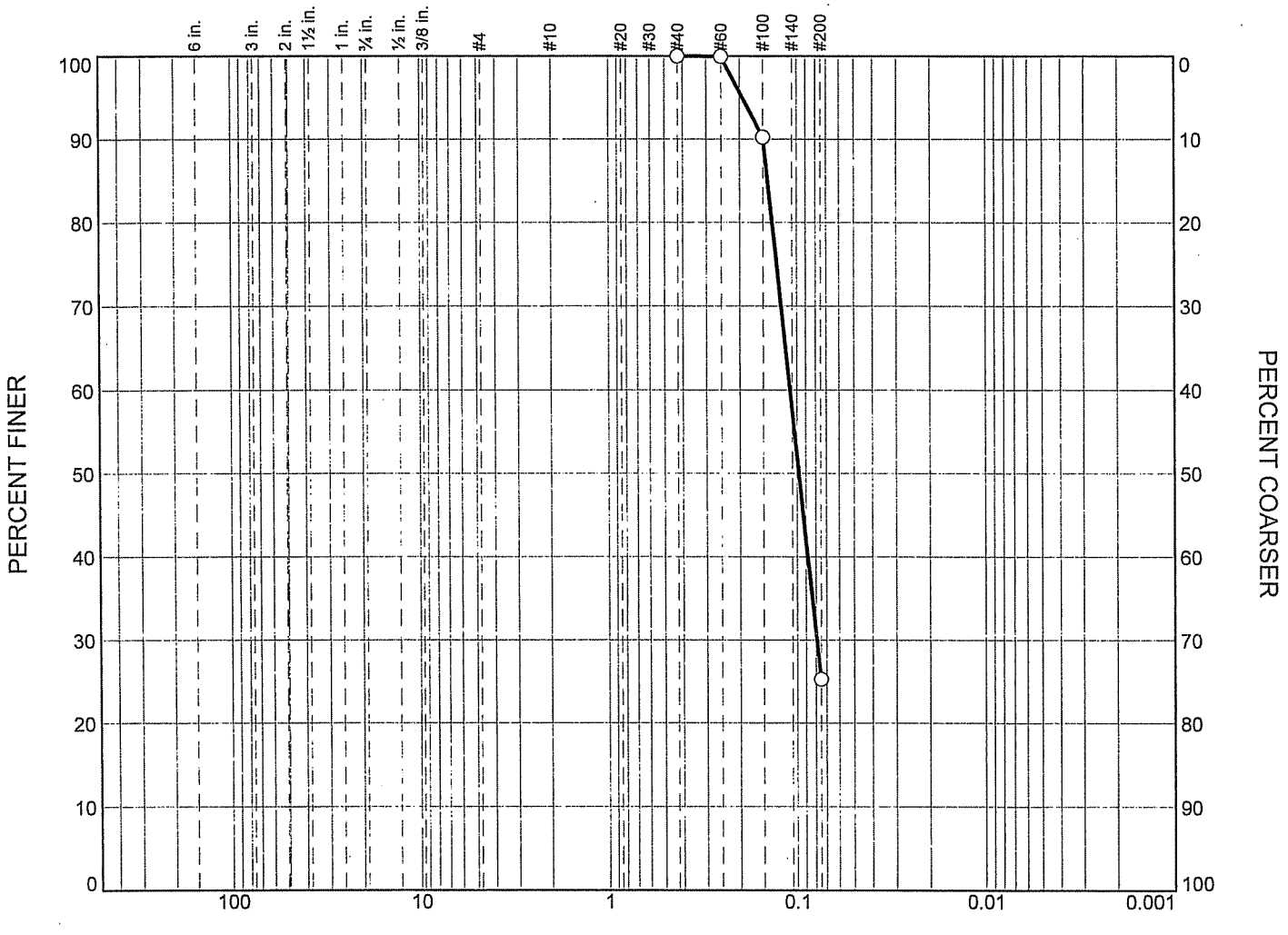
Tolunay-Wong Engineers, Inc.

Project Number:	08.18.921	Client:	United Army Corps of Engineers	Date:	9/18/08
Project Name:	Chocolate Bayou Placement Area DACW64-03-D-0008; Task Order 0079				

Boring No.	Sample No.	Sample Depth (ft)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plasticity Index	Finer than #200 sieve (%)	Uc/UU Compr. Strength (tsf)	Failure Strain (%)	Confining Pressure (psi)	Failure Type
08-79			**El. 8.75, E=3186743 N=13647040**											
	2	2-4	Gray FAT CLAY; calcareous nodules	CH	20.9	103.9								
	3	4-6	Tan and gray FAT CLAY; calcareous nodules	CH	21.0	105.8								
	4	6-8	Reddish-brown and gray SANDY LEAN CLAY	CL	22.7									
	5	8-10	Reddish-brown and tan LEAN CLAY; calcareous nodules	CL	22.6	101.5	25	15	10	86.1	2.44	11.7	9	Bulge
	6	10-12	Reddish-brown SANDY LEAN CLAY	CL	24.3									
	7	12-14	Reddish-brown SANDY LEAN CLAY	CL	26.5					56.7				
	8	14-16	Reddish-brown SANDY SILT	ML	26.6					58.0				
	9	16-18	Reddish-brown SILTY SAND	SM	29.3									
	10	18-20	Reddish-brown SILTY SAND	SM	30.4					48.6				
08-80			**El. 11.50, E=3185851 N=13647657**											
	2	2-4	Tan and gray SANDY LEAN CLAY	CL	11.5	105.4								
	3	4-6	Tan and gray SANDY LEAN CLAY	CL	16.9	109.6								
	4	6-8	Reddish-brown and gray FAT CLAY	CH	33.3	87.9								
	5	8-10	Reddish-brown SANDY LEAN CLAY	CL	23.6					59.4				
	6	10-12	Reddish-brown and gray LEAN CLAY	CL	24.6					92.9				
	7	12-14	Reddish-brown and gray FAT CLAY	CH	23.5	100.5	55	20	35	98.9	2.50	14.6		60 degree
	8	14-16	Reddish-brown and gray FAT CLAY	CH	23.1	103.2								
	9	16-18	Reddish-brown and gray FAT CLAY	CH	24.3	101.5								
	10	18-20	Reddish-brown and gray FAT CLAY; calcareous nodules	CH	25.3	101.5								
08-81			**El. 9.00, E=3185030 N=13648226**											
	2	2-4	Gray and tan SANDY LEAN CLAY	CL	9.9	113.5								
	3	4-6	Tan and gray SANDY LEAN CLAY	CL	19.0	106.5								
	4	6-8	Tan and gray SANDY LEAN CLAY	CL	18.3	107.3								
	5	8-10	Reddish-brown and gray SILTY SAND	SM	25.2	101.9								
	6	10-12	Tan and gray SILT	ML	25.9					95.8				
	7	12-14	Reddish-brown and gray FAT CLAY with SAND	CH	32.9	90.5	57	20	37	80.0	1.30	7.5	12	45 degree
	8	14-16	Tan and gray SILTY SAND	SM	24.4									
	9	16-18	Reddish-brown and gray FAT CLAY	CH	35.0					97.5				
	10	18-20	Reddish-brown and gray SANDY LEAN CLAY	CL	22.3									
08-82			**El. 12.00, E=3184209 N=13648793**											
	2	2-4	Tan and gray SANDY LEAN CLAY	CL	19.8	106.7								
	3	4-6	Tan and gray SANDY LEAN CLAY; ferrous nodules	CL	16.8	111.3	33	16	17	64.1	2.10	15	6	Vertical shear
	4	6-8	Reddish-brown and gray SILTY SAND	SM	24.9					21.4				
	5	8-10	Reddish-brown and gray SILTY SAND	SM	25.3					23.7				
	7	12-14	Reddish-brown and gray SILTY SAND	SM	26.4					16.8				
	10	18-20	Reddish-brown and gray SILTY SAND	SM	24.0					17.8				
08-83			**El. 11.75, E=3183367 N=13648831**											
	2	2-4	Gray and tan SANDY LEAN CLAY	CL	15.2	109.0								
	3	4-6	Tan and gray SANDY LEAN CLAY	CL	19.6	109.0								
	4	6-8	Tan and reddish-brown SANDY SILTY CLAY	CL-ML	19.7	106.9	22	15	7	69.6	1.90	11	8	Bulge
	5	8-10	Tan and gray SILTY SAND	SM	27.2					25.3				
	7	12-14	Tan and gray SILTY SAND	SM	30.3					24.1				
	10	18-20	Tan and gray SILTY SAND	SM	30.3		NV	NP	NP	19.5				
08-84			**El. 9.75, E=3182831 N=13648199**											
	2	2-4	Tan and gray SANDY LEAN CLAY	CL	20.9	102.3								
	3	4-6	Reddish-brown and gray FAT CLAY	CH	27.3	96.0								
	4	6-8	Reddish-brown and gray FAT CLAY	CH	24.9	100.7								
	5	8-10	Reddish-brown and gray FAT CLAY	CH	25.5	98.8	75	23	52	99.1	1.41	11.5	9	60 degree
	6	10-12	Reddish-brown and gray FAT CLAY	CH	27.4	97.4								
	7	12-14	Reddish-brown and gray FAT CLAY; calcareous nodules	CH	27.1	95.9								

Particle Size Analysis - ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	74.7	25.3	

SOIL DATA

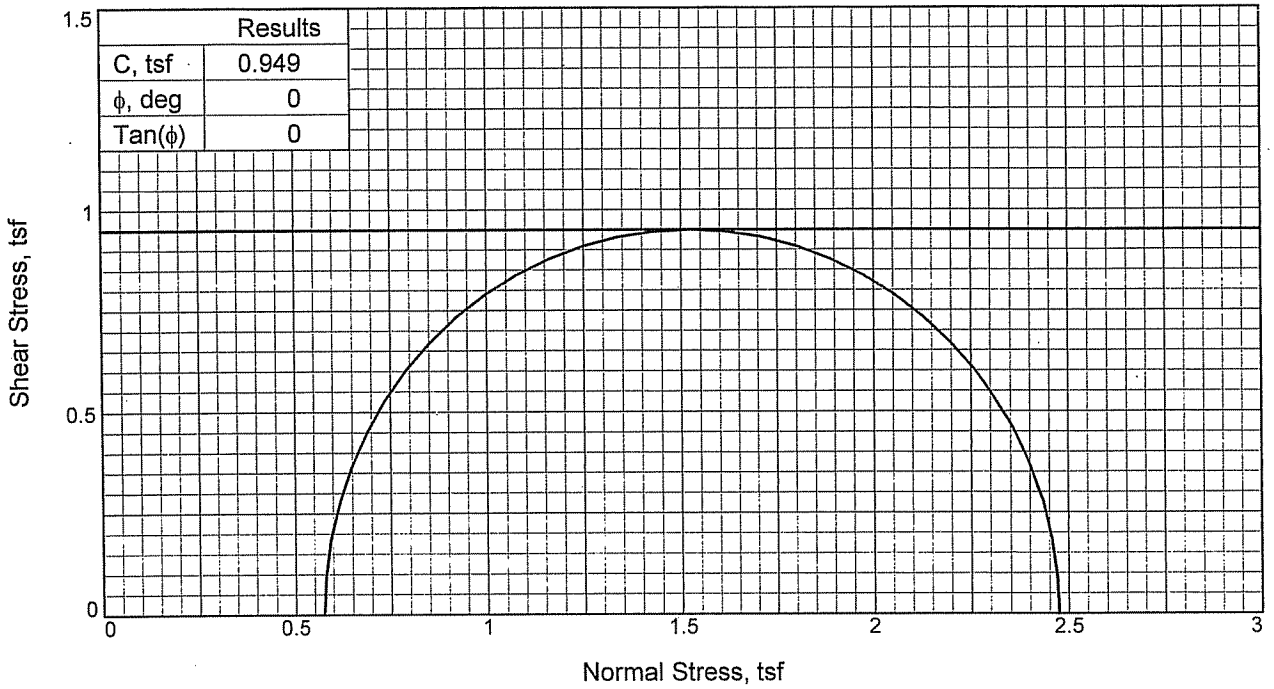
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	08-83	5	8-10	Tan and gray SILTY SAND	SM

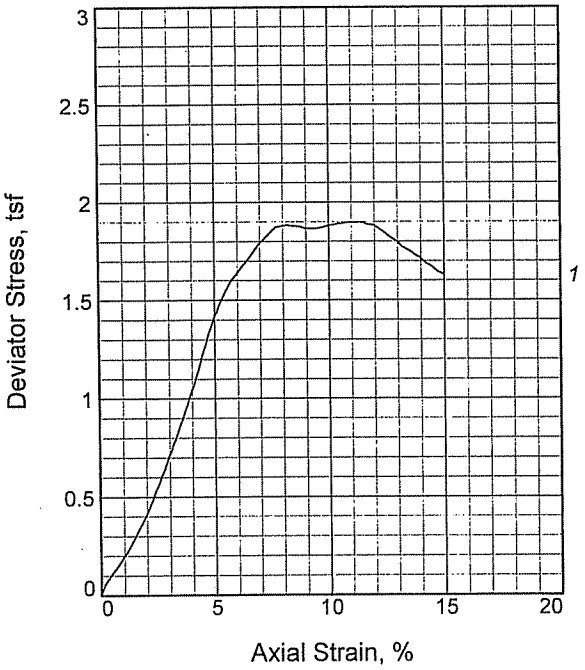
Tolunay-Wong Engineers, Inc.
Houston, Texas

Client: United States Army Corps of Engineers

Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079

Project No.: 08.18.921





Sample No.		1
Initial	Water Content, %	19.7
	Dry Density, pcf	106.8
	Saturation, %	92.2
	Void Ratio	0.5775
	Diameter, in.	2.90
	Height, in.	5.98
At Test	Water Content, %	20.2
	Dry Density, pcf	106.8
	Saturation, %	94.6
	Void Ratio	0.5775
	Diameter, in.	2.90
	Height, in.	5.98
Strain rate, %/min.		1.00
Back Pressure, tsf		0.00
Cell Pressure, tsf		0.58
Fail. Stress, tsf		1.90
Ult. Stress, tsf		
σ_1 Failure, tsf		2.47
σ_3 Failure, tsf		0.58

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and reddish-brown SANDY SILTY CLAY

LL= 22 **PL=** 15 **PI=** 7

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 2850
Failure type: Bulge

Client: United States Army Corps of Engineers

Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079

Source of Sample: 08-83 **Depth:** 6-8

Sample Number: 4

Proj. No.: 08.18.921 **Date Sampled:** 8/14/08

TRIAXIAL SHEAR TEST REPORT

Tolunay-Wong Engineers, Inc.

TRIAXIAL COMPRESSION TEST

Unconsolidated Undrained

8/19/2008
1:12 PM

Date: 8/14/08
Client: United States Army Corps of Engineers
Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079
Project No.: 08.18.921
Location: 08-83
Depth: 6-8 **Sample Number:** 4
Description: Tan and reddish-brown SANDY SILTY CLAY
Remarks:
Test method: ASTM D 2850
Failure type: Bulge
Type of Sample: Undisturbed
Assumed Specific Gravity=2.70 **LL=**22 **PL=**15 **PI=**7
Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	152.950	123.560
Moisture content: Dry soil+tare, gms.	132.940	108.090
Moisture content: Tare, gms.	31.500	31.660
Moisture, %	19.7	20.2
Moist specimen weight, gms.	1325.7	
Diameter, in.	2.90	
Area, in.^{2}	6.61	
Height, in.	5.98	
Wet Density, pcf	127.9	
Dry density, pcf	106.8	
Void ratio	0.5775	
Saturation, %	92.2	

Test Readings for Specimen No. 1

Membrane modulus = .130 kN/cm^2
Membrane thickness = .031 cm
Cell pressure = 8.00 psi (0.576 tsf)
Back pressure = 0.00 psi (0.000 tsf)
Strain rate, %/min. = 1.00
Fail. Stress = 1.899 tsf **at reading no.** 69

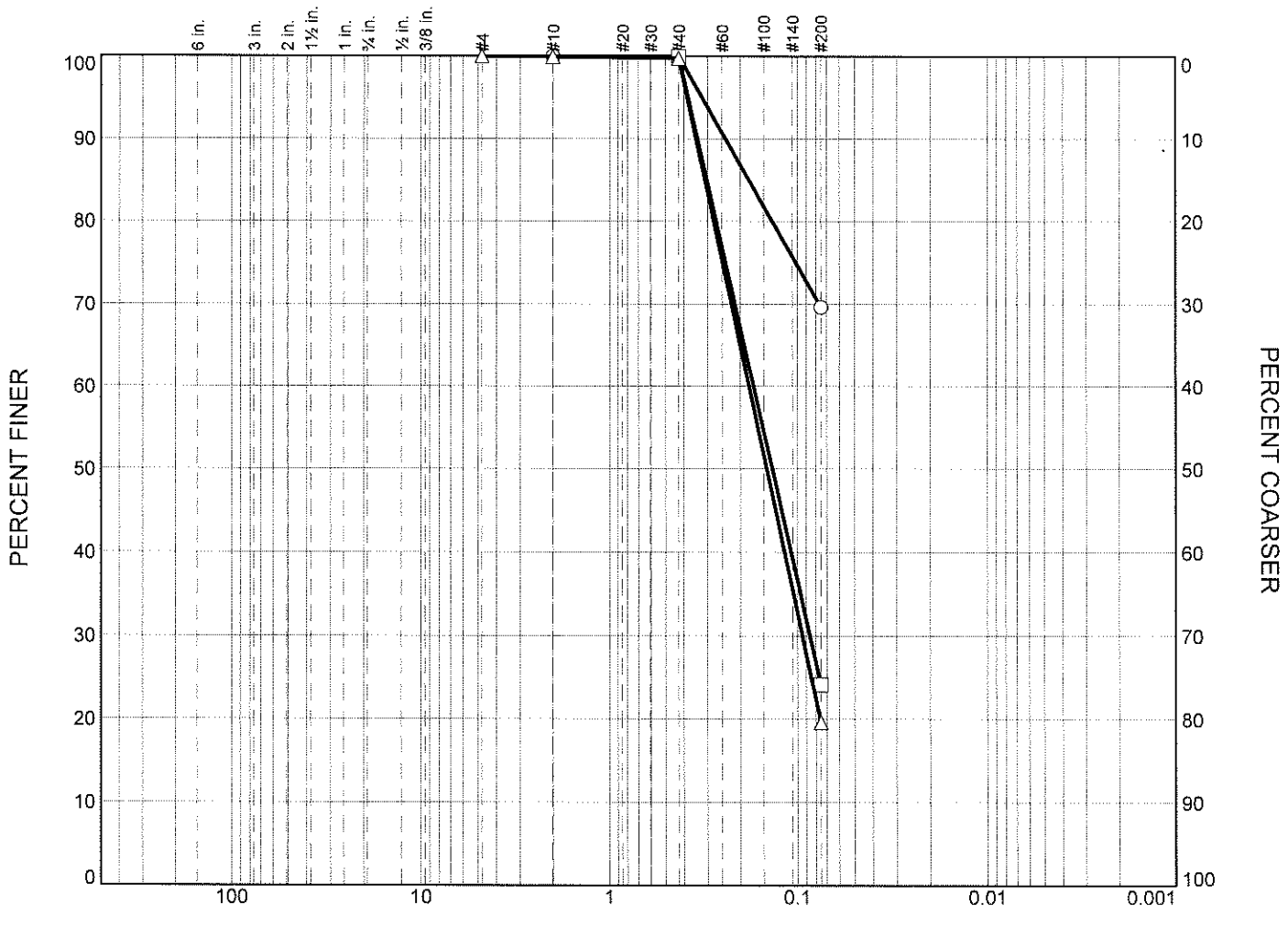
Test Readings for Specimen No. 1

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	0.0339	0.000	0.0	0.0	0.000	0.576	0.576	1.00	0.576	0.000
1	0.0416	4.429	4.4	0.1	0.048	0.576	0.624	1.08	0.600	0.024
2	0.0505	6.832	6.8	0.3	0.074	0.576	0.650	1.13	0.613	0.037
3	0.0584	8.899	8.9	0.4	0.097	0.576	0.673	1.17	0.624	0.048
4	0.0675	11.122	11.1	0.6	0.121	0.576	0.697	1.21	0.636	0.060
5	0.0767	13.468	13.5	0.7	0.146	0.576	0.722	1.25	0.649	0.073
6	0.0857	15.996	16.0	0.9	0.173	0.576	0.749	1.30	0.662	0.086
7	0.0924	18.160	18.2	1.0	0.196	0.576	0.772	1.34	0.674	0.098
8	0.1015	20.261	20.3	1.1	0.218	0.576	0.794	1.38	0.685	0.109
9	0.1086	22.686	22.7	1.2	0.244	0.576	0.820	1.42	0.698	0.122
10	0.1151	25.025	25.0	1.4	0.269	0.576	0.845	1.47	0.711	0.135
11	0.1272	29.114	29.1	1.6	0.312	0.576	0.888	1.54	0.732	0.156
12	0.1330	31.418	31.4	1.7	0.337	0.576	0.913	1.58	0.744	0.168
13	0.1451	35.629	35.6	1.9	0.381	0.576	0.957	1.66	0.767	0.191
14	0.1515	37.923	37.9	2.0	0.405	0.576	0.981	1.70	0.779	0.203
15	0.1572	40.279	40.3	2.1	0.430	0.576	1.006	1.75	0.791	0.215
16	0.1630	43.135	43.1	2.2	0.460	0.576	1.036	1.80	0.806	0.230
17	0.1695	45.675	45.7	2.3	0.487	0.576	1.063	1.84	0.819	0.243
18	0.1752	48.728	48.7	2.4	0.519	0.576	1.095	1.90	0.835	0.259
19	0.1816	51.409	51.4	2.5	0.547	0.576	1.123	1.95	0.849	0.273
20	0.1874	53.978	54.0	2.6	0.573	0.576	1.149	2.00	0.863	0.287
21	0.1931	57.349	57.3	2.7	0.608	0.576	1.184	2.06	0.880	0.304
22	0.1997	59.853	59.9	2.8	0.634	0.576	1.210	2.10	0.893	0.317
23	0.2054	63.187	63.2	2.9	0.669	0.576	1.245	2.16	0.911	0.335
24	0.2112	66.284	66.3	3.0	0.701	0.576	1.277	2.22	0.927	0.351
25	0.2177	69.334	69.3	3.1	0.733	0.576	1.309	2.27	0.942	0.366
26	0.2234	73.053	73.1	3.2	0.771	0.576	1.347	2.34	0.962	0.386
27	0.2298	75.638	75.6	3.3	0.797	0.576	1.373	2.38	0.975	0.399
28	0.2356	79.037	79.0	3.4	0.832	0.576	1.408	2.45	0.992	0.416
29	0.2419	82.336	82.3	3.5	0.866	0.576	1.442	2.50	1.009	0.433
30	0.2477	85.123	85.1	3.6	0.895	0.576	1.471	2.55	1.023	0.447
31	0.2540	89.054	89.1	3.7	0.935	0.576	1.511	2.62	1.043	0.467
32	0.2598	91.868	91.9	3.8	0.964	0.576	1.540	2.67	1.058	0.482
33	0.2656	95.568	95.6	3.9	1.001	0.576	1.577	2.74	1.077	0.501
34	0.2721	99.310	99.3	4.0	1.039	0.576	1.615	2.80	1.096	0.520
35	0.2778	102.180	102.2	4.1	1.068	0.576	1.644	2.85	1.110	0.534
36	0.2842	106.746	106.7	4.2	1.115	0.576	1.691	2.94	1.133	0.557
37	0.2899	110.250	110.2	4.3	1.150	0.576	1.726	3.00	1.151	0.575
38	0.2964	114.334	114.3	4.4	1.192	0.576	1.768	3.07	1.172	0.596
39	0.3021	118.706	118.7	4.5	1.236	0.576	1.812	3.15	1.194	0.618
40	0.3085	122.141	122.1	4.6	1.270	0.576	1.846	3.21	1.211	0.635
41	0.3143	126.663	126.7	4.7	1.316	0.576	1.892	3.28	1.234	0.658
42	0.3206	130.256	130.3	4.8	1.352	0.576	1.928	3.35	1.252	0.676
43	0.3264	133.275	133.3	4.9	1.382	0.576	1.958	3.40	1.267	0.691
44	0.3321	136.956	137.0	5.0	1.418	0.576	1.994	3.46	1.285	0.709
45	0.3386	139.477	139.5	5.1	1.443	0.576	2.019	3.50	1.297	0.721
46	0.3444	142.944	142.9	5.2	1.477	0.576	2.053	3.56	1.315	0.739

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	0.3597	149.276	149.3	5.5	1.538	0.576	2.114	3.67	1.345	0.769
48	0.3744	155.008	155.0	5.7	1.593	0.576	2.169	3.77	1.373	0.797
49	0.3898	159.272	159.3	6.0	1.633	0.576	2.209	3.83	1.392	0.816
50	0.4045	163.381	163.4	6.2	1.671	0.576	2.247	3.90	1.411	0.835
51	0.4192	166.935	166.9	6.4	1.702	0.576	2.278	3.96	1.427	0.851
52	0.4347	171.621	171.6	6.7	1.745	0.576	2.321	4.03	1.449	0.873
53	0.4494	176.048	176.0	7.0	1.786	0.576	2.362	4.10	1.469	0.893
54	0.4647	179.575	179.6	7.2	1.816	0.576	2.392	4.15	1.484	0.908
55	0.4795	182.803	182.8	7.5	1.844	0.576	2.420	4.20	1.498	0.922
56	0.4942	186.006	186.0	7.7	1.871	0.576	2.447	4.25	1.512	0.936
57	0.5097	187.282	187.3	8.0	1.879	0.576	2.455	4.26	1.515	0.939
58	0.5244	188.205	188.2	8.2	1.883	0.576	2.459	4.27	1.518	0.942
59	0.5397	188.235	188.2	8.5	1.878	0.576	2.454	4.26	1.515	0.939
60	0.5544	188.594	188.6	8.7	1.877	0.576	2.453	4.26	1.514	0.938
61	0.5697	188.168	188.2	9.0	1.867	0.576	2.443	4.24	1.510	0.934
62	0.5844	188.537	188.5	9.2	1.866	0.576	2.442	4.24	1.509	0.933
63	0.5998	188.955	189.0	9.5	1.865	0.576	2.441	4.24	1.508	0.932
64	0.6144	190.069	190.1	9.7	1.871	0.576	2.447	4.25	1.511	0.935
65	0.6298	191.520	191.5	10.0	1.880	0.576	2.456	4.26	1.516	0.940
66	0.6445	192.563	192.6	10.2	1.885	0.576	2.461	4.27	1.518	0.942
67	0.6598	193.846	193.8	10.5	1.892	0.576	2.468	4.28	1.522	0.946
68	0.6745	194.572	194.6	10.7	1.894	0.576	2.470	4.29	1.523	0.947
69	0.6898	195.670	195.7	11.0	1.899	0.576	2.475	4.30	1.525	0.949
70	0.7046	195.982	196.0	11.2	1.897	0.576	2.473	4.29	1.524	0.948
71	0.7193	196.732	196.7	11.5	1.899	0.576	2.475	4.30	1.525	0.949
72	0.7347	196.123	196.1	11.7	1.887	0.576	2.463	4.28	1.520	0.944
73	0.7494	196.206	196.2	12.0	1.883	0.576	2.459	4.27	1.517	0.941
74	0.7648	194.807	194.8	12.2	1.864	0.576	2.440	4.24	1.508	0.932
75	0.7795	193.152	193.2	12.5	1.843	0.576	2.419	4.20	1.497	0.921
76	0.7948	191.091	191.1	12.7	1.818	0.576	2.394	4.16	1.485	0.909
77	0.8095	189.731	189.7	13.0	1.800	0.576	2.376	4.12	1.476	0.900
78	0.8243	187.209	187.2	13.2	1.771	0.576	2.347	4.07	1.461	0.885
79	0.8397	186.042	186.0	13.5	1.755	0.576	2.331	4.05	1.453	0.877
80	0.8544	184.423	184.4	13.7	1.734	0.576	2.310	4.01	1.443	0.867
81	0.8698	183.075	183.1	14.0	1.717	0.576	2.293	3.98	1.434	0.858
82	0.8845	180.523	180.5	14.2	1.688	0.576	2.264	3.93	1.420	0.844
83	0.8999	179.162	179.2	14.5	1.670	0.576	2.246	3.90	1.411	0.835
84	0.9146	176.955	177.0	14.7	1.645	0.576	2.221	3.86	1.398	0.822
85	0.9299	175.977	176.0	15.0	1.631	0.576	2.207	3.83	1.391	0.815

Particle Size Analysis - ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	30.4	69.6	
□	0.0	0.0	0.0	0.0	0.0	75.9	24.1	
△	0.0	0.0	0.0	0.1	0.1	80.3	19.5	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	08-83	4	6-8	Tan and reddish-brown SANDY SILTY CLAY	CL-ML
□	08-83	7	12-14	Tan and gray SILTY SAND	SM
△	08-83	10	18-20	Tan and gray SILTY SAND	SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

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