BORING LOG NO. 09-B93

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
BORING LOCATION:	N: 13826981 E: 3260207	SITE:	Cedar Bayou PA6 Baytown, Texas

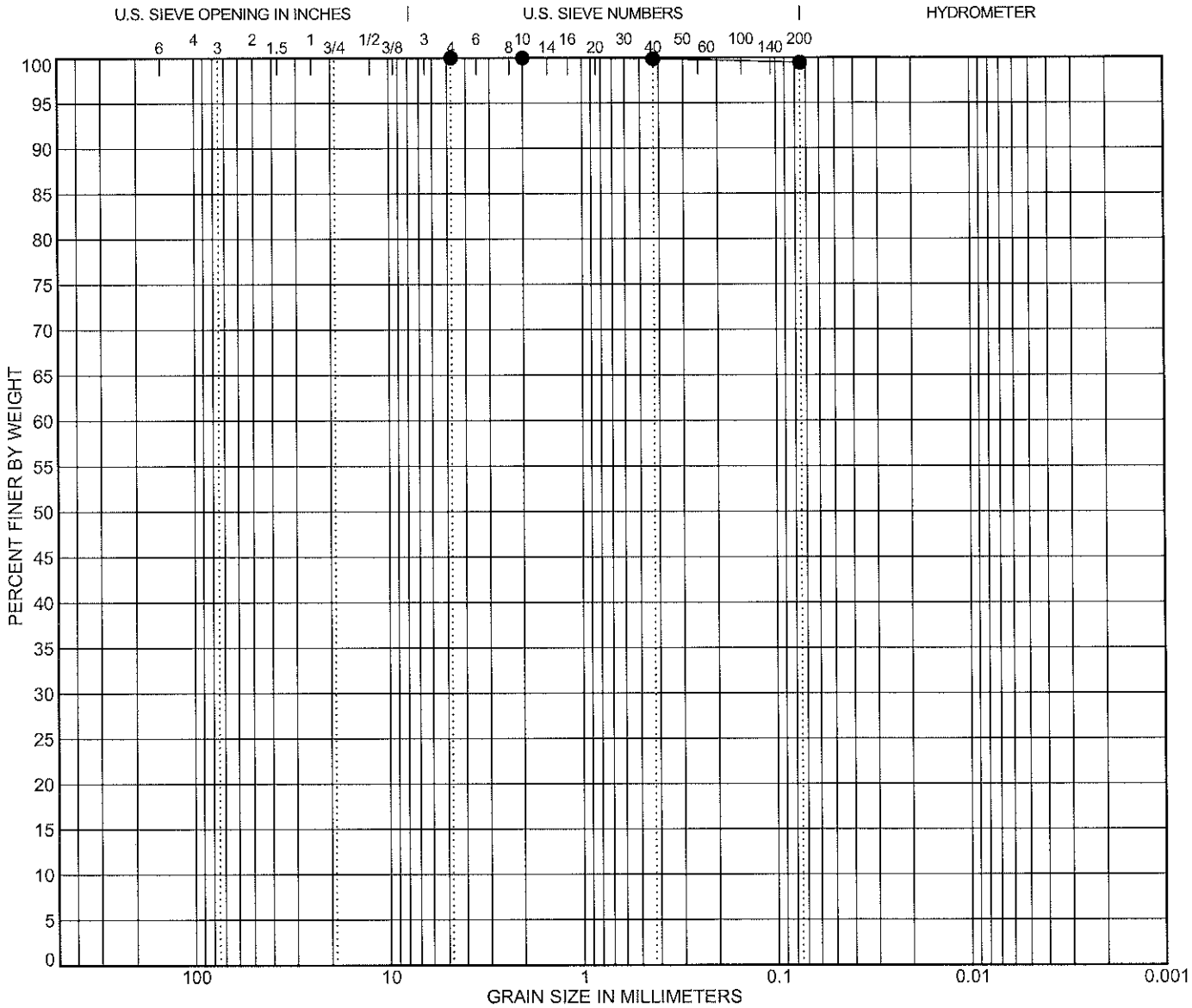
Approx. Surface Elevation: 11.1 feet

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	RECOVERY, IN	SPT, BLOWS/FT	CALIBRATED HAND PENETROM., TSF	TORVANE, TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, TSF	FAILURE STRAIN, %	CONFINING PRESSURE, PSI
	FILL: FAT CLAY brown and gray, very soft, very high plasticity, wet, with organic matter and roots (9.1 – 2.0)	1	CH	ST	13		0.0	0.25	59								
		2															
	FAT CLAY dark gray, very soft to very stiff, very high plasticity, moist to wet	3	CH	ST	9		0.0	0.1	62								
		4															
		5		ST	9		0.0	0.2	68	59	116	33	83	99			
		6															
		7		ST	8		0.75		35								
		8															
		9		ST	9		0.0	0.2	60								
		10															
		11		ST	20		0.25	0.05	41								
	- with sand seams below 12 feet	12															
		13		ST	12		1.0		37	84	74	26	48	93			
	-2.9 / 14.0	14															
	LEAN CLAY w/ SAND dark gray, light gray and yellowish brown, medium stiff to stiff, high plasticity, moist, with calcareous nodules and sand seams	15	CL	ST	9		1.25		21								
		16															
		17		ST	9		1.0		31								
		18															
	-8.9 / 20.0	19		ST	8		1.25		22	105	41	18	23	83			
	Boring terminated at 20 feet.	20															

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS: **Wet rotary from ground surface due to the presence of surface water ponded.**

WATER LEVEL OBSERVATIONS				
▽	▼	Terracon	DATE DRILLED 3/18/2010	Page 1 of 1
▼	▼		PROJECT NUMBER 92105186-A	09-B93
				EXHIBIT A-



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **09-B93**	**4.0**	**FAT CLAY(CH)**	**116**	**33**	**83**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **09-B93**	**4.0**		**100**	**100**	**99.9**		**99.4**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **09-B93**	**4.0**	**4.75**				**0.0**	**0.6**	**99.4**	

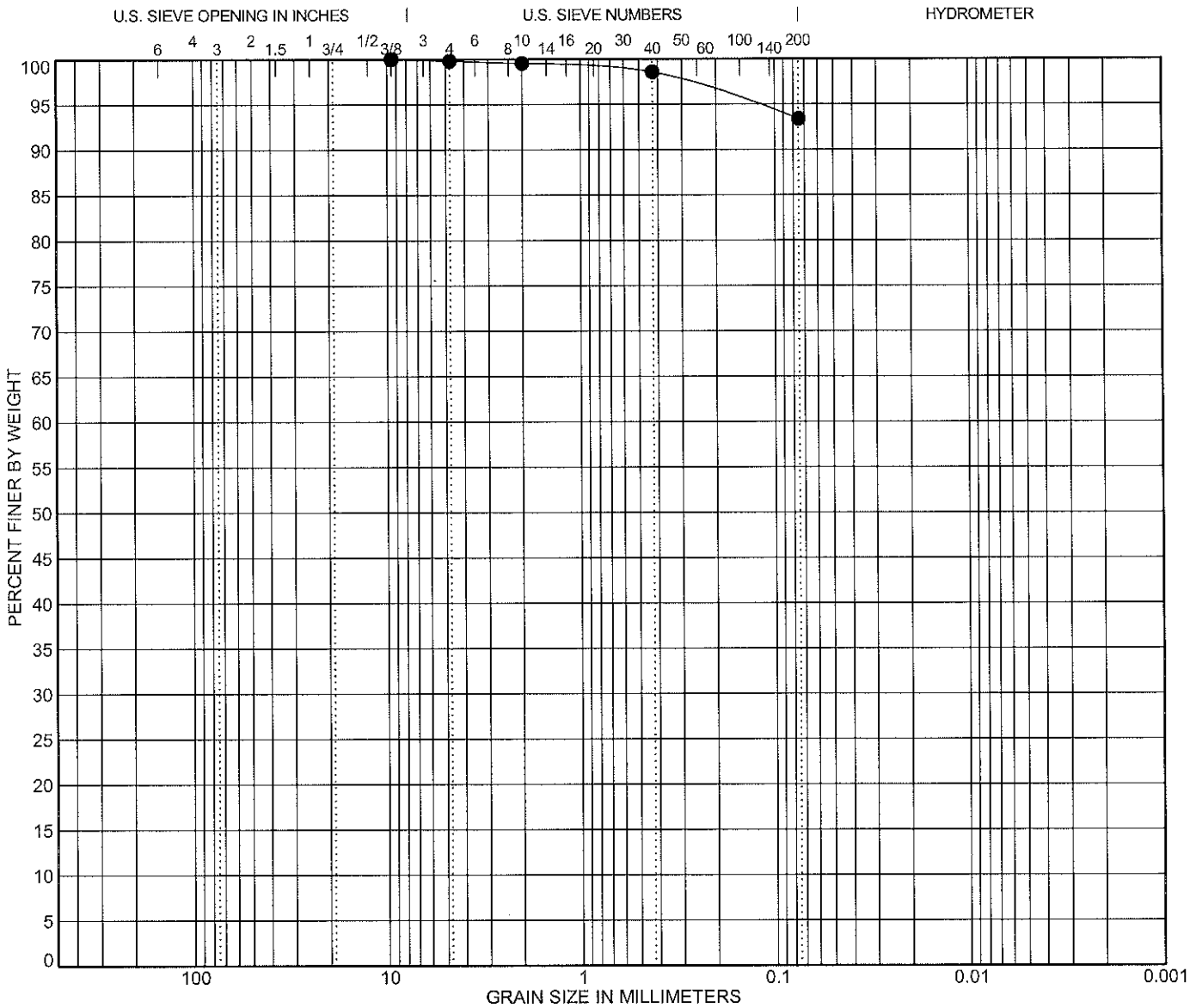
GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
Baytown, Texas
Project Number 92105186-A

Terracon

Terracon Consultants, Inc.
11555 Clay Road, Suite 100
Houston, Texas 77043
Telephone: 713-690-8989
Fax: 713-690-8787

EXHIBIT Ç



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 09-B93	12.0	**FAT CLAY(CH)**	**74**	**26**	**48**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● 09-B93	12.0	**100**	**99.8**	**99.5**	**98.6**		**93.4**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 09-B93	12.0	**9.5**				**0.2**	**6.4**	**93.4**	

GRAIN SIZE DISTRIBUTION

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Baytown, Texas
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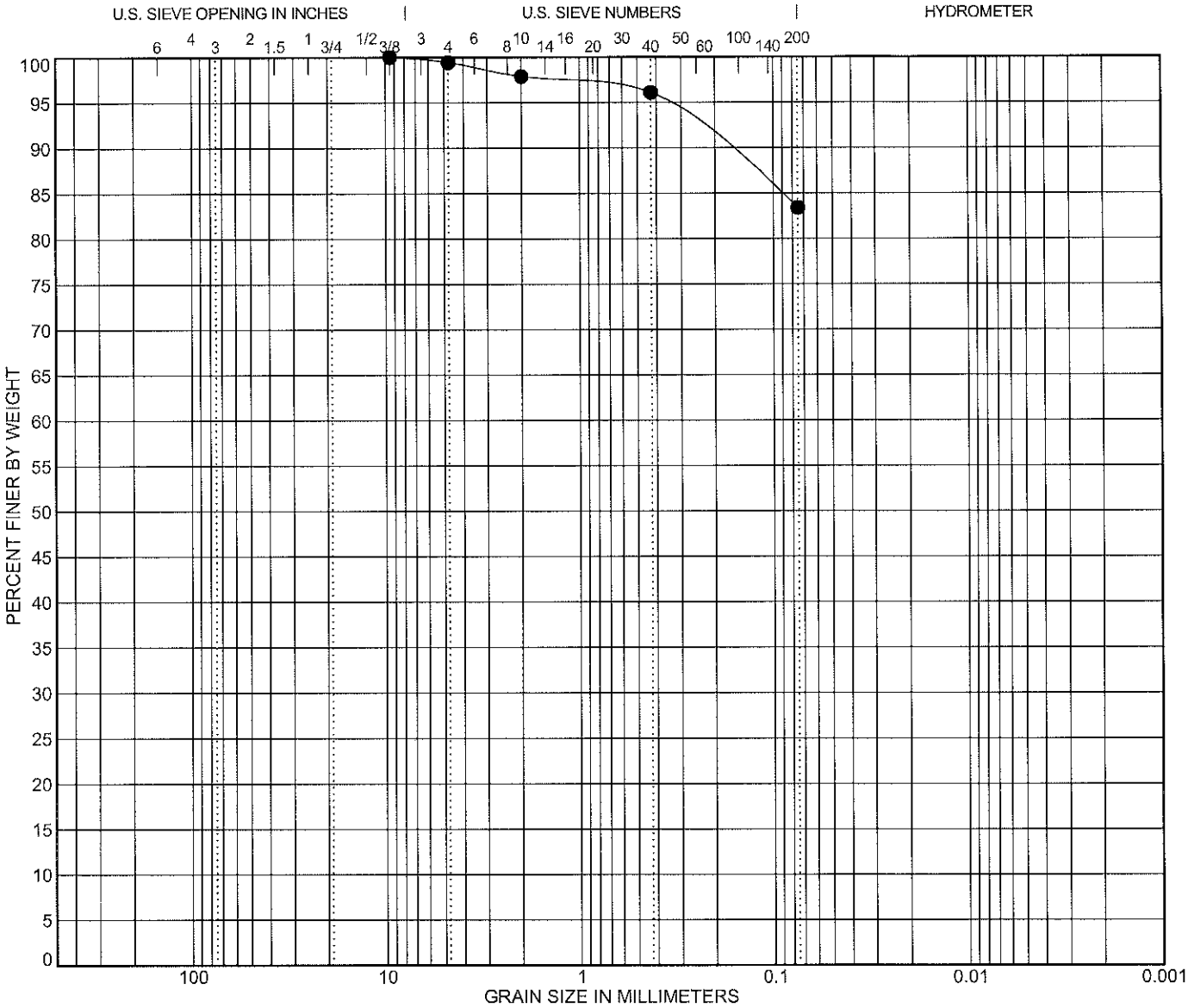

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B93**	**18.0**	**LEAN CLAY with SAND(CL)**	**41**	**18**	**23**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B93**	**18.0**	**100**	**99.4**	**97.9**	**96.1**		**83.4**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B93**	**18.0**	**9.5**				**0.6**	**16.0**	**83.4**	

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
Baytown, Texas
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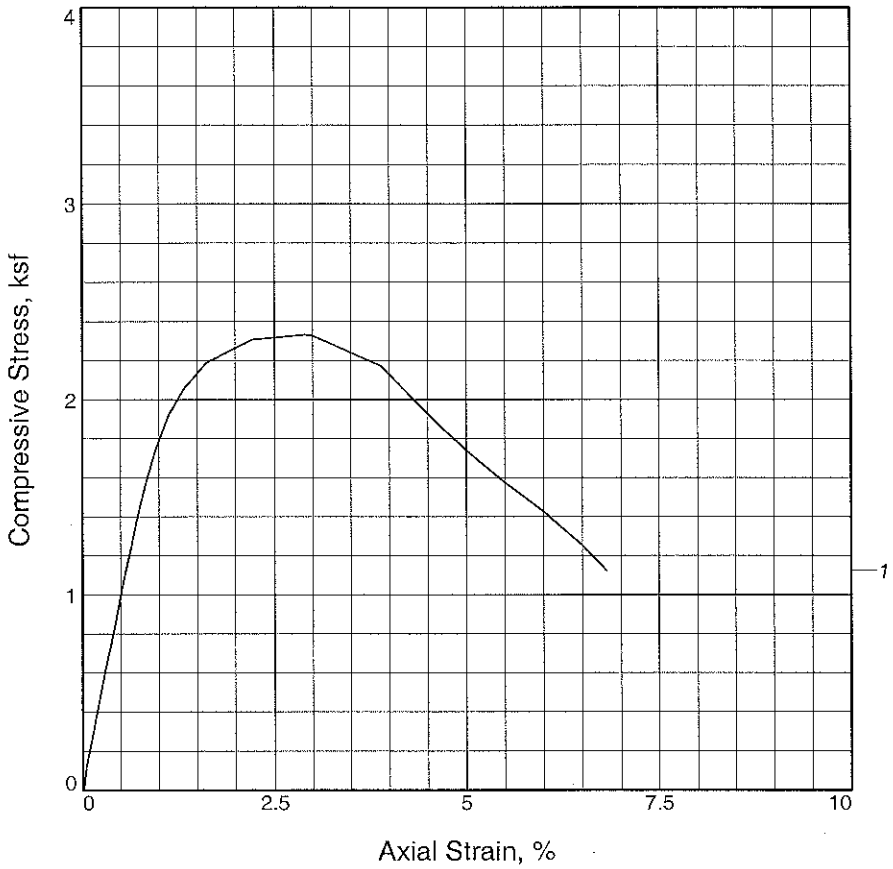
EXHIBIT É

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	2.332			
Undrained shear strength, ksf	1.166			
Failure strain, %	2.9			
Strain rate, in./min.	0.055			
Water content, %	37.0			
Wet density, pcf	114.5			
Dry density, pcf	83.6			
Saturation, %	96.4			
Void ratio	1.0544			
Specimen diameter, in.	2.755			
Specimen height, in.	5.586			
Height/diameter ratio	2.03			

Description: Dark gray Fat Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Undisturbed

Project No.: 92105186-B

Date Sampled:

Remarks:
ASTM D2166

Client: USACE

Project: Pipeline Dredging, Cedar Bayou and Anahuac Channel, PA 16. Contract no. W912HY-09-D-0021, Task Order No. 0012

Location: 09-B93

Sample Number: 7 **Depth:** 12-14 ft.

UNCONFINED COMPRESSION TEST
Terracon, Inc.
Houston, TX

UNCONFINED COMPRESSION TEST

11/5/2010

Date:
Client: USACE
Project: Pipeline Dredging, Cedar Bayou and Anahuac Channel, PA 16.
Contract no. W912HY-09-D-0021, Task Order No. 0012
Project No.: 92105186-B
Location: 09-B93
Depth: 12-14 ft. **Sample Number:** 7
Description: Dark gray Fat Clay
Remarks: ASTM D2166
Type of Sample: Undisturbed
Assumed Specific Gravity=2.75 **LL=** **PL=** **PI=**

Parameters for Specimen No. 1

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	184.160
Moisture content: Dry soil+tare, gms.	147.740
Moisture content: Tare, gms.	49.210
Moisture, %	37.0
Moist specimen weight, gms.	1000.45
Diameter, in.	2.755
Area, in.^{2}	5.961
Height, in.	5.586
Wet density, pcf	114.5
Dry density, pcf	83.6
Void ratio	1.0544
Saturation, %	96.4

Test Readings for Specimen No. 1

Strain rate, in./min. = 0.055
Unconfined compressive strength = 2.332 ksf **at reading no.** 18

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0080	0.000	0.0	0.0	0.000
1	0.0090	0.200	0.2	0.0	0.005
2	0.0109	5.059	5.1	0.1	0.122
3	0.0151	10.978	11.0	0.1	0.265
4	0.0189	17.027	17.0	0.2	0.411
5	0.0232	23.098	23.1	0.3	0.556
6	0.0274	28.921	28.9	0.3	0.696
7	0.0317	34.720	34.7	0.4	0.835
8	0.0355	40.792	40.8	0.5	0.981
9	0.0397	46.502	46.5	0.6	1.117
10	0.0440	52.314	52.3	0.6	1.256
11	0.0477	57.700	57.7	0.7	1.384
12	0.0520	63.019	63.0	0.8	1.510
13	0.0605	72.131	72.1	0.9	1.726
14	0.0714	80.715	80.7	1.1	1.928
15	0.0822	86.325	86.3	1.3	2.058

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.0988	92.125	92.1	1.6	2.189
17	0.1319	97.681	97.7	2.2	2.307
18	0.1702	99.444	99.4	2.9	2.332
19	0.1758	99.246	99.2	3.0	2.325
20	0.2255	93.618	93.6	3.9	2.173
21	0.2472	87.096	87.1	4.3	2.014
22	0.2694	80.605	80.6	4.7	1.856
23	0.2888	75.474	75.5	5.0	1.732
24	0.3162	68.772	68.8	5.5	1.570
25	0.3436	62.706	62.7	6.0	1.424
26	0.3711	55.503	55.5	6.5	1.254
27	0.3886	49.888	49.9	6.8	1.123

Project name: TO-0012 Pipeline Dredging, Volume I, Cedar Bayou PA 6 | Client: USACE, Galveston District | Terracon Project # : 92105186-A

Boring	Depth	Field tests			Atterberg Limits			Grain Size Analysis														USCS Symbol (ASTM 2487)	Wc	γd	Strength tests																						
								Percent Pasing Sieve																	Direct Shear Test					Unconfined Compression				UU Triaxial Test				CU Triaxial Test						
		PP	TV	SPTn	LL	PL	PI	3/4"	3/8"	4	8	10	16	20	30	40	50	70	100	140	200				C	φ	Wc	γd	Symbol	C	Wc	γd	Symbol	C	Wc	γd	Symbol	C	φ	c'	φ'	Wc	γd	Symbol
	ft	tsf	tsf	bl/ft	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		%	pcf	ksf	°	%	pcf		ksf	%	pcf		ksf	%	pcf		ksf	°	ksf	°	%	pcf	
09-B89	0-2	0.25	0.30		100	25	75					100				99					96	CH	52	72																					
	2-4	0.25	0.15																			CH**	75																						
	4-6	0.25	0.15		63	20	43			100		100				99					79	CH	46	79																					
	6-8	0.25	0.10																			CH**	37																						
	8-10	0.25	0.50																			CH**/CL**	70																						
	10-12	3.25																				CL**	20																						
	12-14	0.50			34	18	16		100	100		99				96					88	CL	22							1.1	22	106	CL**											
	14-16	0.75																				CL**	30																						
	16-18	0.50																				CL**	28																						
	18-20	1.50																				CL**	29																						
09-B90	0-2	0.50																				CH**	44																						
	2-4	0.25			95	28	67			100		96				96					92	CH	56	67																					
	4-6	0.75			77	24	53					100				100					91	CH	44							0.9	44	79	CH**											
	6-8	0.25	0.10																			CH**	61																						
	8-10	0.25	0.05																			CL**	35																						
	10-12	0.00	0.20		38	16	22					100				98					63	CL	29	90																					
	12-14	0.00	0.10																			CH**	85																						
	14-16	0.50	0.40																			CH**	36																						
	16-18	0.25	0.40																			CH**	40																						
	18-20	0.25	0.30		145	39	106					100				97					92	CH	105																						
09-B91	0-2	0.25	0.30																			CH**	47																						
	2-4	0.00	0.15																			CH**	56																						
	4-6	0.50			90	29	61					100				100					93	CH	45							0.8	46	77	CH**											
	6-8	0.75																				CH**	41																						
	8-10	0.25	0.15																			CH**	41																						
	10-12	0.25	0.05																			CH**	52																						
	12-14	0.75			75	26	49		100	98		94				87					80	CH	39	82																					
	14-16	0.25	0.25																			CH**	52																						
	16-18	0.00	0.20		166	40	126			100		100				99					84	CH	50							0.4	50	59	CH**											
	18-20	0.25	0.30																			CH**	35																						
09-B92	0-2	0.25	0.20		98	29	69			100		100				99					96	CH	56	67																					
	2-4	0.25	0.05																			CH**	96																						
	4-6	0.25	0.30																			CH**	51																						
	6-8	0.50	0.30		61	20	41					100				99					83	CH	35							0.5	35	85	CH**											
	8-10																					CH**	79																						
	10-12	0.25	0.05																			CH**	56																						
	12-14	0.50																				CH**	31																						
	14-16	0.75			70	19	51			100		100				99					97	CH	33	90																					
	16-18	0.50																				CH**	35																						
	18-20	0.50	0.40																			CH**	45																						
09-B93	0-2	0.00	0.25																			CH**	59																						
	2-4	0.00	0.10																			CH**	62																						
	4-6	0.00	0.20		116	33	83					100				100					99	CH	68	59																					
	6-8	0.75																				CH**	35																						
	8-10	0.00	0.20																			CH**	60																						
	10-12	0.25	0.05																			CH**	41																						
	12-14	1.00			74	26	48		100	100		100				99					93	CH	37							1.2	37	84	CH**											
	14-16	1.25																				CL**	21																						
	16-18	1.00																				CL**	31																						
	18-20	1.25			41	18	23		100	99		98				96					83	CL	22	105																					