BORING LOG NO. 09-B92

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
BORING LOCATION:	N: 13826704 E: 3260205	SITE:	Cedar Bayou PA6 Baytown, Texas

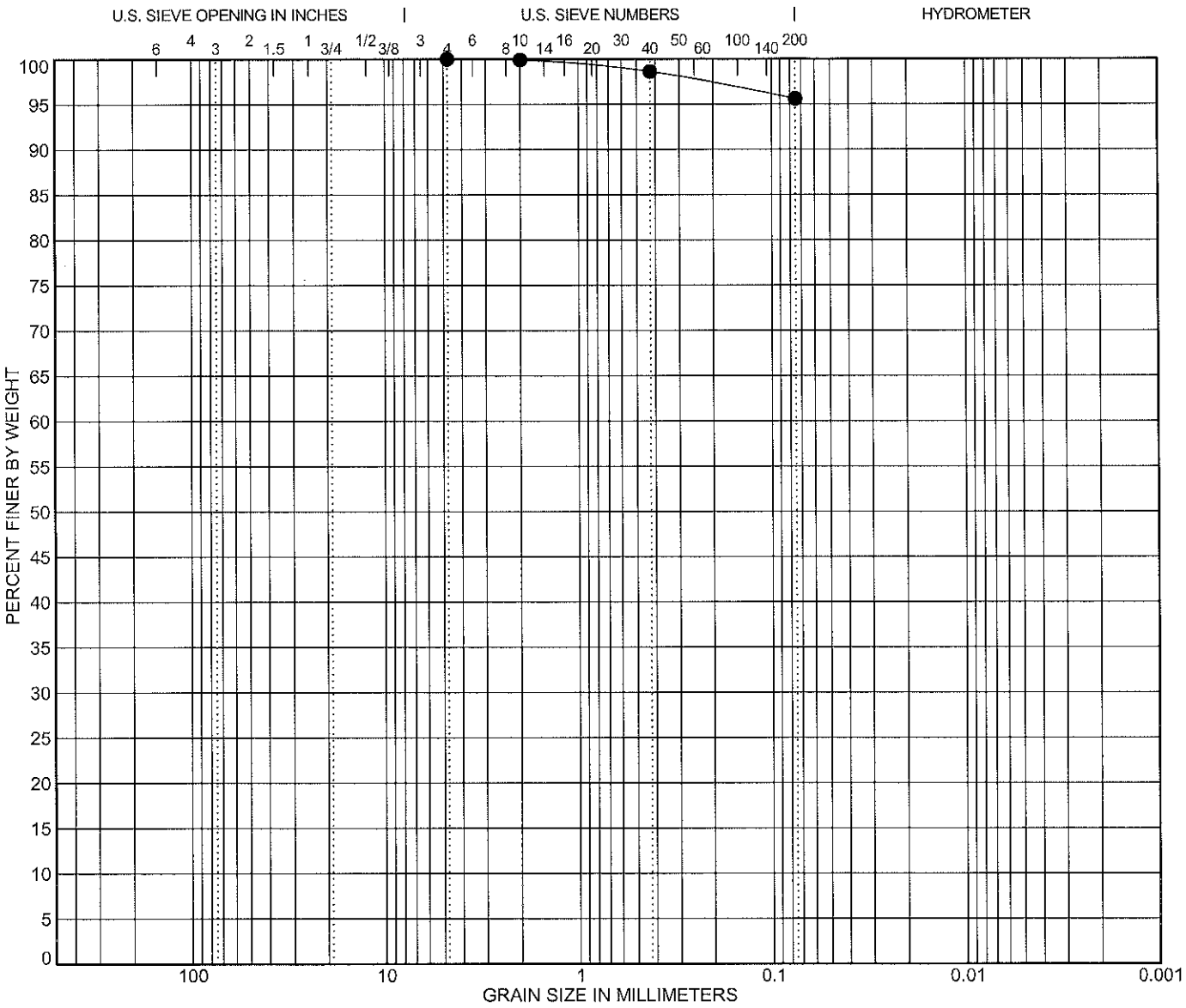
Approx. Surface Elevation: 11.2 feet

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, gray and dark gray, very soft, very high plasticity, wet, with roots, wood and organic matter	1	CH	ST	12		0.25	0.2	56	67	98	29	69	96			
		2–4		ST	6		0.25	0.05	96								
	5.2 — 6.0	5		ST	10		0.25	0.3	51								
	FILL: FAT CLAY w/SAND light gray, medium stiff, very high plasticity, moist, with sand pockets	6–8	CH	ST	12		0.5	0.3	35	85	61	20	41	83			
	3.2 — 8.0	8–10	CH	BS	11				79								
	FILL: FAT CLAY light gray, very soft, very high plasticity, wet	10–12	CH	ST	11		0.25	0.05	56								
	1.2 — 10.0	12–14		ST	15		0.5		31								
	FAT CLAY light gray and dark gray, very soft to medium stiff, very high plasticity, moist - with roots 12 to 14 feet	14–16		ST	19		0.75		33	90	70	19	51	97			
		16–18		ST	9		0.5		35								
	-8.8 — 20.0	18–20		ST	19		0.5	0.4	45								
	Boring terminated at 20 feet.																

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	Page 1 of 1
▽	▼		3/19/2010	09-B92
▼	▼		PROJECT NUMBER	
			92105186-A	EXHIBIT A-



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **09-B92**	**0.0**	**FAT CLAY(CH)**	**98**	**29**	**69**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **09-B92**	**0.0**		**100**	**99.9**	**98.6**		**95.6**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **09-B92**	**0.0**	**4.75**				**0.0**	**4.4**	**95.6**	

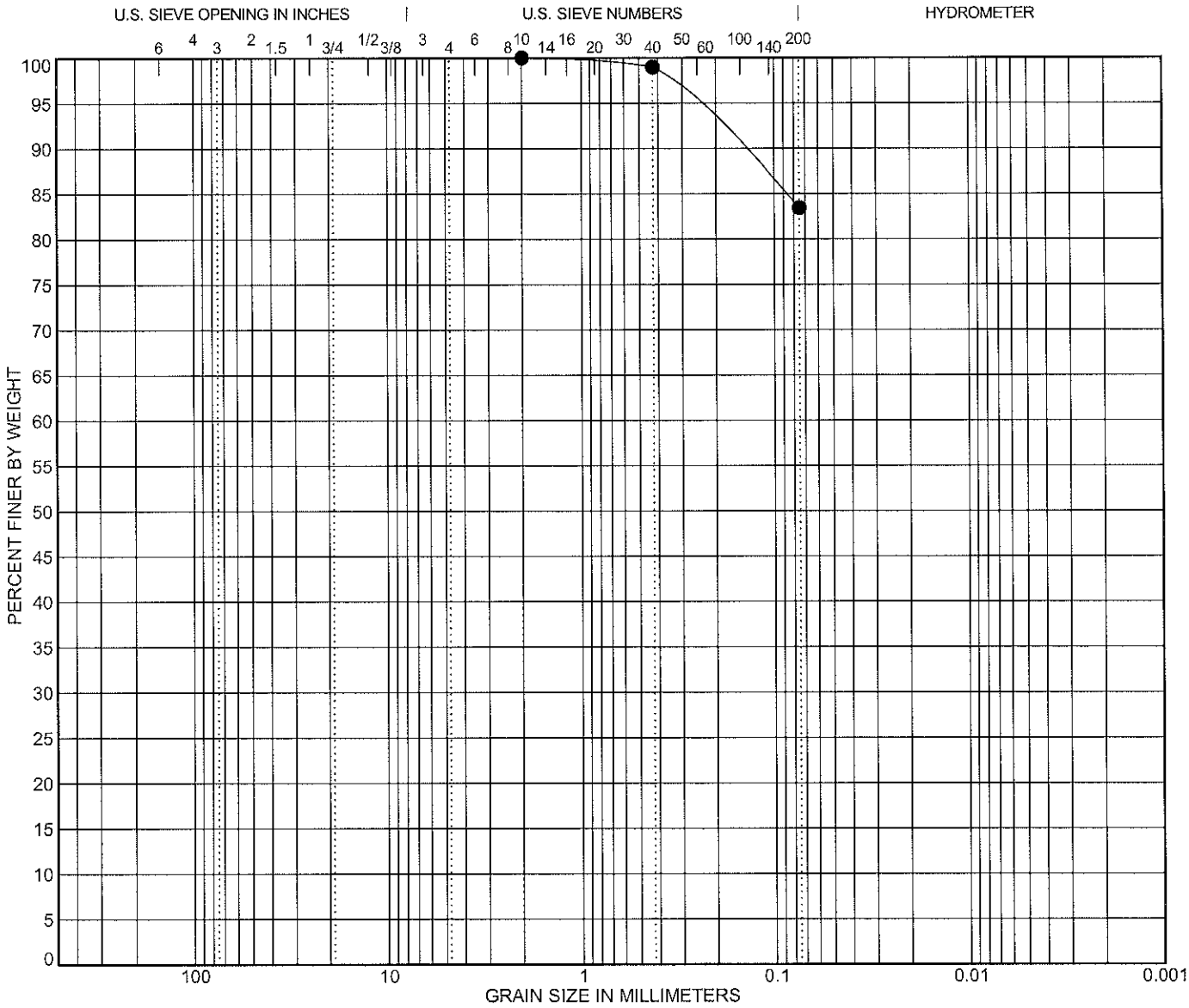
GRAIN SIZE DISTRIBUTION

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 Ä



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B92**	**6.0**	**FAT CLAY with SAND(CH)**	**61**	**20**	**41**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B92**	**6.0**			**100**	**99**		**83.4**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B92**	**6.0**	**2**				**0.0**	**16.6**	**83.4**	

GRAIN SIZE DISTRIBUTION

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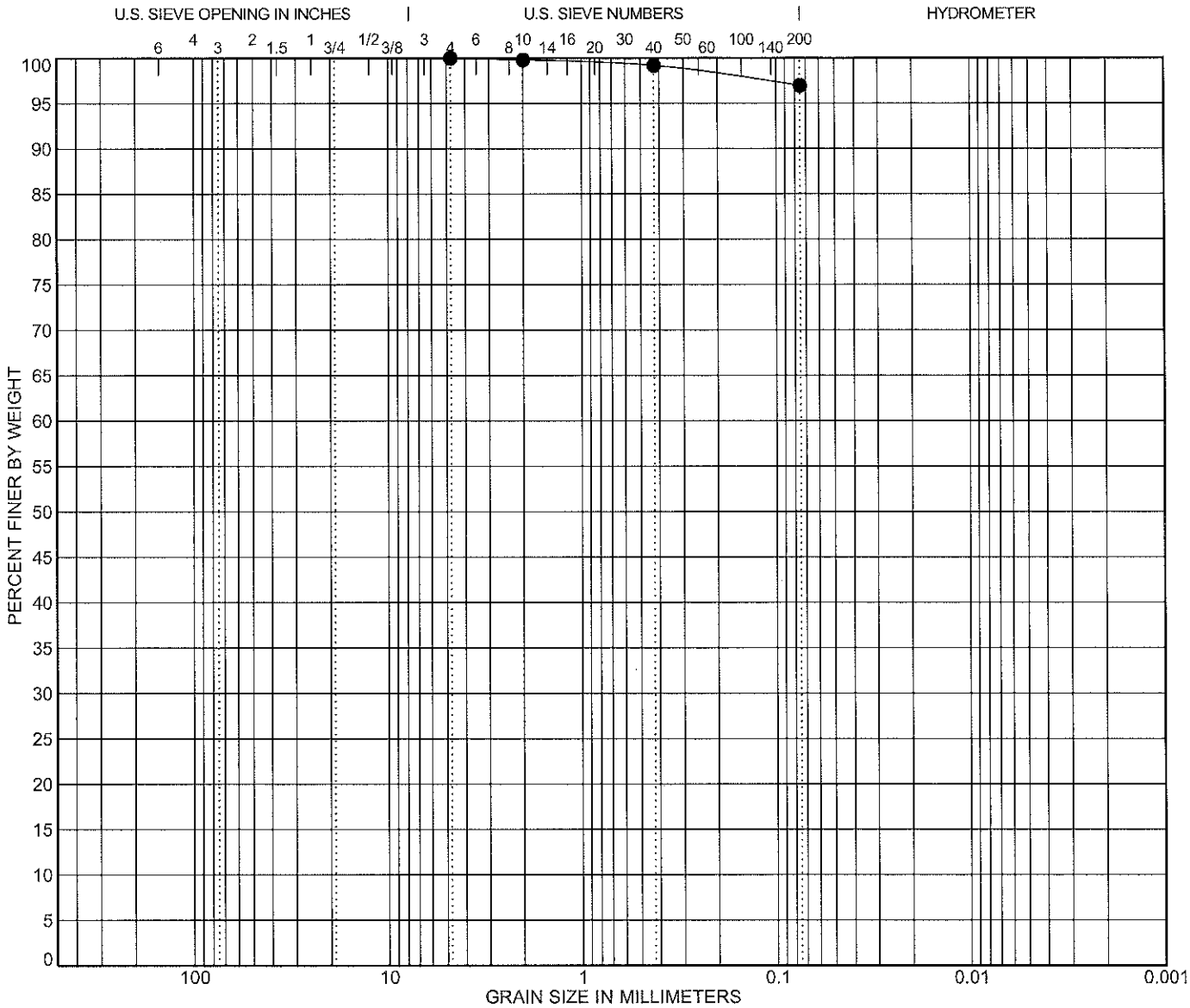
EXHIBIT A



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B92**	**14.0**	**FAT CLAY(CH)**	**70**	**19**	**51**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B92**	**14.0**		**100**	**99.8**	**99.2**		**96.9**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B92**	**14.0**	**4.75**				**0.0**	**3.1**	**96.9**	

GRAIN SIZE DISTRIBUTION

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

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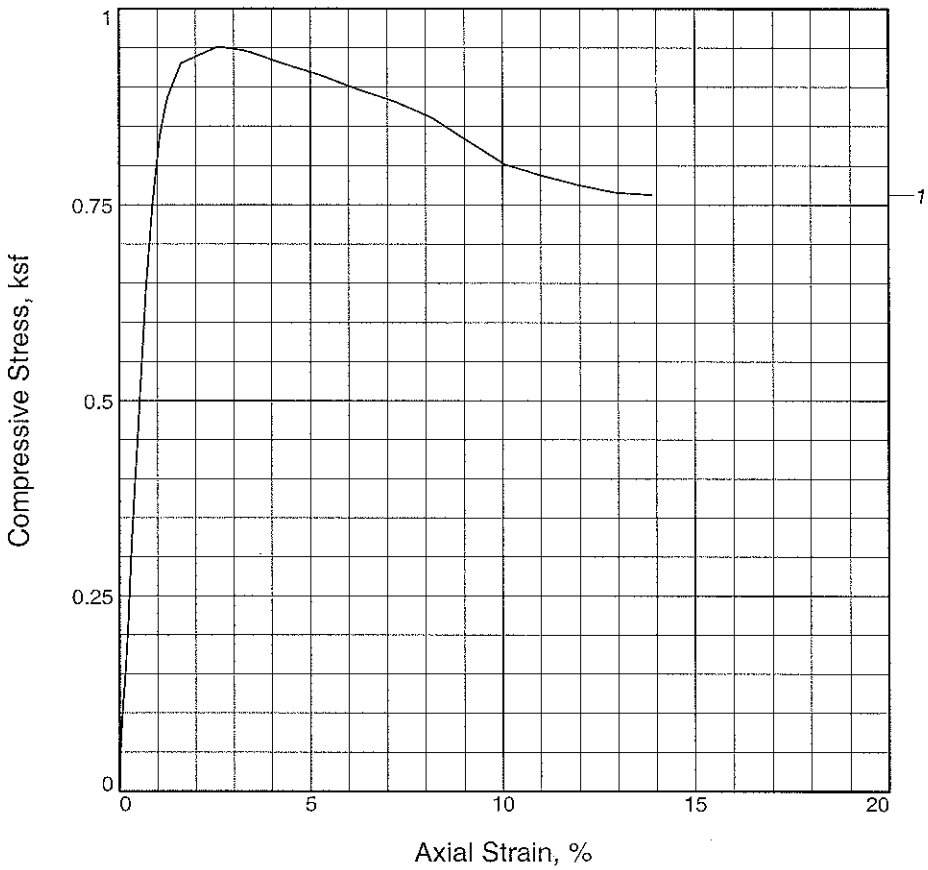
EXHIBIT Æ

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	0.951			
Undrained shear strength, ksf	0.475			
Failure strain, %	2.6			
Strain rate, in./min.	0.055			
Water content, %	34.9			
Wet density, pcf	114.9			
Dry density, pcf	85.2			
Saturation, %	94.5			
Void ratio	1.0141			
Specimen diameter, in.	2.720			
Specimen height, in.	5.778			
Height/diameter ratio	2.12			

Description: Gray 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-B92

Sample Number: 4 **Depth:** 6-8 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-B92
Depth: 6-8 ft. **Sample Number:** 4
Description: Gray 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.	174.830
Moisture content: Dry soil+tare, gms.	142.620
Moisture content: Tare, gms.	50.200
Moisture, %	34.9
Moist specimen weight, gms.	1012.99
Diameter, in.	2.720
Area, in.^{2}	5.811
Height, in.	5.778
Wet density, pcf	114.9
Dry density, pcf	85.2
Void ratio	1.0141
Saturation, %	94.5

Test Readings for Specimen No. 1

Strain rate, in./min. = 0.055
Unconfined compressive strength = 0.951 ksf **at reading no.** 18

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0100	0.000	0.0	0.0	0.000
1	0.0100	0.000	0.0	0.0	0.000
2	0.0100	0.000	0.0	0.0	0.000
3	0.0110	1.792	1.8	0.0	0.044
4	0.0148	4.354	4.4	0.1	0.108
5	0.0191	6.334	6.3	0.2	0.157
6	0.0233	8.989	9.0	0.2	0.222
7	0.0271	11.748	11.7	0.3	0.290
8	0.0299	13.827	13.8	0.3	0.341
9	0.0342	16.414	16.4	0.4	0.405
10	0.0384	18.789	18.8	0.5	0.463
11	0.0422	21.257	21.3	0.6	0.524
12	0.0465	23.819	23.8	0.6	0.587
13	0.0507	26.270	26.3	0.7	0.646
14	0.0602	30.542	30.5	0.9	0.750
15	0.0711	34.072	34.1	1.1	0.835

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.0824	36.140	36.1	1.3	0.884
17	0.1042	38.169	38.2	1.6	0.930
18	0.1595	39.391	39.4	2.6	0.951
19	0.1977	39.489	39.5	3.2	0.947
20	0.2086	39.463	39.5	3.4	0.944
21	0.2639	39.181	39.2	4.4	0.928
22	0.3159	38.950	39.0	5.3	0.914
23	0.3712	38.594	38.6	6.3	0.897
24	0.4261	38.312	38.3	7.2	0.881
25	0.4809	37.840	37.8	8.1	0.861
26	0.5362	36.882	36.9	9.1	0.831
27	0.5910	35.955	36.0	10.1	0.801
28	0.6459	35.705	35.7	11.0	0.787
29	0.7012	35.535	35.5	12.0	0.775
30	0.7560	35.494	35.5	12.9	0.766
31	0.8108	35.723	35.7	13.9	0.763

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																					