C.5

GEOTECHNICAL INVESTIGATION

LAKE CHAPEAU

SEDIMENT INPUT AND HYDROLOGIC RESTORATION

POINT AU FER ISLAND, LOUISIANA

DNR CONTRACT NO. 25085-95-23

FOR
BURK-KLEINPETER, INC.
NEW ORLEANS, LOUISIANA

9 JULY 1996

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / FAX 504-834-0354

50th ANNIVERSARY
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EUSTIS ENGINEERING COMPANY, INC.
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9 July 1996

Burk-Kleinpeter, Inc.
4176 Canal Street
New Orleans, Louisiana 70119

Attention Mr. Stephen Lundgren

Gentlemen:

Geotechnical Investigation
Lake Chapeau
Sediment Input and Hydrologic Restoration
Point Au Fer Island, Louisiana
DNR Contract No. 25085-95-23

Transmitted are three copies of our engineering report covering a geotechnical investigation for the subject project.

Thank you for asking us to perform these services.

Yours very truly,

EUSTIS ENGINEERING COMPANY, INC.

WILLIAM W. GWYN, P.E.

STATE OF LOUISIANA
WILLIAM W. GWYN
REG. NO. 14601
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

Rollins Brown:cp

EE 14090

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LAKE CHAPEAU

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By
Eustis Engineering Company, Inc.
Metairie, Louisiana

9 JULY 1996

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GEOTECHNICAL INVESTIGATION
LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA
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INTRODUCTION

1. This report contains the results of a geotechnical investigation performed for the Lake Chapeau Sediment Input and Hydrologic Restoration Project at Point Au Fer Island, Louisiana. The investigation was performed in accordance with Eustis Engineering Company, Inc.'s (Eustis Engineering) letter of proposal dated 20 October 1995. Authorization to proceed with the investigation was given by signed acceptance of this letter. Mr. William Giardina of Burk-Kleinpeter, Inc., New Orleans, Louisiana, executed the letter on 17 May 1996. Burk-Kleinpeter, Inc., are the project engineers.

2. This report has been prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of Burk-Kleinpeter, Inc., for specific application to this project. In the event any changes in the nature, design or location of this project are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing. Should these data be used by anyone other than Burk-Kleinpeter, Inc., they should

contact Eustis Engineering for interpretation of data and to secure any other information which may be pertinent to this project.

3. Recommendations and conclusions contained in this report are to some degree subjective and should not be included in the contract plans and specifications. However, the results of the soil borings and laboratory tests contained in the Appendix of this report may be included in the plans and specifications.

4. The analyses and recommendations contained in this report are based in part on data obtained from the soil borings. The nature and extent of variations in the subsurface conditions between and away from the boring locations may not become evident until construction. If variations then appear, it will be necessary to reevaluate the recommendations contained in this report.

SCOPE

5. The investigation included the drilling of undisturbed sample type soil test borings to determine subsurface conditions and stratification, and to obtain samples of the various substrata. Soil mechanics laboratory tests were performed on samples obtained from the borings to evaluate the physical properties of the various subsoils. Engineering analyses, based on the soil borings and laboratory test results, were performed to evaluate proposed designs of both shell reefs and timber walls for use as channel plugs. Recommendations for construction were also developed.

SOIL BORINGS

6. Nine undisturbed sample type soil test borings were made on 28-29 May 1996. The undisturbed borings were drilled to a depth of 50 feet below the existing water surface. The locations of the borings are shown on Figure 1. The borings were located in the field by a representative of Eustis Engineering using a site plan provided by Burk-Kleinpeter, Inc. Detailed descriptive logs of the individual borings are shown in both tabular and graphical form in the Appendix.

7. The undisturbed borings were made using a truck mounted rotary type drill rig. Upon completion of drilling operations, these borings were backfilled with a cement-bentonite grout in accordance with current regulatory requirements.

8. Undisturbed samples of cohesive or semi-cohesive subsoils were obtained at close intervals or changes in stratum using a 3-in. diameter thinwall Shelby tube sampling barrel. The samples were immediately extruded from the sampler, inspected and visually classified by Eustis Engineering's soil technician. Pocket penetrometer tests were performed on the soil samples to give a general indication of their shear strength and consistency. The results of these tests are shown on the boring logs under the column heading "PP." Representative samples were then promptly placed in moisture proof containers and sealed for preservation.

LABORATORY TESTS

9. A series of soil mechanics laboratory tests was conducted on samples obtained from the undisturbed borings. Included in these laboratory tests were natural water content, unit weight, unconfined compression shear (UC) and one-point unconsolidated undrained triaxial compression shear (OB). Atterberg liquid and plastic limits were also determined for selected samples. The Atterberg limits and natural water content determinations aid in the classification of the soils and provide an indication of their relative compressibility. The results of the laboratory tests are shown on the individual boring logs in the Appendix.

DESCRIPTION OF SUBSURFACE CONDITIONS

Stratigraphy

10. The undisturbed borings extend from the existing water surface to a depth of 50 feet below this surface. In all of the borings, the mudline was 6 inches to 2.5 feet below the water surface. From the mudline, a stratum of highly organic soils extends to a depth of 7 feet below the water surface. These highly organic soils are composed of extremely soft humus and organic clay. Underlying the highly organic soils is gray clay extending to the boring termination depth at 50 feet below the water surface. The consistency of this clay increases with depth from extremely soft below the highly organic soils to soft at the boring termination depth. This clay contains small zones of silty and sandy clay, clayey sand, silty sand, sandy silt and fine sand between the 31.5 and 50-ft depths.

ENGINEERING ANALYSES

Furnished Information

11. According to information provided by Burk-Kleinpeter, Inc., this project involves the construction of nine plugs or permeable dikes which will be used to retard flow and induce sedimentation in the channels in which they are constructed.

12. Two types of plugs are proposed. The first type of plug is a shell reef which will consist of a submerged shell embankment with side slopes of 3 horizontal to 1 vertical. The second type of plug is timber wall composed of 40-ft long timber soldier piles and 20-ft long timber sheeting. The sheeting will be attached to the piles by two rows of timber walers. The top of the plugs at Sites 3 and 6 will be constructed at el -4 (NGVD). The tops of the plugs at the remainder of the sites will be constructed at el -2.5. The ground water surface is at el 0.0. The walls are to be designed to resist the larger of a uniform hydraulic force of 25 psf applied along the height of wall exposed above the mudline or retained sediment.

13. Surveys provided by T. Baker Smith & Son, Inc., the project surveyors, indicate the plugs be constructed in channel sections varying from 70 to 240 feet in width and from 4.0 to 27.5 feet in depth. A summary of pertinent dimensions at each site is tabulated below.

SITE	APPROXIMATE THALWEG EL, NGVD (FEET)	APPROXIMATE CANAL WIDTH (FEET)	PLUG TOP EL, NGVD (FEET)
1	-8.0	147	-2.5
3	-27.5	229	-4.0
4	-17.5	173	-2.5
5A	-7.0	153	-2.5
5B	-4.0	70	-2.5
6	-5.0	145	-4.0
7	-10.0	157	-2.5
8	-12.5	161	-2.5
9	-11.0	240	-2.5

General Recommendations

14. The two proposed types of plugs have been evaluated for use at each of the nine sites. Based on our analyses, we recommend a shell reef be used at Sites 3, 4, 8 and 9. Timber walls, even with timber soldier and batter piles to provide additional lateral support, are unsuitable for use in these deep channels. Timber walls may be used at the remainder of the sites. At Site 7, vertical soldier and batter timber piles will be required to provide sufficient lateral resistance. At Sites 1 and 5A, timber walls with vertical soldier piles may be used without batter piles.

15. The proposed tops of the plugs at Sites 5B and 6 are at el -2.5 and -4.0, respectively. The thalweg at the channels at Sites 5B and 6 are at el -4.0 and -5.0,

respectively. This results in plugs with maximum heights of 1.5 feet and 1 foot. At these two sites, timber sheeting may be used independently without soldier piles.

16. A summary of recommendations is shown on Figure 2. Specific recommendations and a discussion of our analyses follow in this report.

Shell Reefs

17. Slope Stability. The stability of the proposed shell reefs was evaluated using the U.S. Army Corps of Engineers' Method of Planes. The shell reef at Site 3 was selected for analysis as the largest of the proposed reefs. This reef is 23.5 feet high with a 10-ft crown at elevation -4.0 and side slopes at 3 horizontal on 1 vertical. In our analysis, the upstream side of the reef was assumed to be filled with sediment. This analysis, the results of which are shown on Figure 3, yielded a minimum factor of safety against sliding of 1.32. This factor of safety is acceptable.

18. Material Requirements. We recommend the shell reef consist of a shell core and an exterior 2-ft cover of riprap for erosion protection. The riprap should be graded crushed limestone meeting the material requirements of Section 711 of the *Louisiana Standard Specifications for Roads and Bridges*, 1992 edition (LSSRB) for the 250-lb riprap class. The shell core should comply with the material requirements of Section 1003.09(a)(2) of the LSSRB.

19. Placement of Shell. We recommend the core of the shell reef be placed from the center of the proposed reef outward towards the toe. This will

allow lake bottom sediments to be displaced without trapping mudwaves within the reef section. Shell should be placed in lifts of 3 feet loose measure. Compaction of the shell beyond that which occurs during placement is not necessary.

20. Settlement. Settlement analyses have been performed for the proposed shell reefs. Based on these analyses, we estimate the reefs will experience 6 to 18 inches of settlement at their centers. The larger reefs at Sites 3, 4, 8 and 9 should experience settlements in the upper half of this range while the smaller reefs at Sites 1, 5A, 5B, 6 and 7 should experience settlements in the lower half of this range. The settlement along the edges of the reefs at the bases of the slopes and at the abutments will be considerably less than settlement at the center of the reef.

Timber Walls

21. General. Timber walls are suitable for use at Sites 1, 5A, 5B, 6 and 7. At Site 7, a timber wall with soldier and batter timber piles should be used. At Sites 1 and 5A, timber walls with soldier piles may be used without batter piles. At Sites 5B and 6 with maximum wall heights of 1.5 feet and 1.0 foot, respectively, timber sheeting may be used without soldier piles.

22. Structural requirements for the various components of the timber pile wall should be determined by a structural engineer. Lateral pressure diagrams included with this report should be used for this purpose.

23. Lateral Earth Pressures. The design lateral earth pressures for Sites 1 and 5A are shown on Figure 4. The timber piles used at these two sites should

be timber soldier pile walls composed of vertical timber piles with timber sheeting attached to the tops of the piles with waling. The design lateral earth pressures for timber soldier pile walls with batter piles to be used as a plug at Site 7 are shown on Figure 5. This wall should be similar to those used at Sites 1 and 5A but with the addition of batter piles.

24. Minimum sheeting embedments for timber walls are also shown on Figures 4 and 5. Vertical soldier piles should extend below the bottom of the sheeting to a minimum tip embedment of 40 feet below the top of the wall.

25. As previously mentioned, the plugs at Sites 5B and 6 have maximum heights of 1.5 feet and 1 foot, respectively. If timber walls are used at these sites, the design lateral earth pressures for the timber wall at Site 5A may be used to evaluate timber sheetpile sections. At these two sites, as the exposed height of wall will be so small, timber sheeting may be used independently without soldier piles.

26. Allowable Pile Load Capacities. Allowable load capacities of battered treated ASTM D 25 quality timber piles used at Site 7 are shown in Figure 6. These allowable load capacities are applicable for the timber wall at Site 7 and account for the zone of potential soil movement behind the sheeting. Figure 6 indicates the vertical reaction of a batter pile. The horizontal reaction can be determined from the relationship shown on Figure 7.

27. Allowable pile load capacities for vertical treated ASTM D 25 quality timber piles used as soldier piles in the timber walls at Sites 1, 5A and 7 are shown in Figure 8. These allowable capacities are plotted versus mudline elevation. From

this figure, the allowable pile load capacity for a vertical pile with a given tip elevation can be determined with respect to the mudline elevation at its location.

28. Allowable timber pile load capacities contain an estimated factor of safety of 2 against failure of a single pile through the soil. Analyses for pile capacities are based on a soil-pile relationship only. Therefore, the structural capacity of the piles and connections to transmit the loads should be determined by a structural engineer. The minimum center to center spacing of piles should be 3 feet.

29. Pile Driving. Close field supervision should be maintained by experienced personnel to ensure proper procedures are followed and accurate records are kept for all pile driving operations. The driving record should include the pile type, overall length, tip and butt diameters, embedment below finished grade, hammer type and the number of blows per foot of penetration.

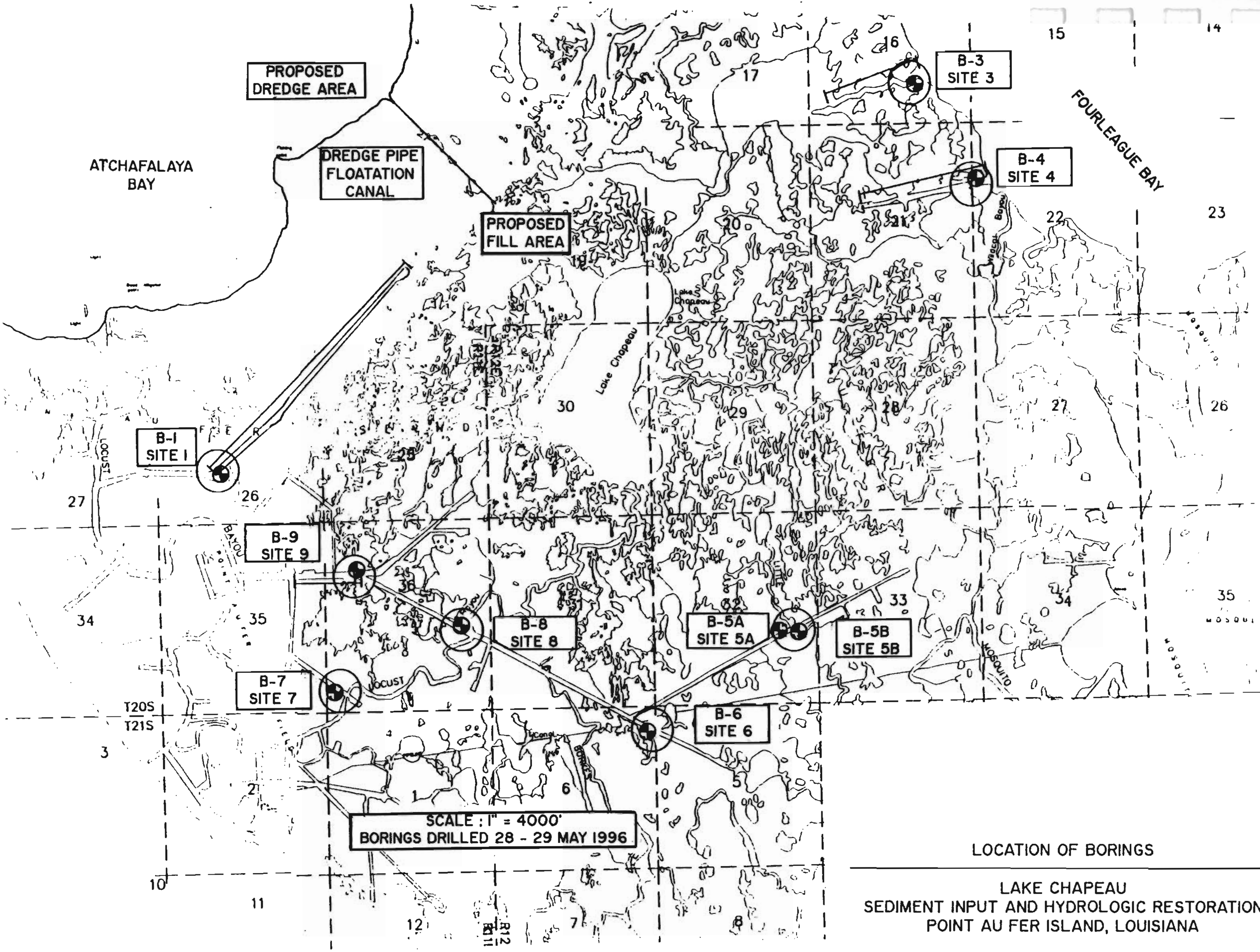
30. Treated ASTM D 25 quality timber piles with tip diameters of 7 inches or more may be driven with a single acting air hammer delivering 15,000 ft-lbs of energy per blow. Using these hammers, the piles should be driven no harder than 25 blows per foot in order to minimize potential damage to the piles.

GEOTECHNICAL SERVICES DURING CONSTRUCTION

31. To provide continuity between the investigation, design and construction phases, Eustis Engineering should be retained to provide geotechnical consultation during design and construction. Eustis Engineering may also be

retained to provide additional services during construction, such as soil and material testing services which will provide quality control during construction and conformance to design specifications.

32. If any construction problems arise, Eustis Engineering should be notified immediately so appropriate actions can be taken. This permits the geotechnical engineer to be available quickly, evaluate unanticipated conditions, conduct additional testing, when required, and recommend alternative solutions to problems when necessary.



LOCATION OF BORINGS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 1

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

SUMMARY OF RECOMMENDATIONS

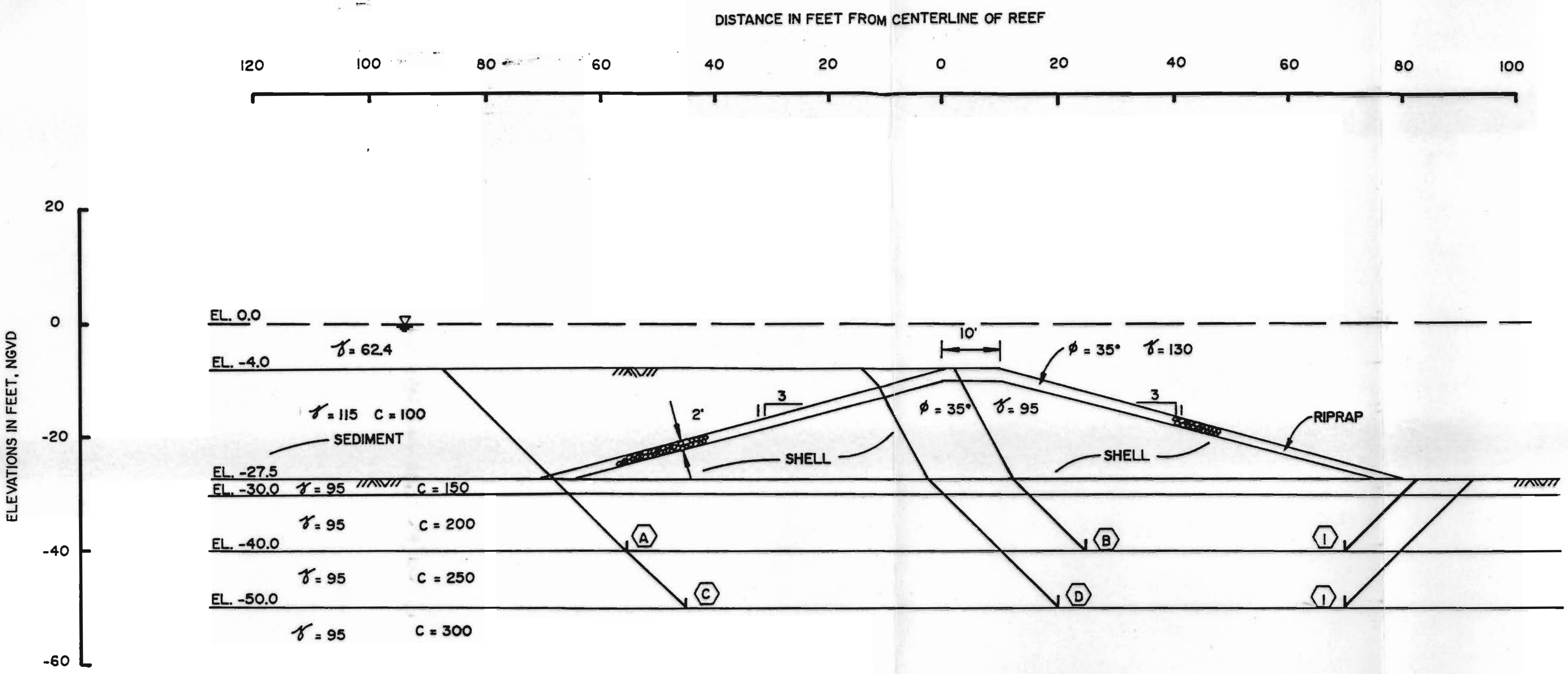
SITE	PLUG TYPE[1]	SHEETING DEPTH (FT)[1]	ANCHOR REACTION (LBS/FT)
1	Sheeting/ Soldier Piles[2]	20	NA
3	Shell Reef[3]	NA	NA
4	Shell Reef[3]	NA	NA
5A	Sheeting/ Soldier Piles[2]	15	NA
5B	Sheeting	20	NA
6	Sheeting	20	NA
7	Sheeting/ Soldier Piles[2] & Batter Piles[4]	25	355
8	Shell Reef[3]	NA	NA
9	Shell Reef[3]	NA	NA

(1) All depths measured from top of plug.

(2) Soldier piles should be 40' long ASTM D 25 timber piles. See Figure 8.

(3) Shell reefs have 1V:3H side slopes with a 10-ft crown. Two feet of riprap erosion protection is required.

(4) Batter pile capacities are attached for use in evaluating Site 7. See Figures 6 and 7.



NOTE :
γ = SATURATED UNIT WEIGHT, PCF
C = UNIT COHESION, PSF

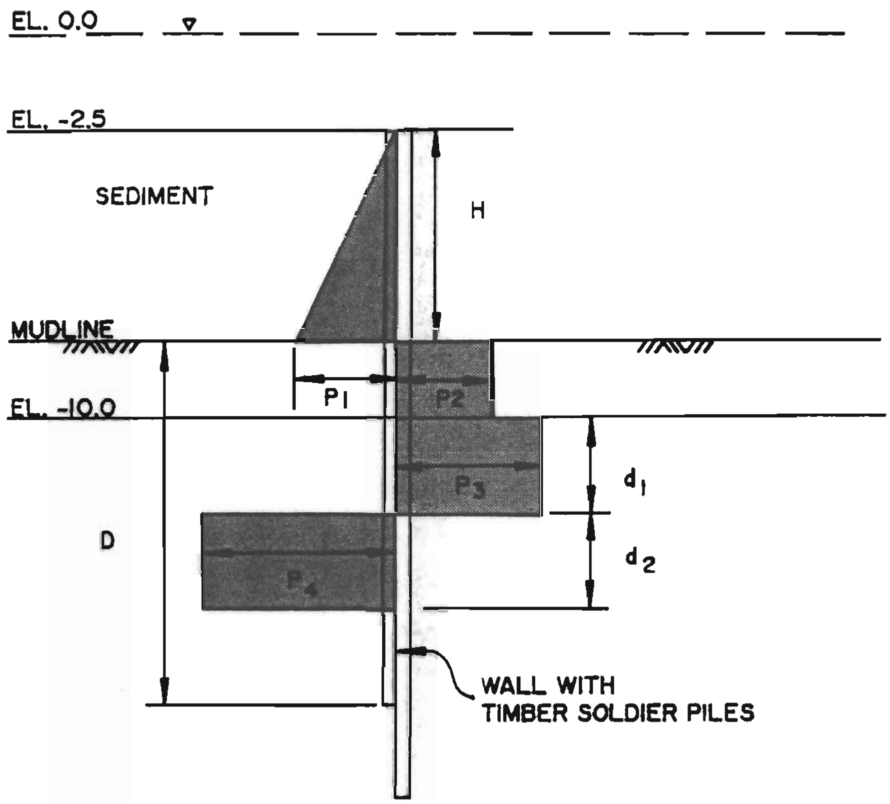
FAILURE SURFACE	SUMMATION OF FORCES LBS/ FT		FACTOR OF SAFETY
	DRIVING	RESISTING	
(A) (1)	28910	39788	1.38
(B) (1)	18648	26134	1.40
(C) (1)	40604	53539	1.32
(D) (1)	28603	40814	1.43

SLOPE STABILITY
SHELL REEF AT SITE 3

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 3



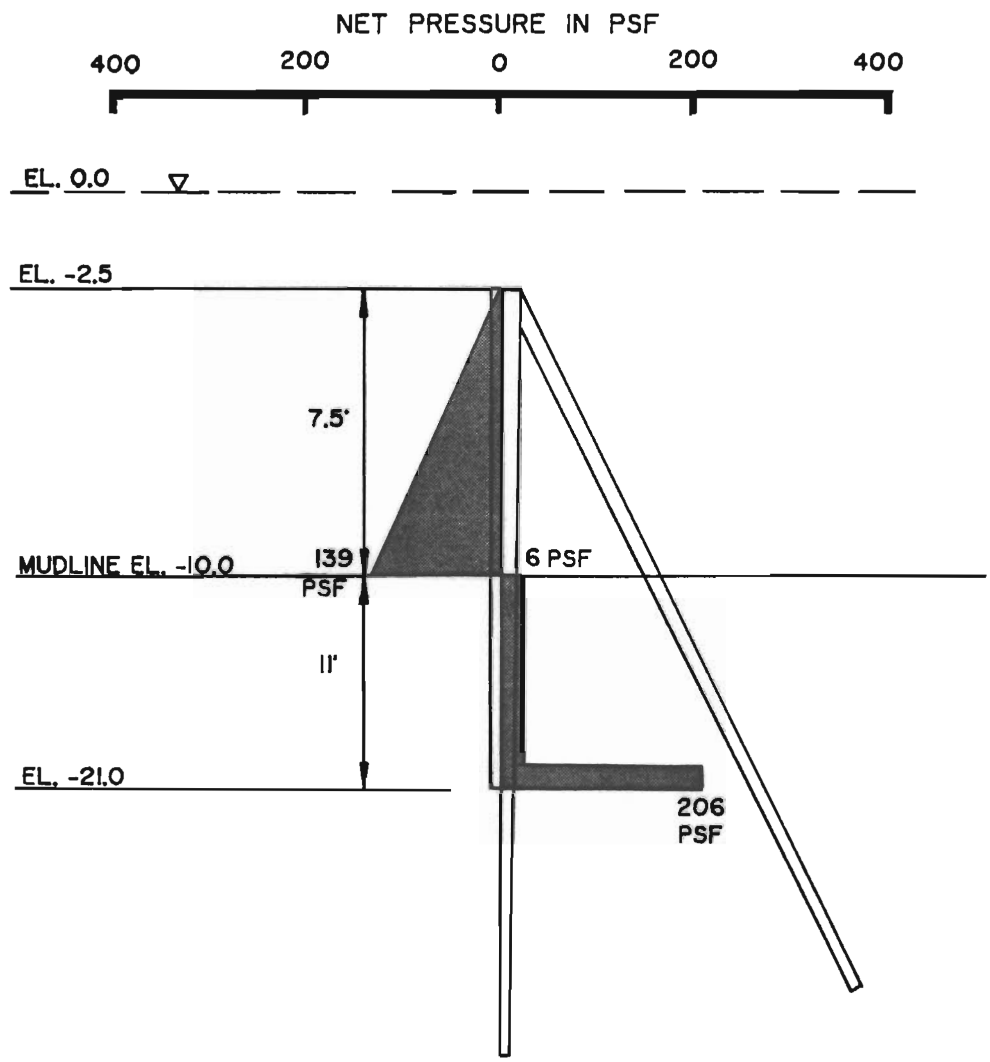
SITE	H (FT)	P1 (PSF)	P2 (PSF)	P3 (PSF)	P4 (PSF)	d1 (FT)	d2 (FT)	D (FT)
1	5.5	83	11	111	637	6.9	0.7	14.5
5A	4.5	102	63	163	689	2.4	0.6	9.5

D = RECOMMENDED MINIMUM SHEETING EMBEDMENT

NOTE : SOLDIER PILES ARE 40' LONG ASTM D-25 TREATED TIMBER PILES WITH MINIMUM 7" TIP AND 12" BUTTS.

LATERAL EARTH PRESSURES
SOLDIER PILE WALLS
SITES 1 AND 5A

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA



NOTE : SOLIDER PILES ARE ASTM D-25 TREATED TIMBER PILES
SEE FIGURES 6 AND 7 FOR RECOMMENDED MINIMUM
SIZES AND ALLOWABLE CAPACITIES.

LATERAL EARTH PRESSURES
SOLDIER PILE WALLS
SITES 7 AND 5A

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
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ALLOWABLE PILE LOAD CAPACITIES
TREATED ASTM D 25 QUALITY TIMBER BATTERED PILES
FOR USE AT SITE 7
TOP OF PILE AT ELEVATION -2.5 NGVD OR BELOW

PILE SIZE	PILE TIP EMBEDMENT BELOW EXISTING GROUND SURFACE IN FEET	ALLOWABLE PILE LOAD COMPRESSIVE CAPACITIES IN TONS FACTOR OF SAFETY = 2
8-In. Tip 12-In. Butt	30 35	2.0 2.5
7-In. Tip 12-In. Butt	40 45 50 55	3.0 4.0 5.0 6.0
7-In. Tip 13-In. Butt	60 65 70 75	7.0 8.0 9.0 10.0
7-In. Tip 14-In. Butt	80	11.0

AXIAL AND HORIZONTAL RESISTANCE OF BATTER PILES

ESTIMATED FROM ALLOWABLE VERTICAL LOAD CAPACITY

L = VERTICAL COMPONENT OF BATTER PILE EMBEDMENT LENGTH.

V = ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY OF A PILE DRIVEN VERTICALLY WITH EMBEDMENT LENGTH, L.

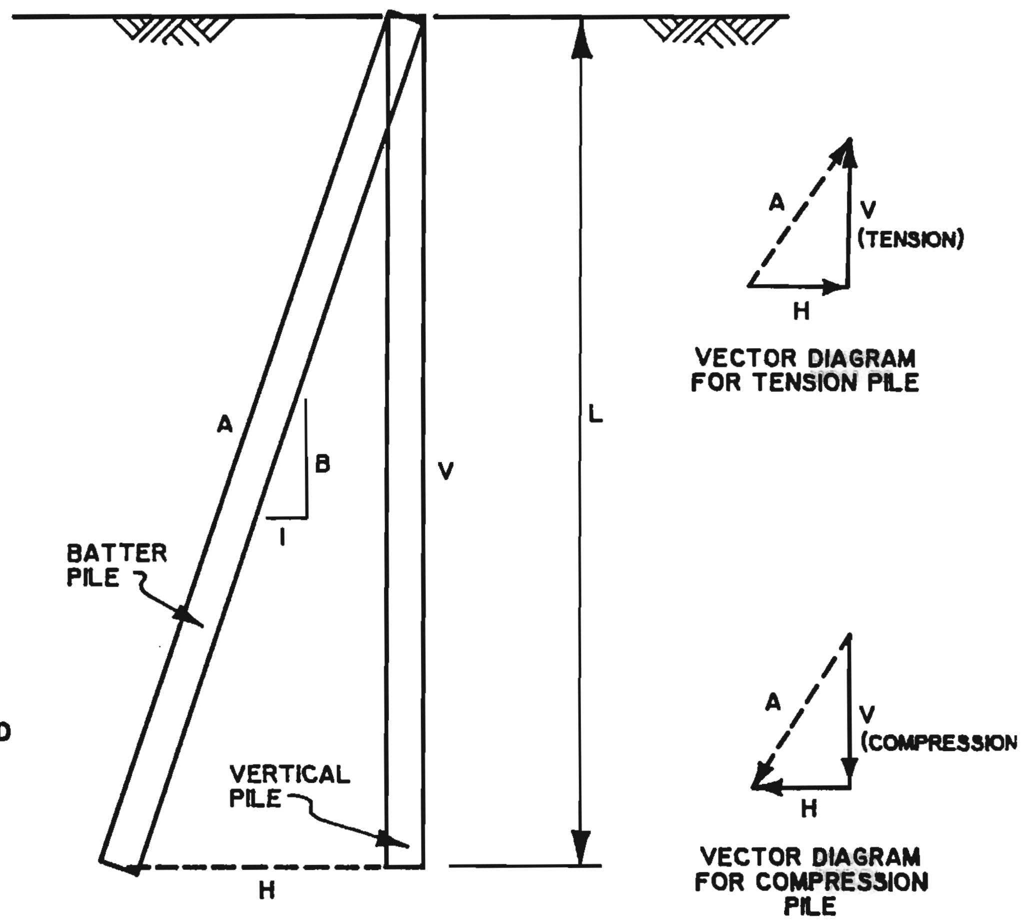
B = BATTER OF PILE EXPRESSED AS A RATIO OF VERTICAL DISTANCE TO ONE FOOT HORIZONTAL DISTANCE.

H = HORIZONTAL RESISTANCE OF BATTER PILE ESTIMATED AS FOLLOWS:

$$H = \frac{V}{B}$$

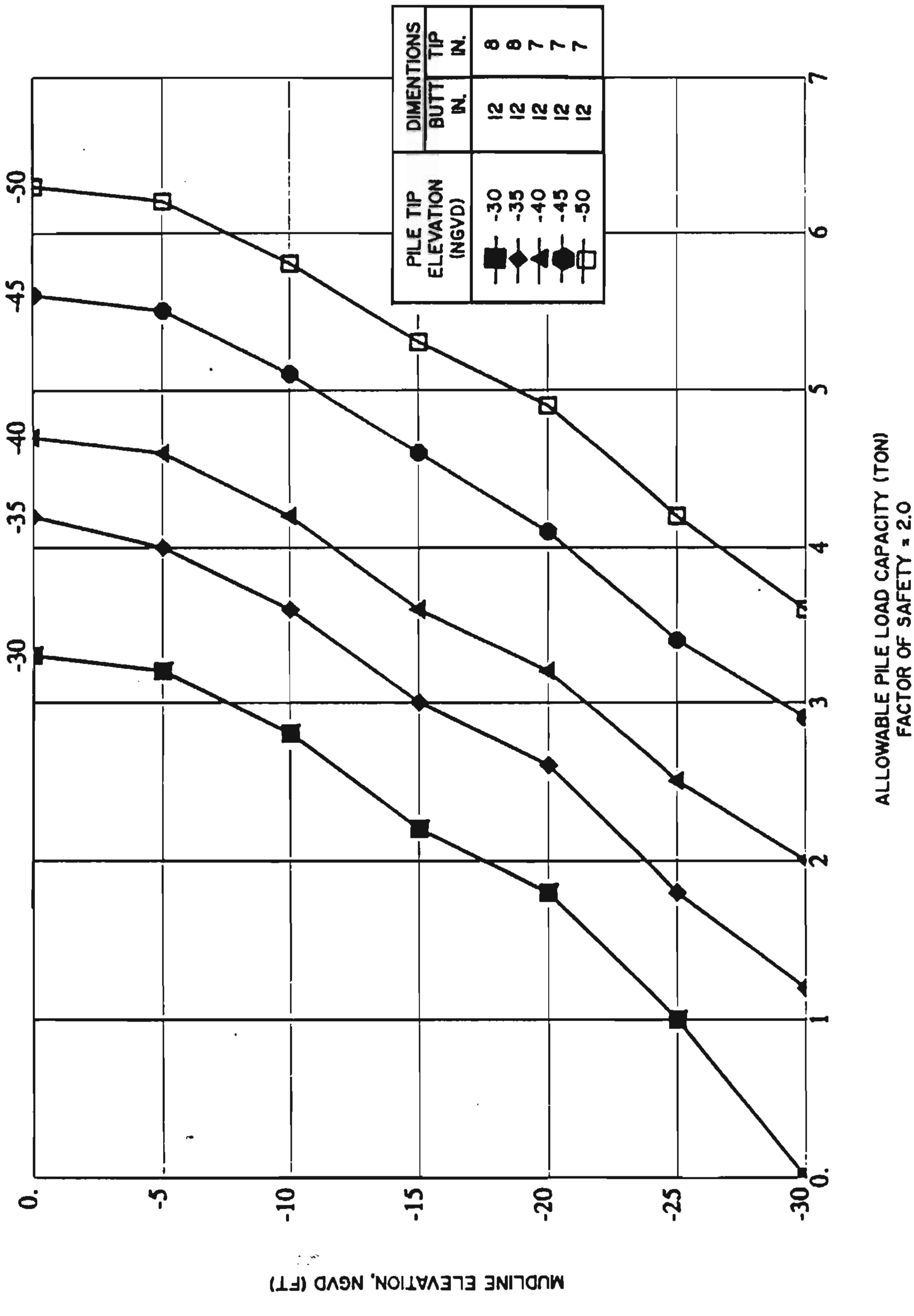
A = ALLOWABLE AXIAL PILE LOAD CAPACITY OF A SINGLE BATTER PILE ESTIMATED AS FOLLOWS:

$$A = \sqrt{V^2 \left(1 + \frac{1}{B^2}\right)}$$



NOTE: THE AXIAL LOAD RESISTANCE OF A VERTICAL PILE, V, IS DEPENDENT ON THE TYPE OF LOADING--TENSION OR COMPRESSION. CAUTION SHOULD BE EXERCISED TO INSURE THAT THE CORRECT VERTICAL CAPACITY IS USED.

ALLOWABLE PILE LOAD CAPACITY VS. MUDLINE ELEVATION
ASTM D 25 TREATED TIMBER PILES
PILE BUTT AT ELEVATION AT -2.5, NGVD



APPENDIX

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP — Pocket penetrometer resistance in tons per square foot

TV — Torvane shear strength in tons per square foot

SPT — Standard Penetration Test. Number of blows of a 140-lb. hammer dropped 30 inches required to drive 2-in O.D., 1.4-in. I.D. sampler a distance of one foot into the soil, after first seating it 6 inches

SPLR — Type of Sampling: Shelby, SPT, Auger, No Sample

SYMBOL — Clay, Silt, Sand, Humus. Predominant type shown heavy; Modifying type shown light

DENSITY — Unit weight in pounds per cubic foot

USC — Unified Soil Classification

TYPE

TYPE	UC	Unconfined compression shear
	OB	Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
	UU	Unconsolidated undrained triaxial compression shear
	CU	Consolidated undrained triaxial compression shear
	DS	Direct shear
	CON	Consolidation
	PD	Particle size distribution
	k	Coefficient of permeability in centimeters per second
	SP	Swelling pressure in pounds per square foot

ϕ — Angle of internal friction in degrees

c — Cohesion in pounds per square foot

Other laboratory test results reported on separate figure

Ground Water Measurements — Initial — Final

GENERAL NOTES

(1) At the time the borings were made, ground water levels were measured below existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction, immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

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LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/29/96 **Boring:** 1 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Water														
					Extremely soft gray organic clay w/organic matter & roots	OH	1	2-3	158	31	80	UC	--	70					
					Extremely soft dark gray clay w/humus layers	OH	2	5-6	178	27	74	OB	--	75	224	60	164		
					Extremely soft gray clay w/organic matter	CH	3	8-9	114	40	86	UC	--	50	112	26	86		
10							4	11-12											
							5	14-15	98	46	90	UC	--	65					
							6	1B-19											
20	0.25				Very soft gray clay w/silt lenses	CH	7	23-24	101	44	89	UC	--	105					
	0.30				w/few shell fragments		8	28-29											
30	0.30				w/few silty sand lenses		9	33-34	77	54	95	UC	--	175					
					Extremely soft gray clay w/clayey silt lenses	CH	10	38-39	63	61	99	UC	--	95					
40	0.30				Very soft gray clay w/silty sand lenses	CH	11	43-44	58	62	99	UC	--	165					
					Soft gray clay w/silt lenses	CH													
50	0.30						12	48-49	54	67	103	UC	--	260					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/29/96 **Boring:** 3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Water														
					Very loose black humus	PT	1	2.5-3	428	13	67	OB	--	30					
					w/roots		2	5-6	569	10	63	OB	--	80	634	170	464		
					Extremely soft gray clay w/organic matter	CH	3	8-9	123	39	86	UC	--	35					
10																			
							4	11-12	155	32	80	UC	--	65					
					Very soft gray clay w/organic matter	CH	5	14-15	126	36	82	UC	--	145					
					w/silt lenses & organic matter		6	18-19	104	43	88								
20																			
	0.25				w/fine sand lenses & shell fragments		7	23-24	74	55	96	UC	--	125	97	25	72		
	0.30				w/sandy silt pockets		8	28-29											
30																			
	0.30				w/sand lenses & shell fragments		9	33-34	69	57	96	UC	--	130					
					Soft gray clay w/sand lenses														
	0.30						10	38-39											
40																			
	0.30						11	43-44	67	59	98	OB	--	275					
50					Medium dense gray fine sand w/silty sand layers		12	49-50											

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/29/96 **Boring:** 4 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Water														
					Very loose black humus w/roots	PT	1	2-3	335	16	67								
							2	5-6	279	18	68	OB	--	60					
					Extremely soft gray clay w/organic matter	CH	3	8-9	102	44	89	UC	--	40	110	27	83		
10	0.25				Very soft gray clay w/roots	CH	4	11-12	97										
					w/silt lenses & organic matter		5	14-15	140	34	82	OB	--	140					
					w/fine sand lenses		6	18-19											
20																			
					w/silt lenses & shells		7	23-24	95	46	90								
	0.25				w/few shell fragments		8	28-29											
30																			
	0.25				w/few sandy silt lenses		9	33-34	78	54	96	UC	--	145	83	24	59		
					Very loose gray clayey sand	SC	10	38-39											
40					Soft gray clay w/silt lenses	CH													
	0.30						11	43-44	66	60	99	UC	--	295					
							12 13	48-49 49-50	53	67	103	UC	--	275					
50					Medium dense gray silty sand	SM													

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/28/96 **Boring:** 5A **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Water														
					Very soft gray & tan clay w/grass	CH	1	2-3											
					Extremely black organic clay w/humus layers	OH	2	5-6	269	19	71				246	57	189		
	0.30				Extremely soft gray clay	CH	3	8-9											
10	0.25				w/organic matter		4	11-12	120	38	85	UC	--	110					
							5	14-15											
20							6	18-19	119	39	85				117	28	89		
	0.25				Very soft gray clay	CH	7	23-24											
30	0.25				w/sand pockets & shell fragments		8	28-29	64	61	100	UC	--	160					
	0.30				w/shell fragments		9	33-34											
40	0.30						10	38-39	86	50	92	UC	--	170					
	0.30				Soft gray clay w/clayey silt lenses	CH	11	43-44											
50	0.30				w/silt pockets & shell fragments		12	48-49	46	72	105	UC	--	265					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

(Sheet 1 of 1)

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/28/96 **Boring:** 5B

Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ϕ	C	LL	PL	PI		
0					Water														
					Very soft gray clay w/grass	CH	1	2-2.5											
					Extremely soft black organic clay w/roots	OH	2	3-4											
							3	5-6	232	22	74	OB	--	55	219	51	168		
	0.25				Extremely soft gray clay	CH	4	8-9											
10	0.25						5	11-12	149	33	82	UC	--	95					
	0.25				w/clayey silt lenses		6	14-15											
20	0.25						7	18-19	105	43	88	UC	--	85					
	0.25						8	23-24											
30					Very soft gray clay w/trace of decayed wood	CH	9	28-29	61	62	100								
	0.25				w/clayey silt lenses		10	33-34											
40	0.25						11	38-39	79	52	93	UC	--	200	106	28	78		
	0.30						12	43-44											
50	0.30						13	48-49	46	72	105	UC	--	230					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

(Sheet 1 of 1)

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/28/96 **Boring:** 6 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Water														
					Extremely soft black organic clay w/roots	OH	1 2	1-2 2-3	174	28	77	OB	--	55	183	44	139		
							3	5-6	216	24	76								
					Extremely soft gray clay w/organic matter	CH	4	8-9	110	42	89	UC	--	60					
10							5	11-12	156	32	81	UC	--	60					
	0.25						6	14-15	138	34	80	UC	--	90					
	0.25				w/silt lenses		7	18-19											
20	0.25						8	23-24	81	51	93	UC	--	100					
	0.25						9	28-29											
30	0.30				Very soft gray clay	CH	10	33-34	56	66	102	UC	--	180					
	0.30						11 12	38-39 39-40											
40					Medium dense gray fine sand	SP													
	0.30				Soft gray clay	CH	13	43-44	57	65	102	UC	--	335	78	22	56		
	0.30				Very soft gray silty clay	CL	14	48-49	37	81	111	UC	--	200					
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/28/96 **Boring:** 7 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0			Water														
			Extremely soft gray organic clay w/many roots	OH	1	2-3	221	23	75								
			Very soft brown organic clay w/wood	OH	2	5-6	183	27	77	OB	--	55	224	48	176		
			Extremely soft gray clay w/organic matter	CH	3	8-9	121	38	84	UC	--	45					
10					4	11-12	117	41	89	UC	--	25					
					5	14-15											
20					6	18-19	129	37	85	UC	--	55	132	30	102		
			w/few clayey silt lenses		7	23-24											
30			w/sand pockets & shell fragments		8	28-29	44										
	0.25		Very soft gray clay w/sand pockets & few shells	CH	9	33-34	48	72	106	UC	--	190					
40	0.30		w/sand lenses		10	38-39	59	64	102	UC	--	170					
			Loose gray clayey sand	SC	11	43-44											
			Loose gray silty sand	SM	12	44-45											
50	0.30		Very soft gray clay w/sand lenses	CH	13	48-49	39	80	111	UC	--	240					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/28/96 **Boring:** 8 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0			Water														
			Extremely soft black silty clay w/many roots	CL	1	2-3	117	37	80	OB	--	50					
			Extremely soft black humus	PT	2	5-6	385	14	67	OB	--	55	350	90	260		
			Extremely soft gray clay w/roots	CH	3	8-9	124	38	84	UC	--	30					
10					4	11-12											
			w/sand lenses		5	14-15	121	38	84	UC	--	65					
					6	18-19											
20					7	23-24	108	42	88	UC	--	110					
	0.30		Very soft gray clay w/shell fragments	CH	8	28-29	66	59	98	UC	--	145					
30	0.30		w/sand pockets		9	33-34	50	70	106	UC	--	135					
	0.30		Soft gray sandy clay	CL	10	38-39											
40	0.30		Very soft gray silty clay w/clay lenses	CL	11	43-44	46	72	106	UC	--	170					
	0.30		Soft gray clay w/silt lenses	CH	12	48-49	56	65	102	UC	--	265	76	25	51		
50																	

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKE CHAPEAU
SEDIMENT INPUT AND HYDROLOGIC RESTORATION
POINT AU FER ISLAND, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** **Job No.:** 14090 **Date Drilled:** 5/28/96 **Boring:** 9 Refer to "Legends & Notes"

PP	SPT	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
		Water														
		Extremely soft dark gray organic clay w/roots	OH	1	1.5-2											
				2	5-6	231	22	73	OB	--	80	150	44	106		
				3	8-9	302	17	69	OB	--	65					
		Extremely soft dark gray humus w/organic clay layers	CH	4	11-12											
				5	14-15	111	41	86	UC	--	70					
				6	18-19	114	40	85								
		w/trace of organic matter & shell fragments		7	23-24	118	39	85								
0.30		Very soft gray clay w/sand pockets	CH	8	28-29											
0.30				9	33-34	51	70	105								
0.30				10	38-39	52	69	105	UC	--	210					
0.30		Soft gray sandy clay	CL	11	43-44	34	84	113	UC	--	290	35	17	18		
0.30		Soft gray clay w/silty sand lenses & pockets	CH	12	48-49	49	70	104								

Scale In Feet: 0, 10, 20, 30, 40, 50

Comments: