Very Stiff, Yellowish Brown & Gray
	97-33	-54.1	24.3	100.9	54	23	0	2	98	2380	UC	CH, w/ Calc nodules & fer stains, slickensided, Very Stiff, Red Brown
	97-33	-40.1	22.4	104.7	33	17	0	2	98	2230	UC	CL, w/ silt & red clay layer, Very Stiff, Reddish Brown
	97-34	-66.1	25.1	102.1	54	23	0	1	99	2530	UC	CH, w/ fer stains & silt Seams, Slickensided, Very Stiff, Reddish Brown
	97-34	-30.1	23.3	99	61	19	0	13	87	1880	Q	CH, Very stiff, very fine sand pockets throughout, yellowish brown & gray
	97-34	-24.1	18.4	112.8	43	20	0	13	87	2140	UC	CL, W/ Fer St, Sand Sms, & Snd Poc, Very Stiff, Gray & Yellow Gray
	97-36	-27.3	16	115	26	13	0	35	65	1270	Q	CL, Gray with black iron staining, very stiff, sand is very fine
Hard	97-33	-30.1	20.9	106	59	17	0	4	96	3940	Q	CH, Few scattered calc nod, hard, gray and reddish brown
	97-34	-38.1	18.1	113.1	33	17	0	15	85	3080	UC	CL, w/ Sand Seams, Very Stiff, Gray & Yellowish Gray
	97-35	-29.1	17.9	111.8	56	22	0	4	96	4630	UC	CH, w/ fer stains & Sand Seams, Hard, Brown & Gray

Legend
UC - Unconfined Compression Test
Q - "Q-Test", Confined Undrained Compression

Figure 2-9

Adjusted Direct Shear Tests
CL Material



BORING #	DESCRIPTION	Sample Elev.[1]	Mc	UDW pcf	LL	PL	Gradation Gr	Gradation Sa	Gradation Fines	Shear Data From Direct Shear Test Phi	Shear Data From Direct Shear Test c, psf	Adjusted phi[2]
97-30	(1) Sdy Cl (CL), Med, Gr	-6	24	104	39	13	0	43	57	31.4	100	33.0
97-32	(2) Lean Cl (CL), w/Sd, VSt, Br & Gr	-26	21	106	44	14	0	21	79	26.5	460	31.6
97-34	(3) Lean Cl (CL), VSt, Br, Sl Poc	-52	21	100	44	17	0	0	100	14.6	1020	27.9
97-35	(4) Lean Cl (CL), w/Sd, VSt, Gr&BrGr	-37	19	110	31	16	0	29	71	24.9	880	35.6
97-36	(5) Sd Lean Cl (CL), VSt, Gr w/Bl Sto	-29	18	111	42	16	0	33	67	29.3	360	33.8

[1] Elevation of Sample is Feet, NGVD '29 Adj.

[2] Adjusted phi is corrected to c = 0 and normal stress of 2 TSF.

NECHES RIVER AND TRIBUTARIES, TEXAS

ADJUSTED DIRECT SHEAR TESTS
CL MATERIAL

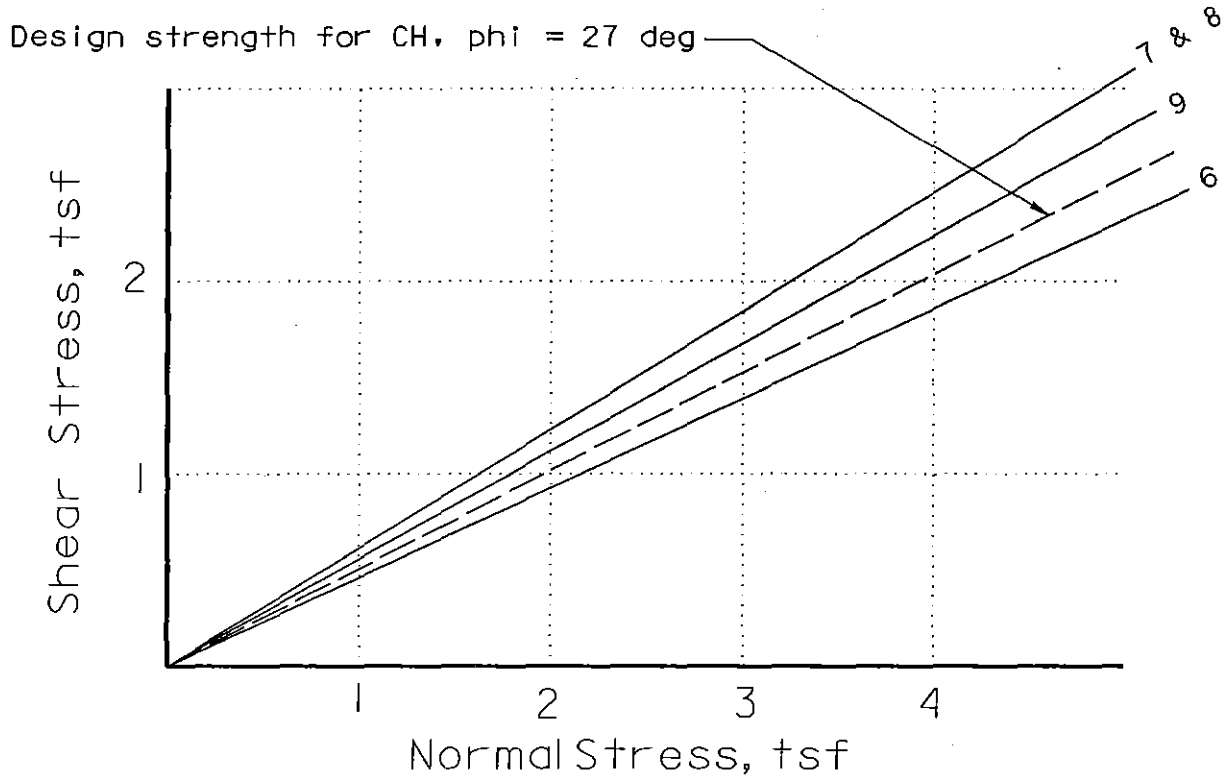
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY GENERAL
REEVALUATION REPORT
DATED: DEC 1997

FILE NO. GRAPH.DGN

FIGURE 2-10

Adjusted Direct Shear Tests
CH Material



BORING #	DESCRIPTION	Sample Elev.[1]	Mc	UDW pcf	LL	PL	Gradation Gr	Gradation Sa	Gradation Fines	Shear Data From Direct Shear Test Phi	Shear Data From Direct Shear Test c, psf	Adjusted Phi[2]
97-31	(6) CI (CH), w/Sd, Gr&BrGr, St	-10	38	85	65	19	0	15	85	21.0	320	24.9
97-33	(7) CI (CH), Gr&Br, vSt, Calc Poc	-32	24	100	69	19	0	8	92	25.0	540	31.6
97-33	(8) CI (CH), Br, vSt	-46	30	92	84	25	0	1	99	17.5	1100	31.6
97-34	(9) CI (CH), w/Sd, YBr, Med, SdPoc	-32	20	101	50	14	0	20	80	15.7	1020	29.2

[1]Elevation of Sample is Feet, NGVD '29 Adj.

[2]Adjusted phi is corrected to c = 0 and normal stress at 2 TSF.

NECHES RIVER AND TRIBUTARIES, TEXAS

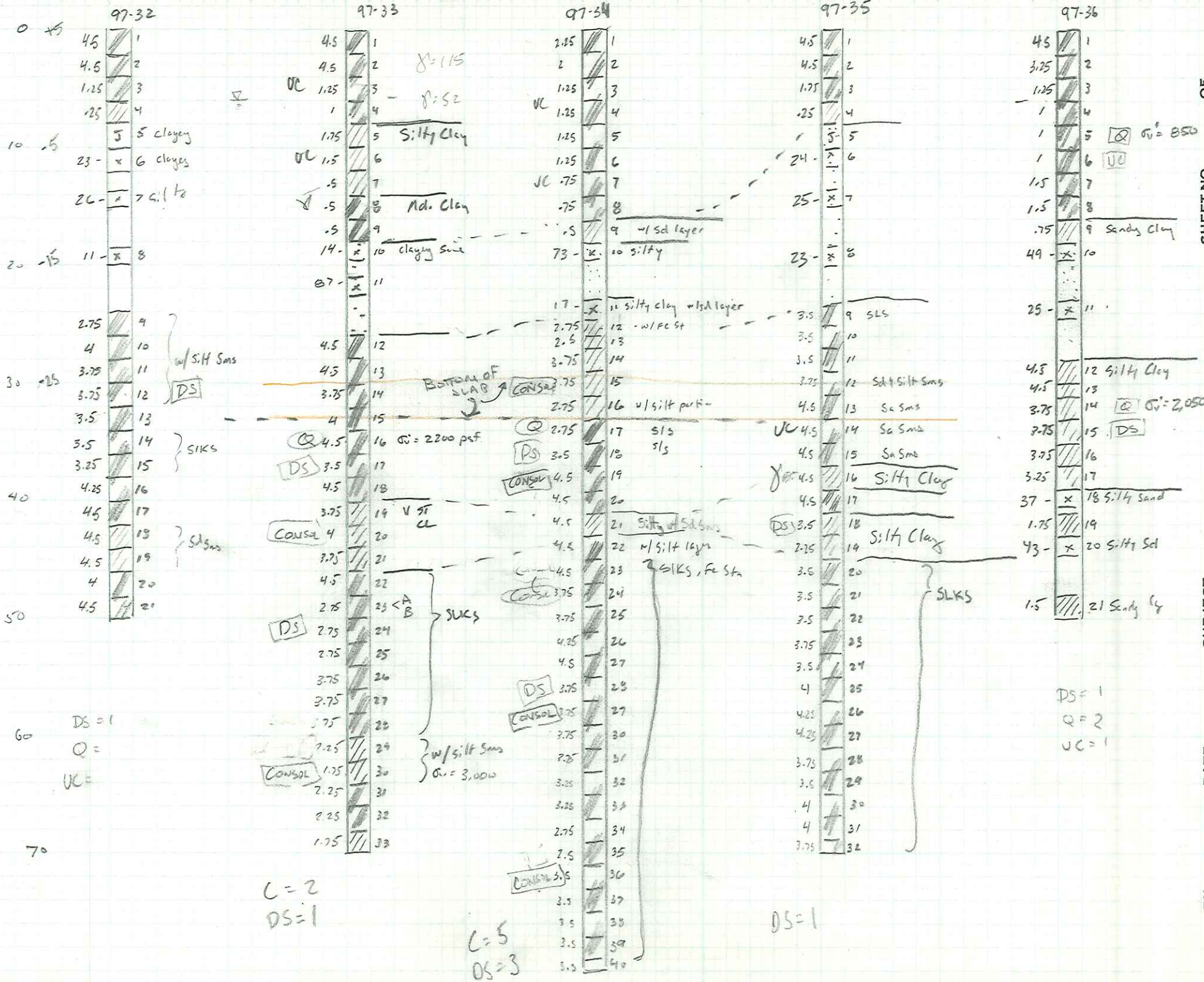
ADJUSTED DIRECT SHEAR TESTS
CH MATERIAL

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY GENERAL
REEVALUATION REPORT
DATED: DEC 1997

FILE NO. GRAPH.DGN

FIGURE 2-11



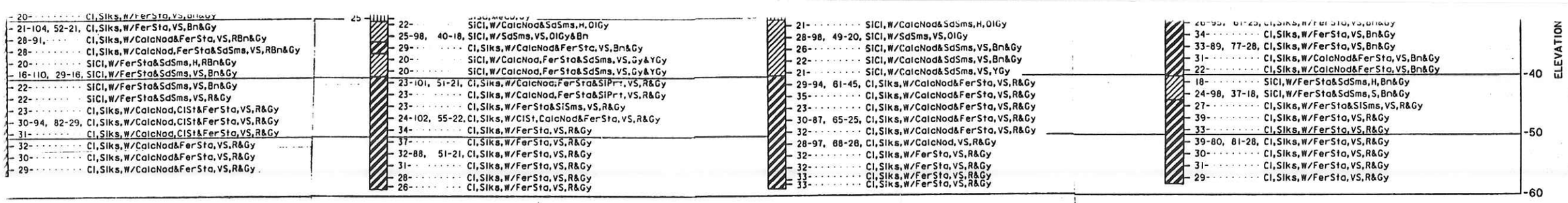
SHEET NO. ..... OF .....

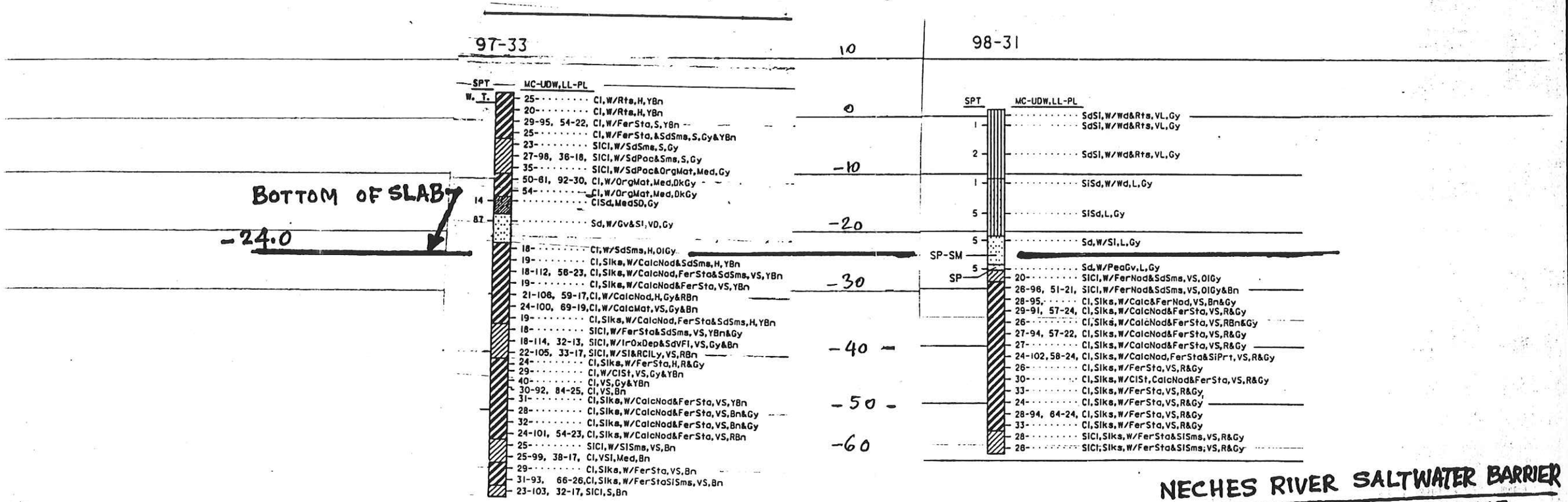
JOB NO. .....

SUBJECT .....

BY ..... DATE .....

CHKD. BY ..... DATE .....

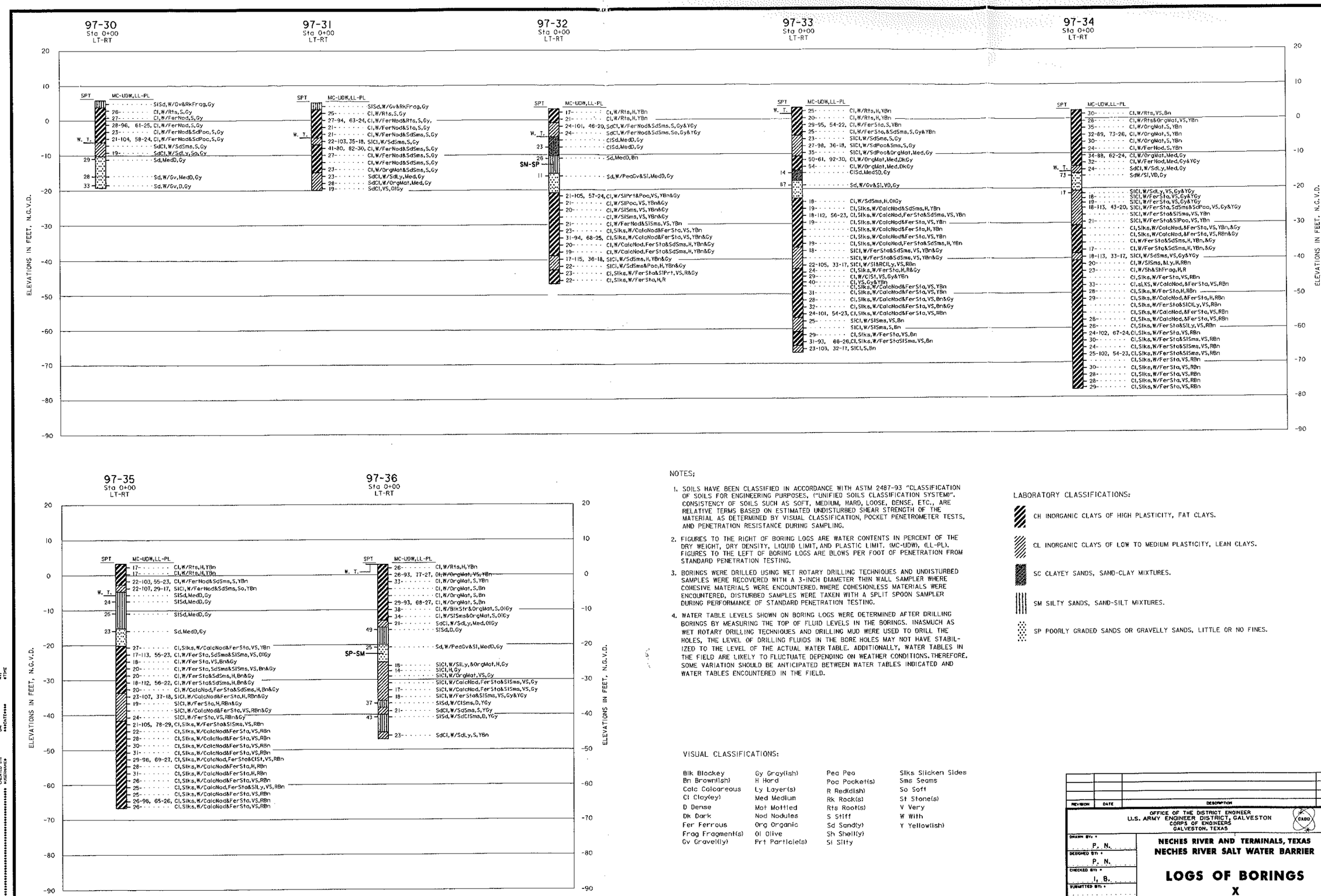




NECHES RIVER SALTWATER BARRIER

TAINTER GATE STRUCTURE

SOIL PROFILE



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- SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

VISUAL CLASSIFICATIONS:

Blk Blockey	Gy Gray(ish)	Pea Pea	Slks Slicken Sides
Bn Brown(ish)	H Hard	Poc Pocket(s)	Sms Seams
Calc Calcareous	Ly Layer(s)	R Red(dish)	So Soft
Cl Clay(ey)	Med Medium	Rk Rock(s)	St Stone(s)
D Dense	Mot Mottled	Rts Root(s)	V Very
Dk Dark	Nod Nodules	S Stiff	W With
Fer Ferrous	Org Organic	Sd Sand(y)	Y Yellow(ish)
Frag Fragment(s)	Ol Olive	Sh Shell(y)	
Gv Gravel(ly)	Prt Particle(s)	Si Silty	

REVISION	DATE	DESCRIPTION	BY

OFFICE OF THE DISTRICT ENGINEER
U.S. ARMY ENGINEER DISTRICT, GALVESTON
CORPS OF ENGINEERS
GALVESTON, TEXAS

CADD

DRAWN BY: P. N.
DESIGNED BY: P. N.
CHECKED BY: I. B.
SUBMITTED BY:
CHIEF,
APPROVED:
CHIEF, ENGINEERING DIVISION

NECHES RIVER AND TERMINALS, TEXAS
NECHES RIVER SALT WATER BARRIER

LOGS OF BORINGS
X

DATE: X
SCALE: AS SHOWN
SPEC. DATE:
DRAWING NUMBER: X
SHEET 1 OF X
FILE NO. X

Prepared under the direction of
Erla R. Potts, Col., C.E.,
District Engineer

EXHIBIT A-1

DESIGN FILE: BORE_LOGN
CREATED BY: ***
ON: ***DATE***
AT: *TIME

SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
NECHES RIVER SALT WATER BARRIER
BEAUMONT, TEXAS
TABLE-

BORING NO.	DEPTH (FT.)	DENSITY DATA Moisture Cont. %	DENSITY DATA Dry Wt (pcf)	MECHANICAL ANALYSIS Gvl.	MECHANICAL ANALYSIS Sand	MECHANICAL ANALYSIS Fine	ATTERBURG LIMITS L.L.	ATTERBURG LIMITS P.L.	% STRAIN @ MAX. STRESS	UNCON. COMP. STR (pcf)	CLASSIFICATION
97-30	6 - 8	27.7	95.5	0	4	96.0	61.0	25.0	3.6	1290	Clay, W / ferrous nodules, Stiff, Gray
97-31	4 - 6	26.5	93.6	0	2	98.0	63.0	24.0	5	1320	Clay, W / ferrous nodules, Stiff, Gray
97-31	12-14	23.6	80.3	-	-	-	82.0	30.0	5.4	1220	Clay, W / ferrous nodules & sand seams, Stiff, Gray
97-32	4 - 6	20.7	100.8	0	30	70.0	46.0	20.0	3.4	1227	Sandy Clay, W / ferrous nodules & sand seams, Stiff, Gray & yellowish gray
97-32	24-26	20.7	104.7	0	1	99.0	57.0	24.0	4.3	2300	Clay, W / Silt parting & silt pockets, Very stiff, Yellowish brown & gray
97-33	4 - 6	29.0	94.7	0	2	98.0	54.0	22.0	2.8	1050	Clay, W / ferrous stains, Stiff, Yellowish brown
97-33	10-12	27.3	98.2	0	4	96.0	36.0	18.0	4	1280	Silty Clay, W / sand pockets & sand seams, Stiff, Gray
97-33	44-46	22.4	104.7	0	2	98.0	33.0	104.7	3.7	2230	Silty Clay, W / silt & red clay layer, Very stiff, Reddish brown
97-33	58-60	24.3	100.9	0	2	98.0	54.0	23.0	2	2380	Clay, W / calc nod & fer stains, Slickensided, Very stiff, Reddish brown
97-34	6 - 8	32.1	88.8	0	2	98.0	73.0	26.0	4	1210	Clay, W / organic material, Stiff, Yellowish brown
97-34	12-14	34.4	87.7	0	1	99.0	62.0	24.0	2.3	620	Clay, W / organic material, Medium Stiff, Gray
97-34	27-29	18.4	112.8	0	13	87.0	43.0	20.0	6	2140	Silty Clay, W / ferrous stains, sand seams,and sand pockets, Very stiff, Gray & yellowish gray
97-34	41-43	18.1	113.1	0	15	85.0	33.0	17.0	3.4	3080	Silty Clay, W / sand seams, Very stiff, Gray & yellowish gray
97-34	69-71	25.1	102.1	0	1	99.0	54.0	23.0	3.2	2530	Clay, W / ferrous stains & silt seams, Slickensided Very stiff, Reddish brown
97-35	4 - 6	21.7	102.6	0	4	96.0	55.6	102.0	3.6	1270	Clay, W / ferrous nodules & sand seams, Stiff, Yellowish brown
97-35	33-35	17.9	111.8	0	4	96.0	56.0	22.0	3	4630	Clay, W / ferrous stains & sand seams, Hard, Brown & Gray
97-36	10-12	29.0	92.6	0	1	99.0	86.0	27.0	2.9	1110	Clay, W / organic material, Stiff, Brown

HP 12x53 Batter 1H : 2V

Prepared by: Ishaq Syed 9 Oct. 1998

PILE CAPACITY TABLE

Elevation	Depth Below Top of Pile (Ft)	Capacity Mode	BORING Nos.					
			98-30	98-31		98-27	98-39	97-33
			Ultimate Pile Capacity in Tons					
-30	8	Compression	2.2	2		**4.1**		1.9
		Tension	0.6	0.6		**0.43**		0.48
-40	18	Compression	7.8	7.9		**13.71**		13.58
		Tension	3.6	3.7		**4.06**		4.28
-50	28	Compression	14.4	13.5		**14.93**		15.4
		Tension	8.3	7.4		**7.88**		8.76
-60	38	Compression	19.7	24.4		**20.23**		21.11
		Tension	12	12.2		**11.7**		12.91
-70	48	Compression	25.4	26.8		**25.8**		26.88
		Tension	16	17		**15.6**		17.06
-80	58	Compression	31	32.4		**30.8**		32.64
		Tension	20	21		**19.2**		21.21

ISHAQ SYED
Sept. 1998

Neches River Saltwater Barrier

TAINTER GATE STRUCTURE

Pile Capacity computations:

Borings 98-27, 98-33, 97-33 and 98-39 will be examined for soil parameters.

A) Similar soil conditions exist for boring No. 98-27 and 98-33, in the middle of structure foundation.

i.e.

El. -24 to -32 silty sand, L
-32 to -40 silty clay, Very stiff
-40 to -60 fat clay, slickensided, V/stiff

B) At both ends, the foundation soil consists of very stiff, slickensided fat clay with an intermediate layer of silty clay (V/S)

Pile capacity will be computed for both the above cases.

$\gamma_w = 63$ pcf (saltwater)

CASE A:

Elevation (NGVD)	Short term condition			Long Term Condition		
	γ_s (pcf)	c (psf)	ϕ	γ_s (pcf)	c (psf)	ϕ
-24 to -32	57	0	30		0	30
-32 To -40		2000	0		0	24

Long Term Condition

Pile in compression

Pile Tip @ -~~40~~ -32:

$$Q_{s1} = 1.75\left(\frac{0+47}{2}\times 8\tan(30\times 0.7)\right)\left[4.31\times 1.118\right]$$

$$= 4868.3 \text{ lbs.}$$

$$Q_{b_1} = \sigma_v' N_q A_t$$

$$= 8\times 47\times 21\times 1.16$$

$$376\times 21\times 1.16 = 9159.36 \text{ lbs.}$$

12.9"

13" A = 1.16

ultimate capacity: $Q_{s1} + Q_b = 4868.3 + 9159.36 = 14{,}027.66$ lbs

$= 7$ tons. compress

Pile Tip @ -40

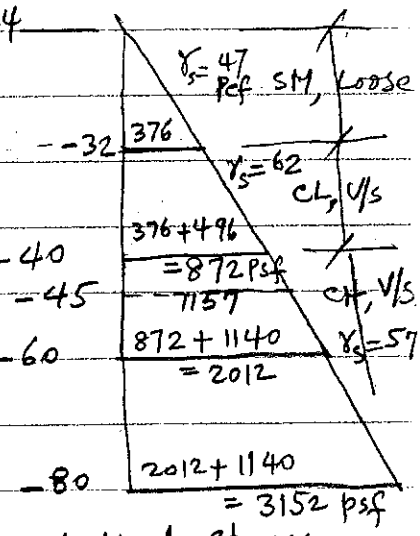
$$Q_{ult} = Q_{s1} + Q_{s2} + Q_{b_2}$$

$$= 4868.3 + 1.25\left(\frac{376+872}{2}\right)\tan(26\times 0.7)(4.31\times 1.118\times 8)$$

$$+ (872\times 18\times 1.16)$$

$$= 4868.3 + 9885.83 + 18207.36$$

$$32961.49 \text{ Lbs} = \underline{16.4 \text{ Tons}} \text{ (Comp)}$$



Pile Tip @ -45:

$$Q_{ult} = Q_{s1} + Q_{s2} + Q_{s3} + Q_{b3}$$

$$= 4868.3 + 9885.83$$

$$+ 1.25\left(\frac{872+872}{2}\right)\tan(17\times 0.7)(4.31\times 5\times 1.118)$$

$$+ (872\times 6\times 1.16) \quad (\sigma_v \text{ limited to } 16')$$

$$Q_{ult} = 4868.3 + 9885.8 + 5534.1 + 6069.1$$

$$= 26357.3 \text{ Lbs}$$

$$= \underline{13.17 \text{ Tons.}}$$

$D_c = 15B$

$= 15\times\frac{12.9}{12} = 16.125'$

$D@40 = (-40-(-24))$

$= \underline{16' < 16.125}$

CASE B

Borings Nos. 98-30 and 98-31 are located on the east end of the Tainter Gate structure, and 98-39 and 97-33 are located on the west side of the structure.

SOIL TYPE	Material Strata			
	98-30	98-31	98-39	97-33
CH, SIK, V/S	El. -24 to -40 = 16'	El -24 to -55 = 31'	El. -24 to -34 = 10'	El. -24 to -3 = 10'
CL, V/S	El. -40 to -44 = 4'	El. -55 to 65 = 10'	El. -34 to -44 = 10'	El. -34 to -4 = 8'
CH, SIK, V/S	El. -44 to 60 = 16'	—	El -44 to -60 16'	El. -42 to -60 18'

HP 12x53 Batter 1H : 2V (Adopted)

Prepared by: Ishaq Syed 9 Oct. 1998

PILE CAPACITY TABLE

Elevation	Depth Below Top of Pile (Ft)	Capacity Mode	BORING Nos.					
			98-30	98-31		98-27	98-39	97-33
			Ultimate Pile Capacity in Tons					
-30	8	Compression	2.2	2		**4.1**		1.9
		Tension	0.6	0.6		**0.43**		0.48
-40	18	Compression	7.8	7.9		**13.71**		13.58
		Tension	3.6	3.7		**4.06**		4.28
-50	28	Compression	14.4	13.5		**14.93**		15.4
		Tension	8.3	7.4		**7.88**		8.76
-60	38	Compression	19.7	24.4		**20.23**		21.11
		Tension	12	12.2		**11.7**		12.91
-70	48	Compression	25.4	26.8		**25.8**		26.88
		Tension	16	17		**15.6**		17.06
-80	58	Compression	31	32.4		**30.8**		32.64
		Tension	20	21		**19.2**		21.21

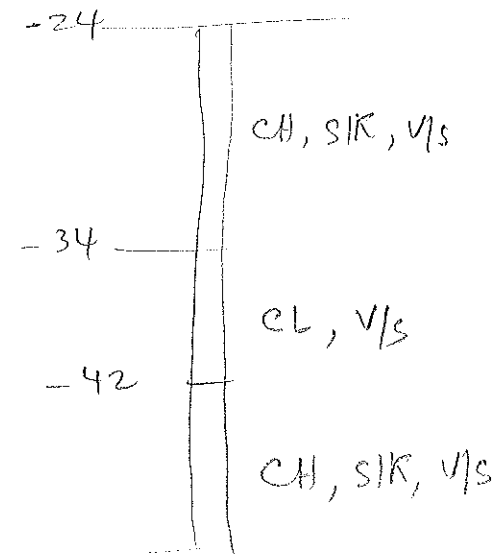
Boring 97-33
HP 12x53
Batter 1H:2V

PILE CAPACITY **ENTER ALL RED VALUES**

If pile is round 0, if square 1	1	
Pile Diameter	12.045	inches, BUTT
	11.78	inches, TIP
Assume Pile Length	68	feet
Top Surface Elev	-24	feet
Batter	63.4	degrees
Water Elev.	2	
Unit weight of Pile	62.4	pcf

Dc = # * B	=	15

Critical Depth Elevation	=	-39
Tip Elevation	=	-85



	Stratum Number	Bouyant Density pcf	Strength Prop Delta Fric, Ang. phi*delt	Strata Cohesion psf	Adhesion Reduction Factor	Coef Ear Prs. Kc	Coef Ear. Prs. Kt	Terzaghi Nc	Terzaghi Nq	Bottom Elev. -24
Clay CH	1	57	13.3	0	0	1.25	0.9	9	7.5	-25
V/stiff	1	57	13.3	0	0	1.25	0.9	9	7.5	-26
	1	57	13.3	0	0	1.25	0.9	9	7.5	-27
	1	57	13.3	0	0	1.25	0.9	9	7.5	-28
	1	57	13.3	0	0	1.25	0.9	9	7.5	-29
	1	57	13.3	0	0	1.25	0.9	9	7.5	-30
	1	57	13.3	0	0	1.25	0.9	9	7.5	-31
	1	57	13.3	0	0	1.25	0.9	9	7.5	-32
	1	57	13.3	0	0	1.25	0.9	9	7.5	-33
	1	57	13.3	0	0	1.25	0.9	9	7.5	-34
Clay CL	2	62	18.2	0	0	1.25	0.9	9	18	-35
V/stiff	2	62	18.2	0	0	1.25	0.9	9	18	-36
	2	62	18.2	0	0	1.25	0.9	9	18	-37
	2	62	18.2	0	0	1.25	0.9	9	18	-38
	2	62	18.2	0	0	1.25	0.9	9	18	-39
	2	62	18.2	0	0	1.25	0.9	9	18	-40

	2	62	18.2	0	0	1.25	0.9	9	18	-41
	2	62	18.2	0	0	1.25	0.9	9	18	-42
Clay CH	3	57	13.3	0	0	1.25	0.9	9	7.5	-43
V/stiff	3	57	13.3	0	0	1.25	0.9	9	7.5	-44
	3	57	13.3	0	0	1.25	0.9	9	7.5	-45
	3	57	13.3	0	0	1.25	0.9	9	7.5	-46
	3	57	13.3	0	0	1.25	0.9	9	7.5	-47
	3	57	13.3	0	0	1.25	0.9	9	7.5	-48
	3	57	13.3	0	0	1.25	0.9	9	7.5	-49
	3	57	13.3	0	0	1.25	0.9	9	7.5	-50
	3	57	13.3	0	0	1.25	0.9	9	7.5	-51
	3	57	13.3	0	0	1.25	0.9	9	7.5	-52
	3	57	13.3	0	0	1.25	0.9	9	7.5	-53
	3	57	13.3	0	0	1.25	0.9	9	7.5	-54
	3	57	13.3	0	0	1.25	0.9	9	7.5	-55
	3	57	13.3	0	0	1.25	0.9	9	7.5	-56
	3	57	13.3	0	0	1.25	0.9	9	7.5	-57
	3	57	13.3	0	0	1.25	0.9	9	7.5	-58
	3	57	13.3	0	0	1.25	0.9	9	7.5	-59
	3	57	13.3	0	0	1.25	0.9	9	7.5	-60
	3	57	13.3	0	0	1.25	0.9	9	7.5	-61
	3	57	13.3	0	0	1.25	0.9	9	7.5	-62
	3	57	13.3	0	0	1.25	0.9	9	7.5	-63
	2	57	13.3	0	0	1.25	0.9	9	7.5	-64
	3	57	13.3	0	0	1.25	0.9	9	7.5	-65
	3	57	13.3	0	0	1.25	0.9	9	7.5	-66
	3	57	13.3	0	0	1.25	0.9	9	7.5	-67
	3	57	13.3	0	0	1.25	0.9	9	7.5	-68
	3	57	13.3	0	0	1.25	0.9	9	7.5	-69
	3	57	13.3	0	0	1.25	0.9	9	7.5	-70
	3	57	13.3	0	0	1.25	0.9	9	7.5	-71
	3	57	13.3	0	0	1.25	0.9	9	7.5	-72
	3	57	13.3	0	0	1.25	0.9	9	7.5	-73
	3	57	13.3	0	0	1.25	0.9	9	7.5	-74

Pile Capacity		Skin	Tip	Total
Compresion (lbs)	=	64698	6360	71058
Compresion (ton)	=	32.35	3.18	35.53
Tension (lbs)	=	46583		46583
Tension (ton)	=	23.29		23.29

Construction condition - Batter; 1H:2V

Weight of pile lbs	Dc Equiv. Bottom -24	Dist. From pile tip L	Average Pile Dia. inches	Pile Length in Sublayer	Total Surface in sub layer (ft^2)	Tip Area (ft^2)	Cohesionless Calculations: stress at bottom 0	stress for skin friction w/ Dc 0	avg-stress psf w/Dc	avg - su psf	comp. fs=kcsu	tension fs=ktSu
0	-25	60.5	12.02	1.12	4.48	0.96	57	57	28.5	7	8	6
0	-26	59.5	12.01	1.12	4.48	0.96	114	114	85.5	20	25	18
0	-27	58.5	12.01	1.12	4.48	0.96	171	171	142.5	34	42	30
0	-28	57.5	12.00	1.12	4.48	0.96	228	228	199.5	47	59	42
0	-29	56.5	12.00	1.12	4.47	0.96	285	285	256.5	61	76	55
0	-30	55.5	12.00	1.12	4.47	0.96	342	342	313.5	74	93	67
0	-31	54.5	11.99	1.12	4.47	0.96	399	399	370.5	88	109	79
0	-32	53.5	11.99	1.12	4.47	0.96	456	456	427.5	101	126	91
0	-33	52.5	11.98	1.12	4.47	0.96	513	513	484.5	115	143	103
0	-34	51.5	11.98	1.12	4.47	0.96	570	570	541.5	128	160	115
0	-35	50.5	11.98	1.12	4.46	0.96	632	632	601	198	247	178
0	-36	49.5	11.97	1.12	4.46	0.96	694	694	663	218	272	196
0	-37	48.5	11.97	1.12	4.46	0.96	756	756	725	238	298	215
0	-38	47.5	11.97	1.12	4.46	0.96	818	818	787	259	323	233
0	-39	46.5	11.96	1.12	4.46	0.96	880	880	849	279	349	251
0	-39	45.5	11.96	1.12	4.46	0.96	942	880	880	289	362	260

0	-39	44.5	11.95	1.12	4.46	0.96	1004	880	880	289	362	260
0	-39	43.5	11.95	1.12	4.45	0.96	1066	880	880	289	362	260
0	-39	42.5	11.95	1.12	4.45	0.96	1123	880	880	208	260	187
0	-39	41.5	11.94	1.12	4.45	0.96	1180	880	880	208	260	187
0	-39	40.5	11.94	1.12	4.45	0.96	1237	880	880	208	260	187
0	-39	39.5	11.93	1.12	4.45	0.96	1294	880	880	208	260	187
0	-39	38.5	11.93	1.12	4.45	0.96	1351	880	880	208	260	187
0	-39	37.5	11.93	1.12	4.45	0.96	1408	880	880	208	260	187
0	-39	36.5	11.92	1.12	4.44	0.96	1465	880	880	208	260	187
0	-39	35.5	11.92	1.12	4.44	0.96	1522	880	880	208	260	187
0	-39	34.5	11.91	1.12	4.44	0.96	1579	880	880	208	260	187
0	-39	33.5	11.91	1.12	4.44	0.96	1636	880	880	208	260	187
0	-39	32.5	11.91	1.12	4.44	0.96	1693	880	880	208	260	187
0	-39	31.5	11.90	1.12	4.44	0.96	1750	880	880	208	260	187
0	-39	30.5	11.90	1.12	4.44	0.96	1807	880	880	208	260	187
0	-39	29.5	11.89	1.12	4.43	0.96	1864	880	880	208	260	187
0	-39	28.5	11.89	1.12	4.43	0.96	1921	880	880	208	260	187
0	-39	27.5	11.89	1.12	4.43	0.96	1978	880	880	208	260	187
0	-39	26.5	11.88	1.12	4.43	0.96	2035	880	880	208	260	187
0	-39	25.5	11.88	1.12	4.43	0.96	2092	880	880	208	260	187
0	-39	24.5	11.88	1.12	4.43	0.96	2149	880	880	208	260	187
0	-39	23.5	11.87	1.12	4.43	0.96	2206	880	880	208	260	187
0	-39	22.5	11.87	1.12	4.42	0.96	2263	880	880	208	260	187
0	-39	21.5	11.86	1.12	4.42	0.96	2320	880	880	208	260	187
0	-39	20.5	11.86	1.12	4.42	0.96	2377	880	880	208	260	187
0	-39	19.5	11.86	1.12	4.42	0.96	2434	880	880	208	260	187
0	-39	18.5	11.85	1.12	4.42	0.96	2491	880	880	208	260	187
0	-39	17.5	11.85	1.12	4.42	0.96	2548	880	880	208	260	187
0	-39	16.5	11.84	1.12	4.42	0.96	2605	880	880	208	260	187
0	-39	15.5	11.84	1.12	4.41	0.96	2662	880	880	208	260	187
0	-39	14.5	11.84	1.12	4.41	0.96	2719	880	880	208	260	187
0	-39	13.5	11.83	1.12	4.41	0.96	2776	880	880	208	260	187
0	-39	12.5	11.83	1.12	4.41	0.96	2833	880	880	208	260	187
0	-39	11.5	11.82	1.12	4.41	0.96	2890	880	880	208	260	187

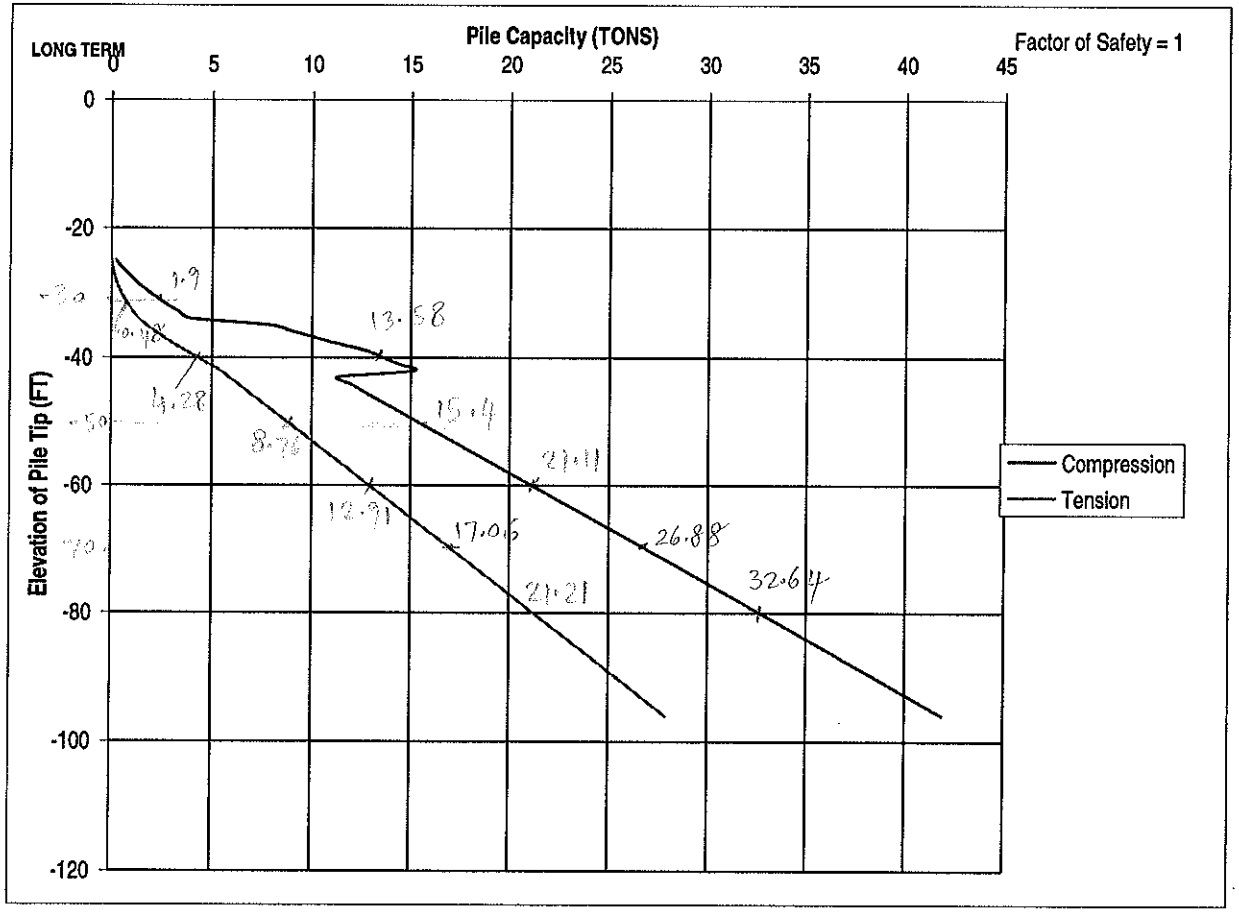
Pile Capacity		Skin	Tip	Pile Weight	Total
Compresion (lbs)	=	64698	6360.218	0	71058
Compresion (ton)	=	32.35	3.18	0.00	35.53
Tension (lbs)	=	46583		0	46583
Tension (ton)	=	23.29		0.00	23.29

		Cohesionless			Cohesive		
Stratum Number	Bottom Elevation -24	Qskin Comp. lbs	Qskin Tension lbs	End Bearing lbs	Qskin lbs	End Bearing lbs	End Bearing lbs
1	-25	38	27	411.9687	0	0	0
1	-26	113	81	823.9374	0	0	0
1	-27	188	136	1235.906	0	0	0
1	-28	264	190	1647.875	0	0	0
1	-29	339	244	2059.843	0	0	0
1	-30	414	298	2471.812	0	0	0
1	-31	489	352	2883.781	0	0	0
1	-32	565	406	3295.75	0	0	0
1	-33	640	461	3707.718	0	0	0
1	-34	715	515	4119.687	0	0	0
2	-35	1103	794	10962.7	0	0	0
2	-36	1216	876	12038.16	0	0	0
2	-37	1329	957	13113.61	0	0	0
2	-38	1443	1039	14189.07	0	0	0
2	-39	1556	1120	15264.52	0	0	0
2	-40	1612	1161	15264.52	0	0	0

Pile Length	Capacity Comp	Tension	Pile tip Elev
	35.53	23.29	-85
1	0.224684	0.013463	-25
2	0.486558	0.053704	-26
3	0.785691	0.120772	-27
4	1.122085	0.214666	-28
5	1.121627	0.214337	-28
6	1.495149	0.334963	-29
7	1.905928	0.482416	-30
8	2.353966	0.656694	-31
9	2.839262	0.857799	-32
10	3.361818	1.085731	-33
11	3.921634	1.340489	-34
12	7.888406	1.733079	-35
13	9.027885	2.16634	-36
14	10.22383	2.640253	-37
15	10.22229	2.639149	-37
16	11.47449	3.153569	-38

2	-41	1612	1160	15264.52	0	0	0	17	12.78311	3.708613	-39
2	-42	1611	1160	15264.52	0	0	0	18	13.58243	4.284121	-40
3	-43	1158	834	6360.218	0	0	0	19	14.38214	4.859912	-41
3	-44	1158	833	6360.218	0	0	0	20	15.18218	5.435943	-42
3	-45	1157	833	6360.218	0	0	0	21	11.30708	5.851419	-43
3	-46	1157	833	6360.218	0	0	0	22	11.88416	6.266917	-44
3	-47	1156	833	6360.218	0	0	0	23	12.46127	6.682434	-45
3	-48	1156	832	6360.218	0	0	0	24	12.45853	6.680466	-45
3	-49	1156	832	6360.218	0	0	0	25	13.03553	7.0959	-46
3	-50	1155	832	6360.218	0	0	0	26	13.61255	7.511355	-47
3	-51	1155	832	6360.218	0	0	0	27	14.18959	7.92683	-48
3	-52	1155	831	6360.218	0	0	0	28	14.76667	8.342321	-49
3	-53	1154	831	6360.218	0	0	0	29	15.34376	8.757828	-50
3	-54	1154	831	6360.218	0	0	0	30	15.92087	9.173348	-51
3	-55	1153	830	6360.218	0	0	0	31	16.498	9.588881	-52
3	-56	1153	830	6360.218	0	0	0	32	17.07514	10.00443	-53
3	-57	1153	830	6360.218	0	0	0	33	17.6523	10.41998	-54
3	-58	1152	830	6360.218	0	0	0	34	17.64883	10.41748	-54
3	-59	1152	829	6360.218	0	0	0	35	18.22593	10.83299	-55
3	-60	1152	829	6360.218	0	0	0	36	18.80303	11.24851	-56
3	-61	1151	829	6360.218	0	0	0	37	19.38016	11.66404	-57
3	-62	1151	829	6360.218	0	0	0	38	19.9573	12.07957	-58
3	-63	1150	828	6360.218	0	0	0	39	20.53445	12.49512	-59
2	-64	1150	828	6360.218	0	0	0	40	21.11161	12.91068	-60
3	-65	1150	828	6360.218	0	0	0	41	21.68878	13.32624	-61
3	-66	1149	827	6360.218	0	0	0	42	22.26596	13.74181	-62
3	-67	1149	827	6360.218	0	0	0	43	22.26215	13.73907	-62
3	-68	1149	827	6360.218	0	0	0	44	22.83928	14.1546	-63
3	-69	1148	827	6360.218	0	0	0	45	23.41643	14.57015	-64
3	-70	1148	826	6360.218	0	0	0	46	23.99359	14.9857	-65
3	-71	1147	826	6360.218	0	0	0	47	24.57075	15.40126	-66
3	-72	1147	826	6360.218	0	0	0	48	25.14793	15.81683	-67
3	-73	1147	826	6360.218	0	0	0	49	25.72511	16.2324	-68
3	-74	1146	825	6360.218	0	0	0	50	26.3023	16.64798	-69

92-33


LONG TERM
Pile Capacity (TONS)
Factor of Safety = 1
0
5
10
15
20
25
30
35
40
45
0
-20
-40
-60
-80
-100
-120
Elevation of Pile Tip (FT)
Compression
Tension
1.9
13.58
4.28
8.76
15.4
21.11
12.91
17.06
26.88
21.21
32.64

Boring No. 97-33

HP14x73, Batter 1H:2V

Long Term condition

PILE CAPACITY **ENTER ALL RED VALUES**

If pile is round 0, if square 1	1	
Pile Diameter	13.61	inches, BUTT
	14.58	inches, TIP
Assume Pile Length	68	feet
Top Surface Elev	-24	feet
Batter	63.4	degrees
Water Elev.	2	
Unit weight of Pile	62.4	pcf

Dc = # * B	=	15
Critical Depth Elevation	=	-39
Tip Elevation	=	-85

El-24

-34

	Stratum Number	Bouyant Density pcf	Strength Prop: Delta Fric, Ang. phi*delt	Strata Cohesion psf	Adhesion Reduction Factor	Coef Ear Prs. Kc	Coef Ear. Prs. Kt	Terzaghi Nc	Terzaghi Nq	Bottom Elev. -24
Clay CH V/stiff	1	57	13.3	0	0	1.25	0.9	9	7.5	-25
	1	57	13.3	0	0	1.25	0.9	9	7.5	-26
	1	57	13.3	0	0	1.25	0.9	9	7.5	-27
	1	57	13.3	0	0	1.25	0.9	9	7.5	-28
	1	57	13.3	0	0	1.25	0.9	9	7.5	-29
	1	57	13.3	0	0	1.25	0.9	9	7.5	-30
	1	57	13.3	0	0	1.25	0.9	9	7.5	-31
	1	57	13.3	0	0	1.25	0.9	9	7.5	-32
	1	57	13.3	0	0	1.25	0.9	9	7.5	-33
	1	57	13.3	0	0	1.25	0.9	9	7.5	-34
Clay CL V/stiff	2	62	18.2	0	0	1.25	0.9	9	18	-35
	2	62	18.2	0	0	1.25	0.9	9	18	-36
	2	62	18.2	0	0	1.25	0.9	9	18	-37
	2	62	18.2	0	0	1.25	0.9	9	18	-38
	2	62	18.2	0	0	1.25	0.9	9	18	-39
	2	62	18.2	0	0	1.25	0.9	9	18	-40

El. -42
← Clay CH
V/stiff

2	62	18.2	0	0	1.25	0.9	9	18	-41
2	62	18.2	0	0	1.25	0.9	9	18	-42
3	57	13.3	0	0	1.25	0.9	9	7.5	-43
3	57	13.3	0	0	1.25	0.9	9	7.5	-44
3	57	13.3	0	0	1.25	0.9	9	7.5	-45
3	57	13.3	0	0	1.25	0.9	9	7.5	-46
3	57	13.3	0	0	1.25	0.9	9	7.5	-47
3	57	13.3	0	0	1.25	0.9	9	7.5	-48
3	57	13.3	0	0	1.25	0.9	9	7.5	-49
3	57	13.3	0	0	1.25	0.9	9	7.5	-50
3	57	13.3	0	0	1.25	0.9	9	7.5	-51
3	57	13.3	0	0	1.25	0.9	9	7.5	-52
3	57	13.3	0	0	1.25	0.9	9	7.5	-53
3	57	13.3	0	0	1.25	0.9	9	7.5	-54
3	57	13.3	0	0	1.25	0.9	9	7.5	-55
3	57	13.3	0	0	1.25	0.9	9	7.5	-56
3	57	13.3	0	0	1.25	0.9	9	7.5	-57
3	57	13.3	0	0	1.25	0.9	9	7.5	-58
3	57	13.3	0	0	1.25	0.9	9	7.5	-59
3	57	13.3	0	0	1.25	0.9	9	7.5	-60
3	57	13.3	0	0	1.25	0.9	9	7.5	-61
3	57	13.3	0	0	1.25	0.9	9	7.5	-62
3	57	13.3	0	0	1.25	0.9	9	7.5	-63
2	57	13.3	0	0	1.25	0.9	9	7.5	-64
3	57	13.3	0	0	1.25	0.9	9	7.5	-65
3	57	13.3	0	0	1.25	0.9	9	7.5	-66
3	57	13.3	0	0	1.25	0.9	9	7.5	-67
3	57	13.3	0	0	1.25	0.9	9	7.5	-68
3	57	13.3	0	0	1.25	0.9	9	7.5	-69
3	57	13.3	0	0	1.25	0.9	9	7.5	-70
3	57	13.3	0	0	1.25	0.9	9	7.5	-71
3	57	13.3	0	0	1.25	0.9	9	7.5	-72
3	57	13.3	0	0	1.25	0.9	9	7.5	-73
3	57	13.3	0	0	1.25	0.9	9	7.5	-74

Pile Capacity		Skin	Tip	Total
Compresion (lbs)	=	77184	9743	86927
Compresion (ton)	=	38.59	4.87	43.46
Tension (lbs)	=	55573		55573
Tension (ton)	=	27.79		27.79

Construction condition - Batter; 1H:2V

Weight of pile lbs	Dc Equiv. Bottom -24	Dist. From pile tip L	Average Pile Dia. inches	Pile Length in Sublayer	Total Surface in sub layer (ft^2)	Tip Area (ft^2)	Cohesionless Calculations: stress at bottom 0	stress for skin friction w/ Dc 0	avg-stress psf w/Dc	avg - su psf	comp. fs=kcsu	tension fs=ktSu
0	-25	60.5	13.72	1.12	5.11	1.48	57	57	28.5	7	8	6
0	-26	59.5	13.73	1.12	5.12	1.48	114	114	85.5	20	25	18
0	-27	58.5	13.75	1.12	5.12	1.48	171	171	142.5	34	42	30
0	-28	57.5	13.76	1.12	5.13	1.48	228	228	199.5	47	59	42
0	-29	56.5	13.77	1.12	5.13	1.48	285	285	256.5	61	76	55
0	-30	55.5	13.79	1.12	5.14	1.48	342	342	313.5	74	93	67
0	-31	54.5	13.80	1.12	5.15	1.48	399	399	370.5	88	109	79
0	-32	53.5	13.82	1.12	5.15	1.48	456	456	427.5	101	126	91
0	-33	52.5	13.83	1.12	5.16	1.48	513	513	484.5	115	143	103
0	-34	51.5	13.85	1.12	5.16	1.48	570	570	541.5	128	160	115
0	-35	50.5	13.86	1.12	5.17	1.48	632	632	601	198	247	178
0	-36	49.5	13.87	1.12	5.17	1.48	694	694	663	218	272	196
0	-37	48.5	13.89	1.12	5.18	1.48	756	756	725	238	298	215
0	-38	47.5	13.90	1.12	5.18	1.48	818	818	787	259	323	233
0	-39	46.5	13.92	1.12	5.19	1.48	880	880	849	279	349	251
0	-39	45.5	13.93	1.12	5.19	1.48	942	880	880	289	362	260

0	-39	44.5	13.95	1.12	5.20	1.48	1004	880	880	289	362	260
0	-39	43.5	13.96	1.12	5.20	1.48	1066	880	880	289	362	260
0	-39	42.5	13.97	1.12	5.21	1.48	1123	880	880	208	260	187
0	-39	41.5	13.99	1.12	5.21	1.48	1180	880	880	208	260	187
0	-39	40.5	14.00	1.12	5.22	1.48	1237	880	880	208	260	187
0	-39	39.5	14.02	1.12	5.23	1.48	1294	880	880	208	260	187
0	-39	38.5	14.03	1.12	5.23	1.48	1351	880	880	208	260	187
0	-39	37.5	14.05	1.12	5.24	1.48	1408	880	880	208	260	187
0	-39	36.5	14.06	1.12	5.24	1.48	1465	880	880	208	260	187
0	-39	35.5	14.07	1.12	5.25	1.48	1522	880	880	208	260	187
0	-39	34.5	14.09	1.12	5.25	1.48	1579	880	880	208	260	187
0	-39	33.5	14.10	1.12	5.26	1.48	1636	880	880	208	260	187
0	-39	32.5	14.12	1.12	5.26	1.48	1693	880	880	208	260	187
0	-39	31.5	14.13	1.12	5.27	1.48	1750	880	880	208	260	187
0	-39	30.5	14.14	1.12	5.27	1.48	1807	880	880	208	260	187
0	-39	29.5	14.16	1.12	5.28	1.48	1864	880	880	208	260	187
0	-39	28.5	14.17	1.12	5.28	1.48	1921	880	880	208	260	187
0	-39	27.5	14.19	1.12	5.29	1.48	1978	880	880	208	260	187
0	-39	26.5	14.20	1.12	5.29	1.48	2035	880	880	208	260	187
0	-39	25.5	14.22	1.12	5.30	1.48	2092	880	880	208	260	187
0	-39	24.5	14.23	1.12	5.31	1.48	2149	880	880	208	260	187
0	-39	23.5	14.24	1.12	5.31	1.48	2206	880	880	208	260	187
0	-39	22.5	14.26	1.12	5.32	1.48	2263	880	880	208	260	187
0	-39	21.5	14.27	1.12	5.32	1.48	2320	880	880	208	260	187
0	-39	20.5	14.29	1.12	5.33	1.48	2377	880	880	208	260	187
0	-39	19.5	14.30	1.12	5.33	1.48	2434	880	880	208	260	187
0	-39	18.5	14.32	1.12	5.34	1.48	2491	880	880	208	260	187
0	-39	17.5	14.33	1.12	5.34	1.48	2548	880	880	208	260	187
0	-39	16.5	14.34	1.12	5.35	1.48	2605	880	880	208	260	187
0	-39	15.5	14.36	1.12	5.35	1.48	2662	880	880	208	260	187
0	-39	14.5	14.37	1.12	5.36	1.48	2719	880	880	208	260	187
0	-39	13.5	14.39	1.12	5.36	1.48	2776	880	880	208	260	187
0	-39	12.5	14.40	1.12	5.37	1.48	2833	880	880	208	260	187
0	-39	11.5	14.42	1.12	5.37	1.48	2890	880	880	208	260	187

Pile Capacity		Skin	Tip	Pile Weight	Total
Compresion (lbs)	=	77184	9743.085	0	86927
Compresion (ton)	=	38.59	4.87	0.00	43.46
Tension (lbs)	=	55573		0	55573
Tension (ton)	=	27.79		0.00	27.79

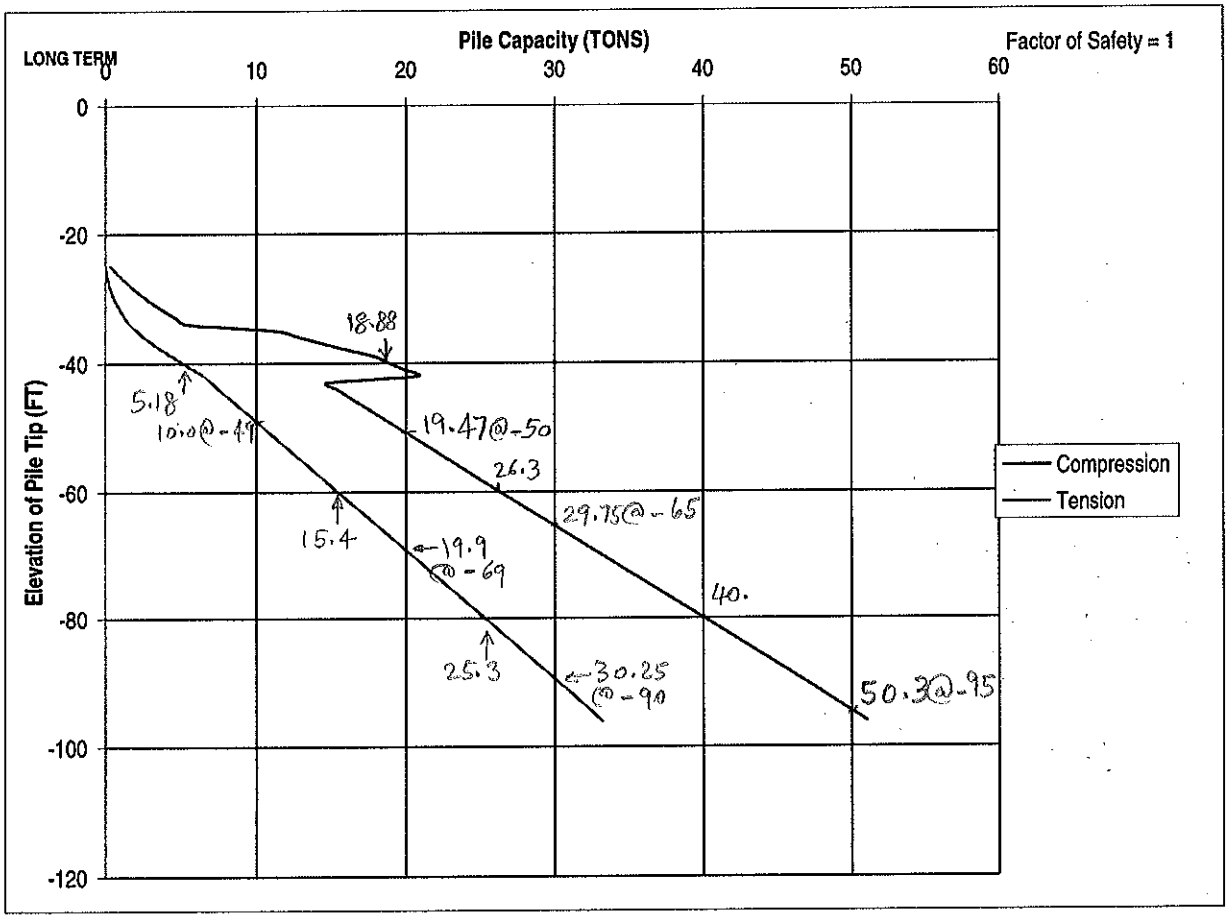
		Cohesionless			Cohesive	
Stratum Number	Bottom Elevation	Qskin Comp.	Qskin Tension	End Bearing	Qskin	End Bearing
	-24	lbs	lbs	lbs	lbs	lbs
1	-25	43	31	631.0862	0	0
1	-26	129	93	1262.172	0	0
1	-27	216	155	1893.259	0	0
1	-28	302	218	2524.345	0	0
1	-29	389	280	3155.431	0	0
1	-30	476	343	3786.517	0	0
1	-31	563	406	4417.603	0	0
1	-32	651	468	5048.69	0	0
1	-33	738	531	5679.776	0	0
1	-34	826	595	6310.862	0	0
2	-35	1276	919	16793.54	0	0
2	-36	1409	1015	18441	0	0
2	-37	1543	1111	20088.47	0	0
2	-38	1676	1207	21735.94	0	0
2	-39	1810	1303	23383.4	0	0
2	-40	1878	1352	23383.4	0	0

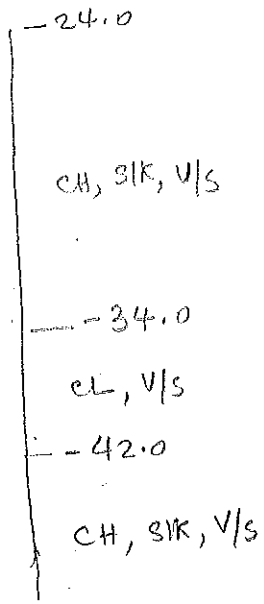
End Bearing lbs
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0

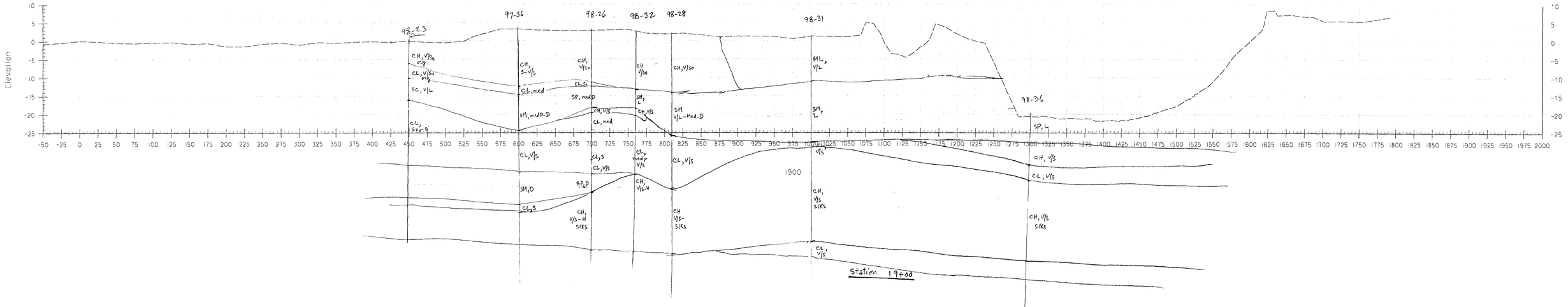
Pile Length	Capacity Comp	Tension	Pile tip Elev
	43.46	27.79	-85
1	0.337668	0.01593	-25
2	0.720348	0.064268	-26
3	1.147785	0.144832	-27
4	1.619981	0.257622	-28
5	1.621655	0.258828	-28
6	2.139091	0.40419	-29
7	2.701291	0.581783	-30
8	3.308253	0.791605	-31
9	3.959976	1.033655	-32
10	4.656459	1.307932	-33
11	5.397702	1.614435	-34
12	11.29961	2.090046	-35
13	12.85119	2.614098	-36
14	14.47015	3.186657	-37
15	14.47576	3.190701	-37
16	16.16283	3.8123	-38

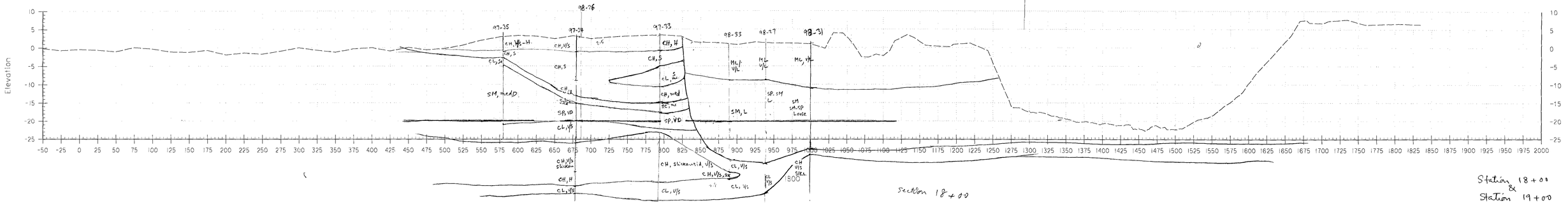
2	-41	1880	1354	23383.4	0	0	0	17	17.91741	4.482509	-39
2	-42	1882	1355	23383.4	0	0	0	18	18.88125	5.176471	-40
3	-43	1355	975	9743.085	0	0	0	19	19.84364	5.869397	-41
3	-44	1356	976	9743.085	0	0	0	20	20.80482	6.561443	-42
3	-45	1357	977	9743.085	0	0	0	21	14.66902	7.054185	-43
3	-46	1359	978	9743.085	0	0	0	22	15.35328	7.546848	-44
3	-47	1360	979	9743.085	0	0	0	23	16.03743	8.039442	-45
3	-48	1361	980	9743.085	0	0	0	24	16.04744	8.046646	-45
3	-49	1363	981	9743.085	0	0	0	25	16.73202	8.539543	-46
3	-50	1364	982	9743.085	0	0	0	26	17.41649	9.032361	-47
3	-51	1366	983	9743.085	0	0	0	27	18.10086	9.52511	-48
3	-52	1367	984	9743.085	0	0	0	28	18.78515	10.0178	-49
3	-53	1368	985	9743.085	0	0	0	29	19.46936	10.51043	-50
3	-54	1370	986	9743.085	0	0	0	30	20.1535	11.00301	-51
3	-55	1371	987	9743.085	0	0	0	31	20.83757	11.49554	-52
3	-56	1373	988	9743.085	0	0	0	32	21.52159	11.98803	-53
3	-57	1374	989	9743.085	0	0	0	33	22.20556	12.48049	-54
3	-58	1375	990	9743.085	0	0	0	34	22.21826	12.48964	-54
3	-59	1377	991	9743.085	0	0	0	35	22.90247	12.98227	-55
3	-60	1378	992	9743.085	0	0	0	36	23.58662	13.47485	-56
3	-61	1379	993	9743.085	0	0	0	37	24.27071	13.9674	-57
3	-62	1381	994	9743.085	0	0	0	38	24.95476	14.45992	-58
3	-63	1382	995	9743.085	0	0	0	39	25.63876	14.9524	-59
2	-64	1384	996	9743.085	0	0	0	40	26.32272	15.44485	-60
3	-65	1385	997	9743.085	0	0	0	41	27.00664	15.93727	-61
3	-66	1386	998	9743.085	0	0	0	42	27.69052	16.42966	-62
3	-67	1388	999	9743.085	0	0	0	43	27.70448	16.43972	-62
3	-68	1389	1000	9743.085	0	0	0	44	28.38854	16.93223	-63
3	-69	1391	1001	9743.085	0	0	0	45	29.07255	17.42472	-64
3	-70	1392	1002	9743.085	0	0	0	46	29.75652	17.91718	-65
3	-71	1393	1003	9743.085	0	0	0	47	30.44046	18.40962	-66
3	-72	1395	1004	9743.085	0	0	0	48	31.12437	18.90204	-67
3	-73	1396	1005	9743.085	0	0	0	49	31.80825	19.39443	-68
3	-74	1397	1006	9743.085	0	0	0	50	32.49209	19.8868	-69

Boring No. 97-33









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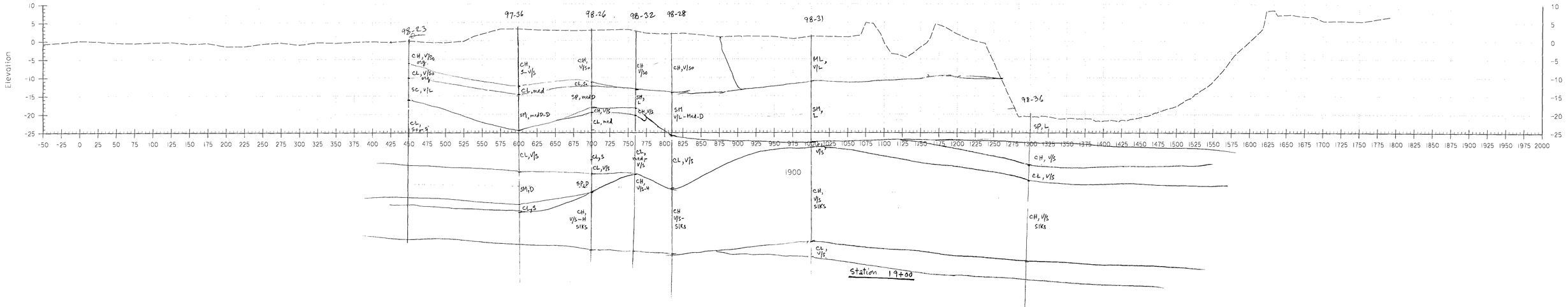

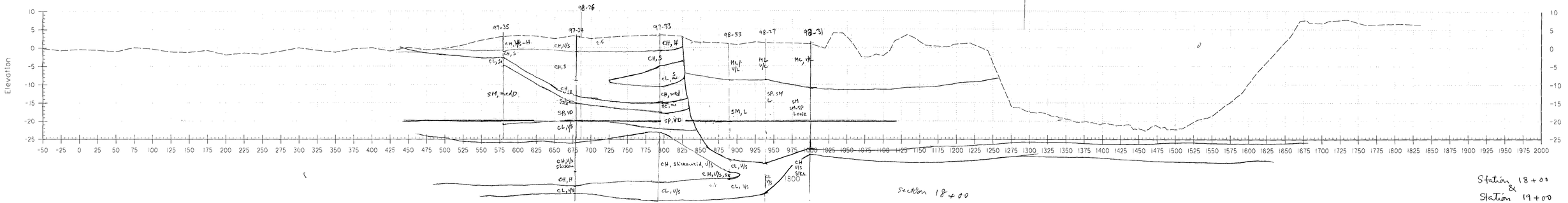

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