BORING LOG NO. 10-B18

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	Galveston Channel Deepening, TO-0010
BORING LOCATION:	N: 13686656.17 E: 3317161.84	SITE:	San Jacinto Placement Area Galveston, Texas

Approx. Surface Elevation: 11.0 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 brownish gray, w/ roots, very soft (9.0 – 2.0)	1	CH	ST	16		0.0	0.2	57								
	FILL: FAT CLAY w/ SAND bluish gray, very soft (7.0 – 4.0)	3	CH	ST	20		0.0	0.2			97	28	69	82			
	FILL: FAT CLAY bluish gray, very soft at 6' - 8' interval: with organic matter content	5	CH	ST	21		0.0	0.25	92	52	96	29	67	98			
		7		ST	15		0.0	0.1	95								
		9		ST	16		0.0	0.05	78		75	24	51	94			
		11		ST	17		0.0	0.05	101								
		13		ST	17		0.0	0.05	88	51	114	33	81				
		15		SS	13	0			85								
		17		SS	14	0			80		109	29	80				
		19		SS	18	0			80								
	(-9.0 – 20.0) 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: **Dry auger to 6 feet; wet rotary thereafter.**

WATER LEVEL OBSERVATIONS			
5 ft	WS	1.5 ft	at 5 min
1 ft	at 10 min	1 ft	at 15 min

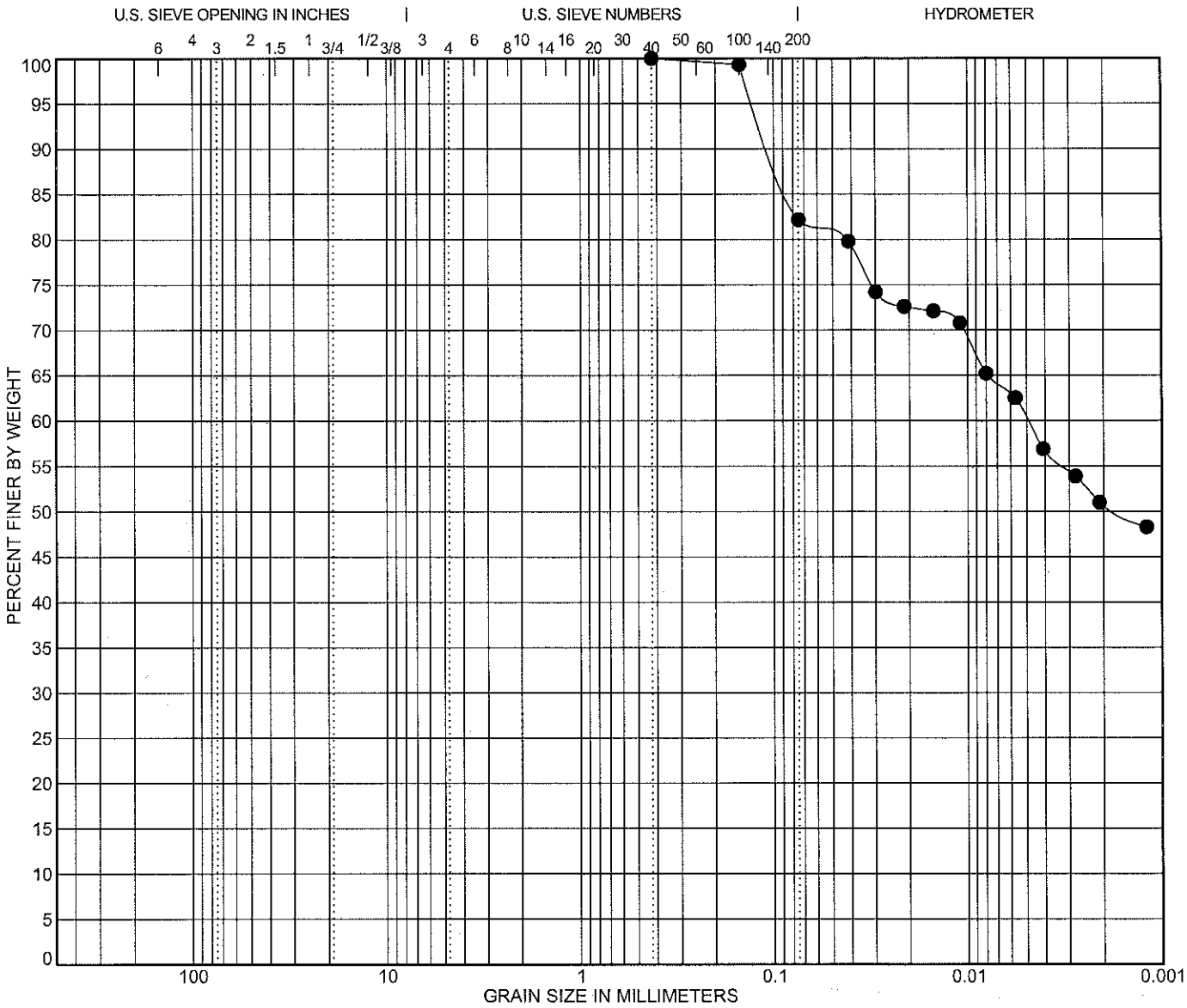
Terracon

DATE DRILLED: 4/14/2010

PROJECT NUMBER: 92105154

10-B18

EXHIBIT A-18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**10-B18**	**2.0**	**FAT CLAY with SAND(CH)**	**97**	**28**	**69**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**10-B18**	**2.0**				**100**	**99.3**	**82.2**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10-B18**	**2.0**	**0.425**	**0.002**			**0.0**	**17.8**	**31.4**	**50.8**

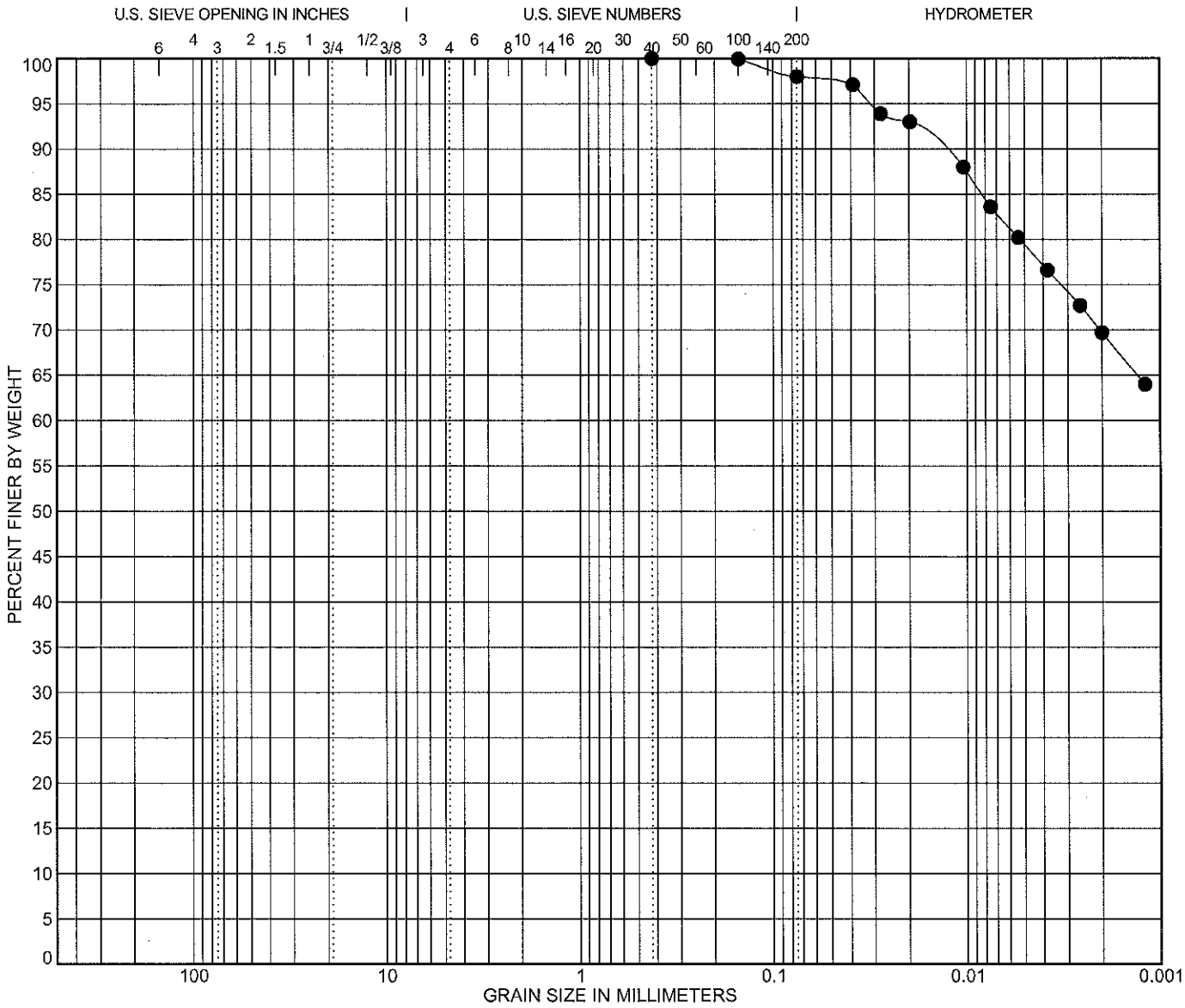
GRAIN SIZE DISTRIBUTION

Galveston Channel Deepening,
TO-0010
Galveston, Texas
Project Number 92105154

Terracon

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

SPECIMEN ID
10-B18, 2.0



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**10-B18**	**4.0**	**FAT CLAY(CH)**	**96**	**29**	**67**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**10-B18**	**4.0**				**100**	**99.9**	**98**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10-B18**	**4.0**	**0.425**				**0.0**	**2.0**	**28.3**	**69.7**

GRAIN SIZE DISTRIBUTION

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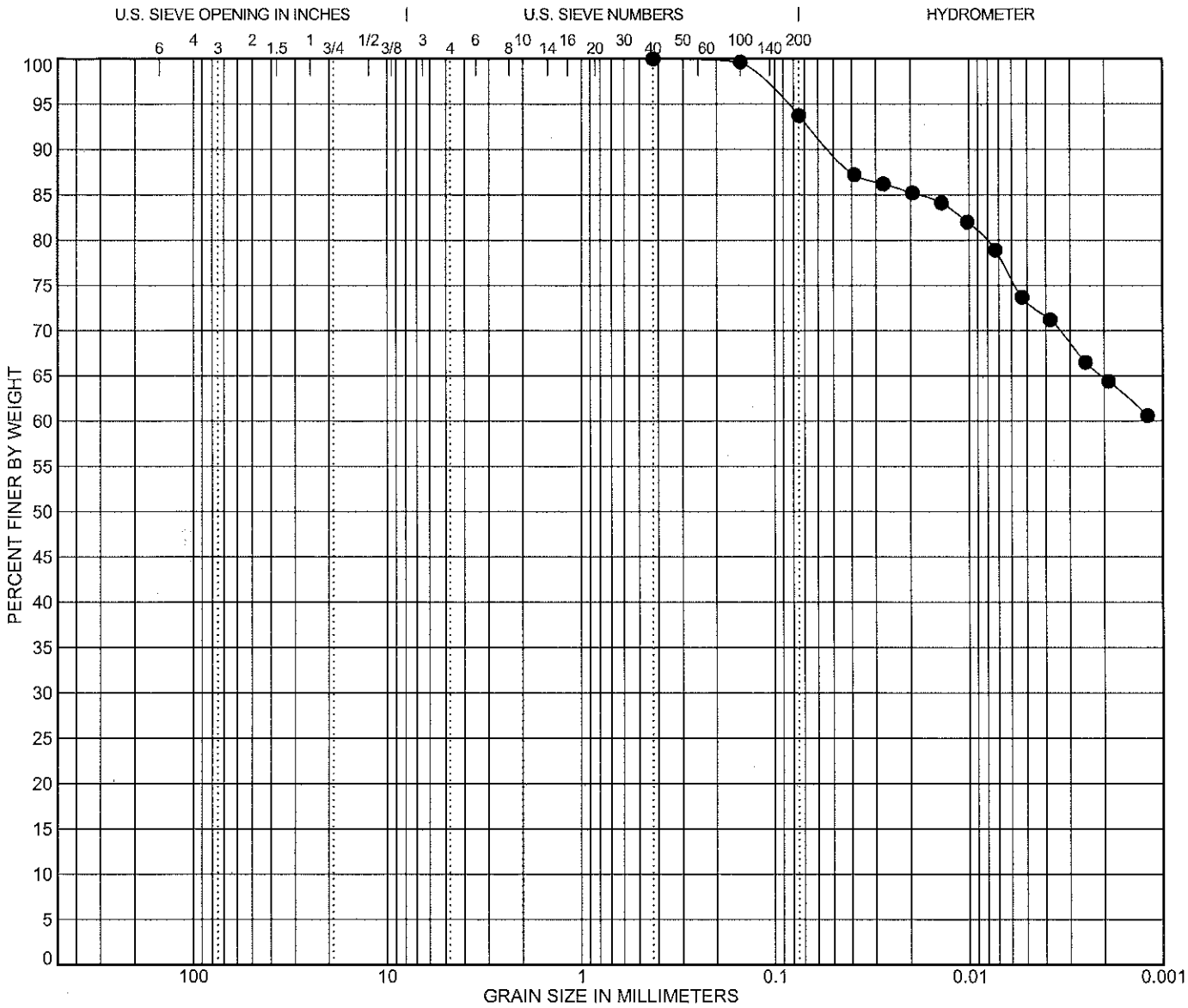
SPECIMEN ID
10-B18, 4.0



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**10-B18**	**8.0**	**FAT CLAY(CH)**	**75**	**24**	**51**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**10-B18**	**8.0**				**100**	**99.6**	**93.7**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10-B18**	**8.0**	**0.425**				**0.0**	**6.3**	**28.9**	**64.8**

GRAIN SIZE DISTRIBUTION

Galveston Channel Deepening,
TO-0010
Galveston, Texas
Project Number 92105154

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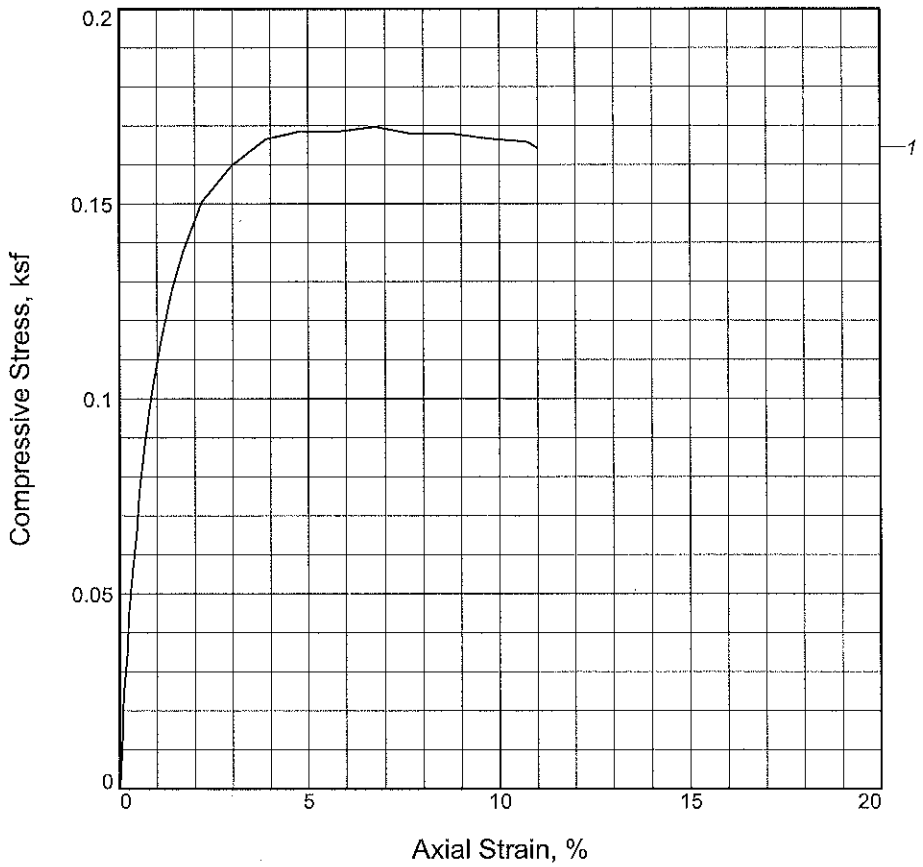
SPECIMEN ID
10-B18, 8.0

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	0.170			
Undrained shear strength, ksf	0.085			
Failure strain, %	6.7			
Strain rate, in./min.	0.055			
Water content, %	77.5			
Wet density, pcf	97.2			
Dry density, pcf	54.8			
Saturation, %	99.8			
Void ratio	2.1355			
Specimen diameter, in.	2.733			
Specimen height, in.	5.812			
Height/diameter ratio	2.13			

Description: Gray Fat Clay

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

Project No.: 92105154

Date Sampled:

Remarks:
ASTM D2166

Client: USACE

Project: Galveston Channel Deepening San Jacinto Placement Area
Contract #W912HY-09-D-0021, Task Order #0010

Location: 10-B18

Sample Number: 5 **Depth:** 8-10 ft.

UNCONFINED COMPRESSION TEST
Terracon, Inc.
Houston, TX

UNCONFINED COMPRESSION TEST

7/22/2010

Date:
Client: USACE
Project: Galveston Channel Deepening San Jacinto Placement Area
Contract #W912HY-09-D-0021, Task Order #0010
Project No.: 92105154
Location: 10-B18
Depth: 8-10 ft. **Sample Number:** 5
Description: 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.	164.750
Moisture content: Dry soil+tare, gms.	113.690
Moisture content: Tare, gms.	47.810
Moisture, %	77.5
Moist specimen weight, gms.	869.81
Diameter, in.	2.733
Area, in.^{2}	5.866
Height, in.	5.812
Wet density, pcf	97.2
Dry density, pcf	54.8
Void ratio	2.1355
Saturation, %	99.8

Test Readings for Specimen No. 1

Strain rate, in./min. = 0.055
Unconfined compressive strength = 0.170 ksf **at reading no.** 20

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0000	0.000	0.0	0.0	0.000
1	0.0010	0.035	0.0	0.0	0.001
2	0.0013	0.045	0.0	0.0	0.001
3	0.0043	0.536	0.5	0.1	0.013
4	0.0058	0.962	1.0	0.1	0.024
5	0.0117	1.400	1.4	0.2	0.034
6	0.0142	1.820	1.8	0.2	0.045
7	0.0202	2.272	2.3	0.3	0.056
8	0.0262	2.670	2.7	0.5	0.065
9	0.0302	3.096	3.1	0.5	0.076
10	0.0392	3.611	3.6	0.7	0.088
11	0.0492	4.132	4.1	0.8	0.101
12	0.0641	4.713	4.7	1.1	0.114
13	0.0812	5.273	5.3	1.4	0.128
14	0.0986	5.710	5.7	1.7	0.138
15	0.1275	6.269	6.3	2.2	0.151

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.1740	6.716	6.7	3.0	0.160
17	0.2263	7.066	7.1	3.9	0.167
18	0.2788	7.218	7.2	4.8	0.169
19	0.3337	7.281	7.3	5.7	0.168
20	0.3916	7.417	7.4	6.7	0.170
21	0.4500	7.417	7.4	7.7	0.168
22	0.5081	7.502	7.5	8.7	0.168
23	0.5660	7.527	7.5	9.7	0.167
24	0.6239	7.573	7.6	10.7	0.166
25	0.6384	7.528	7.5	11.0	0.164

SUMMARY TABLE OF LABORATORY TEST DATA

Project name: TO-0010 Galveston Channel Deepening | Client: USACE, Galveston District | Terracon Project # : 92105154

Boring	Depth	Field tests			Atterberg Limits			Grain size Analysis										USCS Symbol	Wc	γd	Strenght tests																				
								% by weight passing sieve					Soil Particle Content								Direct Shear Test					Unconfined Compression				UU Triaxial Test				CU Triaxial Test						
		PP	TV	SPTn	LL	PL	PI	4	10	40	100	200	gravel	sand	silt	clay	sieve 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	
10-B15	0-2	0.00	0.10															CH**	51																						
	2-4	0.00	0.20		96	30	66	100	100	100	100	99	0	1	35	64		CH								0.17	55	69	CH**												
	4-6	0.00	0.15															MH**	48																						
	6-8	0.00	0.10															MH**	65	58																					
	8-10	0.00	0.05		111	59	52	100	100	100	100	97	0	3	44	53		MH												0.28	46	74	CH**							
	10-12	0.00	0.10															CH**	99																						
	12-14	0.00	0.05															CH**	94	45																					
	14.5-16			0														CH**	91																						
	16.5-18			27														SP-SM**	46																						
	18.5-20			46				100	100	98	85	7	0	93	4	3		SP-SM*	26																						
10-B16	0-2	1.00			87	31	56											CH*	38	81																					
	2-4	0.00	0.15		83	30	53	100	100	100	100	98	0	2	42	56		CH								0.44	38	81	CH**												
	4-6	0.00	0.10															CH**	45																						
	6-8	0.00	0.15															CH**	81	55																					
	8-10	0.00	0.10		60	22	38	100	100	100	99	90	0	10	40	50		CH	44																						
	10-12	0.00	0.15		86	29	57	100	100	100	99	88	0	12	33	55		CH	49	74																					
	12-14	0.00	0.25															CH**	46																						
	14.5-16			0														CH**	62																						
	16.5-18			40				100	100	100	91	6	0	94	4	2		SP-SM*	28																						
	18.5-20			26														SP-SM**	24																						
10-B17	0-2	0.50			101	33	68											CH*	56	67																					
	2-4	0.00	0.20															CH**	56																						
	4-6	0.00	0.20		81	27	54											CH*												0.28	76	54	CH**							
	6-8	0.00	0.15															CH**	83																						
	8-10	0.00	0.10															CH**	87																						
	10-12	0.00	0.10		123	35	88	100	100	100	100	100	0	0	21	79		CH	93	47																					
	12-14	0.00	0.10															CH**	62																						
	14.5-16			0														CH**	50																						
	16.5-18			22				100	100	100	93	5	0	95			5	SP-SM*	26																						
	18.5-20			10														SP-SM**	34																						
10-B18	0-2	0.00	0.20															CH**	57																						
	2-4	0.00	0.20		97	28	69	100	100	100	99	82	0	18	31	51		CH																							
	4-6	0.00	0.25		96	29	67	100	100	100	100	98	0	2	28	70		CH	92	52																					
	6-8	0.00	0.10															CH**	95																						
	8-10	0.00	0.05		75	24	51	100	100	100	100	94	0	6	29	65		CH	78							0.09	78	55	CH**												
	10-12	0.00	0.05															CH**	101																						
	12-14	0.00	0.05		114	33	81											CH*	88	51																					
	14.5-16			0														CH**	85																						
	16.5-18			0	109	29	80											CH*	80																						
	18.5-20			0														CH**	80																						
10-B19	0-2	0.75			103	35	68	100	100	100	100	97	0	3	30	67		CH	45																						
	2-4	0.00	0.15		100	29	71	100	100	100	100	96	0	4	31	65		CH												0.42	47	73	CH**							
	4-6	0.00	0.30															CH**	53																						
	6-8	0.00	0.15															CH**	45	73																					
	8-10	0.00	0.10		80	26	54	100	100	100	100	99	0	1	38	61		CH																0.26	3	0.14	21	67	60	CH**
	10-12	0.00	1.00															CH**	54																						
	12.5-14			7														CH**	32																						
	14.5-16			0				100	100	99	95	57	0	43	20	37		CH*	44																						
	16.5-18			31														SP-SM**	26																						