

**RFI 010a
Pebble Project EIS**

Request for Information

Title/Subject:	Follow-up Questions on Tailings Characteristics
Requestor:	AECOM
Date Transmitted:	10/2/18
Recipient:	Pebble Limited Partnership (PLP)
Response Requested by:	10/5/18
Rationale:	Previous responses to RFI-010 address rock geochemistry and some general tailings operations information. Additional lab test and engineering data is needed to determine the geotechnical strength parameters of the thickened tailings in the Bulk TSF for the purposes of estimating the stability of the upper centerline part of the Bulk TSF main embankment. Based on discussion in the 9/27/18 technical meeting with PLP and USACE regarding downstream embankment alternatives in RFI 075, PLP indicated that previous work has been done in this area. The information will be used to further evaluate the safety and stability of the proposed centerline design for the Bulk TSF main embankment and spill risk in the FMEA.
Describe the Information Requested and Level of Detail:	<ol style="list-style-type: none"> 1) Provide documents of laboratory testing data and geotechnical engineering analyses that were conducted for thickened tailings with solids content of approximately 55 percent. 2) Provide thickened tailings geotechnical strength parameters that were used in the stability analyses of the Bulk TSF main embankment to support the selection of the centerline method of construction.

Recipient Response Form

Date Received from USACE:	Click here to enter text.																																		
Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):	<p>1) <i>Provide documents of laboratory testing data and geotechnical engineering analyses that were conducted for thickened tailings with solids content of approximately 55 percent.</i></p> <p>The Laboratory testing was completed on three samples of hard rock fine-grained tailings in 2008 (underflow tailings samples). Four specimens were prepared from each sample for Consolidated-Undrained (CU) tests at four confinement levels (nominally: 200kPa, 400kPa, 800kPa, 2000kPa). The cyclone underflow tailings represent the coarser tailings fraction, which are considered to be representative of the coarse, tailings materials that will be deposited in the beaches adjacent to the dams. Table 1 provides a summary of the triaxial compression testing results and the laboratory testing sheets for the samples are attached.</p> <p style="text-align: center;">Table 1 Summary of Triaxial Compression Testing</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th rowspan="3">Sample ID</th><th colspan="5">Effective Friction Angle (degrees)</th></tr> <tr> <th colspan="5">Effective Confining Pressure (kPa)</th></tr> <tr> <th>200</th><th>400</th><th>800</th><th>2,000</th><th>Average</th></tr> </thead> <tbody> <tr> <td>G Bulk #3848 (Cyclone Underflow)</td><td>33.0</td><td>34.5</td><td>35.0</td><td>31.0</td><td>34.0</td></tr> <tr> <td>Y Bulk #3847 (Cyclone Underflow)</td><td>34.0</td><td>34.5</td><td>35.0</td><td>31.0</td><td>34.0</td></tr> <tr> <td>80G + 20Y Bulk Tailings (Cyclone Underflow)</td><td>34.0</td><td>36.0</td><td>35.0</td><td>32.0</td><td>35.0</td></tr> </tbody> </table> <p>2) <i>Provide thickened tailings geotechnical strength parameters that were used in the stability analyses of the Bulk TSF main embankment to support the</i></p>	Sample ID	Effective Friction Angle (degrees)					Effective Confining Pressure (kPa)					200	400	800	2,000	Average	G Bulk #3848 (Cyclone Underflow)	33.0	34.5	35.0	31.0	34.0	Y Bulk #3847 (Cyclone Underflow)	34.0	34.5	35.0	31.0	34.0	80G + 20Y Bulk Tailings (Cyclone Underflow)	34.0	36.0	35.0	32.0	35.0
Sample ID	Effective Friction Angle (degrees)																																		
	Effective Confining Pressure (kPa)																																		
	200	400	800	2,000	Average																														
G Bulk #3848 (Cyclone Underflow)	33.0	34.5	35.0	31.0	34.0																														
Y Bulk #3847 (Cyclone Underflow)	34.0	34.5	35.0	31.0	34.0																														
80G + 20Y Bulk Tailings (Cyclone Underflow)	34.0	36.0	35.0	32.0	35.0																														

selection of the centerline method of construction

The centerline embankment construction method typically utilizes a comparatively wider zone of compacted structure fill and does not rely on uncompacted hydraulically paced tailings for embankment stability during on-going staged TSF Expansion. The centerline construction method is well accepted and widely used construction technique that results in an inherently stable structure that does not rely on the strength of the deposited tailings solids.

The peak undrained strength ratio (S_u/p') for hard rock fine-grained tailings materials is typically in the range of 0.2 to 0.3. A value of 0.25 was assumed for the preliminary stability analyses and geotechnical strength parameters used were presented in RFI 008a and 008b as shown in Table 2. Additional stability analysis were also completed in 2011 using a post liquefaction undrained strength ratio of 0.05.

The laboratory test results presented in Table 1 were evaluated and a best-fit S_u/p' value was estimated at 0.41 based on the effective friction angle of 34 degrees. This value is greater than the assumed value of 0.25 used for the preliminary stability analyses, which is a more conservative value for the tailings strength.

Table 2 Summary of Geotechnical Parameters (RFI 008a)

EMBANKMENT	MATERIAL	UNIT WEIGHT (pcf)	Strength Function	Tau/Sigma Ratio	Cohesion (psf)	Phi (°)
Bulk TSF Main Embankment	Bedrock	160	-	-	0	40
	Tailings	90	-	0.25	-	-
	Rockfill	145	Leps – Low density, poorly graded, weak particles	-	-	-
Bulk TSF South Embankment	Bedrock	160	-	-	0	40
	Tailings	90	-	0.25	-	-
	Rockfill	145	Leps – Low density, poorly graded, weak particles	-	-	-
Pyritic TSF Main Embankment	Bedrock	160	-	-	0	40
	Tailings	100	-	0.25	-	-
	Rockfill	145	Leps – Low density, poorly graded, weak particles	-	-	-
Main Water Management Pond	Overburden	120	-	-	0	35
	Rockfill	145	Leps – Low density, poorly graded, weak	-	-	-

	<table border="1"> <tr> <td></td> <td></td> <td></td> <td>particles</td> <td></td> <td></td> <td></td> </tr> </table>				particles			
			particles					
List Number and Type of Response Attachments:	Triaxial Testing Lab Results_2008.pdf							
Date Returned to USACE:	10/5/2018							

AECOM Intake Form

Date Response was Received:	10/5/2018
Received by:	AECOM
Describe any Follow-up Related to this RFI:	None at this time.

3848 (200 kPa)



TRIAXIAL COMPRESSION TESTING

Project: Pebble East

Date: 10-Jul-08 MDH Job #: L1086

Sample: 3848

Test No: 1 Test Designation: CU (Effective confining pressure: 200 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	918.38	average:
Sample diameter (mm):		72.48
Sample height (mm):		152.40
Water Content:		
	height : diameter ratio: 2.1 : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³):	1460
	Dry density (kg/m ³):	1300
Water Content (%):	12.3%	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	-
Mass of pan + dry soil (g): (g):	-
Mass of dry soil (g):	-

Comments:

Sample at end of test

Sample Failure

Change in height during saturation (mm): 0.00
 Sample height after saturation (mm): 152.40
 Change in volume during saturation (m³): 9.2E-06
 Change in height during consolidation (mm): 0.00
 Sample height after consolidation (mm): 152.40
 Change in volume during consolidation (ml): 7.20 (up to 750 kPa cell pressure)
 Change in volume during consolidation (m³): 7.2E-06
 Sample area after consolidation (m²): 0.0040
 Rate of strain (mm/min): 0.035

Load due to cell pressure:

25.68

kgs

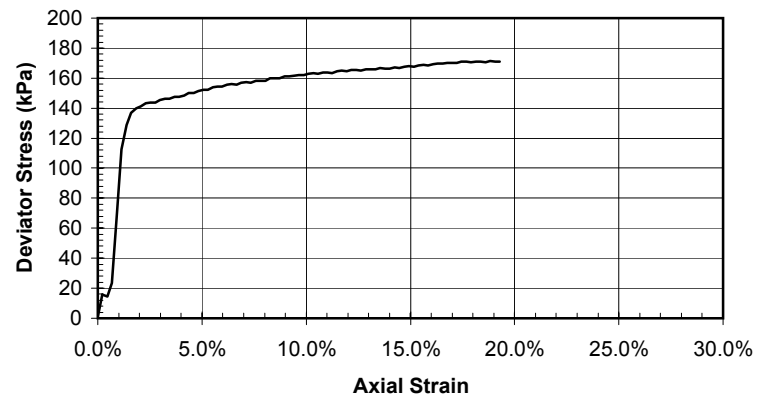
failure criterion	max deviator stress	max. obliquity (maj/min)
σ'_3	72.7	63.1
σ'_1	243.0	218.8
strain	17.00%	6.20%
σ'_1/σ'_3	3.344	3.468
ϕ' (deg)	32.6	33.5

(computed from equation $\sin \phi' = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

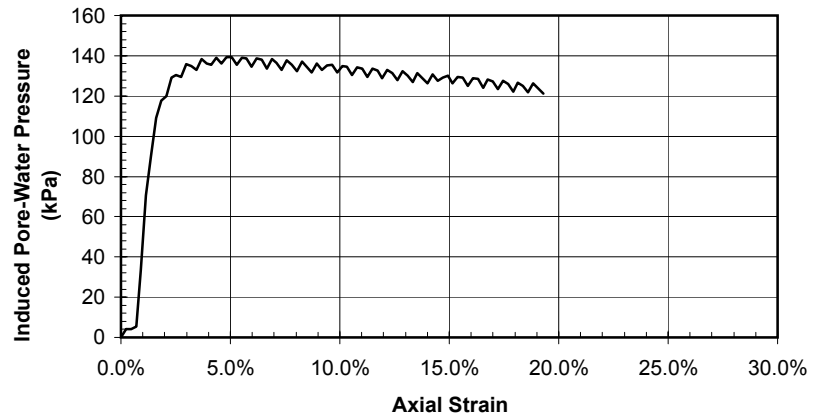
Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2 (σ ₁ -σ ₃)/2	q (σ ₁ -σ ₃)/2 (σ ₁ σ ₃)
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)					
												Filter Paper (kPa)	Rubber Membrane (kPa)						
11/07/2008	19:14:11	297.43	496.9	26.05	61.7	0.000	0.004019	0.37	3.6	0.91	0.0	0.00	0.89	0.0	199.5	200.3	199.9	0.4	1.004
11/07/2008	19:24:11	301.44	500.5	32.17	61.4	0.002	0.004028	6.49	63.7	15.81	0.0	0.11	15.70	4.0	199.0	214.7	206.9	7.8	1.079
11/07/2008	19:34:11	301.55	500.5	31.69	61.0	0.005	0.004037	6.01	59.0	14.61	0.0	0.23	14.38	4.1	198.9	213.3	206.1	7.2	1.072
11/07/2008	19:44:11	302.74	496.4	35.5	60.7	0.007	0.004046	9.82	96.4	23.81	0.0	0.34	23.47	5.3	193.6	217.1	205.4	11.7	1.121
11/07/2008	19:54:11	330.9	500.5	55.04	60.3	0.009	0.004056	29.36	288.0	71.02	0.0	0.46	70.57	33.5	169.6	240.1	204.8	35.3	1.416
11/07/2008	20:04:11	368.02	500.2	72.58	60.0	0.011	0.004065	46.90	460.1	113.19	0.0	0.57	112.62	70.6	132.1	244.7	188.4	56.3	1.852
11/07/2008	20:14:11	387.88	495.7	79.5	59.6	0.014	0.004075	53.82	528.0	129.58	0.0	0.69	128.90	90.5	107.8	236.7	172.3	64.4	2.196
11/07/2008	20:24:11	406.52	500.5	82.95	59.3	0.016	0.004084	57.27	561.8	137.57	0.0	0.80	136.77	109.1	93.9	230.7	162.3	68.4	2.456
11/07/2008	20:34:11	415.02	499.4	84.36	58.9	0.018	0.004094	58.68	575.7	140.63	0.0	0.91	139.71	117.6	84.4	224.1	154.2	69.9	2.656
11/07/2008	20:44:11	417.4	495.6	85.06	58.6	0.021	0.004103	59.38	582.5	141.97	0.0	1.03	140.94	120.0	78.2	219.2	148.7	70.5	2.802
11/07/2008	20:54:11	426.45	500.5	86.19	58.2	0.023	0.004113	60.51	593.6	144.33	0.0	1.14	143.19	129.0	74.0	217.2	145.6	71.6	2.935
11/07/2008	21:04:11	427.95	498.6	86.52	57.9	0.025	0.004123	60.84	596.9	144.78	0.0	1.26	143.52	130.5	70.6	214.1	142.4	71.8	3.032
11/07/2008	21:14:11	426.8	495	86.82	57.5	0.028	0.004132	61.14	599.8	145.15	0.0	1.37	143.78	129.4	68.2	212.0	140.1	71.9	3.108
11/07/2008	21:24:11	433.17	500.3	87.72	57.2	0.030	0.004142	62.04	608.6	146.94	0.0	1.48	145.46	135.7	67.1	212.6	139.9	72.7	3.167
11/07/2008	21:34:11	432.31	498	88.18	56.8	0.032	0.004152	62.50	613.1	147.68	0.0	1.60	146.08	134.9	65.7	211.8	138.7	73.0	3.224
11/07/2008	21:44:11	430.33	495	88.48	56.5	0.034	0.004162	62.80	616.1	148.04	0.0	1.71	146.32	132.9	64.7	211.0	137.9	73.2	3.262
11/07/2008	21:54:11	435.7	499.8	89.27	56.1	0.037	0.004172	63.59	623.8	149.54	0.0	1.83	147.71	138.3	64.1	211.8	137.9	73.9	3.305
11/07/2008	22:04:11	433.57	497.3	89.48	55.8	0.0390	0.004182	63.80	625.9	149.68	0.0	1.94	147.74	136.1	63.8	211.5	137.6	73.9	3.317
11/07/2008	22:14:11	432.88	496.4	89.9	55.4	0.0413	0.004192	64.22	630.0	150.30	0.0	2.06	148.25	135.5	63.5	211.8	137.7	74.1	3.333
11/07/2008	22:24:11	436.52	499.8	90.83	55.1	0.0436	0.004202	65.15	639.1	152.11	0.0	2.17	149.94	139.1	63.3	213.2	138.2	75.0	3.370
11/07/2008	22:34:11	433.59	496.8	91.1	54.7	0.046	0.004212	65.42	641.8	152.38	0.0	2.28	150.09	136.2	63.2	213.3	138.2	75.0	3.376
11/07/2008	22:44:11	436.76	499.8	91.84	54.4	0.048	0.004222	66.16	649.0	153.73	0.0	2.40	151.33	139.3	63.0	214.4	138.7	75.7	3.401
11/07/2008	22:54:11	436.87	499.8	92.45	54.0	0.051	0.004232	66.77	655.0	154.77	0.0	2.51	152.26	139.4	62.9	215.2	139.1	76.1	3.420
11/07/2008	23:04:11	432.82	495.7	92.7	53.7	0.053	0.004242	67.02	657.5	154.98	0.0	2.63	152.35	135.4	62.9	215.2	139.0	76.2	3.424
11/07/2008	23:14:11	436.53	499.3	93.54	53.3	0.055	0.004253	67.86	665.7	156.54	0.0	2.74	153.80	139.1	63.3	217.1	140.2	76.9	3.431
11/07/2008	23:24:11	436.18	499.3	94.01	53.0	0.057	0.004263	68.33	670.3	157.24	0.0	2.85	154.39	138.8	63.2	217.5	140.4	77.2	3.444
11/07/2008	23:34:11	432.1	495.5	94.14	52.6	0.060	0.004274	68.46	671.6	157.16	0.0	2.97	154.19	134.7	63.4	217.6	140.5	77.1	3.433
11/07/2008	23:44:11	436.15	499.2	95.01	52.3	0.062	0.004284	69.33	680.1	158.76	0.0	3.08	155.68	138.7	63.1	218.8	140.9	77.8	3.468
11/07/2008	23:54:11	435.35	499.1	95.38	51.9	0.064	0.004295	69.70	683.8	159.22	0.0	3.20	156.02	137.9	63.7	219.7	141.7	78.0	3.449
12/07/2008	0:04:11	431.09	494.3	95.45	51.6	0.067	0.004305	69.77	684.5	158.99	0.0	3.31	155.68	133.7	63.3	218.9	141.1	77.8	3.461
12/07/2008	0:14:11	435.65	499.8	96.24	51.2	0.069	0.004316	70.56	692.2	160.39	0.0	3.43	156.97	138.2	64.1	221.1	142.6	78.5	3.447
12/07/2008	0:24:11	434.03	497.8	96.55	50.9	0.071	0.004326	70.87	695.3	160.70	0.0	3.54	157.16	136.6	63.7	220.9	142.3	78.6	3.466
12/07/2008	0:34:11	430.34	494.3	96.72	50.5	0.073	0.004337	71.04	696.9	160.69	0.0	3.65	157.03	132.9	64.0	221.0	142.5	78.5	3.454
12/07/2008	0:44:11	435.1	499.2	97.44	50.2	0.076	0.004348	71.76	704.0	161.91	0.0	3.77	158.15	137.7	64.1	222.3	143.2	79.1	3.467
12/07/2008	0:54:11	432.96	497.6	97.68	49.8	0.0781	0.004359	72.00	706.3	162.05	0.0	3.88	158.17	135.5	64.7	222.8	143.8	79.1	3.466
12/07/2008	1:04:11	429.63	494.1	97.89	49.5	0.0804	0.004370	72.21	708.4	162.12	0.0	4.00	158.12	132.2	64.5	222.6	143.5	79.1	3.453
12/07/2008	1:14:11	434.46	499.3	98.83	49.1	0.083	0.004381	73.15	717.6	163.82	0.0	4.11	159.71	137.0	64.8	224.5	144.7	79.9	3.464
12/07/2008	1:24:11	431.75	496.6	99.23	48.8	0.085	0.004392	73.55	721.5	164.30	0.0	4.22	160.08	134.3	64.8	224.9	144.8	80.0	3.470
12/07/2008	1:34:11	429.06	494.4	99.39	48.4	0.087	0.004403	73.71	723.1	164.25	0.0	4.34	159.91	131.6	65.4	225.3	145.3	80.0	3.447
12/07/2008	1:44:11	433.7	499.1	100.19	48.0	0.090	0.004414	74.51	731.0	165.61	0.0	4.45	161.16	136.3	65.4	226.6	146.0	80.6	3.464
12/07/2008	1:54:11	430.33	496.1	100.35	47.7	0.092	0.004425	74.67	732.5	165.55	0.0	4.57	160.98	132.9	65.8	226.8	146.3	80.5	3.447
12/07/2008	2:04:11	432.51	498.4	100.9	47.3	0.094	0.004436	75.22	737.9	166.35	0.0	4.68	161.67	135.1	65.9	227.6	146.7	80.8	3.453
12/07/2008	2:14:11	432.82	498.9	101.41	47.0	0.096	0.004447	75.73	742.9	167.05	0.0	4.80	162.25	135.4	66.1	228.3	147.2	81.1	3.456
12/07/2008	2:24:11	429.15	495.2	101.54	46.6	0.099	0.004459	75.86	744.2	166.91	0.0	4.91	162.00	131.7	66.0	228.0	147.0	81.0	3.453
12/07/2008	2:34:11	432.27	498.5	102.26	46.3	0.101	0.004470	76.58	751.3	168.07	0.0	5.02	163.04	134.8	66.2	229.2	147.7	81.5	3.463
12/07/2008	2:44:11	432.07	499.1	102.55	45.9	0.103	0.004482	76.87	754.1	168.27	0.0	5.14	163.13	134.6	67.0	230.2	148.6	81.6	3.434
12/07/2008	2:54:11	427.9	494.4	102.63	45.6	0.106	0.004493	76.95	754.9	168.02	0.0	5.25	162.76	130.5	66.5	229.2	147.8	81.4	3.449
12/07/2008	3:04:11	431.71	499.1	103.31	45.2	0.108	0.004505	77.63	761.6	169.06	0.0	5.37	163.70	134.3	67.4	231.1	149.2	81.8	3.429
12/07/2008	3:14:11	431	498.1	103.63	44.9	0.110	0.004516	77.95	764.7	169.32	0.0	5.48	163.84	133.6	67.1	231.0	149.0	81.9	3.441
12/07/2008	3:24:11	426.85	494.2	103.67	44.5	0.113	0.004528	77.99	765.1	168.97	0.0	5.59	163.38	129.4	67.4	230.8	149.1	81.7	3.424
12/07/2008	3:34:11	431.03	498.4	104.87	44.2	0.115	0.004540	78.80	773.0	170.29	0.0	5.71	164.58	133.6	67.4	232.0	149.7	82.3	3.442
12/07/2008	3:44:11	429.93	497.7	104.87	43.8	0.117	0.004551	79.19	776.9	170.69	0.0	5.82	164.86	132.5	67.8	232.6	150.2		

3848 (200 kPa)

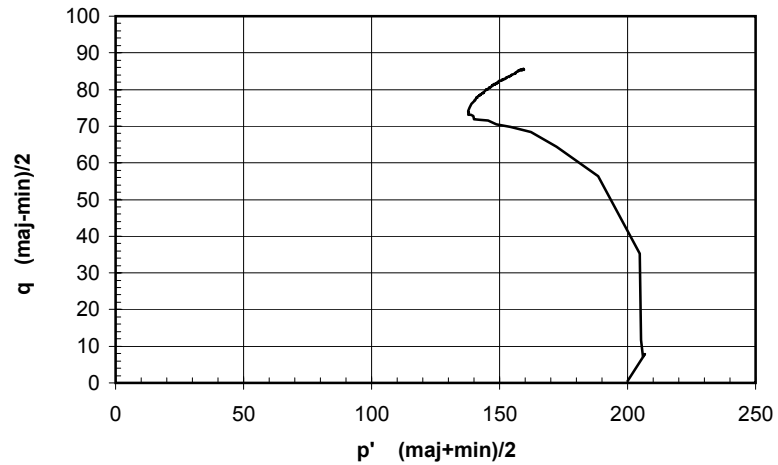
Deviator Stress versus Axial Strain



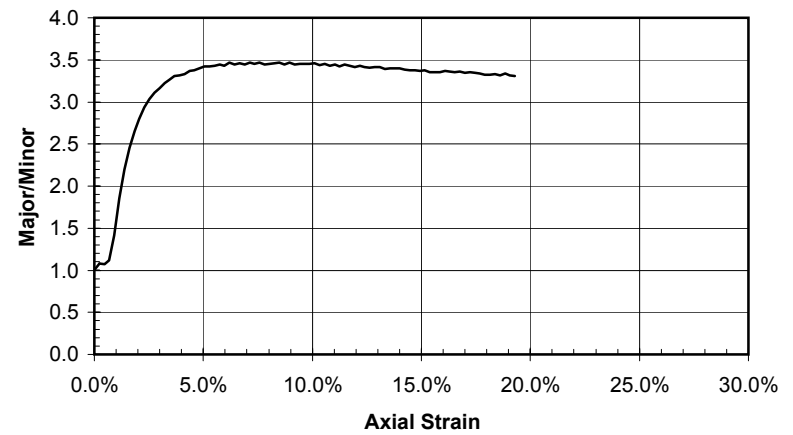
Induced Pore-Water Pressure versus Axial Strain

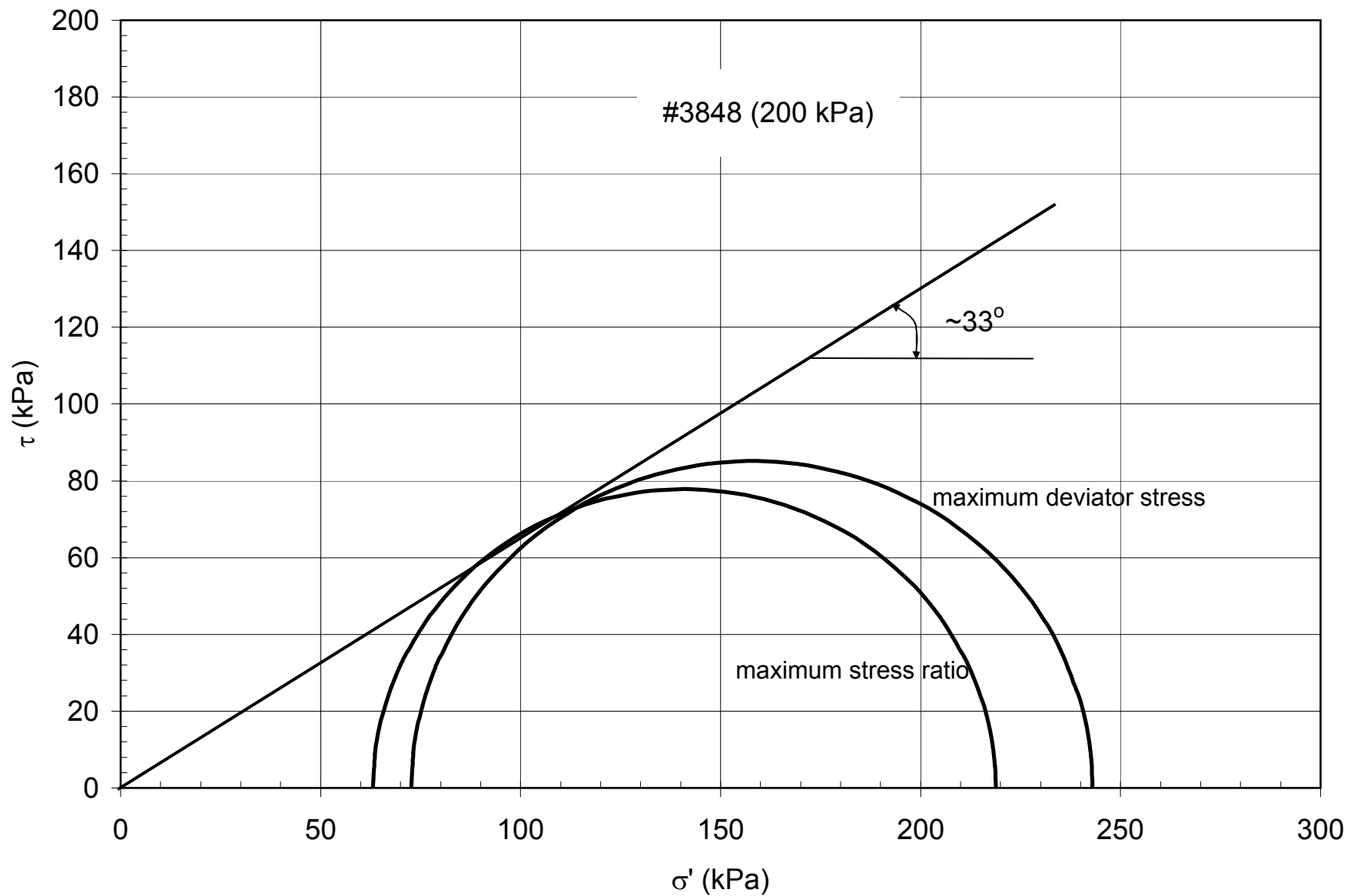


p' versus q



Major/Minor Stress





3848 (400 kPa)



TRIAXIAL COMPRESSION TESTING

Project: Pebble East

Date: 12-Aug-08 MDH Job #: L1086

Sample: 3848

Test No: 2 Test Designation: CU (Effective confining pressure: 400 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	<u>971.93</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.53</u>
Sample height (mm):	<u> </u>	<u>152.40</u>
Water Content:		
	height : diameter ratio: <u>2.1</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1543</u>	
	Dry density (kg/m ³): <u>1380</u>	
Water Content (%):	<u>11.8%</u>	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	<u>-</u>
Mass of pan + dry soil (g): (g):	<u>-</u>
Mass of dry soil (g):	<u>-</u>

Comments:

Sample at end of test

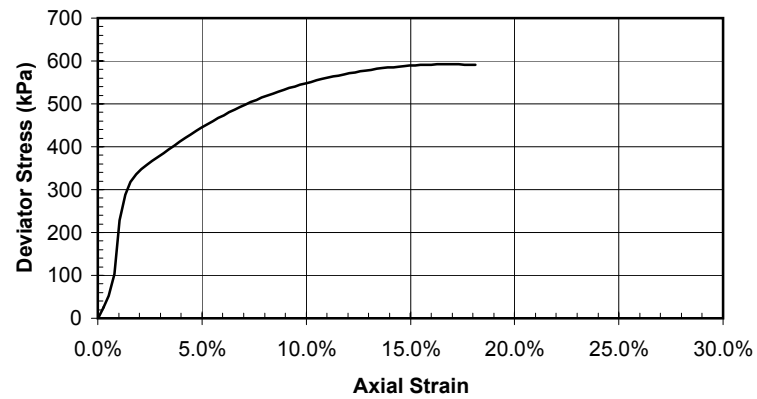
Sample Failure

Change in height during saturation (mm):	0.00	failure criterion	max deviator stress	max. obliquity (maj/min)
Sample height after saturation (mm):	152.40			
Change in volume during saturation (m ³):	7.3E-06			
Change in height during consolidation (mm):	0.00	σ'_3	231.5	193.3
Sample height after consolidation (mm):	152.40	σ'_1	823.9	722.0
Change in volume during consolidation (ml):	12.61 (up to 750 kPa cell pressure)	strain	17.10%	8.70%
Change in volume during consolidation (m ³):	1.3E-05	σ'_1/σ'_3	3.559	3.736
Sample area after consolidation (m ²):	0.0040	ϕ' (deg)	34.1	35.3
Rate of strain (mm/min):	0.04	(computed from equation $\sin \phi = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)		
Load due to cell pressure:		36.31	kgs	

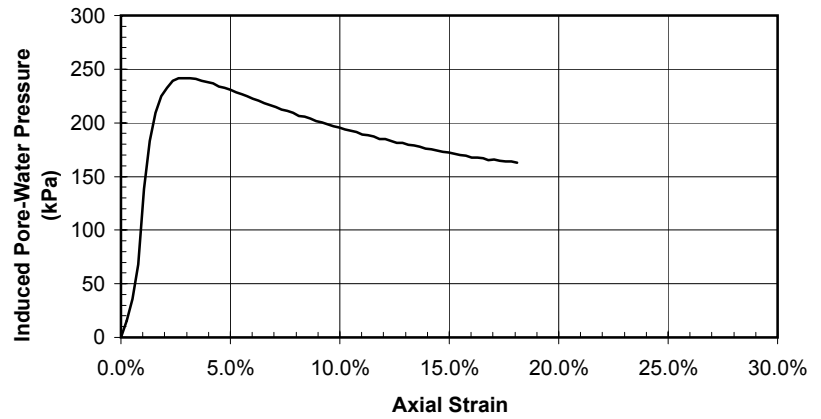
Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load		Uncorrected (kPa)	(σ ₁ -σ ₃) Deviator Stress			Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)
		(kPa)	(kPa)						(kgs)	(N)		Filter Paper (kPa)	Rubber Membrane (kPa)	Corrected (kPa)						
14/08/2008	10:46:13	299.86	702.5	35.59	64.2	0.000	0.004002	-0.72	-7.0	-1.75	0.0	0.00	-1.77	0.0	402.7	400.9	401.8	-0.9	0.996	
14/08/2008	10:56:13	315.64	702.5	46.92	63.8	0.003	0.004012	10.61	104.1	25.96	0.0	0.13	25.83	15.8	386.9	412.7	399.8	12.9	1.067	
14/08/2008	11:06:13	335.76	701.2	58.05	63.4	0.005	0.004022	21.74	213.3	53.03	0.0	0.26	52.77	35.9	365.4	418.2	391.8	26.4	1.144	
14/08/2008	11:16:13	367.76	701.2	78.81	63.0	0.008	0.004033	42.50	417.0	103.39	0.0	0.39	103.00	67.9	333.4	436.4	384.9	51.5	1.309	
14/08/2008	11:26:13	438.16	701.2	130.79	62.6	0.010	0.004044	94.48	926.9	229.21	0.0	0.52	228.69	138.3	263.0	491.7	377.3	114.3	1.870	
14/08/2008	11:36:13	483.16	699.8	155.38	62.2	0.013	0.004055	119.07	1168.1	288.10	0.0	0.65	287.45	183.3	216.6	504.1	360.4	143.7	2.327	
14/08/2008	11:46:13	509.11	699.8	168.17	61.8	0.016	0.004065	131.86	1293.6	318.20	0.0	0.78	317.41	209.3	190.7	508.1	349.4	158.7	2.664	
14/08/2008	11:56:13	524.81	700.5	176.28	61.4	0.018	0.004076	139.97	1373.2	336.87	0.0	0.92	335.95	225.0	175.7	511.6	343.6	168.0	2.913	
14/08/2008	12:06:13	532.67	699.1	181.78	61.0	0.021	0.004087	145.47	1427.1	349.17	0.0	1.05	348.12	232.8	166.4	514.6	340.5	174.1	3.092	
14/08/2008	12:16:13	538.74	699.8	186.3	60.6	0.024	0.004098	149.99	1471.4	359.05	0.0	1.18	357.87	238.9	161.1	518.9	340.0	178.9	3.222	
14/08/2008	12:26:13	541.5	699.8	190.59	60.2	0.026	0.004109	154.28	1513.5	368.33	0.0	1.31	367.02	241.6	158.3	525.3	341.8	183.5	3.319	
14/08/2008	12:36:13	541.31	698.6	194.97	59.8	0.029	0.004120	158.66	1556.5	377.76	0.0	1.44	376.32	241.5	157.3	533.6	345.4	188.2	3.393	
14/08/2008	12:46:13	541.65	699.1	199.28	59.4	0.031	0.004131	162.97	1598.8	386.98	0.0	1.57	385.41	241.8	157.5	542.9	350.2	192.7	3.448	
14/08/2008	12:56:13	540.97	699.1	203.54	59.0	0.034	0.004143	167.23	1640.6	396.02	0.0	1.70	394.32	241.1	158.2	552.5	355.3	197.2	3.493	
14/08/2008	13:06:13	538.93	698.4	207.74	58.6	0.037	0.004154	171.43	1681.8	404.86	0.0	1.83	403.03	239.1	159.5	562.5	361.0	201.5	3.527	
14/08/2008	13:16:13	537.88	698.7	211.95	58.2	0.039	0.004165	175.64	1723.1	413.67	0.0	1.96	411.71	238.0	160.8	572.5	366.7	205.9	3.560	
14/08/2008	13:26:13	536.51	699.1	216.18	57.8	0.042	0.004177	179.87	1764.6	422.47	0.0	2.09	420.38	236.7	162.6	583.0	372.8	210.2	3.585	
14/08/2008	13:36:13	533.6	697.8	220.22	57.4	0.045	0.004188	183.91	1804.2	430.78	0.0	2.22	428.56	233.7	164.2	592.7	378.4	214.3	3.611	
14/08/2008	13:46:13	532.69	698.9	224.23	57.0	0.047	0.004200	187.92	1843.5	438.96	0.0	2.35	436.61	232.8	166.2	602.8	384.5	218.3	3.628	
14/08/2008	13:56:13	530.7	698.4	228.01	56.6	0.050	0.004211	191.70	1880.6	446.56	0.0	2.48	444.07	230.8	167.7	611.8	389.8	222.0	3.648	
14/08/2008	14:06:13	528.19	697.8	232.07	56.2	0.052	0.004223	195.76	1920.5	454.76	0.0	2.62	452.14	228.3	169.6	621.7	395.6	226.1	3.667	
14/08/2008	14:16:13	526.76	698.4	235.95	55.8	0.055	0.004235	199.64	1958.5	462.49	0.0	2.75	459.74	226.9	171.7	631.4	401.5	229.9	3.678	
14/08/2008	14:26:13	524.55	697.8	239.66	55.4	0.058	0.004247	203.35	1994.9	469.77	0.0	2.88	466.89	224.7	173.2	640.1	406.7	233.4	3.695	
14/08/2008	14:36:13	522.39	697.8	243.15	55.0	0.060	0.004258	206.84	2029.1	476.50	0.0	3.01	473.49	222.5	175.4	648.9	412.1	236.7	3.700	
14/08/2008	14:46:13	520.69	697.8	246.61	54.6	0.063	0.004270	210.30	2063.1	483.12	0.0	3.14	479.98	220.8	177.1	657.1	417.1	240.0	3.710	
14/08/2008	14:56:13	517.96	697.4	250.01	54.2	0.066	0.004282	213.70	2096.4	489.56	0.0	3.27	486.29	218.1	179.4	665.7	422.6	243.1	3.710	
14/08/2008	15:06:13	516.2	697.7	253.36	53.8	0.068	0.004294	217.05	2129.3	495.83	0.0	3.40	492.43	216.3	181.5	673.9	427.7	246.2	3.713	
14/08/2008	15:16:13	514.84	697.8	256.69	53.4	0.071	0.004307	220.38	2162.0	502.02	0.0	3.53	498.49	215.0	182.9	681.4	432.2	249.2	3.725	
14/08/2008	15:26:13	511.89	696.5	259.72	53.0	0.073	0.004319	223.41	2191.7	507.49	0.0	3.66	503.82	212.0	184.6	688.4	436.5	251.9	3.729	
14/08/2008	15:36:13	510.77	697.8	262.85	52.6	0.076	0.004331	226.54	2222.4	513.14	0.0	3.79	509.35	210.9	187.0	696.3	441.7	254.7	3.724	
14/08/2008	15:46:13	509.01	697.8	265.96	52.2	0.079	0.004343	229.65	2252.9	518.70	0.0	3.92	514.78	209.2	188.7	703.5	446.1	257.4	3.727	
14/08/2008	15:56:13	506.38	696.6	268.81	51.8	0.081	0.004356	232.50	2280.9	523.65	0.0	4.05	519.59	206.5	190.2	709.8	450.0	259.8	3.732	
14/08/2008	16:06:13	505.5	697.3	271.5	51.4	0.084	0.004368	235.19	2307.3	528.19	0.0	4.18	524.01	205.6	191.8	715.8	453.8	262.0	3.732	
14/08/2008	16:16:13	503.83	697.1	274.35	51.0	0.087	0.004381	238.04	2335.2	533.06	0.0	4.32	528.74	204.0	193.3	722.0	457.6	264.4	3.736	
14/08/2008	16:26:13	501.45	696.4	276.83	50.6	0.089	0.004393	240.52	2359.5	537.06	0.0	4.45	532.62	201.6	194.9	727.6	461.2	266.3	3.732	
14/08/2008	16:36:13	500.4	697.1	279.37	50.2	0.092	0.004406	243.06	2384.5	541.17	0.0	4.58	536.60	200.5	196.7	733.3	465.0	268.3	3.728	
14/08/2008	16:46:13	498.52	697	282.11	49.8	0.094	0.004419	245.80	2411.3	545.69	0.0	4.71	540.98	198.7	198.5	739.4	469.0	270.5	3.726	
14/08/2008	16:56:13	496.8	696.4	284.41	49.4	0.097	0.004432	248.10	2433.9	549.20	0.0	4.84	544.36	196.9	199.6	744.0	471.8	272.2	3.727	
14/08/2008	17:06:13	495.45	697.1	286.78	49.0	0.100	0.004445	250.47	2457.2	552.84	0.0	4.97	547.87	195.6	201.6	749.5	475.6	273.9	3.717	
14/08/2008	17:16:13	493.59	696.4	289.04	48.6	0.102	0.004458	252.73	2479.3	556.20	0.0	5.10	551.10	193.7	202.8	753.9	478.3	275.5	3.717	
14/08/2008	17:26:13	492.53	697.1	291.43	48.2	0.105	0.004471	255.12	2502.8	559.81	0.0	5.23	554.58	192.7	204.5	759.1	481.8	277.3	3.711	
14/08/2008	17:36:13	491.32	697.1	293.65	47.8	0.108	0.004484	257.34	2524.6	563.03	0.0	5.36	557.67	191.5	205.8	763.4	484.6	278.8	3.710	
14/08/2008	17:46:13	489.04	695.7	295.78	47.4	0.110	0.004497	259.47	2545.4	566.02	0.0	5.49	560.53	189.2	206.7	767.2	486.9	280.3	3.712	
14/08/2008	17:56:13	488.4	697	297.96	47.0	0.113	0.004510	261.65	2566.8	569.09	0.0	5.62	563.47	188.5	208.6	772.1	490.4	281.7	3.701	
14/08/2008	18:06:13	487.03	697.1	299.97	46.6	0.115	0.004524	263.66	2586.6	571.77	0.0	5.75	566.01	187.2	210.0	776.0	493.0	283.0	3.695	
14/08/2008	18:16:13	484.96	696.4	302.01	46.2	0.118	0.004537	265.70	2606.6	574.48	0.0	5.88	568.60	185.1	211.4	780.0	495.7	284.3	3.690	
14/08/2008	18:26:13	484.53	696.5	304.07	45.8	0.121	0.004551	267.76	2626.8	577.21	0.0	6.02	571.20	184.7	212.0	783.2	497.6	285.6	3.695	
14/08/2008	18:36:13	483.23	696.6	305.86	45.4	0.123	0.004564	269.55	2644.3	579.34	0.0	6.15	573.19	183.4	213.4	786.5	499.9	286.6	3.687	
14/08/2008	18:46:13	481.43	695.9	307.87	45.0	0.126	0.004578	271.56	2664.1	581.91	0.0	6.28	575.63	181.6	214.5	790.1	502.3	287.8	3.684	
14/08/2008	18:56:13	481.08	696.8	309.54	44.6	0.129	0.004592	273.23	2680.4	583.73	0.0	6.41	577.32	181.2	215.8	793.1	504.4	288.7	3.676	
14/08/2008	19:06:13	479.55	696.4	311.3	44.2	0.131	0.004606	274.99	2697.7	585.72	0.0	6.54	579.18	179.7	216.9	796.0	506.4	289.6	3.671	
14/08/2008	19:16:13	478.97	697.2	313.37	43.8	0.134	0.004620	277.06	2718.0	588.35	0.0	6.67	581.68	179.1	218.2	799.9	509.0	290.8	3.666	
14/08/2008	19:26:13	477.41	696.7	314.97	43.4	0.136														

3848 (400 kPa)

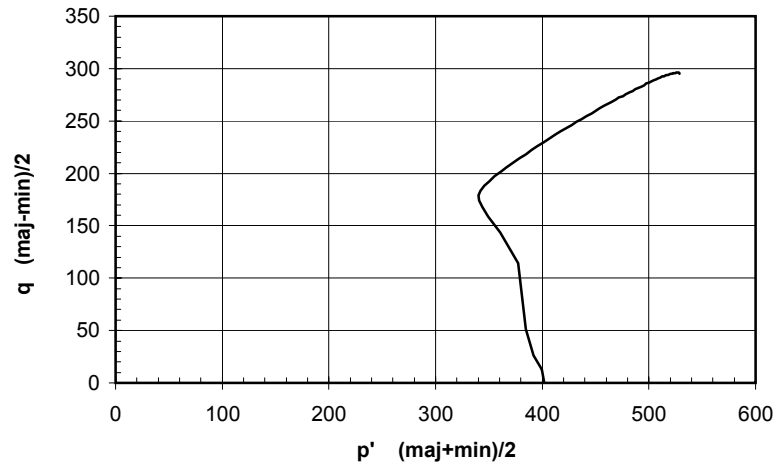
Deviator Stress versus Axial Strain



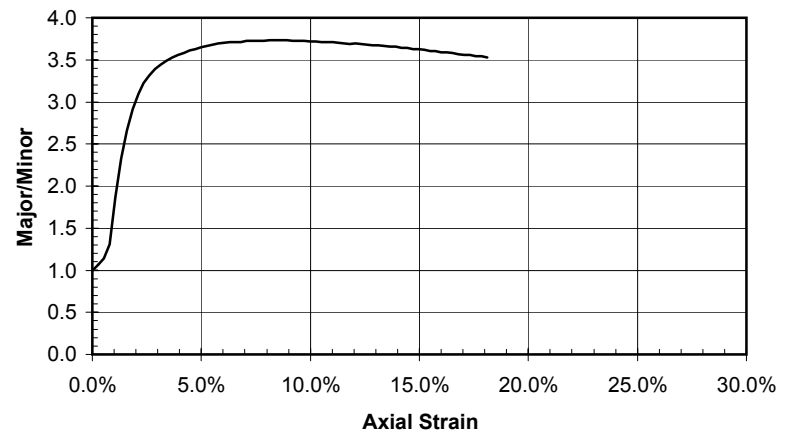
Induced Pore-Water Pressure versus Axial Strain

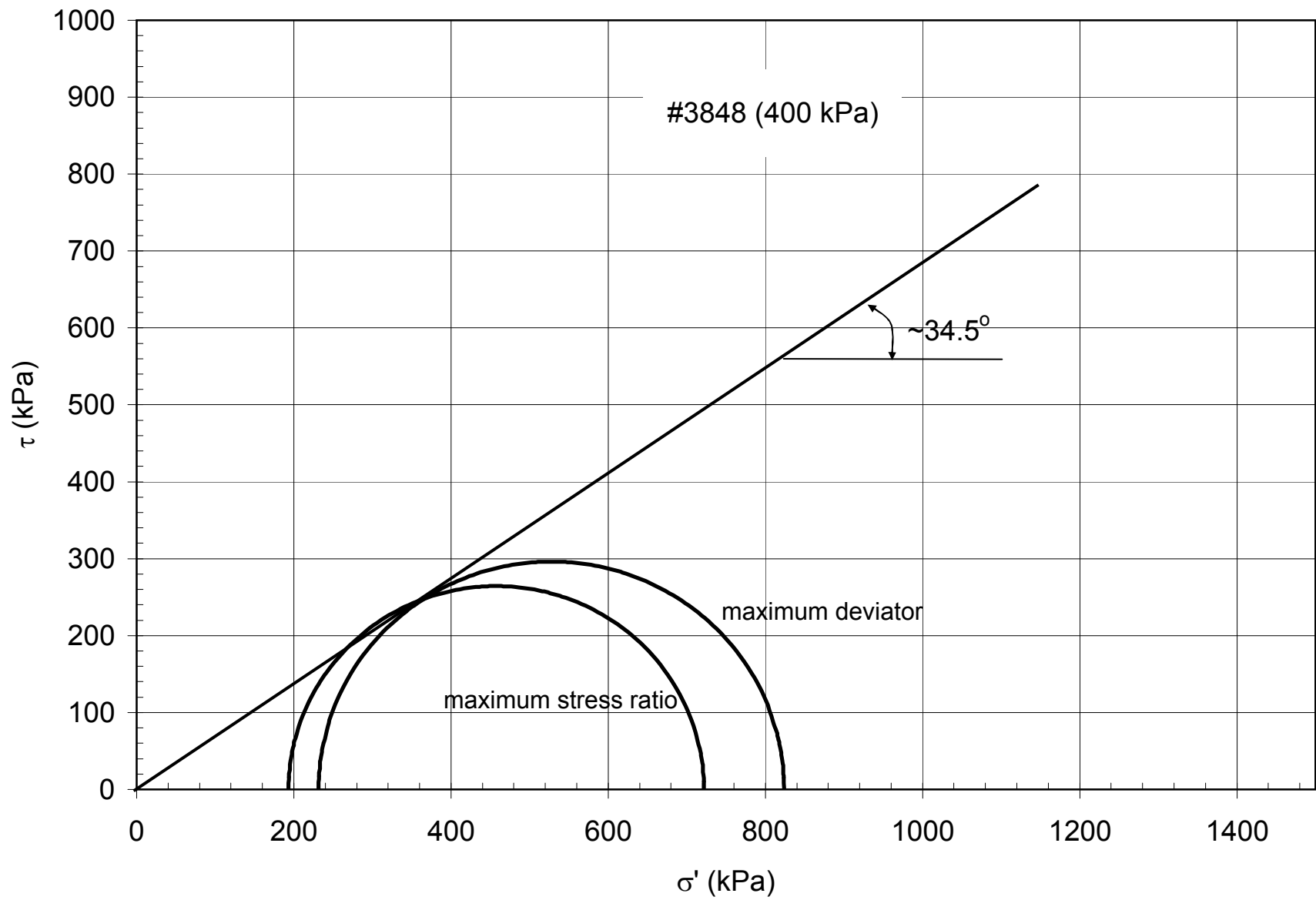



p' versus q



Major/Minor Stress





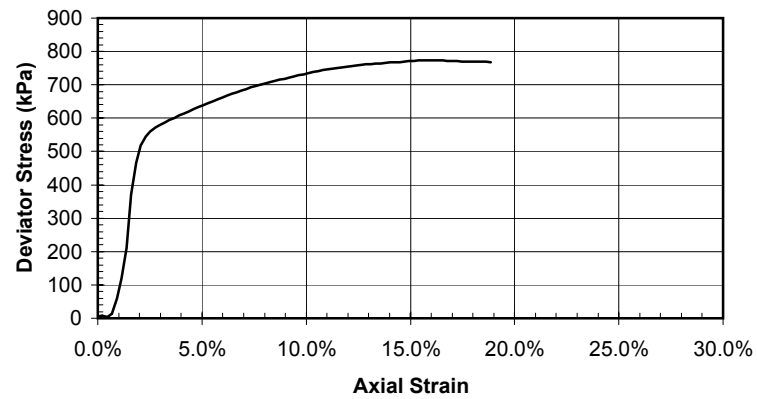
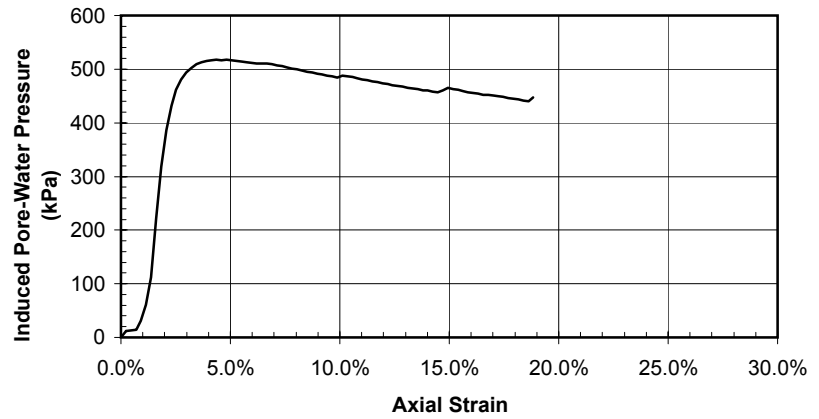
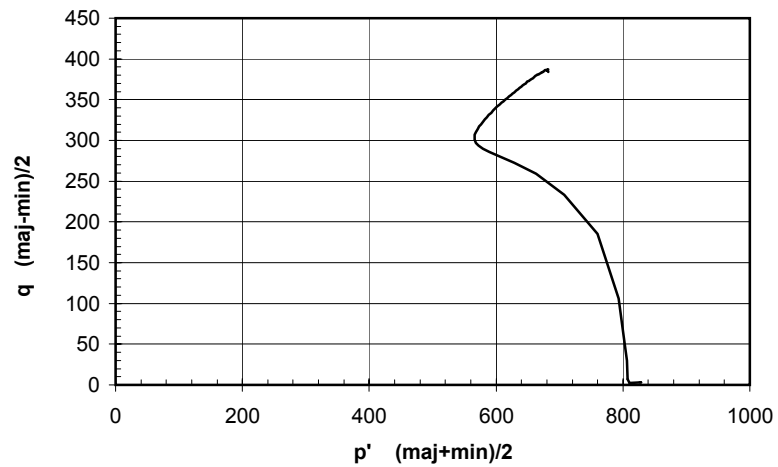
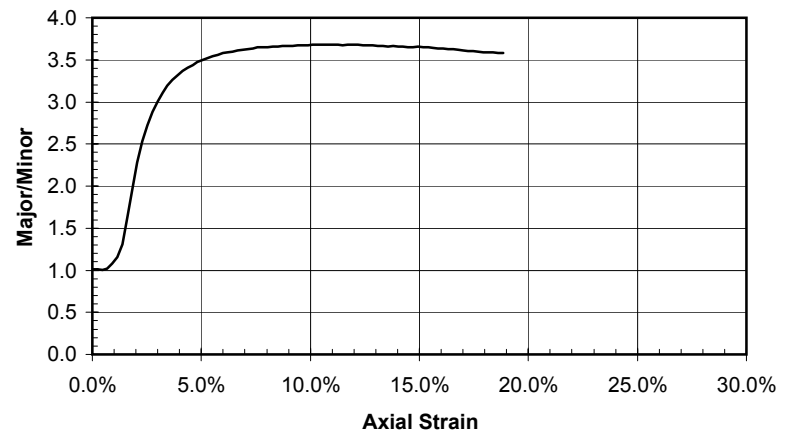
		TRIAXIAL COMPRESSION TESTING	
		Project: <u>Pebble East</u>	
		Date: <u>10-Jul-08</u> MDH Job #: <u>L1086</u>	
Sample: <u>3848</u>			
Test No: <u>3</u> Test Designation: <u>CU</u> (Effective confining pressure: <u>800 kPa</u>)			
PRE-TEST INFORMATION			
Wet sample mass,g <u>955.76</u>		average:	
Sample diameter (mm): _____		<u>72.35</u>	
Sample height (mm): _____		<u>152.30</u>	
Water Content:			
_____		height : diameter ratio: <u>2.11</u> : 1 (should range from 2 to 2.5 : 1)	
_____		Wet density (kg/m ³): <u>1526</u>	
_____		Dry density (kg/m ³): <u>1393</u>	

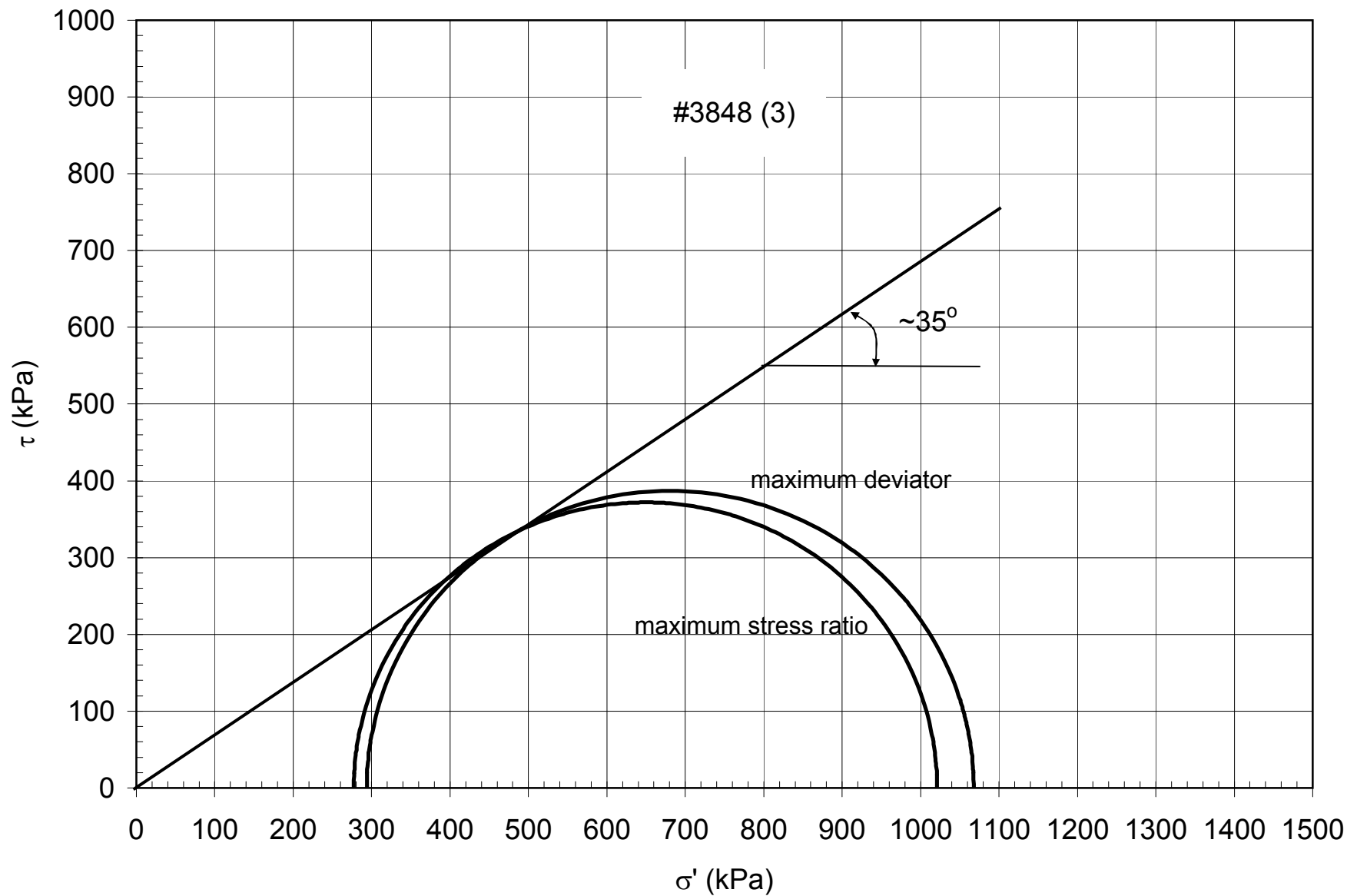
Water Content (%): <u>9.6%</u>			
Comments: <div style="border: 1px solid black; height: 50px; width: 100%;"></div>			
POST-TEST INFORMATION			
<div style="text-align: right; margin-right: 50px;"> Mass of pan (g): _____ Mass of pan + dry soil (g): (g): _____ Mass of dry soil (g): _____ </div>			
Comments:		Sample at end of test	

Sample Failure

Change in height during saturation (mm):	0.00	failure criterion	max deviator stress	max. obliquity (maj/min)
Sample height after saturation (mm):	152.30			
Change in volume during saturation (m³3):	9.1E-06			
Change in height during consolidation (mm):	0.00			
Sample height after consolidation (mm):	152.30			
Change in volume during consolidation (ml):	7.90 (up to 755 kPa cell pressure)			
Change in volume during consolidation (m³3):	7.9E-06			
Sample area after consolidation (m²2):	0.0040	Load due to cellpressure:	57.76 kgs	(computed from equation $\sin \phi = (\sigma'_1 - \sigma'_3) / (\sigma'_1 + \sigma'_3)$)
Rate of strain (mm/min):	0.035			

Date	Time	Pore Pressure		Cell kPa	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress			Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ '+σ ₃ ')/2	q (σ ₁ '-σ ₃ ')/2	(σ ₁ σ ₃)
		(kPa)	kPa						Uncorrected (kPa)	Corrections		Corrected (kPa)							
										Filter Paper (kPa)	Rubber Membrane (kPa)								
06/07/2008	19:21:56	294.1	1118	60.37	61.4	0.000	0.004000	2.61	25.6	6.41	0.0	0.00	6.39	0.0	823.5	829.9	826.7	3.2	1.008
06/07/2008	19:31:56	305.7	1131	60.57	61.0	0.002	0.004009	2.81	27.6	6.88	0.0	0.11	6.77	11.6	825.2	832.0	828.6	3.4	1.008
06/07/2008	19:41:56	307.08	1116	59.73	60.7	0.005	0.004018	1.97	19.3	4.81	0.0	0.23	4.58	13.0	808.5	813.1	810.8	2.3	1.006
06/07/2008	19:51:56	308.01	1108	63.56	60.3	0.007	0.004027	5.80	56.9	14.13	0.0	0.34	13.79	13.9	800.1	813.9	807.0	6.9	1.017
06/07/2008	20:01:56	325.66	1103	82.35	60.0	0.009	0.004037	24.59	241.2	59.76	0.0	0.46	59.31	31.6	776.9	836.2	806.5	29.7	1.076
06/07/2008	20:11:56	355.12	1098	106.74	59.6	0.011	0.004046	48.98	480.5	118.76	0.0	0.57	118.19	61.0	742.6	860.8	801.7	59.1	1.159
06/07/2008	20:21:56	406.72	1094	145.62	59.3	0.014	0.004055	87.86	861.9	212.53	0.0	0.69	211.85	112.6	686.8	898.7	792.7	105.9	1.308
06/07/2008	20:31:56	515.72	1090	211.51	58.9	0.016	0.004065	153.75	1508.3	371.05	0.0	0.80	370.25	221.6	574.4	944.6	759.5	185.1	1.645
06/07/2008	20:41:56	612.93	1087	252.01	58.6	0.018	0.004074	194.25	1905.6	467.70	0.0	0.92	466.78	318.8	474.0	940.7	707.3	233.4	1.985
06/07/2008	20:51:56	680.78	1084	273.84	58.2	0.021	0.004084	216.08	2119.8	519.04	0.0	1.03	518.01	386.7	403.7	921.7	662.7	259.0	2.283
06/07/2008	21:01:56	725.59	1082	285.77	57.9	0.023	0.004094	228.01	2236.8	546.41	0.0	1.15	545.26	431.5	356.5	901.8	629.2	272.6	2.529
06/07/2008	21:11:56	755.15	1080	292.81	57.5	0.025	0.004103	235.05	2305.9	561.95	0.0	1.26	560.69	461.1	324.9	885.6	605.3	280.3	2.726
06/07/2008	21:21:56	774.6	1078	297.86	57.2	0.028	0.004113	240.10	2355.4	572.67	0.0	1.37	571.30	480.5	303.5	874.8	589.1	285.6	2.882
06/07/2008	21:31:56	787.77	1077	302.08	56.8	0.030	0.004123	244.32	2396.8	581.36	0.0	1.49	579.87	493.7	288.9	868.8	578.8	289.9	3.007
06/07/2008	21:41:56	796.83	1075	305.67	56.5	0.032	0.004133	247.91	2432.0	588.51	0.0	1.60	586.90	502.7	278.5	865.4	571.9	293.5	3.108
06/07/2008	21:51:56	802.89	1074	309.33	56.1	0.034	0.004142	251.57	2467.9	595.78	0.0	1.72	594.06	508.8	271.1	865.1	568.1	297.0	3.192
06/07/2008	22:01:56	806.89	1073	313	55.8	0.037	0.004152	255.24	2503.9	603.03	0.0	1.83	601.20	512.8	265.7	866.9	566.3	300.6	3.263
06/07/2008	22:11:56	809.26	1071	316.32	55.4	0.0391	0.004162	258.56	2536.5	609.42	0.0	1.95	607.47	515.2	262.0	869.4	565.7	303.7	3.319
06/07/2008	22:21:56	810.65	1070	319.72	55.1	0.0414	0.004172	261.96	2569.8	615.95	0.0	2.06	613.89	516.6	259.2	873.1	566.2	306.9	3.368
06/07/2008	22:31:56	811.49	1069	323.21	54.7	0.0437	0.004182	265.45	2604.1	622.66	0.0	2.18	620.49	517.4	257.7	878.2	567.9	310.2	3.408
06/07/2008	22:41:56	811	1068	326.98	54.4	0.046	0.004192	269.22	2641.1	629.99	0.0	2.29	627.70	516.9	257.4	885.1	571.3	313.8	3.439
06/07/2008	22:51:56	811.21	1068	330.45	54.0	0.048	0.004202	272.69	2675.1	636.57	0.0	2.40	634.17	517.1	256.5	890.7	573.6	317.1	3.472
06/07/2008	23:01:56	810.1	1066	333.63	53.7	0.051	0.004213	275.87	2706.3	642.44	0.0	2.52	639.92	516.0	255.9	895.8	575.9	320.0	3.500
06/07/2008	23:11:56	809.5	1065	336.84	53.3	0.053	0.004223	279.08	2737.8	648.34	0.0	2.63	645.71	515.4	256.0	901.7	578.8	322.9	3.522
06/07/2008	23:21:56	808.3	1064	340.03	53.0	0.055	0.004233	282.27	2769.1	654.16	0.0	2.75	651.41	514.2	256.1	907.5	581.8	325.7	3.543
06/07/2008	23:31:56	807.15	1064	343.24	52.6	0.057	0.004243	285.48	2800.6	659.99	0.0	2.86	657.13	513.1	256.6	913.7	585.2	328.6	3.561
06/07/2008	23:41:56	806.07	1063	346.32	52.3	0.060	0.004254	288.56	2830.8	665.49	0.0	2.98	662.51	512.0	257.0	919.5	588.2	331.3	3.578
06/07/2008	23:51:56	804.14	1062	349.4	51.9	0.062	0.004264	291.64	2861.0	670.94	0.0	3.09	667.85	510.0	258.2	926.1	592.2	333.9	3.586
07/07/2008	00:1:56	804.81	1064	352.52	51.6	0.064	0.004275	294.76	2891.6	676.46	0.0	3.21	673.25	510.7	258.9	932.2	595.5	336.6	3.600
07/07/2008	01:1:56	804.13	1064	355.37	51.2	0.067	0.004285	297.61	2919.6	681.32	0.0	3.32	678.00	510.0	259.6	937.6	598.6	339.0	3.612
07/07/2008	02:1:56	803.31	1064	358.28	50.9	0.069	0.004296	300.52	2948.1	686.29	0.0	3.44	682.86	509.2	260.4	943.3	601.9	341.4	3.622
07/07/2008	03:1:56	801.01	1062	361.03	50.5	0.071	0.004306	303.27	2975.1	690.86	0.0	3.55	687.31	506.9	261.4	948.7	605.0	343.7	3.630
07/07/2008	04:1:56	799.38	1062	363.91	50.2	0.074	0.004317	306.15	3003.3	695.70	0.0	3.66	692.03	505.3	262.3	954.4	608.3	346.0	3.638
07/07/2008	05:1:56	797.25	1060	366.66	49.8	0.076	0.004328	308.90	3030.3	700.21	0.0	3.78	696.43	503.2	263.1	959.5	611.3	348.2	3.647
07/07/2008	10:1:56	795.65	1060	369.22	49.5	0.0781	0.004339	311.46	3055.4	704.25	0.0	3.89	700.36	501.6	264.2	964.6	614.4	350.2	3.650
07/07/2008	11:1:56	793.48	1059	371.84	49.1	0.0804	0.004349	314.08	3081.1	708.41	0.0	4.01	704.40	499.4	265.5	969.9	617.7	352.2	3.653
07/07/2008	12:1:56	791.77	1058	374.34	48.8	0.083	0.004360	316.58	3105.7	712.26	0.0	4.12	708.14	497.7	266.5	974.7	620.6	354.1	3.657
07/07/2008	13:1:56	789.7	1057	376.75	48.4	0.085	0.004371	318.99	3129.3	715.88	0.0	4.24	711.65	495.6	267.7	979.4	623.6	355.8	3.658
07/07/2008	14:1:56	787.9	1056	379.13	48.0	0.087	0.004382	321.37	3152.7	719.41	0.0	4.35	715.06	493.8	268.4	983.4	625.9	357.5	3.665
07/07/2008	15:1:56	785.59	1055	381.57	47.7	0.090	0.004393	323.81	3176.6	723.05	0.0	4.47	718.59	491.5	269.5	988.1	628.8	359.3	3.666
07/07/2008	20:1:56	784.18	1055	384.11	47.3	0.092	0.004404	326.35	3201.5	726.88	0.0	4.58	722.30	490.1	270.6	992.9	631.8	361.2	3.669
07/07/2008	21:1:56	782.01	1054	386.55	47.0	0.094	0.004416	328.79	3225.4	730.46	0.0	4.70	725.77	487.9	271.5	997.3	634.4	362.9	3.673
07/07/2008	22:1:56	780.76	1053	388.87	46.6	0.097	0.004427	331.11	3248.2	733.75	0.0	4.81	728.94	486.7	272.7	1001.6	637.1	364.5	3.673
07/07/2008	23:1:56	778.58	1052	390.93	46.3	0.099	0.004438	333.17	3268.4	736.44	0.0	4.92	731.52	484.5	273.6	1005.1	639.3	365.8	3.674
07/07/2008	24:1:56	781.52	1056	393.51	45.9	0.101	0.004449	335.75	3293.7	740.25	0.0	5.04	735.21	487.4	274.6	1009.8	642.2	367.6	3.677
07/07/2008	25:1:56	781.19	1057	395.71	45.6	0.103	0.004461	337.95	3315.3	743.20	0.0	5.15	738.04	487.1	275.6	1013.7	644.6	369.0	3.678
07/07/2008	30:1:56	779.31	1056	397.71	45.2	0.106	0.004472	339.95	3334.9	745.68	0.0	5.27	740.41	485.2	276.3	1016.7	646.5	370.2	3.680
07/07/2008	31:1:56	777.02	1054	400.24	44.9	0.108	0.004484	342.48	3359.7	749.30	0.0	5.38	743.91	482.9	277.2	1021.1	649.1	372.0	3.684
07/07/2008	32:1:56	774.95	1054	402.25	44.5	0.110	0.004495	344.49	3379.5	751.75	0.0	5.50	746.26	480.9	278.6	1024.8	651.7	373.1	3.679
07/07/2008	33:1:56	773.27	1052	404.19	44.2	0.113	0.004507	346.43	3398.5	754.03	0.0	5.61	748.42	479.2	279.1	1027.5	653.3	374.2	3.682
07/07/2008	34:1:56	771.14	1051	406.07	43.8	0.115	0.004519	348.31	3416.9	756.16	0.0	5.73							

Deviator Stress versus Axial Strain**Induced Pore-Water Pressure versus Axial Strain****p' versus q****Major/Minor Stress**





TRIAXIAL COMPRESSION TESTING

Project: Pebble East

Date: 31-Aug-08 MDH Job #: L1086

Sample: 3848

Test No: 4 Test Designation: CU (Effective confining pressure: 2000 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	<u>1008.67</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.53</u>
Sample height (mm):	<u> </u>	<u>153.40</u>
Water Content:		
	height : diameter ratio: <u>2.11</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1591</u>	
	Dry density (kg/m ³): <u>1351</u>	
Water Content (%):	<u>17.8%</u>	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	<u>-</u>
Mass of pan + dry soil (g): (g):	<u>-</u>
Mass of dry soil (g):	<u>-</u>

Comments:

Sample at end of test

Sample Failure

Change in height during saturation (mm): 0.00
 Sample height after saturation (mm): 153.40
 Change in volume during saturation (m³3): 1.5E-05
 Change in height during consolidation (mm): 4.23
 Sample height after consolidation (mm): 157.63
 Change in volume during consolidation (ml): 15.71 (up to 700 kPa cell pressure)
 Change in volume during consolidation (m³3): 1.6E-05
 Sample area after consolidation (m²2): 0.0038
 Rate of strain (mm/min): 0.04

Load due to cell pressure:

104.47

kgs

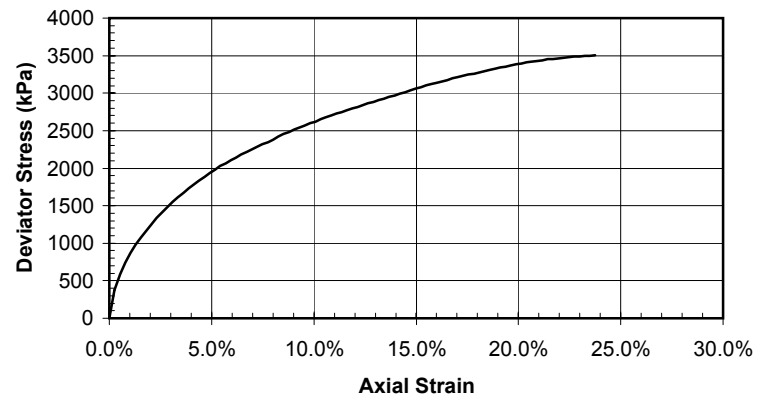
failure criterion	max deviator stress	max. obliquity (maj/min)
σ'_3	1633.5	1633.5
σ'_1	5135.9	5135.9
strain	23.80%	23.80%
σ'_1/σ'_3	3.144	3.144
ϕ' (deg)	31.2	31.2

(computed from equation $\sin \phi' = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

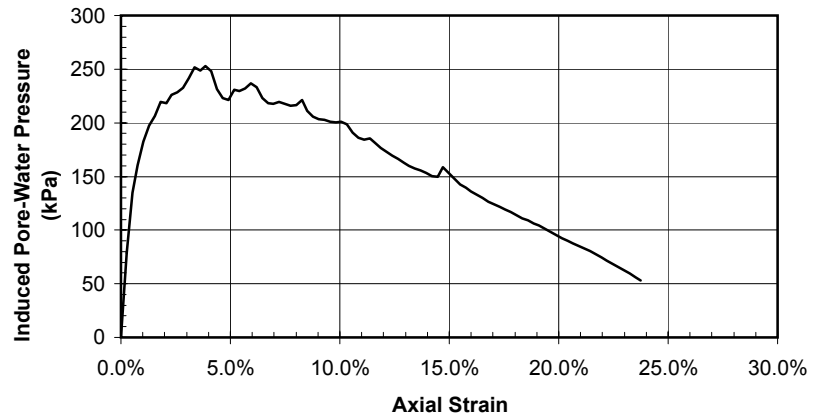
Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (mm ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress			Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ' ₁ +σ' ₃)/2	q (σ' ₁ -σ' ₃)/2	(σ ₁ σ ₃)	
		(kPa)	kPa						(kg)	(N)	Uncorrected (kPa)	Corrections								Corrected (kPa)
												Filter Paper (kPa)	Rubber Membrane (kPa)							
01/09/2008	17:25:27	198.23	2021	104.92	65.41	0.000	0.003827	0.45	4.5	1.16	0.0	0.00	1.15	0.0	1823.2	1824.4	1823.8	0.6	1.001	
01/09/2008	17:35:27	277.08	1990	252.13	65.00	0.003	0.003836	147.66	1448.6	377.60	0.0	0.13	377.47	78.9	1713.0	2090.5	1901.7	188.7	1.220	
01/09/2008	17:45:27	333.02	1969	334.84	64.60	0.005	0.003846	230.37	2260.0	587.58	0.0	0.26	587.32	134.8	1636.4	2223.7	1930.0	293.7	1.359	
01/09/2008	17:55:27	358.75	1959	395.09	64.19	0.008	0.003856	290.62	2851.0	739.33	0.0	0.39	738.94	160.5	1600.1	2339.0	1969.6	369.5	1.462	
01/09/2008	18:05:27	380.69	1949	446.91	63.78	0.010	0.003866	342.44	3359.4	868.89	0.0	0.53	868.36	182.5	1568.0	2436.4	2002.2	434.2	1.554	
01/09/2008	18:15:27	395.9	1944	491.62	63.38	0.013	0.003876	387.15	3798.0	979.77	0.0	0.66	979.11	197.7	1548.2	2527.3	2037.7	489.6	1.632	
01/09/2008	18:25:27	404.57	1943	532.46	62.97	0.015	0.003887	427.99	4198.6	1080.29	0.0	0.79	1079.50	206.3	1538.2	2617.7	2078.0	539.8	1.702	
01/09/2008	18:35:27	417.57	1946	570.42	62.56	0.018	0.003897	465.95	4571.0	1173.02	0.0	0.92	1172.10	219.3	1528.8	2700.9	2114.9	586.1	1.767	
01/09/2008	18:45:27	416.49	1933	605.80	62.15	0.021	0.003907	501.33	4918.1	1258.77	0.0	1.05	1257.72	218.3	1516.9	2774.7	2145.8	628.9	1.829	
01/09/2008	18:55:27	424.18	1938	639.00	61.75	0.023	0.003917	534.53	5243.8	1338.59	0.0	1.18	1337.41	226.0	1514.2	2851.6	2182.9	668.7	1.883	
01/09/2008	19:05:27	426.54	1933	671.36	61.34	0.026	0.003928	566.89	5561.2	1415.88	0.0	1.32	1414.56	228.3	1506.9	2921.4	2214.1	707.3	1.939	
01/09/2008	19:15:27	430.97	1926	701.67	60.93	0.028	0.003938	597.20	5858.6	1487.63	0.0	1.45	1486.18	232.7	1495.1	2981.3	2238.2	743.1	1.994	
01/09/2008	19:25:27	439.74	1920	729.83	60.53	0.031	0.003949	625.36	6134.8	1553.63	0.0	1.58	1552.05	241.5	1480.5	3032.5	2256.5	776.0	2.048	
01/09/2008	19:35:27	449.73	1937	756.92	60.12	0.034	0.003959	652.45	6400.6	1616.61	0.0	1.71	1614.90	251.5	1487.5	3102.4	2294.9	807.5	2.086	
01/09/2008	19:45:27	447.17	1928	782.43	59.71	0.036	0.003970	677.96	6650.8	1675.33	0.0	1.84	1673.49	248.9	1480.9	3154.4	2317.7	836.7	2.130	
01/09/2008	19:55:27	450.83	1923	807.05	59.31	0.039	0.003981	702.58	6892.3	1731.52	0.0	1.97	1729.55	252.6	1472.2	3201.8	2337.0	864.8	2.175	
01/09/2008	20:05:27	446.26	1918	830.31	58.90	0.041	0.003991	725.84	7120.5	1784.04	0.0	2.10	1781.94	248.0	1472.0	3253.9	2362.9	891.0	2.211	
01/09/2008	20:15:27	429.77	1915	853.66	58.49	0.0439	0.004002	749.19	7349.6	1836.47	0.0	2.24	1834.24	231.5	1485.0	3319.2	2402.1	917.1	2.235	
01/09/2008	20:25:27	421.18	1912	876.74	58.08	0.0465	0.004013	772.27	7576.0	1887.94	0.0	2.37	1885.57	223.0	1490.9	3376.4	2433.7	942.8	2.265	
01/09/2008	20:35:27	419.37	1910	898.64	57.68	0.0491	0.004024	794.17	7790.8	1936.22	0.0	2.50	1933.72	221.1	1490.6	3424.4	2457.5	966.9	2.297	
01/09/2008	20:45:27	429.06	1925	920.90	57.27	0.052	0.004035	816.43	8009.2	1985.08	0.0	2.63	1982.45	230.8	1495.9	3478.4	2487.1	991.2	2.325	
01/09/2008	20:55:27	427.92	1920	941.25	56.86	0.054	0.004046	836.78	8208.9	2029.02	0.0	2.76	2026.26	229.7	1491.6	3517.9	2504.7	1013.1	2.358	
01/09/2008	21:05:27	430.17	1916	960.19	56.46	0.057	0.004057	855.72	8394.7	2069.28	0.0	2.89	2066.39	231.9	1485.4	3551.7	2518.6	1033.2	2.391	
01/09/2008	21:15:27	434.79	1912	978.48	56.05	0.059	0.004068	874.01	8574.1	2107.73	0.0	3.03	2104.70	236.6	1477.3	3582.0	2529.7	1052.4	2.425	
01/09/2008	21:25:27	431.19	1909	995.37	55.64	0.062	0.004079	890.90	8739.8	2142.56	0.0	3.16	2139.40	233.0	1478.2	3617.6	2547.9	1069.7	2.447	
01/09/2008	21:35:27	421.01	1907	1014.65	55.24	0.065	0.004090	910.18	8928.9	2182.90	0.0	3.29	2179.61	222.8	1486.3	3665.9	2576.1	1089.8	2.466	
01/09/2008	21:45:27	416.61	1905	1032.84	54.83	0.067	0.004102	928.37	9107.3	2220.38	0.0	3.42	2216.96	218.4	1488.6	3705.6	2597.1	1108.5	2.489	
01/09/2008	21:55:27	416.21	1903	1050.14	54.42	0.070	0.004113	945.67	9277.1	2255.50	0.0	3.55	2251.95	218.0	1487.0	3738.9	2613.0	1126.0	2.514	
01/09/2008	22:05:27	417.63	1901	1066.26	54.01	0.072	0.004125	961.79	9435.2	2287.58	0.0	3.68	2283.89	219.4	1483.6	3767.5	2625.5	1141.9	2.539	
01/09/2008	22:15:27	416.11	1900	1082.94	53.61	0.075	0.004136	978.47	9598.8	2320.77	0.0	3.81	2316.96	217.9	1483.7	3800.6	2642.2	1158.5	2.562	
01/09/2008	22:25:27	414.36	1898	1099.50	53.20	0.077	0.004148	995.03	9761.3	2353.46	0.0	3.95	2349.52	216.1	1483.7	3833.2	2658.5	1174.8	2.584	
01/09/2008	22:35:27	414.55	1898	1115.81	52.79	0.080	0.004159	1011.34	9921.3	2385.35	0.0	4.08	2381.27	216.3	1483.5	3864.7	2674.1	1190.6	2.605	
01/09/2008	22:45:27	419.72	1917	1134.48	52.39	0.083	0.004171	1030.01	10104.4	2422.56	0.0	4.21	2418.35	221.5	1497.3	3915.7	2706.5	1209.2	2.615	
01/09/2008	22:55:27	409.19	1913	1152.40	51.98	0.085	0.004183	1047.93	10280.2	2457.77	0.0	4.34	2453.43	211.0	1503.8	3957.2	2730.5	1226.7	2.631	
01/09/2008	23:05:27	404.13	1911	1168.80	51.57	0.0878	0.004195	1064.33	10441.1	2489.19	0.0	4.47	2484.72	205.9	1506.6	3991.3	2748.9	1242.4	2.649	
01/09/2008	23:15:27	401.55	1909	1184.80	51.17	0.0904	0.004206	1080.33	10598.1	2519.46	0.0	4.60	2514.85	203.3	1507.1	4022.0	2764.5	1257.4	2.669	
01/09/2008	23:25:27	400.86	1907	1200.24	50.76	0.093	0.004218	1095.77	10749.5	2548.21	0.0	4.74	2543.48	202.6	1505.8	4049.2	2777.5	1271.7	2.689	
01/09/2008	23:35:27	399.06	1905	1215.19	50.35	0.096	0.004231	1110.72	10896.2	2575.63	0.0	4.87	2570.76	200.8	1505.5	4076.3	2790.9	1285.4	2.708	
01/09/2008	23:45:27	398.69	1903	1228.85	49.94	0.098	0.004243	1125.38	11040.0	2602.17	0.0	5.00	2597.17	200.5	1504.5	4101.7	2803.1	1298.6	2.726	
01/09/2008	23:55:27	399.06	1902	1243.57	49.54	0.101	0.004255	1139.10	11174.6	2626.35	0.0	5.13	2621.22	200.8	1502.5	4123.7	2813.1	1310.6	2.745	
02/09/2008	0:05:27	396.75	1900	1258.64	49.13	0.103	0.004267	1154.17	11322.4	2653.46	0.0	5.26	2648.20	198.5	1503.1	4151.2	2827.1	1324.1	2.762	
02/09/2008	0:15:27	398.08	1898	1273.94	48.72	0.106	0.004279	1169.47	11472.5	2680.89	0.0	5.39	2675.50	190.9	1503.3	4184.8	2847.1	1337.7	2.773	
02/09/2008	0:25:27	384.59	1897	1288.44	48.32	0.108	0.004292	1183.97	11614.8	2706.30	0.0	5.52	2700.77	186.4	1512.5	4213.3	2862.9	1350.4	2.786	
02/09/2008	0:35:27	382.44	1896	1303.19	47.91	0.111	0.004304	1198.72	11759.5	2732.08	0.0	5.66	2726.42	184.2	1514.0	4240.4	2877.2	1363.2	2.801	
02/09/2008	0:45:27	383.42	1895	1315.99	47.50	0.114	0.004317	1211.52	11885.1	2753.23	0.0	5.79	2747.44	185.2	1511.6	4259.1	2885.3	1373.7	2.818	
02/09/2008	0:55:27	379.56	1894	1330.09	47.10	0.116	0.004329	1225.62	12023.4	2777.16	0.0	5.92	2771.24	181.3	1514.8	4286.0	2900.4	1385.6	2.829	
02/09/2008	1:05:27	375	1894	1344.62	46.69	0.119	0.004342	1240.15	12165.9	2801.87	0.0	6.05	2795.82	176.8	1518.7	4314.5	2916.6	1397.9	2.841	
02/09/2008	1:15:27	371.13	1892	1358.04	46.28	0.121	0.004355	1253.57	12297.6	2823.89	0.0	6.18	2817.71	172.9	1521.2	4338.9	2930.1	1408.9	2.852	
02/09/2008	1:25:27	367.53	1892	1372.10	45.87	0.124	0.004													

#3848 (4) 2000 kPa

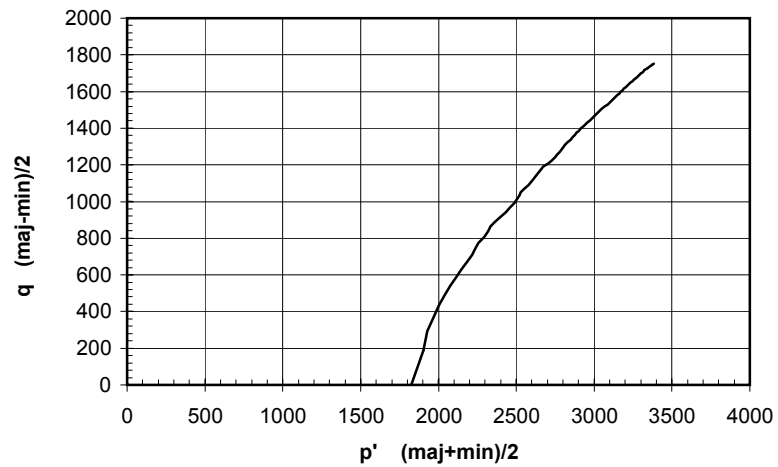
Deviator Stress versus Axial Strain



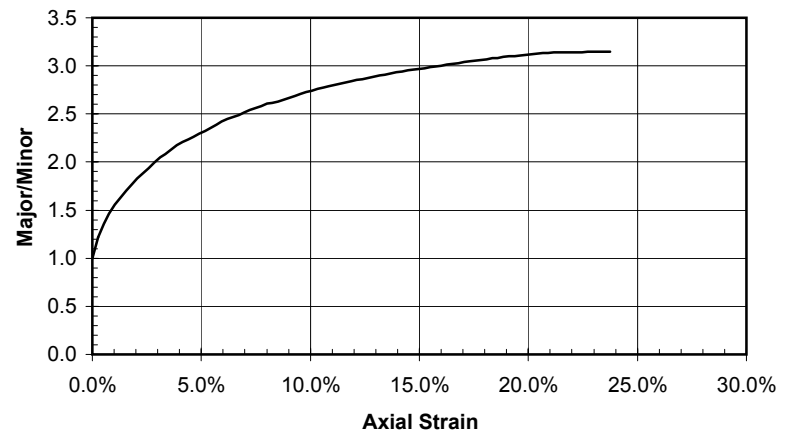
Induced Pore-Water Pressure versus Axial Strain

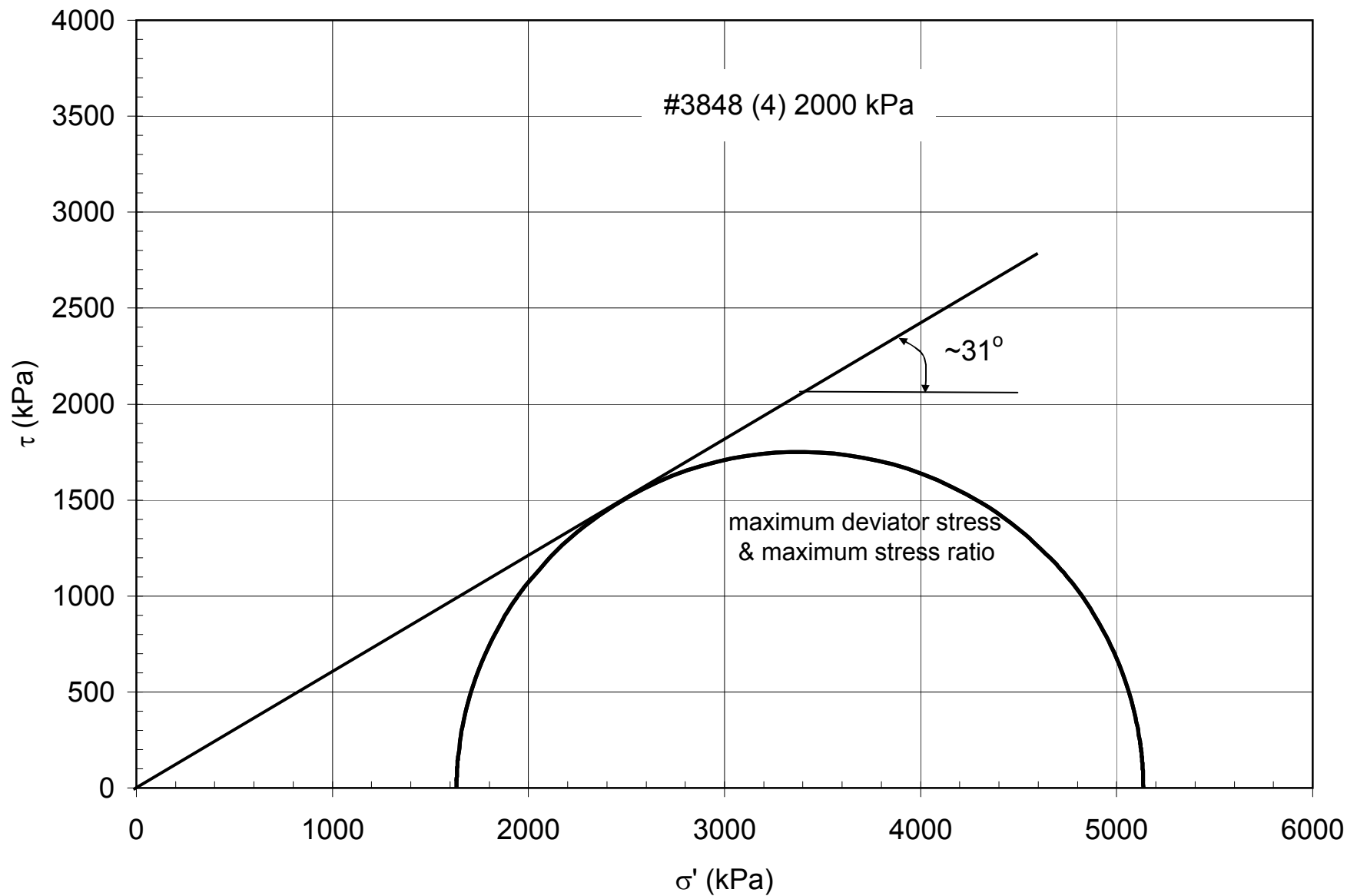


p' versus q



Major/Minor Stress





3847 (200 kPa)



TRIAXIAL COMPRESSION TESTING

Project: Pebble East

Date: 09-Aug-08 MDH Job #: L1086

Sample: 3847

Test No: 1 Test Designation: CU (Effective confining pressure: 200 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	<u>896.00</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.28</u>
Sample height (mm):	<u> </u>	<u>153.20</u>
Water Content:		
	height : diameter ratio: <u>2.12</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1425</u>	
	Dry density (kg/m ³): <u>1271</u>	
Water Content (%):	<u>12.1%</u>	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	<u> </u>	-
Mass of pan + dry soil (g): (g):	<u> </u>	-
Mass of dry soil (g):	<u> </u>	-

Comments:

Sample at end of test

Sample Failure

Change in height during saturation (mm): 0.00
 Sample height after saturation (mm): 153.20
 Change in volume during saturation (m³3): 6.7E-06
 Change in height during consolidation (mm): 0.00
 Sample height after consolidation (mm): 153.20
 Change in volume during consolidation (ml): 18.45 (up to 750 kPa cell pressure)
 Change in volume during consolidation (m³3): 1.8E-05
 Sample area after consolidation (m²2): 0.0039
 Rate of strain (mm/min): 0.03

Load due to cell pressure:

20.84

kgs

failure criterion	max deviator stress	max. obliquity (maj/min)
σ'_3	60.3	43.0
σ'_1	181.4	150.2
strain	3.10%	7.80%
σ'_1/σ'_3	3.009	3.498
ϕ' (deg)	30.1	33.7

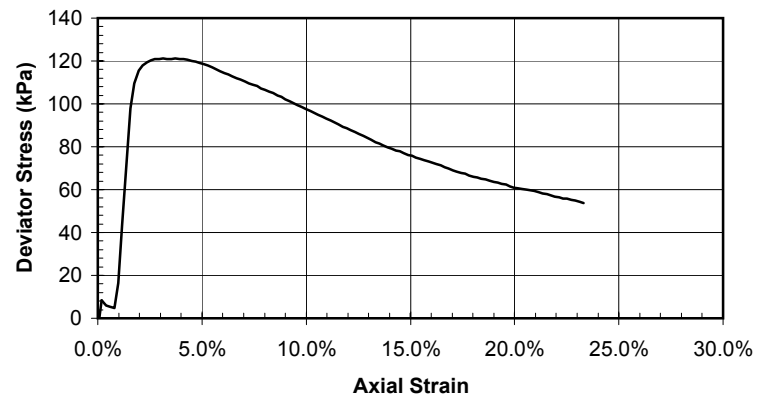
(computed from equation $\sin \phi' = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)						
												Filter Paper (kPa)	Rubber Membrane (kPa)							
10/08/2008	11:56:27	198.73	403.2	18.72	65.2	0.000	0.003940	-2.12	-20.8	-5.27	0.0	0.00	-5.28	0.0	204.5	199.2	201.8	-2.6	0.974	
10/08/2008	12:06:27	200.83	403	24.21	64.9	0.002	0.003947	3.37	33.1	8.38	0.0	0.10	8.29	2.1	202.1	210.4	206.3	4.1	1.041	
10/08/2008	12:16:27	202.88	403.2	23.33	64.6	0.004	0.003955	2.49	24.5	6.18	0.0	0.20	5.99	4.2	200.3	206.3	203.3	3.0	1.030	
10/08/2008	12:26:27	204.24	402.8	23.09	64.3	0.006	0.003963	2.25	22.1	5.58	0.0	0.29	5.28	5.5	198.5	203.8	201.2	2.6	1.027	
10/08/2008	12:36:27	205.2	402.5	22.94	64.0	0.008	0.003970	2.10	20.6	5.20	0.0	0.39	4.80	6.5	197.3	202.1	199.7	2.4	1.024	
10/08/2008	12:46:27	210.75	403.2	27.65	63.7	0.010	0.003978	6.81	66.8	16.80	0.0	0.49	16.31	12.0	192.4	208.7	200.6	8.2	1.085	
10/08/2008	12:56:27	228.7	402.7	38.8	63.4	0.012	0.003986	17.96	176.2	44.21	0.0	0.59	43.62	30.0	174.0	217.6	195.8	21.8	1.251	
10/08/2008	13:06:27	251.98	402.5	50.83	63.1	0.014	0.003994	29.99	294.2	73.67	0.0	0.69	72.98	53.3	150.5	223.5	187.0	36.5	1.485	
10/08/2008	13:16:27	280.09	402.9	61.06	62.8	0.016	0.004002	40.22	394.6	98.60	0.0	0.79	97.81	81.4	122.8	220.6	171.7	48.9	1.796	
10/08/2008	13:26:27	299.45	402.6	66.01	62.5	0.018	0.004010	45.17	443.2	110.51	0.0	0.88	109.62	100.7	103.2	212.8	158.0	54.8	2.062	
10/08/2008	13:36:27	312.43	402.5	68.51	62.2	0.020	0.004018	47.67	467.7	116.39	0.0	0.98	115.41	113.7	90.1	205.5	147.8	57.7	2.281	
10/08/2008	13:46:27	321.74	402.5	69.69	61.9	0.022	0.004026	48.85	479.3	119.04	0.0	1.08	117.95	123.0	80.8	198.7	139.7	59.0	2.461	
10/08/2008	13:56:27	328.32	402.5	70.46	61.6	0.023	0.004034	49.62	486.8	120.67	0.0	1.18	119.49	129.6	74.2	193.7	133.9	59.7	2.611	
10/08/2008	14:06:27	333.21	402.5	70.95	61.3	0.025	0.004042	50.11	491.6	121.62	0.0	1.28	120.34	134.5	69.3	189.6	129.5	60.2	2.737	
10/08/2008	14:16:27	336.78	402.5	71.27	61.0	0.027	0.004050	50.43	494.8	122.15	0.0	1.38	120.77	138.1	65.7	186.5	126.1	60.4	2.838	
10/08/2008	14:26:27	340	402.5	71.48	60.7	0.029	0.004059	50.64	496.8	122.41	0.0	1.47	120.93	141.3	62.5	183.4	123.0	60.5	2.935	
10/08/2008	14:36:27	342.22	402.5	71.7	60.4	0.031	0.004067	50.86	499.0	122.69	0.0	1.57	121.12	143.5	60.3	181.4	120.8	60.6	3.009	
10/08/2008	14:46:27	343.82	401.9	71.71	60.1	0.0333	0.004075	50.87	499.1	122.47	0.0	1.67	120.80	145.1	58.0	178.8	118.4	60.4	3.081	
10/08/2008	14:56:27	345.76	402.5	71.9	59.8	0.0352	0.004083	51.06	500.9	122.68	0.0	1.77	120.91	147.0	56.7	177.6	117.2	60.5	3.131	
10/08/2008	15:06:27	346.87	402.5	72.13	59.5	0.0372	0.004092	51.29	503.2	122.98	0.0	1.87	121.11	148.1	55.6	176.7	116.2	60.6	3.177	
10/08/2008	15:16:27	347.79	402.5	72.13	59.2	0.039	0.004100	51.29	503.2	122.73	0.0	1.97	120.76	149.1	54.7	175.4	115.1	60.4	3.209	
10/08/2008	15:26:27	348.92	402	72.33	58.9	0.041	0.004108	51.49	505.2	122.96	0.0	2.06	120.89	150.2	53.1	174.0	113.6	60.4	3.276	
10/08/2008	15:36:27	349.9	402.5	72.31	58.6	0.043	0.004117	51.47	505.0	122.66	0.0	2.16	120.50	151.2	52.6	173.1	112.8	60.2	3.291	
10/08/2008	15:46:27	350.63	402	72.3	58.3	0.045	0.004125	51.46	504.9	122.38	0.0	2.26	120.12	151.9	51.3	171.5	111.4	60.1	3.340	
10/08/2008	15:56:27	351.41	401.9	72.21	58.0	0.047	0.004134	51.37	504.0	121.92	0.0	2.36	119.56	152.7	50.4	170.0	110.2	59.8	3.370	
10/08/2008	16:06:27	352.08	402	72.22	57.7	0.049	0.004142	51.38	504.1	121.69	0.0	2.46	119.23	153.4	49.9	169.1	109.5	59.6	3.390	
10/08/2008	16:16:27	352.7	401.8	72.06	57.4	0.051	0.004151	51.22	502.5	121.06	0.0	2.56	118.51	154.0	49.1	167.6	108.4	59.3	3.413	
10/08/2008	16:26:27	353.06	401.8	71.92	57.1	0.053	0.004159	51.08	501.1	120.48	0.0	2.65	117.83	154.3	48.8	166.6	107.7	58.9	3.417	
10/08/2008	16:36:27	354.06	401.8	71.73	56.8	0.055	0.004168	50.89	499.3	119.79	0.0	2.75	117.03	155.3	47.8	164.8	106.3	58.5	3.450	
10/08/2008	16:46:27	354.41	401.8	71.44	56.5	0.057	0.004177	50.60	496.4	118.86	0.0	2.85	116.01	155.7	47.4	163.4	105.4	58.0	3.447	
10/08/2008	16:56:27	354.74	401.8	71.24	56.2	0.059	0.004185	50.40	494.5	118.14	0.0	2.95	115.19	156.0	47.1	162.3	104.7	57.6	3.447	
10/08/2008	17:06:27	355.39	401.8	71.02	55.9	0.061	0.004194	50.18	492.3	117.38	0.0	3.05	114.33	156.7	46.4	160.8	103.6	57.2	3.463	
10/08/2008	17:16:27	355.78	401.8	70.86	55.6	0.063	0.004203	50.02	490.7	116.76	0.0	3.15	113.62	157.1	46.0	159.7	102.8	56.8	3.468	
10/08/2008	17:26:27	355.97	401.8	70.66	55.3	0.065	0.004212	49.82	488.8	116.05	0.0	3.24	112.81	157.2	45.9	158.7	102.3	56.4	3.460	
10/08/2008	17:36:27	356.48	401.8	70.47	55.0	0.066	0.004220	49.63	486.9	115.37	0.0	3.34	112.03	157.8	45.3	157.4	101.4	56.0	3.471	
10/08/2008	17:46:27	356.82	401.8	70.27	54.7	0.068	0.004229	49.43	484.9	114.66	0.0	3.44	111.22	158.1	45.0	156.2	100.6	55.6	3.472	
10/08/2008	17:56:27	357.16	401.7	70.05	54.4	0.070	0.004238	49.21	482.8	113.91	0.0	3.54	110.37	158.4	44.6	155.0	99.8	55.2	3.476	
10/08/2008	18:06:27	357.35	401.8	69.87	54.1	0.072	0.004247	49.03	481.0	113.26	0.0	3.64	109.62	158.6	44.4	154.0	99.2	54.8	3.468	
10/08/2008	18:16:27	357.85	401.8	69.79	53.8	0.074	0.004256	48.95	480.2	112.83	0.0	3.74	109.10	159.1	44.0	153.1	98.5	54.5	3.481	
10/08/2008	18:26:27	358.15	401.8	69.57	53.5	0.076	0.004265	48.73	478.1	112.09	0.0	3.83	108.25	159.4	43.7	151.9	97.8	54.1	3.479	
10/08/2008	18:36:27	358.19	401.1	69.3	53.2	0.078	0.004274	48.46	475.4	111.23	0.0	3.93	107.30	159.5	43.0	150.2	96.6	53.6	3.498	
10/08/2008	18:46:27	358.7	401.8	69.1	52.9	0.080	0.004283	48.26	473.5	110.54	0.0	4.03	106.51	160.0	43.1	149.6	96.4	53.3	3.470	
10/08/2008	18:56:27	358.88	401.8	68.91	52.6	0.082	0.004292	48.07	471.6	109.87	0.0	4.13	105.74	160.2	42.9	148.7	95.8	52.9	3.462	
10/08/2008	19:06:27	359.2	401.4	68.74	52.3	0.084	0.004302	47.90	469.9	109.25	0.0	4.23	105.02	160.5	42.2	147.3	94.7	52.5	3.486	
10/08/2008	19:16:27	359.57	401.8	68.43	52.0	0.086	0.004311	47.59	466.9	108.31	0.0	4.33	103.98	160.8	42.3	146.2	94.2	52.0	3.461	
10/08/2008	19:26:27	359.91	401.8	68.21	51.7	0.088	0.004320	47.37	464.7	107.58	0.0	4.42	103.15	161.2	41.9	145.0	93.5	51.6	3.463	
10/08/2008	19:36:27	360.01	401.4	67.88	51.4	0.090	0.004329	47.04	461.5	106.60	0.0	4.52	102.07	161.3	41.4	143.4	92.4	51.0	3.468	
10/08/2008	19:46:27	360.6	401.8	67.57	51.1	0.092	0.004339	46.73	458.5	105.67	0.0	4.62	101.04	161.9	41.2	142.3	91.7	50.5	3.451	
10/08/2008	19:56:27	360.94	401.8	67.37	50.8	0.094	0.004348	46.53	456.5	104.99	0.0	4.72	100.27	162.2	40.9	141.1	91.0	50.1	3.453	
10/08/2008	20:06:27	360.94	401.2	67.1	50.5	0.096	0.004358	46.26	453.8	104.15	0.0	4.82	99.33	162.2	40.3	139.6	89.9	49.7	3.466	
10/08/2008	20:16:27	361.18	401.1	66.81	50.2	0.098	0.004367	45.97	451.0	103.28	0.0	4.92	98.36	162.5	40.0	138.3	89.1	49.2	3.461	

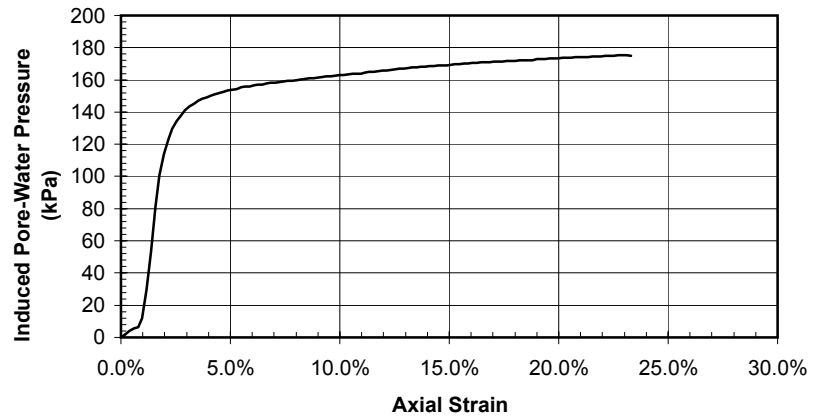
Date	Time	Pore Pressure		Cell	Load Cell	LVDT Reading	Axial Strain	Corrected Area	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore-Water Pressure	Effective Minor Principal Stress	Effective Major Principal Stress	p'	q	(σ ₁ σ ₃)
											Corrections									
											Uncorrected	Filter		Corrected						
		Paper	Rubber																	
		(kPa)	kPa	(kg)	(mm)			(m²)	(kgs)	(N)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(σ' ₁ +σ' ₃)/2	(σ' ₁ -σ' ₃)/2	
11/08/2008	3:36:27	370.93	401.8	57.46	37.0	0.184		0.004828	36.62	359.3	74.41	0.0	9.24	65.17	172.2	30.9	96.1	63.5	32.6	3.110
11/08/2008	3:46:27	371.05	401.3	57.41	36.7	0.186		0.004840	36.57	358.8	74.13	0.0	9.34	64.79	172.3	30.3	95.1	62.7	32.4	3.139
11/08/2008	3:56:27	371.05	401.4	57.2	36.4	0.188		0.004851	36.36	356.7	73.53	0.0	9.44	64.09	172.3	30.3	94.4	62.4	32.0	3.115
11/08/2008	4:06:27	371.56	401.6	57.14	36.1	0.190		0.004863	36.30	356.1	73.23	0.0	9.54	63.69	172.8	30.1	93.8	61.9	31.8	3.119
11/08/2008	4:16:27	371.59	401.6	57	35.8	0.192		0.004875	36.16	354.8	72.77	0.0	9.64	63.14	172.9	30.0	93.1	61.5	31.6	3.107
11/08/2008	4:26:27	371.59	401.1	56.92	35.5	0.194		0.004887	36.08	354.0	72.44	0.0	9.73	62.70	172.9	29.6	92.3	60.9	31.4	3.122
11/08/2008	4:36:27	371.9	401.8	56.83	35.2	0.196		0.004899	35.99	353.1	72.08	0.0	9.83	62.25	173.2	29.9	92.2	61.0	31.1	3.080
11/08/2008	4:46:27	372.12	401.1	56.6	34.9	0.198		0.004911	35.76	350.8	71.45	0.0	9.93	61.51	173.4	29.0	90.5	59.8	30.8	3.120
11/08/2008	4:56:27	372.02	401.1	56.5	34.6	0.200		0.004923	35.66	349.9	71.07	0.0	10.03	61.04	173.3	29.1	90.2	59.6	30.5	3.096
11/08/2008	5:06:27	372.52	401.1	56.47	34.3	0.202		0.004935	35.63	349.6	70.84	0.0	10.13	60.71	173.8	28.6	89.3	59.0	30.4	3.121
11/08/2008	5:16:27	372.54	401.6	56.45	34.0	0.204		0.004947	35.61	349.4	70.62	0.0	10.23	60.40	173.8	29.1	89.5	59.3	30.2	3.078
11/08/2008	5:26:27	372.49	401.1	56.42	33.7	0.206		0.004959	35.58	349.1	70.39	0.0	10.32	60.07	173.8	28.7	88.7	58.7	30.0	3.097
11/08/2008	5:36:27	372.78	401.7	56.32	33.4	0.208		0.004971	35.48	348.1	70.02	0.0	10.42	59.60	174.1	28.9	88.5	58.7	29.8	3.060
11/08/2008	5:46:27	372.93	401.1	56.31	33.1	0.210		0.004984	35.47	348.0	69.83	0.0	10.52	59.31	174.2	28.2	87.5	57.9	29.7	3.102
11/08/2008	5:56:27	372.96	401.1	56.21	32.8	0.211		0.004996	35.37	347.0	69.46	0.0	10.62	58.84	174.2	28.2	87.0	57.6	29.4	3.088
11/08/2008	6:06:27	372.7	401.1	56.08	32.5	0.213		0.005008	35.24	345.7	69.03	0.0	10.72	58.31	174.0	28.4	86.8	57.6	29.2	3.050
11/08/2008	6:16:27	373.31	401.3	55.98	32.2	0.215		0.005021	35.14	344.8	68.66	0.0	10.82	57.85	174.6	28.0	85.8	56.9	28.9	3.067
11/08/2008	6:26:27	373.31	401.1	55.82	31.9	0.217		0.005033	34.98	343.2	68.18	0.0	10.91	57.27	174.6	27.8	85.1	56.5	28.6	3.058
11/08/2008	6:36:27	373.31	401.1	55.72	31.6	0.219		0.005046	34.88	342.2	67.82	0.0	11.01	56.80	174.6	27.8	84.6	56.2	28.4	3.041
11/08/2008	6:46:27	373.59	401.1	55.63	31.3	0.221		0.005059	34.79	341.3	67.47	0.0	11.11	56.36	174.9	27.6	83.9	55.7	28.2	3.046
11/08/2008	6:56:27	373.65	401.1	55.56	31.0	0.223		0.005072	34.72	340.6	67.17	0.0	11.21	55.96	174.9	27.5	83.4	55.5	28.0	3.036
11/08/2008	7:06:27	373.65	401.1	55.57	30.7	0.225		0.005084	34.73	340.7	67.02	0.0	11.31	55.71	174.9	27.5	83.2	55.3	27.9	3.027
11/08/2008	7:16:27	373.99	401.1	55.5	30.4	0.227		0.005097	34.66	340.0	66.71	0.0	11.41	55.31	175.3	27.2	82.5	54.8	27.7	3.037
11/08/2008	7:26:27	374	401.6	55.41	30.1	0.229		0.005110	34.57	339.2	66.37	0.0	11.50	54.87	175.3	27.6	82.5	55.0	27.4	2.989
11/08/2008	7:36:27	374	401.1	55.29	29.8	0.231		0.005123	34.45	338.0	65.97	0.0	11.60	54.37	175.3	27.1	81.5	54.3	27.2	3.003
11/08/2008	7:46:27	373.79	401.1	55.15	29.5	0.233		0.005136	34.31	336.6	65.54	0.0	11.70	53.84	175.1	27.4	81.2	54.3	26.9	2.968

3847 (200 kPa)

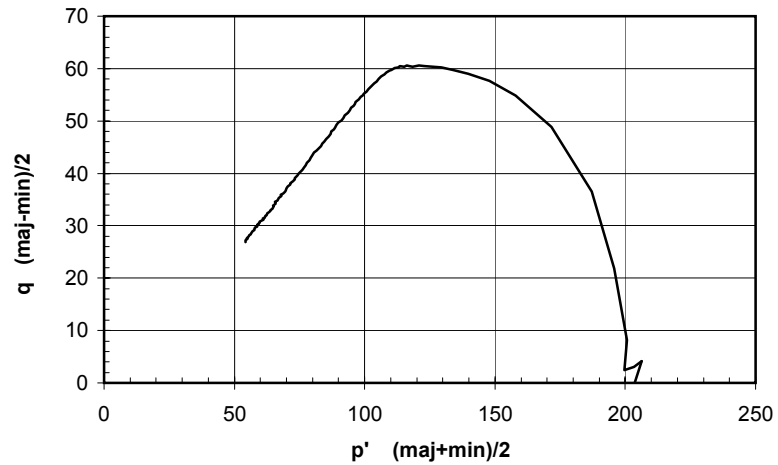
Deviator Stress versus Axial Strain



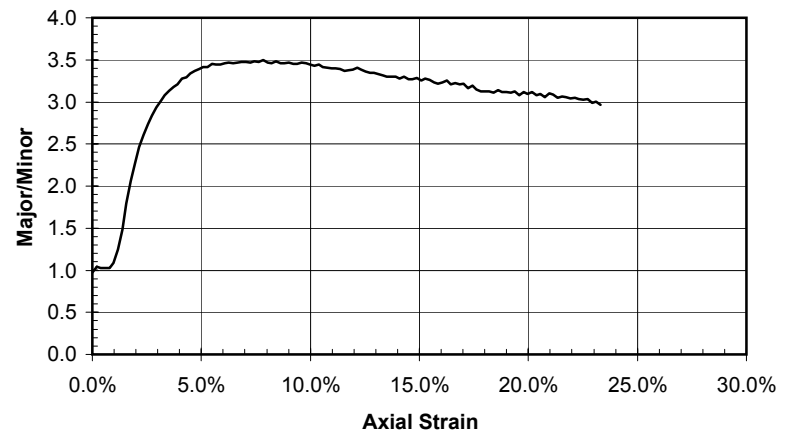
Induced Pore-Water Pressure versus Axial Strain

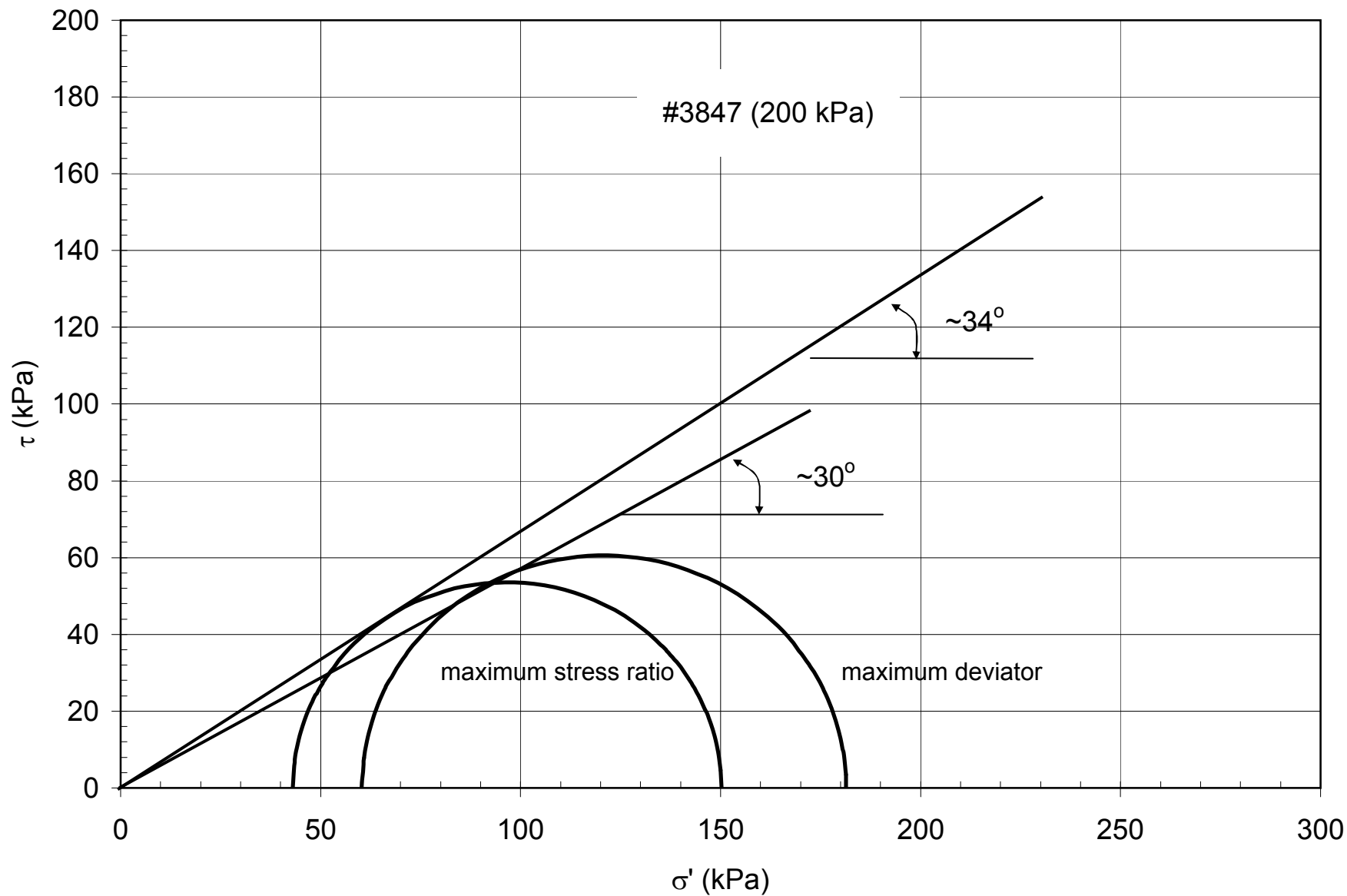


p' versus q



Major/Minor Stress





3847 (400 kPa)



TRIAXIAL COMPRESSION TESTING

Project: Pebble East

Date: 11-Aug-08 MDH Job #: L1086

Sample: 3847

Test No: 2 Test Designation: CU (Effective confining pressure: 400 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	<u>918.64</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.48</u>
Sample height (mm):	<u> </u>	<u>153.20</u>
Water Content:		
	height : diameter ratio: <u>2.11</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1453</u>	
	Dry density (kg/m ³): <u>1301</u>	
Water Content (%):	<u>11.7%</u>	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	<u>-</u>
Mass of pan + dry soil (g): (g):	<u>-</u>
Mass of dry soil (g):	<u>-</u>

Comments:

Sample at end of test

Sample Failure

Change in height during saturation (mm):	0.00	failure criterion	max deviator stress	max. obliquity (maj/min)
Sample height after saturation (mm):	153.20			
Change in volume during saturation (m ³):	6.6E-06			
Change in height during consolidation (mm):	0.00	σ'_3	102.1	97.7
Sample height after consolidation (mm):	153.20	σ'_1	365.0	357.2
Change in volume during consolidation (ml):	20.70 (up to 750 kPa cell pressure)	strain	5.00%	7.10%
Change in volume during consolidation (m ³):	2.1E-05	σ'_1/σ'_3	3.574	3.656
Sample area after consolidation (m ²):	0.0039	ϕ' (deg)	34.3	34.8
Rate of strain (mm/min):	0.035	(computed from equation $\sin \phi' = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)		
Load due to cell pressure:	36.06	kgs		

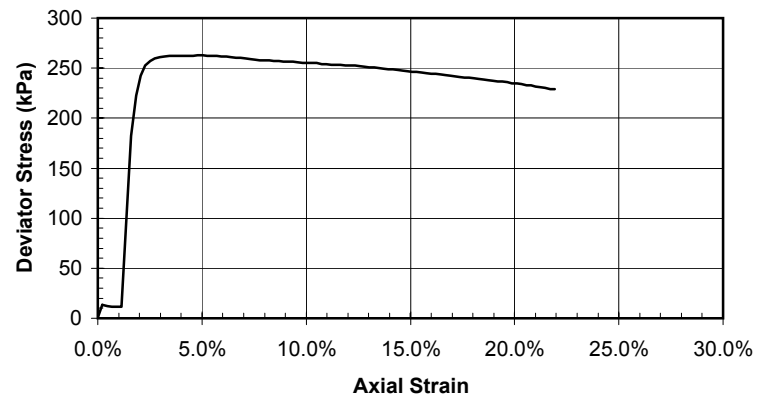
Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (mm ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ' ₁ +σ' ₃)/2	q (σ' ₁ -σ' ₃)/2	(σ ₁ σ ₃)
		(kPa)	(kPa)						(kPa)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)						
												Filter Paper (kPa)	Rubber Membrane (kPa)							
12/08/2008	15:30:42	299.81	697.8	36.24	66.6	0.000	0.003948	0.18	1.8	0.45	0.0	0.00	0.44	0.0	397.9	398.4	398.2	0.2	1.001	
12/08/2008	15:40:42	306.71	697.1	41.65	66.2	0.002	0.003957	5.59	54.8	13.86	0.0	0.11	13.75	6.9	390.4	404.1	397.2	6.9	1.035	
12/08/2008	15:50:42	309.06	696.4	41.02	65.9	0.005	0.003966	4.96	48.7	12.27	0.0	0.23	12.04	9.3	387.3	399.4	393.4	6.0	1.031	
12/08/2008	16:00:42	311.29	697.1	40.98	65.5	0.007	0.003975	4.92	48.3	12.14	0.0	0.34	11.80	11.5	385.8	397.6	391.7	5.9	1.031	
12/08/2008	16:10:42	312.5	696.7	40.96	65.2	0.009	0.003984	4.90	48.1	12.07	0.0	0.46	11.61	12.7	384.2	395.8	390.0	5.8	1.030	
12/08/2008	16:20:42	312.85	695.7	41.03	64.8	0.011	0.003994	4.97	48.8	12.21	0.0	0.57	11.64	13.0	382.9	394.5	388.7	5.8	1.030	
12/08/2008	16:30:42	355.32	696.9	78.47	64.5	0.014	0.004003	42.41	416.1	103.94	0.0	0.69	103.25	55.5	341.6	444.8	393.2	51.6	1.302	
12/08/2008	16:40:42	424.84	696.4	110.82	64.1	0.016	0.004012	74.76	733.4	182.79	0.0	0.80	181.99	125.0	271.6	453.5	362.5	91.0	1.670	
12/08/2008	16:50:42	474.38	695	127.67	63.8	0.018	0.004022	91.61	898.7	223.47	0.0	0.92	222.56	174.6	220.7	443.2	331.9	111.3	2.009	
12/08/2008	17:00:42	509.78	696.9	136.2	63.4	0.021	0.004031	100.14	982.4	243.71	0.0	1.03	242.68	210.0	187.2	429.8	308.5	121.3	2.297	
12/08/2008	17:10:42	532.16	695.9	140.63	63.1	0.023	0.004040	104.57	1025.8	253.90	0.0	1.15	252.75	232.4	163.7	416.5	290.1	126.4	2.544	
12/08/2008	17:20:42	547.54	695	142.73	62.7	0.025	0.004050	106.67	1046.4	258.39	0.0	1.26	257.13	247.7	147.5	404.6	276.1	128.6	2.743	
12/08/2008	17:30:42	560.01	696.1	143.97	62.4	0.027	0.004059	107.91	1058.6	260.78	0.0	1.38	259.41	260.2	136.1	395.5	265.8	129.7	2.907	
12/08/2008	17:40:42	567.97	695.7	144.96	62.0	0.030	0.004069	108.90	1068.3	262.56	0.0	1.49	261.07	268.2	127.7	388.8	258.3	130.5	3.044	
12/08/2008	17:50:42	573.34	695	145.4	61.7	0.032	0.004078	109.34	1072.6	263.00	0.0	1.60	261.39	273.5	121.7	383.1	252.4	130.7	3.148	
12/08/2008	18:00:42	578.58	695.2	145.97	61.3	0.034	0.004088	109.91	1078.2	263.75	0.0	1.72	262.03	278.8	116.6	378.7	247.7	131.0	3.246	
12/08/2008	18:10:42	582.32	695.7	146.32	61.0	0.037	0.004098	110.26	1081.7	263.96	0.0	1.83	262.13	282.5	113.4	375.5	244.5	131.1	3.312	
12/08/2008	18:20:42	584.43	695	146.67	60.6	0.0388	0.004108	110.61	1085.1	264.17	0.0	1.95	262.22	284.6	110.6	372.8	241.7	131.1	3.372	
12/08/2008	18:30:42	587.21	695.1	146.91	60.3	0.0411	0.004117	110.85	1087.4	264.11	0.0	2.06	262.05	287.4	107.8	369.9	238.9	131.0	3.430	
12/08/2008	18:40:42	589.16	695.1	147.32	59.9	0.0434	0.004127	111.26	1091.5	264.46	0.0	2.18	262.28	289.4	105.9	368.2	237.1	131.1	3.476	
12/08/2008	18:50:42	589.48	694.4	147.62	59.6	0.046	0.004137	111.56	1094.4	264.54	0.0	2.29	262.25	289.7	104.9	367.1	236.0	131.1	3.501	
12/08/2008	19:00:42	591.76	695	148.15	59.2	0.048	0.004147	112.09	1099.6	265.16	0.0	2.41	262.75	292.0	103.3	366.0	234.6	131.4	3.544	
12/08/2008	19:10:42	592.75	694.9	148.52	58.9	0.050	0.004157	112.46	1103.2	265.40	0.0	2.52	262.87	292.9	102.1	365.0	233.6	131.4	3.574	
12/08/2008	19:20:42	592.82	694.4	148.66	58.5	0.053	0.004167	112.60	1104.6	265.09	0.0	2.64	262.45	293.0	101.5	364.0	232.8	131.2	3.585	
12/08/2008	19:30:42	594.22	694.8	148.94	58.2	0.055	0.004177	112.88	1107.4	265.11	0.0	2.75	262.36	294.4	100.6	362.9	231.7	131.2	3.609	
12/08/2008	19:40:42	594.9	695	149.18	57.8	0.057	0.004187	113.12	1109.7	265.03	0.0	2.86	262.16	295.1	100.1	362.3	231.2	131.1	3.618	
12/08/2008	19:50:42	594.61	693.9	149.25	57.5	0.059	0.004197	113.19	1110.4	264.55	0.0	2.98	261.57	294.8	99.3	360.9	230.1	130.8	3.634	
12/08/2008	20:00:42	595.94	695	149.51	57.1	0.062	0.004208	113.45	1113.0	264.51	0.0	3.09	261.42	296.1	99.1	360.5	229.8	130.7	3.638	
12/08/2008	20:10:42	596.49	695	149.67	56.8	0.064	0.004218	113.61	1114.5	264.24	0.0	3.21	261.03	296.7	98.5	359.6	229.1	130.5	3.649	
12/08/2008	20:20:42	595.93	694.4	149.8	56.4	0.066	0.004228	113.74	1115.8	263.90	0.0	3.32	260.57	296.1	98.4	359.0	228.7	130.3	3.648	
12/08/2008	20:30:42	596.96	695	149.94	56.1	0.069	0.004239	113.88	1117.2	263.57	0.0	3.44	260.14	297.2	98.1	358.2	228.1	130.1	3.653	
12/08/2008	20:40:42	597.31	695	150	55.7	0.071	0.004249	113.94	1117.8	263.07	0.0	3.55	259.51	297.5	97.7	357.2	227.5	129.8	3.656	
12/08/2008	20:50:42	596.62	694.4	150.08	55.4	0.073	0.004259	114.02	1118.5	262.60	0.0	3.67	258.94	296.8	97.7	356.7	227.2	129.5	3.650	
12/08/2008	21:00:42	597.31	694.9	150.18	55.0	0.075	0.004270	114.12	1119.5	262.19	0.0	3.78	258.41	297.5	97.6	356.0	226.8	129.2	3.648	
12/08/2008	21:10:42	597.66	695	150.37	54.7	0.0777	0.004281	114.31	1121.4	261.97	0.0	3.90	258.08	297.9	97.4	355.4	226.4	129.0	3.650	
12/08/2008	21:20:42	596.95	694.1	150.47	54.3	0.0800	0.004291	114.41	1122.4	261.55	0.0	4.01	257.54	297.1	97.1	354.7	225.9	128.8	3.652	
12/08/2008	21:30:42	597.67	695	150.84	54.0	0.082	0.004302	114.78	1126.0	261.75	0.0	4.13	257.62	297.9	97.4	355.0	226.2	128.8	3.646	
12/08/2008	21:40:42	597.89	695	151.06	53.6	0.085	0.004313	115.00	1128.2	261.60	0.0	4.24	257.36	298.1	97.1	354.5	225.8	128.7	3.649	
12/08/2008	21:50:42	597.16	694.2	151.29	53.3	0.087	0.004323	115.23	1130.4	261.47	0.0	4.35	257.11	297.4	97.1	354.2	225.6	128.6	3.648	
12/08/2008	22:00:42	597.65	694.4	151.48	52.9	0.089	0.004334	115.42	1132.3	261.24	0.0	4.47	256.77	297.8	96.7	353.5	225.1	128.4	3.655	
12/08/2008	22:10:42	597.99	695	151.73	52.6	0.091	0.004345	115.67	1134.7	261.15	0.0	4.58	256.57	298.2	97.0	353.6	225.3	128.3	3.644	
12/08/2008	22:20:42	597.12	694.3	151.97	52.2	0.094	0.004356	115.91	1137.1	261.04	0.0	4.70	256.34	297.3	97.2	353.5	225.4	128.2	3.637	
12/08/2008	22:30:42	597.63	695	152.14	51.9	0.096	0.004367	116.08	1138.8	260.76	0.0	4.81	255.95	297.8	97.4	353.3	225.4	128.0	3.628	
12/08/2008	22:40:42	597.65	695	152.29	51.5	0.098	0.004378	116.23	1140.2	260.44	0.0	4.93	255.51	297.8	97.4	352.9	225.1	127.8	3.624	
12/08/2008	22:50:42	597.07	694.4	152.53	51.2	0.101	0.004389	116.47	1142.6	260.31	0.0	5.04	255.27	297.3	97.3	352.6	224.9	127.6	3.624	
12/08/2008	23:00:42	597.27	695	152.86	50.8	0.103	0.004400	116.80	1145.8	260.39	0.0	5.16	255.23	297.5	97.7	352.9	225.3	127.6	3.612	
12/08/2008	23:10:42	597.31	695	153.12	50.5	0.105	0.004412	117.06	1148.4	260.30	0.0	5.27	255.03	297.5	97.7	352.7	225.2	127.5	3.611	
12/08/2008	23:20:42	596.97	694.4	153.1	50.1	0.107	0.004423	117.04	1148.2	259.59	0.0	5.39	254.21	297.2	97.4	351.6	224.5	127.1	3.610	
12/08/2008	23:30:42	596.96	694.7	153.32	49.8	0.110	0.004434	117.26	1150.3	259.42	0.0	5.50	253.92	297.2	97.8	351.7	224.7	127.0	3.597	
12/08/2008	23:40:42	597.11	694.6	153.5	49.4	0.112	0.004446	117.44	1152.1	259.15	0.0	5.61	253.53	297.3	97.4	351.0	224.2	126.8	3.602	
12/08/2008	23:50:42	596.95	694.49																	

3847 (400 kPa)

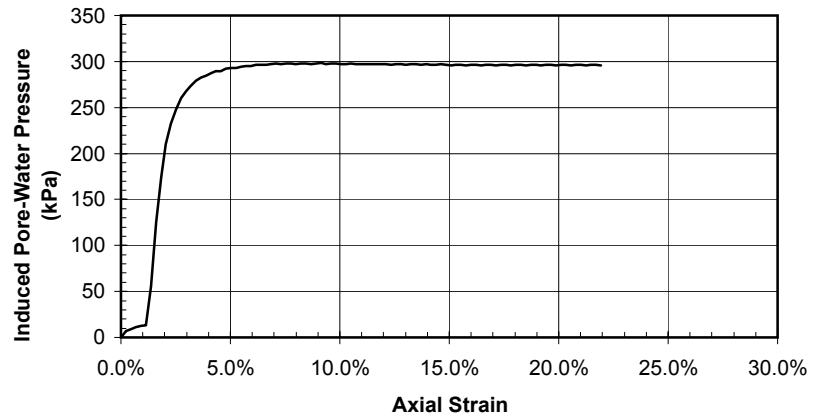
Date	Time			Load Cell Reading (mm)	LVDT Reading (mm)	Axial Strain	Corrected Area (mm ²)	Corrected Load (kgs) (N)		(σ ₁ -σ ₃) Deviator Stress Corrections				Δu Induced Pore- Water Pressure (kPa)	σ _v Effective Minor Principal Stress (kPa)	σ ₁ Effective Major Principal Stress (kPa)	p' (σ ₁ +σ _v)/2	q (σ ₁ -σ _v)/2	(σ ₁ σ ₃)
		Uncorrected (kPa)	Filter							Corrected (kPa)									
			Paper								Rubber								
												Membrane							
13/08/2008	7:10:42	595.94	694.4	159.59	33.6	0.215	0.005028	123.53	1211.8	241.03	0.0	10.77	230.26	296.1	98.4	328.7	213.5	115.1	3.340
13/08/2008	7:20:42	596.21	694.4	159.52	33.3	0.217	0.005042	123.46	1211.2	240.19	0.0	10.89	229.31	296.4	98.1	327.4	212.8	114.7	3.337
13/08/2008	7:30:42	595.26	693.8	159.63	32.9	0.219	0.005057	123.57	1212.2	239.70	0.0	11.00	228.70	295.5	98.5	327.2	212.9	114.4	3.321

3847 (400 kPa)

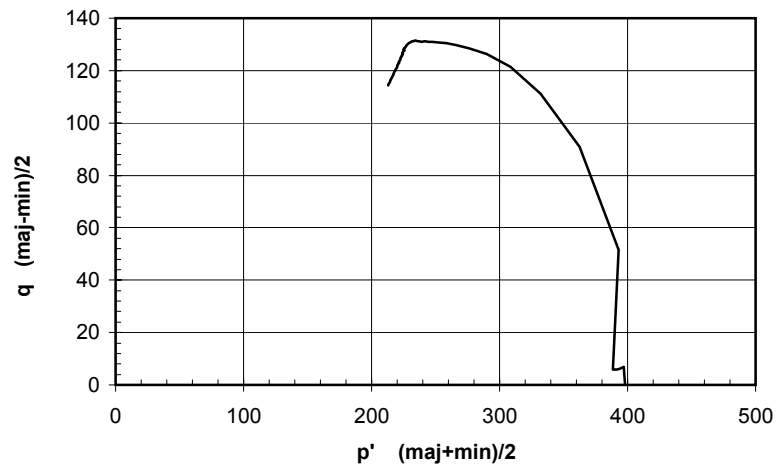
Deviator Stress versus Axial Strain



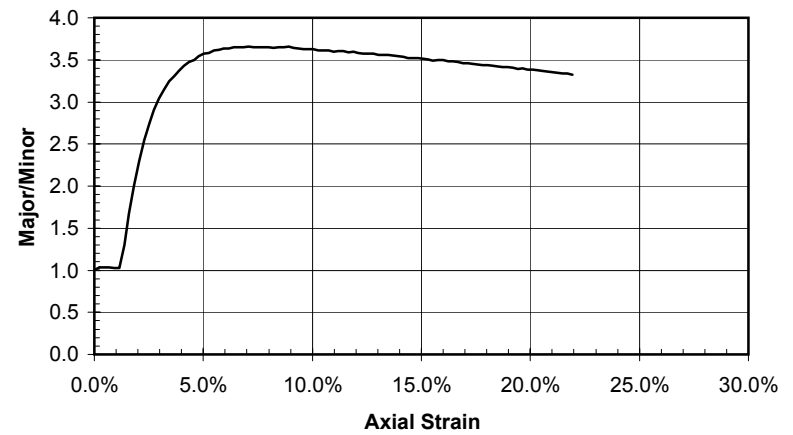
Induced Pore-Water Pressure versus Axial Strain

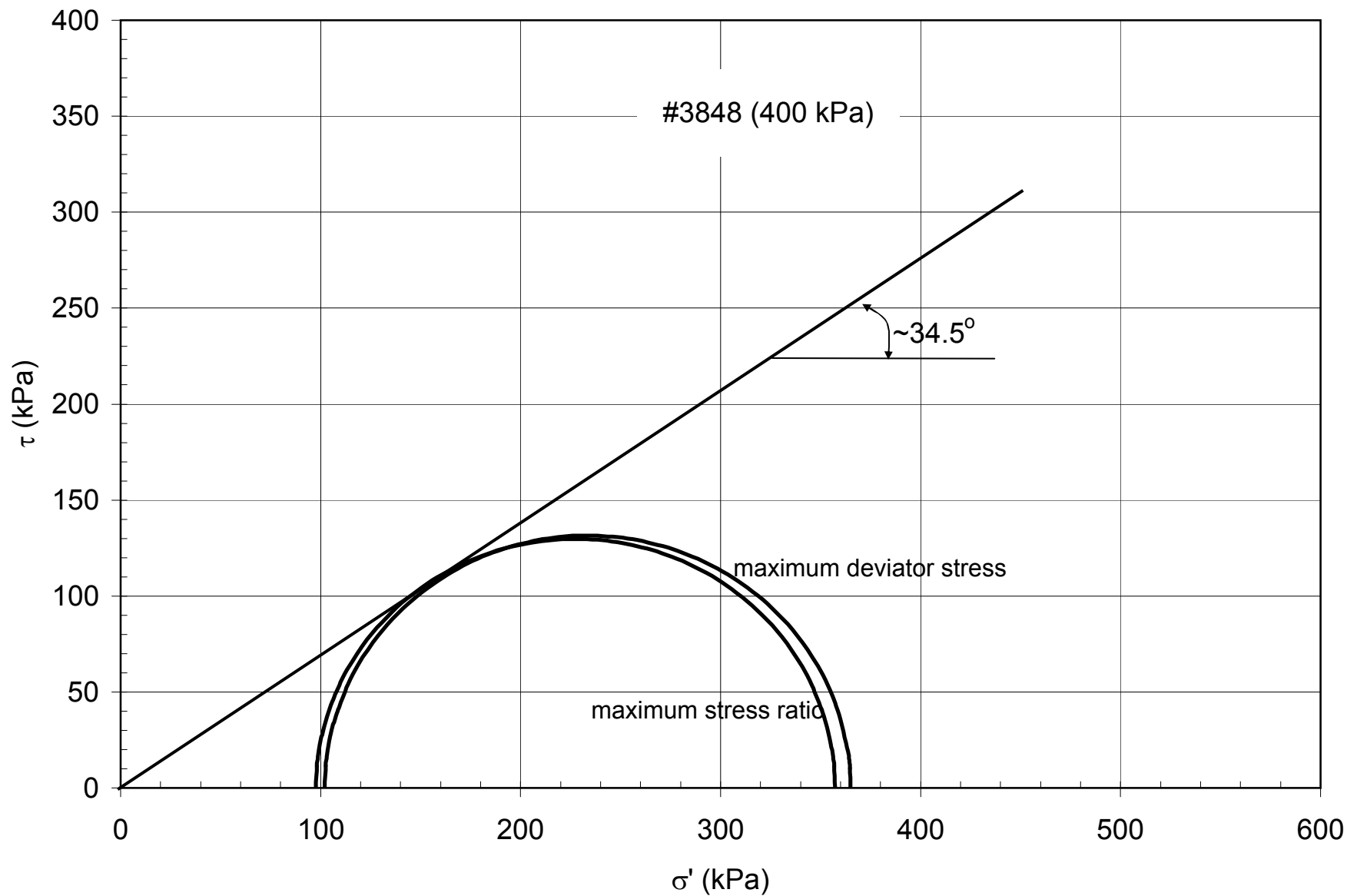


p' versus q



Major/Minor Stress





Project: Pebble East

Date: 06-Aug-08 MDH Job #: L1086

Test No: 3	Test Designation: CU	(Effective confining pressure: 800 kPa
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Wet sample mass,g	1043.09	average:
Sample diameter (mm):		72.48
Sample height (mm):		152.50

height : diameter ratio: 2.1 : 1 (should range from 2 to 2.5 : 1)

Wet density (kg/m³): 1658

Dry density (kg/m³): 1373

Water Content (%):	20.7%
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POST-TEST INFORMATION

Mass of pan (g): -

Mass of pan + dry soil (g): (g): -

Mass of dry soil (g): -

Sample at end of test

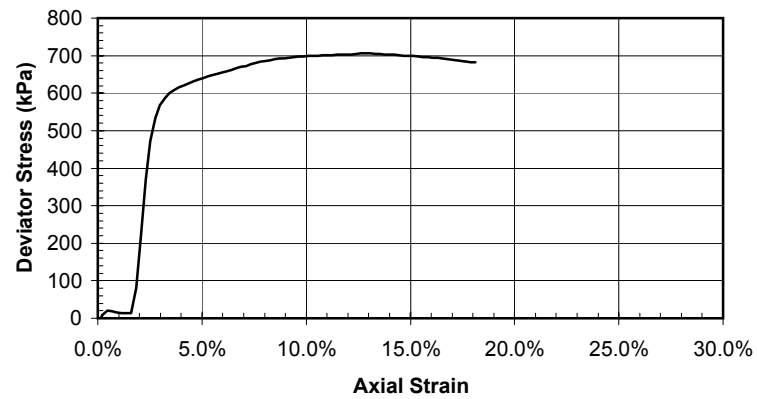
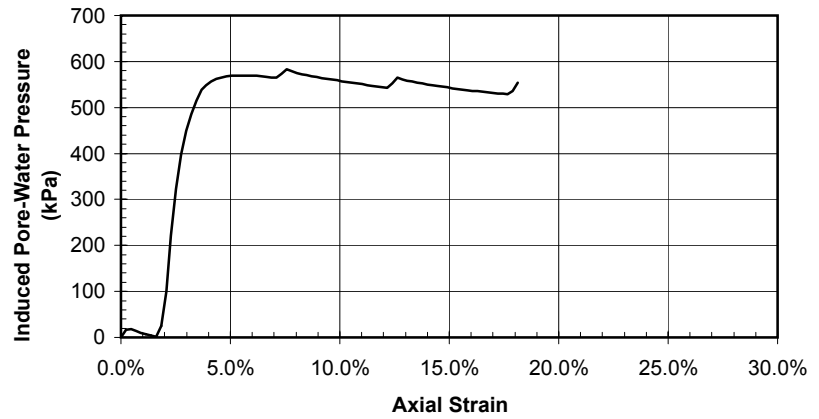
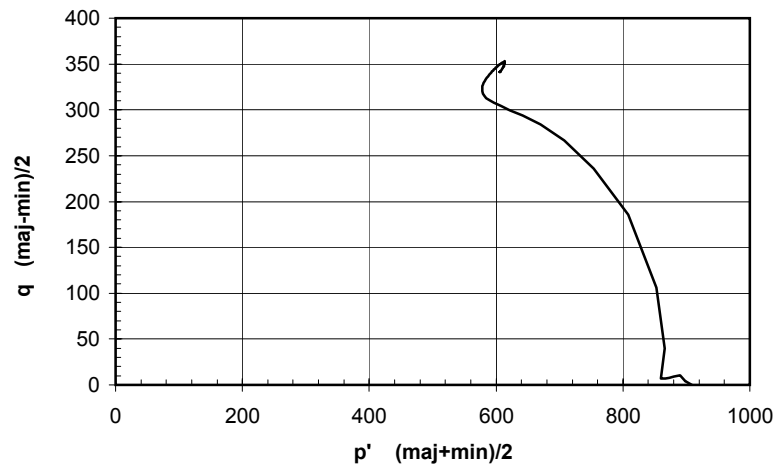
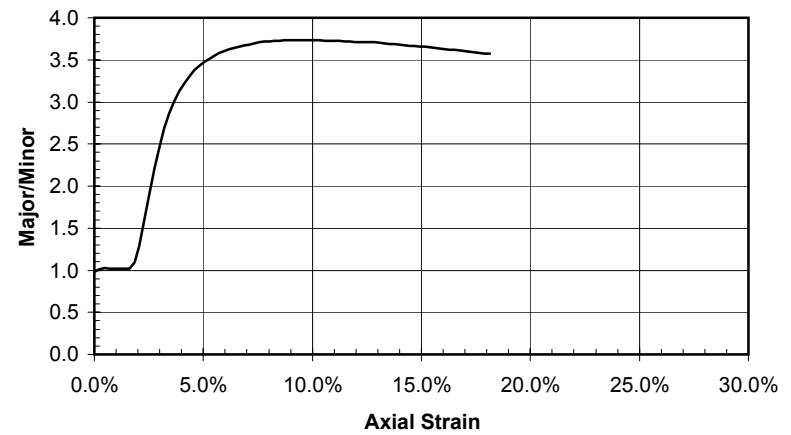
Sample Failure

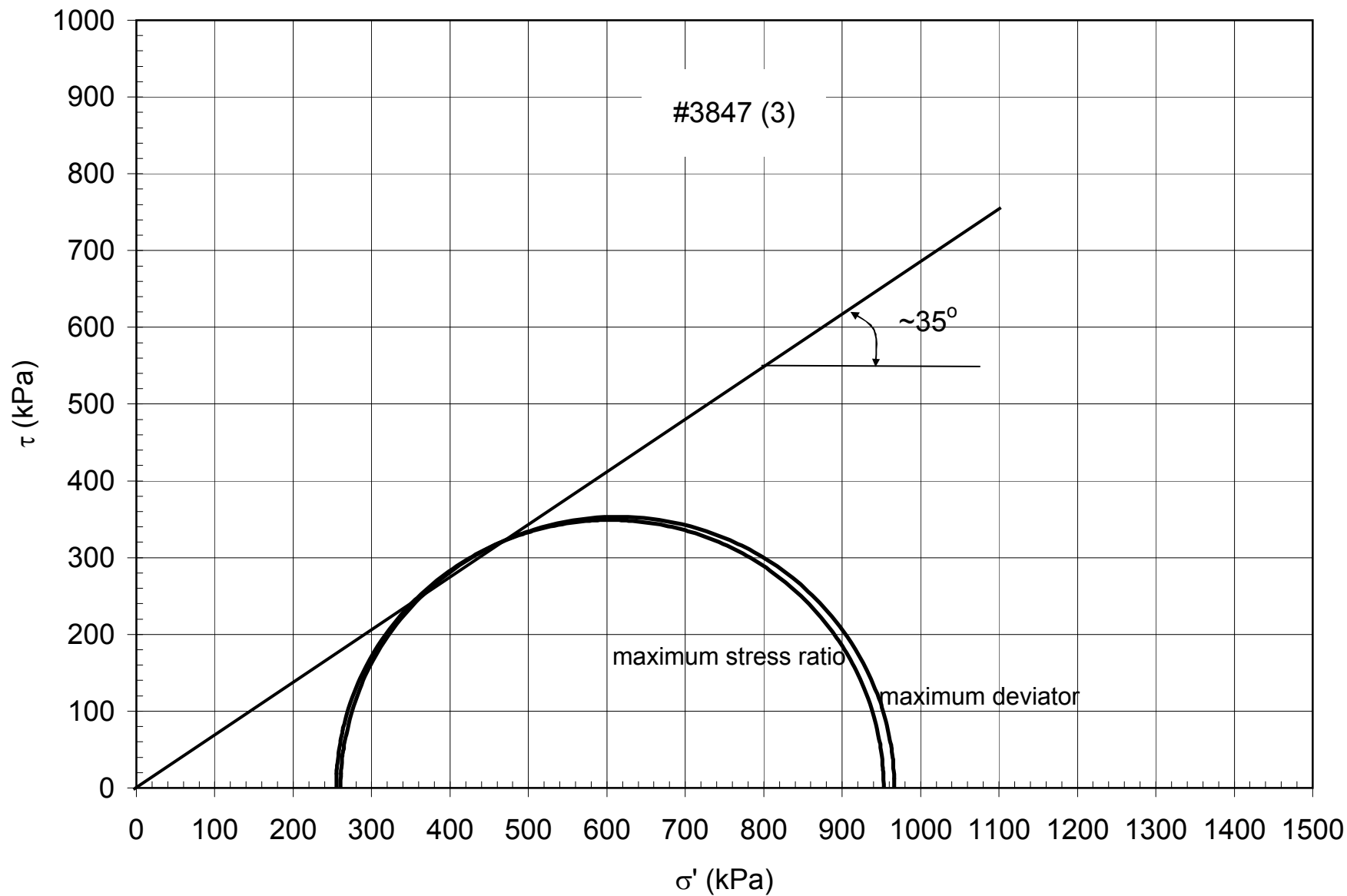
Change in height during saturation (mm):	0.00	failure criterion	max deviator stress	max. obliquity (maj/min)
Sample height after saturation (mm):	152.50			
Change in volume during saturation (m³3):	5.6E-06			
Change in height during consolidation (mm):	0.00			
Sample height after consolidation (mm):	152.50			
Change in volume during consolidation (ml):	21.80	(up to 750 kPa cell pressure)		
Change in volume during consolidation (m³3):	2.2E-05			
Sample area after consolidation (m²2):	0.0039	Load due to cell pressure:	59.02	kgs
Rate of strain (mm/min):	0.035			

σ'_3	260.4	255.0
σ'_1	966.6	953.0
strain	12.60%	9.90%
σ'_1/σ'_3	3.712	3.738
ϕ' (deg)	35.1	35.3

(computed from equation $\sin \phi' = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)
		(kPa)	(kPa)						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)						
												Filter Paper (kPa)	Rubber Membrane (kPa)							
07/08/2008	18:29:14	202.35	1142	51.95	61.4	0.000	0.003947	-7.07	-69.4	-17.58	0.0	0.00	-17.59	0.0	939.7	922.1	930.9	-8.8	0.981	
07/08/2008	18:39:14	219.4	1113	62.71	61.0	0.002	0.003955	3.69	36.2	9.15	0.0	0.12	9.03	17.1	893.8	902.8	898.3	4.5	1.010	
07/08/2008	18:49:14	220.03	1100	67.33	60.7	0.005	0.003964	8.31	81.5	20.56	0.0	0.23	20.33	17.7	880.0	900.3	890.2	10.2	1.023	
07/08/2008	18:59:14	216.35	1087	66.61	60.3	0.007	0.003974	7.59	74.5	18.74	0.0	0.35	18.39	14.0	871.0	889.4	880.2	9.2	1.021	
07/08/2008	19:09:14	212.41	1077	65.5	60.0	0.009	0.003983	6.48	63.6	15.96	0.0	0.46	15.50	10.1	864.6	880.1	872.4	7.7	1.018	
07/08/2008	19:19:14	208.82	1069	65.12	59.6	0.011	0.003992	6.10	59.8	14.99	0.0	0.58	14.41	6.5	859.7	874.1	866.9	7.2	1.017	
07/08/2008	19:29:14	206.32	1062	64.89	59.3	0.014	0.004001	5.87	57.6	14.39	0.0	0.69	13.70	4.0	855.9	869.6	862.7	6.8	1.016	
07/08/2008	19:39:14	204.25	1057	64.92	58.9	0.016	0.004011	5.90	57.9	14.43	0.0	0.81	13.62	1.9	852.8	866.4	859.6	6.8	1.016	
07/08/2008	19:49:14	226.78	1053	91.93	58.6	0.018	0.004020	32.91	322.8	80.31	0.0	0.92	79.39	24.4	826.1	905.5	865.8	39.7	1.096	
07/08/2008	19:59:14	303.18	1049	146.64	58.2	0.021	0.004030	87.62	859.5	213.31	0.0	1.04	212.28	100.8	746.3	958.5	852.4	106.1	1.284	
07/08/2008	20:09:14	423.07	1046	212.12	57.9	0.023	0.004039	153.10	1501.9	371.85	0.0	1.15	370.70	220.7	623.2	993.9	808.5	185.3	1.595	
07/08/2008	20:19:14	525.64	1043	254.23	57.5	0.025	0.004049	195.21	1915.0	473.01	0.0	1.27	471.75	323.3	517.7	989.5	753.6	235.9	1.911	
07/08/2008	20:29:14	600.33	1041	280.19	57.2	0.028	0.004058	221.17	2169.7	534.66	0.0	1.38	533.28	398.0	440.7	974.0	707.3	266.6	2.210	
07/08/2008	20:39:14	652.51	1039	295.25	56.8	0.030	0.004068	236.23	2317.4	569.72	0.0	1.50	568.22	450.2	386.1	954.3	670.2	284.1	2.472	
07/08/2008	20:49:14	688.54	1037	303.73	56.5	0.032	0.004077	244.71	2400.6	588.77	0.0	1.61	587.16	486.2	348.0	935.1	641.6	293.6	2.687	
07/08/2008	20:59:14	717.86	1040	309.56	56.1	0.034	0.004087	250.54	2457.8	601.37	0.0	1.73	599.64	515.5	321.7	921.3	621.5	299.8	2.864	
07/08/2008	21:09:14	741.55	1044	314.19	55.8	0.037	0.004097	255.17	2503.2	611.03	0.0	1.84	609.18	539.2	302.7	911.9	607.3	304.6	3.012	
07/08/2008	21:19:14	751.2	1040	317.47	55.4	0.0390	0.004107	258.45	2535.4	617.41	0.0	1.96	615.45	548.9	289.0	904.5	596.8	307.7	3.129	
07/08/2008	21:29:14	758.81	1038	320.54	55.1	0.0413	0.004116	261.52	2565.5	623.25	0.0	2.07	621.17	556.5	279.1	900.3	589.7	310.6	3.226	
07/08/2008	21:39:14	764.04	1035	323.27	54.7	0.0436	0.004126	264.25	2592.3	628.25	0.0	2.19	626.06	561.7	271.3	897.4	584.4	313.0	3.307	
07/08/2008	21:49:14	767.49	1033	325.93	54.4	0.046	0.004136	266.91	2618.4	633.05	0.0	2.30	630.74	565.1	265.7	896.4	581.1	315.4	3.374	
07/08/2008	21:59:14	769.77	1032	328.71	54.0	0.048	0.004146	269.69	2645.7	638.10	0.0	2.42	635.68	567.4	261.9	897.5	579.7	317.8	3.428	
07/08/2008	22:09:14	771.15	1030	331.32	53.7	0.050	0.004156	272.30	2671.3	642.72	0.0	2.53	640.19	568.8	258.6	898.8	578.7	320.1	3.476	
07/08/2008	22:19:14	771.91	1028	333.7	53.3	0.053	0.004166	274.68	2694.6	646.77	0.0	2.65	644.13	569.6	256.2	900.3	578.2	322.1	3.515	
07/08/2008	22:29:14	771.49	1026	336.12	53.0	0.055	0.004176	277.10	2718.3	650.89	0.0	2.76	648.13	569.1	254.2	902.3	578.2	324.1	3.550	
07/08/2008	22:39:14	771.79	1024	338.38	52.6	0.057	0.004187	279.36	2740.5	654.61	0.0	2.88	651.73	569.4	252.5	904.2	578.4	325.9	3.581	
07/08/2008	22:49:14	771.57	1023	340.67	52.3	0.060	0.004197	281.65	2763.0	658.37	0.0	2.99	655.37	569.2	251.5	906.9	579.2	327.7	3.606	
07/08/2008	22:59:14	771.14	1022	342.89	51.9	0.062	0.004207	283.87	2784.8	661.93	0.0	3.11	658.83	568.8	251.1	909.9	580.5	329.4	3.624	
07/08/2008	23:09:14	770.46	1021	345.29	51.6	0.064	0.004217	286.27	2808.3	665.90	0.0	3.22	662.67	568.1	250.4	913.1	581.8	331.3	3.646	
07/08/2008	23:19:14	769.01	1020	347.54	51.2	0.067	0.004228	288.52	2830.4	669.49	0.0	3.34	666.15	566.7	250.5	916.7	583.6	333.1	3.659	
07/08/2008	23:29:14	767.74	1018	349.78	50.9	0.069	0.004238	290.76	2852.3	673.02	0.0	3.45	669.57	565.4	250.4	920.0	585.2	334.8	3.674	
07/08/2008	23:39:14	766.68	1017	351.97	50.5	0.071	0.004249	292.95	2873.8	676.42	0.0	3.57	672.85	564.3	250.8	923.7	587.2	336.4	3.683	
07/08/2008	23:49:14	776.31	1027	354.63	50.2	0.073	0.004259	295.61	2899.9	680.88	0.0	3.68	677.19	574.0	250.9	928.1	589.5	338.6	3.699	
07/08/2008	23:59:14	785.26	1037	357.24	49.8	0.076	0.004270	298.22	2925.5	685.19	0.0	3.80	681.39	582.9	251.3	932.7	592.0	340.7	3.712	
08/08/2008	0:09:14	781.89	1033	359.11	49.5	0.0780	0.004280	300.09	2943.9	687.77	0.0	3.91	683.86	579.5	251.5	935.4	593.4	341.9	3.719	
08/08/2008	0:19:14	777.67	1030	360.91	49.1	0.0803	0.004291	301.89	2961.5	690.18	0.0	4.03	686.15	575.3	252.1	938.2	595.1	343.1	3.722	
08/08/2008	0:29:14	774.63	1027	362.63	48.8	0.083	0.004302	303.61	2978.4	692.38	0.0	4.14	688.23	572.3	252.4	940.7	596.5	344.1	3.727	
08/08/2008	0:39:14	772.74	1026	364.34	48.4	0.085	0.004313	305.32	2995.2	694.53	0.0	4.26	690.27	570.4	252.9	943.2	598.0	345.1	3.729	
08/08/2008	0:49:14	770.32	1024	365.84	48.0	0.087	0.004323	306.82	3009.9	696.20	0.0	4.38	691.82	568.0	253.3	945.1	599.2	345.9	3.731	
08/08/2008	0:59:14	768.72	1022	367.2	47.7	0.090	0.004334	308.18	3023.2	697.52	0.0	4.49	693.03	566.4	253.5	946.6	600.0	346.5	3.734	
08/08/2008	1:09:14	766.02	1021	368.63	47.3	0.092	0.004345	309.61	3037.3	698.99	0.0	4.61	694.39	564.3	254.1	948.5	601.3	347.2	3.733	
08/08/2008	1:19:14	764.84	1019	370.05	47.0	0.094	0.004356	311.03	3051.2	700.42	0.0	4.72	695.70	562.5	254.2	949.9	602.1	347.9	3.737	
08/08/2008	1:29:14	763.05	1018	371.5	46.6	0.096	0.004367	312.48	3065.4	701.91	0.0	4.84	697.07	560.7	255.0	952.0	603.5	348.5	3.734	
08/08/2008	1:39:14	761.14	1016	372.77	46.3	0.099	0.004378	313.75	3077.9	702.97	0.0	4.95	698.02	558.8	255.0	953.0	604.0	349.0	3.738	
08/08/2008	1:49:14	759.53	1015	373.89	45.9	0.101	0.004390	314.87	3088.9	703.68	0.0	5.07	698.62	557.2	255.5	954.1	604.8	349.3	3.735	
08/08/2008	1:59:14	757.64	1013	375.09	45.6	0.103	0.004401	316.07	3100.6	704.56	0.0	5.18	699.38	555.3	255.8	955.1	605.5	349.7	3.735	
08/08/2008	2:09:14	756.12	1011	376.2	45.2	0.106	0.004412	317.18	3111.5	705.23	0.0	5.30	699.93	553.8	256.6	956.5	606.6	350.0	3.728	
08/08/2008	2:19:14	754.28	1011	377.42	44.9	0.108	0.004423	318.40	3123.5	706.12	0.0	5.41	700.71	551.9	256.9	957.6	607.2	350.4	3.728	
08/08/2008	2:29:14	752.92	1010	378.57	44.5	0.110	0.004435	319.55	3134.8	706.85	0.0	5.53	701.32	550.6	257.1	958.4	607.7	350.7	3.728	
08/08/2008	2:39:14	751.22	1009	379.61	44.2	0.112	0.004446	320.59	3145.0	707.32	0.0	5.64	701.68	548.9	257.4	959.1	608.3	350.8	3.726	
08/08/2008	2:49:14	749.85	1008	380.88	43.8	0.115	0.004458	321.86	3157.4	708.29	0.0	5.76	702.53	547.5	258.0	960.6	609.4	351.3	3.722	
08/08/2008	2:59:14	748.09	1007	382.03	43.5	0.117	0.004469	323.01	3168.7	708.97	0.0	5.87	703.10	545.7	258.5	961.6	610.1	351.6	3.720	
08/08/2008	3><																			

Deviator Stress versus Axial Strain**Induced Pore-Water Pressure versus Axial Strain****p' versus q****Major/Minor Stress**





TRIAXIAL COMPRESSION TESTING

Project: Pebble EastDate: 01-Sep-08 MDH Job #: L1086Sample: 3847Test No: 4 Test Designation: CU (Effective confining pressure: 2000 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	<u>909.82</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.63</u>
Sample height (mm):	<u> </u>	<u>152.40</u>
Water Content:		
	height : diameter ratio: <u>2.1</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1441</u>	
	Dry density (kg/m ³): <u>1302</u>	
Water Content (%):	<u>10.6%</u>	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	<u>-</u>
Mass of pan + dry soil (g): (g):	<u>-</u>
Mass of dry soil (g):	<u>-</u>

Comments:

Sample at end of test

Sample Failure

Change in height during saturation (mm): 0.00
 Sample height after saturation (mm): 152.40
 Change in volume during saturation (m³3): 1.7E-05
 Change in height during consolidation (mm): 4.23
 Sample height after consolidation (mm): 156.63
 Change in volume during consolidation (ml): 22.58 (up to 700 kPa cell pressure)
 Change in volume during consolidation (m³3): 2.3E-05
 Sample area after consolidation (m²2): 0.0038
 Rate of strain (mm/min): 0.04

Load due to cell pressure:

109.45 kgs

failure criterion	max deviator stress	max. obliquity (ma/min)
σ'_3	1624.9	1624.9
σ'_1	5090.6	5090.6
strain	29.10%	29.10%
σ'_1/σ'_3	3.133	3.133
ϕ' (deg)	31.1	31.1

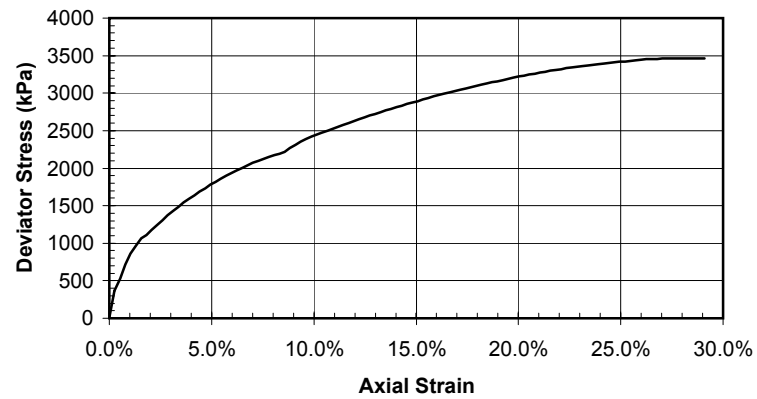
(computed from equation $\sin \phi = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

Date	Time	Pore Pressure		Cell kPa	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)						
												Filter Paper (kPa)	Rubber Membrane (kPa)							
02/09/2008	17:07:34	198.64	2118	111.7	63.13	0.000	0.003778	2.25	22.1	5.84	0.0	0.00	5.83	0.0	1919.3	1925.1	1922.2	2.9	1.003	
02/09/2008	17:17:34	363.17	2097	252.74	62.72	0.003	0.003788	143.29	1405.7	371.11	0.0	0.13	370.98	164.5	1734.1	2105.1	1919.6	185.5	1.214	
02/09/2008	17:27:34	424.32	2077	315.63	62.32	0.005	0.003798	206.18	2022.6	532.61	0.0	0.27	532.34	225.7	1652.6	2184.9	1918.7	266.2	1.322	
02/09/2008	17:37:34	525.72	2060	386.55	61.91	0.008	0.003808	277.10	2718.3	713.94	0.0	0.40	713.54	327.1	1534.3	2247.8	1891.0	356.8	1.465	
02/09/2008	17:47:34	607.09	2053	443.92	61.50	0.010	0.003818	334.47	3281.1	859.50	0.0	0.53	858.96	408.5	1445.9	2304.9	1875.4	429.5	1.594	
02/09/2008	17:57:34	673.7	2046	489.42	61.10	0.013	0.003828	379.97	3727.5	973.85	0.0	0.67	973.19	475.1	1372.0	2345.1	1858.5	486.6	1.709	
02/09/2008	18:07:34	723.69	2039	526.85	60.69	0.016	0.003838	417.40	4094.7	1066.97	0.0	0.80	1066.17	525.1	1315.1	2381.2	1848.2	533.1	1.811	
02/09/2008	18:17:34	637.06	2033	545.32	60.28	0.018	0.003848	435.87	4275.9	1111.24	0.0	0.93	1110.31	438.4	1395.9	2506.2	1951.1	555.2	1.795	
02/09/2008	18:27:34	594.21	2029	571.28	59.87	0.021	0.003858	461.83	4530.5	1174.31	0.0	1.07	1173.25	395.6	1434.9	2608.1	2021.5	586.6	1.818	
02/09/2008	18:37:34	583.13	2025	599.76	59.47	0.023	0.003868	490.31	4809.9	1243.42	0.0	1.20	1242.22	384.5	1441.9	2684.1	2063.0	621.1	1.862	
02/09/2008	18:47:34	579.5	2022	627.25	59.06	0.026	0.003879	517.80	5079.6	1309.64	0.0	1.33	1308.31	380.9	1442.6	2750.9	2096.7	654.2	1.907	
02/09/2008	18:57:34	578.4	2019	653.46	58.65	0.029	0.003889	544.01	5336.7	1372.26	0.0	1.47	1370.80	379.8	1440.4	2811.2	2125.8	685.4	1.952	
02/09/2008	19:07:34	581.59	2016	678.18	58.25	0.031	0.003899	568.73	5579.2	1430.78	0.0	1.60	1429.18	383.0	1434.8	2864.0	2149.4	714.6	1.996	
02/09/2008	19:17:34	600.68	2027	703.18	57.84	0.034	0.003910	593.73	5824.5	1489.67	0.0	1.73	1487.94	402.0	1426.3	2914.3	2170.3	744.0	2.043	
02/09/2008	19:27:34	600.35	2023	726.83	57.43	0.036	0.003920	617.38	6056.5	1544.84	0.0	1.87	1542.97	401.7	1422.3	2965.2	2193.7	771.5	2.085	
02/09/2008	19:37:34	600.09	2017	748.72	57.03	0.039	0.003931	639.27	6271.2	1595.30	0.0	2.00	1593.30	401.5	1417.4	3010.7	2214.0	796.7	2.124	
02/09/2008	19:47:34	598.98	2013	769.93	56.62	0.042	0.003942	660.48	6479.3	1643.77	0.0	2.13	1641.64	400.3	1414.4	3056.1	2235.3	820.8	2.161	
02/09/2008	19:57:34	598.47	2009	790.59	56.21	0.0442	0.003952	681.14	6820.2	1690.60	0.0	2.26	1688.33	399.8	1410.6	3098.9	2254.8	844.2	2.197	
02/09/2008	20:07:34	602.41	2011	810.81	55.80	0.0468	0.003963	701.36	6880.3	1736.05	0.0	2.40	1733.65	403.8	1408.6	3142.3	2275.4	866.8	2.231	
02/09/2008	20:17:34	605.52	2014	831.09	55.40	0.0494	0.003974	721.64	7079.3	1781.38	0.0	2.53	1778.85	406.9	1408.6	3187.5	2298.1	889.4	2.263	
02/09/2008	20:27:34	604.64	2013	849.92	54.99	0.052	0.003985	740.47	7264.0	1822.86	0.0	2.66	1820.20	406.0	1408.8	3229.0	2318.9	910.1	2.292	
02/09/2008	20:37:34	600.28	2009	868.97	54.58	0.055	0.003996	759.52	7450.9	1864.64	0.0	2.80	1861.84	401.6	1408.5	3270.4	2339.4	930.9	2.322	
02/09/2008	20:47:34	596.25	2005	886.67	54.18	0.057	0.004007	777.22	7624.5	1902.85	0.0	2.93	1899.91	397.6	1409.1	3309.0	2359.0	950.0	2.348	
02/09/2008	20:57:34	594.23	2003	904.28	53.77	0.060	0.004018	794.83	7797.3	1940.60	0.0	3.06	1937.53	395.6	1409.0	3346.5	2377.7	968.8	2.375	
02/09/2008	21:07:34	599.42	2003	921.67	53.36	0.062	0.004029	812.22	7967.9	1977.57	0.0	3.20	1974.38	400.8	1403.1	3377.5	2390.3	987.2	2.407	
02/09/2008	21:17:34	599.71	1999	937.54	52.96	0.065	0.004040	828.09	8123.6	2010.63	0.0	3.33	2007.30	401.1	1399.4	3406.7	2403.1	1003.6	2.434	
02/09/2008	21:27:34	602.32	1997	953.13	52.55	0.068	0.004052	843.68	8276.5	2042.79	0.0	3.46	2039.32	403.7	1394.7	3434.0	2414.4	1019.7	2.462	
02/09/2008	21:37:34	608.56	1995	967.78	52.14	0.070	0.004063	858.33	8420.2	2072.47	0.0	3.60	2068.87	409.9	1386.5	3455.4	2420.9	1034.4	2.492	
02/09/2008	21:47:34	615.74	1994	981.28	51.73	0.073	0.004074	871.83	8552.6	2099.18	0.0	3.73	2095.45	417.1	1377.9	3473.4	2425.7	1047.7	2.521	
02/09/2008	21:57:34	624.44	1992	994.51	51.33	0.075	0.004086	885.06	8682.4	2125.06	0.0	3.86	2121.20	425.8	1367.9	3489.1	2428.5	1060.6	2.551	
02/09/2008	22:07:34	631.15	1992	1007.8	50.92	0.078	0.004097	898.33	8812.6	2150.86	0.0	4.00	2146.87	432.5	1360.5	3507.4	2433.9	1073.4	2.578	
02/09/2008	22:17:34	635.44	1990	1020.8	50.51	0.081	0.004109	911.33	8940.1	2175.84	0.0	4.13	2171.71	436.8	1354.8	3526.6	2440.7	1085.9	2.603	
02/09/2008	22:27:34	642.08	1989	1033.2	50.11	0.083	0.004120	923.70	9061.5	2199.14	0.0	4.26	2194.88	443.4	1347.1	3542.0	2444.5	1097.4	2.629	
02/09/2008	22:37:34	645.64	1987	1044.6	49.70	0.086	0.004132	935.19	9174.2	2220.19	0.0	4.40	2215.79	447.0	1341.2	3557.0	2449.1	1107.9	2.652	
02/09/2008	22:47:34	606.32	2032	1068.3	49.29	0.0883	0.004144	958.86	9406.4	2269.91	0.0	4.53	2265.38	407.7	1425.9	3691.3	2558.6	1132.7	2.589	
02/09/2008	22:57:34	563.31	2030	1091.4	48.89	0.0909	0.004156	981.94	9632.8	2317.92	0.0	4.66	2313.26	364.7	1466.9	3780.2	2623.6	1156.6	2.577	
02/09/2008	23:07:34	536.67	2023	1113.3	48.48	0.094	0.004168	1001.81	9827.7	2358.07	0.0	4.80	2353.27	338.0	1486.6	3839.9	2663.2	1176.6	2.583	
02/09/2008	23:17:34	521.22	2018	1128.9	48.07	0.096	0.004180	1019.42	10000.5	2392.64	0.0	4.93	2387.71	322.6	1496.6	3884.3	2690.4	1193.9	2.595	
02/09/2008	23:27:34	511.26	2015	1144.9	47.66	0.099	0.004192	1035.43	10157.6	2423.23	0.0	5.06	2418.17	312.6	1503.5	3921.7	2712.6	1209.1	2.608	
02/09/2008	23:37:34	504.16	2012	1160.5	47.26	0.101	0.004204	1051.00	10310.3	2452.58	0.0	5.20	2447.38	305.5	1507.9	3955.3	2731.6	1223.7	2.623	
02/09/2008	23:47:34	499.23	2011	1175.4	46.85	0.104	0.004216	1065.95	10457.0	2480.27	0.0	5.33	2474.94	300.6	1511.3	3986.2	2748.8	1237.5	2.638	
02/09/2008	23:57:34	494.76	2009	1190.1	46.44	0.107	0.004228	1080.62	10600.9	2507.11	0.0	5.46	2501.65	296.1	1513.9	4015.5	2764.7	1250.8	2.652	
03/09/2008	0:07:34	488.69	2007	1204.7	46.04	0.109	0.004241	1095.22	10744.1	2533.60	0.0	5.60	2528.00	290.1	1517.9	4045.9	2781.9	1264.0	2.665	
03/09/2008	0:17:34	484.23	2005	1219.2	45.63	0.112	0.004253	1109.74	10886.5	2559.70	0.0	5.73	2553.97	285.6	1520.9	4074.8	2797.8	1277.0	2.679	
03/09/2008	0:27:34	478.55	2002	1233.5	45.22	0.114	0.004266	1124.05	11026.9	2585.12	0.0	5.86	2579.26	279.9	1523.3	4102.6	2812.9	1289.6	2.693	
03/09/2008	0:37:34	474.46	1998	1247.4	44.82	0.117	0.004278	1137.94	11163.2	2609.39	0.0	6.00	2603.39	275.8	1524.0	4127.4	2825.7	1301.7	2.708	
03/09/2008	0:47:34	470.93	1997	1261.8	44.41	0.120	0.004291	1152.39	11304.9	2634.75	0.0	6.13	2628.62	272.3	1526.5	4155.1	2840.8	1314.3	2.722	
03/09/2008	0:57:34	466.14	1996	1276.3	44.00	0.122	0.004303	1166.82	11446.5	2659.87	0.0	6.26	2653.60	267.5	1526.9	4183.2	2856.4	1326.8	2.735	
03/09/2008	1:07:34	461.63																		

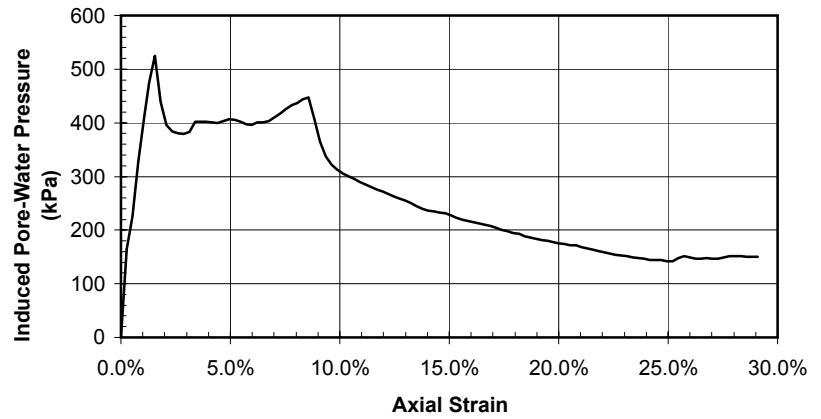
Date	Time						(σ ₁ -σ ₃) Deviator Stress					Δu	σ ₃	σ ₁	p' (σ' ₁ +σ' ₃)/2	q (σ' ₁ -σ' ₃)/2	(σ ₁ σ ₃)		
		Pore Pressure (kPa)	Cell kPa	Load Cell (kN)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load (kgs) (N)	Uncorrected (kPa)	Corrections		Corrected (kPa)	Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)				Effective Major Principal Stress (kPa)	
										Filter Paper (kPa)	Rubber Membrane (kPa)								
03/09/2008	8:47:34	342.4	1971	1850.6	24.87	0.244	0.004999	1741.16	17080.8	3416.94	0.0	12.52	3404.42	143.8	1628.8	5033.2	3331.0	1702.2	3.090
03/09/2008	8:57:34	342.39	1971	1859.6	24.47	0.247	0.005016	1750.10	17168.5	3422.68	0.0	12.66	3410.02	143.8	1628.2	5038.2	3333.2	1705.0	3.094
03/09/2008	9:07:34	341.04	1970	1869.1	24.06	0.249	0.005033	1759.66	17262.3	3429.50	0.0	12.79	3416.71	142.4	1628.5	5045.2	3336.8	1708.4	3.098
03/09/2008	9:17:34	340.95	1970	1878.6	23.65	0.252	0.005051	1769.18	17355.6	3436.12	0.0	12.92	3423.19	142.3	1628.8	5052.0	3340.4	1711.6	3.102
03/09/2008	9:27:34	346.66	1978	1889	23.24	0.255	0.005069	1779.53	17457.2	3444.21	0.0	13.06	3431.16	148.0	1631.5	5062.7	3347.1	1715.6	3.103
03/09/2008	9:37:34	349.6	1985	1900.4	22.84	0.257	0.005086	1790.90	17568.7	3454.13	0.0	13.19	3440.94	151.0	1635.1	5076.1	3355.6	1720.5	3.104
03/09/2008	9:47:34	347.89	1985	1910.2	22.43	0.260	0.005104	1800.70	17664.9	3460.89	0.0	13.32	3447.56	149.3	1637.0	5084.5	3360.7	1723.8	3.106
03/09/2008	9:57:34	344.89	1982	1919.4	22.02	0.262	0.005122	1809.95	17755.6	3466.45	0.0	13.46	3452.99	146.3	1637.2	5090.2	3363.7	1726.5	3.109
03/09/2008	10:07:34	345.08	1981	1927.6	21.62	0.265	0.005140	1818.16	17836.1	3469.91	0.0	13.59	3456.32	146.4	1635.7	5092.0	3363.8	1728.2	3.113
03/09/2008	10:17:34	346.5	1981	1934.6	21.21	0.268	0.005158	1825.16	17904.8	3470.95	0.0	13.72	3457.23	147.9	1634.1	5091.3	3362.7	1728.6	3.116
03/09/2008	10:27:34	345.18	1979	1943.1	20.80	0.270	0.005177	1833.67	17988.3	3474.76	0.0	13.86	3460.91	146.5	1634.0	5094.9	3364.5	1730.5	3.118
03/09/2008	10:37:34	345.13	1978	1950.7	20.40	0.273	0.005195	1841.25	18062.7	3476.70	0.0	13.99	3462.71	146.5	1632.9	5095.6	3364.3	1731.4	3.121
03/09/2008	10:47:34	348.31	1978	1957.5	19.99	0.275	0.005214	1848.09	18129.8	3477.15	0.0	14.12	3463.02	149.7	1629.5	5092.6	3361.0	1731.5	3.125
03/09/2008	10:57:34	349.95	1977	1963.8	19.58	0.278	0.005233	1854.39	18191.6	3476.49	0.0	14.26	3462.23	151.3	1626.8	5089.0	3357.9	1731.1	3.128
03/09/2008	11:07:34	350.36	1976	1970.2	19.17	0.281	0.005252	1860.74	18253.9	3475.84	0.0	14.39	3461.45	151.7	1625.6	5087.1	3356.3	1730.7	3.129
03/09/2008	11:17:34	349.6	1976	1978.7	18.77	0.283	0.005271	1869.20	18336.8	3479.03	0.0	14.52	3464.51	151.0	1626.3	5090.8	3358.6	1732.3	3.130
03/09/2008	11:27:34	349.26	1975	1985.5	18.36	0.286	0.005290	1876.00	18403.6	3479.03	0.0	14.66	3464.37	150.6	1625.5	5089.9	3357.7	1732.2	3.131
03/09/2008	11:37:34	349.31	1975	1992.9	17.95	0.288	0.005309	1883.47	18476.8	3480.17	0.0	14.79	3465.38	150.7	1625.6	5091.0	3358.3	1732.7	3.132
03/09/2008	11:47:34	349.07	1974	2000.1	17.55	0.291	0.005329	1890.62	18547.0	3480.62	0.0	14.92	3465.70	150.4	1624.9	5090.6	3357.7	1732.9	3.133

#3847 (4) 2000 kPa

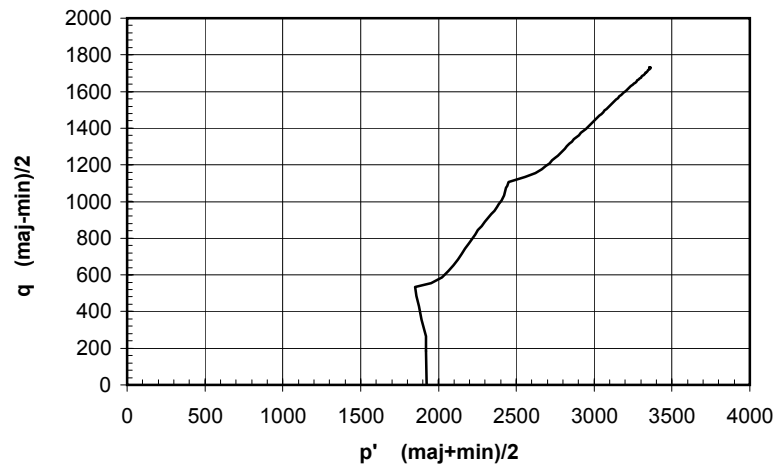
Deviator Stress versus Axial Strain



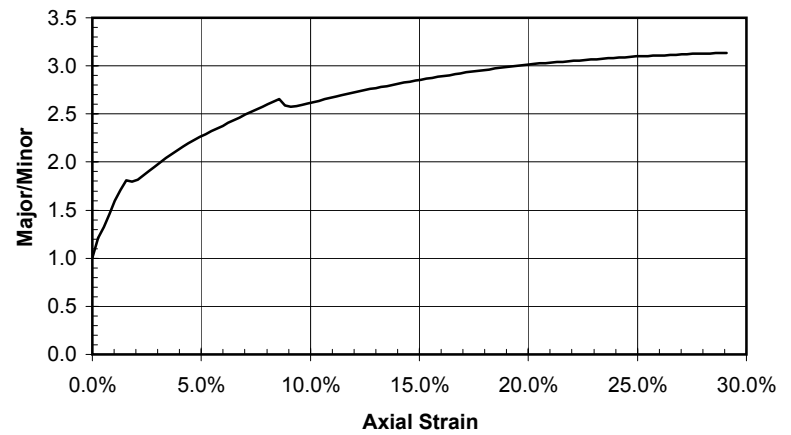
Induced Pore-Water Pressure versus Axial Strain

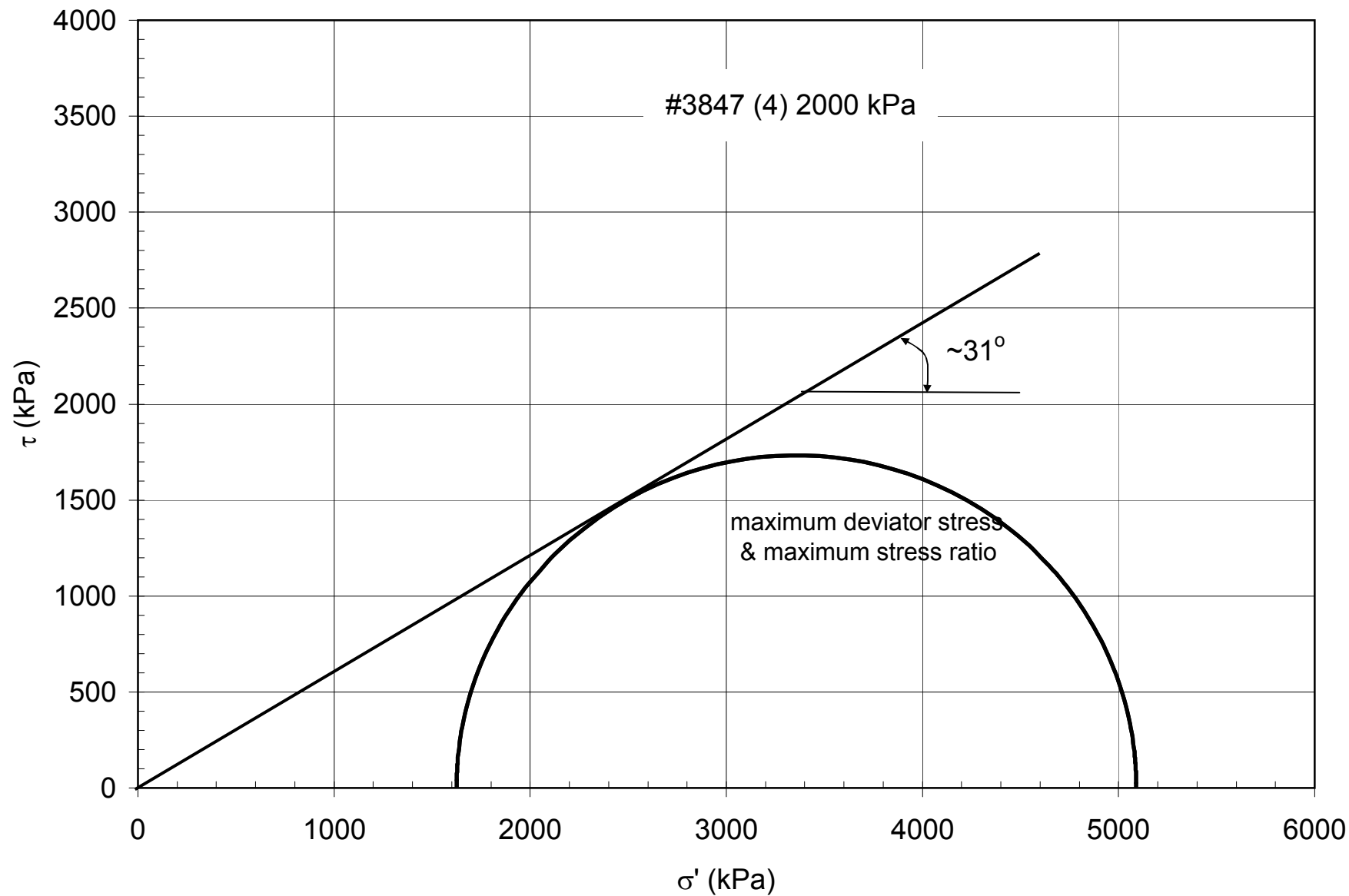



p' versus q



Major/Minor Stress





	TRIAXIAL COMPRESSION TESTING	
	Project: <u>Pebble East</u>	
	Date: <u>08-Jul-08</u> MDH Job #: <u>L1086</u>	
Sample: <u>80G + 20Y Underflow</u>		
Test No: <u>2</u> Test Designation: <u>CU</u> (Effective confining pressure: <u>200 kPa</u>)		
PRE-TEST INFORMATION		
Wet sample mass,g	<u>1019.42</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.60</u>
Sample height (mm):	<u> </u>	<u>152.30</u>
Water Content:		
	height : diameter ratio: <u>2.1</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1617</u>	
	Dry density (kg/m ³): <u>1344</u>	
Water Content (%): <u>20.3%</u>		
Comments:		
POST-TEST INFORMATION		
<div style="text-align: right;"> Mass of pan (g): <u> </u> - Mass of pan + dry soil (g): (g): <u> </u> - Mass of dry soil (g): <u> </u> - </div>		
Comments:	Sample at end of test	

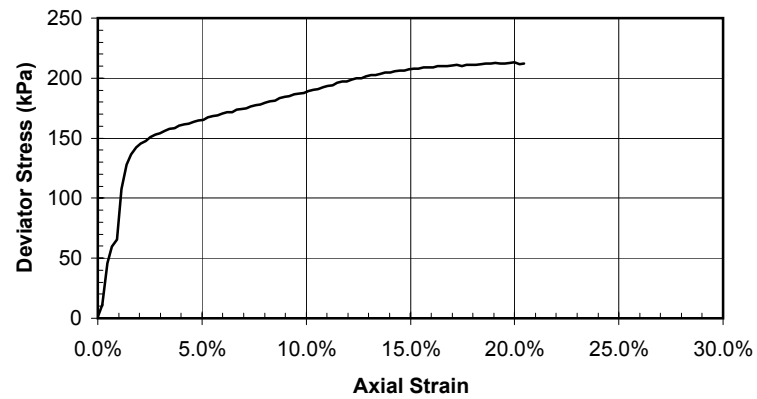
Sample Failure

Change in height during saturation (mm):	0.00	failure criterion	max deviator stress	max. obliquity (ma/min)
Sample height after saturation (mm):	152.30			
Change in volume during saturation (m³3):	1.4E-05			
Change in height during consolidation (mm):	0.00	σ'_3	85.7	70.1
Sample height after consolidation (mm):	152.30	σ'_1	298.2	256.6
Change in volume during consolidation (ml):	9.85	strain	19.10%	9.40%
Change in volume during consolidation (m³3):	9.9E-06	σ'_1/σ'_3	3.482	3.663
Sample area after consolidation (m²2):	0.0040	ϕ' (deg)	33.6	34.8
Rate of strain (mm/min):	0.035	(computed from equation $\sin \phi = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)		
Load due to cellpressure:	20.55	kgs		

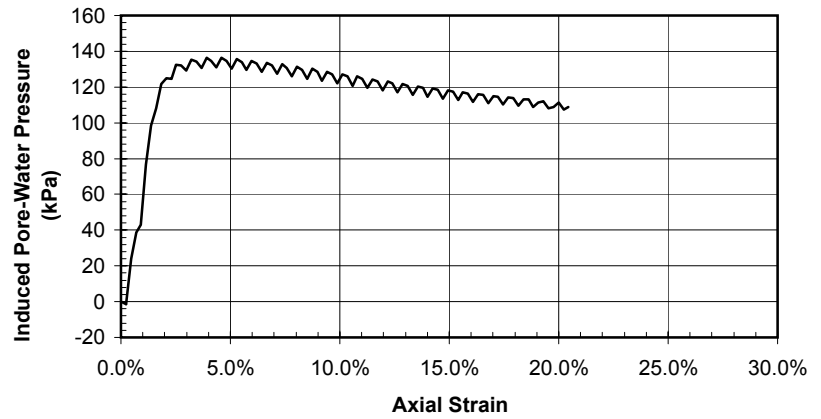
Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress				Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)						
												Filter Paper (kPa)	Rubber Membrane (kPa)							
05/07/2008	17:21:46	199.1	397.7	20.94	66.2	0.000	0.003983	0.39	3.8	0.95	0.0	0.00	0.93	0.0	198.6	199.6	199.1	0.5	1.005	
05/07/2008	17:31:46	197.6	394.1	25.16	65.9	0.002	0.003992	4.61	45.2	11.32	0.0	0.11	11.20	-1.5	196.5	207.7	202.1	5.6	1.057	
05/07/2008	17:41:46	222.95	399.8	39.45	65.5	0.005	0.004001	18.90	185.4	46.32	0.0	0.23	46.09	23.9	176.8	222.9	199.9	23.0	1.261	
05/07/2008	17:51:46	237.94	397.6	45.2	65.2	0.007	0.004011	24.65	241.8	60.28	0.0	0.34	59.94	38.8	159.6	219.6	189.6	30.0	1.375	
05/07/2008	18:01:46	241.96	393.7	47.59	64.8	0.009	0.004020	27.04	265.2	65.97	0.0	0.46	65.51	42.9	151.7	217.2	184.5	32.8	1.432	
05/07/2008	18:11:46	275.74	399.1	65.05	64.5	0.011	0.004029	44.50	436.5	108.33	0.0	0.57	107.76	76.6	123.4	231.1	177.2	53.9	1.874	
05/07/2008	18:21:46	297.57	397.3	73.42	64.1	0.014	0.004039	52.87	518.6	128.41	0.0	0.69	127.72	98.5	99.8	227.5	163.6	63.9	2.280	
05/07/2008	18:31:46	307.38	393.7	77.15	63.8	0.016	0.004048	56.60	555.2	137.15	0.0	0.80	136.34	108.3	86.3	222.6	154.5	68.2	2.580	
05/07/2008	18:41:46	320.93	399.1	79.84	63.4	0.018	0.004058	59.29	581.6	143.33	0.0	0.92	142.41	121.8	78.2	220.6	149.4	71.2	2.822	
05/07/2008	18:51:46	324.18	397.1	81.37	63.1	0.021	0.004067	60.82	596.6	146.69	0.0	1.03	145.65	125.1	72.9	218.5	145.7	72.8	2.999	
05/07/2008	19:01:46	323.74	393.4	82.46	62.7	0.023	0.004077	61.91	607.3	148.96	0.0	1.15	147.82	124.6	69.7	217.5	143.6	73.9	3.122	
05/07/2008	19:11:46	331.4	399.1	83.95	62.4	0.025	0.004086	63.40	621.9	152.19	0.0	1.26	150.93	132.3	67.7	218.6	143.2	75.5	3.229	
05/07/2008	19:21:46	331.08	397.1	84.96	62.0	0.028	0.004096	64.41	631.8	154.25	0.0	1.38	152.87	132.0	66.0	218.9	142.4	76.4	3.317	
05/07/2008	19:31:46	328.33	393.2	85.7	61.7	0.030	0.004106	65.15	639.1	155.65	0.0	1.49	154.16	129.2	64.8	219.0	141.9	77.1	3.378	
05/07/2008	19:41:46	334.5	398.5	86.86	61.3	0.032	0.004115	66.31	650.5	158.05	0.0	1.61	156.44	135.4	64.0	220.5	142.3	78.2	3.443	
05/07/2008	19:51:46	333.33	397.1	87.57	61.0	0.034	0.004125	67.02	657.4	159.36	0.0	1.72	157.64	134.2	63.7	221.4	142.6	78.8	3.474	
05/07/2008	20:01:46	329.88	393.3	88.16	60.6	0.037	0.004135	67.61	663.2	160.38	0.0	1.84	158.55	130.8	63.4	221.9	142.7	79.3	3.501	
05/07/2008	20:11:46	335.51	398.8	89.07	60.3	0.0391	0.004145	68.52	672.1	162.16	0.0	1.95	160.21	136.4	63.3	223.5	143.4	80.1	3.530	
05/07/2008	20:21:46	333.77	396.9	89.85	59.9	0.0414	0.004155	69.30	679.8	163.61	0.0	2.07	161.54	134.7	63.1	224.6	143.9	80.8	3.561	
05/07/2008	20:31:46	330.04	393.3	90.19	59.6	0.0437	0.004165	69.64	683.1	164.02	0.0	2.18	161.84	130.9	63.3	225.1	144.2	80.9	3.588	
05/07/2008	20:41:46	335.35	398.9	91.24	59.2	0.046	0.004175	70.69	693.4	166.09	0.0	2.30	163.80	136.3	63.6	227.4	145.5	81.9	3.577	
05/07/2008	20:51:46	333.68	397.2	91.87	58.9	0.048	0.004185	71.32	699.6	167.17	0.0	2.41	164.76	134.6	63.5	228.2	145.9	82.4	3.595	
05/07/2008	21:01:46	329.53	393.3	92.36	58.5	0.051	0.004195	71.81	704.4	167.91	0.0	2.52	165.39	130.4	63.5	228.9	146.2	82.7	3.604	
05/07/2008	21:11:46	334.76	398.4	93.39	58.2	0.053	0.004205	72.84	714.5	169.91	0.0	2.64	167.27	135.7	63.7	230.9	147.3	83.6	3.628	
05/07/2008	21:21:46	332.96	397.1	94.1	57.8	0.055	0.004216	73.55	721.5	171.15	0.0	2.75	168.39	133.9	64.1	232.5	148.3	84.2	3.627	
05/07/2008	21:31:46	328.53	392.9	94.5	57.5	0.057	0.004226	73.95	725.4	171.66	0.0	2.87	168.79	129.4	64.3	233.1	148.7	84.4	3.623	
05/07/2008	21:41:46	333.81	398.4	95.47	57.1	0.060	0.004236	74.92	734.9	173.49	0.0	2.98	170.50	134.7	64.6	235.1	149.9	85.3	3.639	
05/07/2008	21:51:46	332.12	397.1	96.09	56.8	0.062	0.004247	75.54	741.0	174.49	0.0	3.10	171.40	133.0	64.9	236.3	150.6	85.7	3.640	
05/07/2008	22:01:46	327.5	392.8	96.5	56.4	0.064	0.004257	75.95	745.0	175.01	0.0	3.21	171.80	128.4	65.3	237.1	151.2	85.9	3.631	
05/07/2008	22:11:46	332.77	398.4	97.49	56.1	0.067	0.004267	76.94	754.7	176.86	0.0	3.33	173.53	133.7	65.7	239.2	152.4	86.8	3.643	
05/07/2008	22:21:46	331.3	397.1	98.12	55.7	0.069	0.004278	77.57	760.9	177.87	0.0	3.44	174.42	132.2	65.8	240.2	153.0	87.2	3.651	
05/07/2008	22:31:46	326.36	392.3	98.53	55.4	0.071	0.004289	77.98	764.9	178.37	0.0	3.56	174.81	127.3	65.9	240.7	153.3	87.4	3.649	
05/07/2008	22:41:46	331.74	398.4	99.58	55.0	0.074	0.004299	79.03	775.2	180.32	0.0	3.67	176.65	132.6	66.7	243.3	155.0	88.3	3.649	
05/07/2008	22:51:46	329.91	396.9	100.2	54.7	0.076	0.004310	79.65	781.3	181.28	0.0	3.79	177.50	130.8	67.0	244.5	155.7	88.7	3.650	
05/07/2008	23:01:46	325.07	392.3	100.65	54.3	0.0781	0.004321	80.10	785.7	181.86	0.0	3.90	177.95	126.0	67.2	245.2	156.2	89.0	3.647	
05/07/2008	23:11:46	330.37	398	101.73	54.0	0.0804	0.004331	81.18	796.3	183.85	0.0	4.02	179.83	131.3	67.6	247.5	157.6	89.9	3.659	
05/07/2008	23:21:46	328.82	397.1	102.42	53.6	0.083	0.004342	81.87	803.1	184.95	0.0	4.13	180.82	129.7	68.2	249.1	158.6	90.4	3.650	
05/07/2008	23:31:46	323.71	392.3	102.79	53.3	0.085	0.004353	82.24	806.7	185.32	0.0	4.25	181.07	124.6	68.6	249.7	159.1	90.5	3.640	
05/07/2008	23:41:46	329.33	398.4	103.98	52.9	0.087	0.004364	83.43	818.4	187.53	0.0	4.36	183.17	130.2	69.1	252.3	160.7	91.6	3.651	
05/07/2008	23:51:46	327.51	396.9	104.75	52.6	0.090	0.004375	84.20	826.0	188.78	0.0	4.48	184.31	128.4	69.4	253.7	161.5	92.2	3.657	
06/07/2008	0:01:46	322.5	392.3	105.24	52.2	0.092	0.004386	84.69	830.8	189.40	0.0	4.59	184.81	123.4	69.8	254.6	162.2	92.4	3.648	
06/07/2008	0:11:46	327.68	397.7	106.28	51.9	0.094	0.004397	85.73	841.0	191.24	0.0	4.70	186.54	128.6	70.1	256.6	163.3	93.3	3.663	
06/07/2008	0:21:46	326.16	397.1	106.92	51.5	0.097	0.004409	86.37	847.2	192.18	0.0	4.82	187.36	127.1	70.9	258.3	164.6	93.7	3.643	
06/07/2008	0:31:46	321.14	392.3	107.37	51.2	0.099	0.004420	86.82	851.7	192.69	0.0	4.93	187.76	122.0	71.2	258.9	165.0	93.9	3.639	
06/07/2008	0:41:46	326.26	397.8	108.41	50.8	0.101	0.004431	87.86	861.9	194.50	0.0	5.05	189.45	127.2	71.5	260.9	166.2	94.7	3.650	
06/07/2008	0:51:46	325.07	397.3	109.05	50.5	0.103	0.004442	88.50	868.1	195.42	0.0	5.16	190.25	126.0	72.2	262.5	167.4	95.1	3.634	
06/07/2008	1:01:46	319.76	392.3	109.52	50.1	0.106	0.004454	88.97	872.7	195.95	0.0	5.28	190.67	120.7	72.5	263.2	167.9	95.3	3.629	
06/07/2008	1:11:46	325.02	398.3	110.57	49.8	0.108	0.004465	90.02	883.0	197.76	0.0	5.39	192.36	125.9	73.3	265.7	169.5	96.2	3.624	
06/07/2008	1:21:46	323.65	397	111.32	49.4	0.110	0.004477	90.77	890.4	198.89	0.0	5.51	193.38	124.6	73.4	266.8	170.1	96.7	3.635	
06/07/2008	1:31:46	318.53	392.3	111.92	49.1	0.113	0.004488	91.37	896.3	199.69	0.0	5.62	194.06	119.4	73.8	267.8	170.8	97.0	3.631	
06/07/2008	1:41:46	323.49	397.7	113.2	48.7	0.115	0.004500	92.65	908.8	201.96	0.0	5.74	196.22	124.4	74.3	270.5				

80G + 20Y Underflow (Test No. 2)

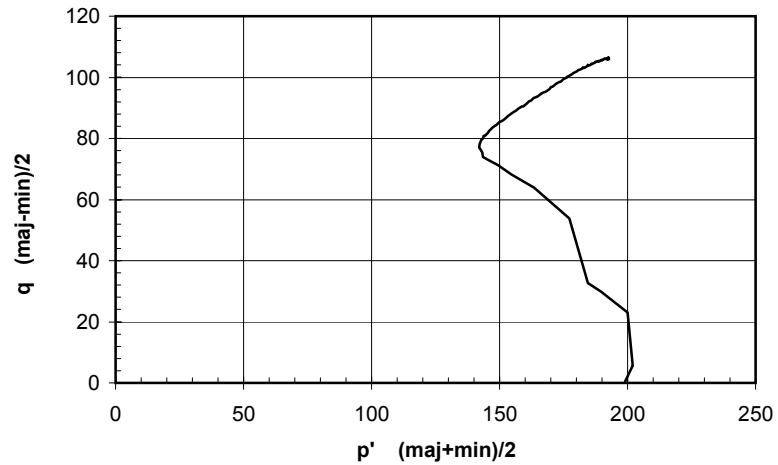
Deviator Stress versus Axial Strain



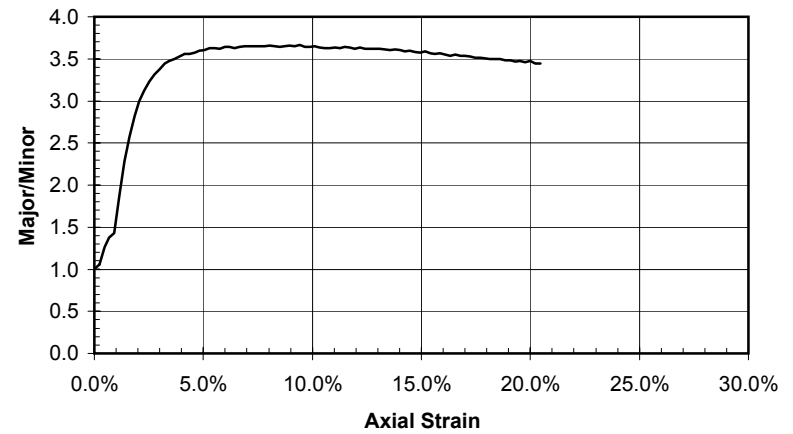
Induced Pore-Water Pressure versus Axial Strain

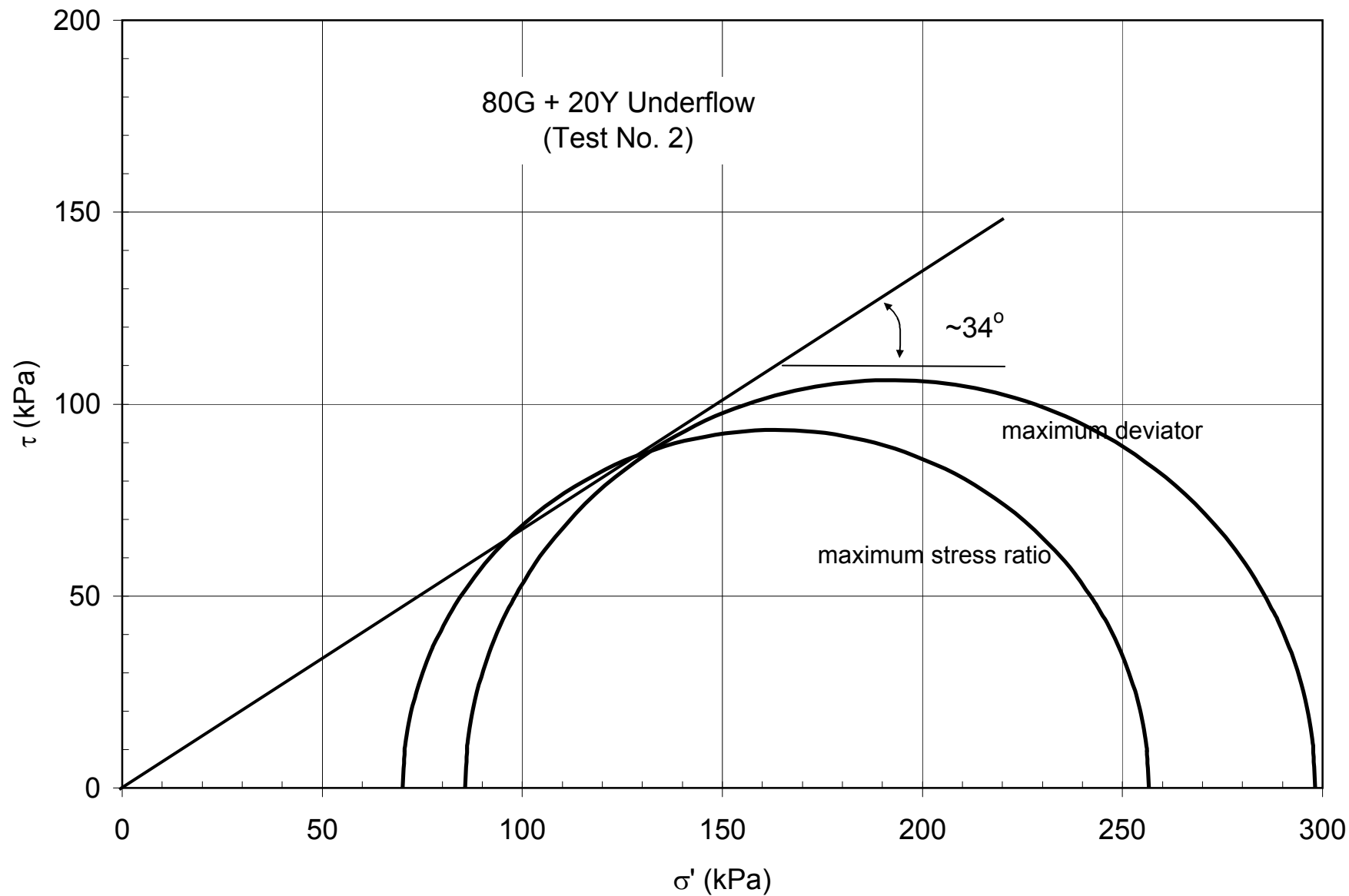



p' versus q



Major/Minor Stress





	TRIAXIAL COMPRESSION TESTING
Project: <u>Pebble East</u>	
Date: <u>31-Jul-08</u> MDH Job #: <u>L1086</u>	
Sample: <u>80G + 20Y Underflow</u>	
Test No: <u>1</u> Test Designation: <u>CU</u> (Effective confining pressure: <u>400 kPa</u>)	
PRE-TEST INFORMATION	
Wet sample mass, g <u>1160.89</u>	average:
Sample diameter (mm): _____	<u>72.75</u>
Sample height (mm): _____	<u>153.40</u>
Water Content:	
_____	height : diameter ratio: <u>2.11</u> : 1 (should range from 2 to 2.5 : 1)
_____	Wet density (kg/m ³): <u>1820</u>
_____	Dry density (kg/m ³): <u>1478</u>
Water Content (%): <u>23.2%</u>	
Comments:	
POST-TEST INFORMATION	
<div style="text-align: right; margin-right: 100px;"> Mass of pan (g): _____ Mass of pan + dry soil (g): (g): _____ Mass of dry soil (g): _____ </div>	
Comments:	Sample at end of test

Sample Failure

Change in height during saturation (mm):	0.00	failure criterion	max deviator stress	max. obliquity (ma/min)
Sample height after saturation (mm):	153.40			
Change in volume during saturation (m³3):	9.5E-06			
Change in height during consolidation (mm):	0.00			
Sample height after consolidation (mm):	153.40			
Change in volume during consolidation (ml):	10.20			
Change in volume during consolidation (m³3):	1.0E-05			
Sample area after consolidation (m²2):	0.0040	Load due to cellpressure:	35.95	kgs
Rate of strain (mm/min):	0.03			

σ'_3	392.3	256.0
σ'_1	1470.3	1024.2
strain	17.80%	7.60%
σ'_1/σ'_3	3.748	4.001
ϕ' (deg)	35.4	36.9

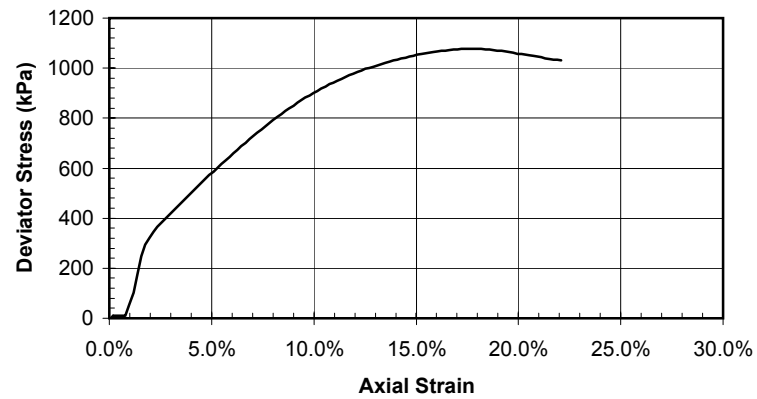
(computed from equation $\sin \phi = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

Date	Time	Pore Pressure		Cell (kPa)	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load		(σ ₁ -σ ₃) Deviator Stress			Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)	
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections								Corrected (kPa)
												Filter Paper (kPa)	Rubber Membrane (kPa)							
03/08/2008	13:26:22	299.72	695.7	33.91	62.3	0.000	0.004029	-2.04	-20.0	-4.98	0.0	0.00	-4.99	0.0	396.0	391.0	393.5	-2.5	0.987	
03/08/2008	13:36:22	301.59	695.7	40.66	62.0	0.002	0.004036	4.71	46.2	11.44	0.0	0.10	11.34	1.9	394.1	405.5	399.8	5.7	1.029	
03/08/2008	13:46:22	301.82	694.4	39.89	61.7	0.004	0.004044	3.94	38.6	9.55	0.0	0.19	9.35	2.1	392.5	401.9	397.2	4.7	1.024	
03/08/2008	13:56:22	303.28	695.5	40.02	61.4	0.006	0.004052	4.07	39.9	9.84	0.0	0.29	9.55	3.6	392.2	401.7	396.9	4.8	1.024	
03/08/2008	14:06:22	303.24	694.4	40.08	61.1	0.008	0.004060	4.13	40.5	9.97	0.0	0.39	9.58	3.5	391.1	400.7	395.9	4.8	1.024	
03/08/2008	14:16:22	318.38	693.7	58.66	60.8	0.010	0.004068	22.71	222.7	54.75	0.0	0.49	54.27	18.7	375.3	429.6	402.4	27.1	1.145	
03/08/2008	14:26:22	344.22	694.4	78.58	60.5	0.012	0.004076	42.63	418.2	102.59	0.0	0.58	102.00	44.5	350.1	452.1	401.1	51.0	1.291	
03/08/2008	14:36:22	385.36	693	110.23	60.2	0.014	0.004084	74.28	728.7	178.40	0.0	0.68	177.72	85.6	307.6	485.3	396.5	88.9	1.578	
03/08/2008	14:46:22	432.84	693.7	139.89	59.9	0.016	0.004092	103.94	1019.6	249.15	0.0	0.78	248.37	133.1	260.8	509.2	385.0	124.2	1.952	
03/08/2008	14:56:22	466.61	693.7	158.94	59.6	0.018	0.004101	122.99	1206.5	294.23	0.0	0.87	293.36	166.9	227.1	520.4	373.7	146.7	2.292	
03/08/2008	15:06:22	488.51	693	171.51	59.3	0.020	0.004109	135.56	1329.8	323.66	0.0	0.97	322.69	188.8	204.5	527.2	365.8	161.3	2.578	
03/08/2008	15:16:22	503.37	693	181.42	59.0	0.022	0.004117	145.47	1427.0	346.62	0.0	1.07	345.56	203.7	189.6	535.2	362.4	172.8	2.822	
03/08/2008	15:26:22	512.47	693.7	189.89	58.7	0.023	0.004125	153.94	1510.1	366.07	0.0	1.17	364.91	212.8	181.2	546.1	363.7	182.5	3.014	
03/08/2008	15:36:22	517.38	692.3	197.53	58.4	0.025	0.004133	161.58	1585.1	383.47	0.0	1.26	382.21	217.7	174.9	557.1	366.0	191.1	3.185	
03/08/2008	15:46:22	520.96	693	204.87	58.1	0.027	0.004142	168.92	1657.1	400.09	0.0	1.36	398.73	221.2	172.0	570.7	371.4	199.4	3.318	
03/08/2008	15:56:22	521.63	692.3	211.97	57.8	0.029	0.004150	176.02	1726.7	416.07	0.0	1.46	414.61	221.9	170.7	585.3	378.0	207.3	3.429	
03/08/2008	16:06:22	521.72	693	219.14	57.5	0.031	0.004158	183.19	1797.1	432.14	0.0	1.55	430.59	222.0	171.3	601.9	386.6	215.3	3.514	
03/08/2008	16:16:22	520.54	692.3	226.3	57.2	0.0332	0.004167	190.35	1867.3	448.13	0.0	1.65	446.48	220.8	171.8	618.3	395.0	223.2	3.599	
03/08/2008	16:26:22	517.9	691.6	233.48	56.9	0.0352	0.004175	197.53	1937.7	464.09	0.0	1.75	462.34	218.2	173.7	638.1	404.9	231.2	3.661	
03/08/2008	16:36:22	516.23	692.4	240.76	56.6	0.0372	0.004184	204.81	2009.1	480.22	0.0	1.84	478.38	216.5	176.1	654.5	415.3	239.2	3.716	
03/08/2008	16:46:22	513.14	692.3	248.16	56.3	0.039	0.004192	212.21	2081.7	496.56	0.0	1.94	494.62	213.4	179.2	678.4	426.5	247.3	3.761	
03/08/2008	16:56:22	509.37	691.6	255.38	56.0	0.041	0.004201	219.43	2152.6	512.41	0.0	2.04	510.37	209.7	182.3	692.6	437.4	255.2	3.800	
03/08/2008	17:06:22	506.96	692.9	262.67	55.7	0.043	0.004209	226.72	2224.1	528.35	0.0	2.14	526.22	207.2	186.0	712.2	449.1	263.1	3.830	
03/08/2008	17:16:22	502.65	692.3	269.84	55.4	0.045	0.004218	233.89	2294.4	543.95	0.0	2.23	541.72	202.9	189.7	731.4	460.5	270.9	3.856	
03/08/2008	17:26:22	498.41	691.6	276.94	55.1	0.047	0.004227	240.99	2364.1	559.32	0.0	2.33	556.98	198.7	193.2	750.2	471.7	278.5	3.882	
03/08/2008	17:36:22	494.69	692.3	283.97	54.8	0.049	0.004235	248.02	2433.0	574.45	0.0	2.43	572.02	195.0	197.6	769.6	483.6	286.0	3.895	
03/08/2008	17:46:22	489.75	690.9	291.09	54.5	0.051	0.004244	255.14	2502.9	589.73	0.0	2.52	587.20	190.0	201.2	788.4	494.8	293.6	3.919	
03/08/2008	17:56:22	486.35	691.9	297.99	54.2	0.053	0.004253	262.04	2570.6	604.43	0.0	2.62	601.81	186.6	205.5	807.3	506.4	300.9	3.928	
03/08/2008	18:06:22	482.06	691.6	305.01	53.9	0.055	0.004262	269.06	2639.4	619.34	0.0	2.72	616.62	182.3	209.6	826.2	517.9	308.3	3.942	
03/08/2008	18:16:22	477.13	690.9	311.6	53.6	0.057	0.004271	275.65	2704.1	633.19	0.0	2.82	630.38	177.4	213.8	844.2	529.0	315.2	3.948	
03/08/2008	18:26:22	473.63	691.6	318.66	53.3	0.059	0.004279	282.71	2773.3	648.07	0.0	2.91	645.15	173.9	218.0	863.1	540.6	322.6	3.960	
03/08/2008	18:36:22	469.19	691.6	325.51	53.0	0.061	0.004288	289.56	2840.5	662.39	0.0	3.01	659.38	169.5	222.5	881.8	552.1	329.7	3.964	
03/08/2008	18:46:22	464.43	691.4	332.26	52.7	0.063	0.004297	296.31	2906.8	676.42	0.0	3.11	673.31	164.7	227.0	900.3	563.6	336.7	3.966	
03/08/2008	18:56:22	460.79	692.1	339.23	52.4	0.065	0.004306	303.28	2975.1	690.89	0.0	3.20	687.68	161.1	231.3	919.0	575.2	343.8	3.973	
03/08/2008	19:06:22	456.22	691.6	346.04	52.1	0.0665	0.004315	310.09	3041.9	704.92	0.0	3.30	701.62	156.5	235.4	937.0	586.2	350.8	3.981	
03/08/2008	19:16:22	451.62	691	352.91	51.8	0.0684	0.004324	316.96	3109.3	719.03	0.0	3.40	715.63	151.9	239.4	955.0	597.2	357.8	3.990	
03/08/2008	19:26:22	447.8	691.6	359.63	51.5	0.070	0.004333	323.68	3175.3	732.74	0.0	3.50	729.24	148.1	243.8	973.1	608.4	364.6	3.991	
03/08/2008	19:36:22	442.53	690.3	366.19	51.2	0.072	0.004343	330.24	3239.6	746.01	0.0	3.59	742.42	142.8	247.7	990.2	618.9	371.2	3.997	
03/08/2008	19:46:22	439.41	691.6	372.71	50.9	0.074	0.004352	336.76	3303.6	759.14	0.0	3.69	755.45	139.7	252.2	1007.7	629.9	377.7	3.995	
03/08/2008	19:56:22	435.05	691	379.15	50.6	0.076	0.004361	343.20	3366.8	772.02	0.0	3.79	768.23	135.3	256.0	1024.2	640.1	384.1	4.001	
03/08/2008	20:06:22	430.48	690.9	385.62	50.3	0.078	0.004370	349.67	3430.2	784.91	0.0	3.88	781.03	130.8	260.5	1041.5	651.0	390.5	3.999	
03/08/2008	20:16:22	427.11	691.6	391.97	50.0	0.080	0.004380	356.02	3492.5	797.47	0.0	3.98	793.49	127.4	264.5	1058.0	661.3	396.7	4.000	
03/08/2008	20:26:22	423.07	691.6	398.31	49.7	0.082	0.004389	362.36	3554.7	809.94	0.0	4.08	805.87	123.4	268.6	1074.4	671.5	402.9	4.001	
03/08/2008	20:36:22	418.53	690.9	404.24	49.4	0.084	0.004398	368.29	3612.9	821.45	0.0	4.18	817.27	118.8	272.4	1089.7	681.0	408.6	4.000	
03/08/2008	20:46:22	415.07	691.6	410.11	49.1	0.086	0.004408	374.16	3670.5	832.76	0.0	4.27	828.48	115.4	276.5	1105.0	690.7	414.2	3.997	
03/08/2008	20:56:22	410.77	690.9	415.77	48.8	0.088	0.004417	379.82	3726.0	843.54	0.0	4.37	839.17	111.1	280.2	1119.3	699.7	419.6	3.995	
03/08/2008	21:06:22	407.43	691.6	421.61	48.5	0.090	0.004427	385.66	3783.3	854.68	0.0	4.47	850.21	107.7	284.2	1134.4	709.3	425.1	3.992	
03/08/2008	21:16:22	403.62	691	427.48	48.2	0.092	0.004436	391.53	3840.9	865.82	0.0	4.56	861.26	103.9	287.3	1148.6	718.0	430.6	3.997	
03/08/2008	21:26:22	399.33	690.6	432.93	47.9	0.094	0.004446	396.98	3894.3	875.98	0.0	4.66	871.32	99.6	291.3	1162.6	727.0	435.7	3.991	
03/08/2008	21:36:22	396.43	691	438.55	47.6	0.096	0.004455	402.60	3949.5	886.47	0.0	4.76	881.71	96.7	294.5	1176.2	735.4	440.9	3.994	
03/08/2008	21:46:22	392.97	691.6	443.78	47.3	0.098	0.004													

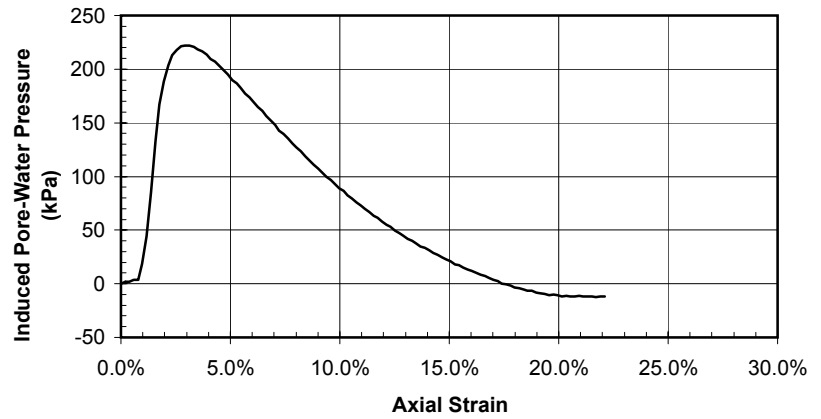
Date	Time	(σ ₁ -σ ₃) Deviator Stress										Induced Pore- Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ ₁ +σ ₃)/2	q (σ ₁ -σ ₃)/2	(σ ₁ σ ₃)		
		Pore Pressure (kPa)	Cell kPa	Load Cell (kg)	LVDT Reading (mm)	Axial Strain	Corrected Area (m ²)	Corrected Load (kgs) (N)	Uncorrected (kPa)	Corrections								Corrected (kPa)	
										Filter Paper (kPa)	Rubber Membrane (kPa)								
04/08/2008	5:06:22	294.29	690.3	581.18	34.1	0.184	0.004936	545.23	5348.7	1083.67	0.0	9.13	1074.54	-5.4	396.0	1470.5	933.2	537.3	3.714
04/08/2008	5:16:22	293.15	689.6	582.05	33.8	0.186	0.004948	546.10	5357.2	1082.80	0.0	9.22	1073.58	-6.6	396.4	1470.0	933.2	536.8	3.708
04/08/2008	5:26:22	293.05	690.5	582.96	33.5	0.188	0.004959	547.01	5366.1	1082.00	0.0	9.32	1072.68	-6.7	397.4	1470.1	933.7	536.3	3.699
04/08/2008	5:36:22	291.67	689.8	583.19	33.2	0.190	0.004971	547.24	5368.4	1079.85	0.0	9.42	1070.43	-8.1	398.1	1468.6	933.4	535.2	3.689
04/08/2008	5:46:22	290.87	689.6	583.5	32.9	0.192	0.004983	547.55	5371.4	1077.85	0.0	9.52	1068.34	-8.9	398.7	1467.0	932.9	534.2	3.679
04/08/2008	5:56:22	290.17	689.6	583.6	32.6	0.194	0.004996	547.65	5372.4	1075.44	0.0	9.61	1065.83	-9.6	399.5	1465.3	932.4	532.9	3.668
04/08/2008	6:06:22	289.14	689	583.71	32.3	0.196	0.005008	547.76	5373.5	1073.05	0.0	9.71	1063.34	-10.6	399.9	1463.2	931.5	531.7	3.659
04/08/2008	6:16:22	289.4	690.3	584.31	32.0	0.198	0.005020	548.36	5379.4	1071.61	0.0	9.81	1061.80	-10.3	400.9	1462.7	931.8	530.9	3.649
04/08/2008	6:26:22	288.79	690	583.69	31.7	0.199	0.005032	547.74	5373.3	1067.79	0.0	9.90	1057.89	-10.9	401.2	1459.1	930.2	528.9	3.637
04/08/2008	6:36:22	288.07	689.6	583.89	31.4	0.201	0.005044	547.94	5375.3	1065.57	0.0	10.00	1055.57	-11.7	401.5	1457.1	929.3	527.8	3.629
04/08/2008	6:46:22	288.45	690.3	584.17	31.1	0.203	0.005057	548.22	5378.0	1063.51	0.0	10.10	1053.41	-11.3	401.8	1455.2	928.5	526.7	3.622
04/08/2008	6:56:22	288.14	690	584.04	30.8	0.205	0.005069	548.09	5376.7	1060.64	0.0	10.20	1050.45	-11.6	401.8	1452.3	927.1	525.2	3.614
04/08/2008	7:06:22	287.73	689.6	584.18	30.5	0.207	0.005082	548.23	5378.1	1058.30	0.0	10.29	1048.01	-12.0	401.9	1449.9	925.9	524.0	3.608
04/08/2008	7:16:22	288.45	690.6	584.6	30.2	0.209	0.005094	548.65	5382.2	1056.50	0.0	10.39	1046.11	-11.3	402.2	1448.3	925.2	523.1	3.601
04/08/2008	7:26:22	287.76	689.6	584.3	29.9	0.211	0.005107	548.35	5379.3	1053.31	0.0	10.49	1042.82	-12.0	401.8	1444.7	923.2	521.4	3.595
04/08/2008	7:36:22	287.76	690.2	583.95	29.6	0.213	0.005120	548.00	5375.8	1050.03	0.0	10.58	1039.45	-12.0	402.5	1441.9	922.2	519.7	3.583
04/08/2008	7:46:22	287.76	689.6	584.21	29.3	0.215	0.005132	548.26	5378.4	1047.92	0.0	10.68	1037.24	-12.0	401.8	1439.1	920.4	518.6	3.581
04/08/2008	7:56:22	287.09	689	584.22	29.0	0.217	0.005145	548.27	5378.5	1045.33	0.0	10.78	1034.55	-12.6	402.0	1436.5	919.2	517.3	3.574
04/08/2008	8:06:22	288.1	690.3	584.72	28.7	0.219	0.005158	548.77	5383.4	1043.66	0.0	10.88	1032.79	-11.6	402.2	1434.9	918.6	516.4	3.568
04/08/2008	8:16:22	287.71	689.6	585.14	28.4	0.221	0.005171	549.19	5387.5	1041.85	0.0	10.97	1030.88	-12.0	401.9	1432.7	917.3	515.4	3.565

80G + 20Y Underflow - Test No. 1

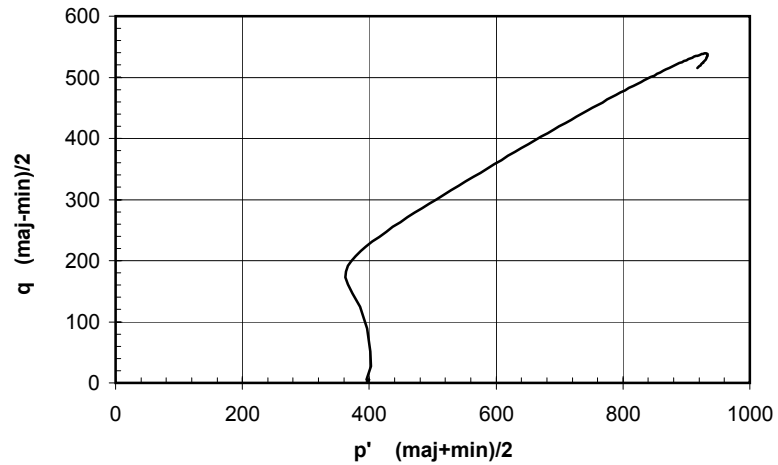
Deviator Stress versus Axial Strain



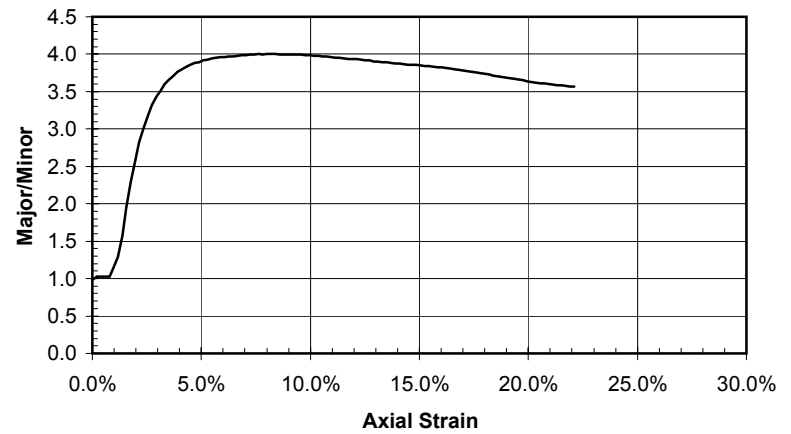
Induced Pore-Water Pressure versus Axial Strain

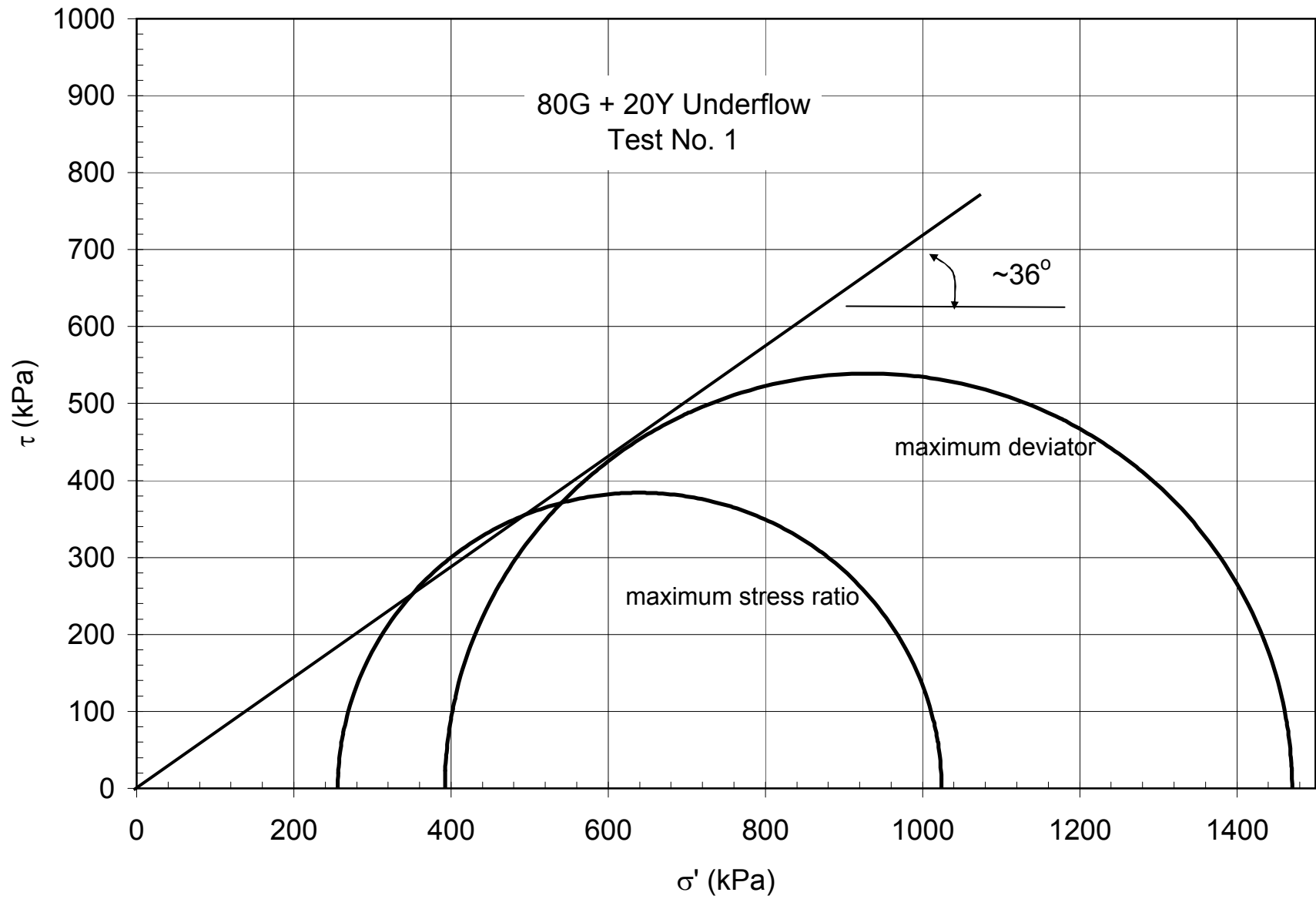


p' versus q



Major/Minor Stress







TRIAXIAL COMPRESSION TESTING

Project: Pebble EastDate: 07-Aug-08 MDH Job #: L1086Sample: 80G + 20YTest No: 3 Test Designation: CU (Effective confining pressure: 800 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	<u>965.42</u>	average:
Sample diameter (mm):	<u> </u>	<u>72.48</u>
Sample height (mm):	<u> </u>	<u>153.20</u>
Water Content:		
	height : diameter ratio: <u>2.11</u> : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³): <u>1527</u>	
	Dry density (kg/m ³): <u>1383</u>	
Water Content (%):	<u>10.4%</u>	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	<u>-</u>
Mass of pan + dry soil (g): (g):	<u>-</u>
Mass of dry soil (g):	<u>-</u>

Comments:

Sample at end of test

Sample Failure

Change in height during saturation (mm): 0.00
 Sample height after saturation (mm): 153.20
 Change in volume during saturation (m³3): 8.5E-06
 Change in height during consolidation (mm): 0.00
 Sample height after consolidation (mm): 153.20
 Change in volume during consolidation (ml): 13.20 (up to 810 kPa cell pressure)
 Change in volume during consolidation (m³3): 1.3E-05
 Sample area after consolidation (m²2): 0.0040
 Rate of strain (mm/min): 0.035

Load due to cell pressure:

57.20

kgs

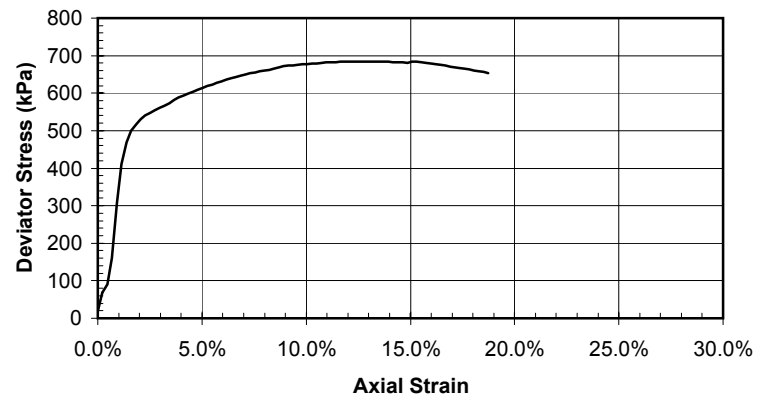
failure criterion	max deviator stress	max. obliquity (maj/min)
σ'_3	251.1	246.5
σ'_1	937.2	920.9
strain	13.30%	9.60%
σ'_1/σ'_3	3.704	3.737
ϕ' (deg)	35.3	35.3

(computed from equation $\sin \phi = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

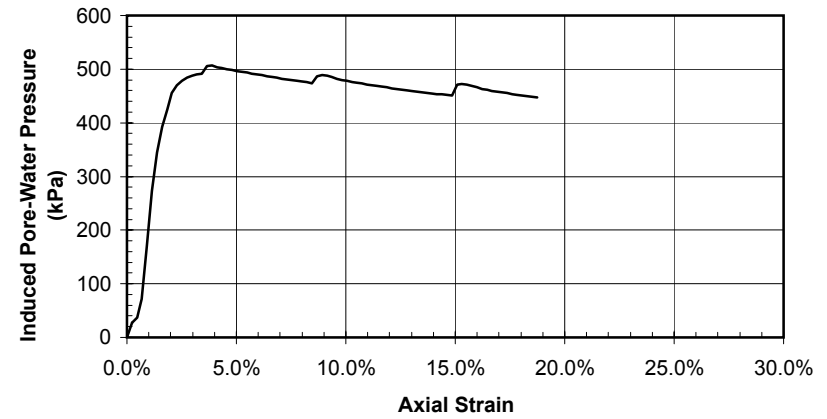
Date	Time	Pore Pressure		Cell	Load Cell	LVDT Reading (mm)	Axial Strain	Corrected Area (m²2)	Corrected Load		$(\sigma - \sigma_3)$ Deviator Stress			Induced Pore-Water Pressure (kPa)	σ'_3 Effective Minor Principal Stress (kPa)	σ'_1 Effective Major Principal Stress (kPa)	p' ($(\sigma'_1 + \sigma'_3)/2$) (kPa)	q ($(\sigma'_1 - \sigma'_3)/2$) (kPa)	$(\sigma_1 \sigma_3)$										
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)															
												Filter Paper (kPa)	Rubber Membrane (kPa)																
08/08/2008	18:40:04	299.38	1107	64.7	62.1	0.000	0.003985	7.50	73.6	18.47	0.0	0.00	18.46	0.0	807.4	825.9	816.6	9.2	1.023										
08/08/2008	18:50:04	326.51	1105	84.82	61.8	0.002	0.003993	27.62	271.0	67.86	0.0	0.11	67.74	27.1	778.1	845.9	812.0	33.9	1.087										
08/08/2008	19:00:04	336.38	1080	94.15	61.4	0.005	0.004003	36.95	362.5	90.57	0.0	0.23	90.34	37.0	743.9	834.2	789.0	45.2	1.121										
08/08/2008	19:10:04	371.49	1071	122.74	61.1	0.007	0.004012	65.54	643.0	160.27	0.0	0.34	159.93	72.1	699.3	859.2	779.2	80.0	1.229										
08/08/2008	19:20:04	468.62	1063	183.94	60.7	0.009	0.004021	126.74	1243.3	309.21	0.0	0.46	308.75	169.2	594.0	902.7	748.3	154.4	1.520										
08/08/2008	19:30:04	572.59	1064	226.66	60.4	0.011	0.004030	169.46	1662.4	412.48	0.0	0.57	411.91	273.2	491.2	903.1	697.1	206.0	1.839										
08/08/2008	19:40:04	644.36	1058	250.37	60.0	0.014	0.004040	193.17	1895.0	469.10	0.0	0.68	468.42	345.0	413.1	881.6	647.3	234.2	2.134										
08/08/2008	19:50:04	691.77	1051	263.7	59.7	0.016	0.004049	206.50	2025.8	500.31	0.0	0.80	499.51	392.4	358.8	858.3	608.5	249.8	2.392										
08/08/2008	20:00:04	723.85	1046	271.58	59.3	0.018	0.004059	214.38	2103.1	518.19	0.0	0.91	517.28	424.5	321.7	839.0	580.3	258.6	2.608										
08/08/2008	20:10:04	755.07	1052	277.77	59.0	0.021	0.004068	220.57	2163.8	531.92	0.0	1.03	530.89	455.7	297.1	827.9	562.5	265.4	2.787										
08/08/2008	20:20:04	769.52	1048	282.13	58.6	0.023	0.004077	224.93	2206.6	541.16	0.0	1.14	540.02	470.1	278.7	818.8	548.8	270.0	2.937										
08/08/2008	20:30:04	777.74	1044	285.69	58.3	0.025	0.004087	228.49	2241.5	548.44	0.0	1.25	547.19	478.4	266.0	813.1	539.5	273.6	3.057										
08/08/2008	20:40:04	783.35	1040	289.08	57.9	0.027	0.004097	231.88	2274.8	555.28	0.0	1.37	553.91	484.0	256.6	810.5	533.5	277.0	3.159										
08/08/2008	20:50:04	787.06	1037	292.46	57.6	0.030	0.004106	235.26	2307.9	562.05	0.0	1.48	560.56	487.7	249.8	810.4	530.1	280.3	3.244										
08/08/2008	21:00:04	789.36	1034	295.66	57.2	0.032	0.004116	238.46	2339.3	568.35	0.0	1.60	566.75	490.0	245.1	811.9	528.5	283.4	3.312										
08/08/2008	21:10:04	790.84	1032	298.89	56.9	0.034	0.004126	241.69	2371.0	574.69	0.0	1.71	572.98	491.5	241.6	814.6	528.1	286.5	3.372										
08/08/2008	21:20:04	805.06	1045	303.09	56.5	0.037	0.004135	245.89	2412.2	583.29	0.0	1.82	581.47	505.7	239.5	820.9	530.2	290.7	3.428										
08/08/2008	21:30:04	806.74	1044	306.36	56.2	0.0388	0.004145	249.16	2444.3	589.65	0.0	1.94	587.71	507.4	237.7	825.4	531.5	293.9	3.473										
08/08/2008	21:40:04	803.14	1039	309.28	55.8	0.0411	0.004155	252.08	2472.9	595.14	0.0	2.05	593.09	503.8	236.2	829.2	532.7	296.5	3.511										
08/08/2008	21:50:04	801.19	1037	312.33	55.5	0.0434	0.004165	255.13	2502.8	600.91	0.0	2.17	598.74	501.8	235.3	834.1	534.7	299.4	3.544										
08/08/2008	22:00:04	799.41	1034	315.25	55.1	0.046	0.004175	258.05	2531.5	606.33	0.0	2.28	604.05	500.0	235.1	839.1	537.1	302.0	3.570										
08/08/2008	22:10:04	797.72	1032	318.18	54.8	0.048	0.004185	260.98	2560.2	611.75	0.0	2.40	609.35	498.3	234.7	844.1	539.4	304.7	3.596										
08/08/2008	22:20:04	796	1031	320.92	54.4	0.050	0.004195	263.72	2587.1	616.69	0.0	2.51	614.18	496.6	235.1	849.3	542.2	307.1	3.613										
08/08/2008	22:30:04	794.47	1030	323.55	54.1	0.053	0.004205	266.35	2612.9	621.34	0.0	2.62	618.72	495.1	235.3	854.0	544.6	309.4	3.630										
08/08/2008	22:40:04	792.78	1028	326.24	53.7	0.055	0.004215	269.04	2639.3	626.10	0.0	2.74	623.36	493.4	235.6	858.9	547.3	311.7	3.646										
08/08/2008	22:50:04	791	1027	328.87	53.4	0.057	0.004226	271.67	2665.1	630.69	0.0	2.85	627.84	491.6	236.0	863.8	549.9	313.9	3.660										
08/08/2008	23:00:04	789.35	1026	331.22	53.0	0.059	0.004236	274.02	2688.2	634.61	0.0	2.97	631.64	490.0	236.3	867.9	552.1	315.8	3.673										
08/08/2008	23:10:04	787.92	1025	333.67	52.7	0.062	0.004246	276.47	2712.2	638.73	0.0	3.08	635.65	488.5	237.0	872.7	554.9	317.8	3.682										
08/08/2008	23:20:04	786.36	1024	336.2	52.3	0.064	0.004257	279.00	2737.0	643.00	0.0	3.19	639.81	487.0	237.9	877.7	557.8	319.9	3.689										
08/08/2008	23:30:04	784.88	1023	338.38	52.0	0.066	0.004267	281.18	2758.4	646.44	0.0	3.31	643.14	485.5	238.2	881.3	559.8	321.6	3.700										
08/08/2008	23:40:04	783.33	1022	340.45	51.6	0.069	0.004277	283.25	2778.7	649.61	0.0	3.42	646.19	484.0	238.9	885.1	562.0	323.1	3.705										
08/08/2008	23:50:04	781.79	1022	342.73	51.3	0.071	0.004288	285.53	2801.1	653.23	0.0	3.54	649.70	482.4	239.8	889.5	564.6	324.8	3.710										
09/08/2008	00:00:04	780.4	1021	344.92	50.9	0.073	0.004299	287.72	2822.6	656.63	0.0	3.65	652.98	481.0	240.5	893.5	567.0	326.5	3.715										
09/08/2008	01:00:04	778.96	1020	346.84	50.6	0.075	0.004309	289.64	2841.4	659.38	0.0	3.76	655.61	479.6	241.2	896.9	569.0	327.8	3.718										
09/08/2008	02:00:04	777.38	1020	348.65	50.2	0.0777	0.004320	291.45	2859.1	661.86	0.0	3.88	657.98	478.0	242.1	900.1	571.1	329.0	3.717										
09/08/2008	03:00:04	776.2	1019	350.47	49.9	0.0800	0.004331	293.27	2877.0	664.34	0.0	3.99	660.35	476.8	242.6	903.0	572.8	330.2	3.722										
09/08/2008	04:00:04	774.86	1018	352.26	49.5	0.082	0.004341	295.06	2894.6	666.74	0.0	4.11	662.63	475.5	243.1	905.7	574.4	331.3	3.726										
09/08/2008	05:00:04	773.11	1017	353.83	49.1	0.085	0.004352	296.63	2910.0	668.82	0.0	4.22	664.40	473.7	243.7	908.1	575.9	332.2	3.726										
09/08/2008	1:00:04	785.77	1031	356.44	48.8	0.087	0.004363	299.24	2935.6	672.82	0.0	4.33	668.48	486.4	244.8	913.2	579.0	334.2	3.731										
09/08/2008	1:10:04	789.01	1034	358.47	48.4	0.089	0.004374	301.27	2955.5	675.69	0.0	4.45	671.24	489.6	245.5	916.7	581.1	335.6	3.734										
09/08/2008	1:20:04	787.64	1034	360.07	48.1	0.091	0.004385	302.87	2971.2	677.57	0.0	4.56	673.01	488.3	246.2	919.2	582.7	336.5	3.734										
09/08/2008	1:30:04	785.32	1032	361.55	47.7	0.094	0.004396	304.35	2985.7	679.17	0.0	4.68	674.49	485.9	246.5	920.9	583.7	337.2	3.737										
09/08/2008	1:40:04	781.62	1028	362.74	47.4	0.096	0.004407	305.54	2997.4	680.11	0.0	4.79	675.32	482.2	246.7	922.1	584.4	337.7	3.737										
09/08/2008	1:50:04	779.06	1027	364.08	47.0	0.098	0.004418	306.88	3010.5	681.36	0.0	4.90	676.46	479.7	247.5	924.0	585.7	338.2	3.733										
09/08/2008	2:00:04	777.67	1026	365.37	46.7	0.101	0.004430	308.17	3023.2	682.49	0.0	5.02	677.47	478.3	248.0	925.4	586.7	338.7	3.732										
09/08/2008	2:10:04	775.68	1024	366.77	46.3	0.103	0.004441	309.57	3036.9	683.85	0.0	5.13	678.72	476.3	248.6	927.3	588.0	339.4	3.730										
09/08/2008	2:20:04	774.13	1023	368.05	46.0	0.105	0.004452	310.85	3049.5	684.93	0.0	5.25	679.68	474.8	248.8	928.5	588.6	339.8	3.732										
09/08/2008	2:30:04	772.59	1022	369.44	45.6	0.107	0.004464	312.24	3063.1	686.24	0.0	5.36	680.88	473.2	249.0	929.9	589.4	340.4	3.735										
09/08/2008	2:40:04	770.99	1021	370.72	45.3	0.110	0.004475	313.52	3075.7	687.29	0.0	5.47	681.81	471.6	249.8	931.6	590.7	340.9	3.730										
09/08/2008	2:50:04	769.54	1020	371.76	44.9	0.112	0.004487	314.56	3085.9	687.80	0.0	5.59	682.21	470.2	250.0	932.2	591.1	341.1	3.729										
09/08/2																													

80G + 20Y (3)

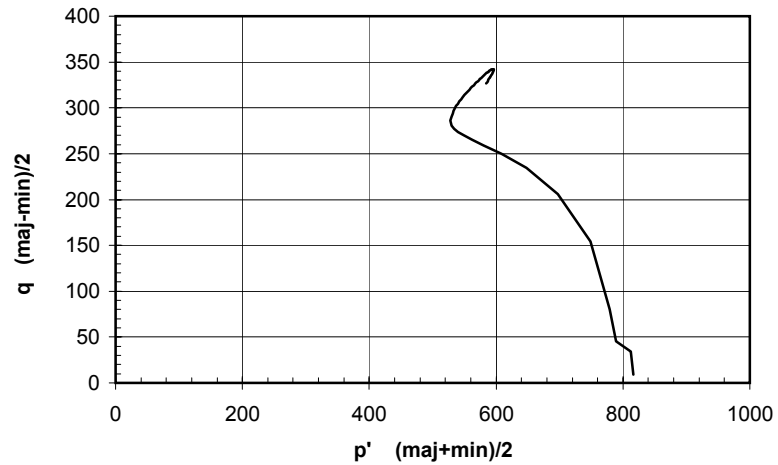
Deviator Stress versus Axial Strain



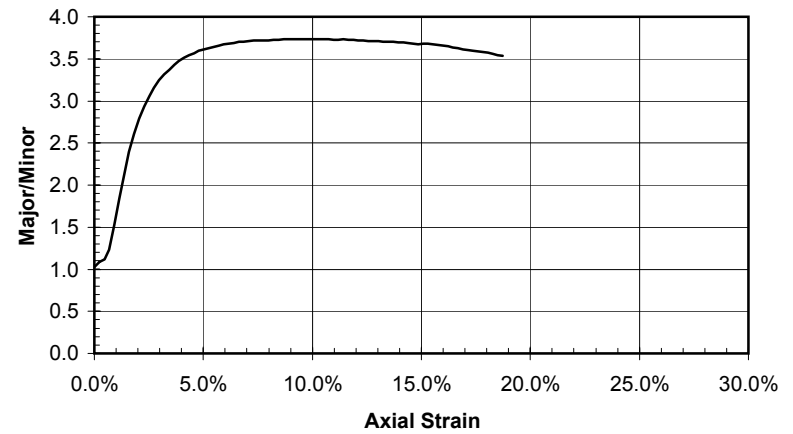
Induced Pore-Water Pressure versus Axial Strain

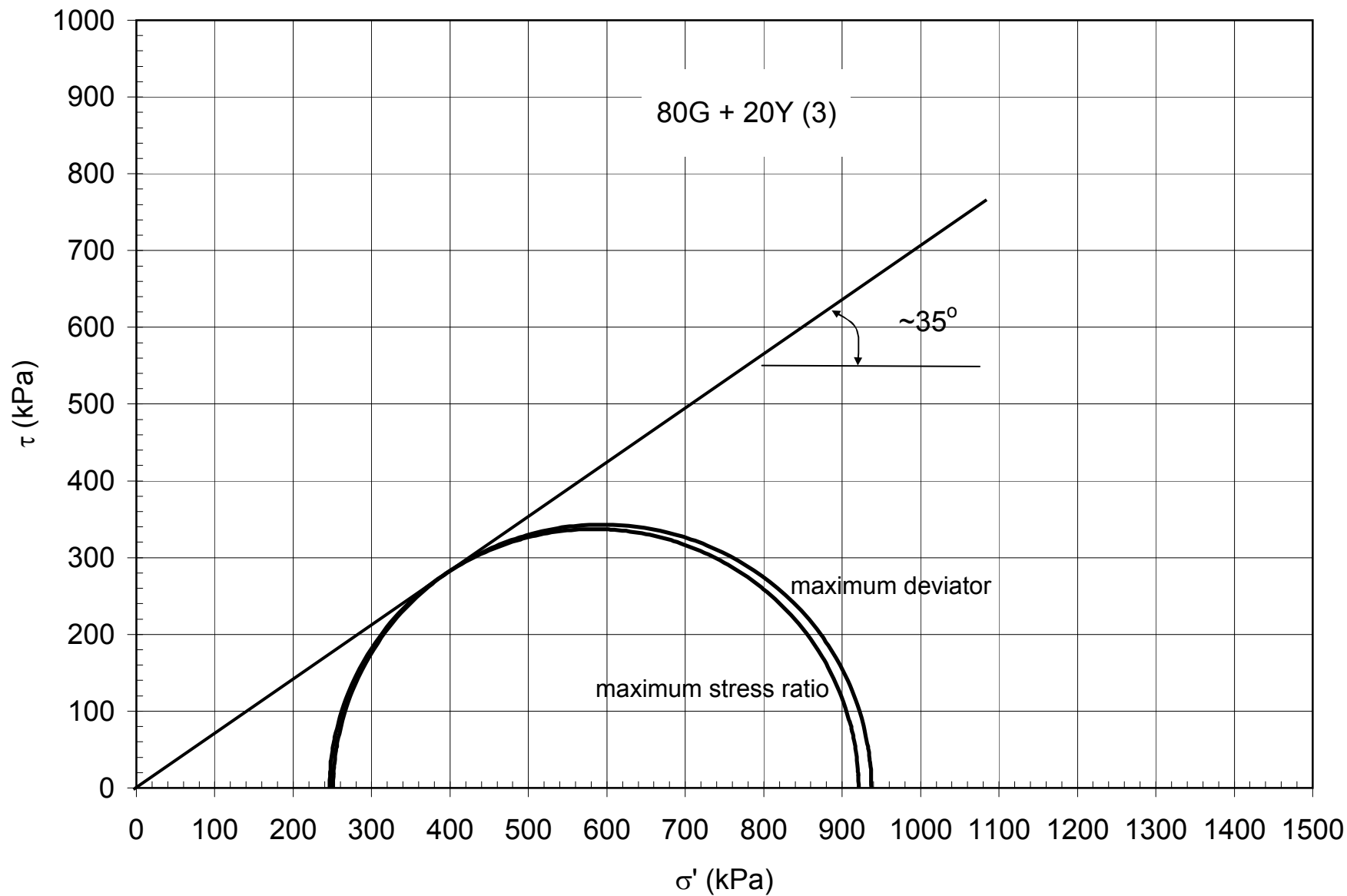


p' versus q



Major/Minor Stress





80G + 20Y (4)
2000 kPa



TRIAXIAL COMPRESSION TESTING

Project: Pebble East

Date: 15-Aug-08 MDH Job #: L1086

Sample: 80G + 20Y

Test No: 4 Test Designation: CU (Effective confining pressure: 2000 kPa)

PRE-TEST INFORMATION

Wet sample mass,g	940.53	average:
Sample diameter (mm):		72.65
Sample height (mm):		153.20
Water Content:		
	height : diameter ratio: 2.11 : 1 (should range from 2 to 2.5 : 1)	
	Wet density (kg/m ³):	1481
	Dry density (kg/m ³):	1366
Water Content (%):	8.4%	

Comments:

POST-TEST INFORMATION

Mass of pan (g):	-
Mass of pan + dry soil (g): (g):	-
Mass of dry soil (g):	-

Comments:

Sample at end of test

80G + 20Y (4)
2000 kPa

Sample Failure

Change in height during saturation (mm): 0.00
Sample height after saturation (mm): 153.20
Change in volume during saturation (m³3): 9.6E-06
Change in height during consolidation (mm): 4.80
Sample height after consolidation (mm): 158.00
Change in volume during consolidation (ml): 15.09 (up to 700 kPa cell pressure)
Change in volume during consolidation (m³3): 1.5E-05
Sample area after consolidation (m²2): 0.0039
Rate of strain (mm/min): 0.04

failure criterion	max deviator stress	max. obliquity (ma/min)
σ'_3	1745.8	1745.8
σ'_1	5658.6	5658.6
strain	21.90%	21.90%
σ'_1/σ'_3	3.241	3.241
ϕ' (deg)	31.9	31.9

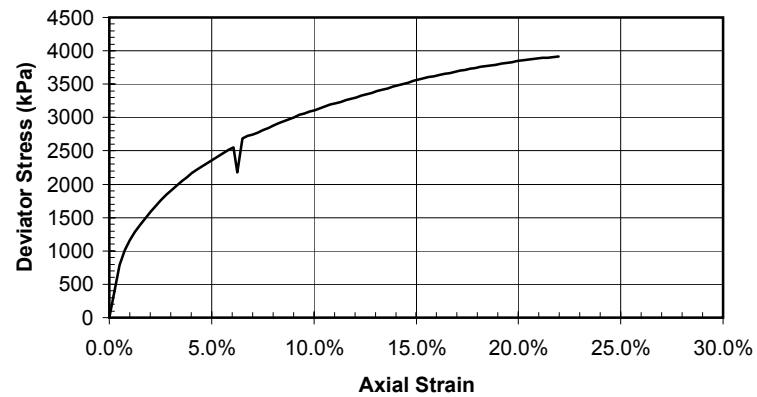
(computed from equation $\sin \phi' = (\sigma'_1 - \sigma'_3)/(\sigma'_1 + \sigma'_3)$)

Load due to cell pressure: 112.64 kgs

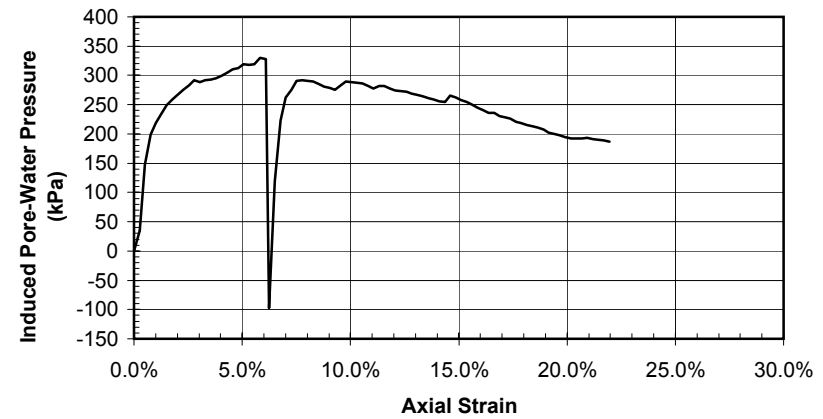
Date	Time	Pore Pressure		Cell	Load Cell	LVDT Reading (mm)	Axial Strain	Corrected Area (m²2)	Corrected Load		(σ-σ₃) Deviator Stress			Induced Pore-Water Pressure (kPa)	Effective Minor Principal Stress (kPa)	Effective Major Principal Stress (kPa)	p' (σ'₁+σ'₃)/2	q (σ'₁-σ'₃)/2	(σ₁σ₃)					
		(kPa)	kPa						(kgs)	(N)	Uncorrected (kPa)	Corrections		Corrected (kPa)										
									Filter Paper (kPa)	Rubber Membrane (kPa)														
31/08/2008	18:27:24	186.44	2180	112.08	69.3	0.000	0.003864	-0.56	-5.4	-1.41	0.0	0.00	-1.42	0.0	1993.1	1991.6	1992.4	-0.7	0.999					
31/08/2008	18:37:24	221.63	2168	266.21	68.9	0.003	0.003873	153.57	1506.6	388.97	0.0	0.13	388.84	35.2	1946.8	2335.7	2141.3	194.4	1.200					
31/08/2008	18:47:24	334.2	2161	422.63	68.5	0.005	0.003883	309.99	3041.0	783.16	0.0	0.26	782.90	147.8	1826.3	2609.2	2217.8	391.5	1.429					
31/08/2008	18:57:24	385.48	2156	512.59	68.1	0.008	0.003893	399.95	3923.6	1007.86	0.0	0.39	1007.47	199.0	1770.5	2778.0	2274.3	503.7	1.569					
31/08/2008	19:07:24	404.77	2153	574.88	67.7	0.010	0.003903	462.24	4534.6	1161.85	0.0	0.51	1161.34	218.3	1747.8	2909.1	2328.5	580.7	1.664					
31/08/2008	19:17:24	421.44	2150	627.43	67.3	0.013	0.003913	514.79	5050.1	1290.63	0.0	0.64	1289.98	235.0	1728.9	3018.9	2373.9	645.0	1.746					
31/08/2008	19:27:24	435.85	2148	673.56	66.9	0.015	0.003923	560.92	5502.7	1402.67	0.0	0.77	1401.90	249.4	1712.3	3114.2	2413.2	701.0	1.819					
31/08/2008	19:37:24	445.11	2146	714.9	66.5	0.018	0.003933	602.26	5908.2	1502.18	0.0	0.90	1501.28	258.7	1701.1	3202.4	2451.7	750.6	1.883					
31/08/2008	19:47:24	453.97	2144	753.9	66.1	0.020	0.003943	641.26	6290.8	1595.33	0.0	1.03	1594.30	267.5	1690.1	3284.4	2487.2	797.2	1.943					
31/08/2008	19:57:24	462	2143	790.18	65.7	0.023	0.003953	677.54	6646.7	1681.23	0.0	1.16	1680.08	275.6	1680.6	3360.7	2520.7	840.0	2.000					
31/08/2008	20:07:24	469.28	2142	824.93	65.3	0.025	0.003964	712.29	6987.6	1762.88	0.0	1.28	1761.60	282.8	1672.3	3433.9	2553.1	880.8	2.053					
31/08/2008	20:17:24	478	2150	857.86	64.9	0.028	0.003974	745.22	7310.7	1839.59	0.0	1.41	1838.18	291.6	1672.2	3510.3	2591.2	919.1	2.099					
31/08/2008	20:27:24	474.98	2145	888.82	64.5	0.030	0.003984	776.18	7614.4	1911.02	0.0	1.54	1909.48	288.5	1670.4	3579.9	2625.2	954.7	2.143					
31/08/2008	20:37:24	477.73	2143	919.13	64.1	0.033	0.003995	806.49	7911.7	1980.46	0.0	1.67	1978.79	291.3	1665.6	3644.4	2655.0	989.4	2.188					
31/08/2008	20:47:24	479.34	2142	947.11	63.7	0.035	0.004005	834.47	8186.2	2043.81	0.0	1.80	2042.01	292.9	1662.6	3704.7	2683.6	1021.0	2.228					
31/08/2008	20:57:24	481.08	2140	975.25	63.3	0.038	0.004016	862.61	8462.2	2107.18	0.0	1.93	2105.26	294.6	1658.9	3764.1	2711.5	1052.6	2.269					
31/08/2008	21:07:24	485.88	2138	1002.1	62.9	0.041	0.004027	889.50	8726.0	2167.15	0.0	2.05	2165.10	299.4	1652.4	3817.5	2734.9	1082.5	2.310					
31/08/2008	21:17:24	490.78	2137	1027.8	62.5	0.0430	0.004037	915.13	8977.5	2223.71	0.0	2.18	2221.53	304.3	1646.1	3867.6	2756.9	1110.8	2.350					
31/08/2008	21:27:24	497.03	2135	1052.4	62.1	0.0456	0.004048	939.79	9219.4	2277.59	0.0	2.31	2275.28	310.6	1637.8	3913.1	2775.4	1137.6	2.389					
31/08/2008	21:37:24	498.95	2134	1075.4	61.7	0.0481	0.004059	964.78	9444.9	2327.12	0.0	2.44	2324.68	312.5	1634.9	3959.6	2797.2	1162.3	2.422					
31/08/2008	21:47:24	505.59	2133	1097.5	61.3	0.051	0.004069	984.84	9661.3	2374.11	0.0	2.57	2371.54	319.2	1627.5	3999.0	2813.2	1185.8	2.457					
31/08/2008	21:57:24	504.89	2130	1119.6	60.9	0.053	0.004080	1006.98	9878.5	2421.01	0.0	2.70	2418.31	318.5	1625.6	4043.9	2834.8	1209.2	2.488					
31/08/2008	22:07:24	505.63	2128	1141.3	60.5	0.056	0.004091	1028.63	10090.9	2466.45	0.0	2.82	2463.62	319.2	1622.8	4086.4	2854.6	1231.8	2.518					
31/08/2008	22:17:24	516.57	2144	1164.2	60.1	0.058	0.004102	1051.58	10316.0	2514.72	0.0	2.95	2511.77	330.1	1627.6	4139.4	2883.5	1255.9	2.543					
31/08/2008	22:27:24	514.22	2146	1185.7	59.7	0.061	0.004113	1073.01	10526.3	2559.07	0.0	3.08	2555.99	327.8	1631.8	4187.8	2909.8	1278.0	2.566					
31/08/2008	23:34:21	89.26	2128	1027.7	59.4	0.063	0.004121	915.07	8976.9	2178.33	0.0	3.17	2175.16	-97.2	2038.4	4213.6	3126.0	1087.6	2.067					
31/08/2008	23:44:21	305.29	2125	1245.9	59.0	0.065	0.004132	1133.28	11117.5	2690.49	0.0	3.30	2687.20	118.9	1819.8	4507.0	3163.4	1343.6	2.477					
31/08/2008	23:54:21	409.35	2124	1265.2	58.6	0.068	0.004143	1152.51	11306.2	2728.74	0.0	3.43	2725.31	222.9	1715.0	4440.3	3077.6	1362.7	2.589					
01/09/2008	0:04:21	448.22	2124	1277.5	58.2	0.070	0.004155	1164.81	11426.8	2750.37	0.0	3.55	2746.82	261.8	1675.7	4422.5	3049.1	1373.4	2.639					
01/09/2008	0:14:21	461.31	2122	1292.2	57.8	0.073	0.004166	1179.56	11571.5	2777.62	0.0	3.68	2773.94	274.9	1660.5	4434.4	3047.4	1387.0	2.671					
01/09/2008	0:24:21	476.82	2137	1310.2	57.4	0.075	0.004177	1197.51	11747.6	2812.19	0.0	3.81	2808.38	290.4	1660.1	4468.5	3064.3	1404.2	2.692					
01/09/2008	0:34:21	478.39	2143	1328.9	57.0	0.078	0.004189	1216.29	11931.9	2848.47	0.0	3.94	2844.53	292.0	1664.3	4508.8	3086.5	1422.3	2.709					
01/09/2008	0:44:21	476.97	2143	1347.3	56.6	0.080	0.004200	1234.62	12111.7	2883.46	0.0	4.07	2879.39	290.5	1666.4	4545.8	3106.1	1439.7	2.728					
01/09/2008	0:54:21	475.52	2142	1365.1	56.2	0.083	0.004212	1252.48	12286.9	2917.12	0.0	4.20	2912.93	289.1	1666.3	4579.2	3122.7	1456.5	2.748					
01/09/2008	1:04:21	471.79	2138	1382.7	55.8	0.0853	0.004224	1270.09	12459.6	2949.97	0.0	4.32	2945.65	285.4	1666.1	4611.8	3139.0	1472.8	2.768					
01/09/2008	1:14:21	467.31	2133	1399.7	55.4	0.0878	0.004235	1287.10	12626.5	2981.21	0.0	4.45	2976.75	280.9	1666.0	4642.7	3154.3	1488.4	2.787					
01/09/2008	1:24:21	465.06	2131	1416.9	55.0	0.090	0.004247	1304.26	12794.8	3012.57	0.0	4.58	3007.99	278.6	1665.7	4673.6	3169.7	1504.0	2.806					
01/09/2008	1:34:21	462.11	2128	1433.3	54.6	0.093	0.004259	1320.64	12955.5	3041.91	0.0	4.71	3037.20	275.7	1666.0	4703.2	3184.6	1518.6	2.823					
01/09/2008	1:44:21	469.97	2128	1447.8	54.2	0.095	0.004271	1335.13	13097.7	3066.71	0.0	4.84	3061.87	283.5	1658.4	4720.3	3189.3	1530.9	2.846					
01/09/2008	1:54:21	475.91	2130	1462.4	53.8	0.098	0.004283	1349.76	13241.2	3091.63	0.0	4.97	3086.67	289.5	1653.7	4740.4	3197.0	1543.3	2.867					
01/09/2008	2:04:21	474.76	2128	1477.4	53.4	0.100	0.004295	1364.79	13388.6	3117.29	0.0	5.09	3112.19	288.3	1653.1	4765.3	3209.2	1556.1	2.883					
01/09/2008	2:14:21	473.77	2127	1492.4	53.0	0.103	0.004307	1379.75	13535.4	3142.59	0.0	5.22	3137.36	287.3	1652.9	4790.3	3221.6	1568.7	2.898					
01/09/2008	2:24:21	472.88	2130	1508.8	52.6	0.106	0.004319	1396.12	13696.0	3170.90	0.0	5.35	3165.55	286.4	1656.9	4822.4	3239.6	1582.8	2.911					
01/09/2008	2:34:21	468.65	2127	1524	52.2	0.108	0.004332	1411.40	13845.9	3196.53	0.0	5.48	3191.05	282.2	1658.2	4849.2	3253.7	1595.5	2.924					
01/09/2008	2:44:21	463.7	2120	1538.8	51.8	0.111	0.004344	1426.15	13990.6	3220.77	0.0	5.61	3215.16	277.3	1656.5	4871.7	3264.1	1607.6	2.941					
01/09/2008	2:54:21	468.34	2123	1552.9	51.4	0.113	0.004356	1440.27	14129.1	3243.40	0.0	5.74	3237.66	281.9	1654.2	4891.9	3273.1	1618.8	2.957					
01/09/2008	3:04:21	468.24	2122	1567.5	51.0	0.116	0.004369	1454.87	14272.3	3266.92	0.0	5.86	3261.06	281.8	1654.0	4915.1	3284.5	1630.5	2.972					
01/09/2008	3:14:21	464.48	2119	1582	50.6	0.118	0.004381	1469.36	14414.5	3290.01	0.0	5.99	3284.02	278.0	1654.9	4938.9	3296.9	1642.0	2.984					
01/09/2008	3:24:21	461.24	2117	1595.8	50.2	0.121	0.004394	1483.17	14549.9	3311.40	0.0	6.12	3305.28	274.8	1656.3	4961.5	3308.9	1652.6	2.996					
01/09/2008	3:34:21	460.07	2117	1610.3	49.8	0.123	0.004407	1497.65	14692.0	3334.10	0.													

80G + 20Y (4) 2000 kPa

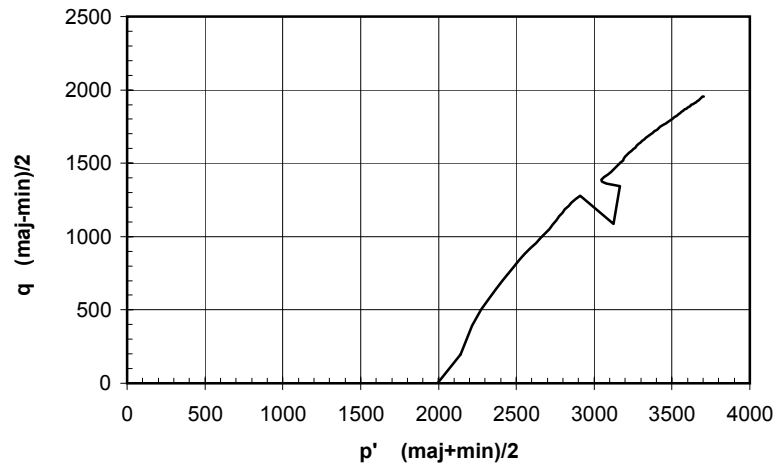
Deviator Stress versus Axial Strain



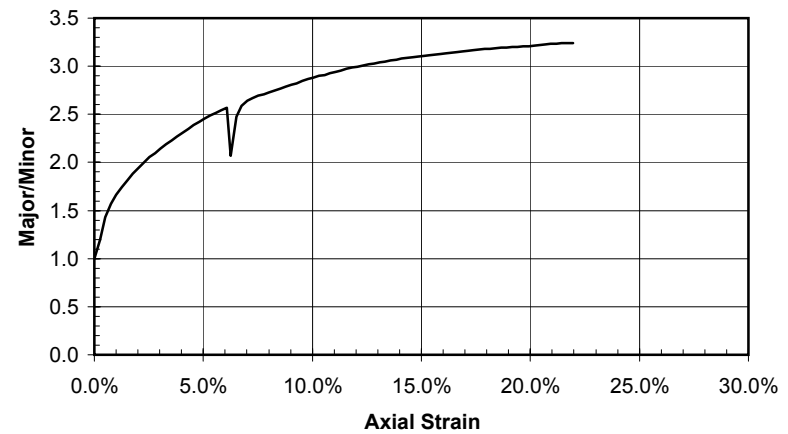
Induced Pore-Water Pressure versus Axial Strain



p' versus q



Major/Minor Stress



There was a short power disruption at ~ 6% strain.

