

MULTISTAGE TRIAXIAL TEST: Specimen Calculations & Summary(1)

Project Number: 0411-08-1686

Cell No.: _____

File Name: B-2304UD_UD11d

Task Number: NA

Specific Gravity: 2.710

☒ Measured; ☐ Assumed

Boring No.: B-2304UD

Sample No.: UD11

Specimen No.: D

Depth (ft): 111.0-113.0

Type Test: CIU Triaxial

Specimen: ☒ "Undisturbed"; ☐ Reconstituted;

Calculations Corr. for Salt (dissolved solids): ☒ No or, ☐ Yes, with concentration = _____ ppm

Initial Water Contents (WC), (W_o) over Saturation, (S_o), in (%):						Calculated Mass of Dry Soil (g)	
	Top, $W_{o,1}$	Bottom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Selct., $W_{o,s}$	Back Cal., $W_{o,bc}$	Initial Selected WC, w_o (%)
W_c	32.12	30.18	29.40	30.57	30.57	24.08	30.57
S_o	105.2	102.2	100.9	102.8	102.8	91.1	Initial, $M_{d,o}$
							352.29
							Final, $M_{d,at}$
							370.71
							Selected, M_d
							370.71
Measured final mass of moist soil, $M_{t,at}$ (g)						452.88	
Final mass of moist soil corrected for excess dry soil, $M_{t,at,c}$ (g)						452.88	

Consolidation Data	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Changes in Height (mm) and Volume (cm^3) Within Given Consolidation Stages/Columns	At Initial Seating Stress	During Back-Pressuring	1st Consol. Increment (1)	Column 2 or 3 to 1st Test Stage (1)	Column 4 to 2nd Test Stage	Column 5 to 3rd Test Stage	Column 6 to 4th Test Stage
Sign Convention: (+) Deformation in compression or Flow out of spec.; (-) Deformation in extension (swell) or Flow into spec.							
Change in Height, $\Delta H_{c,n}$	0.04	0.27		3.01	NA	NA	NA
Sum of changes in burette readings, $\Delta b_{r,n}$ (+ out) (- in)	3.82	10.30		39.92	NA	NA	NA
Theoretical $\Delta V_{c,n} = (3V_o \times \Delta H_{c,n} / H_o)$	0.25	1.68		18.38	NA	NA	NA
Vol. Factor, $F_v = \Delta b_{r,n} / \Delta V_{t,n}$				2.17	NA	NA	NA
Corrected $\Delta V_{c,n} = F_v \times \Delta V_{t,n}$			NA	0.00	NA	NA	NA
Selected $\Delta V_{c,n}$	0.25	1.68		15.92	NA	NA	NA

Summary For Test Stages					
Test Stage:	1st = 1	2nd = 2	3rd = 3	4th = 4	
Cell Pressure, $\sigma_{c,n}$ (psi)	119.83	NA	NA	NA	Number of Test Stages = 1 $t_{50} = 340$ min
Back Pressure, $U_{b,n}$ (psi)	49.65	NA	NA	NA	
Axial Force Reading, $P_{r,n}$ (lbf)	2.00	NA	NA	NA	
Eff. Consol. Stress (σ'_c or $\sigma'_{v,e}$) (4), (ksf)	10.20	NA	NA	NA	
t_c , ON or in ☒ days ☐ hrs	5.00	NA	NA	NA	

At Final Test Stress/Stage - Summary of Calculation of ΔV_c (cm^3) by Different Procedures					
By Selected Volumes	By Saturation = 100 %	By Change in Mass (5)	For Diff. in Meas. Vol. ($V_o - V_{at}$)	For Selected ΔV_c , required G_s for $S_c = 100$ %:	
$\Delta V_c = 17.85$	$\Delta V_c = 15.81$	$\Delta V_c = 7.10$	& corr. for ΔH_{td} $\Delta V_c =$	2.751	

At Final Test Stress/Stage - Consolidation Conclusions					
$\Delta H_{c,f}$ (mm) = 3.32	$\Delta V_{c,f}$ (cm^3) = 17.85	Back Cal. G_s for $S=100\%$ = 2.751	Normalized	Ht. Ch. (%) = -1.04	
$\epsilon_{ac,c}$ (%) = 2.88	$\epsilon_{vc,f}$ (%) = 7.59		Diff. in:	Vol. Ch. (%) =	

Summary of Specimen Physical Properties											
Specific Gravity: $G_s = 2.710$ Measured	Height (mm)	Volume (cm^3)	Area (cm^2)	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio e	Volumetric Water Content	Porosity n	Skempton B parameter % (6)
Condition: Initial:	115.42	235.17	20.37	24.08	122.11	98.41	91.1	0.716	0.3803	0.417	96.0
After to 1st σ'_c	112.10	217.32	19.39	22.17	130.10	106.49	102.5	0.586	0.3788	0.369	
Consol.: to 2nd σ'_c											
to 3rd σ'_c											
to 4th σ'_c											

Notes: (1) If the consol. stress in the 1st consol. increment & 1st test stage are equal, log the data in Column 4.

(2) The height changes occurring within each shearing and unloading stage (1 - 4) are recorded in these rows (after Column 3).

(3) The volume changes occurring within each shearing and unloading stage (1 - 4) are calculated/recorded in these rows (after Column 3).

(4) Stresses are corrected for membrane.

(5) $\sim M_{t,c} - (M_{t,at,c} + \rho_{water} \times \Delta V_{in, column 1 \& 2})$

(6) Initial value is after back pressuring

NA - Not Applicable ON - Over Night; WC - Water Content

Remarks: Wet Method used in the Saturation Stage

Calculated By: TP

Reviewed By: *WED*

MULTISTAGE TRIAXIAL TEST: Specimen Calculations Summary(2)

Project Number: 0411-08-1686 Test Type: CIU Triaxial App. No.: File Name: B-2304UD_UD11d
 Project Name: Exelon (Victoria) Task No.: NA Test No.: 0 Test Series for: 0

☒ Tube	☐ Field Extruded	☐ Liner	☐ Remolded	☐ Tamping	Constant Effort: Blows/Tamps per Layer = <u> </u>
Boring No.: <u>B-2304UD</u>	☐ Reconstituted	☐ Impact/Rammer		Rammer Wgt.(lb)= <u> </u>	No. Layers = <u> </u>
Sample No.: <u>UD11</u>	Composite No.: <u> </u>	☐ Pluviated:		Tamper Force (lb)= <u> </u>	Drop (in.) = <u> </u>
Depth (ft): <u>111.0-113.0</u>	Specimen No.: <u>D</u>	☐ Kneading		Undercompaction: U_{nl} (%) = <u> </u>	Dia. (in.) = <u> </u>
☐ Spec. Selection by X-ray;	☐ Geomarine Sample			Ref. Effort = <u> </u>	% Comp. = <u> </u> $\pm$ Opt. = <u> </u>

Type Consolidation	☒ Isotropic	☐ Anisotropic	☐ K_0 stress path	☒ Used automated system	Drained Axial Strain Rate, $\epsilon_{a,rate}$ (%/hr.)= <u> </u> Value
			45° stress path	Remarks:	
Loading Conditions	☒ Static	☒ Undrained	☒ Comp.	☒ Strain	☐ Stress
	Post Cyclic	Drained	Ext.	Stress Path	
				Constant Cell pressure	Cyclic (Hz)
				Variable Cell pressure	Rate: <u>0.1</u>
					Stress <u>1</u> ; Other: <u> </u>

Specific Gravity: $G_s = 2.710$ Measured	Height (mm)	Volume (cm ³)	Area (cm ²)	Water Content (%)	Unit Weight		Saturation (%)	Void Ratio e	Skempton B para- meter % (1)
					Total (pcf)	Dry (pcf)			
Condition: Initial:	115.42	235.17	20.37	24.08	122.11	98.41	91.12	0.72	96.0
After to 1st σ'_c	112.10	217.32	19.39	22.17	130.10	106.49	102.52	0.59	
Consol.: to 2nd σ'_c									
to 3rd σ'_c									
to 4th σ'_c									

Unit for Stresses: (ksf)

Item	Unit	1st Stage	2nd Stage	3rd Stage	4th Stage
Axial Strain during Consol., ϵ_c :	%	2.878	NA	NA	NA
Vol. Strain during Consol., ϵ_v :	%	7.590	NA	NA	NA
Effective Vertical Stress, σ'_v	(ksf)	10.196	NA	NA	NA
Effective Horizontal Stress, q'	(ksf)	10.133	NA	NA	NA
Consol. Stress Ratio, k (σ'_h / σ'_v):	-	0.994			
Induced OCR:	-	1.00	NA	NA	NA
Eff. Average Stress, $(\sigma'_v + \sigma'_h)/2$:	(ksf)	20.328			
Eff. Mean Stress, $(\sigma'_v + 2\sigma'_h)/3$:	(ksf)	10.154			
Undr. Ambient Shear Stress, $\tau_{a,ua}$:	(ksf)	NA	NA	NA	NA
Undr. Ambient Shear Strain, $\epsilon_{a,ua}$	%	NA	NA	NA	NA

Membrane Correction		
Type:	<u>Bulge</u>	
Modulus:	<u>150.0</u> psi	
Diameter:	<u>47.11</u> mm	
Thickness:	<u>0.33</u> mm	
Area Correction		
Type:	<u>Bulge</u>	
Stage	Area Corr. Const.:	Final Area (cm ²):
1st	<u>1.479</u>	<u>25.52</u>
2nd		
3rd		
4th		
Filter Paper Correction		
Type:	<u>None</u>	Type Strips: <u>Spiral #1</u>
Strips:	<u>8</u>	
Force:	<u>0.000</u> lbf/strip	

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms.

(1) Initial B is after saturation

NA - Not Applicable

Final Visual Description and Remarks: Mottled Pale Yellow and Yellow Fat CLAY (CH)

Stage	Stress Status	ϵ_a (%)	q (ksf)	p' (ksf)	ΔU (ksf)	σ'_1 (ksf)	σ'_3 (ksf)
1st	Max Shear Stress	1.85	2.366	4.511	7.989	6.877	2.146
	Max Obliquity	2.98	2.124	3.741	8.511	5.865	1.616
2nd	Max Shear Stress						
	Max Obliquity						
3rd	Max Shear Stress						
	Max Obliquity						
4th	Max Shear Stress						
	Max Obliquity						

Remarks: Strain Rate (%/min) = 1.18E-03

STAGE 1

Project: 0411-08-1686
Test Type: CIU Triaxial

Boring No.: B-2304UD
Sample No.: UD11
Specimen No.: D

Depth (ft.): 111.0-113.0
Stage No.: 1

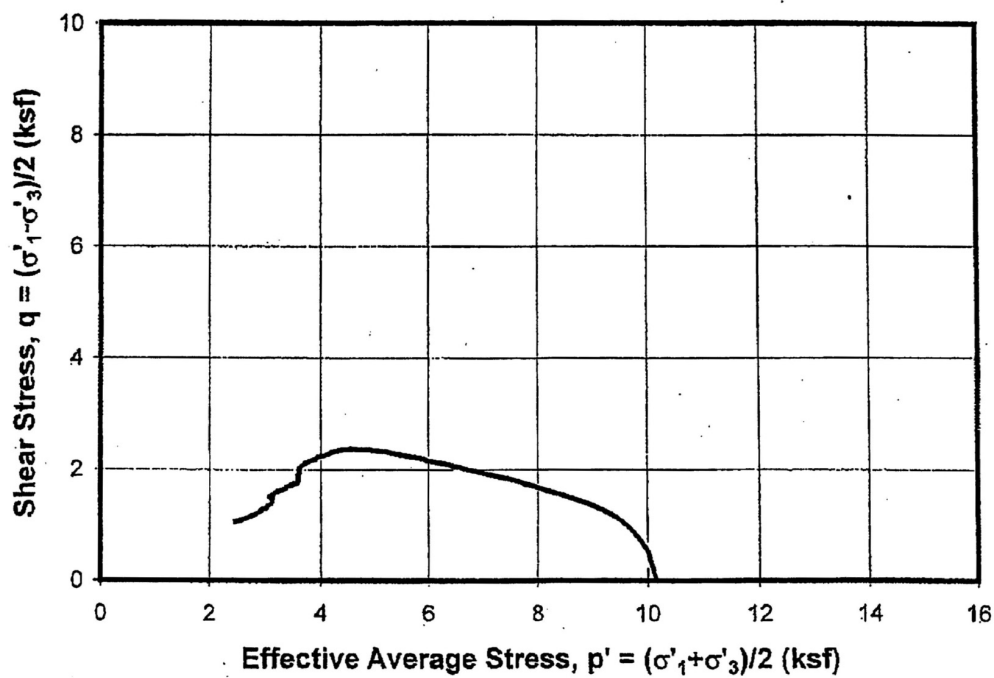
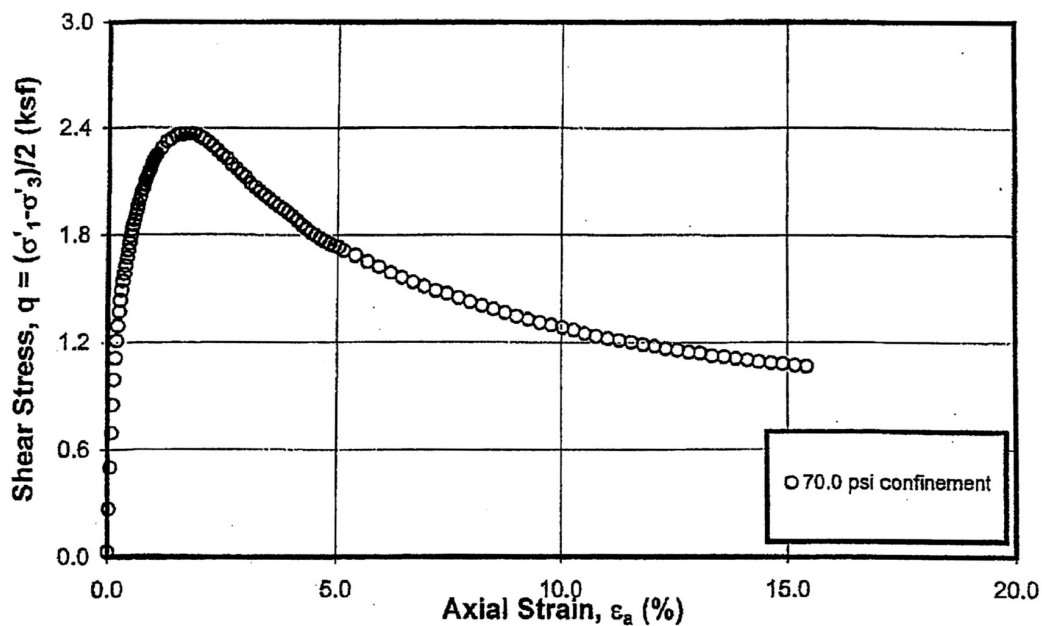
Elapsed Time (min)	Axial Strain ϵ_a (%)	q (ksf)	p' (ksf)	Excess PWP, Δu (ksf)	Volume Change (cm ³)	Obliquity σ'_1/σ'_3	A_r	E_s (ksf)	E_r (ksf)
0.0	0.000	0.032	10.164	0.000	0.000	1.006	0.000	-	-
15.0	0.026	0.270	10.082	0.320	0.000	1.055	0.672	1850.5	1833.1
30.0	0.051	0.503	10.022	0.616	0.000	1.106	0.650	1833.1	1648.4
45.0	0.077	0.693	9.898	0.927	0.000	1.151	0.701	1715.8	1354.4
60.0	0.103	0.851	9.779	1.202	0.000	1.191	0.735	1593.8	1159.3
75.0	0.129	0.992	9.647	1.480	0.000	1.229	0.770	1493.3	1014.1
90.0	0.154	1.112	9.486	1.760	0.000	1.266	0.814	1400.6	846.1
105.0	0.180	1.209	9.324	2.020	0.000	1.298	0.857	1308.4	702.1
120.0	0.206	1.293	9.151	2.275	0.000	1.329	0.902	1226.0	627.2
135.0	0.231	1.370	8.991	2.514	0.000	1.360	0.938	1157.0	551.0
150.0	0.257	1.434	8.804	2.779	0.000	1.389	0.985	1091.0	468.0
165.0	0.283	1.491	8.622	2.993	0.000	1.418	1.028	1031.7	416.3
180.0	0.309	1.541	8.487	3.189	0.000	1.444	1.055	978.6	358.9
195.0	0.334	1.583	8.325	3.396	0.000	1.470	1.093	928.2	335.2
210.0	0.360	1.627	8.167	3.595	0.000	1.498	1.126	886.7	356.7
225.0	0.386	1.675	8.042	3.771	0.000	1.526	1.146	852.1	340.8
240.0	0.411	1.715	7.911	3.947	0.000	1.554	1.169	818.4	310.1
255.0	0.437	1.754	7.751	4.126	0.000	1.585	1.200	788.3	307.1
270.0	0.463	1.794	7.639	4.291	0.000	1.614	1.216	761.6	295.8
285.0	0.489	1.830	7.506	4.461	0.000	1.645	1.239	736.5	244.1
300.1	0.514	1.857	7.371	4.615	0.000	1.674	1.265	709.9	207.4
315.1	0.540	1.884	7.236	4.781	0.000	1.704	1.290	686.1	220.9
330.1	0.566	1.914	7.113	4.930	0.000	1.736	1.311	665.4	216.3
345.1	0.591	1.939	6.990	5.084	0.000	1.768	1.332	645.2	214.2
360.1	0.617	1.969	6.881	5.221	0.000	1.802	1.347	627.8	214.5
375.1	0.643	1.995	6.759	5.361	0.000	1.837	1.367	610.8	186.9
390.1	0.668	2.017	6.666	5.485	0.000	1.867	1.381	593.9	211.3
405.1	0.694	2.049	6.577	5.605	0.000	1.905	1.389	581.2	172.2
420.1	0.720	2.061	6.471	5.722	0.000	1.935	1.410	563.8	149.4
435.1	0.746	2.087	6.387	5.835	0.000	1.971	1.419	551.4	171.6
450.1	0.771	2.105	6.313	5.928	0.000	2.001	1.429	537.6	131.6
465.1	0.797	2.121	6.226	6.031	0.000	2.034	1.442	524.3	121.6
480.1	0.823	2.136	6.143	6.134	0.000	2.067	1.455	511.6	133.3
495.1	0.848	2.155	6.048	6.239	0.000	2.107	1.469	500.6	115.0
510.1	0.874	2.166	5.987	6.313	0.000	2.134	1.478	488.3	145.1
525.1	0.900	2.193	5.906	6.418	0.000	2.181	1.485	480.3	153.3
540.1	0.926	2.205	5.857	6.481	0.000	2.208	1.491	469.7	101.0
555.1	0.951	2.219	5.790	6.560	0.000	2.242	1.500	459.8	95.8

STAGE 1

Elapsed Time (min)	Axial Strain ϵ_a (%)	q (ksf)	p' (ksf)	Excess PWP, ΔU (ksf)	Volume Change (cm ³)	Obliquity σ'_1/σ'_3	A_v	E_s (ksf)	E_T (ksf)
570.1	0.977	2.230	5.735	6.633	0.000	2.273	1.507	450.0	90.8
585.1	1.003	2.242	5.658	6.716	0.000	2.313	1.519	440.9	76.4
600.1	1.028	2.250	5.616	6.772	0.000	2.336	1.525	431.3	64.8
660.1	1.131	2.286	5.413	7.013	0.000	2.462	1.554	398.5	70.2
720.1	1.234	2.322	5.233	7.225	0.000	2.595	1.577	371.1	49.6
780.1	1.337	2.337	5.069	7.399	0.000	2.711	1.605	344.9	32.1
840.1	1.440	2.355	4.934	7.555	0.000	2.826	1.626	322.7	24.8
900.1	1.543	2.362	4.811	7.692	0.000	2.929	1.648	302.2	9.4
960.1	1.645	2.364	4.694	7.810	0.000	3.030	1.672	283.5	2.3
1020.1	1.748	2.365	4.617	7.883	0.000	3.100	1.689	266.9	1.0
1080.1	1.851	2.366	4.511	7.989	0.000	3.205	1.711	252.2	-8.8
1140.1	1.954	2.356	4.390	8.110	0.000	3.317	1.742	237.9	-25.1
1200.1	2.057	2.340	4.312	8.170	0.000	3.373	1.768	224.4	-33.9
1260.1	2.160	2.321	4.253	8.206	0.000	3.402	1.791	212.0	-40.9
1320.1	2.263	2.298	4.175	8.256	0.000	3.448	1.821	200.3	-44.6
1380.1	2.365	2.275	4.134	8.272	0.000	3.448	1.844	189.7	-46.9
1440.1	2.468	2.249	4.059	8.329	0.000	3.486	1.876	179.7	-45.5
1500.1	2.571	2.228	3.955	8.398	0.000	3.582	1.913	170.9	-51.7
1560.1	2.674	2.196	3.923	8.404	0.000	3.543	1.942	161.9	-55.5
1620.1	2.777	2.171	3.869	8.451	0.000	3.558	1.971	154.1	-49.0
1680.1	2.880	2.146	3.792	8.486	0.000	3.606	2.007	146.8	-45.6
1740.1	2.982	2.124	3.741	8.511	0.000	3.628	2.035	140.3	-53.8
1800.1	3.085	2.091	3.710	8.530	0.000	3.582	2.067	133.5	-53.6
1860.1	3.188	2.069	3.664	8.547	0.000	3.595	2.095	127.8	-44.1
1920.1	3.291	2.045	3.638	8.546	0.000	3.568	2.121	122.4	-43.4
1980.1	3.394	2.024	3.620	8.536	0.000	3.537	2.142	117.4	-40.6
2040.1	3.497	2.003	3.614	8.520	0.000	3.487	2.161	112.8	-42.1
2100.1	3.599	1.981	3.614	8.505	0.000	3.427	2.180	108.3	-41.3
2160.1	3.702	1.961	3.609	8.492	0.000	3.380	2.199	104.2	-37.3
2220.1	3.805	1.943	3.626	8.450	0.000	3.308	2.210	100.4	-33.0
2280.1	3.908	1.927	3.635	8.429	0.000	3.257	2.222	97.0	-35.3
2340.1	4.011	1.906	3.621	8.434	0.000	3.224	2.245	93.5	-43.7
2400.1	4.114	1.882	3.583	8.430	0.000	3.214	2.278	90.0	-46.6
2460.1	4.216	1.858	3.580	8.390	0.000	3.159	2.302	86.7	-45.9
2520.1	4.319	1.835	3.603	8.370	0.000	3.076	2.319	83.5	-43.4
2580.1	4.422	1.814	3.590	8.358	0.000	3.042	2.344	80.6	-36.8
2640.1	4.525	1.797	3.583	8.346	0.000	3.013	2.364	78.0	-33.0
2700.1	4.628	1.780	3.607	8.312	0.000	2.948	2.375	75.6	-32.8
2760.1	4.731	1.763	3.600	8.298	0.000	2.920	2.395	73.2	-28.9
2820.1	4.833	1.750	3.587	8.304	0.000	2.906	2.414	71.1	-22.1
2880.1	4.936	1.741	3.532	8.335	0.000	2.943	2.440	69.2	-16.8
2940.1	5.039	1.733	3.480	8.378	0.000	2.984	2.465	67.5	-25.8
3000.1	5.142	1.714	3.474	8.373	0.000	2.948	2.488	65.4	-29.3

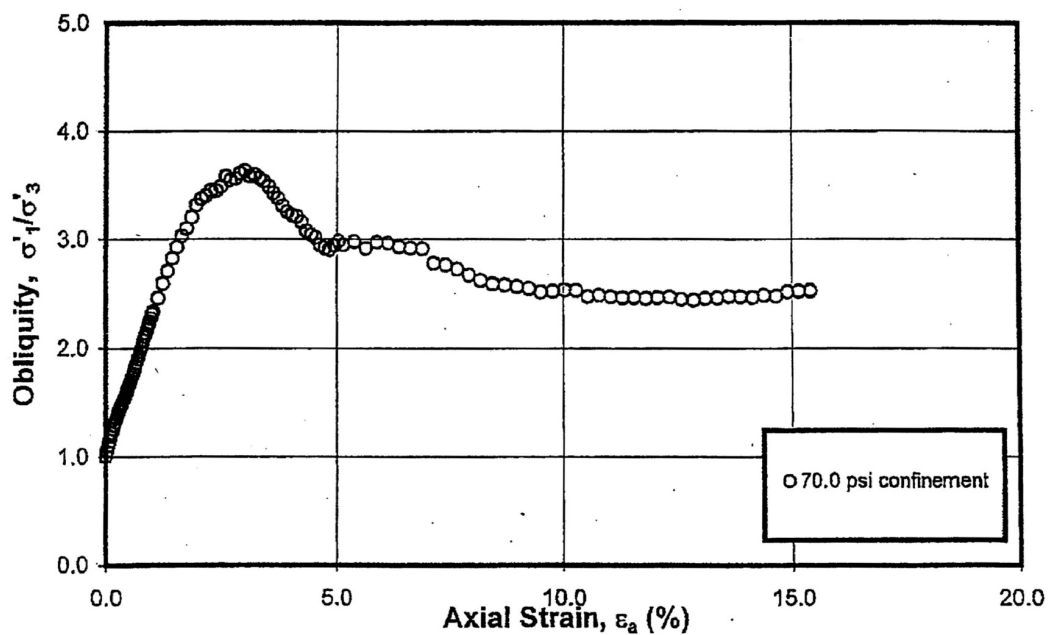
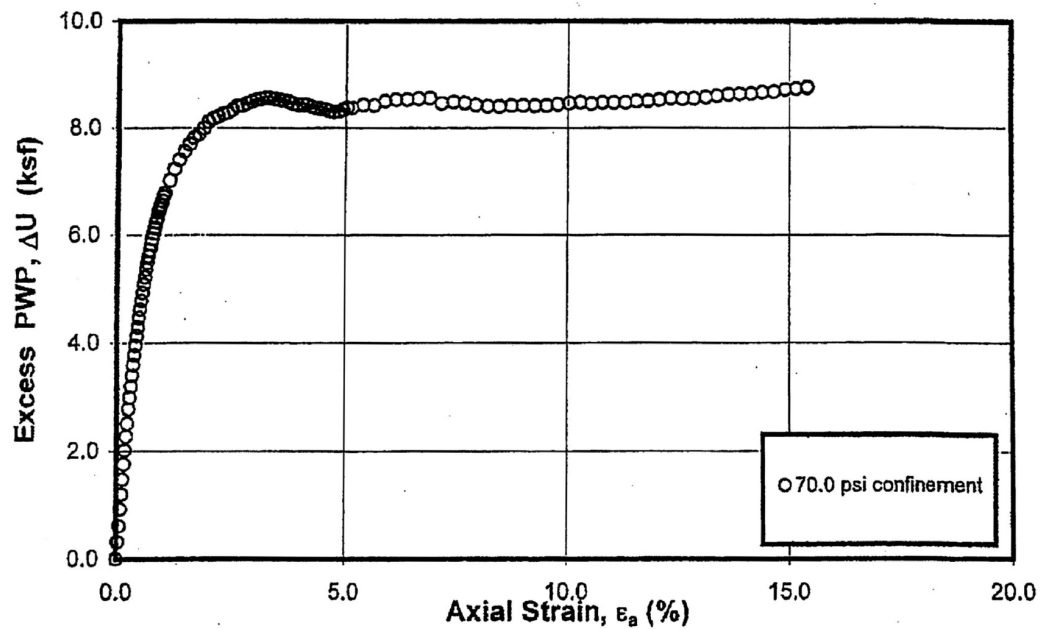
STAGE 1

Elapsed Time (min)	Axial Strain ϵ_a (%)	q (ksf)	p' (ksf)	Excess PWP, ΔU (ksf)	Volume Change (cm^3)	Obliquity σ'_1/σ'_3 -	A_f -	E_s (ksf)	E_T (ksf)
3150.1	5.399	1.686	3.387	8.425	0.000	2.981	2.549	61.3	-24.8
3300.1	5.656	1.650	3.372	8.417	0.000	2.918	2.598	57.2	-25.0
3450.1	5.913	1.621	3.263	8.497	0.000	2.975	2.671	53.8	-24.3
3600.1	6.170	1.588	3.204	8.524	0.000	2.966	2.736	50.4	-23.7
3750.1	6.427	1.560	3.173	8.525	0.000	2.935	2.787	47.6	-20.7
3900.1	6.685	1.535	3.132	8.542	0.000	2.921	2.839	45.0	-19.4
4050.1	6.942	1.510	3.088	8.554	0.000	2.915	2.893	42.6	-18.4
4200.1	7.199	1.487	3.157	8.453	0.000	2.782	2.907	40.4	-15.1
4350.1	7.456	1.472	3.137	8.476	0.000	2.768	2.940	38.6	-15.3
4500.1	7.713	1.448	3.124	8.460	0.000	2.728	2.985	36.7	-17.9
4650.1	7.970	1.426	3.131	8.429	0.000	2.672	3.023	35.0	-16.7
4800.1	8.227	1.405	3.134	8.406	0.000	2.625	3.059	33.4	-15.5
4950.1	8.484	1.386	3.125	8.397	0.000	2.594	3.099	31.9	-15.7
5100.1	8.741	1.365	3.091	8.418	0.000	2.581	3.153	30.5	-15.8
5250.1	8.998	1.345	3.061	8.418	0.000	2.568	3.204	29.2	-14.3
5400.1	9.256	1.328	3.041	8.419	0.000	2.550	3.247	28.0	-13.5
5550.1	9.513	1.311	3.036	8.417	0.000	2.519	3.287	26.9	-12.1
5700.1	9.770	1.297	2.998	8.438	0.000	2.525	3.332	25.9	-10.6
5850.1	10.027	1.283	2.955	8.462	0.000	2.536	3.380	25.0	-10.6
6000.1	10.284	1.270	2.928	8.480	0.000	2.532	3.422	24.1	-13.1
6150.1	10.541	1.250	2.942	8.451	0.000	2.477	3.465	23.1	-13.5
6300.1	10.798	1.235	2.897	8.472	0.000	2.486	3.519	22.3	-10.1
6450.2	11.055	1.224	2.884	8.475	0.000	2.474	3.553	21.6	-8.8
6600.2	11.312	1.212	2.868	8.476	0.000	2.465	3.589	20.9	-8.3
6750.2	11.569	1.202	2.843	8.495	0.000	2.466	3.626	20.2	-9.0
6900.2	11.826	1.189	2.821	8.504	0.000	2.458	3.671	19.6	-8.9
7050.2	12.084	1.180	2.790	8.527	0.000	2.465	3.712	19.0	-8.6
7200.2	12.341	1.167	2.757	8.555	0.000	2.469	3.762	18.4	-8.4
7350.2	12.598	1.158	2.755	8.541	0.000	2.450	3.789	17.9	-8.0
7500.2	12.855	1.147	2.737	8.548	0.000	2.442	3.831	17.3	-7.1
7650.2	13.112	1.140	2.706	8.571	0.000	2.455	3.865	16.9	-8.6
7800.2	13.369	1.124	2.662	8.596	0.000	2.462	3.932	16.3	-8.0
7950.2	13.626	1.119	2.638	8.621	0.000	2.475	3.960	16.0	-5.9
8100.2	13.883	1.109	2.616	8.630	0.000	2.472	4.002	15.5	-6.7
8250.2	14.140	1.102	2.604	8.637	0.000	2.468	4.031	15.1	-6.7
8400.2	14.397	1.092	2.560	8.668	0.000	2.488	4.086	14.7	-6.1
8550.2	14.655	1.086	2.556	8.674	0.000	2.478	4.107	14.4	-4.4
8700.2	14.912	1.081	2.505	8.712	0.000	2.517	4.151	14.1	-5.8
8850.2	15.169	1.071	2.476	8.731	0.000	2.525	4.197	13.7	-5.3
9000.2	15.426	1.067	2.459	8.767	0.000	2.533	4.221	13.4	-27.1
9003.4	15.431	1.066	2.461	8.750	0.000	2.528	4.225	13.4	-50.8



UNDRAINED TRIAXIAL COMPRESSION TEST
 Isotropically Consolidated
 Sample: UD11D - Depth: 111.0-113.0 ft
 Boring B-2304UD

Reviewed By: WIP



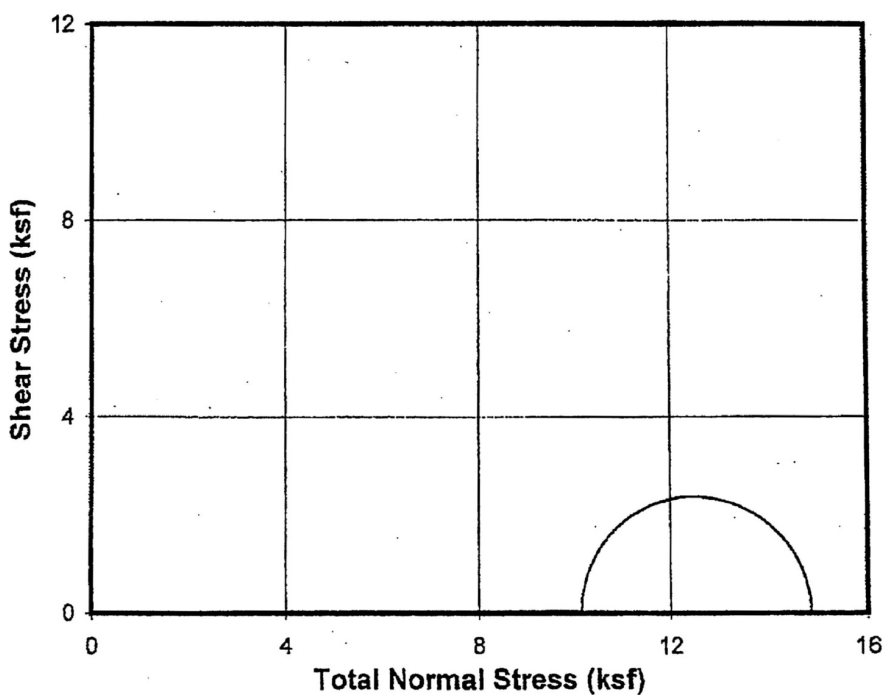
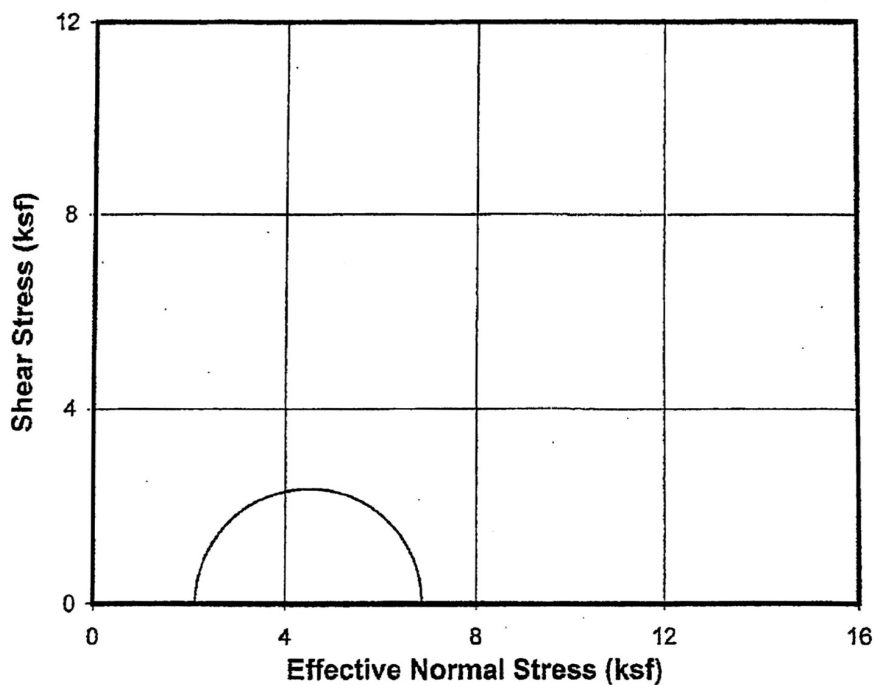
UNDRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

Sample: UD11D - Depth: 111.0-113.0 ft

Boring B-2304UD

Reviewed By: WFR



UNDRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated- Mohr's Circles

Sample: UD11D - Depth: 111.0-113.0 ft

Boring B-2304UD

Reviewed By: WLR

TRIAXIAL TEST (ASTM D 4767-04): Specimen Setup / Take Down

Project Number: 0411-08-1686 Test Type: CIU Triaxial Cell No.: TRX-6 File Name: 2304UD_UD1
 Task No.: NA Test Stress(es), σ'_c or $\sigma'_{v,c}$ = 10.80, NA, NA & NA ksf
 Project Name: Exelon (Victoria) $k(\sigma'_{h,c} / \sigma'_{v,c}) = 1.00$ Induced OCR = 1.00 $K_{ua}(\sigma'_{d,ua} / 2\sigma'_{v,c}) = NA$

Assig. Remarks: Specific Gravity: 2.710 ☒ Meas.; ☐ Assumed

☒ Tube	☐ Field Extruded	☐ Liner	☐ Remolded	Tamping	Constant Effort: Blows/Tamps per Layer =
Boring No.: B-2304UD	☐ Reconstituted			Impact/Rammer	Rammer Wgt. (lb) = No. Layers =
Sample No.: UD13	Composite No.:			Pluviated:	Tamper Force (lb) = Drop (in.) =
Depth (ft): 121.0-123.0	Specimen No.: c			Kneading	Undercompaction: U_{ni} (%) = Dia. (in.) =
☐ Spec. Selection by X-ray;	☐ Geomarine Sample				Ref. Effort = % Comp. = $\pm$ Opt. =

Type	☒ Isotropic	☐ K_o stress path	☒ Used automated system: Drained Axial Strain Rate, $\epsilon_{a,rate}$ (%/h) = NA
Consolidation:	☐ Anisotropic	☐ 45° stress path	Remarks:
Loading	☒ Static	☒ Undrained	☒ Comp.
Conditions:	☐ Post Cyclic	☐ Drained	☐ Ext.
		☒ Strain	☐ Stress
		☐ Constant Cell Pressure	☐ Cyclic (Hz)
		☐ Variable Cell Pressure	Rate: ☐ 0.1; ☐ 1; Other:

Water Content (WC);	Initial - Trimming Location			Final, W_{at} (see below)
	Top ($W_{o,1}$)	Bottom ($W_{o,2}$)	Sides ($W_{o,3}$)	
Container No	990	5018	2033A	4145
Mass Moist Soil + Cont. (g)	81.49	81.39	81.38	133.74
Mass Dry Soil + Container (g)	72.88	72.72	72.61	116.18
Mass Container (g)	32.30	31.32	30.66	29.98
Water Content, $W_{o,n}$ (%)	21.22	20.94	20.91	20.37
Avg. Initial WC, $W_{o,avg}$ (%)	21.02	Final (W_{at}):	☒ Slice ;	Whole Spec.
See attached data sheet(s) for additional water contents				

SOIL MASSES:		Initial	Final
Moist + Tare (etc.) (g)		484.65	490.47
Tare (etc.) (g)		0.00	0.00
Mass Moist Spec., M_n (g)		484.65	490.47
Excess Dry Soil (soil not included in final mass measurement)			
Container No			
Mass Dry Soil + Cont. (g)			
Mass Container (g)			
Mass Excess Dry Soil, $M_{d,es}$ (g)			0.00

Specimen Dimensions, (mm)					
Height		Dia., X indicates with membrane			
Initial (H_o)	Final (H_{at})	Initial (D_o)		Final (D_{at})	
GB	100.000	92.000	1 T	50.10	53.50
1	15.33	4.23	2 M	50.10	51.60
2	15.35	5.26	3 B	50.10	52.00
3	15.27	5.30	1 T		60.10
4	15.23	5.15	2 M		60.80
5	15.25	5.20	3 B		
Avg.	115.29	97.03	Avg.	50.10	55.60

Measuring Devices:	$A_o = \pi D^2 / 400 \text{ (cm}^2\text{)}$	19.71
Pi Tape: ☒ Dia	$V_o \text{ (cm}^3\text{)}$	227.27
Calipers: ☐ Ht.; ☐ Dia	$A_{alb,m} = \pi (D^*_{at})^2 / 400 \text{ (cm}^2\text{)}$	24.43
Dial Comparator ☒ Ht.; ☐ Dia	$A_{stw,m} = (d_{min} - 2\Delta d) d_{max} \pi / 400 \text{ (cm}^2\text{)}$	NA
Remarks: ID# PI-002	$D^*_{at} = (D_T + 2D_M + D_B) / 4 \text{ (mm)}$	55.77

☐ Photo Taken.

Failure Mode: NA - Not Applicable
 GB - Gage Block
 Other Remarks: LL=62 PL=18 PI=44

Failure Sketch

$\epsilon_a = 20\%$

Wedge/Bulge Ht. = NA (mm)

Estimated Initial Unit Weight		Total, $\gamma_{t,o}$ (lb/ft ³) = 133.13	Dry, $\gamma_{d,o}$ (lb/ft ³) = 110.00
Membrane / Filter Paper / Apparatus			
Membrane (mm):		Top	Bottom
Number:	Thickness:	0.70	0.58
= 1	Single; ☒ Double	0.69	0.57
Circumference ($C_{m,o}$)		149.0	150.0
Total Thickness		Dia. ($C_{m,o} / \pi$)	
Average:		0.32	47.59
Filter Paper: Top + Bottom: ☐ Yes; ☒ No			
Filter Strips: ☒ Yes; ☐ No Number = 8			
Type of Filter Strips ☐ Vertical: ¼ in. & Whatman #54			
☒ Spiral: ¼ in. & Whatman #1			
Apparatus: Mass Top Cap, M_{tc} = 53.4 g, 0.12 lbf			
Mass Displ. System, M_{ds} (cap, dial, piston, etc.) = NA g, NA lbf			
Top Cap Attached:		Piston Dia. (in.)	Load Cell:
☐ Yes; ☒ No;		☒ ½; ☐ ¾;	☐ External ☒ Internal
Top Cap - Rotation		Fixed, <1°; ☒ Limited, <5°; ☐ Unlimited, >5°	
With:		Frictionless End Caps;	Lat. Movement Top Cap
		Internal LVDT Jacket	

Final Visual Classification: Mottled Pale Yellow and Yellow Fat CLAY (CH)

Trimmed / Reconstituted By: AW Set Up By: TP Taken Down By: AW
 Date: 3/24/2008 Date: 3/24/2008 Date: 4/14/2008
 Prelim. Calc. By: TP Final Calc. By: TP Reviewed By: WJR

☐ See more detailed sketch on attached sheet. Remarks:

MULTISTAGE TRIAXIAL TEST: Specimen Calculations & Summary(1)

Project Number: 0411-08-1686

Cell No.: TRX-6

File Name: 2304UD_UD13c

Task Number: NA

Specific Gravity: 2.710

☒ Measured; ☒ Assumed

Boring No.: B-2304UD

Sample No.: UD13

Specimen No.: c

Depth (ft): 121.0-123.0

Type Test: CIU Triaxial

Specimen: ☒ "Undisturbed"; ☐ Reconstituted;

Calculations Corr. for Salt (dissolved solids): ☒ No or, ☐ Yes, with concentration = ppm

Initial Water Contents (WC), (W_o) over Saturation, (S_o), in (%):						Calculated Mass of Dry Soil (g)	
Top, $W_{o,1}$	Bottom, $W_{o,2}$	Sides, $W_{o,3}$	Avg., $W_{o,avg}$	Select., $W_{o,s}$	Back Cal., $W_{o,bc}$	Initial Selected WC, w_o (%)	21.02
21.22	20.94	20.91	21.02	21.02	18.94	Initial, $M_{d,o}$	400.47
S_o 106.9	106.2	106.1	106.4	106.4	100.9	Final, $M_{d,at}$	407.46
Measured final mass of moist soil, $M_{t,at}$ (g)						Selected, M_d	407.46
Final mass of moist soil corrected for excess dry soil, $M_{t,at,c}$ (g)							
							490.47

Consolidation Data	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Changes in Height (mm) and Volume (cm^3) Within Given Consolidation Stages/Columns	At Initial Seating Stress	During Back-Pressuring	1st Consol. Increment (1)	Column 2 or 3 to 1st Test Stage (1)	Column 4 to 2nd Test Stage	Column 5 to 3rd Test Stage	Column 6 to 4th Test Stage
Sign Convention: (+) Deformation in compression or Flow out of spec.; (-) Deformation in extension (swell) or Flow into spec.							
Change in Height, $\Delta H_{c,n}$	0.66	0.98		1.43	NA	NA	NA
Sum of changes in burette readings, $\Delta b_{r,n}$ (+ out) (- in)	0.18	-9.31	NA	15.49	NA	NA	NA
Theoretical $\Delta V_{ct,n} = (3V_o \times \Delta H_{c,n} / H_o)$	3.91	5.78		8.44	NA	NA	NA
Vol. Factor, $F_v = \Delta b_{r,n} / \Delta V_{t,n}$				1.84	NA	NA	NA
Corrected $\Delta V_{ct,n} = F_v \times \Delta V_{t,n}$			NA	0.00	NA	NA	NA
Selected $\Delta V_{c,n}$	0.18	-9.31		4.49	NA	NA	NA

Summary For Test Stages					
Test Stage:	1st = 1	2nd = 2	3rd = 3	4th = 4	
Cell Pressure, $\sigma_{c,n}$ (psi)	164.84	NA	NA	NA	Number of Test Stages = 1 $t_{50} = 200$ min
Back Pressure, $U_{b,n}$ (psi)	89.97	NA	NA	NA	
Axial Force Reading, $P_{r,n}$ (lbf)	2.00	NA	NA	NA	
Eff. Consol. Stress (σ'_c or $\sigma'_{v,c}$) (4), (ksf)	10.83	NA	NA	NA	
t_c , ON or in ☒ days ☐ hrs	12.00	NA	NA	NA	

At Final Test Stress/Stage - Summary of Calculation of ΔV_c (cm^3) by Different Procedures				
By Selected Volumes	By Saturation = 100 %	By Change in Mass (5)	For Diff. in Meas. Vol. ($V_o - V_{at}$)	For Selected $\Delta V_{c,r}$ required
$\Delta V_c = -4.64$	$\Delta V_c = -6.52$	$\Delta V_c = 3.47$	& corr. for ΔH_{td} $\Delta V_c =$	G_s for $S_c = 100$ %: 2.744

At Final Test Stress/Stage - Consolidation Conclusions				
$\Delta H_{c,f}$ (mm) = 3.07	$\Delta V_{c,f}$ (cm^3) = -4.64	Back Cal. G_s for $S=100\%$ = 2.744	Normalized	Ht. Ch. (%) = 0.73
$\epsilon_{ac,c}$ (%) = 2.66	$\epsilon_{vc,f}$ (%) = -2.04		Diff. in:	Vol. Ch. (%) =

Summary of Specimen Physical Properties											
Specific Gravity: $G_s = 2.710$ Measured	Height	Volume	Area	Water Content	Unit Weight		Saturation	Void Ratio	Volumetric Water Content	Porosity	Skempton B parameter % (6)
Condition:	(mm)	(cm^3)	(cm^2)	(%)	Total (pcf)	Dry (pcf)	(%)	e		n	
Initial:	115.29	227.27	19.71	18.94	133.13	111.92	100.9	0.509	0.3402	0.337	94.0
After to 1st σ'_c	112.22	231.91	20.67	20.37	132.03	109.68	102.3	0.540	0.3586	0.351	
Consol.: to 2nd σ'_c											
to 3rd σ'_c											
to 4th σ'_c											

Notes: (1) If the consol. stress in the 1st consol. increment & 1st test stage are equal, log the data in Column 4.

(2) The height changes occurring within each shearing and unloading stage (1 - 4) are recorded in these rows (after Column 3).

(3) The volume changes occurring within each shearing and unloading stage (1 - 4) are calculated/recorded in these rows (after Column 3).

(4) Stresses are corrected for membrane.

(5) $\sim M_{t,o} - (M_{t,at,c} + \rho_{water} \times \Delta V_{in, column 1 \& 2})$

(6) Initial value is after back pressuring

NA - Not Applicable ON - Over Night WC - Water Content

Remarks: Wet Method used in the Saturation Stage

Calculated By: TP

Reviewed By: HP

MULTISTAGE TRIAXIAL TEST: Specimen Calculations Summary(2)

Project Number: 0411-08-1686 Test Type: CIU Triaxial App. No.: TRX-6 File Name: 2304UD_UD1:
 Project Name: Exelon (Victoria) Task No.: NA Test No.: 0 Test Series for: 0

☒ Tube	☐ Field Extruded	☐ Liner	☐ Remolded	☐ Tamping	☐ Constant Effort: Blows/Tamps per Layer =
Boring No.: <u>B-2304UD</u>	☐ Reconstituted	☐ Impact/Rammer		Rammer Wgt.(lbf)=	No. Layers =
Sample No.: <u>UD13</u>	Compostite No.:	☐ Pluviated:		Tamper Force (lbf)=	Drop (in.) =
Depth (ft): <u>121.0-123.0</u>	Specimen No.: <u>c</u>	☐ Kneading		Undercompaction: U_{nl} (%) =	Dia. (in.) =
☐ Spec. Selection by X-ray;	☐ Geomarine Sample			Ref. Effort =	% Comp. = $\pm$ Opt. =

Type	☒ Isotropic	☐ K_0 stress path	☒ Used automated system	Drained Axial Strain Rate, $\epsilon_{a,rate}$ (%/hr.)= <u>NA</u>	
Consolidation	☐ Anisotropic	☐ 45° stress path	Remarks:		
Loading	☒ Static	☒ Undrained	☒ Comp.	☒ Strain	☐ Stress
Conditions:	☐ Post Cyclic	☐ Drained	☐ Ext.	☐ Stress Path	☐ Constant Cell pressure
					☐ Variable Cell pressure
					Cyclic (Hz) Rate: ☐ 0.1; ☐ 1; Other:

Specific Gravity: $G_s = 2.710$ Measured	Height (mm)	Volume (cm ³)	Area (cm ²)	Water Content (%)	Unit Weight		Saturation (%)	Void Ratio e	Skempton B para- meter % (1)
Condition:					Total (pcf)	Dry (pcf)			
Initial:	115.29	227.27	19.71	18.94	133.13	111.92	100.87	0.51	94.0
After to 1st σ'_c	112.22	231.91	20.67	20.37	132.03	109.68	102.29	0.54	
Consol.: to 2nd σ'_c									
to 3rd σ'_c									
to 4th σ'_c									

Unit for Stresses: (ksf)

Item	Unit	1st Stage	2nd Stage	3rd Stage	4th Stage
Axial Strain during Consol., ϵ_c :	%	2.659	NA	NA	NA
Vol. Strain during Consol., ϵ_v :	%	-2.042	NA	NA	NA
Effective Vertical Stress, σ'_v :	(ksf)	10.826	NA	NA	NA
Effective Horizontal Stress, σ'_h :	(ksf)	10.796	NA	NA	NA
Consol. Stress Ratio, k (σ'_h / σ'_v):	-	0.997			
Induced OCR:	-	1.00	NA	NA	NA
Eff. Average Stress, $(\sigma'_v + \sigma'_h)/2$:	(ksf)	21.622			
Eff. Mean Stress, $(\sigma'_v + 2\sigma'_h)/3$:	(ksf)	10.806			
Undr. Ambient Shear Stress, $\tau_{a,ua}$:	(ksf)	NA	NA	NA	NA
Undr. Ambient Shear Strain, $\epsilon_{a,ua}$:	%	NA	NA	NA	NA

Membrane Correction		
Type:	<u>Bulge</u>	
Modulus:	<u>150.0</u> psi	
Diameter:	<u>47.59</u> mm	
Thickness:	<u>0.32</u> mm	
Area Correction		
Type:	<u>Bulge</u>	
Stage	Area Corr. Const.:	Final Area (cm ²):
1st	1.351	24.43
2nd		
3rd		
4th		
Filter Paper Correction		
Type:	<u>None</u>	Type Strips: <u>Spiral #1</u>
Strips:	<u>8</u>	
Force:	<u>0.000</u> lbf/strip	

Notes: See Fugro South, Inc. Notation Listing for definition of symbols and acronyms.

(1) Initial B is after saturation

NA - Not Applicable

Final Visual Description and Remarks: Mottled Pale Yellow and Yellow Fat CLAY (CH)

Stage	Stress Status	ϵ_a (%)	q (ksf)	p' (ksf)	ΔU (ksf)	σ'_1 (ksf)	σ'_3 (ksf)
1st	Max Shear Stress	4.65	4.118	10.813	4.101	14.931	6.694
	Max Obliquity	4.01	4.106	10.777	4.115	14.883	6.672
2nd	Max Shear Stress						
	Max Obliquity						
3rd	Max Shear Stress						
	Max Obliquity						
4th	Max Shear Stress						
	Max Obliquity						

Remarks: Strain Rate (%/min) = 2.00E-03

STAGE 1

Project: 0411-08-1686
Test Type: CIU Triaxial

Boring No.: B-2304UD
Sample No.: UD13
Specimen No.: c

Depth (ft.): 121.0-123.0
Stage No.: 1

Elapsed Time (min)	Axial Strain ϵ_a (%)	q (ksf)	p' (ksf)	Excess PWP, ΔU (ksf)	Volume Change (cm ³)	Obliquity σ'_1/σ'_3 -	A_f -	E_s (ksf)	E_T (ksf)
0.0	0.000	0.015	10.811	0.000	0.000	1.003	0.000	-	-
30.0	0.053	0.057	10.772	0.073	0.000	1.011	0.971	156.3	229.4
60.0	0.107	0.114	10.741	0.162	0.000	1.021	0.857	184.2	167.3
90.0	0.160	0.179	10.728	0.255	0.000	1.034	0.754	204.3	269.1
120.0	0.214	0.245	10.710	0.319	0.000	1.047	0.720	214.5	327.6
149.4	0.266	0.335	10.712	0.409	0.000	1.064	0.655	240.0	-30637.3
159.5	0.293	0.378	10.737	0.433	0.000	1.073	0.602	248.0	397.4
179.5	0.346	0.471	10.749	0.513	0.000	1.092	0.569	263.3	290.5
199.5	0.400	0.567	10.759	0.592	0.000	1.111	0.547	275.8	406.5
219.5	0.453	0.665	10.770	0.681	0.000	1.132	0.531	286.6	384.0
239.5	0.507	0.801	10.832	0.769	0.000	1.160	0.487	310.1	659.0
259.5	0.561	1.045	10.921	0.911	0.000	1.212	0.446	367.3	1122.2
279.5	0.614	1.344	11.084	1.052	0.000	1.276	0.398	432.9	1065.0
299.5	0.668	1.614	11.177	1.223	0.000	1.337	0.385	478.9	1039.0
319.5	0.721	1.885	11.277	1.397	0.000	1.401	0.375	518.5	939.2
339.6	0.775	2.134	11.366	1.556	0.000	1.462	0.369	547.0	788.2
359.6	0.828	2.326	11.394	1.728	0.000	1.513	0.374	557.9	734.7
379.6	0.882	2.501	11.388	1.895	0.000	1.563	0.384	563.8	656.8
399.6	0.935	2.674	11.403	2.064	0.000	1.613	0.389	568.5	654.2
419.6	0.989	2.864	11.429	2.230	0.000	1.669	0.392	576.3	684.7
439.6	1.042	3.000	11.404	2.386	0.000	1.714	0.401	572.8	418.9
459.6	1.096	3.125	11.376	2.535	0.000	1.757	0.409	567.6	466.0
509.6	1.230	3.432	11.349	2.874	0.000	1.867	0.421	555.7	392.8
589.6	1.444	3.753	11.284	3.251	0.000	1.997	0.437	517.9	220.3
669.6	1.658	3.943	11.240	3.494	0.000	2.081	0.445	473.9	136.5
749.6	1.872	4.037	11.157	3.673	0.000	2.134	0.457	429.8	67.2
829.6	2.086	4.086	11.064	3.817	0.000	2.171	0.469	390.3	30.0
909.7	2.300	4.091	10.969	3.904	0.000	2.189	0.481	354.4	-7.2
989.7	2.514	4.091	10.940	3.939	0.000	2.195	0.484	324.3	1.3
1069.7	2.728	4.073	10.872	3.999	0.000	2.198	0.492	297.5	-7.4
1149.7	2.942	4.088	10.871	4.005	0.000	2.205	0.493	276.9	4.3
1229.7	3.156	4.088	10.856	4.019	0.000	2.208	0.495	258.1	-7.1
1309.7	3.370	4.096	10.826	4.040	0.000	2.217	0.498	242.2	6.9
1389.7	3.584	4.095	10.800	4.083	0.000	2.221	0.501	227.7	5.4
1469.7	3.798	4.104	10.807	4.088	0.000	2.224	0.500	215.3	-3.1
1549.7	4.012	4.106	10.777	4.115	0.000	2.231	0.504	203.9	15.4
1629.7	4.226	4.106	10.797	4.106	0.000	2.227	0.502	193.6	-9.3
1709.7	4.440	4.102	10.785	4.105	0.000	2.228	0.503	184.1	4.9