SUMMARY OF LABORATORY TESTS

Project No. 08.18.920

Client: United States Army Corps of Engineers

Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080

Boring No.	Sample No.	Depth (ft)	Torvane Shear Test (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
	13	27-28.5		Gray SAND with SILT; shells	SP-SM						11.8				
	14	30-32		Gray FAT CLAY	CH	48.4	72.3	92	25	67	98.7	0.83	4.6	20.0	60 degree
	15	32-34		Gray FAT CLAY	CH	44.6	74.8								
	16	34-36		Gray FAT CLAY	CH	41.8	79.2								
	17	36-38		Gray SILTY SAND; shells and clay	SM	21.5	92.9	NV	NP	NP	23.7	0.34	4.6		Vertical shear
	18	38-40		Gray poorly graded SAND with SILT	SP-SM						11.8				
07-215															
	1	0-2		Gray FAT CLAY	CH	38.1	78.2								
	2	2-4		Gray FAT CLAY	CH	61.8	60.3	83	23	60	96.4	0.32	2.9		Slickensided
	3	4-6		Gray FAT CLAY	CH	45.6	72.4					0.32	15.2	4.0	60 degree
	4	6-8		Gray FAT CLAY	CH	50.3	67.5								
	5	8-10	0.23	Gray FAT CLAY	CH	59.3	63.1	87	25	62	92.3				
	6	10-11.5		Gray poorly graded SAND with SILT; shells	SP-SM						8.0				
	7	15-16.5		Gray SILTY SAND; shells	SM						17.1				
	8	18.5-20		Gray SILTY SAND	SM						14.0				
07-216															
	1	0-2		Gray FAT CLAY	CH	37.5	76.8								
	2	2-4		Gray FAT CLAY	CH	76.5	59.3	81	24	57	91.4	0.34	5.1		Vertical shear
	3	4-6	0.25	Gray FAT CLAY	CH	39.2	61.0					0.17	4.8		Multiple shear
	4	6-8		Gray FAT CLAY	CH	70.0	55.6	72	21	51	92.0	0.27	4.6	5.5	60 degree
	5	8-10	0.13	Gray FAT CLAY	CH	68.1	56.4	86	24	62	95.7				
	6	10-12		Gray FAT CLAY	CH	59.9	61.0								
	7	12-13.5		Gray SILTY SAND	SM						24.5				
	8	16-18		Gray SANDY LEAN CLAY	CL	28.6	95.6								
	9	18-20		Gray SANDY SILTY CLAY	CL-ML	20.6	97.3								
07-217															
	1	0-1		Gray and brown FAT CLAY	CH										
	2	1-2		Gray and brown FAT CLAY	CH	52.6		87	24	63	95.0				
	3	2-3		Gray and brown FAT CLAY	CH										
	4	3-4		Gray FAT CLAY	CH	64.2		103	28	75	98.0				
	5	4-5		Gray FAT CLAY	CH										
	6	5-6		Gray FAT CLAY	CH	85.4		112	28	84	97.7				
07-218															
	1	0-2		Tan and gray SAND with SILT; shells	SP-SM						5.8				
	2	2-3.5		Gray and tan poorly graded SAND with SILT; shells	SP-SM						8.5				
	3	7-8.5		Gray poorly graded SAND	SP						4.2				
	4	12-13.5		Gray poorly graded SAND with SILT	SP-SM						7.8				

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

Particle Size Analysis - ASTM D 422

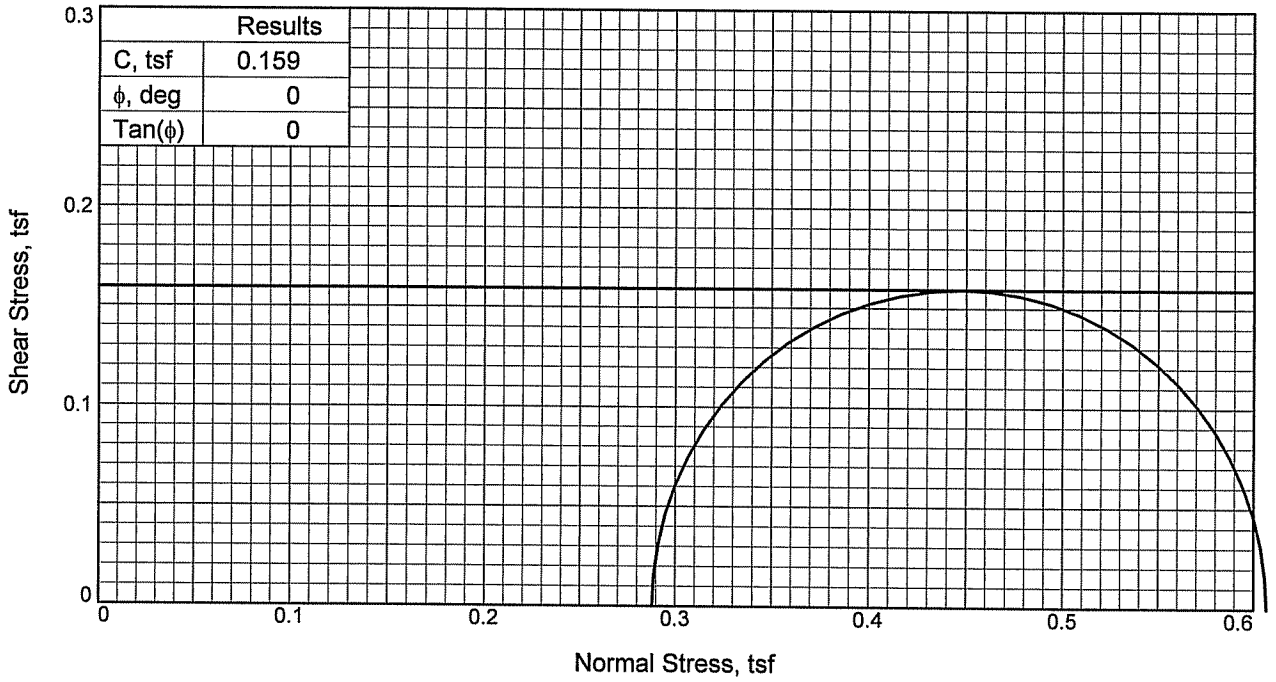
	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.4	3.0	4.7	80.7	10.2	
□	0.0	0.0	0.0	0.0	0.4	76.8	22.8	
△	0.0	0.0	0.0	0.4	1.1	86.7	11.8	
◇	0.0	0.0	14.4	12.1	17.1	48.4	8.0	
▽	0.0	0.0	1.2	0.5	4.2	80.1	14.0	

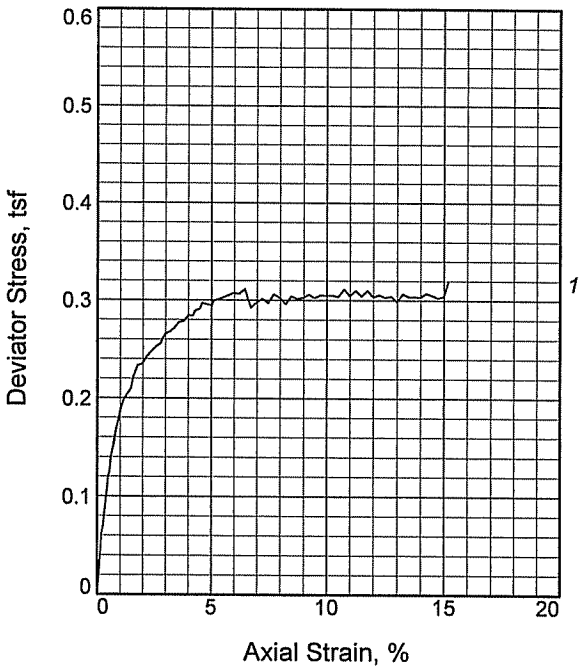
SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	07-212	9	16-17.5	Gray and tan poorly graded SAND with SILT	SP-SM
□	07-214	12	22-23.5	Gray SILTY SAND	SM
△	07-214	18	38-40	Gray poorly graded SAND with SILT	SP-SM
◇	07-215	6	10-11.5	Gray poorly graded SAND with SILT; shells	SP-SM
▽	07-215	8	18.5-20	Gray SILTY SAND	SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client: United States Army Corps of Engineers
Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080
Project No.: 08.18.920 **Figure**





Sample No.		1
Initial	Water Content, %	45.6
	Dry Density, pcf	72.4
	Saturation, %	92.7
	Void Ratio	1.3289
	Diameter, in.	2.77
	Height, in.	5.99
At Test	Water Content, %	46.1
	Dry Density, pcf	72.4
	Saturation, %	93.8
	Void Ratio	1.3289
	Diameter, in.	2.77
	Height, in.	5.99
Strain rate, %/min.		1.00
Back Pressure, tsf		0.00
Cell Pressure, tsf		0.29
Fail. Stress, tsf		0.32
Ult. Stress, tsf		
σ_1 Failure, tsf		0.61
σ_3 Failure, tsf		0.29

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray FAT CLAY

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 2850
Pocket pen; tsf: 0.50
Failure type: 60 degree

Client: United States Army Corps of Engineers

Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080

Source of Sample: 07-215 **Depth:** 4-6

Sample Number: 3

Proj. No.: 08.18.920 **Date Sampled:** 7/31/08

TRIAXIAL SHEAR TEST REPORT

Tolunay-Wong Engineers, Inc.

TRIAXIAL COMPRESSION TEST

Unconsolidated Undrained

8/8/2008
11:27 AM

Date: 7/31/08
Client: United States Army Corps of Engineers
Project: Galveston Channel and San Jacinto PA Contract No. DACW64-03-D-0008, Task Order No. 0080
Project No.: 08.18.920
Location: 07-215
Depth: 4-6 **Sample Number:** 3
Description: Gray FAT CLAY
Remarks:
Test method: ASTM D 2850
Pocket pen; tsf: 0.50
Failure type: 60 degree
Type of Sample: Undisturbed
Assumed Specific Gravity=2.70 **LL=** **PL=** **PI=**
Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	139.650	117.480
Moisture content: Dry soil+tare, gms.	105.610	90.410
Moisture content: Tare, gms.	31.020	31.750
Moisture, %	45.6	46.1
Moist specimen weight, gms.	998.3	
Diameter, in.	2.77	
Area, in.^{2}	6.03	
Height, in.	5.99	
Wet Density, pcf	105.4	
Dry density, pcf	72.4	
Void ratio	1.3289	
Saturation, %	92.7	

Test Readings for Specimen No. 1

Membrane modulus = .130 kN/cm^2
Membrane thickness = .031 cm
Cell pressure = 4.00 psi (0.288 tsf)
Back pressure = 0.00 psi (0.000 tsf)
Strain rate, %/min. = 1.00
Fail. Stress = 0.319 tsf **at reading no.** 85

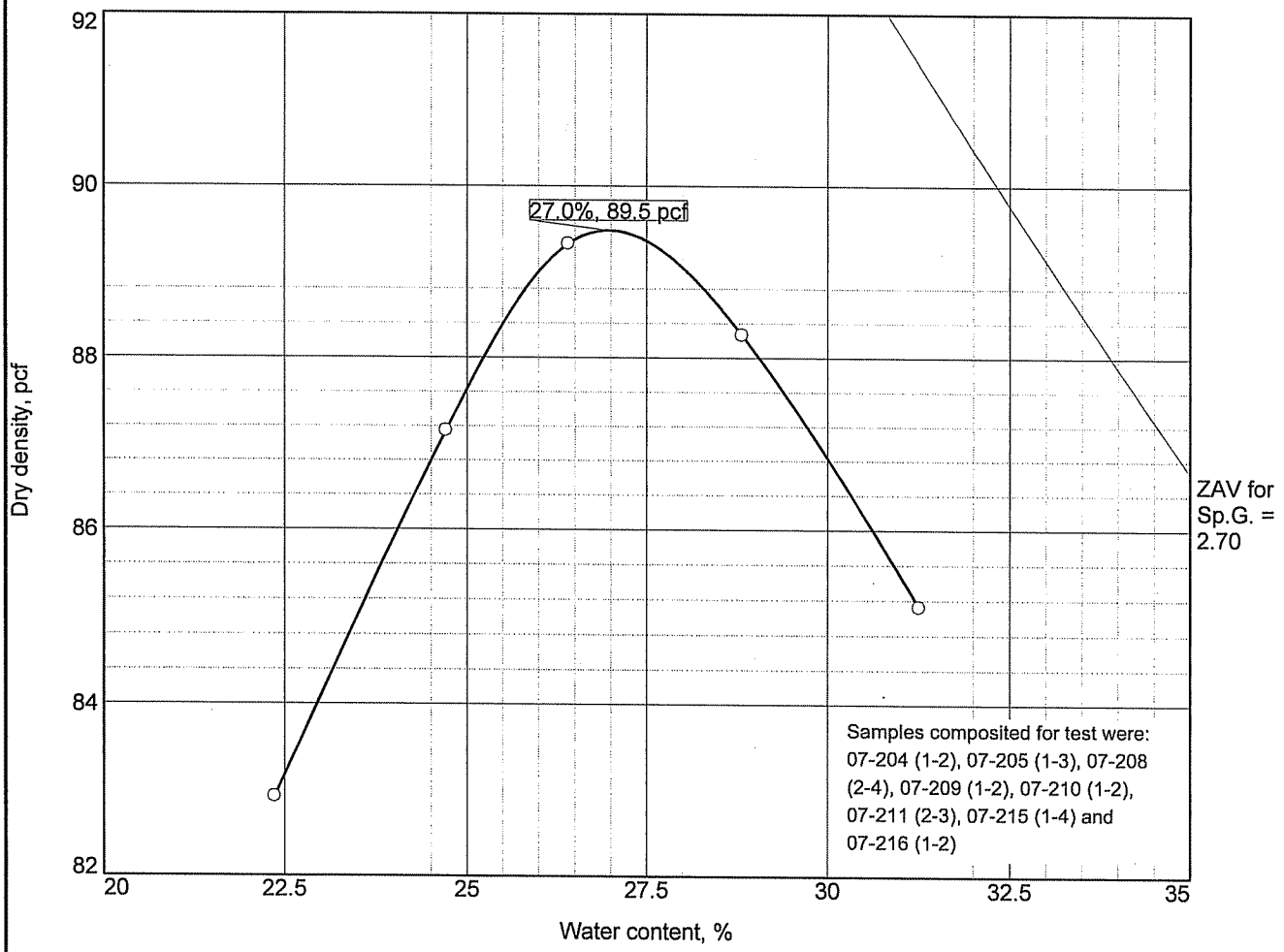
Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
0	0.0390	0.000	0.0	0.0	0.000	0.288	0.288	1.00	0.288	0.000
1	0.0476	4.274	4.3	0.1	0.051	0.288	0.339	1.18	0.313	0.025
2	0.0487	5.090	5.1	0.2	0.061	0.288	0.349	1.21	0.318	0.030
3	0.0533	5.798	5.8	0.2	0.069	0.288	0.357	1.24	0.323	0.035
4	0.0553	6.306	6.3	0.3	0.075	0.288	0.363	1.26	0.326	0.038
5	0.0566	6.854	6.9	0.3	0.082	0.288	0.370	1.28	0.329	0.041
6	0.0599	7.785	7.8	0.3	0.093	0.288	0.381	1.32	0.334	0.046
7	0.0612	8.175	8.2	0.4	0.097	0.288	0.385	1.34	0.337	0.049
8	0.0625	8.534	8.5	0.4	0.102	0.288	0.390	1.35	0.339	0.051
9	0.0645	9.008	9.0	0.4	0.107	0.288	0.395	1.37	0.342	0.054
10	0.0671	10.009	10.0	0.5	0.119	0.288	0.407	1.41	0.348	0.060
11	0.0704	10.408	10.4	0.5	0.124	0.288	0.412	1.43	0.350	0.062
12	0.0717	10.824	10.8	0.5	0.129	0.288	0.417	1.45	0.352	0.064
13	0.0737	11.554	11.6	0.6	0.137	0.288	0.425	1.48	0.357	0.069
14	0.0763	12.022	12.0	0.6	0.143	0.288	0.431	1.50	0.359	0.071
15	0.0809	12.721	12.7	0.7	0.151	0.288	0.439	1.52	0.363	0.075
16	0.0842	13.462	13.5	0.8	0.160	0.288	0.448	1.55	0.368	0.080
17	0.0875	14.065	14.1	0.8	0.167	0.288	0.455	1.58	0.371	0.083
18	0.0921	14.612	14.6	0.9	0.173	0.288	0.461	1.60	0.375	0.087
19	0.0946	15.062	15.1	0.9	0.178	0.288	0.466	1.62	0.377	0.089
20	0.0992	15.827	15.8	1.0	0.187	0.288	0.475	1.65	0.382	0.094
21	0.1025	16.229	16.2	1.1	0.192	0.288	0.480	1.67	0.384	0.096
22	0.1071	16.699	16.7	1.1	0.197	0.288	0.485	1.68	0.387	0.099
23	0.1149	17.164	17.2	1.3	0.202	0.288	0.490	1.70	0.389	0.101
24	0.1271	17.805	17.8	1.5	0.210	0.288	0.498	1.73	0.393	0.105
25	0.1328	18.827	18.8	1.6	0.221	0.288	0.509	1.77	0.399	0.111
26	0.1449	19.863	19.9	1.8	0.233	0.288	0.521	1.81	0.405	0.117
27	0.1572	20.064	20.1	2.0	0.235	0.288	0.523	1.82	0.405	0.117
28	0.1688	20.731	20.7	2.2	0.242	0.288	0.530	1.84	0.409	0.121
29	0.1810	21.227	21.2	2.4	0.248	0.288	0.536	1.86	0.412	0.124
30	0.1933	21.687	21.7	2.6	0.252	0.288	0.540	1.88	0.414	0.126
31	0.2055	22.008	22.0	2.8	0.256	0.288	0.544	1.89	0.416	0.128
32	0.2113	22.503	22.5	2.9	0.261	0.288	0.549	1.91	0.419	0.131
33	0.2177	22.888	22.9	3.0	0.265	0.288	0.553	1.92	0.421	0.133
34	0.2298	23.156	23.2	3.2	0.268	0.288	0.556	1.93	0.422	0.134
35	0.2414	23.529	23.5	3.4	0.272	0.288	0.560	1.94	0.424	0.136
36	0.2536	24.070	24.1	3.6	0.277	0.288	0.565	1.96	0.427	0.139
37	0.2657	24.215	24.2	3.8	0.278	0.288	0.566	1.97	0.427	0.139
38	0.2779	24.780	24.8	4.0	0.284	0.288	0.572	1.99	0.430	0.142
39	0.2900	24.833	24.8	4.2	0.284	0.288	0.572	1.99	0.430	0.142
40	0.2958	25.254	25.3	4.3	0.289	0.288	0.577	2.00	0.432	0.144
41	0.3081	25.520	25.5	4.5	0.291	0.288	0.579	2.01	0.434	0.146
42	0.3145	26.082	26.1	4.6	0.297	0.288	0.585	2.03	0.437	0.149
43	0.3266	26.000	26.0	4.8	0.296	0.288	0.584	2.03	0.436	0.148
44	0.3387	25.952	26.0	5.0	0.295	0.288	0.583	2.02	0.435	0.147
45	0.3445	26.417	26.4	5.1	0.300	0.288	0.588	2.04	0.438	0.150
46	0.3657	26.754	26.8	5.5	0.302	0.288	0.590	2.05	0.439	0.151

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
47	0.3810	27.048	27.0	5.7	0.305	0.288	0.593	2.06	0.440	0.152
48	0.3957	27.363	27.4	6.0	0.307	0.288	0.595	2.07	0.442	0.154
49	0.4110	27.363	27.4	6.2	0.307	0.288	0.595	2.06	0.441	0.153
50	0.4258	27.847	27.8	6.5	0.311	0.288	0.599	2.08	0.444	0.156
51	0.4412	27.698	27.7	6.7	0.293	0.288	0.581	2.02	0.434	0.146
52	0.4559	28.246	28.2	7.0	0.297	0.288	0.585	2.03	0.437	0.149
53	0.4712	28.751	28.8	7.2	0.301	0.288	0.589	2.05	0.439	0.151
54	0.4860	28.504	28.5	7.5	0.297	0.288	0.585	2.03	0.437	0.149
55	0.5014	29.426	29.4	7.7	0.306	0.288	0.594	2.06	0.441	0.153
56	0.5161	29.271	29.3	8.0	0.303	0.288	0.591	2.05	0.439	0.151
57	0.5314	28.789	28.8	8.2	0.296	0.288	0.584	2.03	0.436	0.148
58	0.5461	29.668	29.7	8.5	0.304	0.288	0.592	2.06	0.440	0.152
59	0.5615	29.544	29.5	8.7	0.301	0.288	0.589	2.05	0.439	0.151
60	0.5762	29.807	29.8	9.0	0.303	0.288	0.591	2.05	0.439	0.151
61	0.5916	30.237	30.2	9.2	0.306	0.288	0.594	2.06	0.441	0.153
62	0.6063	30.049	30.0	9.5	0.302	0.288	0.590	2.05	0.439	0.151
63	0.6217	30.462	30.5	9.7	0.305	0.288	0.593	2.06	0.441	0.153
64	0.6364	30.580	30.6	10.0	0.305	0.288	0.593	2.06	0.441	0.153
65	0.6518	30.738	30.7	10.2	0.305	0.288	0.593	2.06	0.441	0.153
66	0.6665	30.743	30.7	10.5	0.304	0.288	0.592	2.05	0.440	0.152
67	0.6819	31.594	31.6	10.7	0.311	0.288	0.599	2.08	0.444	0.156
68	0.6966	31.128	31.1	11.0	0.305	0.288	0.593	2.06	0.440	0.152
69	0.7120	31.756	31.8	11.2	0.310	0.288	0.598	2.08	0.443	0.155
70	0.7267	31.382	31.4	11.5	0.304	0.288	0.592	2.06	0.440	0.152
71	0.7415	32.049	32.0	11.7	0.310	0.288	0.598	2.08	0.443	0.155
72	0.7569	31.567	31.6	12.0	0.303	0.288	0.591	2.05	0.440	0.152
73	0.7716	31.944	31.9	12.2	0.306	0.288	0.594	2.06	0.441	0.153
74	0.7864	31.833	31.8	12.5	0.303	0.288	0.591	2.05	0.439	0.151
75	0.8019	32.094	32.1	12.7	0.304	0.288	0.592	2.06	0.440	0.152
76	0.8166	31.734	31.7	13.0	0.299	0.288	0.587	2.04	0.437	0.149
77	0.8319	32.651	32.7	13.2	0.307	0.288	0.595	2.07	0.441	0.153
78	0.8466	32.515	32.5	13.5	0.304	0.288	0.592	2.05	0.440	0.152
79	0.8620	32.650	32.6	13.7	0.304	0.288	0.592	2.05	0.440	0.152
80	0.8767	32.791	32.8	14.0	0.303	0.288	0.591	2.05	0.440	0.152
81	0.8914	33.305	33.3	14.2	0.307	0.288	0.595	2.07	0.442	0.154
82	0.9070	33.265	33.3	14.5	0.305	0.288	0.593	2.06	0.441	0.153
83	0.9217	33.164	33.2	14.7	0.303	0.288	0.591	2.05	0.439	0.151
84	0.9365	33.510	33.5	15.0	0.304	0.288	0.592	2.06	0.440	0.152
85	0.9468	35.016	35.0	15.2	0.319	0.288	0.607	2.11	0.447	0.159

COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CH			2.70			0.0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 89.5 pcf Optimum moisture = 27.0 %	Dark Gray FAT CLAY

Project No. 08.18.920 **Client:** United States Army Corps of Engineers
Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080 **Date:**
○ **Source of Sample:** Mix 01 **Sample Number:** 1

Remarks:
Test method: ASTM D 698
Preparation Method: Dry
Specific Gravity: Assumed

Tolunay-Wong Engineers, Inc.

Houston, Texas

Tested By: SA **Checked By:** JL

Hole No. 07-215

BORING LOG	DISTRICT	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT Galveston Channel and San Jacinto PA	7. ELEVATION OF HOLE
2. LOCATION (Coordinates or Station) N=13693658 E=3318818	8. DATUM FOR ELEVATION
3. DRILLING AGENCY Dempsey (Geotest Engineering, Inc.)	9. ELEVATION OF GROUNDWATER TOD: 24-HR:
4. LABORATORY TESTING AGENCY Tolunay-Wong Engineers, Inc.	10. DRILLING DATE and TIME STARTED: 4/21/08 COMPLETED: 4/21/08
5. DEPTH OF WATER TOD: 24-HR:	11. CLASSIFICATION REFERENCE
6. DEPTH OF HOLE 20 ft	12. ENGINEER

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (%)	SPT (N)	PENETROMETER (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (% <200)
			FAT CLAY(CH), firm, brown -w/ roots @ 0' - 2'		1			0.75	78.2	38.1				
			-brown & gray @ 2' - 6' -soft, w/ slickensides @ 2' - 4' -w/ sand seams @ 3' - 5'		2			0.50	60.3	61.8	83	23	60	96.4
5					3			0.75	72.4	45.6				
			-soft @ 6' - 8' -gray below 6'		4			0.50	67.5	50.3				
			-very soft below 8'		5			0.0	63.1	59.3	87	25	62	92.3
10			**POORLY GRADED SAND WITH SILT (SP-SM)**, loose, gray, w/ shell fragments		6		9							8
15			**SILTY SAND (SM)**, medium dense, gray		7		24							17.1
					8		22							14
20														
25														
30														

SWG 1836 BOR 08.18.920.GPJ TOLUNAY-WONG ENGINEERS.GDT 11/10/08

ENG FORM: SWG 1836 BOR