Technical Memorandum

Project: 94201191A0

To: Rosemont Copper

From: AMEC Earth and Environmental

Date: August 23, 2010

Re: Physical and Mechanical Properties of Tailings and Waste Rockfill Materials

AMEC Earth and Environmental (AMEC) has prepared this memorandum at the request of Rosemont Copper to provide responses to the April 14, 2010 letter received from the Arizona Department of Environmental Quality (ADEQ). The subject of the ADEQ letter addressed in this memorandum pertains to the additional laboratory testing program developed to further delineate the engineering properties of both the tailings and waste rock material. The results of the laboratory testing are described below and are compared with previous laboratory results in order to verify estimated values for geotechnical modeling in the original design report.

1.0 Additional Sampling and Testing

Additional samples of tailings were developed and waste rock was obtained for further laboratory analysis as requested by ADEQ. Six tailings samples were developed representing the different anticipated ore types to be encountered over the life of the mine. In addition, core samples of waste rock units were obtained from different spatial locations within the pit limits to define the material that would be developed over the mine life. Testing included, but was not limited to material characterization, moisture retention, strength parameters, and durability. Test results are summarized in Tables 1.1 through 1.6, which are attached at the end of this memorandum. Individual laboratory results are presented in Appendix A. Testing was completed in general accordance with applicable ASTM testing procedures.

The tailings tested previously include:

- Colina (Year 4+ Composite)
- MSRD-1 (Earp, Horquilla, & Escabrosa Lithology Composite)

Additional tailings developed for laboratory testing include:

- Escabrosa Lithology
- Years 4-7 Composite
- Earp Lithology
- Epitaph Lithology
- Colina
- Horquilla

Waste rock samples were selected to encompass spatial and time dependant variability in the mining schedule and include the following rock units:

- Willow Canyon
- Glance
- Tertiary Gravels (Gila)

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- Abrigo
- Horquilla
- Concha
- Epitaph

1.1 Index Properties

Testing for index properties included sieve analysis, liquid limit, and plastic limit tests in order to classify tailings with the Unified Soil Classification System (USCS) as defined by ASTM D2487. In addition, standard proctor compaction tests were conducted to obtain remolding parameters for specialized testing.

Laboratory gradations of the new tailing samples resulted in an average of 63 percent passing the No. 200 sieve. Atterberg limit testing indicates that the plastic limit is non-plastic, while the liquid limit is approximately 17. All tailings samples obtained classified as a sandy silt (ML) according to the USCS. Previously tested tailings had an average of 72.6 percent passing the No. 200 sieve, an average plastic limit of 20, and an average liquid limit of 21. This demonstrates close uniformity between samples.

Standard Proctor tests completed showed the average dry density to be 119.3 pcf and the average optimum moisture content to be 14.5 percent. The maximum dry density ranged between 117.4 and 125.9 pcf with the optimum moisture content ranging between 12.2 and 16.8 percent. Previously tested tailings had maximum dry densities and optimum moisture contents of 115.8 pcf at 14.9 percent and 118.9 pcf at 14.8 percent for the Colina and MSRD-1 samples, respectively.

New and previous laboratory results are summarized in Table 1.1. Individual laboratory tests results can be referenced in Appendix A.1.

1.2 One-Dimensional Consolidation

One-dimensional consolidation tests were conducted on remolded tailings samples under saturated conditions in order to determine compressibility characteristics under loading and calculate the associated hydraulic conductivity. Each sample was prepared by loosely placing the tailings in an odometer ring between porous discs to represent the initially loose conditions produced from radial stacking. An initial seating load of 0.05 ksf was placed on the sample. The percent change in sample height was measured with a dial gauge. The sample height was monitored until deformation practically ceased under each load increment. The tests were completed to evaluate consolidation characteristics under self weight compression for both saturated and unsaturated conditions.

Consolidation testing was completed similar to the procedure outlined in ASTM D2435 and are summarized in Table 1.2 with previously completed test results. Individual laboratory results can be referenced in Appendix A.2. Results of the consolidation tests are plotted as a curve of the final strain at each increment of pressure against the log of the applied pressure.

In addition to the compressibility characteristics, hydraulic conductivity was calculated based on the one-dimensional consolidation test results. In one-dimensional consolidation, the hydraulic conductivity (k) is dependent on the coefficient of consolidation (c_v), void ratio (e), and the coefficient of compressibility (a_v). Using values obtained from the consolidation testing, hydraulic conductivity can be determined. The hydraulic conductivity ranged from 9.35×10^{-9} to 1.24×10^{-7} cm/sec over a range of confining pressures from 30 to 240 psi. The previous and current values of hydraulic conductivity are summarized in Table 1.2.

1.3 Triaxial Shear

Triaxial shear testing was performed on samples remolded to relatively loose densities considered representative of the *in-situ* density when placed by a radial stacker. The remolded densities are

considered conservative based on the one-dimensional consolidation tests, which indicates the tailings will consolidate to much higher densities in a relatively short time. The testing consisted of subjecting a cylindrical specimen to a confining pressure and an axial load varied independently of the confining pressure. The confining pressure was applied in a fluid filled chamber and the axial load was applied by means of a piston passing through the chamber top.

Porous discs were placed against the bottom of the sample that was wrapped in a watertight membrane, and the discs were connected to the outside of the chamber by tubing. The water pressure in the pores of the sample can be measured through these tubes when drainage from the sample is not permitted. When flow is permitted, the quantity of water passing into or out of the sample upon loading can be measured.

Consolidated, undrained triaxial shear testing was performed. The samples were saturated and the chamber pressure was raised incrementally. The samples were allowed to consolidate under the applied chamber pressure until no excess pore pressure remained. Valves on the porous tubes were then closed and axial load was applied to the sample. The axial stress and strain within the sample were measured as the axial load was increased to failure. The rate of strain selected was based on an estimate of the consolidation characteristics of the material.

Consolidated, drained results were obtained from the consolidated, undrained test results by measuring the pore pressures and subtracting pressures measured during the test from the chamber and axial pressures applied. The peak effective strength (drained) friction angle values ranged between 35.7 to 38.0 degrees and values of cohesion from 0 to 97.9 psf. The peak total (undrained) friction angle values ranged between 18.6 to 25.2 degrees and values of cohesion from 397.9 to 1,168 psf.

Previous testing showed a peak effective strength (drained) friction angle values between 36.5 to 36.6 degrees and cohesion values between 0 and 130 psf. The peak (undrained) friction angle values ranged between 18.7 and 18.9 degrees and values of cohesion from 1,930 to 3,260 psf.

The previous and current results of the triaxial shear testing are summarized in Table 1.3. Individual test results can be referenced in Appendix A.3.

1.4 Direct Shear

Direct shear tests, ASTM D3080, were conducted on tailings samples. The samples were saturated, loaded with a normal pressure, and sheared horizontally at a controlled strain rate. The rate of strain selected for sample failure was dependent upon an estimate of the material's consolidation characteristics. Normal stresses of 50, 100, and 200 psi were applied to the samples prior to shearing. The peak strengths indicate an effective angle of internal friction ranging between 30.7 to 32.6 degrees and a cohesion value range of 7.9 to 334.5 psf.

The results of the direct shear testing are summarized in Table 1.3. Individual plots of horizontal displacement, shear stress, and normal stress can be referenced in Appendix A.4.

1.5 Point Load Testing

Point load tests were conducted on samples of core, free from obvious structures (fractures or planes of weakness), obtained from various lithology at various depths. Core specimens with length/diameter ratios between 0.76 and 1.1 were selected for diametral testing to assess general strength characteristics. The point load test is empirically related to the unconfined compressive strength of rock.

The results of the point load testing for the intact rock indicate an average unconfined compressive strength of approximately 12,419 psi with a range between 360 psi and 46,320 psi. Results of the point load testing are summarized in Table 1.4 and individual test results can be referenced in Appendix A.5.

1.6 L.A. Abrasion

L.A. Abrasion testing was conducted on samples of core. The L.A. Abrasion test is a measure of degradation of aggregates under the influence of abrasion including attrition, impact, and grinding and is conducted in general accordance with ASTM C131. The test consists of placing the above aggregate into a steel drum along with a specified number of steel balls according the material gradation. The drum is then rotated and a small shelf plate along the circumference of the interior picks up and drops the material for each successive cycle. After 100 and 500 revolutions, the sample is removed and sieved to measure the percentage loss of aggregate.

The aggregate expressed a range of loss from 4 to 7.8 percent after 100 revolutions and a range of loss from 16.6 to 33 percent after 500 revolutions. This indicates relatively uniform hardness for the lithologies tested. However, the Tertiary Gravel (Gila) showed a loss of 58 percent after 100 revolutions and a loss of 90.7 percent after 500 revolutions, degrading to a granular material. This lithology only represents approximately 11 percent of the total waste rock volume and will be blended with other waste lithologies and will be suitable for use as buttress material.

The results of the L.A. Abrasion testing are summarized in Table 1.5. Individual test results can be referenced in Appendix A.5.

1.7 Slake Durability

Slake durability testing was conducted on core samples. The slake durability test involves subjecting a sample of aggregate to 2 wetting and drying cycles to assess the durability of the material. The aggregate is thoroughly dried, subjected to an immersed cycle of rotation within a wire mesh drum, and then the procedure is repeated for a second time. The aggregate is assessed qualitatively based upon the remaining material (e.g. Type I through III for degree of degradation).

The slake durability index (I_d) ranged from 98.4 to 99.7 percent indicating the materials tested have a very high durability. These samples classified as a Type I, which is defined as a retained specimen that remains virtually unchanged. However, the Tertiary Gravel (Gila Conglomerate) had very low durability with an I_d of 58.5 percent. This sample was classified as a Type II, which is defined as a retained specimen consisting of large and small fragments which when blended with other waste lithologies is still considered suitable for buttress material. The results of the slake durability testing can be summarized in Table 1.5. Individual testing results are presented in Appendix A.5.

1.8 Torvane Undrained Shear Strength

Torvane shear testing was conducted under laboratory conditions on remolded, tailing samples. This type of testing allows for rapid determination of undrained shear strength. The blades of the Torvane are inserted into the soil surface and the knob is rotated such that failure develops within 5 to 10 seconds with the maximum torque recorded on the face of the device. These tests do not typically replace laboratory shear testing, but give an indication of the undrained shear strength for zones of probable weakness.

The results of the Torvane testing for the previous and current testing are summarized in Table 1.7and shown in Figure 1. Individual test results can be referenced in Appendix A.6.

1.9 Moisture Retention Testing

Previous moisture retention testing was performed by Daniel B. Stephens and Associates, Inc. to delineate the moisture retention curve of the tailings over a wide range of negative pore pressures. The testing methodologies included the Hanging Column method, the Pressure Plate method, the Relative Humidity (box) method, and the Water Potential (dew point potentiometer) method. A soil water

characteristic curve (SWCC) was developed using the Fredlund and Xing method to correlate hydraulic conductivity (saturated and unsaturated) with soil suction from these tests and data.

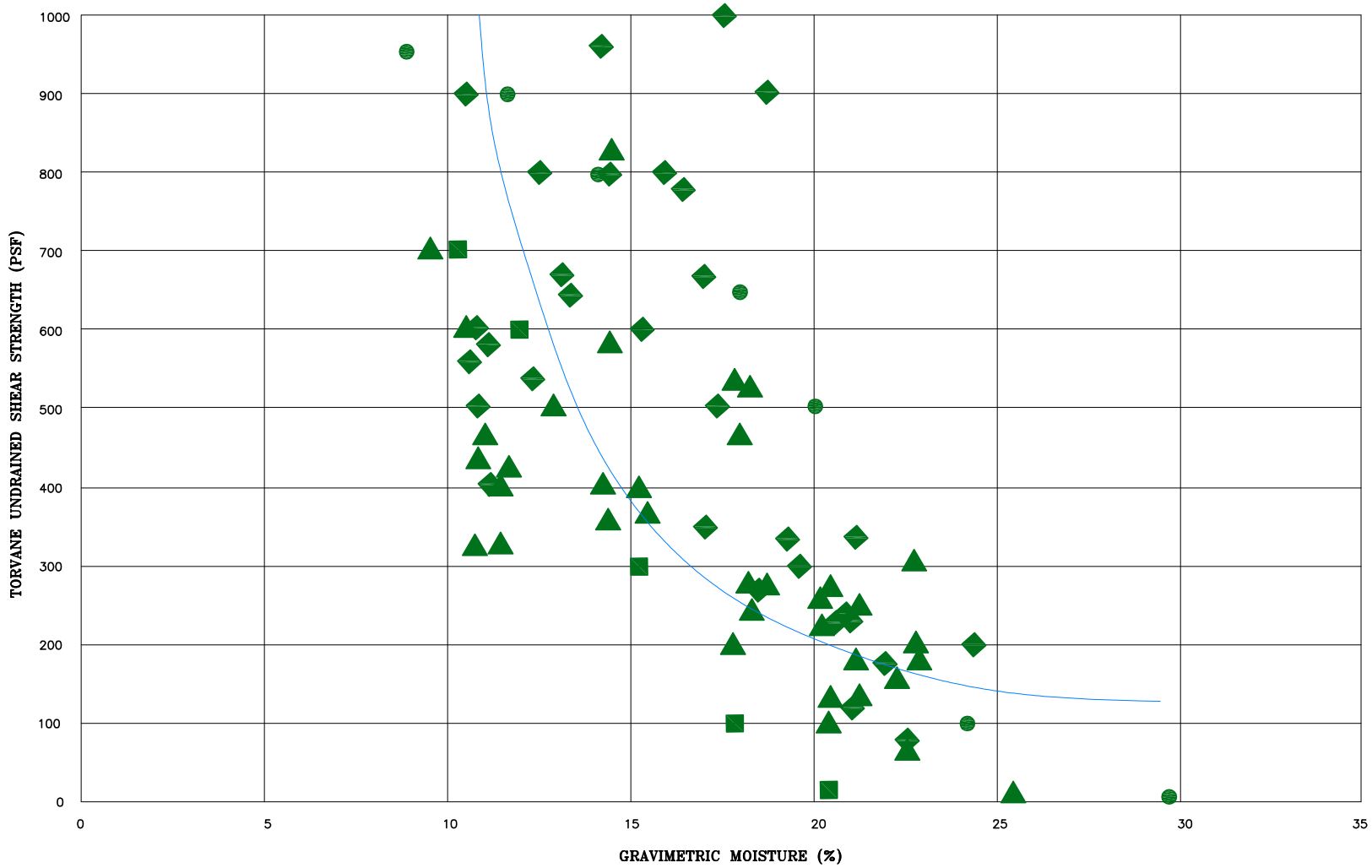
Additional testing was completed by Advanced Terra Testing, Inc (ATT) following the Pressure Extractor Method as described in ASTM D6836. Saturated soil specimens were placed in contact with a water saturated porous plate or membrane. Pore water pressure was maintained at atmospheric pressure, and the pore gas pressure is raised to apply the suction by the axis translation principle. Equilibrium was established by monitoring when water ceases to flow from the specimen.

The results of the previous and current moisture retention testing are shown on Figure 2 and individual test results can be referenced in Appendix A.7.

2.0 Conclusions

Additional samples of tailings were developed and waste rock was obtained for further laboratory analysis as requested by ADEQ. The results of the waste rock laboratory testing indicate that for the lithologies under consideration, all are considered hard, durable materials that will not degrade under meteoric influence or impact, with exception of the Gila Conglomerates. The Gila Conglomerates do show degradation under saturated, impact conditions although the material is still considered a free draining, granular material. Integration of the Gila Conglomerate into the waste rock buttress is still considered appropriate as the Gila Conglomerates only comprise a small percentage of the overall waste rock (approximately 11 percent) and will be blended with other waste lithologies and is considered suitable for buttress material. The results of the current tailings laboratory testing are very similar to the previous laboratory program results and indicate that the material parameters selected for both the seepage and stability analyses are appropriate.

Figures



BEST FIT

DD OF 90 PCF

DD OF 95 PCF

DD OF 100 PCF

DD OF 110 PCF

NOTES:

1. DD – DRY DENSITY
2. RESULTS OF THE TORVANE TESTING ARE SUMMARIZED IN TABLE 1.6.

CLIENT	ROSEMONT COPPER
PROJECT	ROSEMONT PROJECT
TITLE	TORVANE UNDRAINED SHEAR STRENGTH VS. MOISTURE

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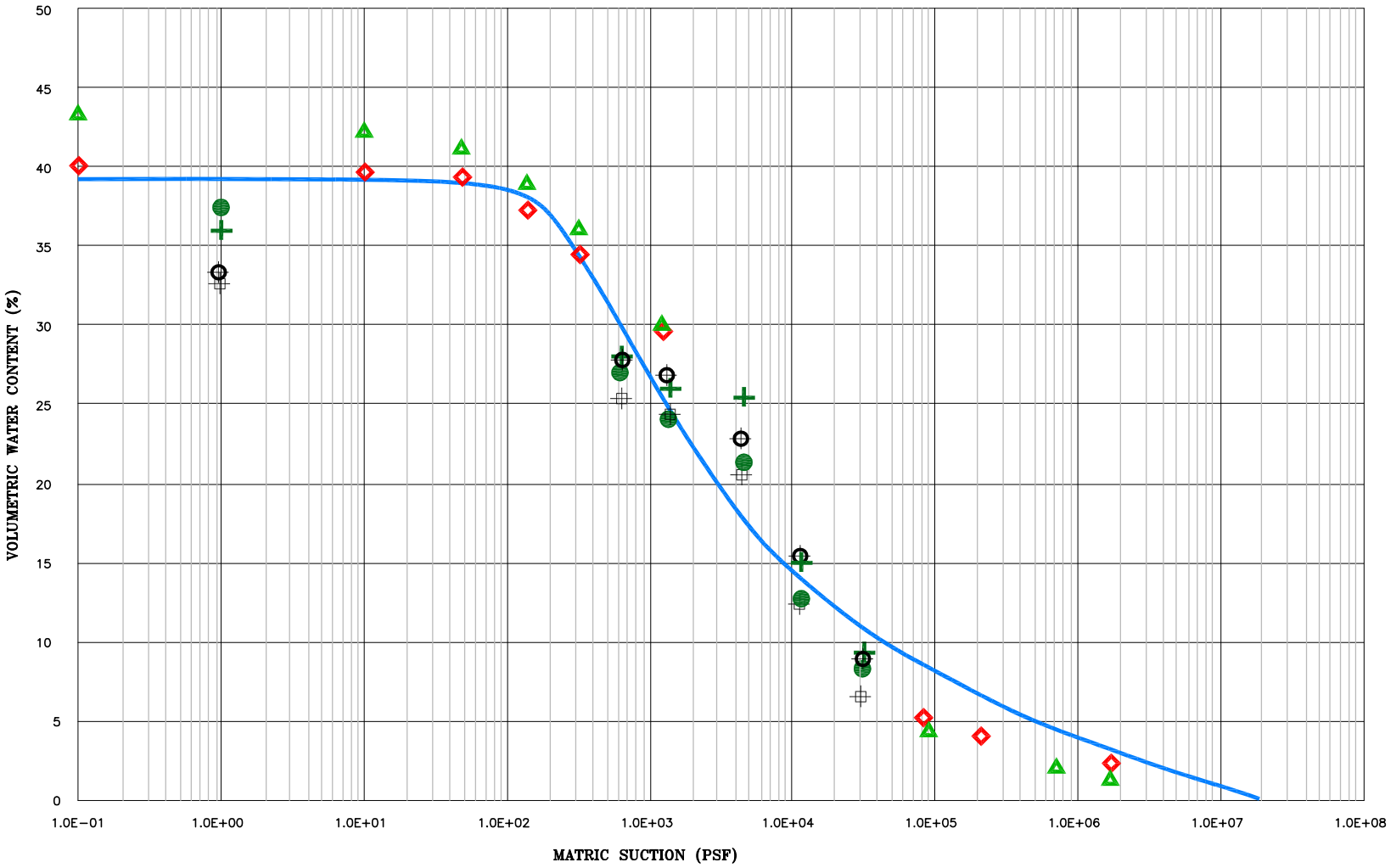
DESIGNED BY	JLW	CHECKED BY	JWH	DATE
DRAWN BY	JW/KS	APPROVED BY	JWH	04-15-09

FILENAME	FIGURE No.	REV
FIGURE 1	1	A



FREDLUND AND XING TAILINGS FIT

MSRD−1 TAILINGS

COLINA TAILINGS

ESCABROSA TAILINGS

YEARS 4−7 COMPOSITE TAILINGS

EPITAPH TAILINGS

EARP TAILINGS

CLIENT: ROSEMONT COPPER

PROJECT: ROSEMONT PROJECT

TITLE: MOISTURE RETENTION DATA AND SOIL−WATER CHARACTERISTIC CURVE

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DRAWN BY	JW/KS	APPROVED BY	JWH	04−15−09

FILENAME	FIGURE No.	REV
FIGURE 2	2	A

Tables

Table 1.1
Rosemont Copper Project
ADEQ Memorandum

Index Test Summary																										
Tailings Samples				GRAIN-SIZE DISTRIBUTION - PERCENT PASSING																		Atterberg Limits			Uncorrected Laboratory DD/MC % (Standard)	
Sample Location	Date	Material Description	USCS	#4	#10	#20	#40	#60	#100	#200	0.05 mm	0.04 mm	0.03 mm	0.02 mm	0.01 mm	0.008 mm	0.006 mm	0.005 mm	0.004 mm	0.003 mm	0.001 mm	Plastic Limit	Liquid Limit	Plasticity Index	MDD (pcf)	MC (%)
Current Testing																										
Colina	7/27/2010	Sandy Silt	ML	-	-	100.0	99.9	99.7	90.4	62.4	56.0	48.4	40.1	31.7	25.6	21.8	18.9	-	16.8	15.1	11.5	NP	17	NP	118.1	13.3
Earp Lithology	7/12/2010	Sandy Silt	ML	-	-	-	100.0	99.7	89.3	59.9	-	52.1	46.0	36.8	30.6	25.9	22.1	19.3	17.5	-	13.9	NP	17	NP	117.4	15.3
Epitaph Lithology	7/12/2010	Sandy Silt	ML	-	-	-	100.0	99.7	91.2	64.9	58.3	49.2	41.6	34.0	27.2	22.6	18.9	-	16.0	15.2	11.4	NP	17	NP	119.6	14.4
Escabrosa	6/28/2010	Sandy Silt	ML	-	-	-	100.0	99.5	90.2	66.9	-	47.7	39.9	32.2	25.9	21.3	-	18.2	15.3	12.9	10.2	NP	NV	NP	119.3	15.0
Horquila	7/27/2010	Sandy Silt	ML	-	100.0	99.9	99.9	98.5	80.1	57.5	50.5	41.8	35.3	28.8	23.0	18.7	-	15.0	12.3	10.6	9.5	NP	15	NP	125.9	12.2
Years 4-7 Composite	6/28/2010	Sandy Silt	ML	-	100.0	100.0	99.9	99.8	91.7	66.1	54.7	46.4	40.3	32.8	25.2	22.2	19.2	-	16.4	14.1	11.4	NP	NV	NP	115.3	16.8
Previous Testing																										
Tailings (TT)	4/15/2009	Lean Clay with Sand	CL	-	-	-	-	100.0	98.0	87.6	-	-	-	-	-	-	-	10.0	-	-	-	16	24	7	121.7	13.9
Colina tailings	4/15/2009	Silt with Sand	ML	-	-	-	100.0	99.9	96.3	72.6	-	-	-	-	-	-	-	21.2	-	-	-	20	22	2	115.8	14.9
MSRD-1 Tailings	4/15/2009	Silt with Sand	ML	-	-	-	100.0	99.9	97.7	72.7	-	-	-	-	-	-	-	18.2	-	-	-	20	21	1	118.9	14.8

Notes:

1. TP - Test Pit
2. NP - Non-plastic
3. MDD - Maximum Dry Density
4. OMC - Optimum Moisture Content

Table 1.2
Rosemont Copper Project
ADEQ Memorandum

One-Dimensional Consolidation Testing and Hydraulic Conductivity											
Sample Location	Material Description	USCS	Remold Test Data				Test Results			Hydraulic Conductivity	
			Dry Density (pcf)	Moisture (%)	Saturation (%)	Initial Void Ratio (e_o)	Preconsolidation Pressure (ksf)	Compression Index (C_c)	Heave (%)	Applied Load (lb/in^2)	k (cm/sec)
Current Testing											
Escabrosa	Sandy Silt	ML	107.1	17.6	68.4	0.776	24.22	0.16	-0.2	30	$2.62x10^{-08}$
										60	$2.02x10^{-08}$
										120	$2.4x10^{-08}$
										240	$8.22x10^{-09}$
Years 4-7 Composite	Sandy Silt	ML	103.9	18.9	72.3	0.764	15.7	0.18	-	30	$8.12x10^{-09}$
										60	$1.42x10^{-07}$
										120	$1.66x10^{-08}$
										240	$6.4x10^{-09}$
EARP Lithology	Sandy Silt	ML	105.2	18.0	70.5	0.731	3.23	0.16	-0.1	30	$1.24x10^{-07}$
										60	$3.10x10^{-08}$
										120	$1.73x10^{-08}$
										240	$1.63x10^{-08}$
Epitaph Lithology	Sandy Silt	ML	107.0	17.1	80	0.638	3.68	0.17	-0.3	30	$2.30x10^{-08}$
										60	$3.08x10^{-08}$
										120	$7.41x10^{-09}$
										240	$9.35x10^{-09}$
Horquila	Sandy Silt	ML	112.0	15.6	65.1	0.743	4.38	0.15	-0.3	30	$5.11x10^{-08}$
										60	$3.00x10^{-08}$
										120	$1.56x10^{-08}$
										240	$8.51x10^{-09}$
Colina	Sandy Silt	ML	105.8	16.5	69.1	0.665	11.6	0.19	-0.3	30	$2.31x10^{-08}$
										60	$3.73x10^{-08}$
										120	$3.79x10^{-08}$
										240	$1.09x10^{-08}$
Previous Testing											
Colina	-	-	101.6	19.9	73.4	0.787	10.38	0.17	-	30	-
										60	$4.00x10^{-08}$
										120	$8.3x10^{-07}$
										240	$7.10x10^{-07}$
MSRD-1	-	-	110.3	20.5	87.6	0.703	21.53	0.08	-	30	$1.00x10^{-06}$
										60	$9.2x10^{-07}$
										120	$8.5x10^{-07}$
										240	$5.9x10^{-07}$

Notes:
1. Tap water was used as the permeant
2. Back pressure saturation continued until 'B' Parameter was a minimum of 0.95.

Table 1.3
Rosemont Copper Project
ADEQ Memorandum

Triaxial Shear (CU) Testing								
Sample Location	Material Description	USCS	Remold Test Data		Effective Strength		Total Strength	
			Dry Density (pcf)	Moisture (%)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle	Cohesion (psf)
Current Testing								
Escabrosa	Sandy Silt	ML	108.1	17.5	38.0	0.0	25.2	397.9
4-7 Years Composite	Sandy Silt	ML	105.0	18.8	35.9	0.0	20.4	895.7
EARP Lithology	Sandy Silt	ML	106.9	18.6	35.7	0.0	20.8	483.9
Epitaph Lithology	Sandy Silt	ML	108.0	17.1	36.7	97.9	19.8	1,168
Horquila	Sandy Silt	ML	113.2	15.5	37.0	0.0	19.1	527.7
Colina	Sandy Silt	ML	106.1	16.5	36.1	0.0	18.6	678.7
Previous Testing								
Tailings (TT)	Lean Clay with Sand	CL	103.7	13.6	34.5	0.0	17.0	0.0
Colina	Silt with Sand	ML	96.6	19.6	36.5	0.0	18.7	1,930
MSDR-1 Tailings	Silt with Sand	ML	105.0	20.8	36.6	130	18.9	3,260

Direct Shear								
Sample Location	Material Description	USCS	Remold Test Data			Ultimate Strength		
			Dry Density (pcf)	Moisture (%)	Compaction (%) DD	Friction Angle	Cohesion (psf)	
Current Testing								
Escabrosa	Sandy Silt	ML	106.9	17.3	90	30.7	334.5	
4-7 Years Composite	Sandy Silt	ML	103.8	18.8	90	31.6	170.3	
EARP Lithology	Sandy Silt	ML	106.2	17.5	90	32.6	7.9	
Epitaph Lithology	Sandy Silt	ML	104.6	18.5	90	32.1	63.1	
Horquila	Sandy Silt	ML	112.1	15.5	90	31.2	192.5	
Colina	Sandy Silt	ML	105.0	16.5	90	31.9	120	
Previous Testing								
Tailings (TT)	Lean Clay with Sand	CL	110.7	14.0	91	26.3	420	

Notes:
1. Tap water was used as the permeant
2. Back pressure saturation continued until 'B' Parameter was a minimum of 0.95.
3. Failure Tangents draw at peak principle stress ratio and C=0.

Table 1.4
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Point Load Test Summary							
Sample Location	**Depth (ft)**	**Lithology**	**Diameter (in)**	**Thickness (in)**	**Uncorrected Load (lbs)**	**Point Load* (psi)**	**Compressive Strength* (psi)**
AR-2033	1337-1339	Abrigo	3.049	2.403	4984.6	863.2	23400
AR-2050	328.4-330.4	Tertiary Gravel (Gila)	3.005	2.487	569.3	92	2570
AR-2050	228.8-230.7	Tertiary Gravel (Gila)	3.131	2.382	149	26.3	710
A-819	1351.2-1351.5	Horquilla	2.011	1.716	6723	2283.2	46320
1919	483.6-483.9	Horquilla	2.49	1.99	6541.2	1651.8	37940
AR-2049	601.8-603.5	Glance	2.991	2.407	2995.3	517	14030
AR-2027	126-127	Glance	3.058	2.498	2628.9	421.3	11830
AR-2027	380.2-380.5	Concha	2.997	2.493	1676.7	269.8	7560
AR-2044	499.7-500	Concha	3.156	2.398	1788.5	311	8410
AR-2051A	1315.2-1317	Epitaph	3.126	2.39	788.7	138.1	3720
AR-2051B	1315.2-1317	Epitaph	2.561	2.39	1368.3	239.5	6460
AR-2053	190.9-192.8	Willow Canyon	2.974	2.514	364.3	57.6	1630
AR-2052	592-593.9	Willow Canyon	2.97	2.404	76.6	13.3	360
AR-2033	1208-1209.9	Abrigo	2.237	2.391	2165.2	317.9	8920

*Brook, N. 1980. Size Correction for Point Load Testing. International Journal of Rock Mechanics & Mining Sciences & Geomechanical Abstracts. Vol. 17, No. 4, August 1980.

Table 1.5
Rosemont Copper Project
ADEQ Memorandum

LA Abrasion and Slake Durability Summary									
Sample		Slake Durability				LA Abrasion			
Lithology	Composite Sample Depths	Type	1st Cycle Durability (%)	2nd Cycle Durability (%)	Moisture Content (%)	Aggregate Accumulated (g)	100 Revolutions Percent Loss	500 Revolutions Percent Loss	Uniform Hardness Ratio
Epitaph	1315.2-1317.5	I	99.56	99.17	1.17	-	-	-	-
Abrigo	1337.0-1339.0, 1208.0-1209.9	I	98.91	98.40	0.40	5003.4	4.6	18.7	0.247
Tertiary Gravel (Gila)	228.8-230.7, 328.4-330.4	II	66.96	58.47	3.00	5001.7	58.0	90.7	0.639
Horquilla	1350.9-1352.8, 481.0-484.3	I	99.74	99.57	0.16	5006.2	4.0	16.6	0.239
Concha	498.6-500.0, 379.5-381.5	I	99.70	99.47	0.09	4998.3	7.8	33.0	0.237
Willow Canyon	592.0-593.9, 190.9-192.8	I	99.19	98.70	0.94	5004.4	6.8	25.9	0.262
Glance	126.0-127.0, 601.8-603.5	I	99.62	99.39	0.21	5005.5	5.8	23.4	0.249

Notes:

1. Type I - Retained specimen remain virtually unchanged

2. Type II - Retained specimen consist of large and small fragments.

Table 1.6
Rosemont Copper Project
ADEQ Memorandum

Moisture-Density and Torvane Summary						
Sample	Target Dry Density = 95 pcf			Target Dry Density = 110 pcf		
	Target Moisture (%)	Actual Moisture (%)	Torvane Value (psf)	Target Moisture (%)	Actual Moisture (%)	Torvane Value (tsf)
Current Testing						
Years 4-7 Composite	12	11.3	460	12	10.9	560
	15	14.4	580	15	13.8	620
	18	17.8	520	18	16.5	760
	21	21.2	180	21	18.8	900
	24	23.7	180	24	21.6	240
Earp	12	11.4	420	12	11.2	580
	15	13.8	500	15	14.4	800
	18	18.1	240	18	16	800
	21	21.4	240	21	18.8	260
	24	23	200	24	21.2	220
Escabrosa	12	11.2	320	12	11.1	400
	15	14.3	400	15	13.9	620
	18	17.4	460	18	16.8	660
	21	20.5	260	21	19.2	300
	24	22.8	120	24	22.1	180
Epitaph	12	11.1	420	12	11.2	760
	15	14.3	820	15	13.7	700
	18	17.6	280	18	16.4	340
	21	20.2	220	21	19.5	300
	24	23	160	24	22.1	180
Horquilla	12	12	320	12	11.8	500
	15	15.2	380	15	14.6	620
	18	18.2	280	18	17.4	360
	21	21.1	140	21	20.3	220
	24	23.8	60	24	23.4	80
Colina	12	11.9	400	12	11.5	600
	15	14.5	360	15	14.3	980
	18	17.8	520	18	17.1	1000
	21	20.7	260	21	19.1	320
	24	23	300	24	22.4	320
Previous Testing						
Sample	Target Dry Density = 100 pcf			Target Dry Density = 90 pcf		
	Target Moisture (%)	Actual Moisture (%)	Torvane Value (tsf)	Target Moisture (%)	Actual Moisture (%)	Torvane Value (tsf)
Colina	-	9.8	950	-	10.1	700
	-	12.1	900	-	12.4	600
	-	14.5	800	-	15.1	300
	-	17.3	650	-	17.6	100
	-	20.0	500	-	20.7	20
	-	24.1	100	-	-	-
	-	29.3	20	-	-	-
	Target Dry Density = 110 pcf			Target Dry Density = 95 pcf		
MSRD-1	-	10.5	900	-	9.8	700
	-	13.0	800	-	12.6	600
	-	15.5	600	-	15.1	400
	-	17.5	500	-	17.8	200
	-	20.3	240	-	20.6	100
	-	24.5	200	-	26.0	20

Appendix A

Laboratory Testing

Appendix A.1 – Index Testing

Appendix A.2 – One-Dimensional Consolidation

Appendix A.3 – Triaxial Shear

Appendix A.4 – Direct Shear

Appendix A.5 – Point Load Testing, L.A. Abrasion, and Slake Durability

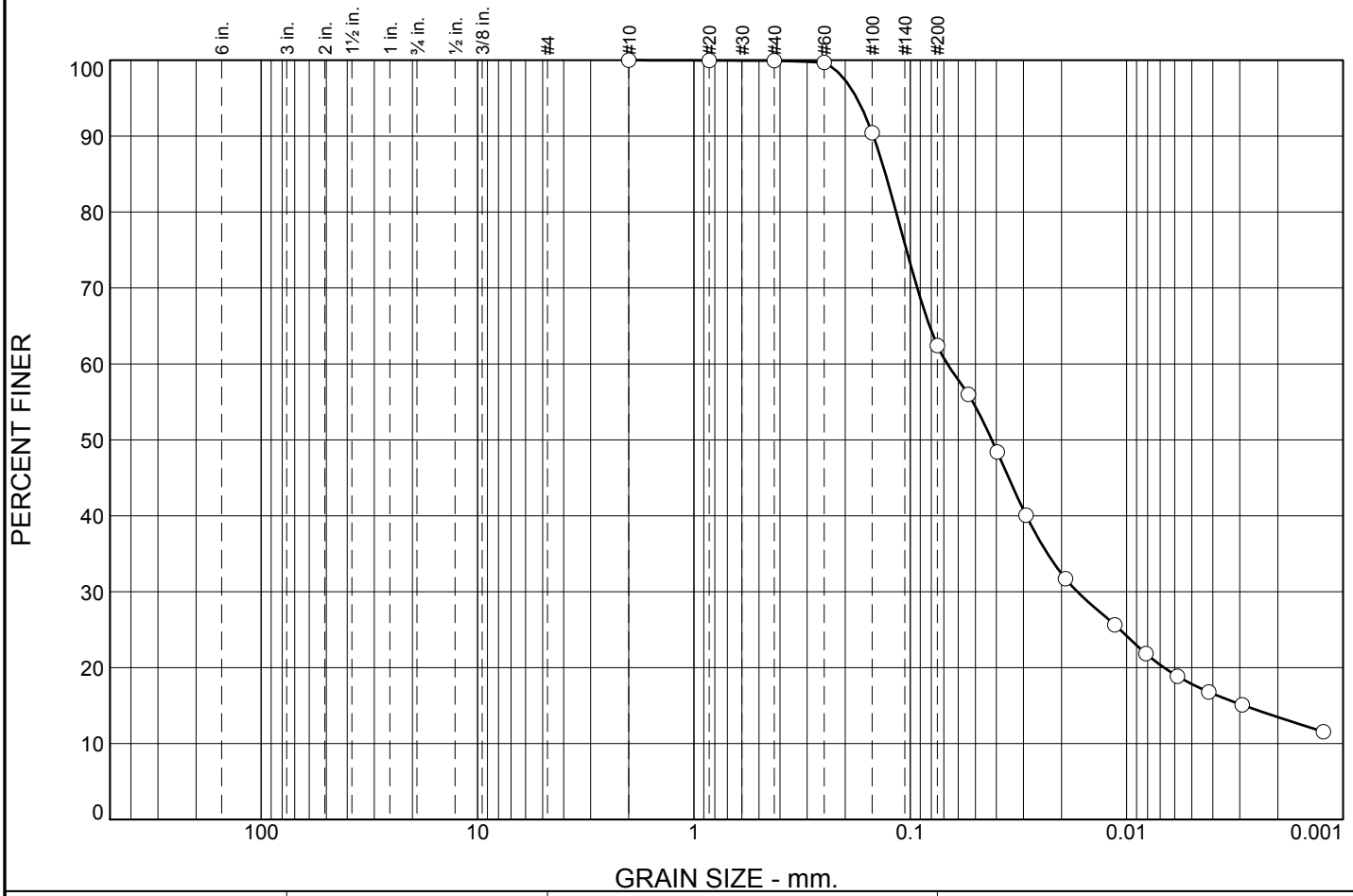
Appendix A.6 – Torvane Undrained Shear Strength

Appendix A.7 – Moisture Retention

Appendix A.1

Index Testing

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	37.5	48.9	13.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.7		
#100	90.4		
#200	62.4		
0.0539 mm.	56.0		
0.0396 mm.	48.4		
0.0292 mm.	40.1		
0.0192 mm.	31.7		
0.0113 mm.	25.6		
0.0081 mm.	21.8		
0.0058 mm.	18.9		
0.0042 mm.	16.8		
0.0029 mm.	15.1		
0.0012 mm.	11.5		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= 17 PI= NP

Coefficients

D_{85}= 0.1302 D_{60}= 0.0675 D_{50}= 0.0420
D_{30}= 0.0169 D_{15}= 0.0029 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

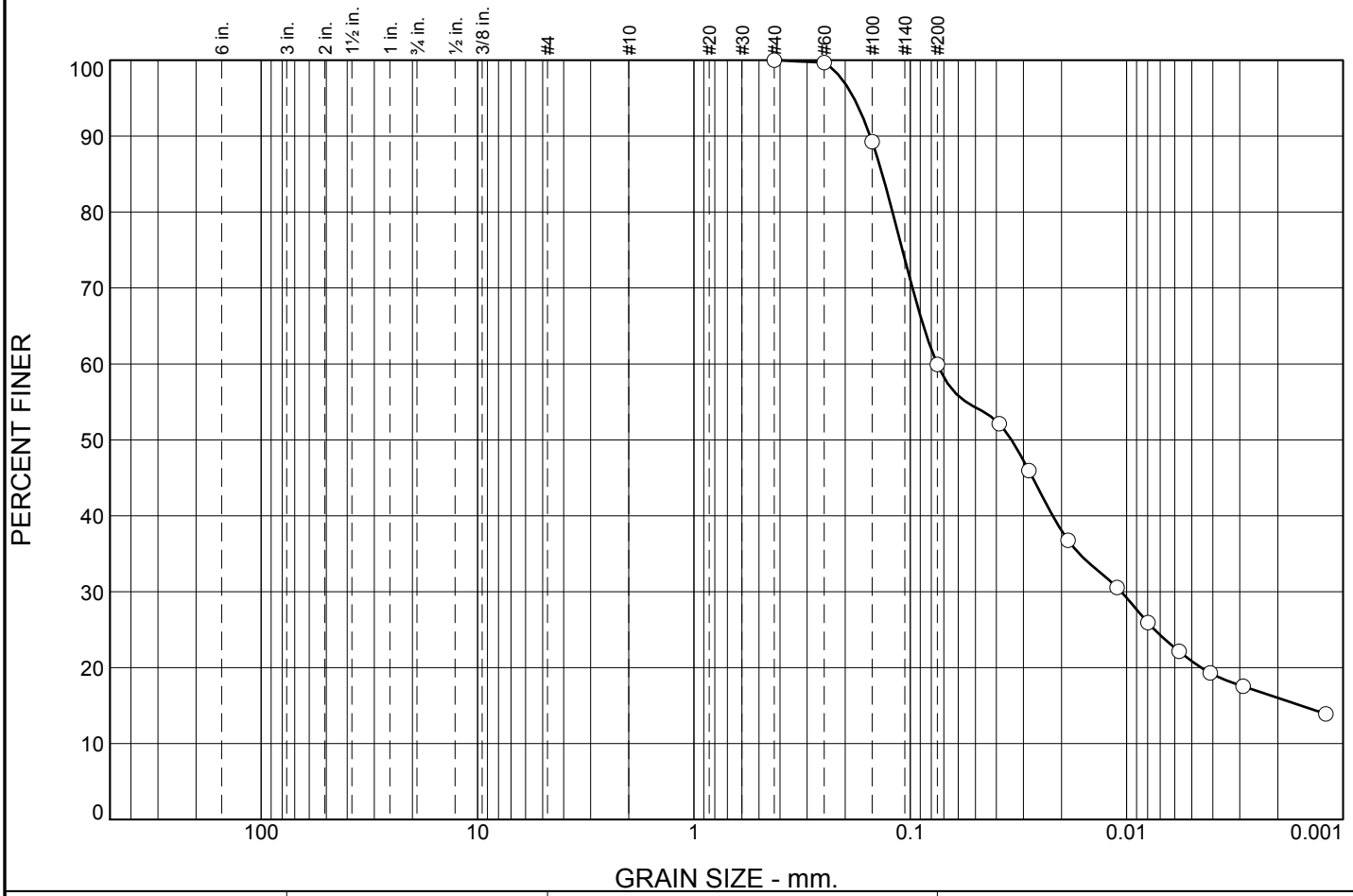
Gs=2.79

Sample No.: **Source of Sample:** **Date:** 7/27/10
Location: Colina #3 **Elev./Depth:**

Knight Piésold CONSULTING

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No: DV108-130.10 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	40.1	43.9	16.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#40	100.0		
#60	99.7		
#100	89.3		
#200	59.9		
0.0388 mm.	52.1		
0.0283 mm.	46.0		
0.0187 mm.	36.8		
0.0111 mm.	30.6		
0.0080 mm.	25.9		
0.0057 mm.	22.1		
0.0041 mm.	19.3		
0.0029 mm.	17.5		
0.0012 mm.	13.9		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= 17 PI= NP

Coefficients

D_{85}= 0.1348 D_{60}= 0.0752 D_{50}= 0.0341
D_{30}= 0.0106 D_{15}= 0.0016 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

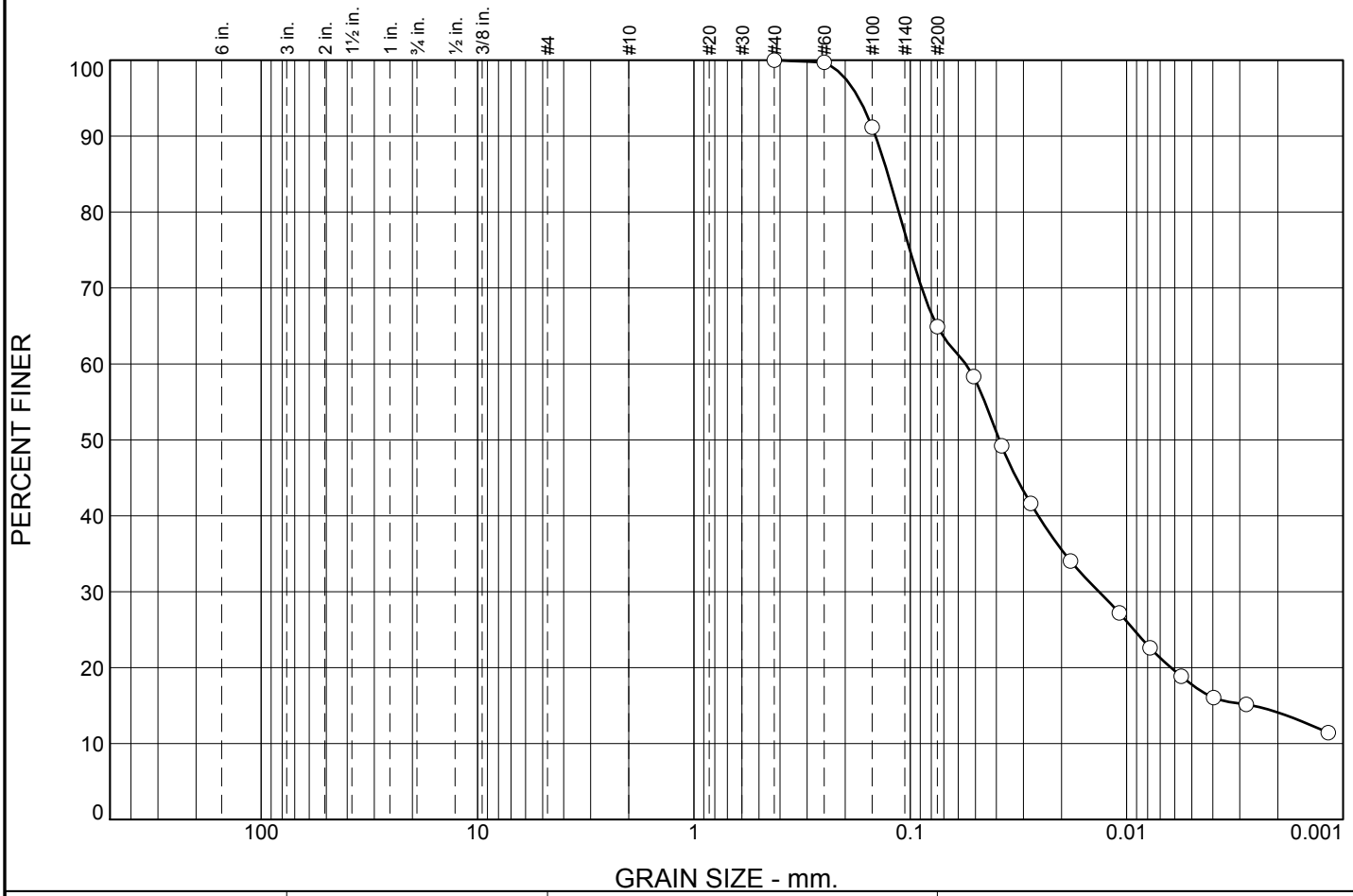
Gs=2.87

Sample No.: **Source of Sample:** **Date:** 7/12/10
Location: Earp Lithology 1 **Elev./Depth:**

Knight Piésold CONSULTING

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No: DV108-130.10 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	35.1	50.8	14.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#40	100.0		
#60	99.7		
#100	91.2		
#200	64.9		
0.0509 mm.	58.3		
0.0378 mm.	49.2		
0.0278 mm.	41.6		
0.0182 mm.	34.0		
0.0108 mm.	27.2		
0.0078 mm.	22.6		
0.0056 mm.	18.9		
0.0040 mm.	16.0		
0.0028 mm.	15.2		
0.0012 mm.	11.4		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= 17 PI= NP

Coefficients

D_{85}= 0.1270 D_{60}= 0.0554 D_{50}= 0.0388
D_{30}= 0.0134 D_{15}= 0.0026 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

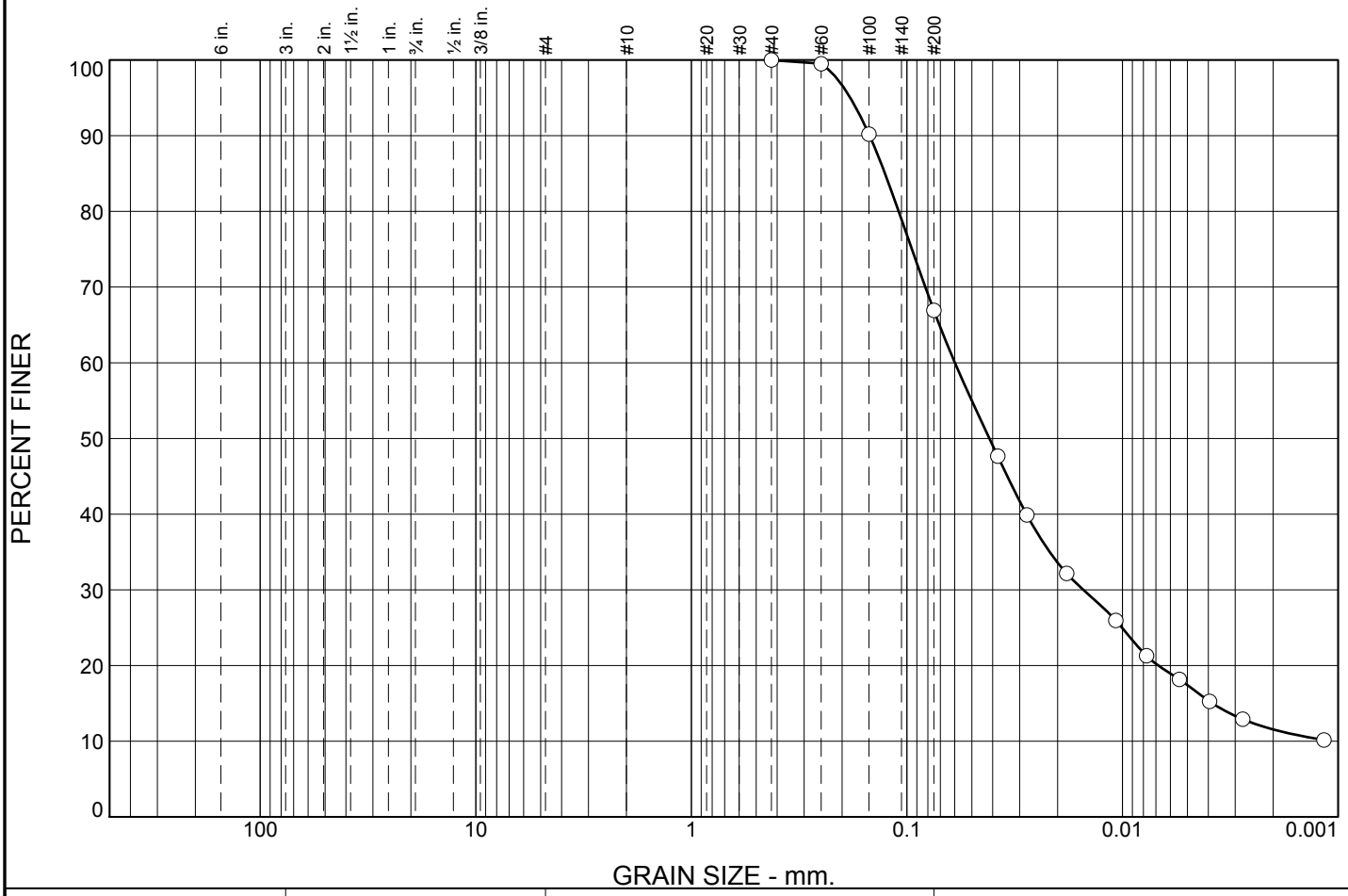
Gs=2.99

Sample No.: **Source of Sample:** **Date:** 7/12/10
Location: Epitaph Lithology 2 **Elev./Depth:**

Knight Piésold CONSULTING

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No: DV108-130.10 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	33.1	55.3	11.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#40	100.0		
#60	99.5		
#100	90.2		
#200	66.9		
0.0379 mm.	47.7		
0.0278 mm.	39.9		
0.0181 mm.	32.2		
0.0107 mm.	25.9		
0.0077 mm.	21.3		
0.0054 mm.	18.2		
0.0039 mm.	15.3		
0.0028 mm.	12.9		
0.0012 mm.	10.2		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.1264 D_{60}= 0.0599 D_{50}= 0.0414
D_{30}= 0.0152 D_{15}= 0.0038 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

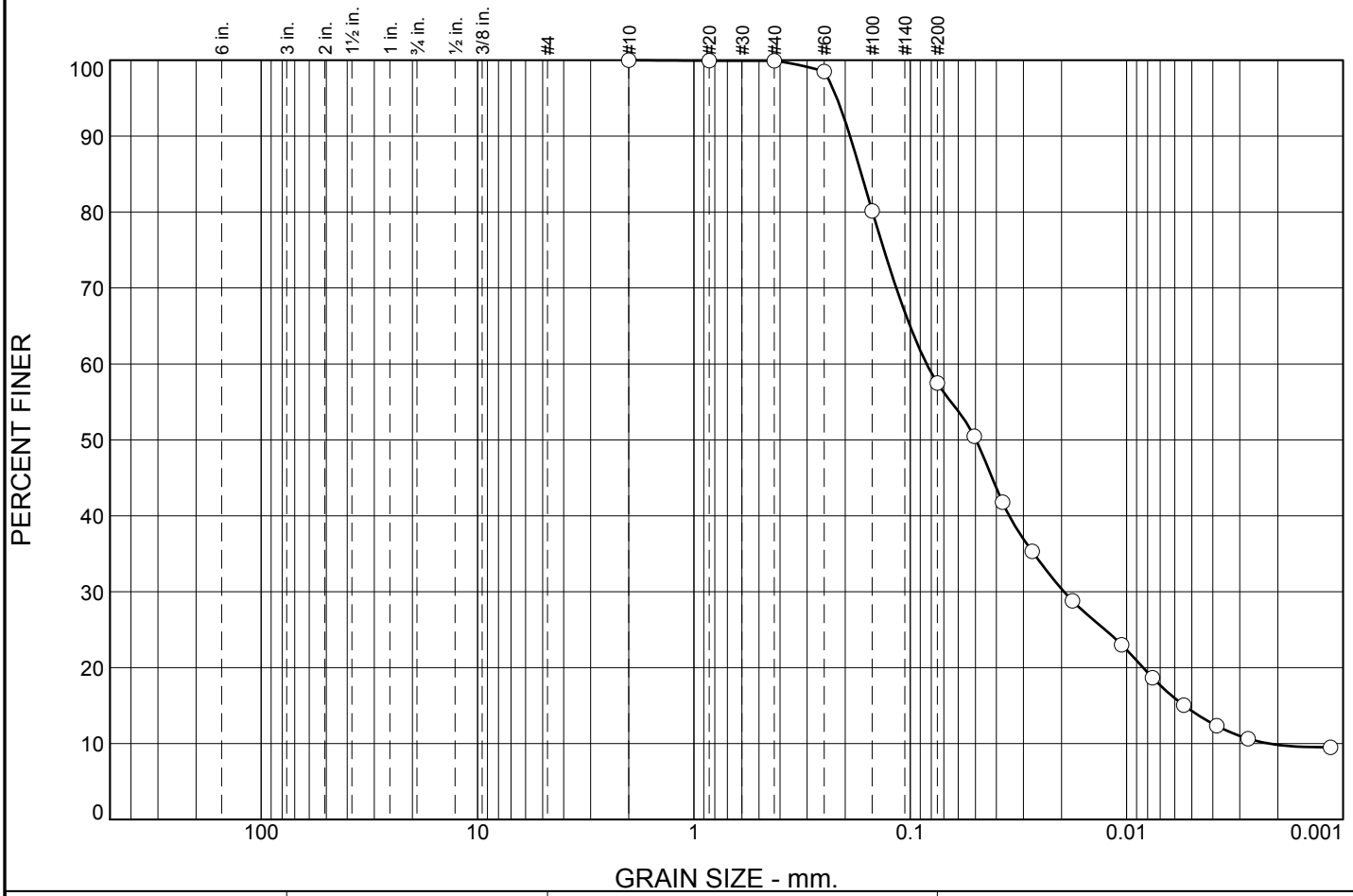
Gs=3.02

Sample No.: **Source of Sample:** **Date:** 6/28/10
Location: Escabrosa **Elev./Depth:**

Knight Piésold CONSULTING

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No: DV108-130.10 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	42.4	47.7	9.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.9		
#60	98.5		
#100	80.1		
#200	57.5		
0.0506 mm.	50.5		
0.0375 mm.	41.8		
0.0273 mm.	35.3		
0.0178 mm.	28.8		
0.0105 mm.	23.0		
0.0076 mm.	18.7		
0.0054 mm.	15.0		
0.0038 mm.	12.3		
0.0027 mm.	10.6		
0.0011 mm.	9.5		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= 15 PI= NP

Coefficients

D_{85}= 0.1681 D_{60}= 0.0841 D_{50}= 0.0497
D_{30}= 0.0195 D_{15}= 0.0054 D_{10}= 0.0022
C_u= 38.15 C_c= 2.05

Classification

USCS= ML AASHTO= A-4(0)

Remarks

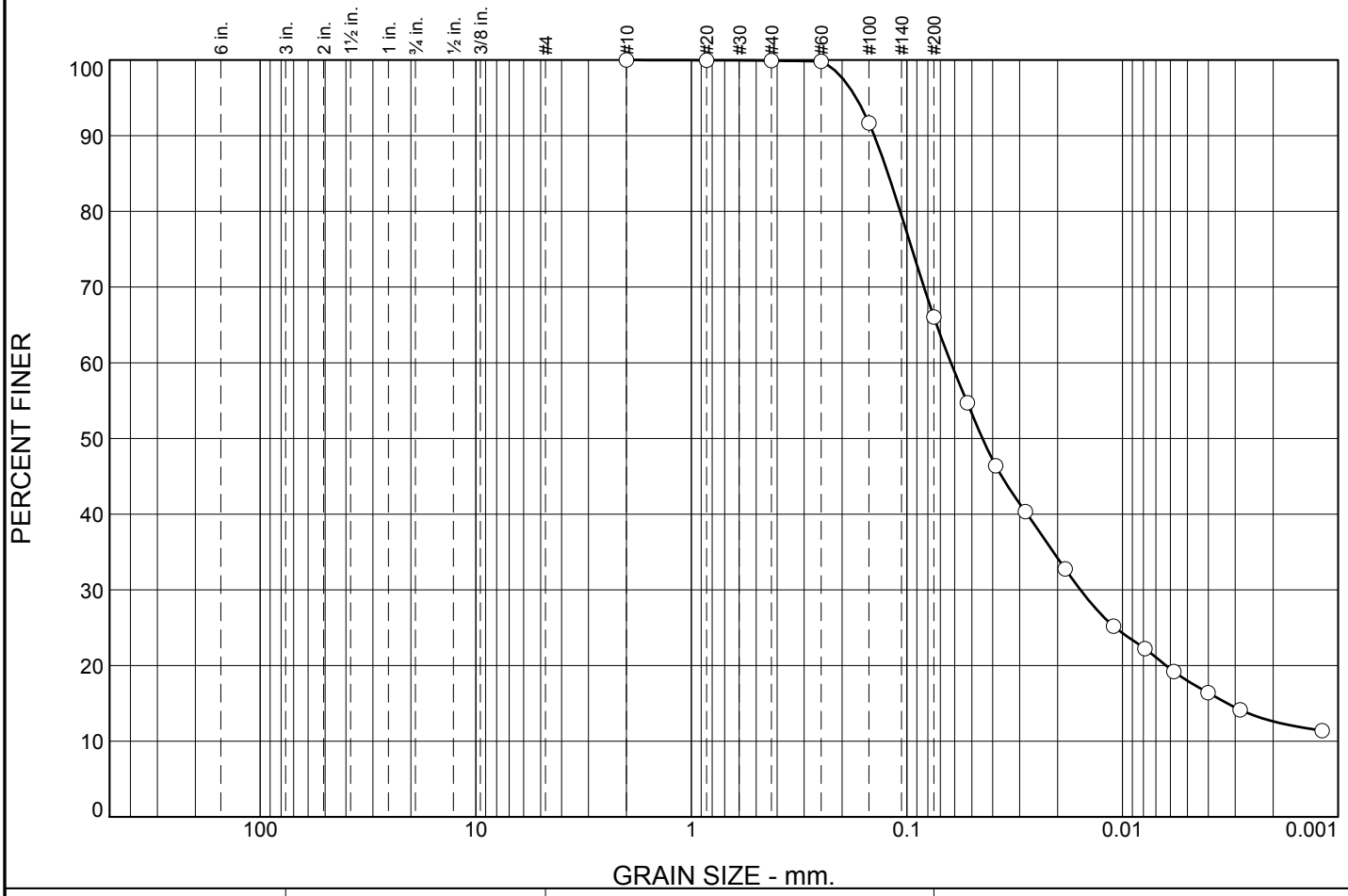
Gs=3.10

Sample No.: **Source of Sample:** **Date:** 7/27/10
Location: Horquila #3 **Elev./Depth:**

Knight Piésold CONSULTING

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No: DV108-130.10 **Fig.**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	33.8	53.5	12.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.8		
#100	91.7		
#200	66.1		
0.0525 mm.	54.7		
0.0387 mm.	46.4		
0.0282 mm.	40.3		
0.0185 mm.	32.8		
0.0110 mm.	25.2		
0.0079 mm.	22.2		
0.0058 mm.	19.2		
0.0040 mm.	16.4		
0.0028 mm.	14.1		
0.0012 mm.	11.4		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.1224 D_{60}= 0.0625 D_{50}= 0.0446
D_{30}= 0.0157 D_{15}= 0.0033 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Gs=2.93

Sample No.: **Source of Sample:** **Date:** 6/28/10
Location: Years 4-7 Composite **Elev./Depth:**

Knight Piésold CONSULTING

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No: DV108-130.10 **Fig.**

COMPACTION TEST REPORT

Project No.: DV108-130.10 **Date:** 07/30/10

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Colina #3

Elev./Depth: **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description: sandy silt

Classifications - **USCS:** ML **AASHTO:** A-4(0)

Nat. Moist. =

Liquid Limit = 17

Sp.G. = 2.79

Plasticity Index = NP

% < No.200 = 62.4 %

TEST RESULTS
Maximum dry density = 118.1 pcf
Optimum moisture = 13.3 %

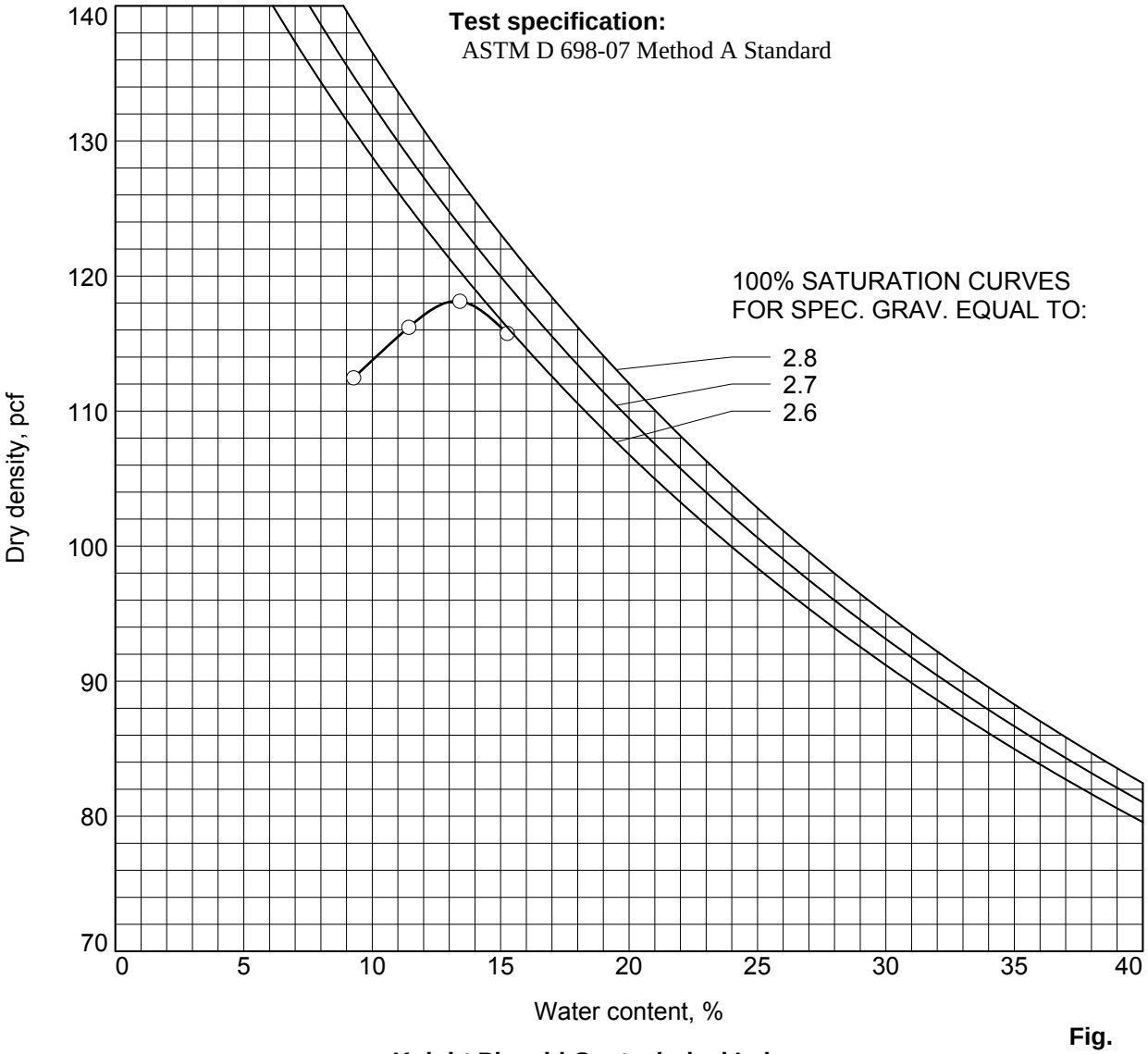


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: DV108-130.10 **Date:** 07/13/10

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Earp Lithology 1

Elev./Depth: **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description: sandy silt

Classifications - **USCS:** ML **AASHTO:** A-4(0)

Nat. Moist. = **Sp.G. =** 2.87

Liquid Limit = 17 **Plasticity Index =** NP

% < No.200 = 59.9 %

TEST RESULTS
Maximum dry density = 117.4 pcf
Optimum moisture = 15.3 %

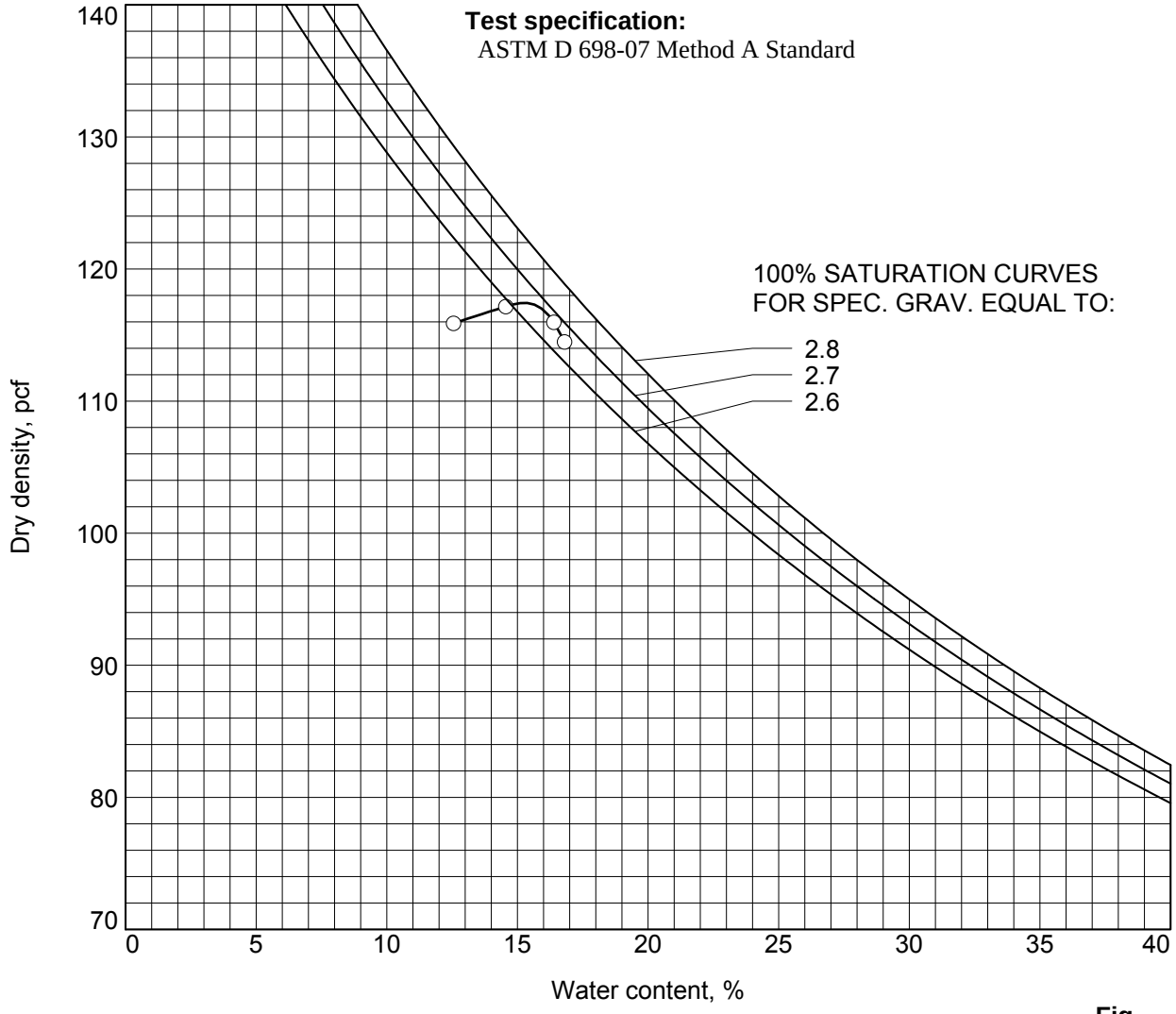


Fig.

Knight Piesold Geotechnical Lab.

Tested By: jk

COMPACTION TEST REPORT

Project No.: DV108-130.10 **Date:** 07/13/10

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Epitaph Lithology 2

Elev./Depth: **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description: sandy silt

Classifications - **USCS:** ML **AASHTO:** A-4(0)

Nat. Moist. = **Sp.G. =** 2.99

Liquid Limit = 17 **Plasticity Index =** NP

% < No.200 = 64.9 %

TEST RESULTS
Maximum dry density = 119.6 pcf
Optimum moisture = 14.4 %

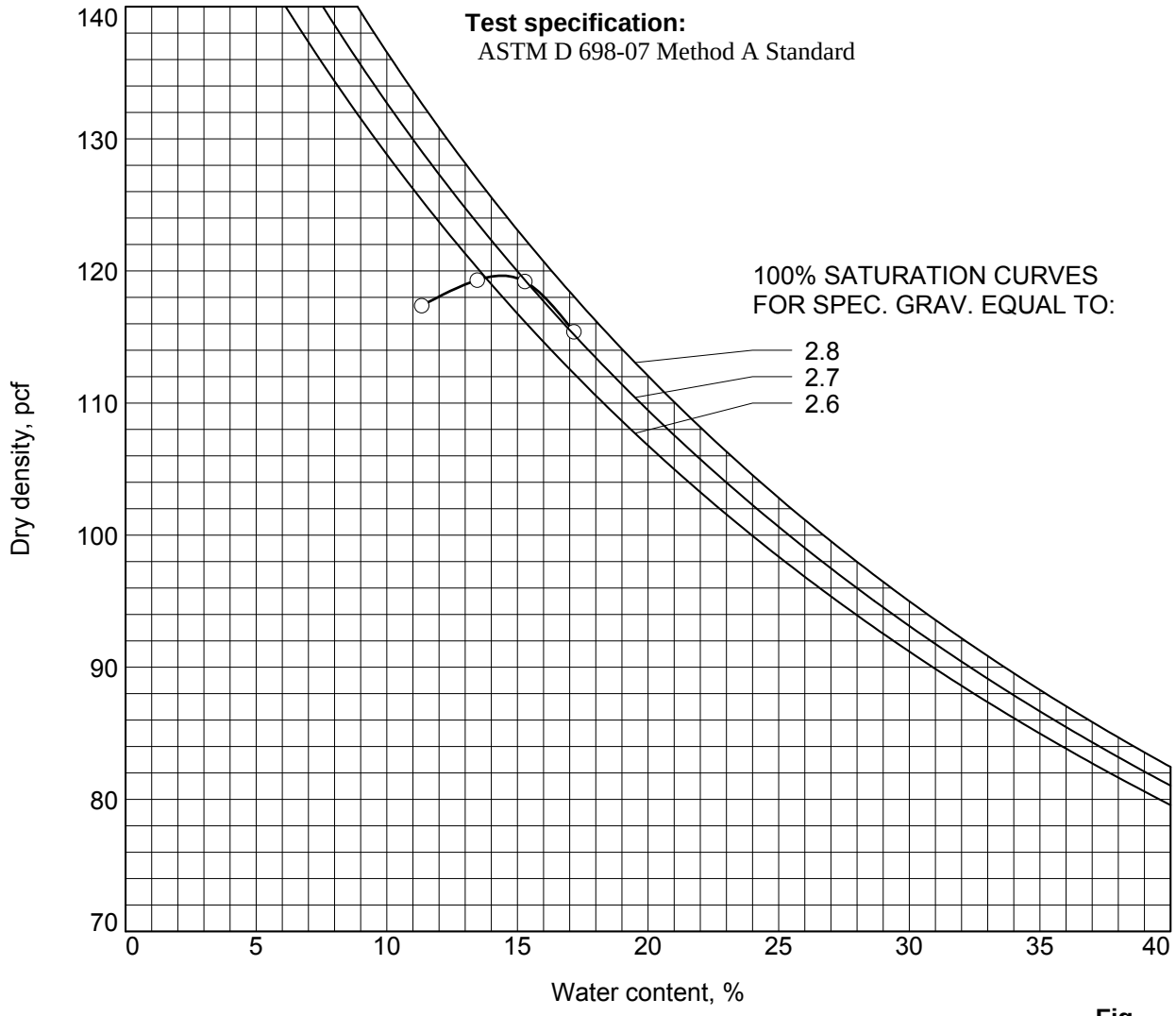


Fig.

Knight Piesold Geotechnical Lab.

Tested By: jk

COMPACTION TEST REPORT

Curve No.: -

Project No.: DV108-130.10 **Date:** 7-1-10

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Escabrosa

Elev./Depth: **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description: sandy silt

Classifications - **USCS:** ML **AASHTO:** A-4(0)

Nat. Moist. = **Sp.G. =** 2.93

Liquid Limit = NV **Plasticity Index =** NP

% < No.200 = 66.9 %

TEST RESULTS
Maximum dry density = 119.3 pcf
Optimum moisture = 15.0 %

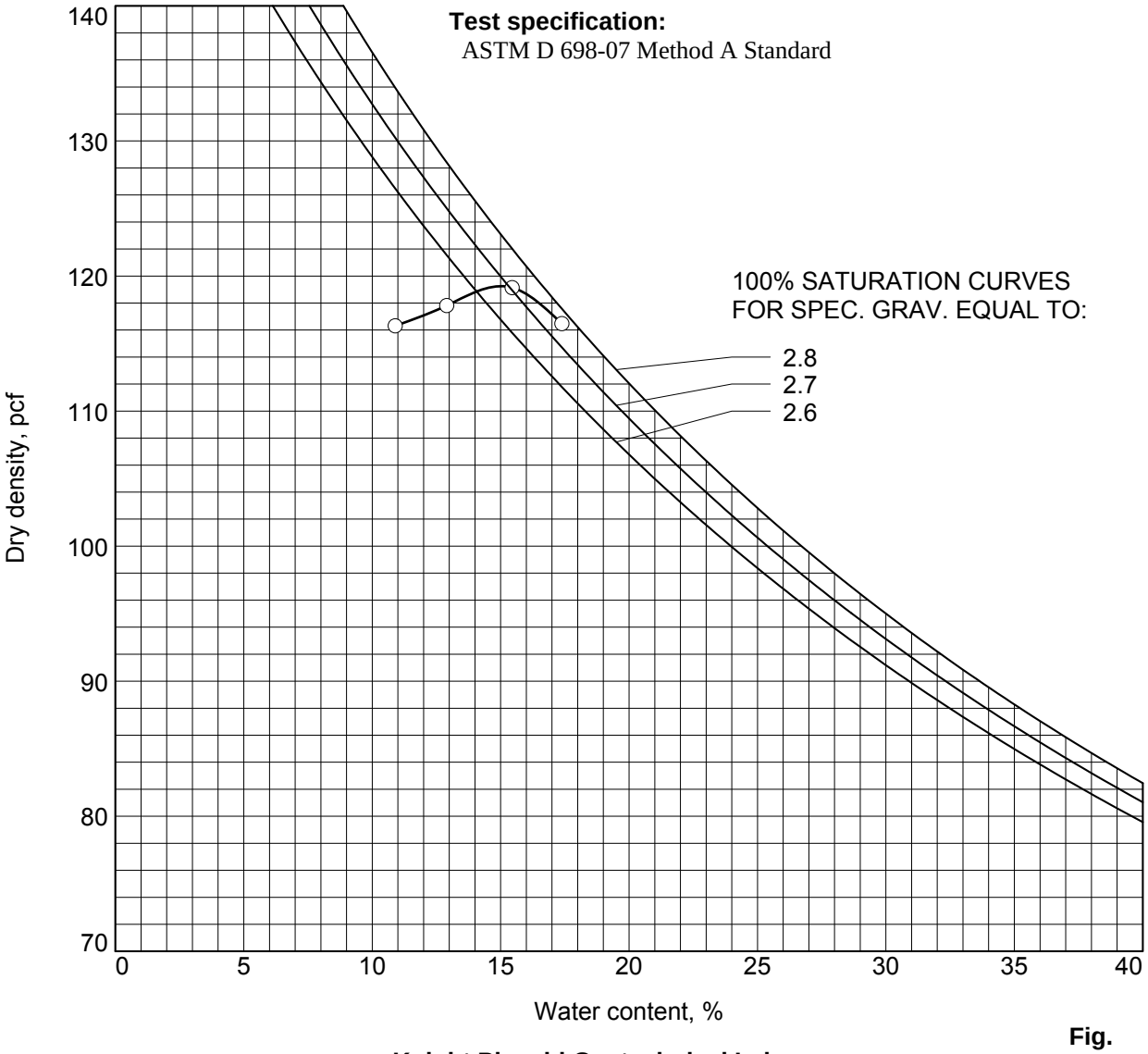


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: DV108-130.10 **Date:** 07/30/10

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Horquila #3

Elev./Depth: **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description: sandy silt

Classifications - **USCS:** ML **AASHTO:** A-4(0)

Nat. Moist. = **Sp.G. =** 3.10

Liquid Limit = 15 **Plasticity Index =** NP

% < No.200 = 57.5 %

TEST RESULTS
Maximum dry density = 125.9 pcf
Optimum moisture = 12.2 %

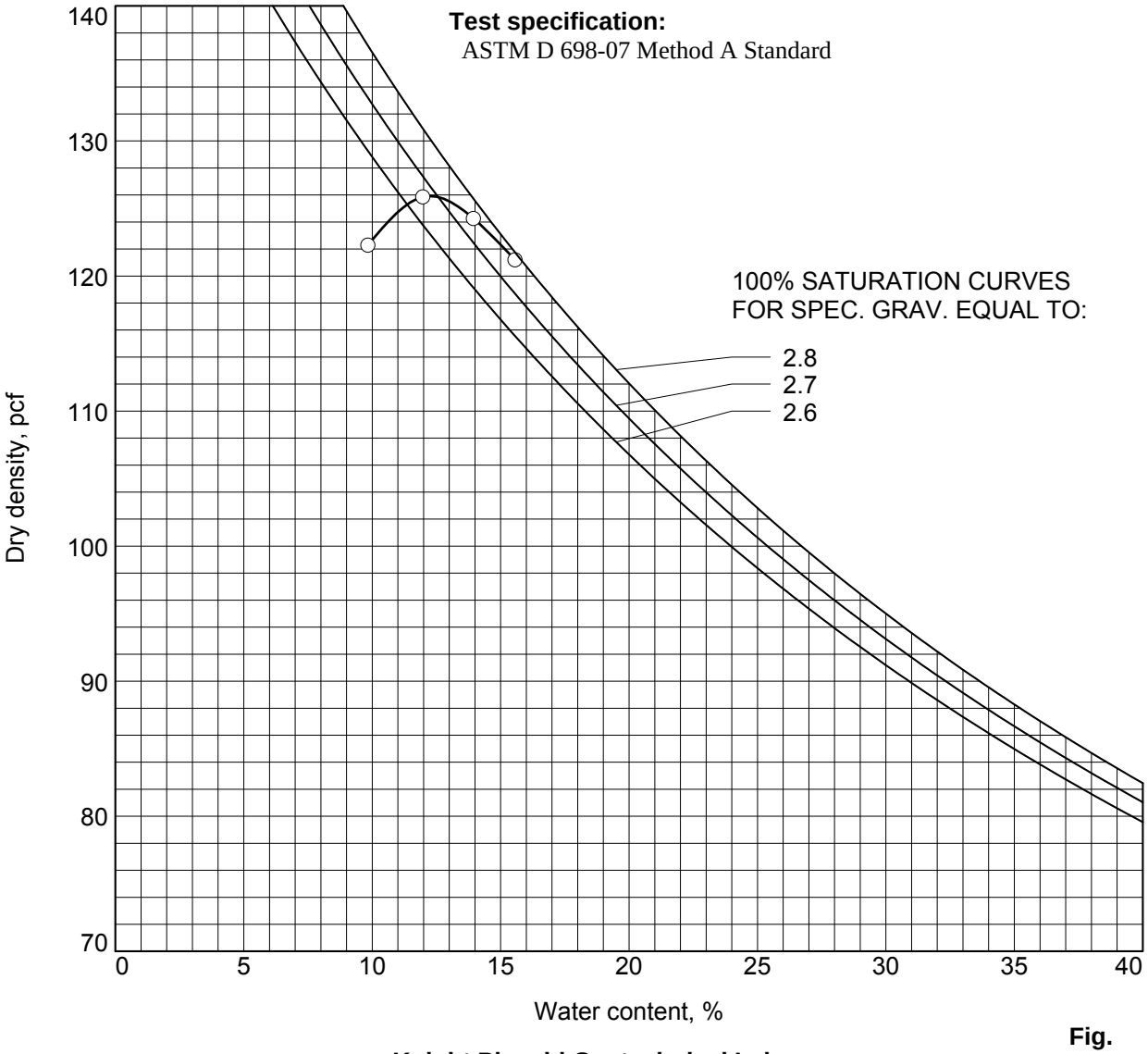


Fig.

Knight Piesold Geotechnical Lab.

COMPACTION TEST REPORT

Project No.: DV108-130.10 **Date:** 7-1-10

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Years 4-7 Composite

Elev./Depth: **Sample No.**

Remarks:

MATERIAL DESCRIPTION

Description: sandy silt

Classifications - **USCS:** ML **AASHTO:** A-4(0)

Nat. Moist. = **Sp.G. =** 2.93

Liquid Limit = NV **Plasticity Index =** NP

% < No.200 = 66.1 %

TEST RESULTS
Maximum dry density = 115.3 pcf
Optimum moisture = 16.8 %

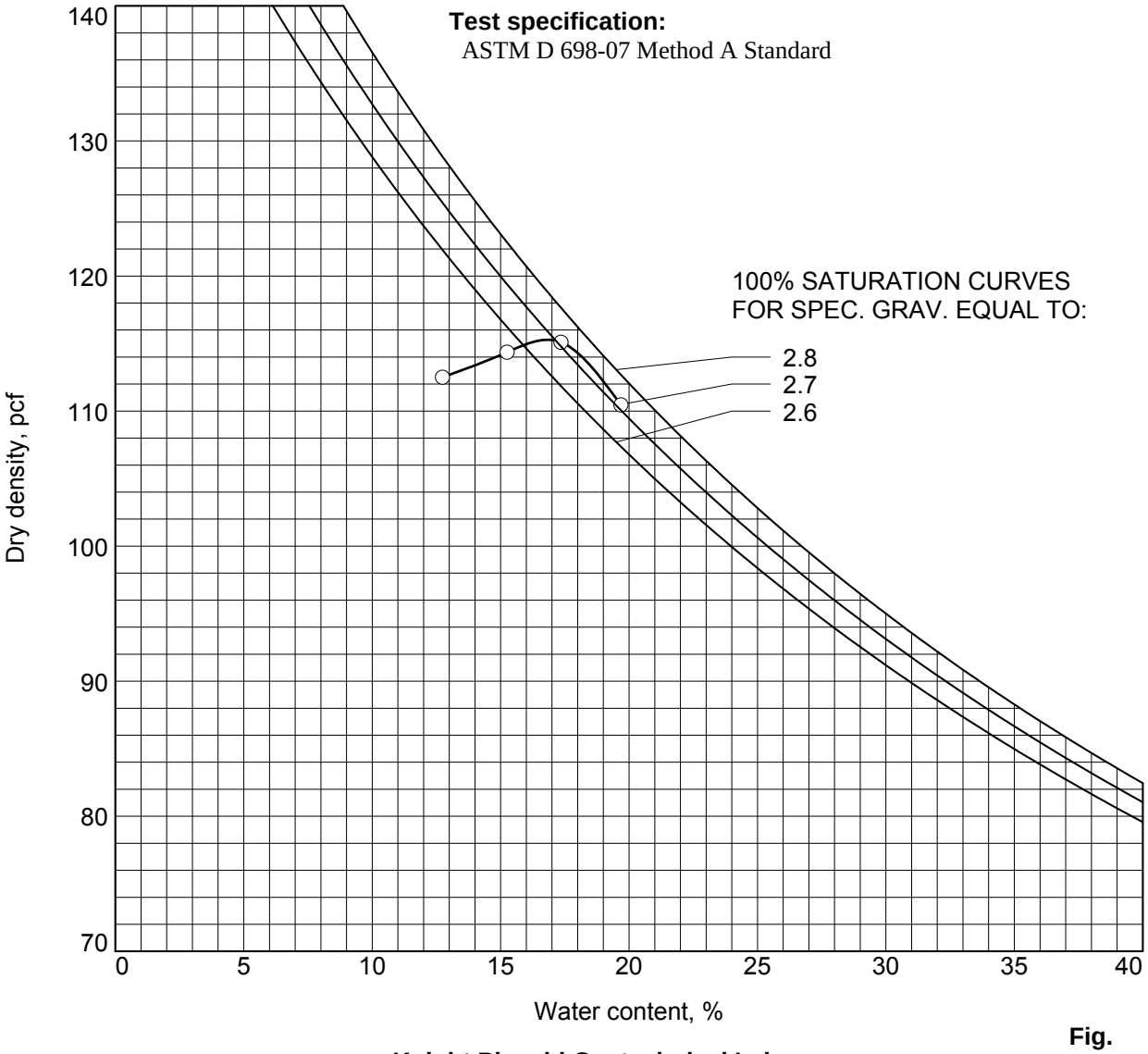


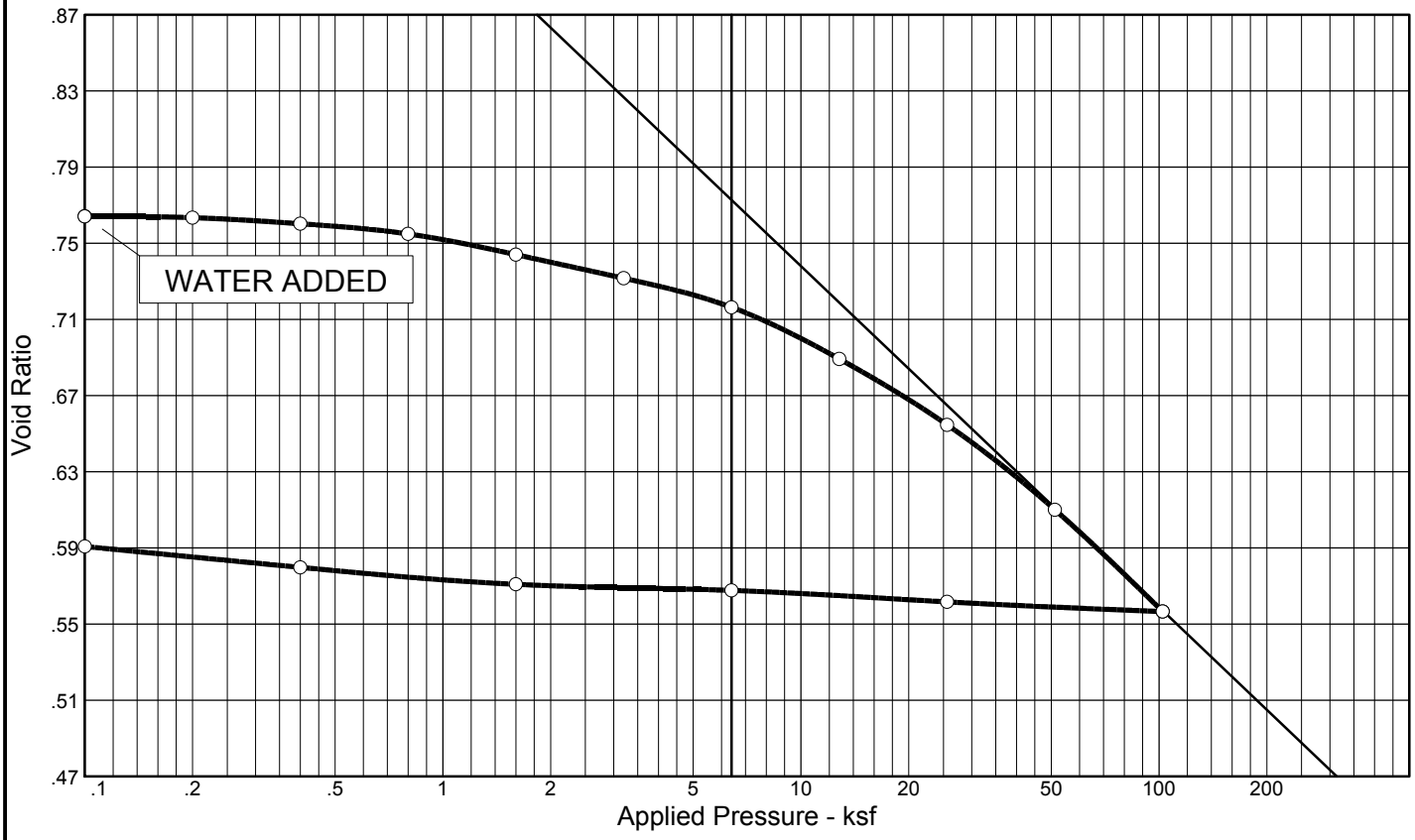
Fig.

Knight Piesold Geotechnical Lab.

Appendix A.2

One-Dimensional Consolidation

CONSOLIDATION-SWELL TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
8	6.40	0.15									
9	12.80	0.72									
10	25.60	0.71									
11	51.20	0.67									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Heave %	e_o
Sat.	Moist.											
72.3 %	18.9 %	103.9	NV	NP	2.93		15.70	0.18	0.01			0.764

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silt	ML	A-4(0)

Project No. 108-130.10 **Client:** AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Years 4-7 Composite

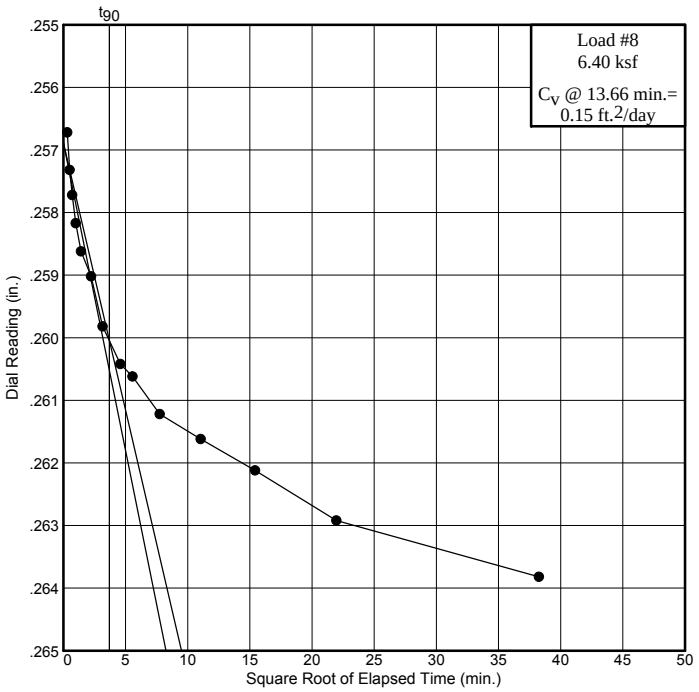
Remarks:

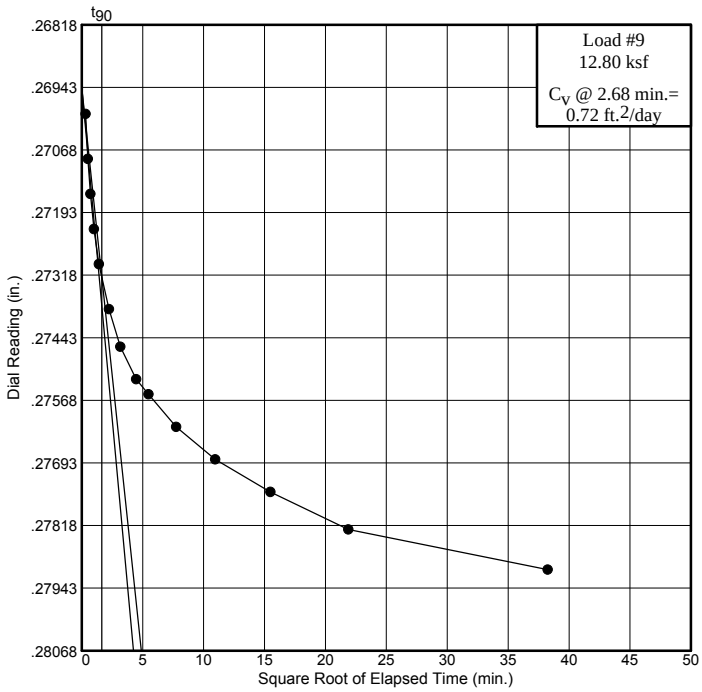
Knight Piésold CONSULTING

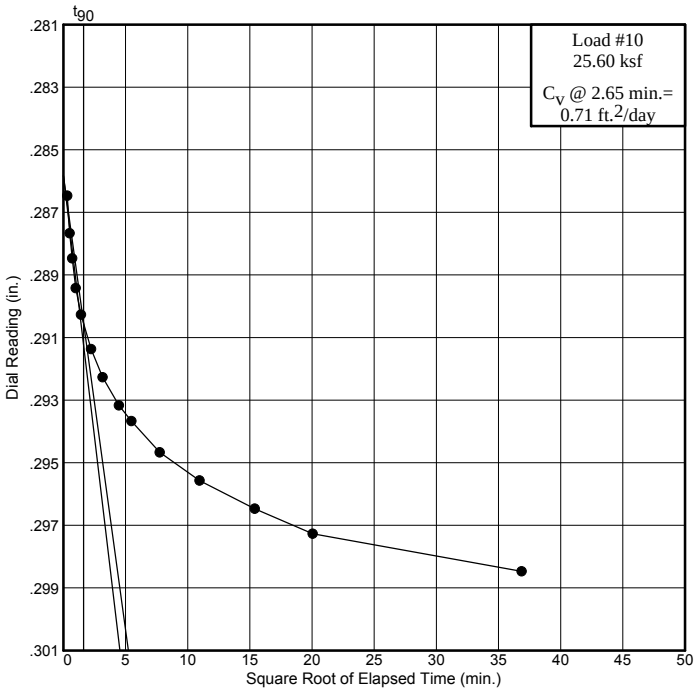
Fig.

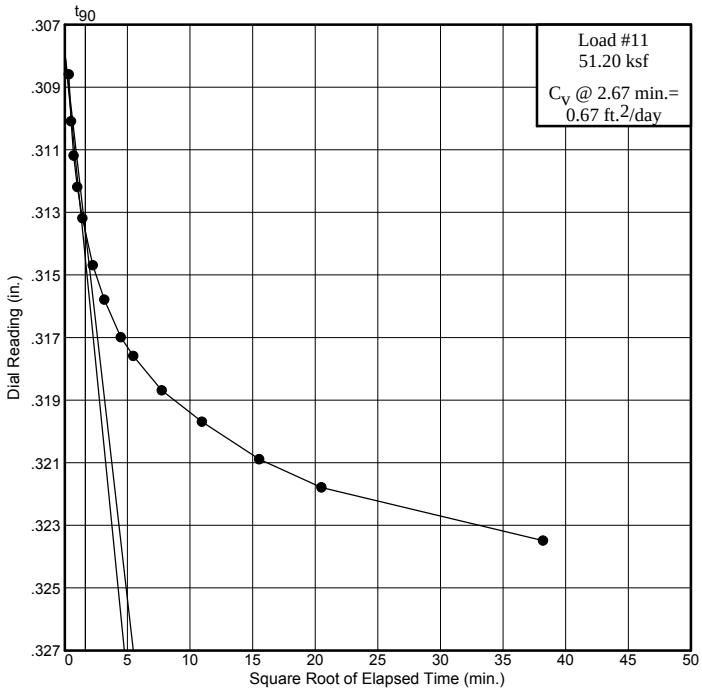
Dial Reading vs. Time

Project No.: 108-130.10
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Years 4-7 Composite









Knight Piésold CONSULTING

Fig.

CONSOLIDATION TEST DATA

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project Number: 108-130.10

Sample Data

Source:
Sample No.:
Elev. or Depth: **Sample Length (in./cm.):**
Location: Years 4-7 Composite
Description: sandy silt
Liquid Limit: NV **Plasticity Index:** NP
USCS: ML **AASHTO:** A-4(0) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t	= 254.89 g.	**Consolidometer #**	= 1	**Wet w+t**	= 232.50 g.
Dry w+t	= 233.65 g.			**Dry w+t**	= 214.94 g.
Tare Wt.	= 121.02 g.	**Spec. Gravity**	= 2.93	**Tare Wt.**	= 91.01 g.
Height	= .99 in.	**Height**	= .99 in.		
Diameter	= 2.41 in.	**Diameter**	= 2.42 in.		
Weight	= 146.36 g.	**Defl. Table**	= Std 102 R		
Moisture	= 18.9 %	**Ht. Solids**	= 0.5612 in.	**Moisture**	= 14.2 %
Wet Den.	= 123.5 pcf	**Dry Wt.**	= 124.16 g.	**Dry Wt.**	= 123.93 g.*
Dry Den.	= 103.9 pcf	**Void Ratio**	= 0.764	**Void Ratio**	= 0.591
		Saturation	= 72.3 %		

*** Final dry weight used in calculations**

End-of-Load Summary

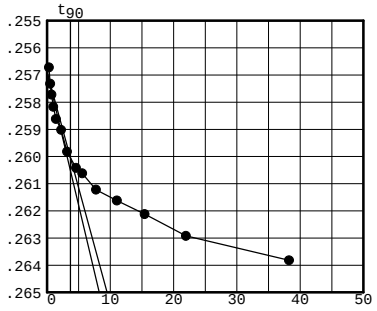
Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v ($ft.^2/day$)	C_α	Void Ratio	% Compression /Swell
start	0.23700				0.764	
0.10	0.23700	0.00000			0.764	0.0 Comprs.
water	0.23705	0.00000			0.764	0.0 Comprs.
0.20	0.23770	0.00030			0.763	0.0 Comprs.
0.40	0.24010	0.00090			0.760	0.2 Comprs.
0.80	0.24490	0.00270			0.755	0.5 Comprs.
1.60	0.25340	0.00510			0.744	1.1 Comprs.
3.20	0.26300	0.00774			0.732	1.8 Comprs.
6.40	0.27440	0.01058	0.15		0.716	2.7 Comprs.
12.80	0.29210	0.01304	0.72		0.689	4.2 Comprs.
25.60	0.31460	0.01613	0.71		0.655	6.2 Comprs.
51.20	0.34320	0.01971	0.67		0.610	8.7 Comprs.
102.40	0.37790	0.02440			0.557	11.8 Comprs.
25.60	0.37080	0.02016			0.562	11.5 Comprs.

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
6.40	0.36420	0.01695			0.568	11.1 Comprs.
1.60	0.35950	0.01404			0.571	11.0 Comprs.
0.40	0.35320	0.01273			0.580	10.5 Comprs.
0.10	0.34590	0.01158			0.591	9.8 Comprs.

C_c = 0.18 **P_c =** 15.70 ksf **C_s =** 0.01
Heave percentage = -0.0

Pressure: 6.40 ksf **TEST READINGS** **Load No. 8**

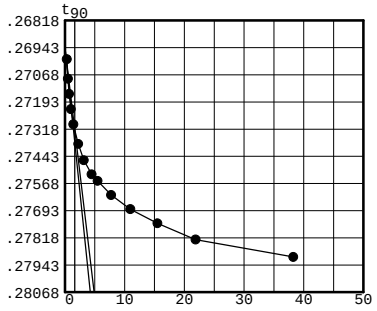
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26300	11	60.00	0.27180
2	0.10	0.26730	12	122.00	0.27220
3	0.25	0.26790	13	238.00	0.27270
4	0.50	0.26830	14	482.00	0.27350
5	1.00	0.26875	15	1463.00	0.27440
6	2.00	0.26920			
7	5.00	0.26960			
8	10.00	0.27040			
9	21.00	0.27100			
10	31.00	0.27120			



Void Ratio = 0.716 **Compression =** 2.7 %
D_0 = 0.25689 **D_{90} =** 0.26005 **D_{100} =** 0.26040
C_v at 13.7 min. = 0.15 ft.^{2}/day

Pressure: 12.80 ksf **TEST READINGS** **Load No. 9**

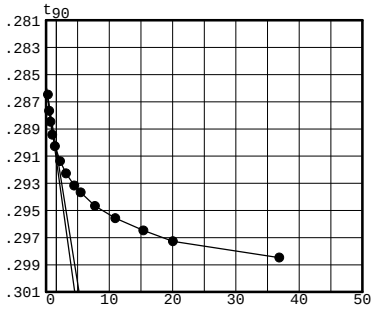
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.27440	11	60.00	0.28925
2	0.10	0.28300	12	120.00	0.28990
3	0.25	0.28390	13	240.00	0.29055
4	0.50	0.28460	14	479.00	0.29130
5	1.00	0.28530	15	1463.00	0.29210
6	2.00	0.28600			
7	5.00	0.28690			
8	10.00	0.28765			
9	20.00	0.28830			
10	30.00	0.28860			



Void Ratio = 0.689 **Compression =** 4.2 %
D_0 = 0.26944 **D_{90} =** 0.27321 **D_{100} =** 0.27362
C_v at 2.7 min. = 0.72 ft.^{2}/day

Pressure: 25.60 ksf **TEST READINGS** **Load No. 10**

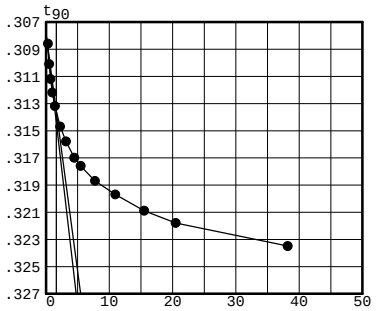
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.29210	11	60.00	0.31080
2	0.10	0.30260	12	120.00	0.31170
3	0.25	0.30380	13	237.00	0.31260
4	0.50	0.30460	14	402.00	0.31340
5	1.00	0.30555	15	1359.00	0.31460
6	2.00	0.30640			
7	5.00	0.30750			
8	10.00	0.30840			
9	20.00	0.30930			
10	30.00	0.30980			



Void Ratio = 0.655 **Compression =** 6.2 %
D_0 = 0.28583 **D_{90} =** 0.29055 **D_{100} =** 0.29108
C_v at 2.6 min. = 0.71 ft.^{2}/day

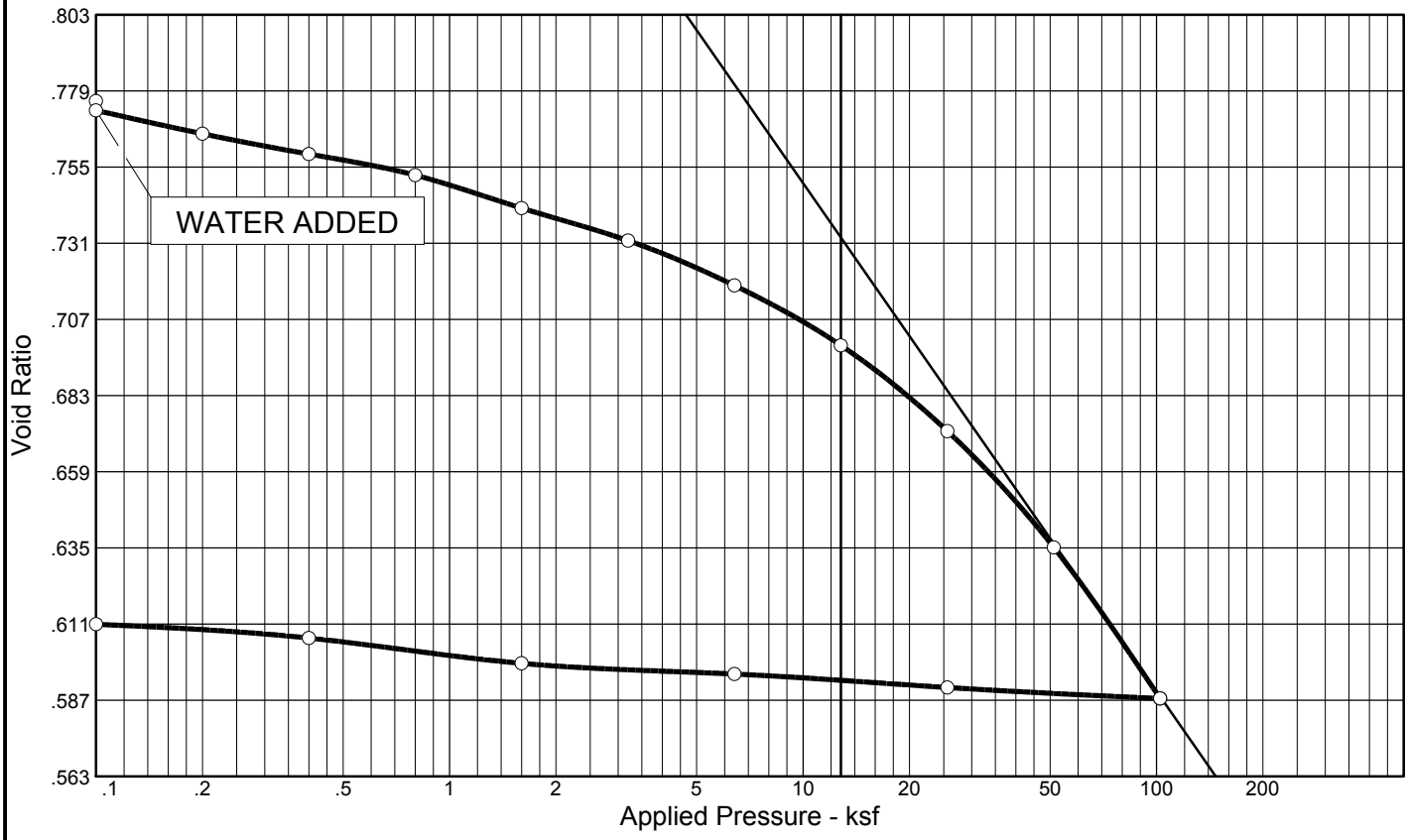
Pressure: 51.20 ksf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.31460	11	60.00	0.33840
2	0.10	0.32830	12	120.00	0.33940
3	0.25	0.32980	13	241.00	0.34060
4	0.50	0.33090	14	420.00	0.34150
5	1.00	0.33190	15	1459.00	0.34320
6	2.00	0.33290			
7	5.00	0.33440			
8	10.00	0.33550			
9	20.00	0.33670			
10	30.00	0.33730			



Void Ratio = 0.610 **Compression =** 8.7 %
D_0 = 0.30789 **D_{90} =** 0.31359 **D_{100} =** 0.31422
C_v at 2.7 min. = 0.67 ft.^{2}/day

CONSOLIDATION-SWELL TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
8	6.40	0.69									
9	12.80	0.74									
10	25.60	1.26									
11	51.20	0.66									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Heave %	e_o
Sat.	Moist.											
68.4 %	17.6 %	107.1	NV	NP	3.02		24.22	0.16	0.01		-0.2	0.776

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silt	ML	A-4(0)

Project No. 108-130.10 **Client:** AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Escabrosa

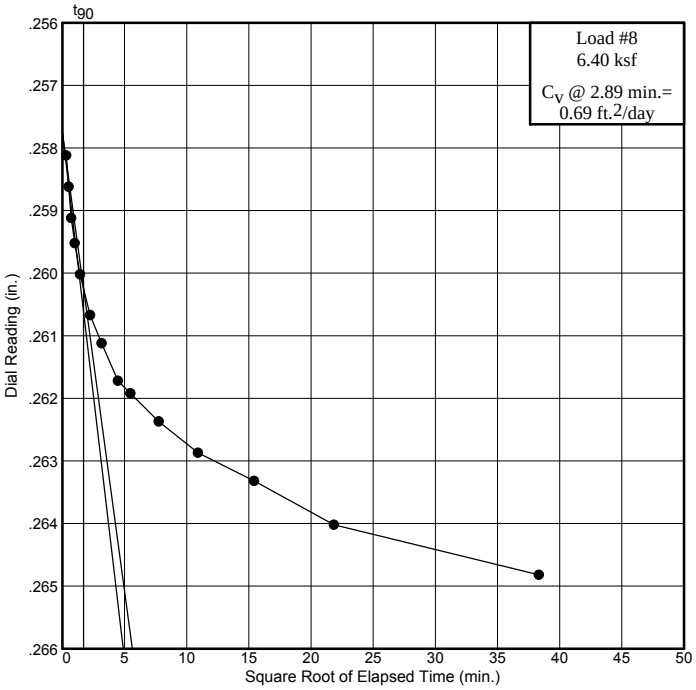
Remarks:

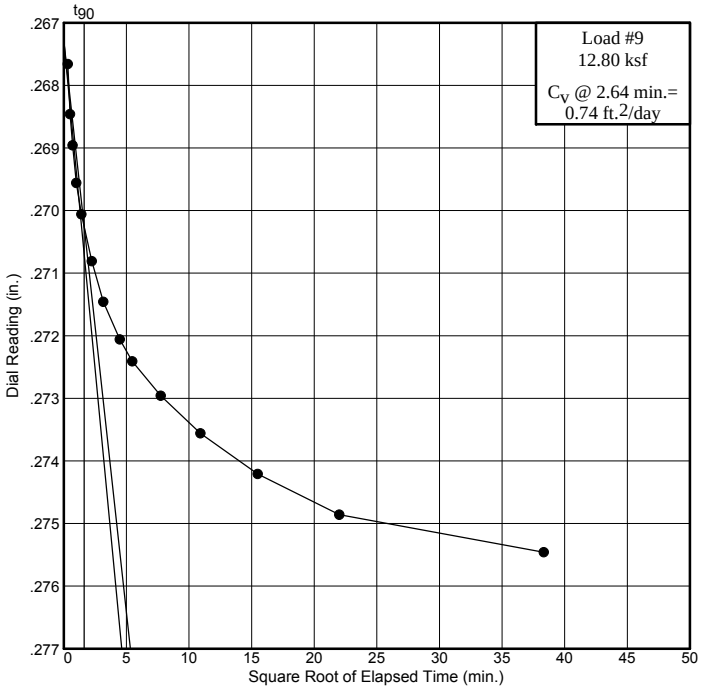
Knight Piésold CONSULTING

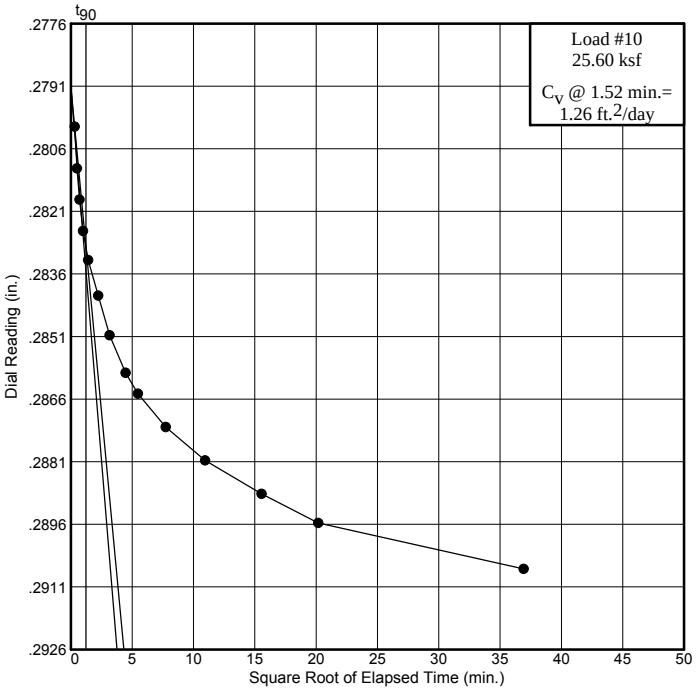
Fig.

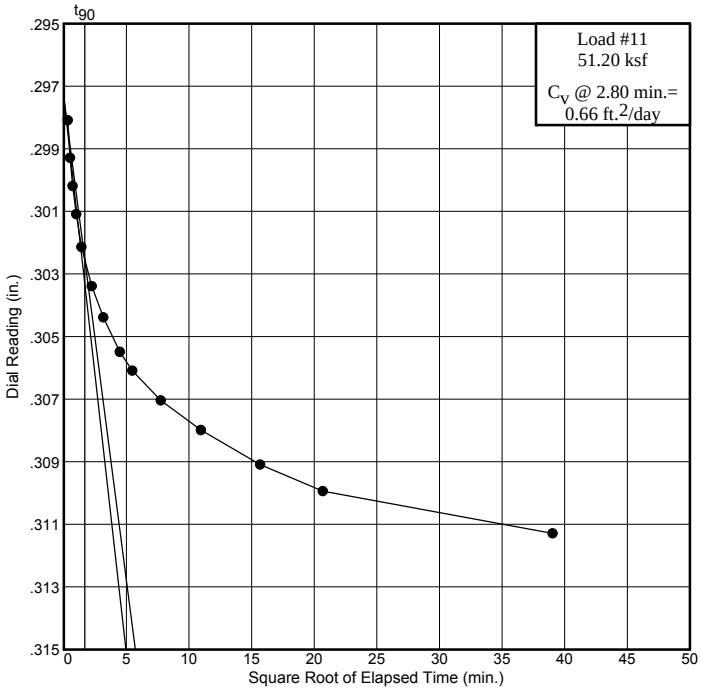
Dial Reading vs. Time

Project No.: 108-130.10
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Escabrosa









Knight Piésold CONSULTING

Fig.

CONSOLIDATION TEST DATA

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project Number: 108-130.10

Sample Data

Source:
Sample No.:
Elev. or Depth: **Sample Length (in./cm.):**
Location: Escabrosa
Description: sandy silt
Liquid Limit: NV **Plasticity Index:** NP
USCS: ML **AASHTO:** A-4(0) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t =	239.64 g.	**Consolidometer #** =	1	**Wet w+t** =	265.92 g.
Dry w+t =	221.71 g.			**Dry w+t** =	247.48 g.
Tare Wt. =	119.70 g.	**Spec. Gravity** =	3.02	**Tare Wt.** =	119.31 g.
Height =	1.00 in.	**Height** =	1.00 in.		
Diameter =	2.41 in.	**Diameter** =	2.42 in.		
Weight =	150.82 g.	**Defl. Table** =	Std 102 R		
Moisture =	17.6 %	**Ht. Solids** =	0.5631 in.	**Moisture** =	14.4 %
Wet Den. =	126.0 pcf	**Dry Wt.** =	129.34 g.	**Dry Wt.** =	128.17 g.*
Dry Den. =	107.1 pcf	**Void Ratio** =	0.776	**Void Ratio** =	0.611
		Saturation =	68.4 %		

*** Final dry weight used in calculations**

End-of-Load Summary

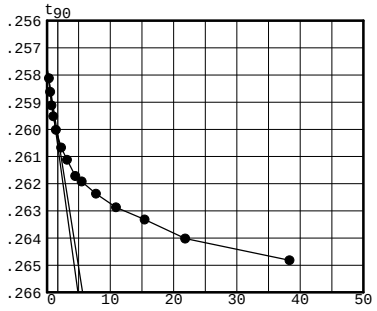
Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v ($ft.^2$/day)	C_α	Void Ratio	% Compression /Swell
start	0.23200				0.776	
0.10	0.23210	0.00000			0.776	0.0 Comprs.
water	0.23375	0.00000			0.773	0.2 Comprs.
0.20	0.23820	0.00030			0.766	0.6 Comprs.
0.40	0.24240	0.00090			0.759	1.0 Comprs.
0.80	0.24795	0.00270			0.752	1.3 Comprs.
1.60	0.25620	0.00510			0.742	1.9 Comprs.
3.20	0.26460	0.00774			0.732	2.5 Comprs.
6.40	0.27540	0.01058	0.69		0.718	3.3 Comprs.
12.80	0.28850	0.01304	0.74		0.699	4.3 Comprs.
25.60	0.30680	0.01613	1.26		0.672	5.9 Comprs.
51.20	0.33100	0.01971	0.66		0.635	7.9 Comprs.
102.40	0.36250	0.02440			0.588	10.6 Comprs.
25.60	0.35630	0.02016			0.591	10.4 Comprs.

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
6.40	0.35070	0.01695			0.595	10.2 Comprs.
1.60	0.34590	0.01404			0.599	10.0 Comprs.
0.40	0.34010	0.01273			0.607	9.5 Comprs.
0.10	0.33650	0.01158			0.611	9.3 Comprs.

C_c = 0.16 **P_c =** 24.22 ksf **C_s =** 0.01
Heave percentage = -0.2

Pressure: 6.40 ksf **TEST READINGS** **Load No. 8**

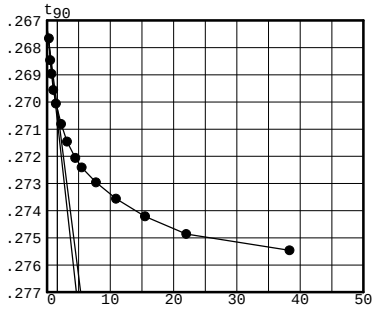
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26460	11	60.00	0.27295
2	0.10	0.26870	12	119.00	0.27345
3	0.25	0.26920	13	238.00	0.27390
4	0.50	0.26970	14	477.00	0.27460
5	1.00	0.27010	15	1469.00	0.27540
6	2.00	0.27060			
7	5.00	0.27125			
8	10.00	0.27170			
9	20.00	0.27230			
10	30.00	0.27250			



Void Ratio = 0.718 **Compression =** 3.3 %
D_0 = 0.25775 **D_{90} =** 0.26025 **D_{100} =** 0.26052
C_v at 2.9 min. = 0.69 ft.^{2}/day

Pressure: 12.80 ksf **TEST READINGS** **Load No. 9**

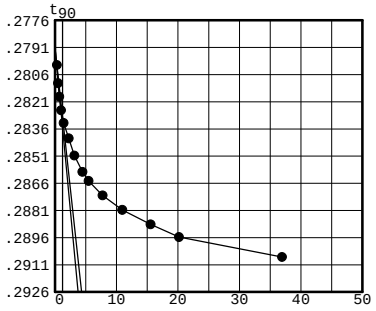
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.27540	11	60.00	0.28600
2	0.10	0.28070	12	119.00	0.28660
3	0.25	0.28150	13	240.00	0.28725
4	0.50	0.28200	14	484.00	0.28790
5	1.00	0.28260	15	1469.00	0.28850
6	2.00	0.28310			
7	5.00	0.28385			
8	10.00	0.28450			
9	20.00	0.28510			
10	30.00	0.28545			



Void Ratio = 0.699 **Compression =** 4.3 %
D_0 = 0.26729 **D_{90} =** 0.27025 **D_{100} =** 0.27058
C_v at 2.6 min. = 0.74 ft.^{2}/day

Pressure: 25.60 ksf **TEST READINGS** **Load No. 10**

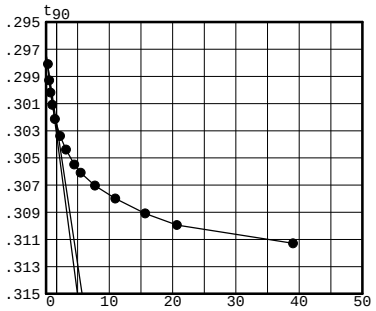
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.28850	11	60.00	0.30340
2	0.10	0.29620	12	120.00	0.30420
3	0.25	0.29720	13	242.00	0.30500
4	0.50	0.29795	14	407.00	0.30570
5	1.00	0.29870	15	1364.00	0.30680
6	2.00	0.29940			
7	5.00	0.30025			
8	10.00	0.30120			
9	20.00	0.30210			
10	30.00	0.30260			



Void Ratio = 0.672 **Compression =** 5.9 %
D_0 = 0.27912 **D_{90} =** 0.28296 **D_{100} =** 0.28339
C_v at 1.5 min. = 1.26 ft.^{2}/day

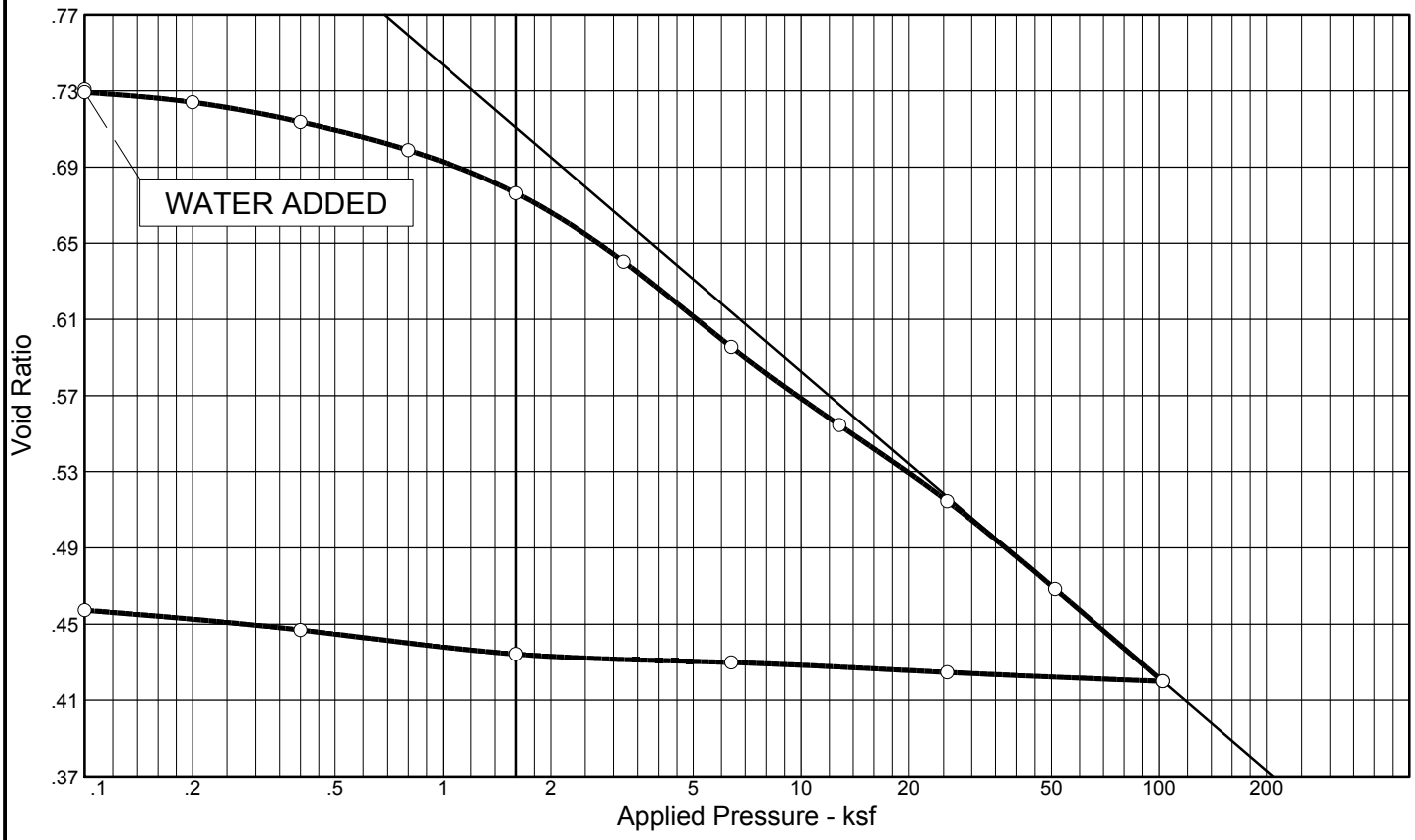
Pressure: 51.20 ksf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.30680	11	60.00	0.32675
2	0.10	0.31780	12	120.00	0.32770
3	0.25	0.31900	13	246.00	0.32880
4	0.50	0.31990	14	428.00	0.32965
5	1.00	0.32080	15	1524.00	0.33100
6	2.00	0.32185			
7	5.00	0.32310			
8	10.00	0.32410			
9	20.00	0.32520			
10	30.00	0.32580			



Void Ratio = 0.635 **Compression =** 7.9 %
D_0 = 0.29736 **D_{90} =** 0.30254 **D_{100} =** 0.30311
C_v at 2.8 min. = 0.66 ft.^{2}/day

CONSOLIDATION-SWELL TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
8	6.40	1.44									
9	12.80	0.70									
10	25.60	0.65									
11	51.20	1.15									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Heave %	e_o
Sat.	Moist.											
70.5 %	18.0 %	105.2	17	NP	2.87		3.23	0.16	0.01		-0.1	0.731

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silt	ML	A-4(0)

Project No. 108-130.10 **Client:** AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Earp Lithology 1

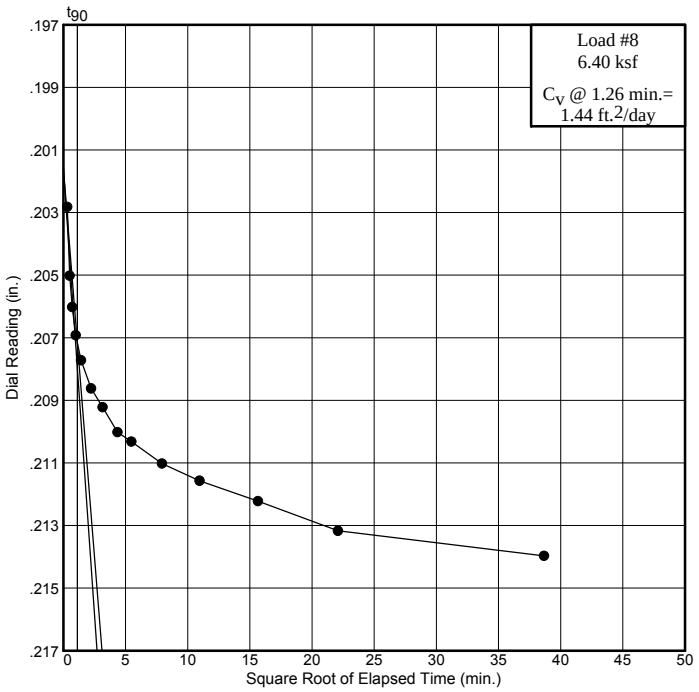
Remarks:

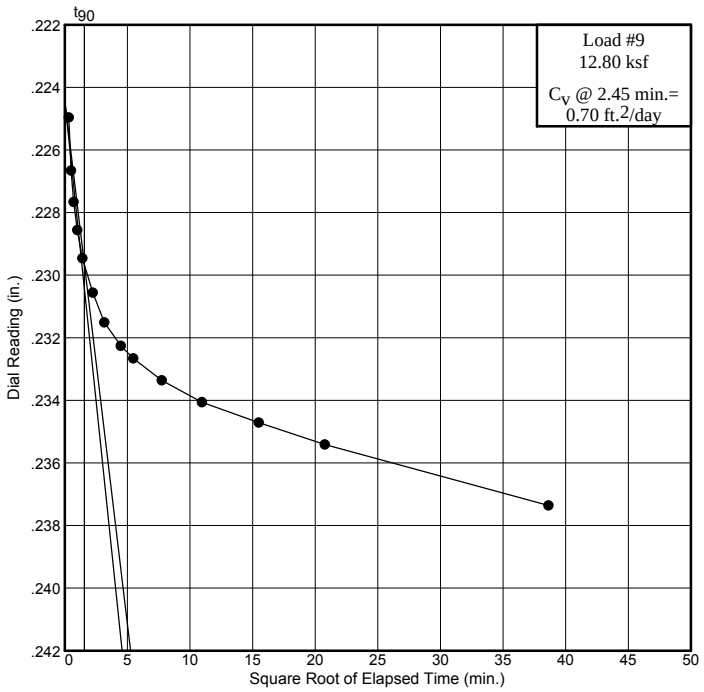
Knight Piésold CONSULTING

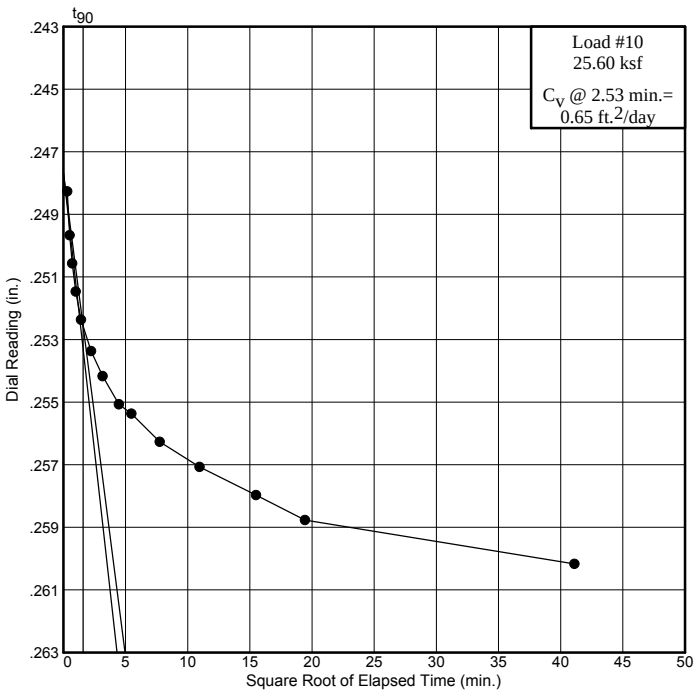
Fig.

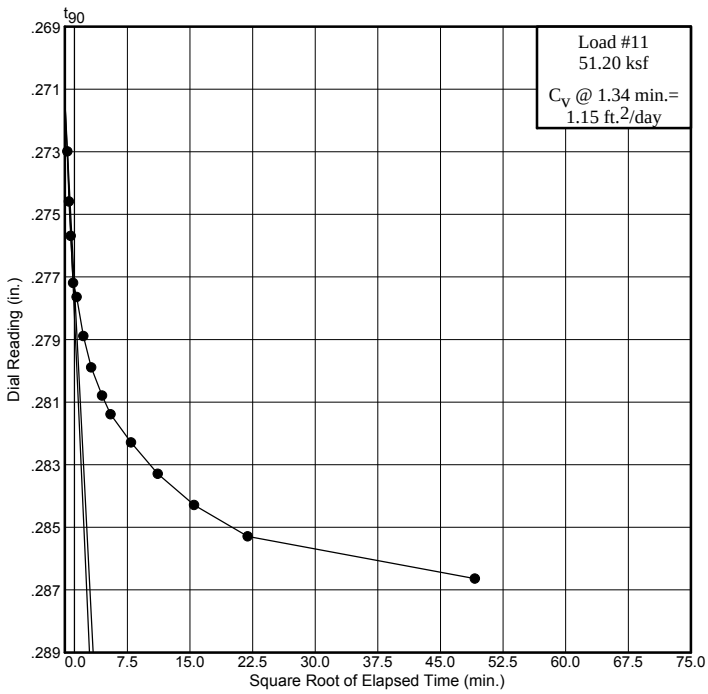
Dial Reading vs. Time

Project No.: 108-130.10
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Earp Lithology 1









Knight Piésold CONSULTING

Fig.

CONSOLIDATION TEST DATA

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project Number: 108-130.10

Sample Data

Source:
Sample No.:
Elev. or Depth: **Sample Length (in./cm.):**
Location: Earp Lithology 1
Description: sandy silt
Liquid Limit: 17 **Plasticity Index:** NP
USCS: ML **AASHTO:** A-4(0) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t =	293.48 g.	**Consolidometer #** =	1	**Wet w+t** =	260.56 g.
Dry w+t =	267.23 g.			**Dry w+t** =	242.07 g.
Tare Wt. =	121.01 g.	**Spec. Gravity** =	2.87	**Tare Wt.** =	118.34 g.
Height =	.99 in.	**Height** =	.99 in.		
Diameter =	2.41 in.	**Diameter** =	2.42 in.		
Weight =	147.16 g.	**Defl. Table** =	Std 102 R		
Moisture =	18.0 %	**Ht. Solids** =	0.5720 in.	**Moisture** =	14.9 %
Wet Den. =	124.1 pcf	**Dry Wt.** =	125.80 g.	**Dry Wt.** =	123.73 g.*
Dry Den. =	105.2 pcf	**Void Ratio** =	0.731	**Void Ratio** =	0.457
		Saturation =	70.5 %		

*** Final dry weight used in calculations**

End-of-Load Summary

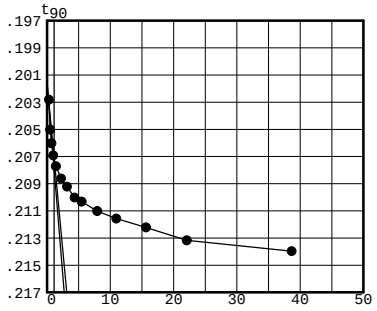
Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v ($ft.^2$/day)	C_α	Void Ratio	% Compression /Swell
start	0.13650				0.731	
0.10	0.13655	0.00000			0.731	0.0 Comprs.
water	0.13740	0.00000			0.729	0.1 Comprs.
0.20	0.14070	0.00030			0.724	0.4 Comprs.
0.40	0.14720	0.00090			0.714	1.0 Comprs.
0.80	0.15745	0.00270			0.699	1.8 Comprs.
1.60	0.17280	0.00510			0.676	3.2 Comprs.
3.20	0.19600	0.00774			0.640	5.2 Comprs.
6.40	0.22455	0.01058	1.44		0.595	7.8 Comprs.
12.80	0.25040	0.01304	0.70		0.555	10.2 Comprs.
25.60	0.27630	0.01613	0.65		0.515	12.5 Comprs.
51.20	0.30635	0.01971	1.15		0.468	15.2 Comprs.
102.40	0.33875	0.02440			0.420	18.0 Comprs.
25.60	0.33180	0.02016			0.425	17.7 Comprs.

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
6.40	0.32560	0.01695			0.430	17.4 Comprs.
1.60	0.32015	0.01404			0.434	17.1 Comprs.
0.40	0.31160	0.01273			0.447	16.4 Comprs.
0.10	0.30450	0.01158			0.457	15.8 Comprs.

C_c = 0.16 **P_c =** 3.23 ksf **C_s =** 0.01
Heave percentage = -0.1

Pressure: 6.40 ksf **TEST READINGS** **Load No. 8**

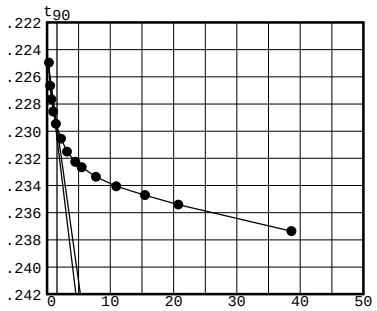
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.19600	11	63.00	0.22160
2	0.10	0.21340	12	120.00	.22215.
3	0.25	0.21560	13	245.00	0.22280
4	0.50	0.21660	14	488.00	0.22375
5	1.00	0.21750	15	1495.00	0.22455
6	2.00	0.21830			
7	5.00	0.21920			
8	10.00	0.21980			
9	19.00	0.22060			
10	30.00	0.22090			



Void Ratio = 0.595 **Compression =** 7.8 %
D_0 = 0.20160 **D_{90} =** 0.20715 **D_{100} =** 0.20777
C_v at 1.3 min. = 1.44 ft.^{2}/day

Pressure: 12.80 ksf **TEST READINGS** **Load No. 9**

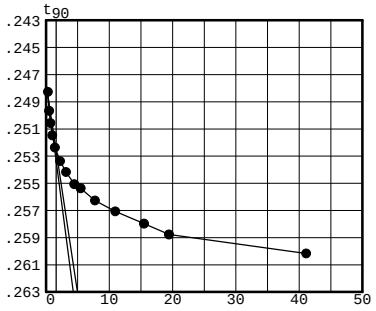
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.22455	11	60.00	0.24640
2	0.10	0.23800	12	120.00	0.24710
3	0.25	0.23970	13	240.00	0.24775
4	0.50	0.24070	14	431.00	0.24845
5	1.00	0.24160	15	1492.00	0.25040
6	2.00	0.24250			
7	5.00	0.24360			
8	10.00	0.24455			
9	20.00	0.24530			
10	30.00	0.24570			



Void Ratio = 0.555 **Compression =** 10.2 %
D_0 = 0.22443 **D_{90} =** 0.22966 **D_{100} =** 0.23024
C_v at 2.4 min. = 0.70 ft.^{2}/day

Pressure: 25.60 ksf **TEST READINGS** **Load No. 10**

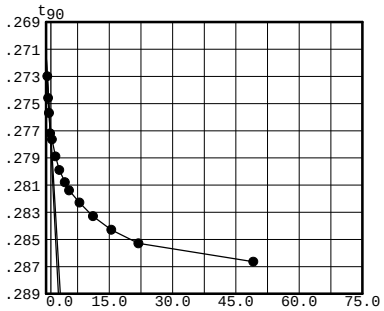
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.25040	11	60.00	0.27240
2	0.10	0.26440	12	120.00	0.27320
3	0.25	0.26580	13	240.00	0.27410
4	0.50	0.26670	14	378.00	0.27490
5	1.00	0.26760	15	1690.00	0.27630
6	2.00	0.26850			
7	5.00	0.26950			
8	10.00	0.27030			
9	20.00	0.27120			
10	30.00	0.27150			



Void Ratio = 0.515 **Compression =** 12.5 %
D_0 = 0.24767 **D_{90} =** 0.25258 **D_{100} =** 0.25313
C_v at 2.5 min. = 0.65 ft.^{2}/day

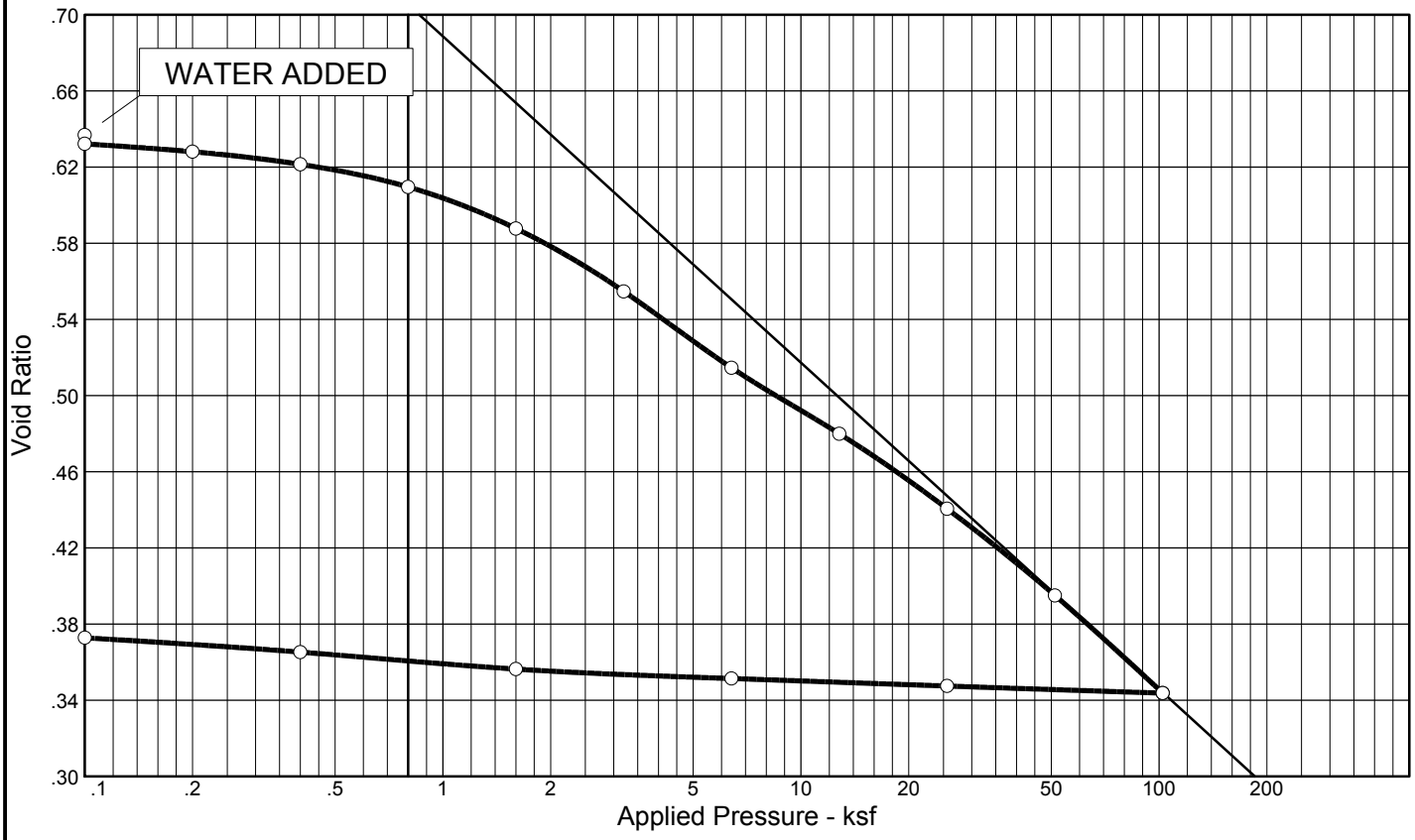
Pressure: 51.20 ksf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.27630	11	63.00	0.30200
2	0.10	0.29270	12	124.00	0.30300
3	0.25	0.29430	13	240.00	0.30400
4	0.50	0.29540	14	480.00	0.30500
5	1.00	0.29690	15	2414.00	0.30635
6	2.00	0.29735			
7	5.00	0.29860			
8	10.00	0.29960			
9	20.00	0.30050			
10	30.00	0.30110			



Void Ratio = 0.468 **Compression =** 15.2 %
D_0 = 0.27134 **D_{90} =** 0.27736 **D_{100} =** 0.27803
C_v at 1.3 min. = 1.15 ft.^{2}/day

CONSOLIDATION-SWELL TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
8	6.40	0.29									
9	12.80	0.68									
10	25.60	0.27									
11	51.20	0.59									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Heave %	e_o
Sat.	Moist.											
80.0 %	17.1 %	107.0	17	NP	2.99		3.68	0.17	0.01		-0.3	0.638

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silt	ML	A-4(0)

Project No. 108-130.10 **Client:** AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Epitaph Lithology 2

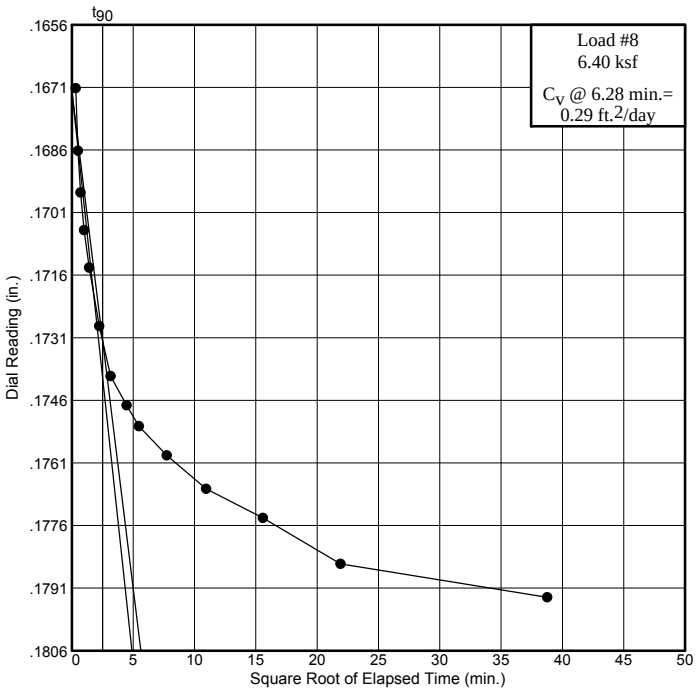
Remarks:

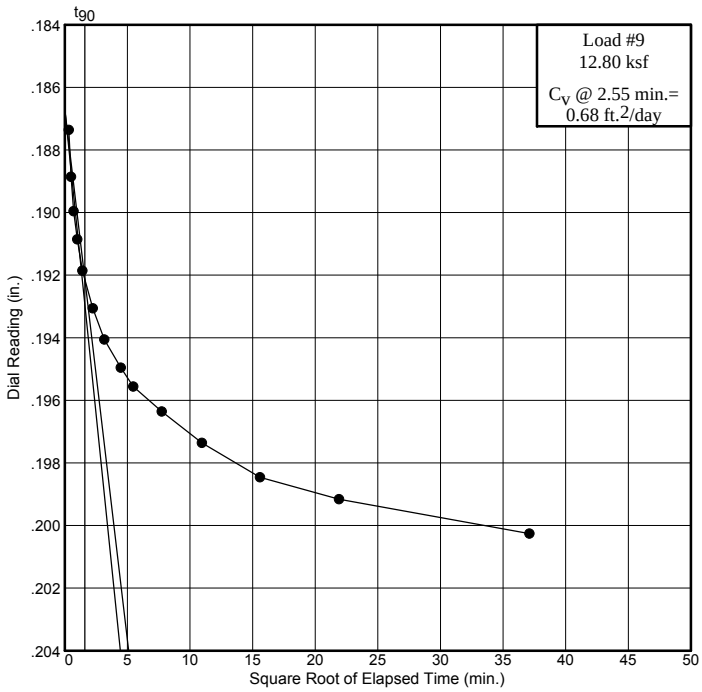
Knight Piésold CONSULTING

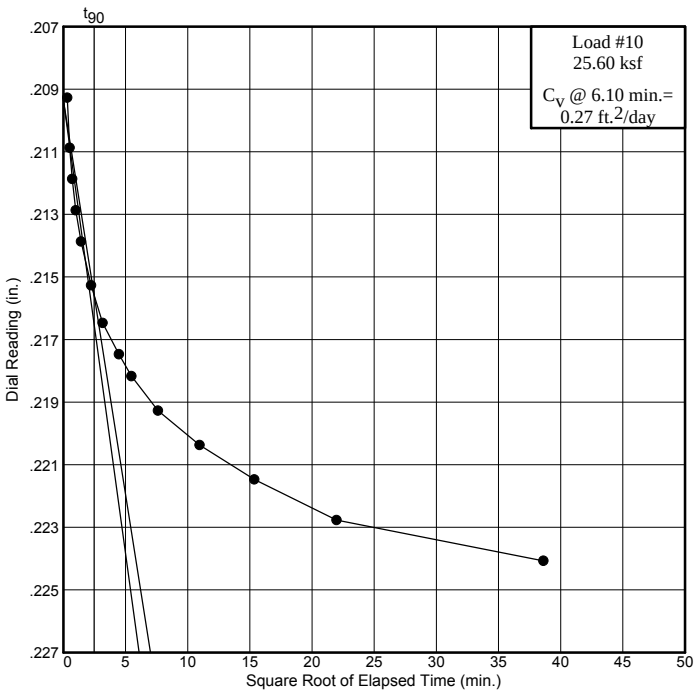
Fig.

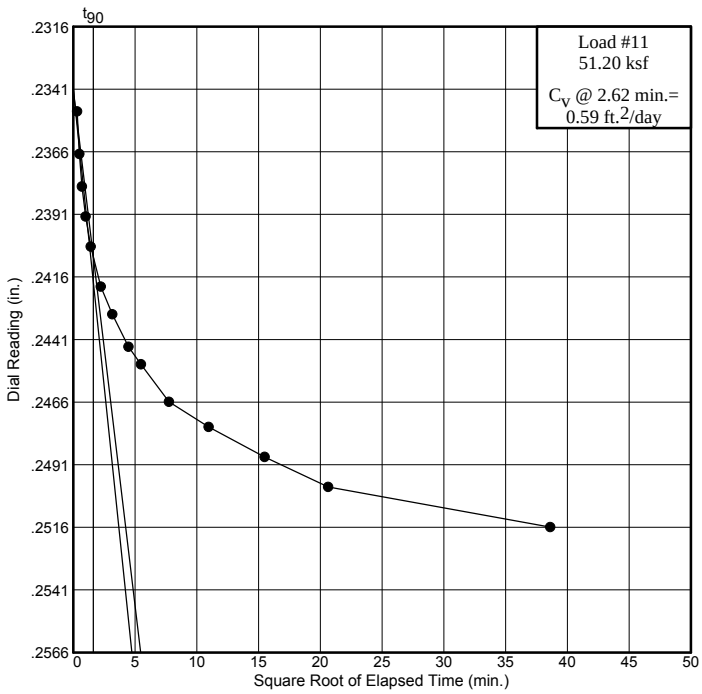
Dial Reading vs. Time

Project No.: 108-130.10
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Epitaph Lithology 2









Knight Piésold CONSULTING

Fig.

CONSOLIDATION TEST DATA

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project Number: 108-130.10

Sample Data

Source:
Sample No.:
Elev. or Depth: **Sample Length (in./cm.):**
Location: Epitaph Lithology 2
Description: sandy silt
Liquid Limit: 17 **Plasticity Index:** NP
USCS: ML **AASHTO:** A-4(0) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t	= 258.66 g.	**Consolidometer #**	= 1	**Wet w+t**	= 235.96 g.
Dry w+t	= 237.86 g.			**Dry w+t**	= 217.26 g.
Tare Wt.	= 115.89 g.	**Spec. Gravity**	= 2.99	**Tare Wt.**	= 81.01 g.
Height	= .99 in.	**Height**	= .99 in.		
Diameter	= 2.41 in.	**Diameter**	= 2.42 in.		
Weight	= 148.41 g.	**Defl. Table**	= Std 102 R		
Moisture	= 17.1 %	**Ht. Solids**	= 0.6046 in.	**Moisture**	= 13.7 %
Wet Den.	= 125.2 pcf	**Dry Wt.**	= 127.84 g.	**Dry Wt.**	= 136.25 g.*
Dry Den.	= 107.0 pcf	**Void Ratio**	= 0.638	**Void Ratio**	= 0.373
		Saturation	= 80.0 %		

*** Final dry weight used in calculations**

End-of-Load Summary

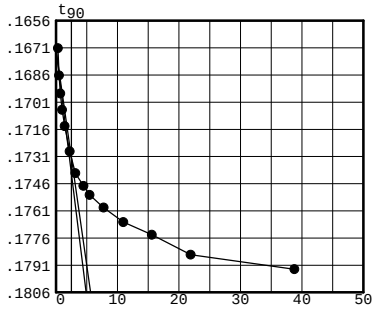
Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v ($ft.^2$/day)	C_α	Void Ratio	% Compression /Swell
start	0.10500				0.638	
0.10	0.10540	0.00000			0.637	0.0 Comprs.
water	0.10820	0.00000			0.632	0.3 Comprs.
0.20	0.11100	0.00030			0.628	0.6 Comprs.
0.40	0.11560	0.00090			0.621	1.0 Comprs.
0.80	0.12460	0.00270			0.610	1.7 Comprs.
1.60	0.14020	0.00510			0.588	3.0 Comprs.
3.20	0.16280	0.00774			0.555	5.1 Comprs.
6.40	0.18990	0.01058	0.29		0.515	7.5 Comprs.
12.80	0.21330	0.01304	0.68		0.480	9.6 Comprs.
25.60	0.24020	0.01613	0.27		0.441	12.0 Comprs.
51.20	0.27130	0.01971	0.59		0.395	14.8 Comprs.
102.40	0.30700	0.02440			0.344	17.9 Comprs.
25.60	0.30050	0.02016			0.348	17.7 Comprs.

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
6.40	0.29490	0.01695			0.351	17.5 Comprs.
1.60	0.28900	0.01404			0.356	17.2 Comprs.
0.40	0.28230	0.01273			0.365	16.6 Comprs.
0.10	0.27660	0.01158			0.373	16.2 Comprs.

C_c = 0.17 **P_c =** 3.68 ksf **C_s =** 0.01
Heave percentage = -0.3

Pressure: 6.40 ksf **TEST READINGS** **Load No. 8**

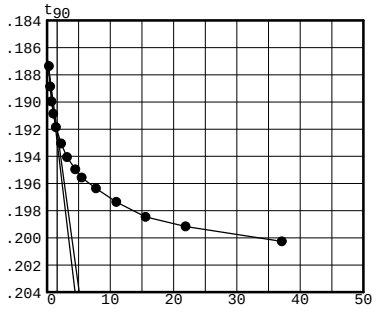
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.16280	11	60.00	0.18650
2	0.10	0.17770	12	120.00	0.18730
3	0.25	0.17920	13	243.00	0.18800
4	0.50	0.18020	14	480.00	0.18910
5	1.00	0.18110	15	1503.00	0.18990
6	2.00	0.18200			
7	5.00	0.18340			
8	10.00	0.18460			
9	20.00	0.18530			
10	30.00	0.18580			



Void Ratio = 0.515 **Compression =** 7.5 %
D_0 = 0.16720 **D_{90} =** 0.17317 **D_{100} =** 0.17383
C_v at 6.3 min. = 0.29 ft.^{2}/day

Pressure: 12.80 ksf **TEST READINGS** **Load No. 9**

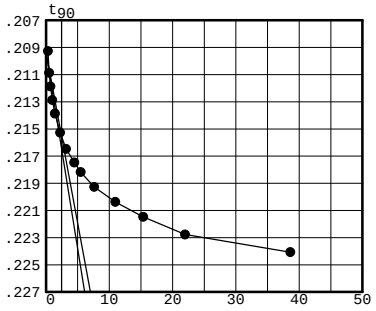
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.18990	11	60.00	0.20940
2	0.10	0.20040	12	120.00	0.21040
3	0.25	0.20190	13	243.00	0.21150
4	0.50	0.20300	14	480.00	0.21220
5	1.00	0.20390	15	1377.00	0.21330
6	2.00	0.20490			
7	5.00	0.20610			
8	10.00	0.20710			
9	20.00	0.20800			
10	30.00	0.20860			



Void Ratio = 0.480 **Compression =** 9.6 %
D_0 = 0.18671 **D_{90} =** 0.19213 **D_{100} =** 0.19273
C_v at 2.6 min. = 0.68 ft.^{2}/day

Pressure: 25.60 ksf **TEST READINGS** **Load No. 10**

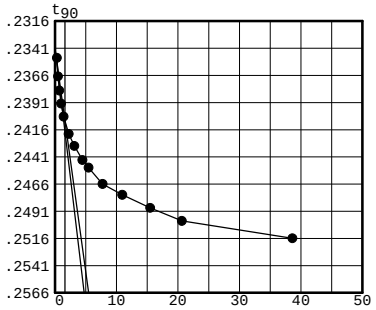
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.21330	11	58.00	0.23540
2	0.10	0.22540	12	120.00	0.23650
3	0.25	0.22700	13	236.00	0.23760
4	0.50	0.22800	14	483.00	0.23890
5	1.00	0.22900	15	1491.00	0.24020
6	2.00	0.23000			
7	5.00	0.23140			
8	10.00	0.23260			
9	20.00	0.23360			
10	30.00	0.23430			



Void Ratio = 0.441 **Compression =** 12.0 %
D_0 = 0.20936 **D_{90} =** 0.21557 **D_{100} =** 0.21626
C_v at 6.1 min. = 0.27 ft.^{2}/day

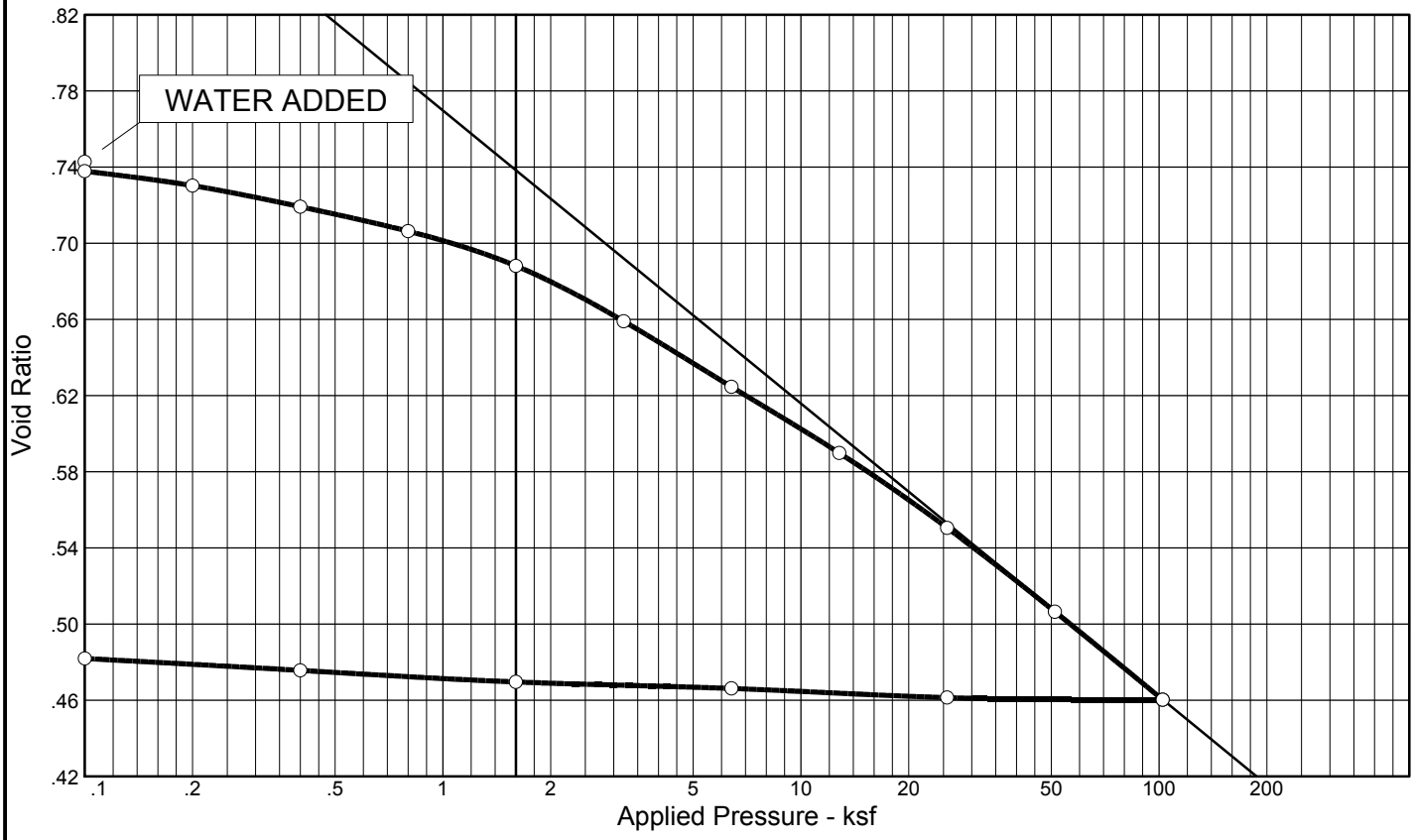
Pressure: 51.20 ksf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.24020	11	60.00	0.26630
2	0.10	0.25470	12	120.00	0.26730
3	0.25	0.25640	13	240.00	0.26850
4	0.50	0.25770	14	426.00	0.26970
5	1.00	0.25890	15	1491.00	0.27130
6	2.00	0.26010			
7	5.00	0.26170			
8	10.00	0.26280			
9	20.00	0.26410			
10	30.00	0.26480			



Void Ratio = 0.395 **Compression =** 14.8 %
D_0 = 0.23412 **D_{90} =** 0.24079 **D_{100} =** 0.24153
C_v at 2.6 min. = 0.59 ft.^{2}/day

CONSOLIDATION-SWELL TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
8	6.40	0.69									
9	12.80	0.71									
10	25.60	0.64									
11	51.20	0.63									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Heave %	e_o
Sat.	Moist.											
65.1 %	15.6 %	112.0	15	NP	3.10		4.38	0.15	0.01		-0.3	0.743

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silt	ML	A-4(0)

Project No. 108-130.10 **Client:** AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Horquila #3

Remarks:

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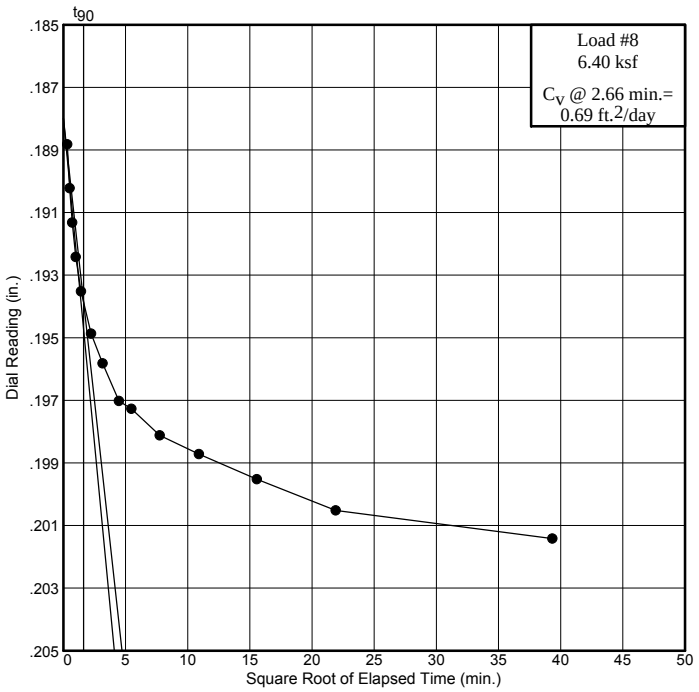
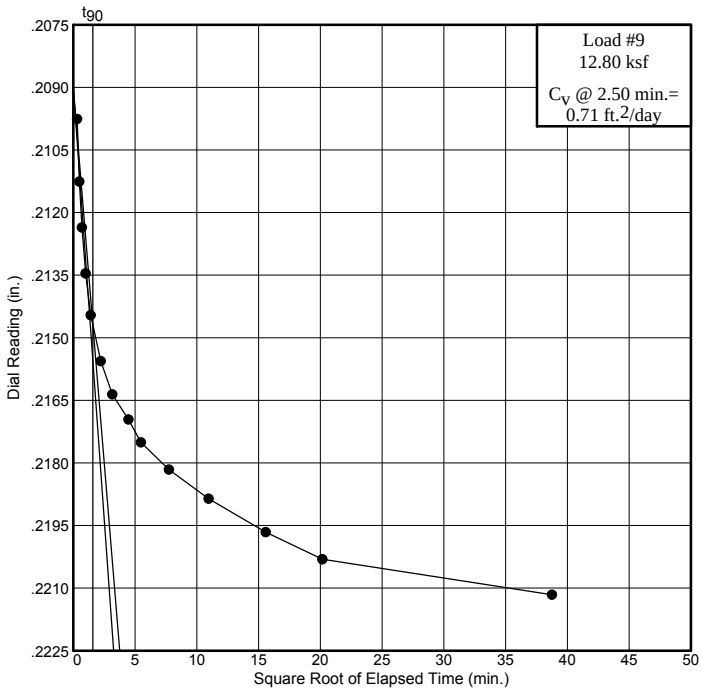
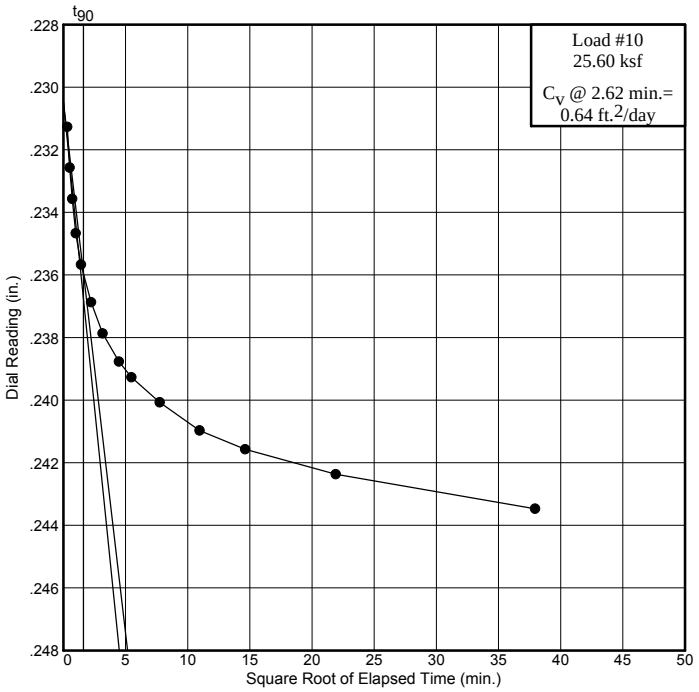
Fig.

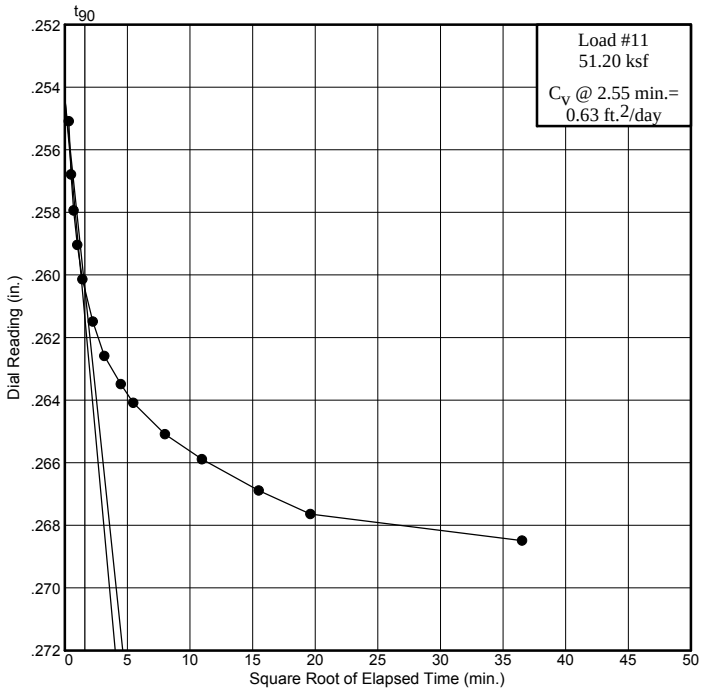
Dial Reading vs. Time

Project No.: 108-130.10
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Horquila #3









Knight Piésold CONSULTING

Fig.

CONSOLIDATION TEST DATA

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project Number: 108-130.10

Sample Data

Source:
Sample No.:
Elev. or Depth: **Sample Length (in./cm.):**
Location: Horquila #3
Description: sandy silt
Liquid Limit: 15 **Plasticity Index:** NP
USCS: ML **AASHTO:** A-4(0) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t	= 279.46 g.	**Consolidometer #**	= 1	**Wet w+t**	= 306.68 g.
Dry w+t	= 257.37 g.			**Dry w+t**	= 287.65 g.
Tare Wt.	= 115.88 g.	**Spec. Gravity**	= 3.10	**Tare Wt.**	= 154.96 g.
Height	= .99 in.	**Height**	= .99 in.		
Diameter	= 2.41 in.	**Diameter**	= 2.42 in.		
Weight	= 153.46 g.	**Defl. Table**	= Std 102 R		
Moisture	= 15.6 %	**Ht. Solids**	= 0.5679 in.	**Moisture**	= 14.3 %
Wet Den.	= 129.5 pcf	**Dry Wt.**	= 133.84 g.	**Dry Wt.**	= 132.69 g.*
Dry Den.	= 112.0 pcf	**Void Ratio**	= 0.743	**Void Ratio**	= 0.482
		Saturation	= 65.1 %		

*** Final dry weight used in calculations**

End-of-Load Summary

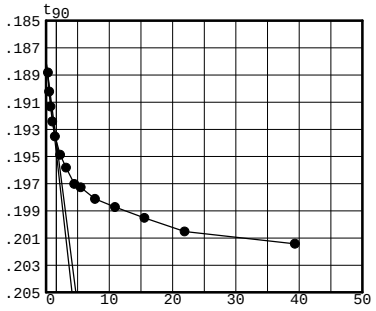
Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v ($ft.^2$/day)	C_α	Void Ratio	% Compression /Swell
start	0.13400				0.743	
0.10	0.13430	0.00000			0.743	0.0 Comprs.
water	0.13710	0.00000			0.738	0.3 Comprs.
0.20	0.14170	0.00030			0.730	0.7 Comprs.
0.40	0.14860	0.00090			0.719	1.4 Comprs.
0.80	0.15770	0.00270			0.706	2.1 Comprs.
1.60	0.17045	0.00510			0.688	3.2 Comprs.
3.20	0.18960	0.00774			0.659	4.8 Comprs.
6.40	0.21200	0.01058	0.69		0.625	6.8 Comprs.
12.80	0.23420	0.01304	0.71		0.590	8.8 Comprs.
25.60	0.25960	0.01613	0.64		0.551	11.1 Comprs.
51.20	0.28820	0.01971	0.63		0.507	13.6 Comprs.
102.40	0.31915	0.02440			0.460	16.2 Comprs.
25.60	0.31425	0.02016			0.461	16.2 Comprs.

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
6.40	0.30830	0.01695			0.466	15.9 Comprs.
1.60	0.30345	0.01404			0.470	15.7 Comprs.
0.40	0.29870	0.01273			0.476	15.4 Comprs.
0.10	0.29400	0.01158			0.482	15.0 Comprs.

C_c = 0.15 **P_c =** 4.38 ksf **C_s =** 0.01
Heave percentage = -0.3

Pressure: 6.40 ksf **TEST READINGS** **Load No. 8**

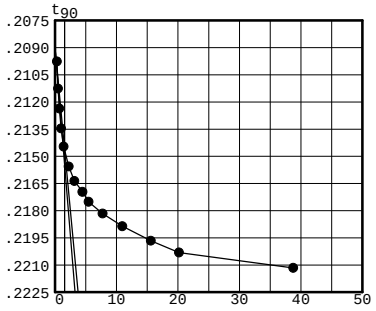
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.18960	11	60.00	0.20870
2	0.10	0.19940	12	119.00	0.20930
3	0.25	0.20080	13	242.00	0.21010
4	0.50	0.20190	14	480.00	0.21110
5	1.00	0.20300	15	1547.00	0.21200
6	2.00	0.20410			
7	5.00	0.20545			
8	10.00	0.20640			
9	20.00	0.20760			
10	30.00	0.20785			



Void Ratio = 0.625 **Compression =** 6.8 %
D_0 = 0.18799 **D_{90} =** 0.19388 **D_{100} =** 0.19453
C_v at 2.7 min. = 0.69 ft.^{2}/day

Pressure: 12.80 ksf **TEST READINGS** **Load No. 9**

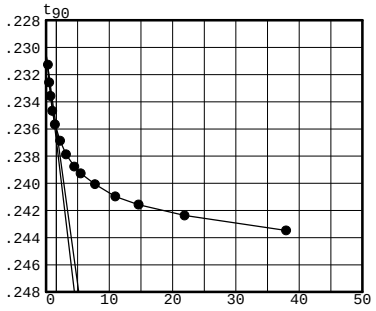
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.21200	11	60.00	0.23120
2	0.10	0.22280	12	120.00	0.23190
3	0.25	0.22430	13	243.00	0.23270
4	0.50	0.22540	14	407.00	0.23335
5	1.00	0.22650	15	1502.00	0.23420
6	2.00	0.22750			
7	5.00	0.22860			
8	10.00	0.22940			
9	20.00	0.23000			
10	30.00	0.23055			



Void Ratio = 0.590 **Compression =** 8.8 %
D_0 = 0.20901 **D_{90} =** 0.21468 **D_{100} =** 0.21531
C_v at 2.5 min. = 0.71 ft.^{2}/day

Pressure: 25.60 ksf **TEST READINGS** **Load No. 10**

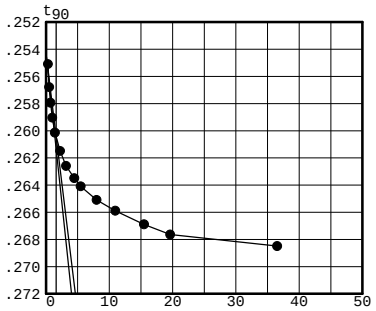
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.23420	11	60.00	0.25620
2	0.10	0.24740	12	120.00	0.25710
3	0.25	0.24870	13	214.00	0.25770
4	0.50	0.24970	14	480.00	0.25850
5	1.00	0.25080	15	1440.00	0.25960
6	2.00	0.25180			
7	5.00	0.25300			
8	10.00	0.25400			
9	20.00	0.25490			
10	30.00	0.25540			



Void Ratio = 0.551 **Compression =** 11.1 %
D_0 = 0.23048 **D_{90} =** 0.23597 **D_{100} =** 0.23658
C_v at 2.6 min. = 0.64 ft.^{2}/day

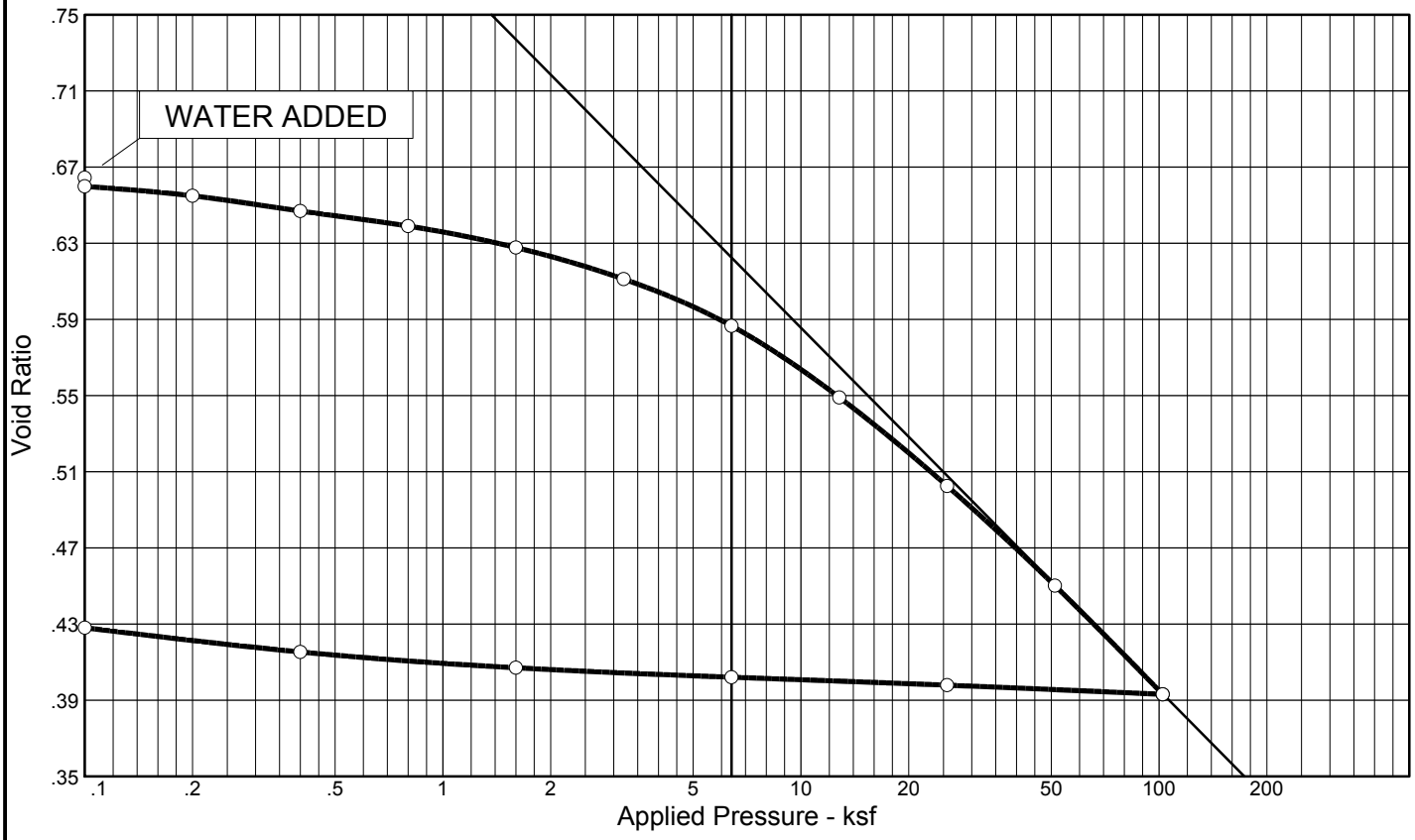
Pressure: 51.20 ksf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.25960	11	64.00	0.28480
2	0.10	0.27480	12	120.00	0.28560
3	0.25	0.27650	13	240.00	0.28660
4	0.50	0.27765	14	385.00	0.28735
5	1.00	0.27875	15	1334.00	0.28820
6	2.00	0.27985			
7	5.00	0.28120			
8	10.00	0.28230			
9	20.00	0.28320			
10	30.00	0.28380			



Void Ratio = 0.507 **Compression =** 13.6 %
D_0 = 0.25435 **D_{90} =** 0.26044 **D_{100} =** 0.26112
C_v at 2.6 min. = 0.63 ft.^{2}/day

CONSOLIDATION-SWELL TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
8	6.40	0.28									
9	12.80	0.73									
10	25.60	1.25									
11	51.20	0.64									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Heave %	e_o
Sat.	Moist.											
69.1 %	16.5 %	105.8	17	NP	2.79		11.60	0.19	0.01		-0.3	0.665

MATERIAL DESCRIPTION	USCS	AASHTO
sandy silt	ML	A-4(0)

Project No. 108-130.10 **Client:** AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A

Location: Colina #3

Remarks:

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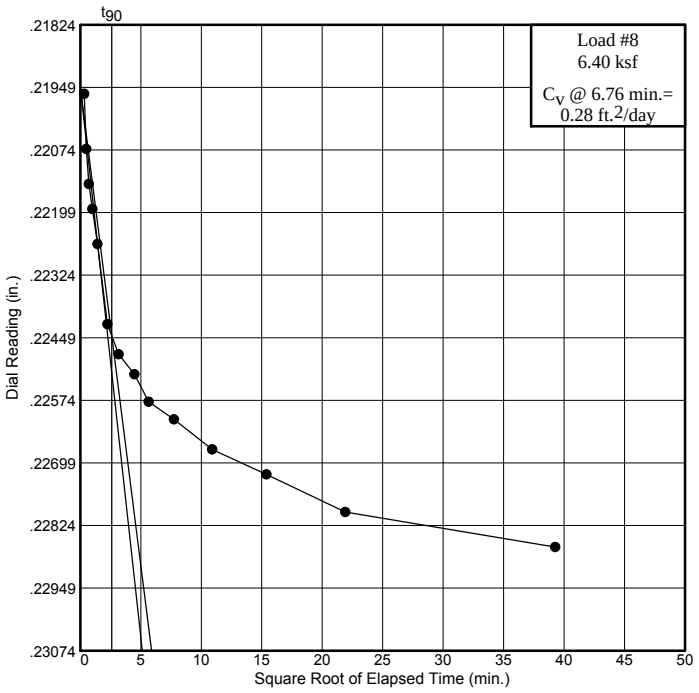
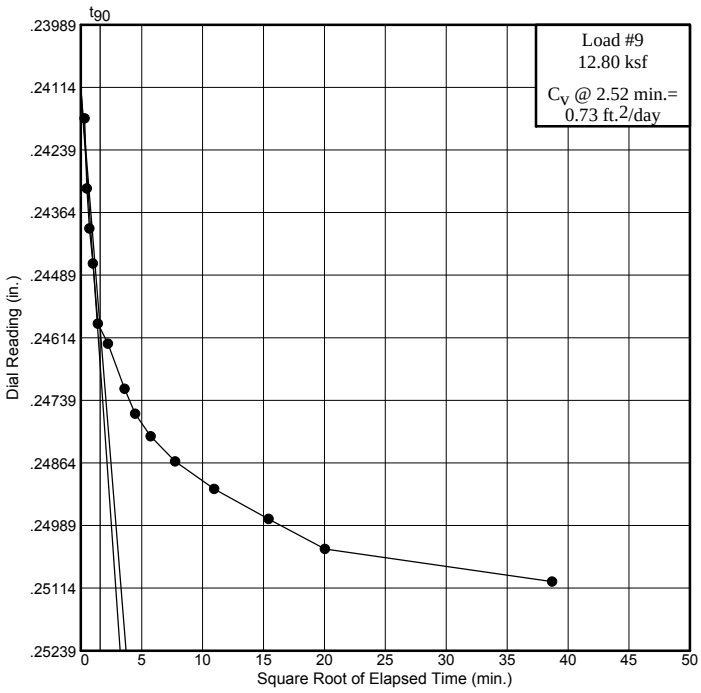
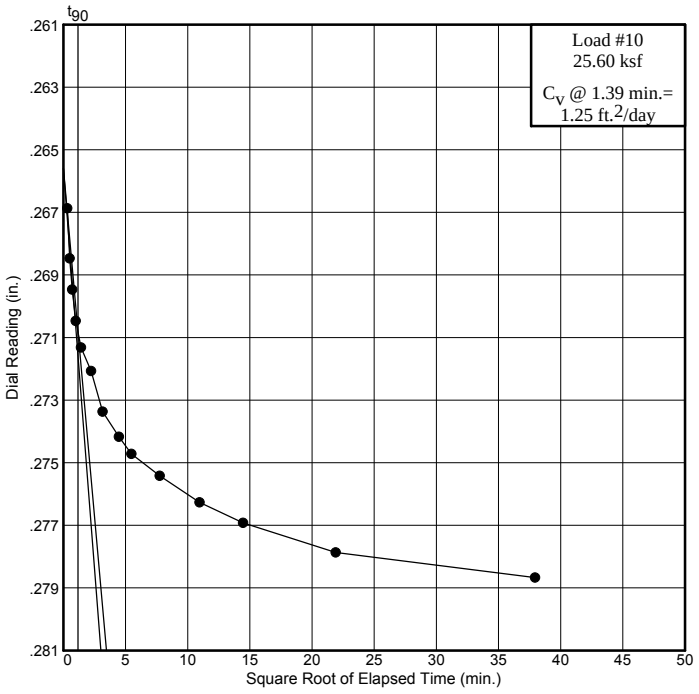
Fig.

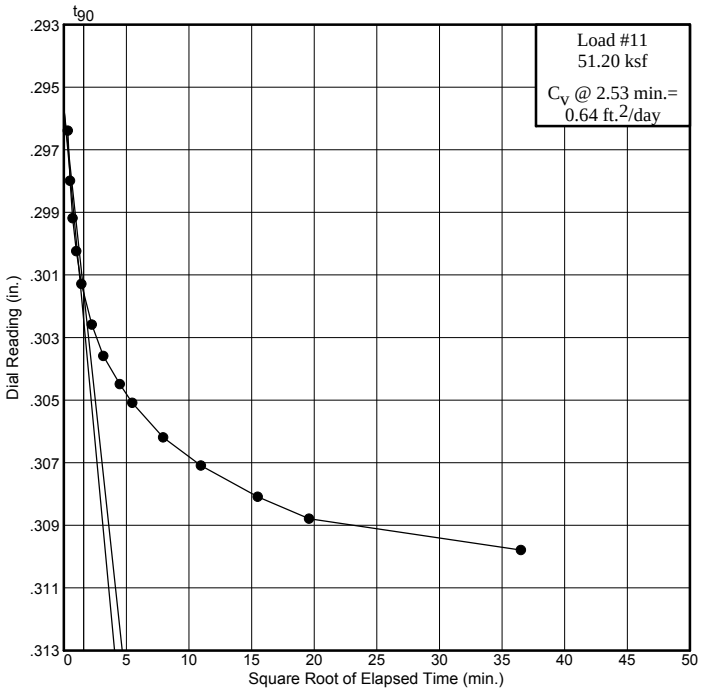
Dial Reading vs. Time

Project No.: 108-130.10
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Colina #3









Knight Piésold CONSULTING

Fig.

CONSOLIDATION TEST DATA

Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project Number: 108-130.10

Sample Data

Source:
Sample No.:
Elev. or Depth: **Sample Length (in./cm.):**
Location: Colina #3
Description: sandy silt
Liquid Limit: 17 **Plasticity Index:** NP
USCS: ML **AASHTO:** A-4(0) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 264.14 g.	**Consolidometer # =** 1	**Wet w+t =** 273.28 g.
Dry w+t = 240.48 g.		**Dry w+t =** 254.88 g.
Tare Wt. = 96.93 g.	**Spec. Gravity =** 2.79	**Tare Wt. =** 129.85 g.
Height = .99 in.	**Height =** .99 in.	
Diameter = 2.41 in.	**Diameter =** 2.42 in.	
Weight = 146.11 g.	**Defl. Table =** Std 102 R	
Moisture = 16.5 %	**Ht. Solids =** 0.5945 in.	**Moisture =** 14.7 %
Wet Den. = 123.3 pcf	**Dry Wt. =** 126.48 g.	**Dry Wt. =** 125.03 g.*
Dry Den. = 105.8 pcf	**Void Ratio =** 0.665	**Void Ratio =** 0.428
	Saturation = 69.1 %	

*** Final dry weight used in calculations**

End-of-Load Summary

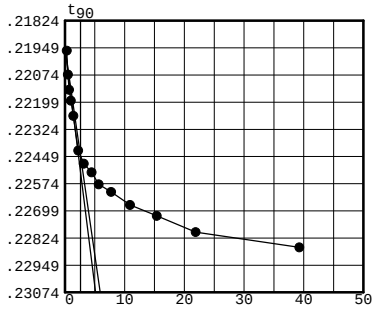
Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v ($ft.^2$/day)	C_α	Void Ratio	% Compression /Swell
start	0.18200				0.665	
0.10	0.18240	0.00000			0.664	0.0 Comprs.
water	0.18510	0.00000			0.660	0.3 Comprs.
0.20	0.18835	0.00030			0.655	0.6 Comprs.
0.40	0.19370	0.00090			0.647	1.1 Comprs.
0.80	0.20020	0.00270			0.639	1.6 Comprs.
1.60	0.20930	0.00510			0.628	2.2 Comprs.
3.20	0.22180	0.00774			0.611	3.2 Comprs.
6.40	0.23925	0.01058	0.28		0.587	4.7 Comprs.
12.80	0.26405	0.01304	0.73		0.549	7.0 Comprs.
25.60	0.29480	0.01613	1.25		0.503	9.8 Comprs.
51.20	0.32950	0.01971	0.64		0.450	12.9 Comprs.
102.40	0.36810	0.02440			0.393	16.3 Comprs.
25.60	0.36100	0.02016			0.398	16.0 Comprs.

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
6.40	0.35530	0.01695			0.402	15.8 Comprs.
1.60	0.34945	0.01404			0.407	15.5 Comprs.
0.40	0.34320	0.01273			0.415	15.0 Comprs.
0.10	0.33450	0.01158			0.428	14.2 Comprs.

C_c = 0.19 **P_c =** 11.60 ksf **C_s =** 0.01
Heave percentage = -0.3

Pressure: 6.40 ksf **TEST READINGS** **Load No. 8**

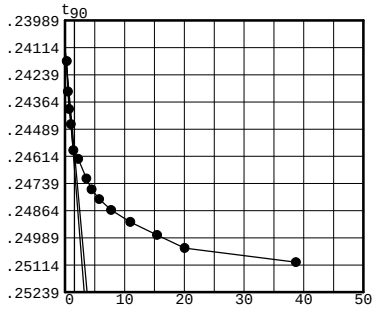
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.22180	11	60.00	0.23670
2	0.10	0.23020	12	119.00	0.23730
3	0.25	0.23130	13	237.00	0.23780
4	0.50	0.23200	14	480.00	0.23855
5	1.00	0.23250	15	1542.00	0.23925
6	2.00	0.23320			
7	5.00	0.23480			
8	10.00	0.23540			
9	20.00	0.23580			
10	32.00	0.23635			



Void Ratio = 0.587 **Compression =** 4.7 %
D_0 = 0.21950 **D_{90} =** 0.22446 **D_{100} =** 0.22501
C_v at 6.8 min. = 0.28 ft.^{2}/day

Pressure: 12.80 ksf **TEST READINGS** **Load No. 9**

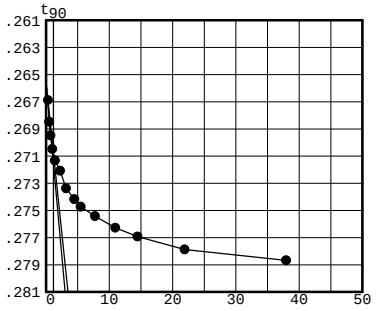
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.23925	11	60.00	0.26165
2	0.10	0.25480	12	120.00	0.26220
3	0.25	0.25620	13	238.00	0.26280
4	0.50	0.25700	14	402.00	0.26340
5	1.00	0.25770	15	1497.00	0.26405
6	2.00	0.25890			
7	5.00	0.25930			
8	13.00	0.26020			
9	20.00	0.26070			
10	33.00	0.26115			



Void Ratio = 0.549 **Compression =** 7.0 %
D_0 = 0.24114 **D_{90} =** 0.24594 **D_{100} =** 0.24648
C_v at 2.5 min. = 0.73 ft.^{2}/day

Pressure: 25.60 ksf **TEST READINGS** **Load No. 10**

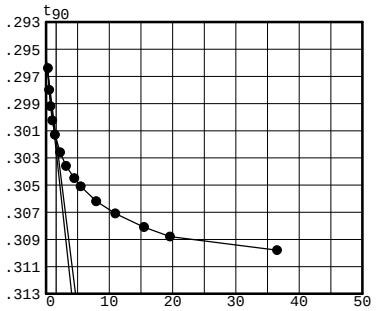
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.26405	11	60.00	0.29155
2	0.10	0.28300	12	120.00	0.29240
3	0.25	0.28460	13	209.00	0.29305
4	0.50	0.28560	14	480.00	0.29400
5	1.00	0.28660	15	1440.00	0.29480
6	2.00	0.28745			
7	5.00	0.28820			
8	10.00	0.28950			
9	20.00	0.29030			
10	30.00	0.29085			



Void Ratio = 0.503 **Compression =** 9.8 %
D_0 = 0.26560 **D_{90} =** 0.27084 **D_{100} =** 0.27142
C_v at 1.4 min. = 1.25 ft.^{2}/day

Pressure: 51.20 ksf **TEST READINGS** **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.29480	11	63.00	0.32590
2	0.10	0.31610	12	120.00	0.32680
3	0.25	0.31770	13	240.00	0.32780
4	0.50	0.31890	14	384.00	0.32850
5	1.00	0.31995	15	1333.00	0.32950
6	2.00	0.32100			
7	5.00	0.32230			
8	10.00	0.32330			
9	20.00	0.32420			
10	30.00	0.32480			

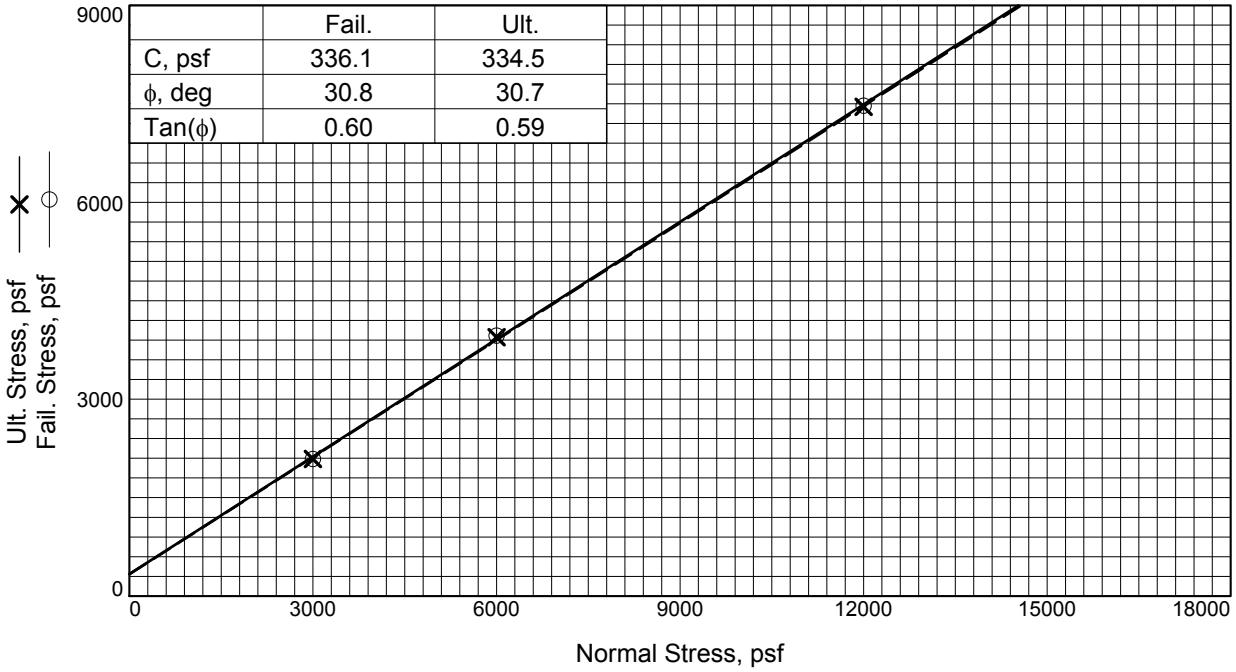


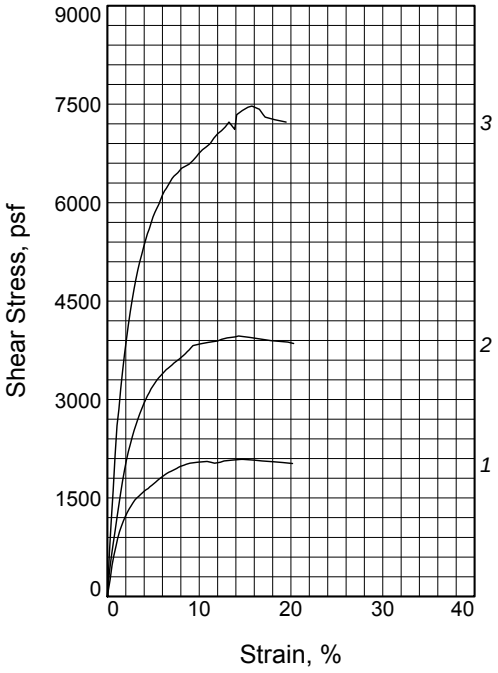
Void Ratio = 0.450 **Compression =** 12.9 %
D_0 = 0.29565 **D_{90} =** 0.30157 **D_{100} =** 0.30223
C_v at 2.5 min. = 0.64 ft.^{2}/day

Appendix A.3

Triaxial Shear

	Fail.	Ult.
C, psf	336.1	334.5
ϕ, deg	30.8	30.7
Tan(ϕ)	0.60	0.59





Sample No.		1	2	3
Initial	Water Content, %	17.3	17.3	17.3
	Dry Density, pcf	106.9	107.2	107.3
	Saturation, %	68.5	69.0	69.2
	Void Ratio	0.7640	0.7581	0.7568
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	21.4	20.1	18.9
	Dry Density, pcf	114.4	117.3	119.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6476	0.6069	0.5723
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.93	0.91	0.90
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2088.8	3967.2	7472.6
Strain, %		14.6	14.3	15.7
Ult. Stress, psf		2088.8	3945.2	7453.8
Strain, %		14.8	15.5	15.3
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= NV **PI=** NP
Specific Gravity= 3.02
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Escabrosa
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 6/28/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 6/28/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Escabrosa
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=3.02 **LL=**NV **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	272.460		305.070
Moisture content: Dry soil+tare, gms.	249.690		277.450
Moisture content: Tare, gms.	118.320		148.610
Moisture, %	17.3	21.4	21.4
Moist specimen weight, gms.	150.8		
Diameter, in.	2.42	2.42	
Area, in.²	4.58	4.58	
Height, in.	1.00	0.93	
Net decrease in height, in.		0.07	
Wet Density, pcf	125.4	139.0	
Dry density, pcf	106.9	114.4	
Void ratio	0.7640	0.6476	
Saturation, %	68.5	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2088.8 psf **at reading no.** 51
Ult. Stress = 2088.8 psf **at reading no.** 52

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0010	0.0000	0.0	0.0	0.0
2	0.0010	0.0541	1.7	0.0	53.4
3	0.0070	0.2577	8.1	0.3	254.4
4	0.0120	0.4803	15.1	0.5	474.3
5	0.0170	0.6362	20.0	0.7	628.2
6	0.0220	0.7666	24.1	0.9	757.0
7	0.0270	0.8939	28.1	1.1	882.6
8	0.0320	1.0020	31.5	1.3	989.4
9	0.0370	1.0847	34.1	1.5	1071.1
10	0.0420	1.1642	36.6	1.7	1149.6

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0470	1.2342	38.8	1.9	1218.7
12	0.0520	1.2947	40.7	2.2	1278.4
13	0.0570	1.3487	42.4	2.4	1331.8
14	0.0620	1.3965	43.9	2.6	1378.9
15	0.0670	1.4410	45.3	2.8	1422.9
16	0.0720	1.4855	46.7	3.0	1466.9
17	0.0770	1.5173	47.7	3.2	1498.3
18	0.0820	1.5428	48.5	3.4	1523.4
19	0.0870	1.5714	49.4	3.6	1551.7
20	0.0920	1.6000	50.3	3.8	1580.0
21	0.0970	1.6255	51.1	4.0	1605.1
22	0.1020	1.6478	51.8	4.2	1627.1
23	0.1070	1.6637	52.3	4.4	1642.8
24	0.1120	1.6923	53.2	4.6	1671.1
25	0.1170	1.7146	53.9	4.8	1693.0
26	0.1220	1.7400	54.7	5.1	1718.2
27	0.1270	1.7654	55.5	5.3	1743.3
28	0.1320	1.7909	56.3	5.5	1768.4
29	0.1370	1.8163	57.1	5.7	1793.6
30	0.1420	1.8386	57.8	5.9	1815.5
31	0.1470	1.8577	58.4	6.1	1834.4
32	0.1520	1.8800	59.1	6.3	1856.4
33	0.1570	1.8990	59.7	6.5	1875.2
34	0.1620	1.9181	60.3	6.7	1894.1
35	0.1670	1.9309	60.6	6.9	1906.6
36	0.1720	1.9436	61.0	7.1	1919.2
37	0.1770	1.9595	61.5	7.3	1934.9
38	0.1820	1.9754	62.0	7.5	1950.6
39	0.1870	1.9913	62.5	7.7	1966.3
40	0.1920	2.0072	63.0	8.0	1982.0
41	0.2020	2.0263	63.6	8.4	2000.9
42	0.2070	2.0390	64.0	8.6	2013.4
43	0.2170	2.0549	64.5	9.0	2029.1
44	0.2370	2.0708	65.0	9.8	2044.8
45	0.2620	2.0835	65.4	10.8	2057.4
46	0.2720	2.0708	65.0	11.3	2044.8
47	0.2820	2.0549	64.5	11.7	2029.1
48	0.2970	2.0708	65.0	12.3	2044.8
49	0.3070	2.0899	65.6	12.7	2063.7
50	0.3270	2.1026	66.0	13.5	2076.3
51	0.3520	2.1154	66.4	14.6	2088.8
52	0.3570	2.1154	66.4	14.8	2088.8
53	0.3870	2.1026	66.0	16.0	2076.3
54	0.4070	2.0899	65.6	16.9	2063.7
55	0.4370	2.0772	65.2	18.1	2051.1
56	0.4620	2.0645	64.8	19.1	2038.6
57	0.4870	2.0517	64.4	20.2	2026.0

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	272.460		304.870
Moisture content: Dry soil+tare, gms.	249.690		278.790
Moisture content: Tare, gms.	118.320		149.020
Moisture, %	17.3	20.1	20.1
Moist specimen weight, gms.	151.3		
Diameter, in.	2.42	2.42	
Area, in.²	4.58	4.58	
Height, in.	1.00	0.91	
Net decrease in height, in.		0.09	
Wet Density, pcf	125.8	140.9	
Dry density, pcf	107.2	117.3	
Void ratio	0.7581	0.6069	
Saturation, %	69.0	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3967.2 psf **at reading no.** 51

Ult. Stress = 3945.2 psf **at reading no.** 52

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3626	11.4	0.2	358.1
2	0.0100	0.6012	18.9	0.4	593.7
3	0.0150	0.8112	25.5	0.6	801.0
4	0.0200	1.0084	31.7	0.8	995.7
5	0.0250	1.2183	38.3	1.0	1203.0
6	0.0300	1.4155	44.5	1.2	1397.8
7	0.0350	1.6000	50.3	1.4	1580.0
8	0.0400	1.7845	56.1	1.7	1762.1
9	0.0450	1.9499	61.2	1.9	1925.5
10	0.0500	2.1026	66.0	2.1	2076.3
11	0.0550	2.2362	70.2	2.3	2208.2
12	0.0600	2.3444	73.6	2.5	2315.0
13	0.0650	2.4589	77.2	2.7	2428.1
14	0.0700	2.5607	80.4	2.9	2528.6
15	0.0750	2.6434	83.0	3.1	2610.2
16	0.0800	2.7325	85.8	3.3	2698.2
17	0.0850	2.8152	88.4	3.5	2779.9
18	0.0900	2.8915	90.8	3.7	2855.2
19	0.0950	2.9647	93.1	3.9	2927.5
20	0.1000	3.0315	95.2	4.1	2993.4
21	0.1050	3.0951	97.2	4.3	3056.3
22	0.1100	3.1460	98.8	4.6	3106.5
23	0.1150	3.2033	100.6	4.8	3163.1
24	0.1200	3.2478	102.0	5.0	3207.0
25	0.1250	3.2923	103.4	5.2	3251.0
26	0.1300	3.3369	104.8	5.4	3295.0

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.3750	106.0	5.6	3332.7
28	0.1400	3.4068	107.0	5.8	3364.1
29	0.1450	3.4386	108.0	6.0	3395.5
30	0.1500	3.4705	109.0	6.2	3426.9
31	0.1550	3.4991	109.9	6.4	3455.2
32	0.1600	3.5214	110.6	6.6	3477.2
33	0.1650	3.5468	111.4	6.8	3502.3
34	0.1700	3.5722	112.2	7.0	3527.4
35	0.1750	3.6009	113.1	7.2	3555.7
36	0.1800	3.6231	113.8	7.5	3577.7
37	0.1900	3.6677	115.2	7.9	3621.7
38	0.1950	3.6931	116.0	8.1	3646.8
39	0.2000	3.7186	116.8	8.3	3671.9
40	0.2050	3.7440	117.6	8.5	3697.1
41	0.2100	3.7758	118.6	8.7	3728.5
42	0.2150	3.8045	119.5	8.9	3756.7
43	0.2200	3.8394	120.6	9.1	3791.3
44	0.2250	3.8713	121.6	9.3	3822.7
45	0.2450	3.8967	122.4	10.1	3847.8
46	0.2650	3.9190	123.1	11.0	3869.8
47	0.2900	3.9412	123.8	12.0	3891.8
48	0.3000	3.9667	124.6	12.4	3916.9
49	0.3150	3.9890	125.3	13.0	3938.9
50	0.3350	4.0049	125.8	13.9	3954.6
51	0.3450	4.0176	126.2	14.3	3967.2
52	0.3750	3.9953	125.5	15.5	3945.2
53	0.4000	3.9731	124.8	16.6	3923.2
54	0.4300	3.9476	124.0	17.8	3898.1
55	0.4750	3.9253	123.3	19.7	3876.1
56	0.4900	3.9031	122.6	20.3	3854.1

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	272.460		303.380
Moisture content: Dry soil+tare, gms.	249.690		278.790
Moisture content: Tare, gms.	118.320		149.020
Moisture, %	17.3	18.9	18.9
Moist specimen weight, gms.	151.4		
Diameter, in.	2.42	2.42	
Area, in.²	4.58	4.58	
Height, in.	1.00	0.90	
Net decrease in height, in.		0.10	
Wet Density, pcf	125.9	142.6	
Dry density, pcf	107.3	119.9	
Void ratio	0.7568	0.5723	
Saturation, %	69.2	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 7472.6 psf **at reading no.** 54

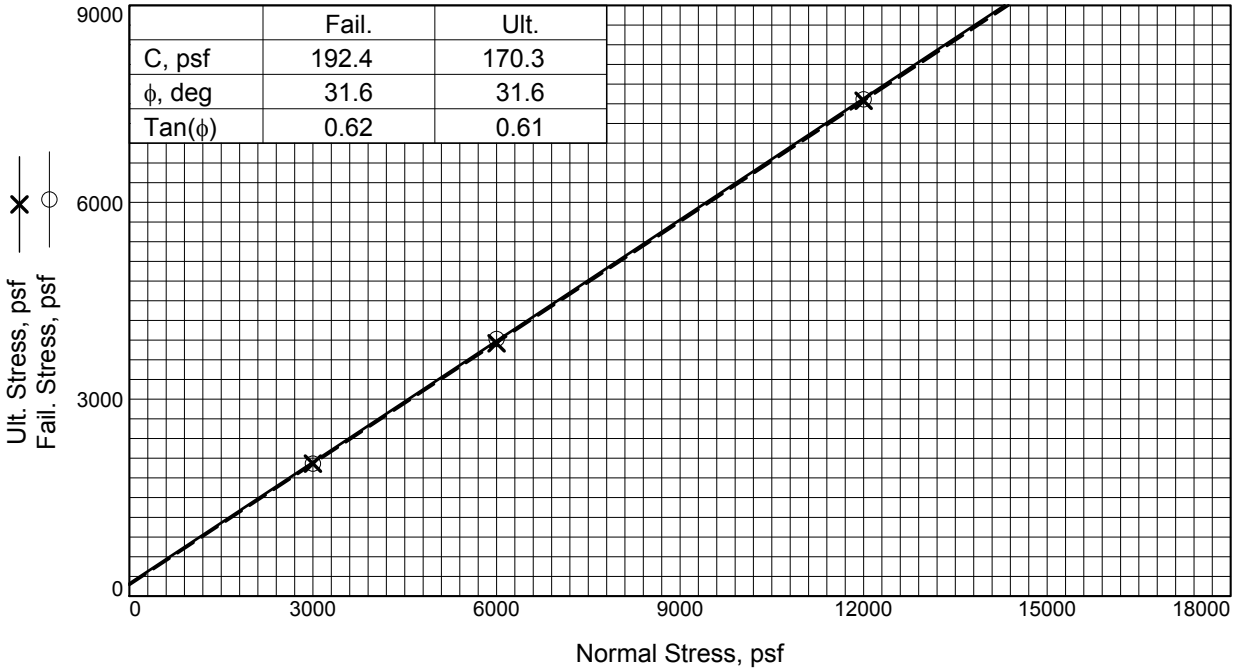
Ult. Stress = 7453.8 psf **at reading no.** 53

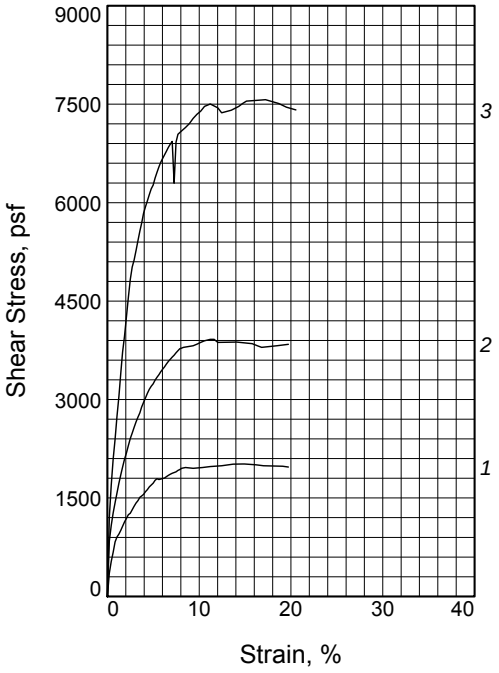
No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.6457	20.3	0.2	637.6
2	0.0100	1.1674	36.7	0.4	1152.8
3	0.0150	1.6318	51.3	0.6	1611.4
4	0.0200	2.1726	68.2	0.8	2145.4
5	0.0250	2.6339	82.7	1.0	2600.8
6	0.0300	2.8915	90.8	1.2	2855.2
7	0.0350	3.1969	100.4	1.4	3156.8
8	0.0400	3.4768	109.2	1.7	3433.2
9	0.0450	3.7377	117.4	1.9	3690.8
10	0.0500	3.9667	124.6	2.1	3916.9
11	0.0550	4.1925	131.7	2.3	4139.9
12	0.0600	4.3929	138.0	2.5	4337.8
13	0.0650	4.5774	143.8	2.7	4520.0
14	0.0700	4.7492	149.2	2.9	4689.6
15	0.0750	4.8924	153.7	3.1	4831.0
16	0.0800	5.0355	158.2	3.3	4972.3
17	0.0850	5.1627	162.2	3.5	5098.0
18	0.0900	5.2709	165.6	3.7	5204.8
19	0.0950	5.3854	169.2	3.9	5317.8
20	0.1000	5.4936	172.6	4.1	5424.6
21	0.1050	5.5954	175.8	4.3	5525.2
22	0.1100	5.6717	178.2	4.6	5600.5
23	0.1150	5.7608	181.0	4.8	5688.5
24	0.1200	5.8562	183.9	5.0	5782.7
25	0.1250	5.9262	186.1	5.2	5851.8
26	0.1300	5.9898	188.1	5.4	5914.7

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	6.0471	189.9	5.6	5971.2
28	0.1400	6.1234	192.3	5.8	6046.6
29	0.1450	6.1997	194.7	6.0	6122.0
30	0.1500	6.2570	196.5	6.2	6178.5
31	0.1550	6.2952	197.7	6.4	6216.2
32	0.1650	6.3970	200.9	6.8	6316.7
33	0.1700	6.4479	202.5	7.0	6367.0
34	0.1750	6.4860	203.7	7.2	6404.7
35	0.1850	6.5369	205.3	7.7	6454.9
36	0.1950	6.6069	207.5	8.1	6524.0
37	0.2150	6.6705	209.5	8.9	6586.8
38	0.2250	6.7278	211.3	9.3	6643.4
39	0.2350	6.7914	213.3	9.7	6706.2
40	0.2400	6.8296	214.5	9.9	6743.9
41	0.2500	6.8932	216.5	10.4	6806.7
42	0.2600	6.9377	217.9	10.8	6850.7
43	0.2700	6.9854	219.4	11.2	6897.8
44	0.2750	7.0268	220.7	11.4	6938.6
45	0.2800	7.0713	222.1	11.6	6982.6
46	0.2900	7.1381	224.2	12.0	7048.6
47	0.3000	7.1858	225.7	12.4	7095.7
48	0.3100	7.2463	227.6	12.8	7155.4
49	0.3200	7.3194	229.9	13.3	7227.6
50	0.3350	7.2049	226.3	13.9	7114.5
51	0.3400	7.4340	233.5	14.1	7340.7
52	0.3550	7.4976	235.5	14.7	7403.5
53	0.3700	7.5485	237.1	15.3	7453.8
54	0.3800	7.5676	237.7	15.7	7472.6
55	0.3850	7.5548	237.3	15.9	7460.1
56	0.4000	7.5167	236.1	16.6	7422.4
57	0.4100	7.4340	233.5	17.0	7340.7
58	0.4150	7.3958	232.3	17.2	7303.0
59	0.4400	7.3576	231.1	18.2	7265.3
60	0.4700	7.3194	229.9	19.5	7227.6

	Fail.	Ult.
C, psf	192.4	170.3
ϕ, deg	31.6	31.6
Tan(ϕ)	0.62	0.61





Sample No.		1	2	3
Initial	Water Content, %	18.8	18.8	18.8
	Dry Density, pcf	103.8	103.4	103.4
	Saturation, %	72.3	71.8	71.7
	Void Ratio	0.7628	0.7689	0.7696
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	0.99
At Test	Water Content, %	21.7	19.8	16.2
	Dry Density, pcf	111.7	115.7	123.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6370	0.5805	0.4758
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.92	0.89	0.83
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2018.6	3917.4	7569.9
Strain, %		14.9	11.2	17.2
Ult. Stress, psf		2018.6	3851.2	7547.8
Strain, %		14.9	15.8	15.1
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= NV **PI=** NP
Specific Gravity= 2.93
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Years 4-7 Composite
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 6/28/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 6/28/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Years 4-7 Composite
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.93 **LL=**NV **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	425.000		300.020
Moisture content: Dry soil+tare, gms.	376.380		273.030
Moisture content: Tare, gms.	118.200		148.880
Moisture, %	18.8	21.7	21.7
Moist specimen weight, gms.	146.9		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.92	
Net decrease in height, in.		0.07	
Wet Density, pcf	123.3	136.0	
Dry density, pcf	103.8	111.7	
Void ratio	0.7628	0.6370	
Saturation, %	72.3	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2018.6 psf **at reading no.** 44
Ult. Stress = 2018.6 psf **at reading no.** 44

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3563	11.2	0.2	353.3
2	0.0100	0.5376	16.9	0.4	533.0
3	0.0150	0.6775	21.3	0.6	671.8
4	0.0200	0.8366	26.3	0.8	829.5
5	0.0250	0.9129	28.7	1.0	905.2
6	0.0300	0.9575	30.1	1.2	949.4
7	0.0350	1.0179	32.0	1.5	1009.3
8	0.0400	1.0784	33.9	1.7	1069.2
9	0.0450	1.1452	36.0	1.9	1135.5
10	0.0500	1.1992	37.7	2.1	1189.1

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.2565	39.5	2.3	1245.9
12	0.0600	1.2788	40.2	2.5	1268.0
13	0.0650	1.3328	41.9	2.7	1321.6
14	0.0700	1.3869	43.6	2.9	1375.2
15	0.0750	1.4346	45.1	3.1	1422.5
16	0.0800	1.4728	46.3	3.3	1460.4
17	0.0850	1.5237	47.9	3.5	1510.8
18	0.0900	1.5428	48.5	3.7	1529.8
19	0.0950	1.5682	49.3	3.9	1555.0
20	0.1000	1.6096	50.6	4.1	1596.0
21	0.1050	1.6414	51.6	4.4	1627.5
22	0.1100	1.6827	52.9	4.6	1668.5
23	0.1200	1.7400	54.7	5.0	1725.3
24	0.1250	1.7845	56.1	5.2	1769.5
25	0.1300	1.8100	56.9	5.4	1794.7
26	0.1350	1.7973	56.5	5.6	1782.1
27	0.1500	1.8195	57.2	6.2	1804.2
28	0.1550	1.8418	57.9	6.4	1826.2
29	0.1600	1.8609	58.5	6.6	1845.2
30	0.1650	1.8768	59.0	6.8	1860.9
31	0.1700	1.8927	59.5	7.1	1876.7
32	0.1800	1.9150	60.2	7.5	1898.8
33	0.1850	1.9372	60.8	7.7	1920.9
34	0.1900	1.9499	61.2	7.9	1933.5
35	0.1950	1.9690	61.8	8.1	1952.4
36	0.2050	1.9818	62.2	8.5	1965.0
37	0.2250	1.9690	61.8	9.3	1952.4
38	0.2500	1.9818	62.2	10.4	1965.0
39	0.2700	1.9945	62.6	11.2	1977.6
40	0.3000	2.0072	63.0	12.4	1990.3
41	0.3150	2.0199	63.4	13.1	2002.9
42	0.3300	2.0326	63.8	13.7	2015.5
43	0.3550	2.0358	63.9	14.7	2018.6
44	0.3600	2.0358	63.9	14.9	2018.6
45	0.3900	2.0231	63.5	16.2	2006.0
46	0.4100	2.0072	63.0	17.0	1990.3
47	0.4600	2.0008	62.8	19.1	1983.9
48	0.4750	1.9881	62.4	19.7	1971.3

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	425.000		293.820
Moisture content: Dry soil+tare, gms.	376.380		269.280
Moisture content: Tare, gms.	118.200		145.440
Moisture, %	18.8	19.8	19.8
Moist specimen weight, gms.	146.4		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.89	
Net decrease in height, in.		0.11	
Wet Density, pcf	122.9	138.7	
Dry density, pcf	103.4	115.7	
Void ratio	0.7689	0.5805	
Saturation, %	71.8	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3917.4 psf **at reading no.** 42

Ult. Stress = 3851.2 psf **at reading no.** 47

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.8493	26.7	0.2	842.2
2	0.0100	1.0911	34.3	0.4	1081.9
3	0.0150	1.2819	40.3	0.6	1271.1
4	0.0200	1.4410	45.3	0.8	1428.8
5	0.0250	1.5905	50.0	1.0	1577.1
6	0.0300	1.7400	54.7	1.2	1725.3
7	0.0350	1.8736	58.9	1.5	1857.8
8	0.0400	1.9881	62.4	1.7	1971.3
9	0.0450	2.1090	66.2	1.9	2091.2
10	0.0500	2.2044	69.2	2.1	2185.8
11	0.0550	2.3189	72.8	2.3	2299.4
12	0.0600	2.4271	76.2	2.5	2406.6
13	0.0650	2.5098	78.8	2.7	2488.6
14	0.0700	2.5989	81.6	2.9	2576.9
15	0.0750	2.6816	84.2	3.1	2658.9
16	0.0800	2.7547	86.5	3.3	2731.5
17	0.0850	2.8215	88.6	3.5	2797.7
18	0.0900	2.9106	91.4	3.7	2886.0
19	0.0950	2.9806	93.6	3.9	2955.4
20	0.1000	3.0506	95.8	4.1	3024.8
21	0.1050	3.1205	98.0	4.4	3094.2
22	0.1100	3.1842	100.0	4.6	3157.3
23	0.1150	3.2287	101.4	4.8	3201.4
24	0.1200	3.2669	102.6	5.0	3239.3
25	0.1250	3.3241	104.4	5.2	3296.1
26	0.1300	3.3687	105.8	5.4	3340.2

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.4068	107.0	5.6	3378.1
28	0.1400	3.4514	108.4	5.8	3422.2
29	0.1450	3.4895	109.6	6.0	3460.1
30	0.1500	3.5277	110.8	6.2	3497.9
31	0.1550	3.5722	112.2	6.4	3542.1
32	0.1600	3.6104	113.4	6.6	3579.9
33	0.1700	3.6772	115.5	7.1	3646.2
34	0.1750	3.7058	116.4	7.3	3674.6
35	0.1800	3.7440	117.6	7.5	3712.4
36	0.1900	3.8045	119.5	7.9	3772.3
37	0.2000	3.8267	120.2	8.3	3794.4
38	0.2250	3.8522	121.0	9.3	3819.6
39	0.2350	3.8776	121.8	9.8	3844.9
40	0.2450	3.9031	122.6	10.2	3870.1
41	0.2550	3.9285	123.4	10.6	3895.3
42	0.2700	3.9508	124.1	11.2	3917.4
43	0.2800	3.9508	124.1	11.6	3917.4
44	0.2850	3.9253	123.3	11.8	3892.2
45	0.2900	3.9031	122.6	12.0	3870.1
46	0.3400	3.9094	122.8	14.1	3876.4
47	0.3800	3.8840	122.0	15.8	3851.2
48	0.3950	3.8490	120.9	16.4	3816.5
49	0.4050	3.8267	120.2	16.8	3794.4
50	0.4450	3.8522	121.0	18.5	3819.6
51	0.4750	3.8744	121.7	19.7	3841.7

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	425.000		295.920
Moisture content: Dry soil+tare, gms.	376.380		275.810
Moisture content: Tare, gms.	118.200		152.000
Moisture, %	18.8	16.2	16.2
Moist specimen weight, gms.	146.2		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.83	
Net decrease in height, in.		0.17	
Wet Density, pcf	122.8	144.1	
Dry density, pcf	103.4	123.9	
Void ratio	0.7696	0.4758	
Saturation, %	71.7	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

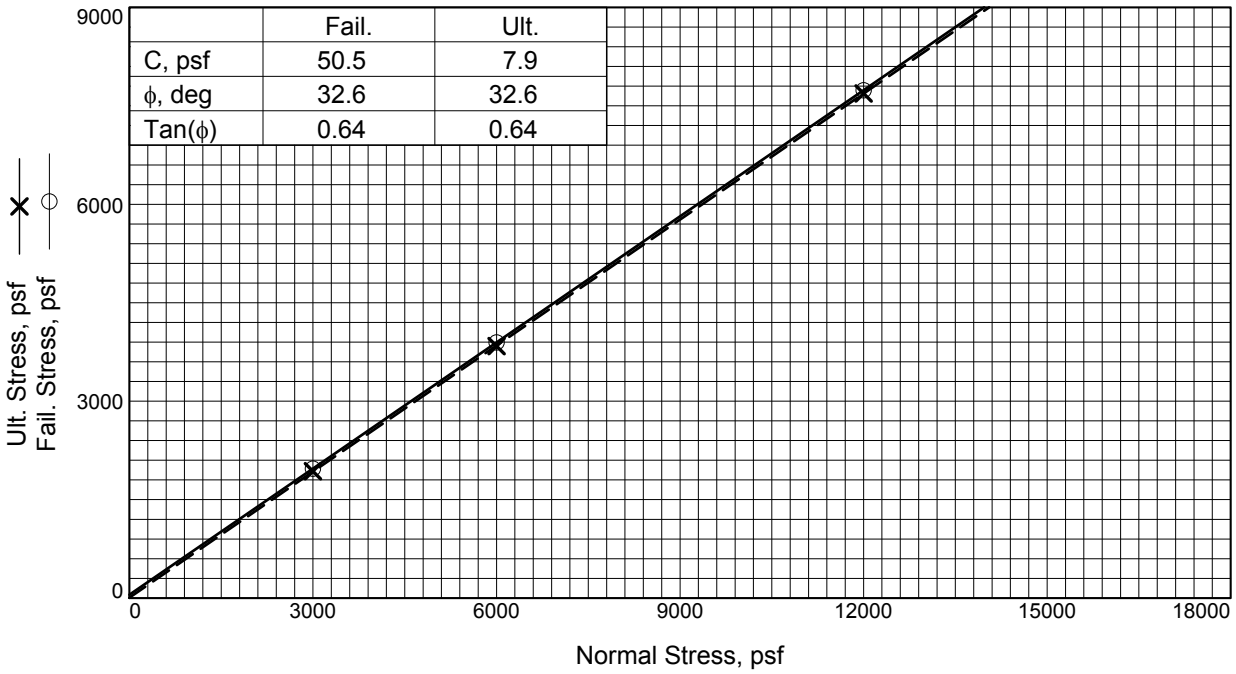
Fail. Stress = 7569.9 psf **at reading no.** 53

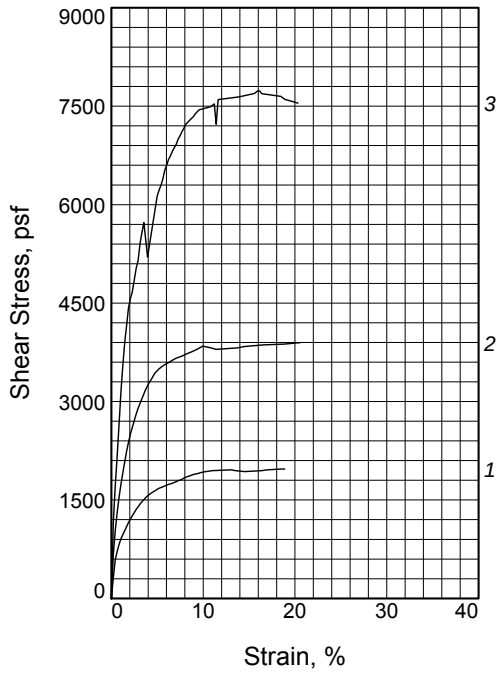
Ult. Stress = 7547.8 psf **at reading no.** 51

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	1.2151	38.2	0.2	1204.9
2	0.0100	1.7114	53.8	0.4	1696.9
3	0.0150	2.1090	66.2	0.6	2091.2
4	0.0200	2.4144	75.8	0.8	2394.0
5	0.0250	2.7706	87.0	1.0	2747.2
6	0.0300	3.0760	96.6	1.2	3050.0
7	0.0350	3.4418	108.1	1.5	3412.8
8	0.0400	3.7567	118.0	1.7	3725.0
9	0.0450	3.9985	125.6	1.9	3964.7
10	0.0500	4.2975	135.0	2.1	4261.2
11	0.0550	4.5933	144.3	2.3	4554.6
12	0.0600	4.8701	153.0	2.5	4829.0
13	0.0650	5.0609	159.0	2.7	5018.2
14	0.0700	5.1691	162.4	2.9	5125.5
15	0.0750	5.3154	167.0	3.1	5270.5
16	0.0800	5.4681	171.8	3.3	5421.9
17	0.0850	5.6144	176.4	3.5	5567.0
18	0.0900	5.7353	180.2	3.7	5686.9
19	0.0950	5.8880	184.9	3.9	5838.3
20	0.1000	5.9898	188.1	4.1	5939.2
21	0.1050	6.0789	190.9	4.4	6027.5
22	0.1100	6.1743	193.9	4.6	6122.2
23	0.1150	6.2634	196.7	4.8	6210.5
24	0.1200	6.3206	198.5	5.0	6267.3
25	0.1250	6.4288	201.9	5.2	6374.5
26	0.1300	6.5178	204.7	5.4	6462.8

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	6.6005	207.3	5.6	6544.8
28	0.1400	6.6705	209.5	5.8	6614.2
29	0.1450	6.7278	211.3	6.0	6671.0
30	0.1500	6.7850	213.1	6.2	6727.8
31	0.1550	6.8423	214.9	6.4	6784.5
32	0.1600	6.8996	216.7	6.6	6841.3
33	0.1650	6.9505	218.3	6.8	6891.8
34	0.1700	6.9918	219.6	7.1	6932.8
35	0.1750	6.3492	199.4	7.3	6295.6
36	0.1800	6.9823	219.3	7.5	6923.3
37	0.1850	7.1031	223.1	7.7	7043.2
38	0.1950	7.1540	224.7	8.1	7093.6
39	0.2050	7.2049	226.3	8.5	7144.1
40	0.2150	7.2654	228.2	8.9	7204.0
41	0.2250	7.3449	230.7	9.3	7282.9
42	0.2350	7.4085	232.7	9.8	7346.0
43	0.2450	7.4562	234.2	10.2	7393.3
44	0.2550	7.5294	236.5	10.6	7465.8
45	0.2700	7.5676	237.7	11.2	7503.7
46	0.2900	7.5071	235.8	12.0	7443.7
47	0.3000	7.4308	233.4	12.4	7368.0
48	0.3250	7.4721	234.7	13.5	7409.0
49	0.3450	7.5294	236.5	14.3	7465.8
50	0.3550	7.5739	237.9	14.7	7510.0
51	0.3650	7.6121	239.1	15.1	7547.8
52	0.4050	7.6280	239.6	16.8	7563.6
53	0.4150	7.6344	239.8	17.2	7569.9
54	0.4500	7.5739	237.9	18.7	7510.0
55	0.4700	7.5167	236.1	19.5	7453.2
56	0.4950	7.4753	234.8	20.5	7412.2





Sample No.		1	2	3
Initial	Water Content, %	17.5	17.5	17.5
	Dry Density, pcf	106.2	106.3	106.3
	Saturation, %	69.0	69.1	69.1
	Void Ratio	0.7570	0.7558	0.7554
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	20.9	20.0	17.2
	Dry Density, pcf	114.8	116.8	123.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6263	0.5988	0.5154
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.92	0.91	0.86
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		1971.3	3895.3	7737.1
Strain, %		18.5	20.3	16.0
Ult. Stress, psf		1933.5	3838.6	7689.8
Strain, %		14.5	14.5	16.4
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 17 **PI=** NP
Specific Gravity= 2.99
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Epitaph Lithology
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 7/12/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 7/12/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Epitaph Lithology
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.99 **LL=**17 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	258.490		301.750
Moisture content: Dry soil+tare, gms.	237.290		275.150
Moisture content: Tare, gms.	115.900		148.180
Moisture, %	17.5	20.9	20.9
Moist specimen weight, gms.	148.7		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.92	
Net decrease in height, in.		0.07	
Wet Density, pcf	124.8	138.8	
Dry density, pcf	106.2	114.8	
Void ratio	0.7570	0.6263	
Saturation, %	69.0	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 1971.3 psf **at reading no.** 48
Ult. Stress = 1933.5 psf **at reading no.** 45

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3213	10.1	0.2	318.6
2	0.0100	0.5885	18.5	0.4	583.5
3	0.0150	0.7221	22.7	0.6	716.0
4	0.0200	0.8302	26.1	0.8	823.2
5	0.0250	0.9193	28.9	1.0	911.5
6	0.0300	0.9829	30.9	1.2	974.6
7	0.0350	1.0434	32.8	1.5	1034.6
8	0.0400	1.1038	34.7	1.7	1094.5
9	0.0450	1.1674	36.7	1.9	1157.6
10	0.0500	1.2183	38.3	2.1	1208.0

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.2724	40.0	2.3	1261.7
12	0.0600	1.3201	41.5	2.5	1309.0
13	0.0650	1.3678	43.0	2.7	1356.3
14	0.0700	1.4092	44.3	2.9	1397.3
15	0.0750	1.4505	45.6	3.1	1438.3
16	0.0800	1.4855	46.7	3.3	1473.0
17	0.0850	1.5173	47.7	3.5	1504.5
18	0.0900	1.5491	48.7	3.7	1536.1
19	0.0950	1.5746	49.5	3.9	1561.3
20	0.1000	1.6000	50.3	4.1	1586.5
21	0.1050	1.6191	50.9	4.4	1605.5
22	0.1100	1.6382	51.5	4.6	1624.4
23	0.1150	1.6573	52.1	4.8	1643.3
24	0.1200	1.6764	52.7	5.0	1662.2
25	0.1250	1.6923	53.2	5.2	1678.0
26	0.1350	1.7146	53.9	5.6	1700.1
27	0.1400	1.7273	54.3	5.8	1712.7
28	0.1450	1.7400	54.7	6.0	1725.3
29	0.1500	1.7527	55.1	6.2	1737.9
30	0.1600	1.7686	55.6	6.6	1753.7
31	0.1700	1.7941	56.4	7.1	1778.9
32	0.1750	1.8100	56.9	7.3	1794.7
33	0.1850	1.8291	57.5	7.7	1813.6
34	0.1900	1.8482	58.1	7.9	1832.5
35	0.1950	1.8609	58.5	8.1	1845.2
36	0.2000	1.8736	58.9	8.3	1857.8
37	0.2100	1.8927	59.5	8.7	1876.7
38	0.2150	1.9054	59.9	8.9	1889.3
39	0.2250	1.9181	60.3	9.3	1901.9
40	0.2350	1.9340	60.7	9.8	1917.7
41	0.2450	1.9468	61.1	10.2	1930.3
42	0.2650	1.9627	61.6	11.0	1946.1
43	0.3150	1.9754	62.0	13.1	1958.7
44	0.3250	1.9627	61.6	13.5	1946.1
45	0.3500	1.9499	61.2	14.5	1933.5
46	0.3950	1.9627	61.6	16.4	1946.1
47	0.4100	1.9754	62.0	17.0	1958.7
48	0.4450	1.9881	62.4	18.5	1971.3
49	0.4550	1.9881	62.4	18.9	1971.3

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	258.490		304.450
Moisture content: Dry soil+tare, gms.	237.290		279.000
Moisture content: Tare, gms.	115.900		151.940
Moisture, %	17.5	20.0	20.0
Moist specimen weight, gms.	148.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.91	
Net decrease in height, in.		0.09	
Wet Density, pcf	124.9	140.1	
Dry density, pcf	106.3	116.8	
Void ratio	0.7558	0.5988	
Saturation, %	69.1	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3895.3 psf **at reading no.** 43

Ult. Stress = 3838.6 psf **at reading no.** 40

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.6712	21.1	0.2	665.5
2	0.0100	1.0402	32.7	0.4	1031.4
3	0.0150	1.3201	41.5	0.6	1309.0
4	0.0200	1.5555	48.9	0.8	1542.4
5	0.0250	1.7591	55.3	1.0	1744.2
6	0.0300	1.9372	60.8	1.2	1920.9
7	0.0350	2.1090	66.2	1.5	2091.2
8	0.0400	2.2617	71.0	1.7	2242.6
9	0.0450	2.4016	75.4	1.9	2381.4
10	0.0500	2.5289	79.4	2.1	2507.5
11	0.0550	2.6307	82.6	2.3	2608.5
12	0.0600	2.7325	85.8	2.5	2709.4
13	0.0650	2.8343	89.0	2.7	2810.3
14	0.0700	2.9233	91.8	2.9	2898.6
15	0.0750	2.9997	94.2	3.1	2974.3
16	0.0800	3.0697	96.4	3.3	3043.7
17	0.0850	3.1428	98.7	3.5	3116.3
18	0.0900	3.2096	100.8	3.7	3182.5
19	0.0950	3.2669	102.6	3.9	3239.3
20	0.1000	3.3241	104.4	4.1	3296.1
21	0.1050	3.3687	105.8	4.4	3340.2
22	0.1100	3.4227	107.5	4.6	3393.8
23	0.1150	3.4673	108.9	4.8	3438.0
24	0.1200	3.4991	109.9	5.0	3469.5
25	0.1250	3.5277	110.8	5.2	3497.9
26	0.1300	3.5532	111.6	5.4	3523.2

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1400	3.5913	112.8	5.8	3561.0
28	0.1500	3.6231	113.8	6.2	3592.6
29	0.1600	3.6613	115.0	6.6	3630.4
30	0.1700	3.6931	116.0	7.1	3661.9
31	0.1850	3.7249	117.0	7.7	3693.5
32	0.1950	3.7504	117.8	8.1	3718.7
33	0.2100	3.7886	119.0	8.7	3756.6
34	0.2200	3.8140	119.8	9.1	3781.8
35	0.2300	3.8458	120.8	9.5	3813.3
36	0.2400	3.8776	121.8	10.0	3844.9
37	0.2600	3.8522	121.0	10.8	3819.6
38	0.2750	3.8267	120.2	11.4	3794.4
39	0.3300	3.8490	120.9	13.7	3816.5
40	0.3500	3.8713	121.6	14.5	3838.6
41	0.4000	3.8967	122.4	16.6	3863.8
42	0.4550	3.9094	122.8	18.9	3876.4
43	0.4900	3.9285	123.4	20.3	3895.3
44	0.4950	3.9285	123.4	20.5	3895.3

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	258.490		297.890
Moisture content: Dry soil+tare, gms.	237.290		275.970
Moisture content: Tare, gms.	115.900		148.810
Moisture, %	17.5	17.2	17.2
Moist specimen weight, gms.	148.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.86	
Net decrease in height, in.		0.14	
Wet Density, pcf	124.9	144.4	
Dry density, pcf	106.3	123.2	
Void ratio	0.7554	0.5154	
Saturation, %	69.1	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

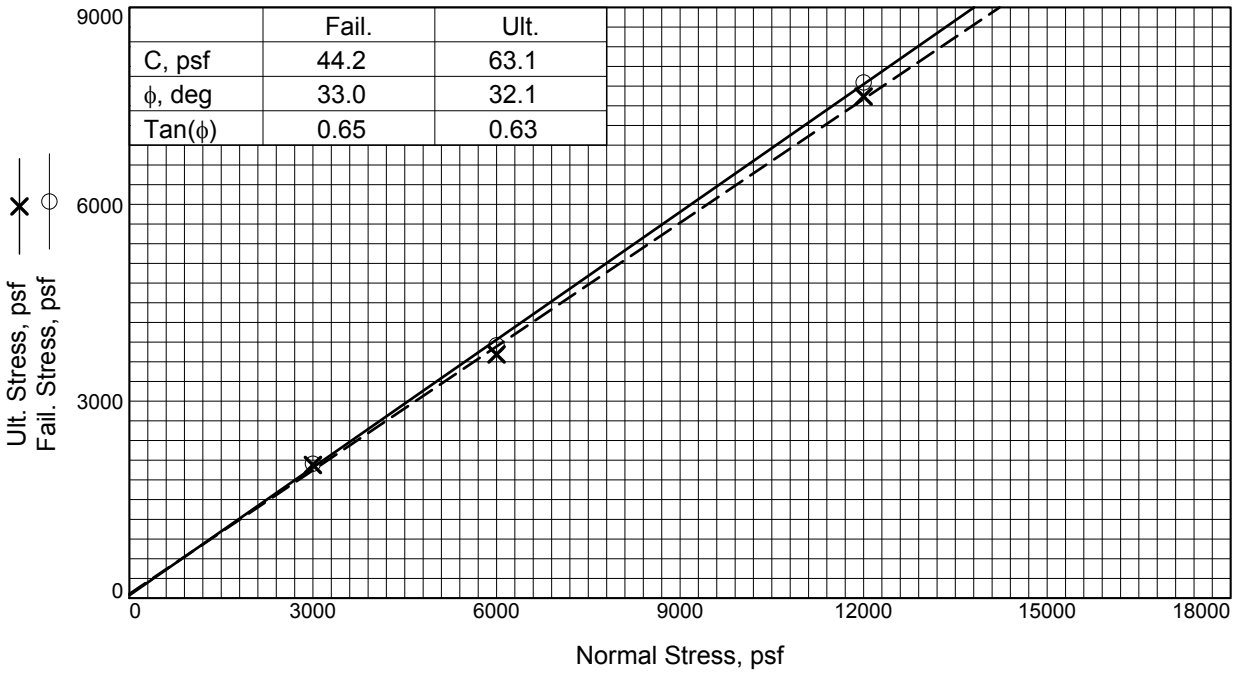
Fail. Stress = 7737.1 psf **at reading no.** 45

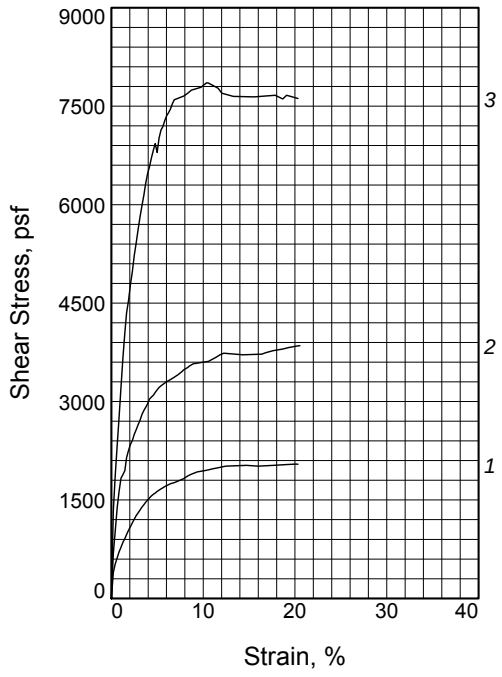
Ult. Stress = 7689.8 psf **at reading no.** 47

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	1.1674	36.7	0.2	1157.6
2	0.0100	1.7273	54.3	0.4	1712.7
3	0.0150	2.1853	68.6	0.6	2166.9
4	0.0200	2.6816	84.2	0.8	2658.9
5	0.0250	3.1905	100.2	1.0	3163.6
6	0.0300	3.5977	113.0	1.2	3567.3
7	0.0350	3.9540	124.2	1.5	3920.6
8	0.0400	4.1925	131.7	1.7	4157.1
9	0.0450	4.4693	140.4	1.9	4431.5
10	0.0500	4.6092	144.8	2.1	4570.3
11	0.0550	4.7174	148.2	2.3	4677.6
12	0.0600	4.8955	153.8	2.5	4854.2
13	0.0650	5.0737	159.4	2.7	5030.8
14	0.0700	5.1945	163.2	2.9	5150.7
15	0.0750	5.4490	171.2	3.1	5403.0
16	0.0800	5.6272	176.8	3.3	5579.7
17	0.0850	5.7735	181.3	3.5	5724.7
18	0.0950	5.2454	164.8	3.9	5201.2
19	0.1200	6.1807	194.1	5.0	6128.5
20	0.1250	6.2729	197.0	5.2	6219.9
21	0.1300	6.3492	199.4	5.4	6295.6
22	0.1350	6.4479	202.5	5.6	6393.4
23	0.1400	6.5751	206.5	5.8	6519.6
24	0.1450	6.6514	208.9	6.0	6595.3
25	0.1500	6.7469	211.9	6.2	6689.9
26	0.1550	6.8009	213.6	6.4	6743.5

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1600	6.8709	215.8	6.6	6812.9
28	0.1650	6.9250	217.5	6.8	6866.5
29	0.1700	6.9759	219.1	7.1	6917.0
30	0.1750	7.0586	221.7	7.3	6999.0
31	0.1800	7.1095	223.3	7.5	7049.5
32	0.1850	7.1731	225.3	7.7	7112.6
33	0.1900	7.2208	226.8	7.9	7159.9
34	0.1950	7.2813	228.7	8.1	7219.8
35	0.2050	7.3449	230.7	8.5	7282.9
36	0.2150	7.4022	232.5	8.9	7339.7
37	0.2200	7.4467	233.9	9.1	7383.8
38	0.2300	7.5071	235.8	9.5	7443.7
39	0.2600	7.5548	237.3	10.8	7491.1
40	0.2700	7.5994	238.7	11.2	7535.2
41	0.2750	7.2876	228.9	11.4	7226.1
42	0.2800	7.6662	240.8	11.6	7601.4
43	0.3350	7.7075	242.1	13.9	7642.4
44	0.3750	7.7584	243.7	15.6	7692.9
45	0.3850	7.8030	245.1	16.0	7737.1
46	0.3900	7.7966	244.9	16.2	7730.8
47	0.3950	7.7552	243.6	16.4	7689.8
48	0.4450	7.7139	242.3	18.5	7648.8
49	0.4550	7.6694	240.9	18.9	7604.6
50	0.4900	7.6121	239.1	20.3	7547.8





Sample No.		1	2	3
Initial	Water Content, %	18.5	18.5	18.5
	Dry Density, pcf	104.2	105.3	104.3
	Saturation, %	74.0	75.8	74.1
	Void Ratio	0.7189	0.7013	0.7172
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	22.0	19.8	17.9
	Dry Density, pcf	109.9	114.3	118.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6308	0.5679	0.5136
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.94	0.92	0.88
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2047.0	3851.2	7856.9
Strain, %		20.1	20.5	10.4
Ult. Stress, psf		2028.1	3712.4	7642.4
Strain, %		14.7	14.3	15.6
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 17 **PI=** NP
Specific Gravity= 2.87
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Earp Lithology
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 7/12/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 7/12/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Earp Lithology
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.87 **LL=**17 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	301.550		301.030
Moisture content: Dry soil+tare, gms.	272.910		273.590
Moisture content: Tare, gms.	118.340		148.800
Moisture, %	18.5	22.0	22.0
Moist specimen weight, gms.	147.2		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.94	
Net decrease in height, in.		0.05	
Wet Density, pcf	123.5	134.0	
Dry density, pcf	104.2	109.9	
Void ratio	0.7189	0.6308	
Saturation, %	74.0	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2047.0 psf **at reading no.** 53
Ult. Stress = 2028.1 psf **at reading no.** 49

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3976	12.5	0.2	394.3
2	0.0100	0.5312	16.7	0.4	526.7
3	0.0150	0.6235	19.6	0.6	618.2
4	0.0200	0.7157	22.5	0.8	709.7
5	0.0250	0.7857	24.7	1.0	779.1
6	0.0300	0.8620	27.1	1.2	854.8
7	0.0350	0.9193	28.9	1.5	911.5
8	0.0400	0.9829	30.9	1.7	974.6
9	0.0450	1.0465	32.9	1.9	1037.7
10	0.0500	1.1038	34.7	2.1	1094.5

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.1611	36.5	2.3	1151.3
12	0.0600	1.2183	38.3	2.5	1208.0
13	0.0650	1.2724	40.0	2.7	1261.7
14	0.0700	1.3137	41.3	2.9	1302.7
15	0.0750	1.3583	42.7	3.1	1346.8
16	0.0800	1.4028	44.1	3.3	1391.0
17	0.0850	1.4410	45.3	3.5	1428.8
18	0.0900	1.4760	46.4	3.7	1463.5
19	0.0950	1.5110	47.5	3.9	1498.2
20	0.1000	1.5428	48.5	4.1	1529.8
21	0.1050	1.5746	49.5	4.4	1561.3
22	0.1100	1.6000	50.3	4.6	1586.5
23	0.1150	1.6191	50.9	4.8	1605.5
24	0.1200	1.6446	51.7	5.0	1630.7
25	0.1250	1.6637	52.3	5.2	1649.6
26	0.1300	1.6827	52.9	5.4	1668.5
27	0.1350	1.7018	53.5	5.6	1687.5
28	0.1400	1.7177	54.0	5.8	1703.2
29	0.1450	1.7336	54.5	6.0	1719.0
30	0.1500	1.7464	54.9	6.2	1731.6
31	0.1550	1.7623	55.4	6.4	1747.4
32	0.1650	1.7782	55.9	6.8	1763.2
33	0.1700	1.7909	56.3	7.1	1775.8
34	0.1750	1.8036	56.7	7.3	1788.4
35	0.1800	1.8163	57.1	7.5	1801.0
36	0.1900	1.8418	57.9	7.9	1826.2
37	0.1950	1.8609	58.5	8.1	1845.2
38	0.2000	1.8800	59.1	8.3	1864.1
39	0.2050	1.8959	59.6	8.5	1879.9
40	0.2100	1.9086	60.0	8.7	1892.5
41	0.2200	1.9309	60.6	9.1	1914.6
42	0.2250	1.9436	61.0	9.3	1927.2
43	0.2450	1.9627	61.6	10.2	1946.1
44	0.2550	1.9754	62.0	10.6	1958.7
45	0.2650	1.9913	62.5	11.0	1974.5
46	0.2800	2.0072	63.0	11.6	1990.3
47	0.2900	2.0199	63.4	12.0	2002.9
48	0.3000	2.0326	63.8	12.4	2015.5
49	0.3550	2.0454	64.2	14.7	2028.1
50	0.3850	2.0326	63.8	16.0	2015.5
51	0.4250	2.0454	64.2	17.6	2028.1
52	0.4600	2.0581	64.6	19.1	2040.7
53	0.4850	2.0645	64.8	20.1	2047.0
54	0.4900	2.0613	64.7	20.3	2043.9

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	301.550		296.800
Moisture content: Dry soil+tare, gms.	272.910		271.790
Moisture content: Tare, gms.	118.340		145.420
Moisture, %	18.5	19.8	19.8
Moist specimen weight, gms.	148.7		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.92	
Net decrease in height, in.		0.08	
Wet Density, pcf	124.8	136.9	
Dry density, pcf	105.3	114.3	
Void ratio	0.7013	0.5679	
Saturation, %	75.8	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3851.2 psf **at reading no.** 50

Ult. Stress = 3712.4 psf **at reading no.** 43

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.6903	21.7	0.2	684.4
2	0.0100	1.0338	32.5	0.4	1025.1
3	0.0150	1.3901	43.7	0.6	1378.4
4	0.0200	1.6446	51.7	0.8	1630.7
5	0.0250	1.8482	58.1	1.0	1832.5
6	0.0300	1.9022	59.8	1.2	1886.2
7	0.0350	1.9627	61.6	1.5	1946.1
8	0.0400	2.1663	68.0	1.7	2148.0
9	0.0450	2.2744	71.4	1.9	2255.2
10	0.0500	2.3667	74.3	2.1	2346.7
11	0.0550	2.4271	76.2	2.3	2406.6
12	0.0600	2.5225	79.2	2.5	2501.2
13	0.0650	2.5925	81.4	2.7	2570.6
14	0.0700	2.6688	83.8	2.9	2646.3
15	0.0750	2.7388	86.0	3.1	2715.7
16	0.0800	2.8279	88.8	3.3	2804.0
17	0.0850	2.8883	90.7	3.5	2863.9
18	0.0900	2.9360	92.2	3.7	2911.3
19	0.0950	2.9901	93.9	3.9	2964.9
20	0.1000	3.0633	96.2	4.1	3037.4
21	0.1050	3.0951	97.2	4.4	3069.0
22	0.1100	3.1205	98.0	4.6	3094.2
23	0.1150	3.1651	99.4	4.8	3138.4
24	0.1200	3.2064	100.7	5.0	3179.4
25	0.1250	3.2414	101.8	5.2	3214.1
26	0.1300	3.2669	102.6	5.4	3239.3

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.2891	103.3	5.6	3261.4
28	0.1450	3.3305	104.6	6.0	3302.4
29	0.1550	3.3623	105.6	6.4	3333.9
30	0.1650	3.4005	106.8	6.8	3371.8
31	0.1750	3.4386	108.0	7.3	3409.6
32	0.1800	3.4641	108.8	7.5	3434.8
33	0.1850	3.4864	109.5	7.7	3456.9
34	0.1900	3.5118	110.3	7.9	3482.2
35	0.2000	3.5468	111.4	8.3	3516.9
36	0.2050	3.5722	112.2	8.5	3542.1
37	0.2150	3.6072	113.3	8.9	3576.8
38	0.2550	3.6422	114.4	10.6	3611.5
39	0.2650	3.6740	115.4	11.0	3643.0
40	0.2750	3.7058	116.4	11.4	3674.6
41	0.2850	3.7440	117.6	11.8	3712.4
42	0.2950	3.7695	118.4	12.2	3737.6
43	0.3450	3.7440	117.6	14.3	3712.4
44	0.3950	3.7536	117.9	16.4	3721.9
45	0.4050	3.7758	118.6	16.8	3743.9
46	0.4250	3.8076	119.6	17.6	3775.5
47	0.4500	3.8331	120.4	18.7	3800.7
48	0.4650	3.8554	121.1	19.3	3822.8
49	0.4850	3.8776	121.8	20.1	3844.9
50	0.4950	3.8840	122.0	20.5	3851.2

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	301.550		296.500
Moisture content: Dry soil+tare, gms.	272.910		274.090
Moisture content: Tare, gms.	118.340		148.880
Moisture, %	18.5	17.9	17.9
Moist specimen weight, gms.	147.3		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.88	
Net decrease in height, in.		0.12	
Wet Density, pcf	123.7	139.6	
Dry density, pcf	104.3	118.4	
Void ratio	0.7172	0.5136	
Saturation, %	74.1	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

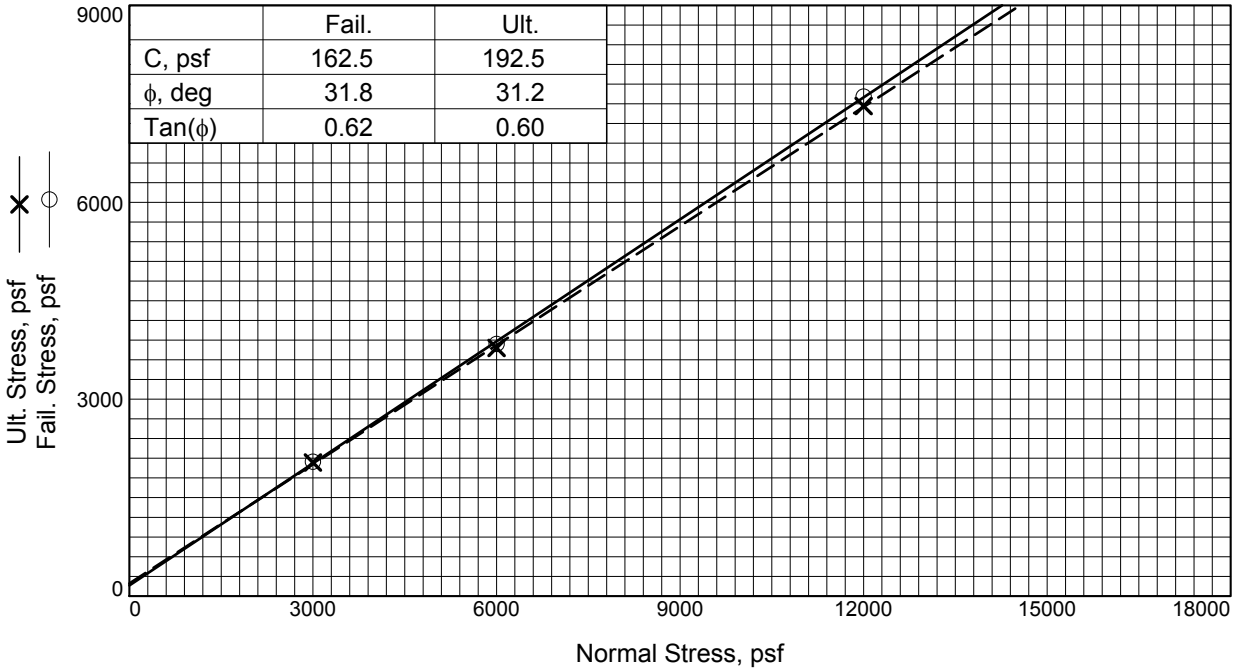
Fail. Stress = 7856.9 psf **at reading no.** 38

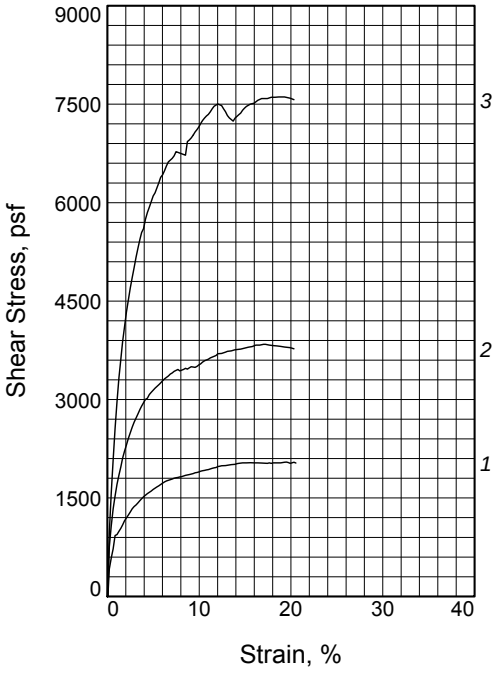
Ult. Stress = 7642.4 psf **at reading no.** 43

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	1.3456	42.3	0.2	1334.2
2	0.0100	1.8927	59.5	0.4	1876.7
3	0.0150	2.3444	73.6	0.6	2324.6
4	0.0200	2.7834	87.4	0.8	2759.9
5	0.0250	3.2478	102.0	1.0	3220.4
6	0.0300	3.6963	116.1	1.2	3665.1
7	0.0350	4.0812	128.2	1.5	4046.7
8	0.0400	4.3898	137.9	1.7	4352.7
9	0.0450	4.5774	143.8	1.9	4538.8
10	0.0500	4.8256	151.6	2.1	4784.8
11	0.0550	5.0228	157.8	2.3	4980.4
12	0.0600	5.2741	165.7	2.5	5229.5
13	0.0650	5.4618	171.6	2.7	5415.6
14	0.0700	5.6717	178.2	2.9	5623.8
15	0.0750	5.8626	184.1	3.1	5813.1
16	0.0800	6.0343	189.5	3.3	5983.4
17	0.0850	6.1966	194.6	3.5	6144.2
18	0.0900	6.3747	200.2	3.7	6320.9
19	0.0950	6.5242	204.9	3.9	6469.1
20	0.1000	6.6324	208.3	4.1	6576.4
21	0.1050	6.7691	212.6	4.4	6712.0
22	0.1100	6.8868	216.3	4.6	6828.7
23	0.1150	6.9886	219.5	4.8	6929.6
24	0.1200	6.8550	215.3	5.0	6797.1
25	0.1250	7.0745	222.2	5.2	7014.8
26	0.1300	7.1986	226.1	5.4	7137.8

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	7.2526	227.8	5.6	7191.4
28	0.1400	7.3385	230.5	5.8	7276.6
29	0.1450	7.4149	232.9	6.0	7352.3
30	0.1500	7.4626	234.4	6.2	7399.6
31	0.1550	7.5198	236.2	6.4	7456.4
32	0.1600	7.6026	238.8	6.6	7538.4
33	0.1650	7.6630	240.7	6.8	7598.3
34	0.1900	7.7203	242.5	7.9	7655.1
35	0.2000	7.7616	243.8	8.3	7696.1
36	0.2100	7.8093	245.3	8.7	7743.4
37	0.2350	7.8539	246.7	9.8	7787.5
38	0.2500	7.9238	248.9	10.4	7856.9
39	0.2550	7.9175	248.7	10.6	7850.6
40	0.2800	7.8411	246.3	11.6	7774.9
41	0.2900	7.7648	243.9	12.0	7699.2
42	0.3200	7.7139	242.3	13.3	7648.8
43	0.3750	7.7075	242.1	15.6	7642.4
44	0.4300	7.7330	242.9	17.8	7667.7
45	0.4500	7.6757	241.1	18.7	7610.9
46	0.4600	7.7330	242.9	19.1	7667.7
47	0.4900	7.6821	241.3	20.3	7617.2





Sample No.		1	2	3
Initial	Water Content, %	15.5	15.5	15.5
	Dry Density, pcf	112.3	112.0	112.1
	Saturation, %	66.3	65.9	66.0
	Void Ratio	0.7234	0.7274	0.7265
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.99	0.99	0.99
At Test	Water Content, %	19.9	18.4	17.6
	Dry Density, pcf	119.8	123.2	125.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6154	0.5704	0.5469
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.93	0.90	0.89
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2047.0	3841.8	7610.9
Strain, %		19.5	17.0	18.7
Ult. Stress, psf		2034.4	3781.8	7465.7
Strain, %		15.1	14.9	15.1
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 15 **PI=** NP
Specific Gravity= 3.1
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Horquila #3
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 7/27/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 7/27/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Horquila #3
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=3.1 **LL=**15 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	243.670		309.220
Moisture content: Dry soil+tare, gms.	224.020		282.660
Moisture content: Tare, gms.	96.920		148.900
Moisture, %	15.5	19.9	19.9
Moist specimen weight, gms.	153.7		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.93	
Net decrease in height, in.		0.06	
Wet Density, pcf	129.7	143.6	
Dry density, pcf	112.3	119.8	
Void ratio	0.7234	0.6154	
Saturation, %	66.3	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2047.0 psf **at reading no.** 80
Ult. Stress = 2034.4 psf **at reading no.** 68

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0010	0.0000	0.0	0.0	0.0
2	0.0050	0.4231	13.3	0.2	419.5
3	0.0100	0.5885	18.5	0.4	583.5
4	0.0150	0.7316	23.0	0.6	725.4
5	0.0200	0.9352	29.4	0.8	927.3
6	0.0250	0.9511	29.9	1.0	943.1
7	0.0300	0.9988	31.4	1.2	990.4
8	0.0350	1.0465	32.9	1.5	1037.7
9	0.0400	1.0974	34.5	1.7	1088.2
10	0.0450	1.1611	36.5	1.9	1151.3

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0500	1.2056	37.9	2.1	1195.4
12	0.0550	1.2501	39.3	2.3	1239.6
13	0.0600	1.2978	40.8	2.5	1286.9
14	0.0650	1.3456	42.3	2.7	1334.2
15	0.0700	1.3805	43.4	2.9	1368.9
16	0.0750	1.4060	44.2	3.1	1394.1
17	0.0800	1.4378	45.2	3.3	1425.7
18	0.0850	1.4728	46.3	3.5	1460.4
19	0.0900	1.5014	47.2	3.7	1488.7
20	0.0950	1.5301	48.1	3.9	1517.1
21	0.1000	1.5555	48.9	4.1	1542.4
22	0.1050	1.5809	49.7	4.4	1567.6
23	0.1100	1.6000	50.3	4.6	1586.5
24	0.1150	1.6191	50.9	4.8	1605.5
25	0.1200	1.6446	51.7	5.0	1630.7
26	0.1250	1.6637	52.3	5.2	1649.6
27	0.1300	1.6827	52.9	5.4	1668.5
28	0.1350	1.7018	53.5	5.6	1687.5
29	0.1400	1.7209	54.1	5.8	1706.4
30	0.1450	1.7400	54.7	6.0	1725.3
31	0.1500	1.7591	55.3	6.2	1744.2
32	0.1550	1.7750	55.8	6.4	1760.0
33	0.1600	1.7845	56.1	6.6	1769.5
34	0.1650	1.7941	56.4	6.8	1778.9
35	0.1700	1.8036	56.7	7.1	1788.4
36	0.1750	1.8163	57.1	7.3	1801.0
37	0.1800	1.8227	57.3	7.5	1807.3
38	0.1850	1.8291	57.5	7.7	1813.6
39	0.1900	1.8354	57.7	7.9	1819.9
40	0.1950	1.8418	57.9	8.1	1826.2
41	0.2000	1.8513	58.2	8.3	1835.7
42	0.2050	1.8609	58.5	8.5	1845.2
43	0.2150	1.8736	58.9	8.9	1857.8
44	0.2200	1.8800	59.1	9.1	1864.1
45	0.2250	1.8863	59.3	9.3	1870.4
46	0.2300	1.8990	59.7	9.5	1883.0
47	0.2350	1.9054	59.9	9.8	1889.3
48	0.2400	1.9118	60.1	10.0	1895.6
49	0.2450	1.9245	60.4	10.2	1908.2
50	0.2500	1.9309	60.6	10.4	1914.6
51	0.2550	1.9372	60.8	10.6	1920.9
52	0.2600	1.9436	61.0	10.8	1927.2
53	0.2650	1.9499	61.2	11.0	1933.5
54	0.2700	1.9595	61.5	11.2	1942.9
55	0.2750	1.9690	61.8	11.4	1952.4
56	0.2800	1.9754	62.0	11.6	1958.7
57	0.2850	1.9818	62.2	11.8	1965.0

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
58	0.2900	1.9945	62.6	12.0	1977.6
59	0.2950	2.0008	62.8	12.2	1983.9
60	0.3000	2.0072	63.0	12.4	1990.3
61	0.3100	2.0104	63.1	12.9	1993.4
62	0.3200	2.0199	63.4	13.3	2002.9
63	0.3250	2.0263	63.6	13.5	2009.2
64	0.3350	2.0295	63.7	13.9	2012.3
65	0.3400	2.0390	64.0	14.1	2021.8
66	0.3450	2.0454	64.2	14.3	2028.1
67	0.3550	2.0517	64.4	14.7	2034.4
68	0.3650	2.0517	64.4	15.1	2034.4
69	0.3750	2.0549	64.5	15.6	2037.6
70	0.3850	2.0517	64.4	16.0	2034.4
71	0.3950	2.0517	64.4	16.4	2034.4
72	0.4050	2.0486	64.3	16.8	2031.3
73	0.4200	2.0454	64.2	17.4	2028.1
74	0.4250	2.0517	64.4	17.6	2034.4
75	0.4300	2.0454	64.2	17.8	2028.1
76	0.4350	2.0517	64.4	18.0	2034.4
77	0.4450	2.0517	64.4	18.5	2034.4
78	0.4550	2.0517	64.4	18.9	2034.4
79	0.4650	2.0613	64.7	19.3	2043.9
80	0.4700	2.0645	64.8	19.5	2047.0
81	0.4750	2.0581	64.6	19.7	2040.7
82	0.4800	2.0454	64.2	19.9	2028.1
83	0.4900	2.0613	64.7	20.3	2043.9
84	0.4950	2.0486	64.3	20.5	2031.3

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	243.670		307.270
Moisture content: Dry soil+tare, gms.	224.020		282.660
Moisture content: Tare, gms.	96.920		148.900
Moisture, %	15.5	18.4	18.4
Moist specimen weight, gms.	153.3		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.90	
Net decrease in height, in.		0.09	
Wet Density, pcf	129.4	145.9	
Dry density, pcf	112.0	123.2	
Void ratio	0.7274	0.5704	
Saturation, %	65.9	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3841.8 psf **at reading no.** 68

Ult. Stress = 3781.8 psf **at reading no.** 63

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0010	0.0000	0.0	0.0	0.0
2	0.0010	0.0478	1.5	0.0	47.4
3	0.0050	0.7609	23.9	0.2	754.5
4	0.0100	1.0824	34.0	0.4	1073.3
5	0.0150	1.3467	42.3	0.6	1335.3
6	0.0200	1.5441	48.5	0.8	1531.0
7	0.0250	1.7223	54.1	1.0	1707.8
8	0.0300	1.8624	58.5	1.2	1846.7
9	0.0350	1.9898	62.5	1.5	1973.0
10	0.0400	2.1235	66.7	1.7	2105.5
11	0.0450	2.2317	70.1	1.9	2212.9
12	0.0500	2.3272	73.1	2.1	2307.6
13	0.0550	2.4291	76.3	2.3	2408.6
14	0.0600	2.5151	79.0	2.5	2493.8
15	0.0650	2.6010	81.7	2.7	2579.1
16	0.0700	2.6774	84.1	2.9	2654.8
17	0.0750	2.7411	86.1	3.1	2718.0
18	0.0800	2.8048	88.1	3.3	2781.1
19	0.0850	2.8716	90.2	3.5	2847.4
20	0.0900	2.9257	91.9	3.7	2901.0
21	0.0950	2.9767	93.5	3.9	2951.6
22	0.1000	3.0276	95.1	4.1	3002.1
23	0.1050	3.0467	95.7	4.4	3021.0
24	0.1100	3.1008	97.4	4.6	3074.7
25	0.1150	3.1359	98.5	4.8	3109.4
26	0.1200	3.1677	99.5	5.0	3141.0

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1250	3.1995	100.5	5.2	3172.5
28	0.1300	3.2282	101.4	5.4	3200.9
29	0.1350	3.2537	102.2	5.6	3226.2
30	0.1400	3.2823	103.1	5.8	3254.6
31	0.1450	3.3141	104.1	6.0	3286.2
32	0.1500	3.3428	105.0	6.2	3314.6
33	0.1550	3.3651	105.7	6.4	3336.7
34	0.1600	3.3874	106.4	6.6	3358.8
35	0.1650	3.4160	107.3	6.8	3387.2
36	0.1700	3.4351	107.9	7.1	3406.1
37	0.1750	3.4574	108.6	7.3	3428.2
38	0.1800	3.4733	109.1	7.5	3444.0
39	0.1850	3.4892	109.6	7.7	3459.8
40	0.1900	3.4670	108.9	7.9	3437.7
41	0.2000	3.4892	109.6	8.3	3459.8
42	0.2050	3.5052	110.1	8.5	3475.6
43	0.2100	3.4924	109.7	8.7	3462.9
44	0.2150	3.5115	110.3	8.9	3481.9
45	0.2200	3.5306	110.9	9.1	3500.8
46	0.2300	3.5211	110.6	9.5	3491.4
47	0.2350	3.5338	111.0	9.8	3504.0
48	0.2400	3.5561	111.7	10.0	3526.1
49	0.2450	3.5752	112.3	10.2	3545.0
50	0.2500	3.6007	113.1	10.4	3570.3
51	0.2550	3.6198	113.7	10.6	3589.2
52	0.2650	3.6452	114.5	11.0	3614.5
53	0.2700	3.6643	115.1	11.2	3633.4
54	0.2800	3.6898	115.9	11.6	3658.7
55	0.2850	3.7026	116.3	11.8	3671.3
56	0.2900	3.7280	117.1	12.0	3696.5
57	0.3000	3.7344	117.3	12.4	3702.9
58	0.3100	3.7535	117.9	12.9	3721.8
59	0.3150	3.7662	118.3	13.1	3734.4
60	0.3250	3.7726	118.5	13.5	3740.7
61	0.3350	3.7917	119.1	13.9	3759.7
62	0.3500	3.8012	119.4	14.5	3769.1
63	0.3600	3.8140	119.8	14.9	3781.8
64	0.3700	3.8299	120.3	15.4	3797.6
65	0.3800	3.8394	120.6	15.8	3807.0
66	0.3900	3.8617	121.3	16.2	3829.1
67	0.4000	3.8617	121.3	16.6	3829.1
68	0.4100	3.8745	121.7	17.0	3841.8
69	0.4150	3.8745	121.7	17.2	3841.8
70	0.4250	3.8617	121.3	17.6	3829.1
71	0.4350	3.8554	121.1	18.0	3822.8
72	0.4450	3.8490	120.9	18.5	3816.5
73	0.4550	3.8426	120.7	18.9	3810.2

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
74	0.4650	3.8331	120.4	19.3	3800.7
75	0.4800	3.8235	120.1	19.9	3791.2
76	0.4900	3.8044	119.5	20.3	3772.3

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	243.670		352.200
Moisture content: Dry soil+tare, gms.	224.020		328.680
Moisture content: Tare, gms.	96.920		195.350
Moisture, %	15.5	17.6	17.6
Moist specimen weight, gms.	153.4		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.89	
Net decrease in height, in.		0.10	
Wet Density, pcf	129.4	147.2	
Dry density, pcf	112.1	125.1	
Void ratio	0.7265	0.5469	
Saturation, %	66.0	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 7610.9 psf **at reading no.** 73

Ult. Stress = 7465.7 psf **at reading no.** 65

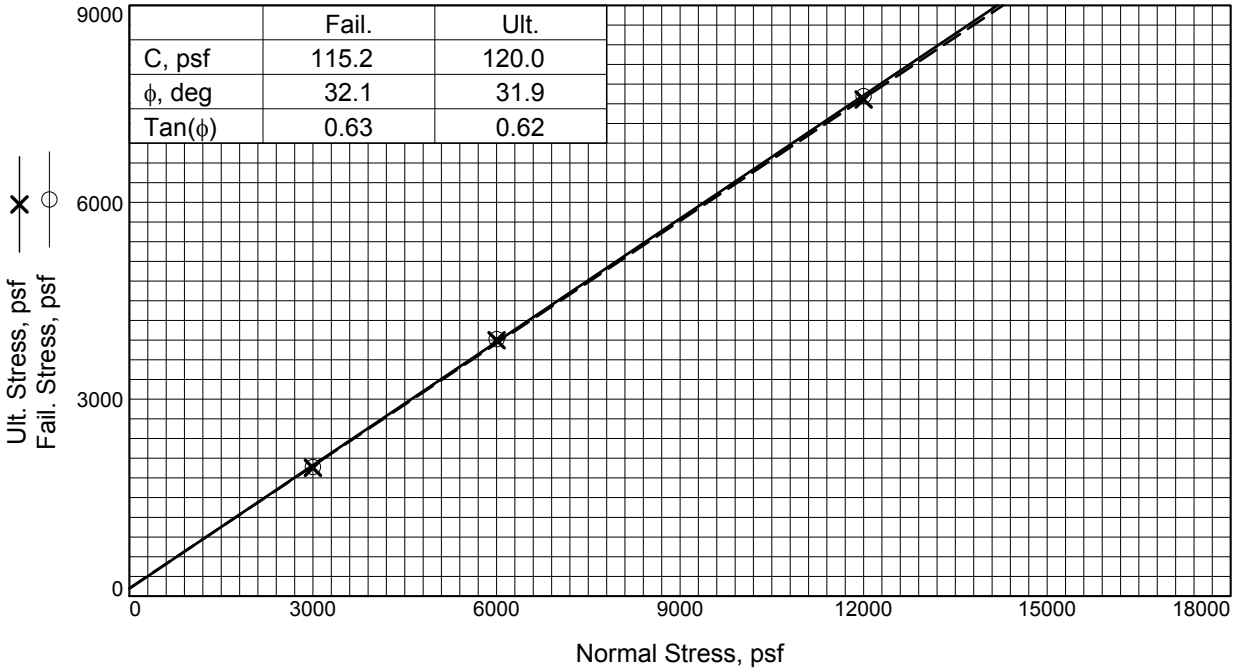
No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.9837	30.9	0.2	975.4
2	0.0100	1.5886	49.9	0.4	1575.2
3	0.0150	2.0980	65.9	0.6	2080.3
4	0.0200	2.5819	81.1	0.8	2560.1
5	0.0250	2.9926	94.0	1.0	2967.3
6	0.0300	3.3587	105.5	1.2	3330.4
7	0.0350	3.6452	114.5	1.5	3614.5
8	0.0400	3.9127	122.9	1.7	3879.6
9	0.0450	4.1419	130.1	1.9	4106.9
10	0.0500	4.3711	137.3	2.1	4334.2
11	0.0550	4.5558	143.1	2.3	4517.3
12	0.0600	4.7404	148.9	2.5	4700.4
13	0.0650	4.8996	153.9	2.7	4858.2
14	0.0700	5.0524	158.7	2.9	5009.7
15	0.0750	5.2116	163.7	3.1	5167.6
16	0.0800	5.3517	168.1	3.3	5306.5
17	0.0850	5.4854	172.3	3.5	5439.1
18	0.0900	5.5936	175.7	3.7	5546.4
19	0.0950	5.6509	177.5	3.9	5603.2

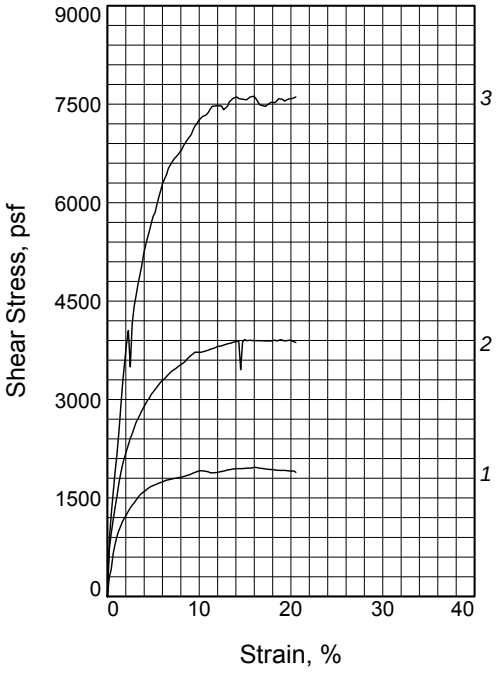
Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
20	0.1000	5.7974	182.1	4.1	5748.4
21	0.1050	5.8992	185.3	4.4	5849.4
22	0.1100	5.9820	187.9	4.6	5931.5
23	0.1150	6.0680	190.6	4.8	6016.7
24	0.1200	6.1539	193.3	5.0	6102.0
25	0.1250	6.2017	194.8	5.2	6149.3
26	0.1300	6.2813	197.3	5.4	6228.2
27	0.1350	6.3609	199.8	5.6	6307.2
28	0.1400	6.4405	202.3	5.8	6386.1
29	0.1450	6.4787	203.5	6.0	6424.0
30	0.1500	6.5423	205.5	6.2	6487.1
31	0.1550	6.6156	207.8	6.4	6559.7
32	0.1600	6.6761	209.7	6.6	6619.7
33	0.1700	6.7302	211.4	7.1	6673.3
34	0.1750	6.7716	212.7	7.3	6714.4
35	0.1800	6.8352	214.7	7.5	6777.5
36	0.2050	6.7811	213.0	8.5	6723.9
37	0.2100	6.9880	219.5	8.7	6929.0
38	0.2150	7.0135	220.3	8.9	6954.3
39	0.2200	7.0454	221.3	9.1	6985.9
40	0.2250	7.0867	222.6	9.3	7026.9
41	0.2300	7.1377	224.2	9.5	7077.4
42	0.2350	7.1727	225.3	9.8	7112.1
43	0.2400	7.2141	226.6	10.0	7153.2
44	0.2450	7.2682	228.3	10.2	7206.8
45	0.2500	7.3128	229.7	10.4	7251.0
46	0.2550	7.3510	230.9	10.6	7288.9
47	0.2600	7.3828	231.9	10.8	7320.5
48	0.2650	7.4083	232.7	11.0	7345.7
49	0.2700	7.4465	233.9	11.2	7383.6
50	0.2750	7.4942	235.4	11.4	7431.0
51	0.2800	7.5324	236.6	11.6	7468.8
52	0.2900	7.5675	237.7	12.0	7503.6
53	0.3000	7.5420	236.9	12.4	7478.3
54	0.3050	7.4942	235.4	12.7	7431.0
55	0.3100	7.4497	234.0	12.9	7386.8
56	0.3150	7.3892	232.1	13.1	7326.8
57	0.3200	7.3542	231.0	13.3	7292.1
58	0.3300	7.3032	229.4	13.7	7241.6
59	0.3350	7.3510	230.9	13.9	7288.9
60	0.3400	7.3764	231.7	14.1	7314.2
61	0.3450	7.4019	232.5	14.3	7339.4
62	0.3500	7.4274	233.3	14.5	7364.7
63	0.3550	7.4720	234.7	14.7	7408.9
64	0.3600	7.5038	235.7	14.9	7440.4
65	0.3650	7.5293	236.5	15.1	7465.7
66	0.3750	7.5643	237.6	15.6	7500.4

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
67	0.3850	7.5802	238.1	16.0	7516.2
68	0.3950	7.6248	239.5	16.4	7560.4
69	0.4050	7.6502	240.3	16.8	7585.6
70	0.4200	7.6502	240.3	17.4	7585.6
71	0.4300	7.6693	240.9	17.8	7604.6
72	0.4400	7.6693	240.9	18.3	7604.6
73	0.4500	7.6757	241.1	18.7	7610.9
74	0.4550	7.6757	241.1	18.9	7610.9
75	0.4650	7.6757	241.1	19.3	7610.9
76	0.4800	7.6566	240.5	19.9	7592.0
77	0.4900	7.6343	239.8	20.3	7569.9





Sample No.		1	2	3
Initial	Water Content, %	16.5	16.5	16.5
	Dry Density, pcf	104.8	105.0	105.0
	Saturation, %	69.7	70.0	70.1
	Void Ratio	0.6623	0.6587	0.6584
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	21.6	20.2	17.6
	Dry Density, pcf	108.7	111.5	116.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6021	0.5620	0.4917
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.96	0.94	0.90
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		1966.6	3914.4	7617.2
Strain, %		16.0	14.9	15.8
Ult. Stress, psf		1954.0	3898.6	7566.7
Strain, %		15.1	15.1	15.1
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 17 **PI=** NP
Specific Gravity= 2.79
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Colina #3
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 8/7/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 8/7/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Colina #3
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.79 **LL=**17 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	296.700		304.600
Moisture content: Dry soil+tare, gms.	271.730		277.500
Moisture content: Tare, gms.	120.710		151.980
Moisture, %	16.5	21.6	21.6
Moist specimen weight, gms.	145.5		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.96	
Net decrease in height, in.		0.04	
Wet Density, pcf	122.1	132.2	
Dry density, pcf	104.8	108.7	
Void ratio	0.6623	0.6021	
Saturation, %	69.7	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 1966.6 psf **at reading no.** 65
Ult. Stress = 1954.0 psf **at reading no.** 62

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.2961	9.3	0.2	293.6
2	0.0100	0.4171	13.1	0.4	413.5
3	0.0150	0.6590	20.7	0.6	653.4
4	0.0200	0.8023	25.2	0.8	795.5
5	0.0250	0.9264	29.1	1.0	918.6
6	0.0300	1.0156	31.9	1.2	1007.0
7	0.0350	1.0856	34.1	1.5	1076.4
8	0.0400	1.1557	36.3	1.7	1145.9
9	0.0450	1.2066	37.9	1.9	1196.4
10	0.0500	1.2575	39.5	2.1	1246.9

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.3085	41.1	2.3	1297.4
12	0.0600	1.3594	42.7	2.5	1347.9
13	0.0650	1.4040	44.1	2.7	1392.1
14	0.0700	1.4358	45.1	2.9	1423.7
15	0.0750	1.4804	46.5	3.1	1467.9
16	0.0800	1.5186	47.7	3.3	1505.8
17	0.0850	1.5568	48.9	3.5	1543.6
18	0.0900	1.5823	49.7	3.7	1568.9
19	0.0950	1.6045	50.4	3.9	1591.0
20	0.1000	1.6268	51.1	4.1	1613.1
21	0.1050	1.6523	51.9	4.4	1638.3
22	0.1100	1.6746	52.6	4.6	1660.4
23	0.1150	1.6905	53.1	4.8	1676.2
24	0.1200	1.7032	53.5	5.0	1688.9
25	0.1250	1.7160	53.9	5.2	1701.5
26	0.1300	1.7287	54.3	5.4	1714.1
27	0.1350	1.7414	54.7	5.6	1726.7
28	0.1400	1.7510	55.0	5.8	1736.2
29	0.1450	1.7605	55.3	6.0	1745.7
30	0.1500	1.7733	55.7	6.2	1758.3
31	0.1550	1.7860	56.1	6.4	1770.9
32	0.1600	1.7924	56.3	6.6	1777.2
33	0.1700	1.8051	56.7	7.1	1789.9
34	0.1750	1.8115	56.9	7.3	1796.2
35	0.1800	1.8178	57.1	7.5	1802.5
36	0.1850	1.8242	57.3	7.7	1808.8
37	0.1950	1.8338	57.6	8.1	1818.3
38	0.2000	1.8433	57.9	8.3	1827.8
39	0.2050	1.8497	58.1	8.5	1834.1
40	0.2100	1.8624	58.5	8.7	1846.7
41	0.2150	1.8688	58.7	8.9	1853.0
42	0.2200	1.8815	59.1	9.1	1865.6
43	0.2250	1.8943	59.5	9.3	1878.3
44	0.2300	1.9070	59.9	9.5	1890.9
45	0.2350	1.9165	60.2	9.8	1900.4
46	0.2400	1.9261	60.5	10.0	1909.8
47	0.2450	1.9325	60.7	10.2	1916.1
48	0.2550	1.9261	60.5	10.6	1909.8
49	0.2650	1.9134	60.1	11.0	1897.2
50	0.2700	1.9006	59.7	11.2	1884.6
51	0.2800	1.9006	59.7	11.6	1884.6
52	0.2900	1.9070	59.9	12.0	1890.9
53	0.2950	1.9134	60.1	12.2	1897.2
54	0.3000	1.9197	60.3	12.4	1903.5
55	0.3050	1.9261	60.5	12.7	1909.8
56	0.3100	1.9325	60.7	12.9	1916.1
57	0.3150	1.9452	61.1	13.1	1928.8

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
58	0.3250	1.9516	61.3	13.5	1935.1
59	0.3300	1.9579	61.5	13.7	1941.4
60	0.3400	1.9643	61.7	14.1	1947.7
61	0.3550	1.9643	61.7	14.7	1947.7
62	0.3650	1.9707	61.9	15.1	1954.0
63	0.3750	1.9707	61.9	15.6	1954.0
64	0.3800	1.9770	62.1	15.8	1960.3
65	0.3850	1.9834	62.3	16.0	1966.6
66	0.3900	1.9834	62.3	16.2	1966.6
67	0.3950	1.9770	62.1	16.4	1960.3
68	0.4000	1.9707	61.9	16.6	1954.0
69	0.4100	1.9643	61.7	17.0	1947.7
70	0.4150	1.9579	61.5	17.2	1941.4
71	0.4250	1.9516	61.3	17.6	1935.1
72	0.4350	1.9484	61.2	18.0	1931.9
73	0.4450	1.9388	60.9	18.5	1922.5
74	0.4550	1.9356	60.8	18.9	1919.3
75	0.4650	1.9356	60.8	19.3	1919.3
76	0.4800	1.9261	60.5	19.9	1909.8
77	0.4900	1.9261	60.5	20.3	1909.8
78	0.4950	1.9070	59.9	20.5	1890.9

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	296.700		299.600
Moisture content: Dry soil+tare, gms.	271.730		274.310
Moisture content: Tare, gms.	120.710		148.810
Moisture, %	16.5	20.2	20.2
Moist specimen weight, gms.	145.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.94	
Net decrease in height, in.		0.06	
Wet Density, pcf	122.4	134.0	
Dry density, pcf	105.0	111.5	
Void ratio	0.6587	0.5620	
Saturation, %	70.0	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3914.4 psf **at reading no.** 62

Ult. Stress = 3898.6 psf **at reading no.** 63

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.7259	22.8	0.2	719.7
2	0.0100	0.9710	30.5	0.4	962.8
3	0.0150	1.1748	36.9	0.6	1164.8
4	0.0200	1.3658	42.9	0.8	1354.2
5	0.0250	1.5441	48.5	1.0	1531.0
6	0.0300	1.7414	54.7	1.2	1726.7
7	0.0350	1.9006	59.7	1.5	1884.6
8	0.0400	2.0280	63.7	1.7	2010.8
9	0.0450	2.1362	67.1	1.9	2118.2
10	0.0500	2.2349	70.2	2.1	2216.0
11	0.0550	2.3304	73.2	2.3	2310.7
12	0.0600	2.4291	76.3	2.5	2408.6
13	0.0650	2.4991	78.5	2.7	2478.0
14	0.0700	2.5883	81.3	2.9	2566.4
15	0.0750	2.6711	83.9	3.1	2648.5
16	0.0800	2.7284	85.7	3.3	2705.3
17	0.0850	2.7889	87.6	3.5	2765.3
18	0.0900	2.8493	89.5	3.7	2825.3
19	0.0950	2.9003	91.1	3.9	2875.8
20	0.1000	2.9576	92.9	4.1	2932.6
21	0.1050	3.0117	94.6	4.4	2986.3
22	0.1100	3.0467	95.7	4.6	3021.0
23	0.1150	3.1040	97.5	4.8	3077.8
24	0.1200	3.1422	98.7	5.0	3115.7
25	0.1250	3.1804	99.9	5.2	3153.6
26	0.1300	3.2186	101.1	5.4	3191.5

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.2568	102.3	5.6	3229.3
28	0.1400	3.2919	103.4	5.8	3264.1
29	0.1450	3.3205	104.3	6.0	3292.5
30	0.1500	3.3460	105.1	6.2	3317.7
31	0.1550	3.3778	106.1	6.4	3349.3
32	0.1600	3.4097	107.1	6.6	3380.9
33	0.1650	3.4415	108.1	6.8	3412.4
34	0.1700	3.4670	108.9	7.1	3437.7
35	0.1750	3.4861	109.5	7.3	3456.6
36	0.1800	3.5052	110.1	7.5	3475.6
37	0.1850	3.5306	110.9	7.7	3500.8
38	0.1900	3.5497	111.5	7.9	3519.8
39	0.1950	3.5720	112.2	8.1	3541.9
40	0.2000	3.5879	112.7	8.3	3557.6
41	0.2050	3.6166	113.6	8.5	3586.1
42	0.2100	3.6516	114.7	8.7	3620.8
43	0.2200	3.7057	116.4	9.1	3674.4
44	0.2250	3.7280	117.1	9.3	3696.5
45	0.2300	3.7535	117.9	9.5	3721.8
46	0.2450	3.7503	117.8	10.2	3718.6
47	0.2550	3.7662	118.3	10.6	3734.4
48	0.2650	3.7853	118.9	11.0	3753.4
49	0.2700	3.7981	119.3	11.2	3766.0
50	0.2800	3.8140	119.8	11.6	3781.8
51	0.2850	3.8299	120.3	11.8	3797.6
52	0.2900	3.8426	120.7	12.0	3810.2
53	0.3000	3.8490	120.9	12.4	3816.5
54	0.3050	3.8617	121.3	12.7	3829.1
55	0.3150	3.8808	121.9	13.1	3848.1
56	0.3250	3.8936	122.3	13.5	3860.7
57	0.3300	3.9063	122.7	13.7	3873.3
58	0.3400	3.9190	123.1	14.1	3885.9
59	0.3450	3.9318	123.5	14.3	3898.6
60	0.3500	3.4829	109.4	14.5	3453.5
61	0.3550	3.9095	122.8	14.7	3876.5
62	0.3600	3.9477	124.0	14.9	3914.4
63	0.3650	3.9318	123.5	15.1	3898.6
64	0.3750	3.9350	123.6	15.6	3901.7
65	0.3850	3.9318	123.5	16.0	3898.6
66	0.3950	3.9318	123.5	16.4	3898.6
67	0.4050	3.9286	123.4	16.8	3895.4
68	0.4200	3.9254	123.3	17.4	3892.3
69	0.4300	3.9254	123.3	17.8	3892.3
70	0.4400	3.9381	123.7	18.3	3904.9
71	0.4450	3.9254	123.3	18.5	3892.3
72	0.4550	3.9445	123.9	18.9	3911.2
73	0.4650	3.9254	123.3	19.3	3892.3

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
74	0.4800	3.9381	123.7	19.9	3904.9
75	0.4900	3.9127	122.9	20.3	3879.6
76	0.4950	3.8999	122.5	20.5	3867.0

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	296.700		296.580
Moisture content: Dry soil+tare, gms.	271.730		274.470
Moisture content: Tare, gms.	120.710		148.990
Moisture, %	16.5	17.6	17.6
Moist specimen weight, gms.	145.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.90	
Net decrease in height, in.		0.10	
Wet Density, pcf	122.4	137.3	
Dry density, pcf	105.0	116.8	
Void ratio	0.6584	0.4917	
Saturation, %	70.1	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 7617.2 psf **at reading no.** 65

Ult. Stress = 7566.7 psf **at reading no.** 63

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.8787	27.6	0.2	871.3
2	0.0100	1.2639	39.7	0.4	1253.2
3	0.0150	1.5886	49.9	0.6	1575.2
4	0.0200	1.9102	60.0	0.8	1894.0
5	0.0250	2.1871	68.7	1.0	2168.7
6	0.0300	2.5310	79.5	1.2	2509.6
7	0.0350	2.9226	91.8	1.5	2897.9
8	0.0400	3.2696	102.7	1.7	3242.0
9	0.0450	3.5816	112.5	1.9	3551.3
10	0.0500	3.8681	121.5	2.1	3835.4
11	0.0550	4.0846	128.3	2.3	4050.1
12	0.0600	3.5275	110.8	2.5	3497.7
13	0.0650	4.1896	131.6	2.7	4154.3
14	0.0700	4.4539	139.9	2.9	4416.3
15	0.0750	4.6194	145.1	3.1	4580.4
16	0.0800	4.7945	150.6	3.3	4754.0
17	0.0850	4.9378	155.1	3.5	4896.1
18	0.0900	5.0715	159.3	3.7	5028.7
19	0.0950	5.2530	165.0	3.9	5208.6

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
20	0.1000	5.3899	169.3	4.1	5344.4
21	0.1050	5.5045	172.9	4.4	5458.0
22	0.1100	5.6127	176.3	4.6	5565.3
23	0.1150	5.7337	180.1	4.8	5685.3
24	0.1200	5.8419	183.5	5.0	5792.6
25	0.1250	5.8992	185.3	5.2	5849.4
26	0.1300	6.0266	189.3	5.4	5975.7
27	0.1350	6.1412	192.9	5.6	6089.4
28	0.1400	6.2367	195.9	5.8	6184.1
29	0.1450	6.3450	199.3	6.0	6291.4
30	0.1500	6.4150	201.5	6.2	6360.8
31	0.1550	6.4787	203.5	6.4	6424.0
32	0.1600	6.5774	206.6	6.6	6521.8
33	0.1650	6.6283	208.2	6.8	6572.3
34	0.1700	6.6761	209.7	7.1	6619.7
35	0.1750	6.7238	211.2	7.3	6667.0
36	0.1800	6.7525	212.1	7.5	6695.4
37	0.1850	6.7875	213.2	7.7	6730.2
38	0.1900	6.8257	214.4	7.9	6768.0
39	0.1950	6.8607	215.5	8.1	6802.8
40	0.2000	6.9276	217.6	8.3	6869.1
41	0.2050	6.9753	219.1	8.5	6916.4
42	0.2100	7.0199	220.5	8.7	6960.6
43	0.2200	7.0963	222.9	9.1	7036.4
44	0.2250	7.1727	225.3	9.3	7112.1
45	0.2300	7.2300	227.1	9.5	7169.0
46	0.2350	7.2682	228.3	9.8	7206.8
47	0.2400	7.3160	229.8	10.0	7254.2
48	0.2450	7.3446	230.7	10.2	7282.6
49	0.2500	7.3764	231.7	10.4	7314.2
50	0.2600	7.4019	232.5	10.8	7339.4
51	0.2650	7.4401	233.7	11.0	7377.3
52	0.2700	7.4911	235.3	11.2	7427.8
53	0.2750	7.5293	236.5	11.4	7465.7
54	0.2900	7.5420	236.9	12.0	7478.3
55	0.3000	7.5356	236.7	12.4	7472.0
56	0.3050	7.4783	234.9	12.7	7415.2
57	0.3150	7.5293	236.5	13.1	7465.7
58	0.3200	7.5993	238.7	13.3	7535.1
59	0.3300	7.6566	240.5	13.7	7592.0
60	0.3400	7.6757	241.1	14.1	7610.9
61	0.3450	7.6502	240.3	14.3	7585.6
62	0.3550	7.6407	240.0	14.7	7576.2
63	0.3650	7.6311	239.7	15.1	7566.7
64	0.3750	7.6757	241.1	15.6	7610.9
65	0.3800	7.6821	241.3	15.8	7617.2
66	0.3850	7.6821	241.3	16.0	7617.2

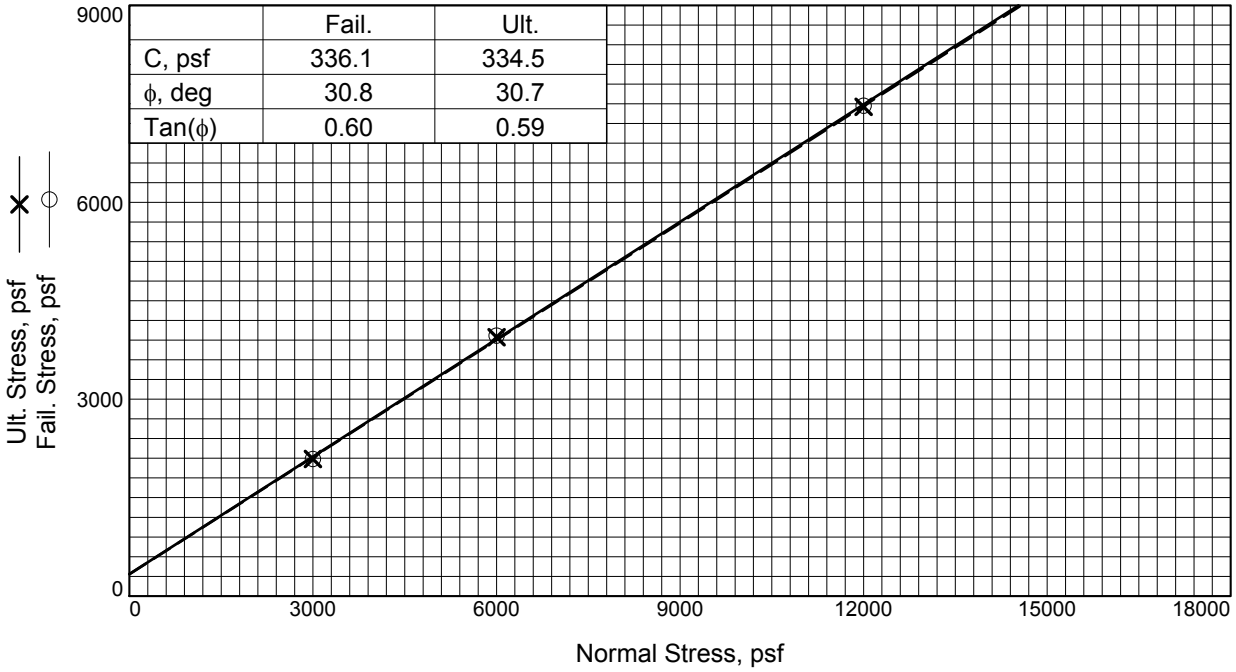
Test Readings for Specimen No. 3

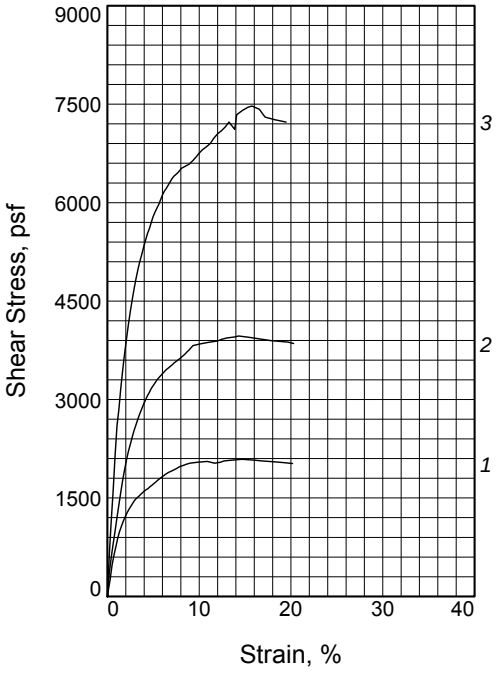
No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
67	0.3900	7.6502	240.3	16.2	7585.6
68	0.4000	7.5547	237.3	16.6	7490.9
69	0.4150	7.5293	236.5	17.2	7465.7
70	0.4200	7.5547	237.3	17.4	7490.9
71	0.4300	7.5929	238.5	17.8	7528.8
72	0.4400	7.5866	238.3	18.3	7522.5
73	0.4500	7.6471	240.2	18.7	7582.5
74	0.4600	7.6375	239.9	19.1	7573.0
75	0.4650	7.6120	239.1	19.3	7547.8
76	0.4750	7.6439	240.1	19.7	7579.3
77	0.4850	7.6502	240.3	20.1	7585.6
78	0.4950	7.6757	241.1	20.5	7610.9

Appendix A.4

Direct Shear

	Fail.	Ult.
C, psf	336.1	334.5
ϕ, deg	30.8	30.7
Tan(ϕ)	0.60	0.59





Sample No.		1	2	3
Initial	Water Content, %	17.3	17.3	17.3
	Dry Density, pcf	106.9	107.2	107.3
	Saturation, %	68.5	69.0	69.2
	Void Ratio	0.7640	0.7581	0.7568
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	21.4	20.1	18.9
	Dry Density, pcf	114.4	117.3	119.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6476	0.6069	0.5723
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.93	0.91	0.90
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2088.8	3967.2	7472.6
Strain, %		14.6	14.3	15.7
Ult. Stress, psf		2088.8	3945.2	7453.8
Strain, %		14.8	15.5	15.3
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= NV **PI=** NP
Specific Gravity= 3.02
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Escabrosa
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 6/28/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 6/28/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Escabrosa
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=3.02 **LL=**NV **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	272.460		305.070
Moisture content: Dry soil+tare, gms.	249.690		277.450
Moisture content: Tare, gms.	118.320		148.610
Moisture, %	17.3	21.4	21.4
Moist specimen weight, gms.	150.8		
Diameter, in.	2.42	2.42	
Area, in.²	4.58	4.58	
Height, in.	1.00	0.93	
Net decrease in height, in.		0.07	
Wet Density, pcf	125.4	139.0	
Dry density, pcf	106.9	114.4	
Void ratio	0.7640	0.6476	
Saturation, %	68.5	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2088.8 psf **at reading no.** 51
Ult. Stress = 2088.8 psf **at reading no.** 52

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0010	0.0000	0.0	0.0	0.0
2	0.0010	0.0541	1.7	0.0	53.4
3	0.0070	0.2577	8.1	0.3	254.4
4	0.0120	0.4803	15.1	0.5	474.3
5	0.0170	0.6362	20.0	0.7	628.2
6	0.0220	0.7666	24.1	0.9	757.0
7	0.0270	0.8939	28.1	1.1	882.6
8	0.0320	1.0020	31.5	1.3	989.4
9	0.0370	1.0847	34.1	1.5	1071.1
10	0.0420	1.1642	36.6	1.7	1149.6

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0470	1.2342	38.8	1.9	1218.7
12	0.0520	1.2947	40.7	2.2	1278.4
13	0.0570	1.3487	42.4	2.4	1331.8
14	0.0620	1.3965	43.9	2.6	1378.9
15	0.0670	1.4410	45.3	2.8	1422.9
16	0.0720	1.4855	46.7	3.0	1466.9
17	0.0770	1.5173	47.7	3.2	1498.3
18	0.0820	1.5428	48.5	3.4	1523.4
19	0.0870	1.5714	49.4	3.6	1551.7
20	0.0920	1.6000	50.3	3.8	1580.0
21	0.0970	1.6255	51.1	4.0	1605.1
22	0.1020	1.6478	51.8	4.2	1627.1
23	0.1070	1.6637	52.3	4.4	1642.8
24	0.1120	1.6923	53.2	4.6	1671.1
25	0.1170	1.7146	53.9	4.8	1693.0
26	0.1220	1.7400	54.7	5.1	1718.2
27	0.1270	1.7654	55.5	5.3	1743.3
28	0.1320	1.7909	56.3	5.5	1768.4
29	0.1370	1.8163	57.1	5.7	1793.6
30	0.1420	1.8386	57.8	5.9	1815.5
31	0.1470	1.8577	58.4	6.1	1834.4
32	0.1520	1.8800	59.1	6.3	1856.4
33	0.1570	1.8990	59.7	6.5	1875.2
34	0.1620	1.9181	60.3	6.7	1894.1
35	0.1670	1.9309	60.6	6.9	1906.6
36	0.1720	1.9436	61.0	7.1	1919.2
37	0.1770	1.9595	61.5	7.3	1934.9
38	0.1820	1.9754	62.0	7.5	1950.6
39	0.1870	1.9913	62.5	7.7	1966.3
40	0.1920	2.0072	63.0	8.0	1982.0
41	0.2020	2.0263	63.6	8.4	2000.9
42	0.2070	2.0390	64.0	8.6	2013.4
43	0.2170	2.0549	64.5	9.0	2029.1
44	0.2370	2.0708	65.0	9.8	2044.8
45	0.2620	2.0835	65.4	10.8	2057.4
46	0.2720	2.0708	65.0	11.3	2044.8
47	0.2820	2.0549	64.5	11.7	2029.1
48	0.2970	2.0708	65.0	12.3	2044.8
49	0.3070	2.0899	65.6	12.7	2063.7
50	0.3270	2.1026	66.0	13.5	2076.3
51	0.3520	2.1154	66.4	14.6	2088.8
52	0.3570	2.1154	66.4	14.8	2088.8
53	0.3870	2.1026	66.0	16.0	2076.3
54	0.4070	2.0899	65.6	16.9	2063.7
55	0.4370	2.0772	65.2	18.1	2051.1
56	0.4620	2.0645	64.8	19.1	2038.6
57	0.4870	2.0517	64.4	20.2	2026.0

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	272.460		304.870
Moisture content: Dry soil+tare, gms.	249.690		278.790
Moisture content: Tare, gms.	118.320		149.020
Moisture, %	17.3	20.1	20.1
Moist specimen weight, gms.	151.3		
Diameter, in.	2.42	2.42	
Area, in.²	4.58	4.58	
Height, in.	1.00	0.91	
Net decrease in height, in.		0.09	
Wet Density, pcf	125.8	140.9	
Dry density, pcf	107.2	117.3	
Void ratio	0.7581	0.6069	
Saturation, %	69.0	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3967.2 psf **at reading no.** 51

Ult. Stress = 3945.2 psf **at reading no.** 52

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3626	11.4	0.2	358.1
2	0.0100	0.6012	18.9	0.4	593.7
3	0.0150	0.8112	25.5	0.6	801.0
4	0.0200	1.0084	31.7	0.8	995.7
5	0.0250	1.2183	38.3	1.0	1203.0
6	0.0300	1.4155	44.5	1.2	1397.8
7	0.0350	1.6000	50.3	1.4	1580.0
8	0.0400	1.7845	56.1	1.7	1762.1
9	0.0450	1.9499	61.2	1.9	1925.5
10	0.0500	2.1026	66.0	2.1	2076.3
11	0.0550	2.2362	70.2	2.3	2208.2
12	0.0600	2.3444	73.6	2.5	2315.0
13	0.0650	2.4589	77.2	2.7	2428.1
14	0.0700	2.5607	80.4	2.9	2528.6
15	0.0750	2.6434	83.0	3.1	2610.2
16	0.0800	2.7325	85.8	3.3	2698.2
17	0.0850	2.8152	88.4	3.5	2779.9
18	0.0900	2.8915	90.8	3.7	2855.2
19	0.0950	2.9647	93.1	3.9	2927.5
20	0.1000	3.0315	95.2	4.1	2993.4
21	0.1050	3.0951	97.2	4.3	3056.3
22	0.1100	3.1460	98.8	4.6	3106.5
23	0.1150	3.2033	100.6	4.8	3163.1
24	0.1200	3.2478	102.0	5.0	3207.0
25	0.1250	3.2923	103.4	5.2	3251.0
26	0.1300	3.3369	104.8	5.4	3295.0

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.3750	106.0	5.6	3332.7
28	0.1400	3.4068	107.0	5.8	3364.1
29	0.1450	3.4386	108.0	6.0	3395.5
30	0.1500	3.4705	109.0	6.2	3426.9
31	0.1550	3.4991	109.9	6.4	3455.2
32	0.1600	3.5214	110.6	6.6	3477.2
33	0.1650	3.5468	111.4	6.8	3502.3
34	0.1700	3.5722	112.2	7.0	3527.4
35	0.1750	3.6009	113.1	7.2	3555.7
36	0.1800	3.6231	113.8	7.5	3577.7
37	0.1900	3.6677	115.2	7.9	3621.7
38	0.1950	3.6931	116.0	8.1	3646.8
39	0.2000	3.7186	116.8	8.3	3671.9
40	0.2050	3.7440	117.6	8.5	3697.1
41	0.2100	3.7758	118.6	8.7	3728.5
42	0.2150	3.8045	119.5	8.9	3756.7
43	0.2200	3.8394	120.6	9.1	3791.3
44	0.2250	3.8713	121.6	9.3	3822.7
45	0.2450	3.8967	122.4	10.1	3847.8
46	0.2650	3.9190	123.1	11.0	3869.8
47	0.2900	3.9412	123.8	12.0	3891.8
48	0.3000	3.9667	124.6	12.4	3916.9
49	0.3150	3.9890	125.3	13.0	3938.9
50	0.3350	4.0049	125.8	13.9	3954.6
51	0.3450	4.0176	126.2	14.3	3967.2
52	0.3750	3.9953	125.5	15.5	3945.2
53	0.4000	3.9731	124.8	16.6	3923.2
54	0.4300	3.9476	124.0	17.8	3898.1
55	0.4750	3.9253	123.3	19.7	3876.1
56	0.4900	3.9031	122.6	20.3	3854.1

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	272.460		303.380
Moisture content: Dry soil+tare, gms.	249.690		278.790
Moisture content: Tare, gms.	118.320		149.020
Moisture, %	17.3	18.9	18.9
Moist specimen weight, gms.	151.4		
Diameter, in.	2.42	2.42	
Area, in.²	4.58	4.58	
Height, in.	1.00	0.90	
Net decrease in height, in.		0.10	
Wet Density, pcf	125.9	142.6	
Dry density, pcf	107.3	119.9	
Void ratio	0.7568	0.5723	
Saturation, %	69.2	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 7472.6 psf **at reading no.** 54

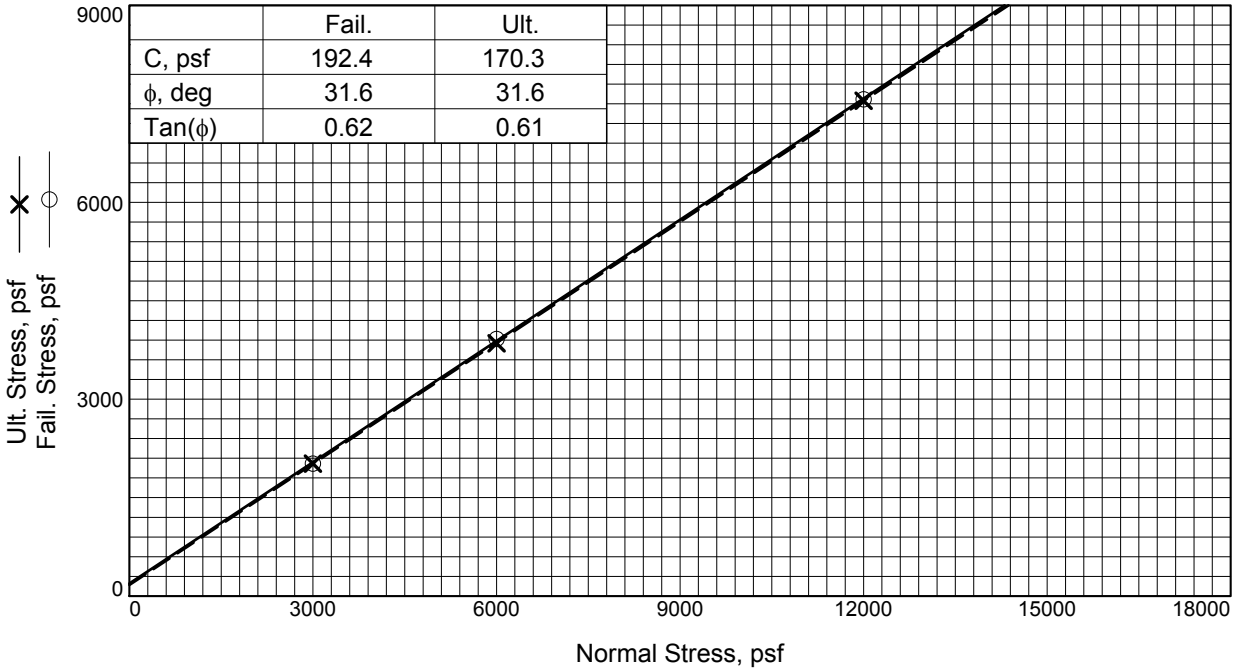
Ult. Stress = 7453.8 psf **at reading no.** 53

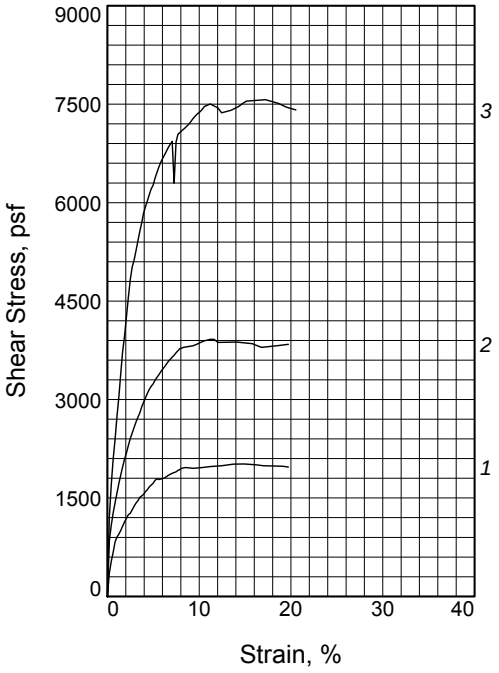
No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.6457	20.3	0.2	637.6
2	0.0100	1.1674	36.7	0.4	1152.8
3	0.0150	1.6318	51.3	0.6	1611.4
4	0.0200	2.1726	68.2	0.8	2145.4
5	0.0250	2.6339	82.7	1.0	2600.8
6	0.0300	2.8915	90.8	1.2	2855.2
7	0.0350	3.1969	100.4	1.4	3156.8
8	0.0400	3.4768	109.2	1.7	3433.2
9	0.0450	3.7377	117.4	1.9	3690.8
10	0.0500	3.9667	124.6	2.1	3916.9
11	0.0550	4.1925	131.7	2.3	4139.9
12	0.0600	4.3929	138.0	2.5	4337.8
13	0.0650	4.5774	143.8	2.7	4520.0
14	0.0700	4.7492	149.2	2.9	4689.6
15	0.0750	4.8924	153.7	3.1	4831.0
16	0.0800	5.0355	158.2	3.3	4972.3
17	0.0850	5.1627	162.2	3.5	5098.0
18	0.0900	5.2709	165.6	3.7	5204.8
19	0.0950	5.3854	169.2	3.9	5317.8
20	0.1000	5.4936	172.6	4.1	5424.6
21	0.1050	5.5954	175.8	4.3	5525.2
22	0.1100	5.6717	178.2	4.6	5600.5
23	0.1150	5.7608	181.0	4.8	5688.5
24	0.1200	5.8562	183.9	5.0	5782.7
25	0.1250	5.9262	186.1	5.2	5851.8
26	0.1300	5.9898	188.1	5.4	5914.7

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	6.0471	189.9	5.6	5971.2
28	0.1400	6.1234	192.3	5.8	6046.6
29	0.1450	6.1997	194.7	6.0	6122.0
30	0.1500	6.2570	196.5	6.2	6178.5
31	0.1550	6.2952	197.7	6.4	6216.2
32	0.1650	6.3970	200.9	6.8	6316.7
33	0.1700	6.4479	202.5	7.0	6367.0
34	0.1750	6.4860	203.7	7.2	6404.7
35	0.1850	6.5369	205.3	7.7	6454.9
36	0.1950	6.6069	207.5	8.1	6524.0
37	0.2150	6.6705	209.5	8.9	6586.8
38	0.2250	6.7278	211.3	9.3	6643.4
39	0.2350	6.7914	213.3	9.7	6706.2
40	0.2400	6.8296	214.5	9.9	6743.9
41	0.2500	6.8932	216.5	10.4	6806.7
42	0.2600	6.9377	217.9	10.8	6850.7
43	0.2700	6.9854	219.4	11.2	6897.8
44	0.2750	7.0268	220.7	11.4	6938.6
45	0.2800	7.0713	222.1	11.6	6982.6
46	0.2900	7.1381	224.2	12.0	7048.6
47	0.3000	7.1858	225.7	12.4	7095.7
48	0.3100	7.2463	227.6	12.8	7155.4
49	0.3200	7.3194	229.9	13.3	7227.6
50	0.3350	7.2049	226.3	13.9	7114.5
51	0.3400	7.4340	233.5	14.1	7340.7
52	0.3550	7.4976	235.5	14.7	7403.5
53	0.3700	7.5485	237.1	15.3	7453.8
54	0.3800	7.5676	237.7	15.7	7472.6
55	0.3850	7.5548	237.3	15.9	7460.1
56	0.4000	7.5167	236.1	16.6	7422.4
57	0.4100	7.4340	233.5	17.0	7340.7
58	0.4150	7.3958	232.3	17.2	7303.0
59	0.4400	7.3576	231.1	18.2	7265.3
60	0.4700	7.3194	229.9	19.5	7227.6

	Fail.	Ult.
C, psf	192.4	170.3
ϕ, deg	31.6	31.6
Tan(ϕ)	0.62	0.61





Sample No.		1	2	3
Initial	Water Content, %	18.8	18.8	18.8
	Dry Density, pcf	103.8	103.4	103.4
	Saturation, %	72.3	71.8	71.7
	Void Ratio	0.7628	0.7689	0.7696
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	0.99
At Test	Water Content, %	21.7	19.8	16.2
	Dry Density, pcf	111.7	115.7	123.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6370	0.5805	0.4758
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.92	0.89	0.83
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2018.6	3917.4	7569.9
Strain, %		14.9	11.2	17.2
Ult. Stress, psf		2018.6	3851.2	7547.8
Strain, %		14.9	15.8	15.1
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= NV **PI=** NP
Specific Gravity= 2.93
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Years 4-7 Composite
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 6/28/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 6/28/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Years 4-7 Composite
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.93 **LL=**NV **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	425.000		300.020
Moisture content: Dry soil+tare, gms.	376.380		273.030
Moisture content: Tare, gms.	118.200		148.880
Moisture, %	18.8	21.7	21.7
Moist specimen weight, gms.	146.9		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.92	
Net decrease in height, in.		0.07	
Wet Density, pcf	123.3	136.0	
Dry density, pcf	103.8	111.7	
Void ratio	0.7628	0.6370	
Saturation, %	72.3	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2018.6 psf **at reading no.** 44
Ult. Stress = 2018.6 psf **at reading no.** 44

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3563	11.2	0.2	353.3
2	0.0100	0.5376	16.9	0.4	533.0
3	0.0150	0.6775	21.3	0.6	671.8
4	0.0200	0.8366	26.3	0.8	829.5
5	0.0250	0.9129	28.7	1.0	905.2
6	0.0300	0.9575	30.1	1.2	949.4
7	0.0350	1.0179	32.0	1.5	1009.3
8	0.0400	1.0784	33.9	1.7	1069.2
9	0.0450	1.1452	36.0	1.9	1135.5
10	0.0500	1.1992	37.7	2.1	1189.1

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.2565	39.5	2.3	1245.9
12	0.0600	1.2788	40.2	2.5	1268.0
13	0.0650	1.3328	41.9	2.7	1321.6
14	0.0700	1.3869	43.6	2.9	1375.2
15	0.0750	1.4346	45.1	3.1	1422.5
16	0.0800	1.4728	46.3	3.3	1460.4
17	0.0850	1.5237	47.9	3.5	1510.8
18	0.0900	1.5428	48.5	3.7	1529.8
19	0.0950	1.5682	49.3	3.9	1555.0
20	0.1000	1.6096	50.6	4.1	1596.0
21	0.1050	1.6414	51.6	4.4	1627.5
22	0.1100	1.6827	52.9	4.6	1668.5
23	0.1200	1.7400	54.7	5.0	1725.3
24	0.1250	1.7845	56.1	5.2	1769.5
25	0.1300	1.8100	56.9	5.4	1794.7
26	0.1350	1.7973	56.5	5.6	1782.1
27	0.1500	1.8195	57.2	6.2	1804.2
28	0.1550	1.8418	57.9	6.4	1826.2
29	0.1600	1.8609	58.5	6.6	1845.2
30	0.1650	1.8768	59.0	6.8	1860.9
31	0.1700	1.8927	59.5	7.1	1876.7
32	0.1800	1.9150	60.2	7.5	1898.8
33	0.1850	1.9372	60.8	7.7	1920.9
34	0.1900	1.9499	61.2	7.9	1933.5
35	0.1950	1.9690	61.8	8.1	1952.4
36	0.2050	1.9818	62.2	8.5	1965.0
37	0.2250	1.9690	61.8	9.3	1952.4
38	0.2500	1.9818	62.2	10.4	1965.0
39	0.2700	1.9945	62.6	11.2	1977.6
40	0.3000	2.0072	63.0	12.4	1990.3
41	0.3150	2.0199	63.4	13.1	2002.9
42	0.3300	2.0326	63.8	13.7	2015.5
43	0.3550	2.0358	63.9	14.7	2018.6
44	0.3600	2.0358	63.9	14.9	2018.6
45	0.3900	2.0231	63.5	16.2	2006.0
46	0.4100	2.0072	63.0	17.0	1990.3
47	0.4600	2.0008	62.8	19.1	1983.9
48	0.4750	1.9881	62.4	19.7	1971.3

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	425.000		293.820
Moisture content: Dry soil+tare, gms.	376.380		269.280
Moisture content: Tare, gms.	118.200		145.440
Moisture, %	18.8	19.8	19.8
Moist specimen weight, gms.	146.4		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.89	
Net decrease in height, in.		0.11	
Wet Density, pcf	122.9	138.7	
Dry density, pcf	103.4	115.7	
Void ratio	0.7689	0.5805	
Saturation, %	71.8	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3917.4 psf **at reading no.** 42

Ult. Stress = 3851.2 psf **at reading no.** 47

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.8493	26.7	0.2	842.2
2	0.0100	1.0911	34.3	0.4	1081.9
3	0.0150	1.2819	40.3	0.6	1271.1
4	0.0200	1.4410	45.3	0.8	1428.8
5	0.0250	1.5905	50.0	1.0	1577.1
6	0.0300	1.7400	54.7	1.2	1725.3
7	0.0350	1.8736	58.9	1.5	1857.8
8	0.0400	1.9881	62.4	1.7	1971.3
9	0.0450	2.1090	66.2	1.9	2091.2
10	0.0500	2.2044	69.2	2.1	2185.8
11	0.0550	2.3189	72.8	2.3	2299.4
12	0.0600	2.4271	76.2	2.5	2406.6
13	0.0650	2.5098	78.8	2.7	2488.6
14	0.0700	2.5989	81.6	2.9	2576.9
15	0.0750	2.6816	84.2	3.1	2658.9
16	0.0800	2.7547	86.5	3.3	2731.5
17	0.0850	2.8215	88.6	3.5	2797.7
18	0.0900	2.9106	91.4	3.7	2886.0
19	0.0950	2.9806	93.6	3.9	2955.4
20	0.1000	3.0506	95.8	4.1	3024.8
21	0.1050	3.1205	98.0	4.4	3094.2
22	0.1100	3.1842	100.0	4.6	3157.3
23	0.1150	3.2287	101.4	4.8	3201.4
24	0.1200	3.2669	102.6	5.0	3239.3
25	0.1250	3.3241	104.4	5.2	3296.1
26	0.1300	3.3687	105.8	5.4	3340.2

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.4068	107.0	5.6	3378.1
28	0.1400	3.4514	108.4	5.8	3422.2
29	0.1450	3.4895	109.6	6.0	3460.1
30	0.1500	3.5277	110.8	6.2	3497.9
31	0.1550	3.5722	112.2	6.4	3542.1
32	0.1600	3.6104	113.4	6.6	3579.9
33	0.1700	3.6772	115.5	7.1	3646.2
34	0.1750	3.7058	116.4	7.3	3674.6
35	0.1800	3.7440	117.6	7.5	3712.4
36	0.1900	3.8045	119.5	7.9	3772.3
37	0.2000	3.8267	120.2	8.3	3794.4
38	0.2250	3.8522	121.0	9.3	3819.6
39	0.2350	3.8776	121.8	9.8	3844.9
40	0.2450	3.9031	122.6	10.2	3870.1
41	0.2550	3.9285	123.4	10.6	3895.3
42	0.2700	3.9508	124.1	11.2	3917.4
43	0.2800	3.9508	124.1	11.6	3917.4
44	0.2850	3.9253	123.3	11.8	3892.2
45	0.2900	3.9031	122.6	12.0	3870.1
46	0.3400	3.9094	122.8	14.1	3876.4
47	0.3800	3.8840	122.0	15.8	3851.2
48	0.3950	3.8490	120.9	16.4	3816.5
49	0.4050	3.8267	120.2	16.8	3794.4
50	0.4450	3.8522	121.0	18.5	3819.6
51	0.4750	3.8744	121.7	19.7	3841.7

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	425.000		295.920
Moisture content: Dry soil+tare, gms.	376.380		275.810
Moisture content: Tare, gms.	118.200		152.000
Moisture, %	18.8	16.2	16.2
Moist specimen weight, gms.	146.2		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.83	
Net decrease in height, in.		0.17	
Wet Density, pcf	122.8	144.1	
Dry density, pcf	103.4	123.9	
Void ratio	0.7696	0.4758	
Saturation, %	71.7	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

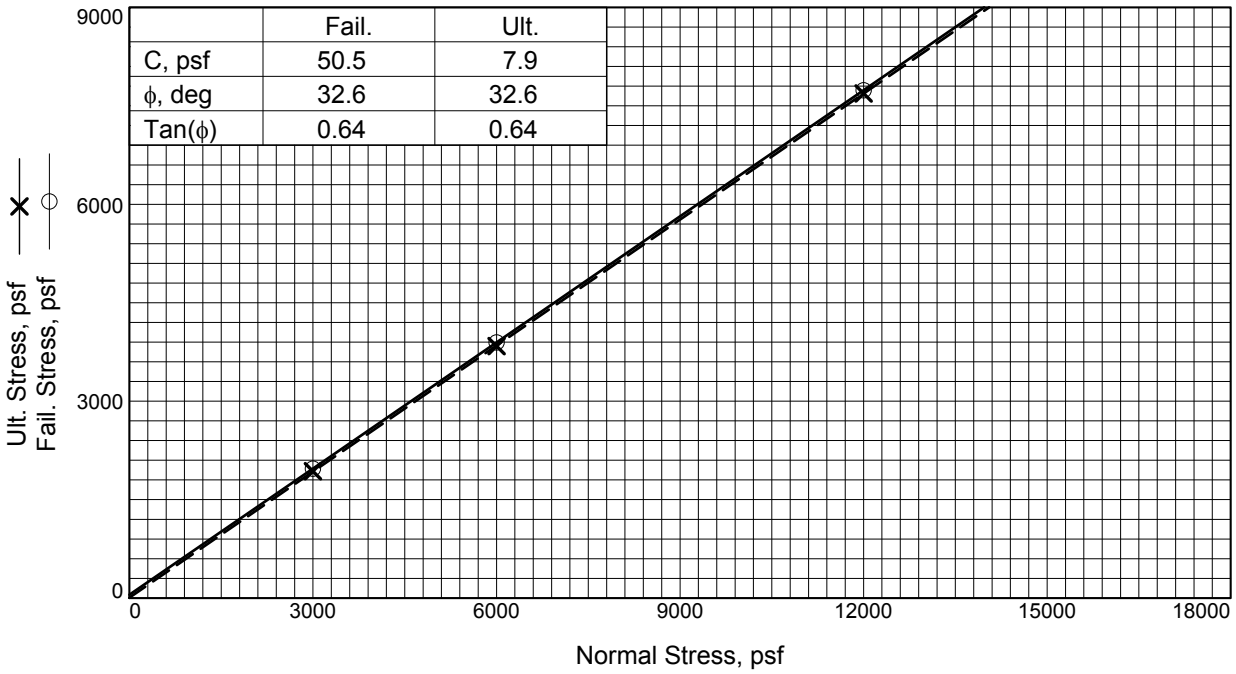
Fail. Stress = 7569.9 psf **at reading no.** 53

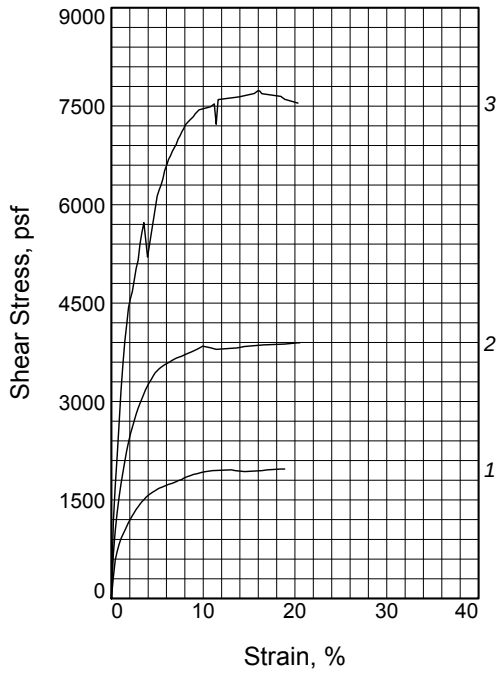
Ult. Stress = 7547.8 psf **at reading no.** 51

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	1.2151	38.2	0.2	1204.9
2	0.0100	1.7114	53.8	0.4	1696.9
3	0.0150	2.1090	66.2	0.6	2091.2
4	0.0200	2.4144	75.8	0.8	2394.0
5	0.0250	2.7706	87.0	1.0	2747.2
6	0.0300	3.0760	96.6	1.2	3050.0
7	0.0350	3.4418	108.1	1.5	3412.8
8	0.0400	3.7567	118.0	1.7	3725.0
9	0.0450	3.9985	125.6	1.9	3964.7
10	0.0500	4.2975	135.0	2.1	4261.2
11	0.0550	4.5933	144.3	2.3	4554.6
12	0.0600	4.8701	153.0	2.5	4829.0
13	0.0650	5.0609	159.0	2.7	5018.2
14	0.0700	5.1691	162.4	2.9	5125.5
15	0.0750	5.3154	167.0	3.1	5270.5
16	0.0800	5.4681	171.8	3.3	5421.9
17	0.0850	5.6144	176.4	3.5	5567.0
18	0.0900	5.7353	180.2	3.7	5686.9
19	0.0950	5.8880	184.9	3.9	5838.3
20	0.1000	5.9898	188.1	4.1	5939.2
21	0.1050	6.0789	190.9	4.4	6027.5
22	0.1100	6.1743	193.9	4.6	6122.2
23	0.1150	6.2634	196.7	4.8	6210.5
24	0.1200	6.3206	198.5	5.0	6267.3
25	0.1250	6.4288	201.9	5.2	6374.5
26	0.1300	6.5178	204.7	5.4	6462.8

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	6.6005	207.3	5.6	6544.8
28	0.1400	6.6705	209.5	5.8	6614.2
29	0.1450	6.7278	211.3	6.0	6671.0
30	0.1500	6.7850	213.1	6.2	6727.8
31	0.1550	6.8423	214.9	6.4	6784.5
32	0.1600	6.8996	216.7	6.6	6841.3
33	0.1650	6.9505	218.3	6.8	6891.8
34	0.1700	6.9918	219.6	7.1	6932.8
35	0.1750	6.3492	199.4	7.3	6295.6
36	0.1800	6.9823	219.3	7.5	6923.3
37	0.1850	7.1031	223.1	7.7	7043.2
38	0.1950	7.1540	224.7	8.1	7093.6
39	0.2050	7.2049	226.3	8.5	7144.1
40	0.2150	7.2654	228.2	8.9	7204.0
41	0.2250	7.3449	230.7	9.3	7282.9
42	0.2350	7.4085	232.7	9.8	7346.0
43	0.2450	7.4562	234.2	10.2	7393.3
44	0.2550	7.5294	236.5	10.6	7465.8
45	0.2700	7.5676	237.7	11.2	7503.7
46	0.2900	7.5071	235.8	12.0	7443.7
47	0.3000	7.4308	233.4	12.4	7368.0
48	0.3250	7.4721	234.7	13.5	7409.0
49	0.3450	7.5294	236.5	14.3	7465.8
50	0.3550	7.5739	237.9	14.7	7510.0
51	0.3650	7.6121	239.1	15.1	7547.8
52	0.4050	7.6280	239.6	16.8	7563.6
53	0.4150	7.6344	239.8	17.2	7569.9
54	0.4500	7.5739	237.9	18.7	7510.0
55	0.4700	7.5167	236.1	19.5	7453.2
56	0.4950	7.4753	234.8	20.5	7412.2





Sample No.		1	2	3
Initial	Water Content, %	17.5	17.5	17.5
	Dry Density, pcf	106.2	106.3	106.3
	Saturation, %	69.0	69.1	69.1
	Void Ratio	0.7570	0.7558	0.7554
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	20.9	20.0	17.2
	Dry Density, pcf	114.8	116.8	123.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6263	0.5988	0.5154
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.92	0.91	0.86
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		1971.3	3895.3	7737.1
Strain, %		18.5	20.3	16.0
Ult. Stress, psf		1933.5	3838.6	7689.8
Strain, %		14.5	14.5	16.4
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 17 **PI=** NP
Specific Gravity= 2.99
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Epitaph Lithology
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 7/12/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 7/12/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Epitaph Lithology
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.99 **LL=**17 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	258.490		301.750
Moisture content: Dry soil+tare, gms.	237.290		275.150
Moisture content: Tare, gms.	115.900		148.180
Moisture, %	17.5	20.9	20.9
Moist specimen weight, gms.	148.7		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.92	
Net decrease in height, in.		0.07	
Wet Density, pcf	124.8	138.8	
Dry density, pcf	106.2	114.8	
Void ratio	0.7570	0.6263	
Saturation, %	69.0	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 1971.3 psf **at reading no.** 48
Ult. Stress = 1933.5 psf **at reading no.** 45

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3213	10.1	0.2	318.6
2	0.0100	0.5885	18.5	0.4	583.5
3	0.0150	0.7221	22.7	0.6	716.0
4	0.0200	0.8302	26.1	0.8	823.2
5	0.0250	0.9193	28.9	1.0	911.5
6	0.0300	0.9829	30.9	1.2	974.6
7	0.0350	1.0434	32.8	1.5	1034.6
8	0.0400	1.1038	34.7	1.7	1094.5
9	0.0450	1.1674	36.7	1.9	1157.6
10	0.0500	1.2183	38.3	2.1	1208.0

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.2724	40.0	2.3	1261.7
12	0.0600	1.3201	41.5	2.5	1309.0
13	0.0650	1.3678	43.0	2.7	1356.3
14	0.0700	1.4092	44.3	2.9	1397.3
15	0.0750	1.4505	45.6	3.1	1438.3
16	0.0800	1.4855	46.7	3.3	1473.0
17	0.0850	1.5173	47.7	3.5	1504.5
18	0.0900	1.5491	48.7	3.7	1536.1
19	0.0950	1.5746	49.5	3.9	1561.3
20	0.1000	1.6000	50.3	4.1	1586.5
21	0.1050	1.6191	50.9	4.4	1605.5
22	0.1100	1.6382	51.5	4.6	1624.4
23	0.1150	1.6573	52.1	4.8	1643.3
24	0.1200	1.6764	52.7	5.0	1662.2
25	0.1250	1.6923	53.2	5.2	1678.0
26	0.1350	1.7146	53.9	5.6	1700.1
27	0.1400	1.7273	54.3	5.8	1712.7
28	0.1450	1.7400	54.7	6.0	1725.3
29	0.1500	1.7527	55.1	6.2	1737.9
30	0.1600	1.7686	55.6	6.6	1753.7
31	0.1700	1.7941	56.4	7.1	1778.9
32	0.1750	1.8100	56.9	7.3	1794.7
33	0.1850	1.8291	57.5	7.7	1813.6
34	0.1900	1.8482	58.1	7.9	1832.5
35	0.1950	1.8609	58.5	8.1	1845.2
36	0.2000	1.8736	58.9	8.3	1857.8
37	0.2100	1.8927	59.5	8.7	1876.7
38	0.2150	1.9054	59.9	8.9	1889.3
39	0.2250	1.9181	60.3	9.3	1901.9
40	0.2350	1.9340	60.7	9.8	1917.7
41	0.2450	1.9468	61.1	10.2	1930.3
42	0.2650	1.9627	61.6	11.0	1946.1
43	0.3150	1.9754	62.0	13.1	1958.7
44	0.3250	1.9627	61.6	13.5	1946.1
45	0.3500	1.9499	61.2	14.5	1933.5
46	0.3950	1.9627	61.6	16.4	1946.1
47	0.4100	1.9754	62.0	17.0	1958.7
48	0.4450	1.9881	62.4	18.5	1971.3
49	0.4550	1.9881	62.4	18.9	1971.3

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	258.490		304.450
Moisture content: Dry soil+tare, gms.	237.290		279.000
Moisture content: Tare, gms.	115.900		151.940
Moisture, %	17.5	20.0	20.0
Moist specimen weight, gms.	148.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.91	
Net decrease in height, in.		0.09	
Wet Density, pcf	124.9	140.1	
Dry density, pcf	106.3	116.8	
Void ratio	0.7558	0.5988	
Saturation, %	69.1	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3895.3 psf **at reading no.** 43

Ult. Stress = 3838.6 psf **at reading no.** 40

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.6712	21.1	0.2	665.5
2	0.0100	1.0402	32.7	0.4	1031.4
3	0.0150	1.3201	41.5	0.6	1309.0
4	0.0200	1.5555	48.9	0.8	1542.4
5	0.0250	1.7591	55.3	1.0	1744.2
6	0.0300	1.9372	60.8	1.2	1920.9
7	0.0350	2.1090	66.2	1.5	2091.2
8	0.0400	2.2617	71.0	1.7	2242.6
9	0.0450	2.4016	75.4	1.9	2381.4
10	0.0500	2.5289	79.4	2.1	2507.5
11	0.0550	2.6307	82.6	2.3	2608.5
12	0.0600	2.7325	85.8	2.5	2709.4
13	0.0650	2.8343	89.0	2.7	2810.3
14	0.0700	2.9233	91.8	2.9	2898.6
15	0.0750	2.9997	94.2	3.1	2974.3
16	0.0800	3.0697	96.4	3.3	3043.7
17	0.0850	3.1428	98.7	3.5	3116.3
18	0.0900	3.2096	100.8	3.7	3182.5
19	0.0950	3.2669	102.6	3.9	3239.3
20	0.1000	3.3241	104.4	4.1	3296.1
21	0.1050	3.3687	105.8	4.4	3340.2
22	0.1100	3.4227	107.5	4.6	3393.8
23	0.1150	3.4673	108.9	4.8	3438.0
24	0.1200	3.4991	109.9	5.0	3469.5
25	0.1250	3.5277	110.8	5.2	3497.9
26	0.1300	3.5532	111.6	5.4	3523.2

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1400	3.5913	112.8	5.8	3561.0
28	0.1500	3.6231	113.8	6.2	3592.6
29	0.1600	3.6613	115.0	6.6	3630.4
30	0.1700	3.6931	116.0	7.1	3661.9
31	0.1850	3.7249	117.0	7.7	3693.5
32	0.1950	3.7504	117.8	8.1	3718.7
33	0.2100	3.7886	119.0	8.7	3756.6
34	0.2200	3.8140	119.8	9.1	3781.8
35	0.2300	3.8458	120.8	9.5	3813.3
36	0.2400	3.8776	121.8	10.0	3844.9
37	0.2600	3.8522	121.0	10.8	3819.6
38	0.2750	3.8267	120.2	11.4	3794.4
39	0.3300	3.8490	120.9	13.7	3816.5
40	0.3500	3.8713	121.6	14.5	3838.6
41	0.4000	3.8967	122.4	16.6	3863.8
42	0.4550	3.9094	122.8	18.9	3876.4
43	0.4900	3.9285	123.4	20.3	3895.3
44	0.4950	3.9285	123.4	20.5	3895.3

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	258.490		297.890
Moisture content: Dry soil+tare, gms.	237.290		275.970
Moisture content: Tare, gms.	115.900		148.810
Moisture, %	17.5	17.2	17.2
Moist specimen weight, gms.	148.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.86	
Net decrease in height, in.		0.14	
Wet Density, pcf	124.9	144.4	
Dry density, pcf	106.3	123.2	
Void ratio	0.7554	0.5154	
Saturation, %	69.1	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

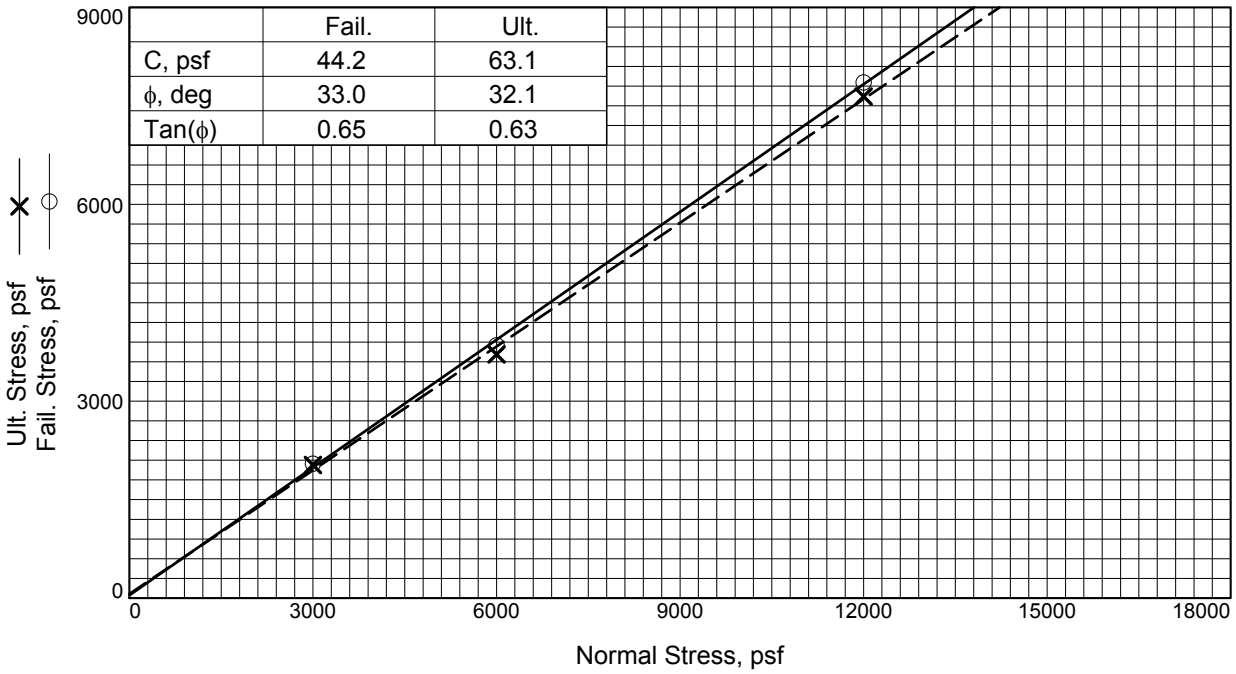
Fail. Stress = 7737.1 psf **at reading no.** 45

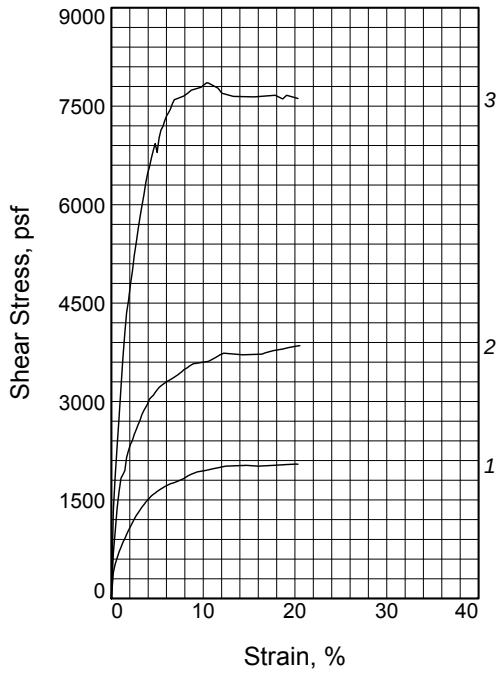
Ult. Stress = 7689.8 psf **at reading no.** 47

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	1.1674	36.7	0.2	1157.6
2	0.0100	1.7273	54.3	0.4	1712.7
3	0.0150	2.1853	68.6	0.6	2166.9
4	0.0200	2.6816	84.2	0.8	2658.9
5	0.0250	3.1905	100.2	1.0	3163.6
6	0.0300	3.5977	113.0	1.2	3567.3
7	0.0350	3.9540	124.2	1.5	3920.6
8	0.0400	4.1925	131.7	1.7	4157.1
9	0.0450	4.4693	140.4	1.9	4431.5
10	0.0500	4.6092	144.8	2.1	4570.3
11	0.0550	4.7174	148.2	2.3	4677.6
12	0.0600	4.8955	153.8	2.5	4854.2
13	0.0650	5.0737	159.4	2.7	5030.8
14	0.0700	5.1945	163.2	2.9	5150.7
15	0.0750	5.4490	171.2	3.1	5403.0
16	0.0800	5.6272	176.8	3.3	5579.7
17	0.0850	5.7735	181.3	3.5	5724.7
18	0.0950	5.2454	164.8	3.9	5201.2
19	0.1200	6.1807	194.1	5.0	6128.5
20	0.1250	6.2729	197.0	5.2	6219.9
21	0.1300	6.3492	199.4	5.4	6295.6
22	0.1350	6.4479	202.5	5.6	6393.4
23	0.1400	6.5751	206.5	5.8	6519.6
24	0.1450	6.6514	208.9	6.0	6595.3
25	0.1500	6.7469	211.9	6.2	6689.9
26	0.1550	6.8009	213.6	6.4	6743.5

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1600	6.8709	215.8	6.6	6812.9
28	0.1650	6.9250	217.5	6.8	6866.5
29	0.1700	6.9759	219.1	7.1	6917.0
30	0.1750	7.0586	221.7	7.3	6999.0
31	0.1800	7.1095	223.3	7.5	7049.5
32	0.1850	7.1731	225.3	7.7	7112.6
33	0.1900	7.2208	226.8	7.9	7159.9
34	0.1950	7.2813	228.7	8.1	7219.8
35	0.2050	7.3449	230.7	8.5	7282.9
36	0.2150	7.4022	232.5	8.9	7339.7
37	0.2200	7.4467	233.9	9.1	7383.8
38	0.2300	7.5071	235.8	9.5	7443.7
39	0.2600	7.5548	237.3	10.8	7491.1
40	0.2700	7.5994	238.7	11.2	7535.2
41	0.2750	7.2876	228.9	11.4	7226.1
42	0.2800	7.6662	240.8	11.6	7601.4
43	0.3350	7.7075	242.1	13.9	7642.4
44	0.3750	7.7584	243.7	15.6	7692.9
45	0.3850	7.8030	245.1	16.0	7737.1
46	0.3900	7.7966	244.9	16.2	7730.8
47	0.3950	7.7552	243.6	16.4	7689.8
48	0.4450	7.7139	242.3	18.5	7648.8
49	0.4550	7.6694	240.9	18.9	7604.6
50	0.4900	7.6121	239.1	20.3	7547.8





Sample No.		1	2	3
Initial	Water Content, %	18.5	18.5	18.5
	Dry Density, pcf	104.2	105.3	104.3
	Saturation, %	74.0	75.8	74.1
	Void Ratio	0.7189	0.7013	0.7172
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	22.0	19.8	17.9
	Dry Density, pcf	109.9	114.3	118.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6308	0.5679	0.5136
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.94	0.92	0.88
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2047.0	3851.2	7856.9
Strain, %		20.1	20.5	10.4
Ult. Stress, psf		2028.1	3712.4	7642.4
Strain, %		14.7	14.3	15.6
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 17 **PI=** NP
Specific Gravity= 2.87
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Earp Lithology
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 7/12/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 7/12/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Earp Lithology
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.87 **LL=**17 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	301.550		301.030
Moisture content: Dry soil+tare, gms.	272.910		273.590
Moisture content: Tare, gms.	118.340		148.800
Moisture, %	18.5	22.0	22.0
Moist specimen weight, gms.	147.2		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.94	
Net decrease in height, in.		0.05	
Wet Density, pcf	123.5	134.0	
Dry density, pcf	104.2	109.9	
Void ratio	0.7189	0.6308	
Saturation, %	74.0	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2047.0 psf **at reading no.** 53
Ult. Stress = 2028.1 psf **at reading no.** 49

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.3976	12.5	0.2	394.3
2	0.0100	0.5312	16.7	0.4	526.7
3	0.0150	0.6235	19.6	0.6	618.2
4	0.0200	0.7157	22.5	0.8	709.7
5	0.0250	0.7857	24.7	1.0	779.1
6	0.0300	0.8620	27.1	1.2	854.8
7	0.0350	0.9193	28.9	1.5	911.5
8	0.0400	0.9829	30.9	1.7	974.6
9	0.0450	1.0465	32.9	1.9	1037.7
10	0.0500	1.1038	34.7	2.1	1094.5

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.1611	36.5	2.3	1151.3
12	0.0600	1.2183	38.3	2.5	1208.0
13	0.0650	1.2724	40.0	2.7	1261.7
14	0.0700	1.3137	41.3	2.9	1302.7
15	0.0750	1.3583	42.7	3.1	1346.8
16	0.0800	1.4028	44.1	3.3	1391.0
17	0.0850	1.4410	45.3	3.5	1428.8
18	0.0900	1.4760	46.4	3.7	1463.5
19	0.0950	1.5110	47.5	3.9	1498.2
20	0.1000	1.5428	48.5	4.1	1529.8
21	0.1050	1.5746	49.5	4.4	1561.3
22	0.1100	1.6000	50.3	4.6	1586.5
23	0.1150	1.6191	50.9	4.8	1605.5
24	0.1200	1.6446	51.7	5.0	1630.7
25	0.1250	1.6637	52.3	5.2	1649.6
26	0.1300	1.6827	52.9	5.4	1668.5
27	0.1350	1.7018	53.5	5.6	1687.5
28	0.1400	1.7177	54.0	5.8	1703.2
29	0.1450	1.7336	54.5	6.0	1719.0
30	0.1500	1.7464	54.9	6.2	1731.6
31	0.1550	1.7623	55.4	6.4	1747.4
32	0.1650	1.7782	55.9	6.8	1763.2
33	0.1700	1.7909	56.3	7.1	1775.8
34	0.1750	1.8036	56.7	7.3	1788.4
35	0.1800	1.8163	57.1	7.5	1801.0
36	0.1900	1.8418	57.9	7.9	1826.2
37	0.1950	1.8609	58.5	8.1	1845.2
38	0.2000	1.8800	59.1	8.3	1864.1
39	0.2050	1.8959	59.6	8.5	1879.9
40	0.2100	1.9086	60.0	8.7	1892.5
41	0.2200	1.9309	60.6	9.1	1914.6
42	0.2250	1.9436	61.0	9.3	1927.2
43	0.2450	1.9627	61.6	10.2	1946.1
44	0.2550	1.9754	62.0	10.6	1958.7
45	0.2650	1.9913	62.5	11.0	1974.5
46	0.2800	2.0072	63.0	11.6	1990.3
47	0.2900	2.0199	63.4	12.0	2002.9
48	0.3000	2.0326	63.8	12.4	2015.5
49	0.3550	2.0454	64.2	14.7	2028.1
50	0.3850	2.0326	63.8	16.0	2015.5
51	0.4250	2.0454	64.2	17.6	2028.1
52	0.4600	2.0581	64.6	19.1	2040.7
53	0.4850	2.0645	64.8	20.1	2047.0
54	0.4900	2.0613	64.7	20.3	2043.9

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	301.550		296.800
Moisture content: Dry soil+tare, gms.	272.910		271.790
Moisture content: Tare, gms.	118.340		145.420
Moisture, %	18.5	19.8	19.8
Moist specimen weight, gms.	148.7		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.92	
Net decrease in height, in.		0.08	
Wet Density, pcf	124.8	136.9	
Dry density, pcf	105.3	114.3	
Void ratio	0.7013	0.5679	
Saturation, %	75.8	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3851.2 psf **at reading no.** 50

Ult. Stress = 3712.4 psf **at reading no.** 43

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.6903	21.7	0.2	684.4
2	0.0100	1.0338	32.5	0.4	1025.1
3	0.0150	1.3901	43.7	0.6	1378.4
4	0.0200	1.6446	51.7	0.8	1630.7
5	0.0250	1.8482	58.1	1.0	1832.5
6	0.0300	1.9022	59.8	1.2	1886.2
7	0.0350	1.9627	61.6	1.5	1946.1
8	0.0400	2.1663	68.0	1.7	2148.0
9	0.0450	2.2744	71.4	1.9	2255.2
10	0.0500	2.3667	74.3	2.1	2346.7
11	0.0550	2.4271	76.2	2.3	2406.6
12	0.0600	2.5225	79.2	2.5	2501.2
13	0.0650	2.5925	81.4	2.7	2570.6
14	0.0700	2.6688	83.8	2.9	2646.3
15	0.0750	2.7388	86.0	3.1	2715.7
16	0.0800	2.8279	88.8	3.3	2804.0
17	0.0850	2.8883	90.7	3.5	2863.9
18	0.0900	2.9360	92.2	3.7	2911.3
19	0.0950	2.9901	93.9	3.9	2964.9
20	0.1000	3.0633	96.2	4.1	3037.4
21	0.1050	3.0951	97.2	4.4	3069.0
22	0.1100	3.1205	98.0	4.6	3094.2
23	0.1150	3.1651	99.4	4.8	3138.4
24	0.1200	3.2064	100.7	5.0	3179.4
25	0.1250	3.2414	101.8	5.2	3214.1
26	0.1300	3.2669	102.6	5.4	3239.3

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.2891	103.3	5.6	3261.4
28	0.1450	3.3305	104.6	6.0	3302.4
29	0.1550	3.3623	105.6	6.4	3333.9
30	0.1650	3.4005	106.8	6.8	3371.8
31	0.1750	3.4386	108.0	7.3	3409.6
32	0.1800	3.4641	108.8	7.5	3434.8
33	0.1850	3.4864	109.5	7.7	3456.9
34	0.1900	3.5118	110.3	7.9	3482.2
35	0.2000	3.5468	111.4	8.3	3516.9
36	0.2050	3.5722	112.2	8.5	3542.1
37	0.2150	3.6072	113.3	8.9	3576.8
38	0.2550	3.6422	114.4	10.6	3611.5
39	0.2650	3.6740	115.4	11.0	3643.0
40	0.2750	3.7058	116.4	11.4	3674.6
41	0.2850	3.7440	117.6	11.8	3712.4
42	0.2950	3.7695	118.4	12.2	3737.6
43	0.3450	3.7440	117.6	14.3	3712.4
44	0.3950	3.7536	117.9	16.4	3721.9
45	0.4050	3.7758	118.6	16.8	3743.9
46	0.4250	3.8076	119.6	17.6	3775.5
47	0.4500	3.8331	120.4	18.7	3800.7
48	0.4650	3.8554	121.1	19.3	3822.8
49	0.4850	3.8776	121.8	20.1	3844.9
50	0.4950	3.8840	122.0	20.5	3851.2

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	301.550		296.500
Moisture content: Dry soil+tare, gms.	272.910		274.090
Moisture content: Tare, gms.	118.340		148.880
Moisture, %	18.5	17.9	17.9
Moist specimen weight, gms.	147.3		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.88	
Net decrease in height, in.		0.12	
Wet Density, pcf	123.7	139.6	
Dry density, pcf	104.3	118.4	
Void ratio	0.7172	0.5136	
Saturation, %	74.1	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

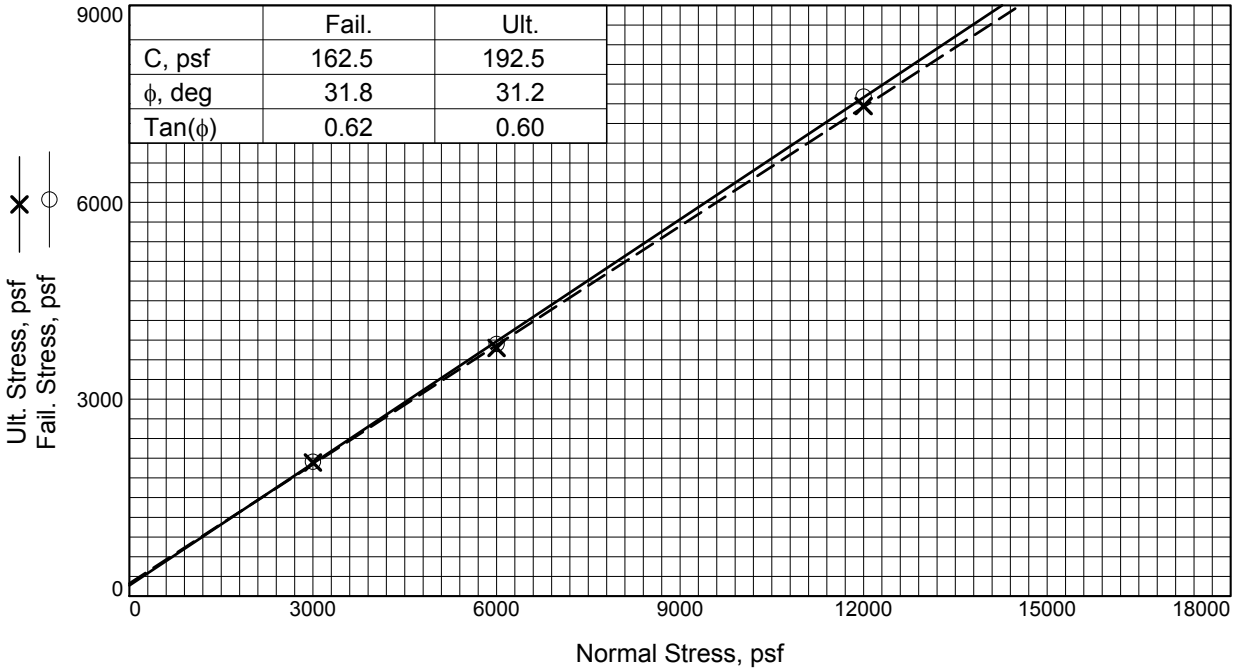
Fail. Stress = 7856.9 psf **at reading no.** 38

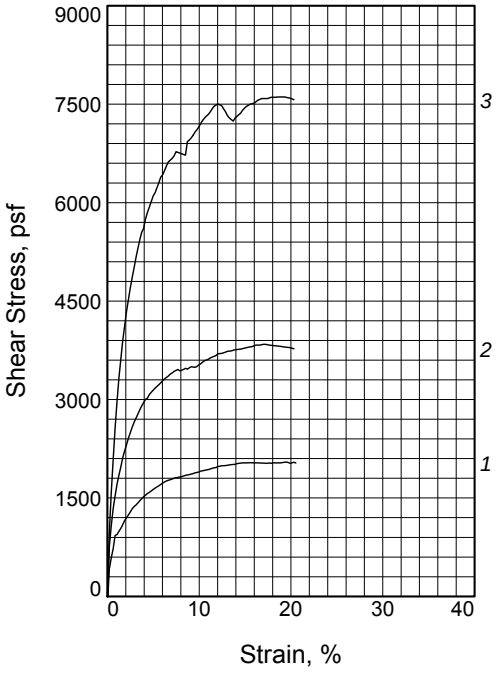
Ult. Stress = 7642.4 psf **at reading no.** 43

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	1.3456	42.3	0.2	1334.2
2	0.0100	1.8927	59.5	0.4	1876.7
3	0.0150	2.3444	73.6	0.6	2324.6
4	0.0200	2.7834	87.4	0.8	2759.9
5	0.0250	3.2478	102.0	1.0	3220.4
6	0.0300	3.6963	116.1	1.2	3665.1
7	0.0350	4.0812	128.2	1.5	4046.7
8	0.0400	4.3898	137.9	1.7	4352.7
9	0.0450	4.5774	143.8	1.9	4538.8
10	0.0500	4.8256	151.6	2.1	4784.8
11	0.0550	5.0228	157.8	2.3	4980.4
12	0.0600	5.2741	165.7	2.5	5229.5
13	0.0650	5.4618	171.6	2.7	5415.6
14	0.0700	5.6717	178.2	2.9	5623.8
15	0.0750	5.8626	184.1	3.1	5813.1
16	0.0800	6.0343	189.5	3.3	5983.4
17	0.0850	6.1966	194.6	3.5	6144.2
18	0.0900	6.3747	200.2	3.7	6320.9
19	0.0950	6.5242	204.9	3.9	6469.1
20	0.1000	6.6324	208.3	4.1	6576.4
21	0.1050	6.7691	212.6	4.4	6712.0
22	0.1100	6.8868	216.3	4.6	6828.7
23	0.1150	6.9886	219.5	4.8	6929.6
24	0.1200	6.8550	215.3	5.0	6797.1
25	0.1250	7.0745	222.2	5.2	7014.8
26	0.1300	7.1986	226.1	5.4	7137.8

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	7.2526	227.8	5.6	7191.4
28	0.1400	7.3385	230.5	5.8	7276.6
29	0.1450	7.4149	232.9	6.0	7352.3
30	0.1500	7.4626	234.4	6.2	7399.6
31	0.1550	7.5198	236.2	6.4	7456.4
32	0.1600	7.6026	238.8	6.6	7538.4
33	0.1650	7.6630	240.7	6.8	7598.3
34	0.1900	7.7203	242.5	7.9	7655.1
35	0.2000	7.7616	243.8	8.3	7696.1
36	0.2100	7.8093	245.3	8.7	7743.4
37	0.2350	7.8539	246.7	9.8	7787.5
38	0.2500	7.9238	248.9	10.4	7856.9
39	0.2550	7.9175	248.7	10.6	7850.6
40	0.2800	7.8411	246.3	11.6	7774.9
41	0.2900	7.7648	243.9	12.0	7699.2
42	0.3200	7.7139	242.3	13.3	7648.8
43	0.3750	7.7075	242.1	15.6	7642.4
44	0.4300	7.7330	242.9	17.8	7667.7
45	0.4500	7.6757	241.1	18.7	7610.9
46	0.4600	7.7330	242.9	19.1	7667.7
47	0.4900	7.6821	241.3	20.3	7617.2





Sample No.		1	2	3
Initial	Water Content, %	15.5	15.5	15.5
	Dry Density, pcf	112.3	112.0	112.1
	Saturation, %	66.3	65.9	66.0
	Void Ratio	0.7234	0.7274	0.7265
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.99	0.99	0.99
At Test	Water Content, %	19.9	18.4	17.6
	Dry Density, pcf	119.8	123.2	125.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6154	0.5704	0.5469
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.93	0.90	0.89
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		2047.0	3841.8	7610.9
Strain, %		19.5	17.0	18.7
Ult. Stress, psf		2034.4	3781.8	7465.7
Strain, %		15.1	14.9	15.1
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 15 **PI=** NP
Specific Gravity= 3.1
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Horquila #3
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 7/27/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 7/27/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Horquila #3
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=3.1 **LL=**15 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	243.670		309.220
Moisture content: Dry soil+tare, gms.	224.020		282.660
Moisture content: Tare, gms.	96.920		148.900
Moisture, %	15.5	19.9	19.9
Moist specimen weight, gms.	153.7		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.93	
Net decrease in height, in.		0.06	
Wet Density, pcf	129.7	143.6	
Dry density, pcf	112.3	119.8	
Void ratio	0.7234	0.6154	
Saturation, %	66.3	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 2047.0 psf **at reading no.** 80
Ult. Stress = 2034.4 psf **at reading no.** 68

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0010	0.0000	0.0	0.0	0.0
2	0.0050	0.4231	13.3	0.2	419.5
3	0.0100	0.5885	18.5	0.4	583.5
4	0.0150	0.7316	23.0	0.6	725.4
5	0.0200	0.9352	29.4	0.8	927.3
6	0.0250	0.9511	29.9	1.0	943.1
7	0.0300	0.9988	31.4	1.2	990.4
8	0.0350	1.0465	32.9	1.5	1037.7
9	0.0400	1.0974	34.5	1.7	1088.2
10	0.0450	1.1611	36.5	1.9	1151.3

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0500	1.2056	37.9	2.1	1195.4
12	0.0550	1.2501	39.3	2.3	1239.6
13	0.0600	1.2978	40.8	2.5	1286.9
14	0.0650	1.3456	42.3	2.7	1334.2
15	0.0700	1.3805	43.4	2.9	1368.9
16	0.0750	1.4060	44.2	3.1	1394.1
17	0.0800	1.4378	45.2	3.3	1425.7
18	0.0850	1.4728	46.3	3.5	1460.4
19	0.0900	1.5014	47.2	3.7	1488.7
20	0.0950	1.5301	48.1	3.9	1517.1
21	0.1000	1.5555	48.9	4.1	1542.4
22	0.1050	1.5809	49.7	4.4	1567.6
23	0.1100	1.6000	50.3	4.6	1586.5
24	0.1150	1.6191	50.9	4.8	1605.5
25	0.1200	1.6446	51.7	5.0	1630.7
26	0.1250	1.6637	52.3	5.2	1649.6
27	0.1300	1.6827	52.9	5.4	1668.5
28	0.1350	1.7018	53.5	5.6	1687.5
29	0.1400	1.7209	54.1	5.8	1706.4
30	0.1450	1.7400	54.7	6.0	1725.3
31	0.1500	1.7591	55.3	6.2	1744.2
32	0.1550	1.7750	55.8	6.4	1760.0
33	0.1600	1.7845	56.1	6.6	1769.5
34	0.1650	1.7941	56.4	6.8	1778.9
35	0.1700	1.8036	56.7	7.1	1788.4
36	0.1750	1.8163	57.1	7.3	1801.0
37	0.1800	1.8227	57.3	7.5	1807.3
38	0.1850	1.8291	57.5	7.7	1813.6
39	0.1900	1.8354	57.7	7.9	1819.9
40	0.1950	1.8418	57.9	8.1	1826.2
41	0.2000	1.8513	58.2	8.3	1835.7
42	0.2050	1.8609	58.5	8.5	1845.2
43	0.2150	1.8736	58.9	8.9	1857.8
44	0.2200	1.8800	59.1	9.1	1864.1
45	0.2250	1.8863	59.3	9.3	1870.4
46	0.2300	1.8990	59.7	9.5	1883.0
47	0.2350	1.9054	59.9	9.8	1889.3
48	0.2400	1.9118	60.1	10.0	1895.6
49	0.2450	1.9245	60.4	10.2	1908.2
50	0.2500	1.9309	60.6	10.4	1914.6
51	0.2550	1.9372	60.8	10.6	1920.9
52	0.2600	1.9436	61.0	10.8	1927.2
53	0.2650	1.9499	61.2	11.0	1933.5
54	0.2700	1.9595	61.5	11.2	1942.9
55	0.2750	1.9690	61.8	11.4	1952.4
56	0.2800	1.9754	62.0	11.6	1958.7
57	0.2850	1.9818	62.2	11.8	1965.0

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
58	0.2900	1.9945	62.6	12.0	1977.6
59	0.2950	2.0008	62.8	12.2	1983.9
60	0.3000	2.0072	63.0	12.4	1990.3
61	0.3100	2.0104	63.1	12.9	1993.4
62	0.3200	2.0199	63.4	13.3	2002.9
63	0.3250	2.0263	63.6	13.5	2009.2
64	0.3350	2.0295	63.7	13.9	2012.3
65	0.3400	2.0390	64.0	14.1	2021.8
66	0.3450	2.0454	64.2	14.3	2028.1
67	0.3550	2.0517	64.4	14.7	2034.4
68	0.3650	2.0517	64.4	15.1	2034.4
69	0.3750	2.0549	64.5	15.6	2037.6
70	0.3850	2.0517	64.4	16.0	2034.4
71	0.3950	2.0517	64.4	16.4	2034.4
72	0.4050	2.0486	64.3	16.8	2031.3
73	0.4200	2.0454	64.2	17.4	2028.1
74	0.4250	2.0517	64.4	17.6	2034.4
75	0.4300	2.0454	64.2	17.8	2028.1
76	0.4350	2.0517	64.4	18.0	2034.4
77	0.4450	2.0517	64.4	18.5	2034.4
78	0.4550	2.0517	64.4	18.9	2034.4
79	0.4650	2.0613	64.7	19.3	2043.9
80	0.4700	2.0645	64.8	19.5	2047.0
81	0.4750	2.0581	64.6	19.7	2040.7
82	0.4800	2.0454	64.2	19.9	2028.1
83	0.4900	2.0613	64.7	20.3	2043.9
84	0.4950	2.0486	64.3	20.5	2031.3

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	243.670		307.270
Moisture content: Dry soil+tare, gms.	224.020		282.660
Moisture content: Tare, gms.	96.920		148.900
Moisture, %	15.5	18.4	18.4
Moist specimen weight, gms.	153.3		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.90	
Net decrease in height, in.		0.09	
Wet Density, pcf	129.4	145.9	
Dry density, pcf	112.0	123.2	
Void ratio	0.7274	0.5704	
Saturation, %	65.9	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3841.8 psf **at reading no.** 68

Ult. Stress = 3781.8 psf **at reading no.** 63

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0010	0.0000	0.0	0.0	0.0
2	0.0010	0.0478	1.5	0.0	47.4
3	0.0050	0.7609	23.9	0.2	754.5
4	0.0100	1.0824	34.0	0.4	1073.3
5	0.0150	1.3467	42.3	0.6	1335.3
6	0.0200	1.5441	48.5	0.8	1531.0
7	0.0250	1.7223	54.1	1.0	1707.8
8	0.0300	1.8624	58.5	1.2	1846.7
9	0.0350	1.9898	62.5	1.5	1973.0
10	0.0400	2.1235	66.7	1.7	2105.5
11	0.0450	2.2317	70.1	1.9	2212.9
12	0.0500	2.3272	73.1	2.1	2307.6
13	0.0550	2.4291	76.3	2.3	2408.6
14	0.0600	2.5151	79.0	2.5	2493.8
15	0.0650	2.6010	81.7	2.7	2579.1
16	0.0700	2.6774	84.1	2.9	2654.8
17	0.0750	2.7411	86.1	3.1	2718.0
18	0.0800	2.8048	88.1	3.3	2781.1
19	0.0850	2.8716	90.2	3.5	2847.4
20	0.0900	2.9257	91.9	3.7	2901.0
21	0.0950	2.9767	93.5	3.9	2951.6
22	0.1000	3.0276	95.1	4.1	3002.1
23	0.1050	3.0467	95.7	4.4	3021.0
24	0.1100	3.1008	97.4	4.6	3074.7
25	0.1150	3.1359	98.5	4.8	3109.4
26	0.1200	3.1677	99.5	5.0	3141.0

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1250	3.1995	100.5	5.2	3172.5
28	0.1300	3.2282	101.4	5.4	3200.9
29	0.1350	3.2537	102.2	5.6	3226.2
30	0.1400	3.2823	103.1	5.8	3254.6
31	0.1450	3.3141	104.1	6.0	3286.2
32	0.1500	3.3428	105.0	6.2	3314.6
33	0.1550	3.3651	105.7	6.4	3336.7
34	0.1600	3.3874	106.4	6.6	3358.8
35	0.1650	3.4160	107.3	6.8	3387.2
36	0.1700	3.4351	107.9	7.1	3406.1
37	0.1750	3.4574	108.6	7.3	3428.2
38	0.1800	3.4733	109.1	7.5	3444.0
39	0.1850	3.4892	109.6	7.7	3459.8
40	0.1900	3.4670	108.9	7.9	3437.7
41	0.2000	3.4892	109.6	8.3	3459.8
42	0.2050	3.5052	110.1	8.5	3475.6
43	0.2100	3.4924	109.7	8.7	3462.9
44	0.2150	3.5115	110.3	8.9	3481.9
45	0.2200	3.5306	110.9	9.1	3500.8
46	0.2300	3.5211	110.6	9.5	3491.4
47	0.2350	3.5338	111.0	9.8	3504.0
48	0.2400	3.5561	111.7	10.0	3526.1
49	0.2450	3.5752	112.3	10.2	3545.0
50	0.2500	3.6007	113.1	10.4	3570.3
51	0.2550	3.6198	113.7	10.6	3589.2
52	0.2650	3.6452	114.5	11.0	3614.5
53	0.2700	3.6643	115.1	11.2	3633.4
54	0.2800	3.6898	115.9	11.6	3658.7
55	0.2850	3.7026	116.3	11.8	3671.3
56	0.2900	3.7280	117.1	12.0	3696.5
57	0.3000	3.7344	117.3	12.4	3702.9
58	0.3100	3.7535	117.9	12.9	3721.8
59	0.3150	3.7662	118.3	13.1	3734.4
60	0.3250	3.7726	118.5	13.5	3740.7
61	0.3350	3.7917	119.1	13.9	3759.7
62	0.3500	3.8012	119.4	14.5	3769.1
63	0.3600	3.8140	119.8	14.9	3781.8
64	0.3700	3.8299	120.3	15.4	3797.6
65	0.3800	3.8394	120.6	15.8	3807.0
66	0.3900	3.8617	121.3	16.2	3829.1
67	0.4000	3.8617	121.3	16.6	3829.1
68	0.4100	3.8745	121.7	17.0	3841.8
69	0.4150	3.8745	121.7	17.2	3841.8
70	0.4250	3.8617	121.3	17.6	3829.1
71	0.4350	3.8554	121.1	18.0	3822.8
72	0.4450	3.8490	120.9	18.5	3816.5
73	0.4550	3.8426	120.7	18.9	3810.2

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
74	0.4650	3.8331	120.4	19.3	3800.7
75	0.4800	3.8235	120.1	19.9	3791.2
76	0.4900	3.8044	119.5	20.3	3772.3

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	243.670		352.200
Moisture content: Dry soil+tare, gms.	224.020		328.680
Moisture content: Tare, gms.	96.920		195.350
Moisture, %	15.5	17.6	17.6
Moist specimen weight, gms.	153.4		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.89	
Net decrease in height, in.		0.10	
Wet Density, pcf	129.4	147.2	
Dry density, pcf	112.1	125.1	
Void ratio	0.7265	0.5469	
Saturation, %	66.0	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 7610.9 psf **at reading no.** 73

Ult. Stress = 7465.7 psf **at reading no.** 65

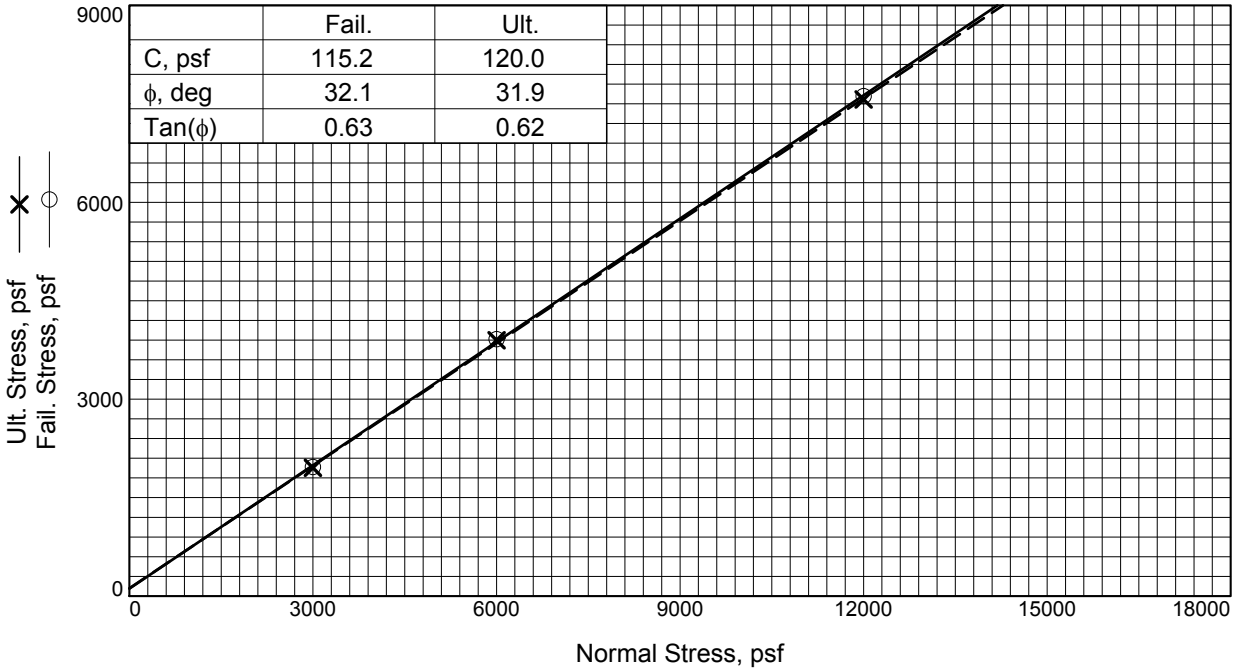
No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.9837	30.9	0.2	975.4
2	0.0100	1.5886	49.9	0.4	1575.2
3	0.0150	2.0980	65.9	0.6	2080.3
4	0.0200	2.5819	81.1	0.8	2560.1
5	0.0250	2.9926	94.0	1.0	2967.3
6	0.0300	3.3587	105.5	1.2	3330.4
7	0.0350	3.6452	114.5	1.5	3614.5
8	0.0400	3.9127	122.9	1.7	3879.6
9	0.0450	4.1419	130.1	1.9	4106.9
10	0.0500	4.3711	137.3	2.1	4334.2
11	0.0550	4.5558	143.1	2.3	4517.3
12	0.0600	4.7404	148.9	2.5	4700.4
13	0.0650	4.8996	153.9	2.7	4858.2
14	0.0700	5.0524	158.7	2.9	5009.7
15	0.0750	5.2116	163.7	3.1	5167.6
16	0.0800	5.3517	168.1	3.3	5306.5
17	0.0850	5.4854	172.3	3.5	5439.1
18	0.0900	5.5936	175.7	3.7	5546.4
19	0.0950	5.6509	177.5	3.9	5603.2

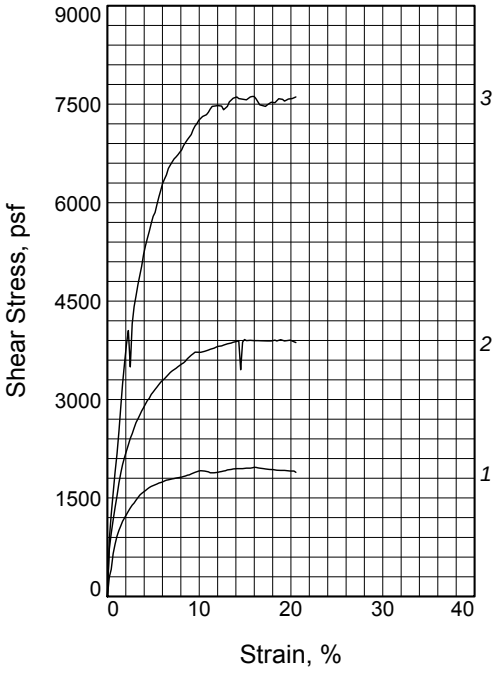
Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
20	0.1000	5.7974	182.1	4.1	5748.4
21	0.1050	5.8992	185.3	4.4	5849.4
22	0.1100	5.9820	187.9	4.6	5931.5
23	0.1150	6.0680	190.6	4.8	6016.7
24	0.1200	6.1539	193.3	5.0	6102.0
25	0.1250	6.2017	194.8	5.2	6149.3
26	0.1300	6.2813	197.3	5.4	6228.2
27	0.1350	6.3609	199.8	5.6	6307.2
28	0.1400	6.4405	202.3	5.8	6386.1
29	0.1450	6.4787	203.5	6.0	6424.0
30	0.1500	6.5423	205.5	6.2	6487.1
31	0.1550	6.6156	207.8	6.4	6559.7
32	0.1600	6.6761	209.7	6.6	6619.7
33	0.1700	6.7302	211.4	7.1	6673.3
34	0.1750	6.7716	212.7	7.3	6714.4
35	0.1800	6.8352	214.7	7.5	6777.5
36	0.2050	6.7811	213.0	8.5	6723.9
37	0.2100	6.9880	219.5	8.7	6929.0
38	0.2150	7.0135	220.3	8.9	6954.3
39	0.2200	7.0454	221.3	9.1	6985.9
40	0.2250	7.0867	222.6	9.3	7026.9
41	0.2300	7.1377	224.2	9.5	7077.4
42	0.2350	7.1727	225.3	9.8	7112.1
43	0.2400	7.2141	226.6	10.0	7153.2
44	0.2450	7.2682	228.3	10.2	7206.8
45	0.2500	7.3128	229.7	10.4	7251.0
46	0.2550	7.3510	230.9	10.6	7288.9
47	0.2600	7.3828	231.9	10.8	7320.5
48	0.2650	7.4083	232.7	11.0	7345.7
49	0.2700	7.4465	233.9	11.2	7383.6
50	0.2750	7.4942	235.4	11.4	7431.0
51	0.2800	7.5324	236.6	11.6	7468.8
52	0.2900	7.5675	237.7	12.0	7503.6
53	0.3000	7.5420	236.9	12.4	7478.3
54	0.3050	7.4942	235.4	12.7	7431.0
55	0.3100	7.4497	234.0	12.9	7386.8
56	0.3150	7.3892	232.1	13.1	7326.8
57	0.3200	7.3542	231.0	13.3	7292.1
58	0.3300	7.3032	229.4	13.7	7241.6
59	0.3350	7.3510	230.9	13.9	7288.9
60	0.3400	7.3764	231.7	14.1	7314.2
61	0.3450	7.4019	232.5	14.3	7339.4
62	0.3500	7.4274	233.3	14.5	7364.7
63	0.3550	7.4720	234.7	14.7	7408.9
64	0.3600	7.5038	235.7	14.9	7440.4
65	0.3650	7.5293	236.5	15.1	7465.7
66	0.3750	7.5643	237.6	15.6	7500.4

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
67	0.3850	7.5802	238.1	16.0	7516.2
68	0.3950	7.6248	239.5	16.4	7560.4
69	0.4050	7.6502	240.3	16.8	7585.6
70	0.4200	7.6502	240.3	17.4	7585.6
71	0.4300	7.6693	240.9	17.8	7604.6
72	0.4400	7.6693	240.9	18.3	7604.6
73	0.4500	7.6757	241.1	18.7	7610.9
74	0.4550	7.6757	241.1	18.9	7610.9
75	0.4650	7.6757	241.1	19.3	7610.9
76	0.4800	7.6566	240.5	19.9	7592.0
77	0.4900	7.6343	239.8	20.3	7569.9





Sample No.		1	2	3
Initial	Water Content, %	16.5	16.5	16.5
	Dry Density, pcf	104.8	105.0	105.0
	Saturation, %	69.7	70.0	70.1
	Void Ratio	0.6623	0.6587	0.6584
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	21.6	20.2	17.6
	Dry Density, pcf	108.7	111.5	116.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6021	0.5620	0.4917
	Diameter, in.	2.41	2.41	2.41
	Height, in.	0.96	0.94	0.90
Normal Stress, psf		3000.0	6000.0	12000.0
Fail. Stress, psf		1966.6	3914.4	7617.2
Strain, %		16.0	14.9	15.8
Ult. Stress, psf		1954.0	3898.6	7566.7
Strain, %		15.1	15.1	15.1
Strain rate, %/min.		0.17	0.17	0.17

Sample Type: Remolded to 90% MDD
Description: sandy silt

LL= 17 **PI=** NP
Specific Gravity= 2.79
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.

Fig. _____

Client: AMEC

Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Location: Colina #3
Sample Number: DS
Proj. No.: DV108-130.10 **Date Sampled:** 8/7/10

Knight Piésold CONSULTING

Tested By: jhk **Checked By:** jdb

DIRECT SHEAR TEST

8/11/2010

Date: 8/7/10
Client: AMEC
Project: Rosemont Dry Stack Tailings Facility
Project No. 74201191A
Project No.: DV108-130.10
Location: Colina #3
Sample Number: DS
Description: sandy silt
Remarks: Failure tangents drawn at peak shear stress and approximately 15% strain. Specimens were inundated.
Type of Sample: Remolded to 90% MDD
Specific Gravity=2.79 **LL=**17 **PL=** **PI=**NP

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	296.700		304.600
Moisture content: Dry soil+tare, gms.	271.730		277.500
Moisture content: Tare, gms.	120.710		151.980
Moisture, %	16.5	21.6	21.6
Moist specimen weight, gms.	145.5		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.96	
Net decrease in height, in.		0.04	
Wet Density, pcf	122.1	132.2	
Dry density, pcf	104.8	108.7	
Void ratio	0.6623	0.6021	
Saturation, %	69.7	100.0	

Test Readings for Specimen No. 1

Load ring constant = 31.4108 lbs. per input unit
Normal stress = 3000 psf
Strain rate, %/min. = 0.17
Fail. Stress = 1966.6 psf **at reading no.** 65
Ult. Stress = 1954.0 psf **at reading no.** 62

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.2961	9.3	0.2	293.6
2	0.0100	0.4171	13.1	0.4	413.5
3	0.0150	0.6590	20.7	0.6	653.4
4	0.0200	0.8023	25.2	0.8	795.5
5	0.0250	0.9264	29.1	1.0	918.6
6	0.0300	1.0156	31.9	1.2	1007.0
7	0.0350	1.0856	34.1	1.5	1076.4
8	0.0400	1.1557	36.3	1.7	1145.9
9	0.0450	1.2066	37.9	1.9	1196.4
10	0.0500	1.2575	39.5	2.1	1246.9

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
11	0.0550	1.3085	41.1	2.3	1297.4
12	0.0600	1.3594	42.7	2.5	1347.9
13	0.0650	1.4040	44.1	2.7	1392.1
14	0.0700	1.4358	45.1	2.9	1423.7
15	0.0750	1.4804	46.5	3.1	1467.9
16	0.0800	1.5186	47.7	3.3	1505.8
17	0.0850	1.5568	48.9	3.5	1543.6
18	0.0900	1.5823	49.7	3.7	1568.9
19	0.0950	1.6045	50.4	3.9	1591.0
20	0.1000	1.6268	51.1	4.1	1613.1
21	0.1050	1.6523	51.9	4.4	1638.3
22	0.1100	1.6746	52.6	4.6	1660.4
23	0.1150	1.6905	53.1	4.8	1676.2
24	0.1200	1.7032	53.5	5.0	1688.9
25	0.1250	1.7160	53.9	5.2	1701.5
26	0.1300	1.7287	54.3	5.4	1714.1
27	0.1350	1.7414	54.7	5.6	1726.7
28	0.1400	1.7510	55.0	5.8	1736.2
29	0.1450	1.7605	55.3	6.0	1745.7
30	0.1500	1.7733	55.7	6.2	1758.3
31	0.1550	1.7860	56.1	6.4	1770.9
32	0.1600	1.7924	56.3	6.6	1777.2
33	0.1700	1.8051	56.7	7.1	1789.9
34	0.1750	1.8115	56.9	7.3	1796.2
35	0.1800	1.8178	57.1	7.5	1802.5
36	0.1850	1.8242	57.3	7.7	1808.8
37	0.1950	1.8338	57.6	8.1	1818.3
38	0.2000	1.8433	57.9	8.3	1827.8
39	0.2050	1.8497	58.1	8.5	1834.1
40	0.2100	1.8624	58.5	8.7	1846.7
41	0.2150	1.8688	58.7	8.9	1853.0
42	0.2200	1.8815	59.1	9.1	1865.6
43	0.2250	1.8943	59.5	9.3	1878.3
44	0.2300	1.9070	59.9	9.5	1890.9
45	0.2350	1.9165	60.2	9.8	1900.4
46	0.2400	1.9261	60.5	10.0	1909.8
47	0.2450	1.9325	60.7	10.2	1916.1
48	0.2550	1.9261	60.5	10.6	1909.8
49	0.2650	1.9134	60.1	11.0	1897.2
50	0.2700	1.9006	59.7	11.2	1884.6
51	0.2800	1.9006	59.7	11.6	1884.6
52	0.2900	1.9070	59.9	12.0	1890.9
53	0.2950	1.9134	60.1	12.2	1897.2
54	0.3000	1.9197	60.3	12.4	1903.5
55	0.3050	1.9261	60.5	12.7	1909.8
56	0.3100	1.9325	60.7	12.9	1916.1
57	0.3150	1.9452	61.1	13.1	1928.8

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
58	0.3250	1.9516	61.3	13.5	1935.1
59	0.3300	1.9579	61.5	13.7	1941.4
60	0.3400	1.9643	61.7	14.1	1947.7
61	0.3550	1.9643	61.7	14.7	1947.7
62	0.3650	1.9707	61.9	15.1	1954.0
63	0.3750	1.9707	61.9	15.6	1954.0
64	0.3800	1.9770	62.1	15.8	1960.3
65	0.3850	1.9834	62.3	16.0	1966.6
66	0.3900	1.9834	62.3	16.2	1966.6
67	0.3950	1.9770	62.1	16.4	1960.3
68	0.4000	1.9707	61.9	16.6	1954.0
69	0.4100	1.9643	61.7	17.0	1947.7
70	0.4150	1.9579	61.5	17.2	1941.4
71	0.4250	1.9516	61.3	17.6	1935.1
72	0.4350	1.9484	61.2	18.0	1931.9
73	0.4450	1.9388	60.9	18.5	1922.5
74	0.4550	1.9356	60.8	18.9	1919.3
75	0.4650	1.9356	60.8	19.3	1919.3
76	0.4800	1.9261	60.5	19.9	1909.8
77	0.4900	1.9261	60.5	20.3	1909.8
78	0.4950	1.9070	59.9	20.5	1890.9

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	296.700		299.600
Moisture content: Dry soil+tare, gms.	271.730		274.310
Moisture content: Tare, gms.	120.710		148.810
Moisture, %	16.5	20.2	20.2
Moist specimen weight, gms.	145.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.94	
Net decrease in height, in.		0.06	
Wet Density, pcf	122.4	134.0	
Dry density, pcf	105.0	111.5	
Void ratio	0.6587	0.5620	
Saturation, %	70.0	100.0	

Test Readings for Specimen No. 2

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 6000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 3914.4 psf **at reading no.** 62

Ult. Stress = 3898.6 psf **at reading no.** 63

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.7259	22.8	0.2	719.7
2	0.0100	0.9710	30.5	0.4	962.8
3	0.0150	1.1748	36.9	0.6	1164.8
4	0.0200	1.3658	42.9	0.8	1354.2
5	0.0250	1.5441	48.5	1.0	1531.0
6	0.0300	1.7414	54.7	1.2	1726.7
7	0.0350	1.9006	59.7	1.5	1884.6
8	0.0400	2.0280	63.7	1.7	2010.8
9	0.0450	2.1362	67.1	1.9	2118.2
10	0.0500	2.2349	70.2	2.1	2216.0
11	0.0550	2.3304	73.2	2.3	2310.7
12	0.0600	2.4291	76.3	2.5	2408.6
13	0.0650	2.4991	78.5	2.7	2478.0
14	0.0700	2.5883	81.3	2.9	2566.4
15	0.0750	2.6711	83.9	3.1	2648.5
16	0.0800	2.7284	85.7	3.3	2705.3
17	0.0850	2.7889	87.6	3.5	2765.3
18	0.0900	2.8493	89.5	3.7	2825.3
19	0.0950	2.9003	91.1	3.9	2875.8
20	0.1000	2.9576	92.9	4.1	2932.6
21	0.1050	3.0117	94.6	4.4	2986.3
22	0.1100	3.0467	95.7	4.6	3021.0
23	0.1150	3.1040	97.5	4.8	3077.8
24	0.1200	3.1422	98.7	5.0	3115.7
25	0.1250	3.1804	99.9	5.2	3153.6
26	0.1300	3.2186	101.1	5.4	3191.5

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
27	0.1350	3.2568	102.3	5.6	3229.3
28	0.1400	3.2919	103.4	5.8	3264.1
29	0.1450	3.3205	104.3	6.0	3292.5
30	0.1500	3.3460	105.1	6.2	3317.7
31	0.1550	3.3778	106.1	6.4	3349.3
32	0.1600	3.4097	107.1	6.6	3380.9
33	0.1650	3.4415	108.1	6.8	3412.4
34	0.1700	3.4670	108.9	7.1	3437.7
35	0.1750	3.4861	109.5	7.3	3456.6
36	0.1800	3.5052	110.1	7.5	3475.6
37	0.1850	3.5306	110.9	7.7	3500.8
38	0.1900	3.5497	111.5	7.9	3519.8
39	0.1950	3.5720	112.2	8.1	3541.9
40	0.2000	3.5879	112.7	8.3	3557.6
41	0.2050	3.6166	113.6	8.5	3586.1
42	0.2100	3.6516	114.7	8.7	3620.8
43	0.2200	3.7057	116.4	9.1	3674.4
44	0.2250	3.7280	117.1	9.3	3696.5
45	0.2300	3.7535	117.9	9.5	3721.8
46	0.2450	3.7503	117.8	10.2	3718.6
47	0.2550	3.7662	118.3	10.6	3734.4
48	0.2650	3.7853	118.9	11.0	3753.4
49	0.2700	3.7981	119.3	11.2	3766.0
50	0.2800	3.8140	119.8	11.6	3781.8
51	0.2850	3.8299	120.3	11.8	3797.6
52	0.2900	3.8426	120.7	12.0	3810.2
53	0.3000	3.8490	120.9	12.4	3816.5
54	0.3050	3.8617	121.3	12.7	3829.1
55	0.3150	3.8808	121.9	13.1	3848.1
56	0.3250	3.8936	122.3	13.5	3860.7
57	0.3300	3.9063	122.7	13.7	3873.3
58	0.3400	3.9190	123.1	14.1	3885.9
59	0.3450	3.9318	123.5	14.3	3898.6
60	0.3500	3.4829	109.4	14.5	3453.5
61	0.3550	3.9095	122.8	14.7	3876.5
62	0.3600	3.9477	124.0	14.9	3914.4
63	0.3650	3.9318	123.5	15.1	3898.6
64	0.3750	3.9350	123.6	15.6	3901.7
65	0.3850	3.9318	123.5	16.0	3898.6
66	0.3950	3.9318	123.5	16.4	3898.6
67	0.4050	3.9286	123.4	16.8	3895.4
68	0.4200	3.9254	123.3	17.4	3892.3
69	0.4300	3.9254	123.3	17.8	3892.3
70	0.4400	3.9381	123.7	18.3	3904.9
71	0.4450	3.9254	123.3	18.5	3892.3
72	0.4550	3.9445	123.9	18.9	3911.2
73	0.4650	3.9254	123.3	19.3	3892.3

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
74	0.4800	3.9381	123.7	19.9	3904.9
75	0.4900	3.9127	122.9	20.3	3879.6
76	0.4950	3.8999	122.5	20.5	3867.0

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	296.700		296.580
Moisture content: Dry soil+tare, gms.	271.730		274.470
Moisture content: Tare, gms.	120.710		148.990
Moisture, %	16.5	17.6	17.6
Moist specimen weight, gms.	145.8		
Diameter, in.	2.41	2.41	
Area, in.²	4.56	4.56	
Height, in.	0.99	0.90	
Net decrease in height, in.		0.10	
Wet Density, pcf	122.4	137.3	
Dry density, pcf	105.0	116.8	
Void ratio	0.6584	0.4917	
Saturation, %	70.1	100.0	

Test Readings for Specimen No. 3

Load ring constant = 31.4108 lbs. per input unit

Normal stress = 12000 psf

Strain rate, %/min. = 0.17

Fail. Stress = 7617.2 psf **at reading no.** 65

Ult. Stress = 7566.7 psf **at reading no.** 63

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
0	0.0000	0.0000	0.0	0.0	0.0
1	0.0050	0.8787	27.6	0.2	871.3
2	0.0100	1.2639	39.7	0.4	1253.2
3	0.0150	1.5886	49.9	0.6	1575.2
4	0.0200	1.9102	60.0	0.8	1894.0
5	0.0250	2.1871	68.7	1.0	2168.7
6	0.0300	2.5310	79.5	1.2	2509.6
7	0.0350	2.9226	91.8	1.5	2897.9
8	0.0400	3.2696	102.7	1.7	3242.0
9	0.0450	3.5816	112.5	1.9	3551.3
10	0.0500	3.8681	121.5	2.1	3835.4
11	0.0550	4.0846	128.3	2.3	4050.1
12	0.0600	3.5275	110.8	2.5	3497.7
13	0.0650	4.1896	131.6	2.7	4154.3
14	0.0700	4.4539	139.9	2.9	4416.3
15	0.0750	4.6194	145.1	3.1	4580.4
16	0.0800	4.7945	150.6	3.3	4754.0
17	0.0850	4.9378	155.1	3.5	4896.1
18	0.0900	5.0715	159.3	3.7	5028.7
19	0.0950	5.2530	165.0	3.9	5208.6

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
20	0.1000	5.3899	169.3	4.1	5344.4
21	0.1050	5.5045	172.9	4.4	5458.0
22	0.1100	5.6127	176.3	4.6	5565.3
23	0.1150	5.7337	180.1	4.8	5685.3
24	0.1200	5.8419	183.5	5.0	5792.6
25	0.1250	5.8992	185.3	5.2	5849.4
26	0.1300	6.0266	189.3	5.4	5975.7
27	0.1350	6.1412	192.9	5.6	6089.4
28	0.1400	6.2367	195.9	5.8	6184.1
29	0.1450	6.3450	199.3	6.0	6291.4
30	0.1500	6.4150	201.5	6.2	6360.8
31	0.1550	6.4787	203.5	6.4	6424.0
32	0.1600	6.5774	206.6	6.6	6521.8
33	0.1650	6.6283	208.2	6.8	6572.3
34	0.1700	6.6761	209.7	7.1	6619.7
35	0.1750	6.7238	211.2	7.3	6667.0
36	0.1800	6.7525	212.1	7.5	6695.4
37	0.1850	6.7875	213.2	7.7	6730.2
38	0.1900	6.8257	214.4	7.9	6768.0
39	0.1950	6.8607	215.5	8.1	6802.8
40	0.2000	6.9276	217.6	8.3	6869.1
41	0.2050	6.9753	219.1	8.5	6916.4
42	0.2100	7.0199	220.5	8.7	6960.6
43	0.2200	7.0963	222.9	9.1	7036.4
44	0.2250	7.1727	225.3	9.3	7112.1
45	0.2300	7.2300	227.1	9.5	7169.0
46	0.2350	7.2682	228.3	9.8	7206.8
47	0.2400	7.3160	229.8	10.0	7254.2
48	0.2450	7.3446	230.7	10.2	7282.6
49	0.2500	7.3764	231.7	10.4	7314.2
50	0.2600	7.4019	232.5	10.8	7339.4
51	0.2650	7.4401	233.7	11.0	7377.3
52	0.2700	7.4911	235.3	11.2	7427.8
53	0.2750	7.5293	236.5	11.4	7465.7
54	0.2900	7.5420	236.9	12.0	7478.3
55	0.3000	7.5356	236.7	12.4	7472.0
56	0.3050	7.4783	234.9	12.7	7415.2
57	0.3150	7.5293	236.5	13.1	7465.7
58	0.3200	7.5993	238.7	13.3	7535.1
59	0.3300	7.6566	240.5	13.7	7592.0
60	0.3400	7.6757	241.1	14.1	7610.9
61	0.3450	7.6502	240.3	14.3	7585.6
62	0.3550	7.6407	240.0	14.7	7576.2
63	0.3650	7.6311	239.7	15.1	7566.7
64	0.3750	7.6757	241.1	15.6	7610.9
65	0.3800	7.6821	241.3	15.8	7617.2
66	0.3850	7.6821	241.3	16.0	7617.2

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress psf
67	0.3900	7.6502	240.3	16.2	7585.6
68	0.4000	7.5547	237.3	16.6	7490.9
69	0.4150	7.5293	236.5	17.2	7465.7
70	0.4200	7.5547	237.3	17.4	7490.9
71	0.4300	7.5929	238.5	17.8	7528.8
72	0.4400	7.5866	238.3	18.3	7522.5
73	0.4500	7.6471	240.2	18.7	7582.5
74	0.4600	7.6375	239.9	19.1	7573.0
75	0.4650	7.6120	239.1	19.3	7547.8
76	0.4750	7.6439	240.1	19.7	7579.3
77	0.4850	7.6502	240.3	20.1	7585.6
78	0.4950	7.6757	241.1	20.5	7610.9

Appendix A.5

Point Load Testing, L.A. Abrasion, and Slake Durability

SLAKE DURABILITY
ASTM D 4644

CLIENT: AMEC Earth & Enviromental JOB NO.: 2399-22

PROJECT: Rosemont Copper Co. DATE TESTED: 7/26-8/3/10 BL

Boring	Epitaph	Abrigo	Tertiary Gravel	Horquilla
Depth	1315.2-1317.5	1337.0-1339.0	228.8-230.7	1350.9-1352.8
Depth		1208.0-1209.9	328.4-330.4	481.0-484.3
Rock Type				
Initial Wt. wet Sample & Drum (g)	1652.0	1712.2	1641.8	1746.6
Initial Wt. dry Sample & Drum (g)	1645.9	1710.1	1627.3	1745.8
1st Cycle Wt. Sample & Drum (g)	1643.6	1704.4	1467.8	1744.5
2nd Cycle Wt. Sample & Drum (g)	1641.6	1701.7	1426.8	1743.7
Wt. of Drum (g)	1125.8	1185.0	1144.5	1252.1
Initial Wt Dry Sample (g)	520.1	525.1	482.8	493.7
1st Cycle Wt. Sample (g)	517.8	519.4	323.3	492.4
2nd Cycle Wt. Sample (g)	515.8	516.7	282.3	491.6
1st Cycle Durability (%)	99.56	98.91	66.96	99.74
2nd Cycle Durability (%)	99.17	98.40	58.47	99.57
Moisture Content (%)	1.17	0.40	3.00	0.16
Type (I, II, III)	I	I	II	I

Boring	Concha	Willow Canyon	Glance
Depth	498.6-500.0	592.0-593.9	126.0-127.0
Depth	379.5-381.5	190.9-192.8	601.8-603.5
Rock Type			
Initial Wt. wet Sample & Drum (g)	1674.3	1724.3	1662.8
Initial Wt. dry Sample & Drum (g)	1673.8	1719.3	1661.7
1st Cycle Wt. Sample & Drum (g)	1672.1	1715.0	1659.7
2nd Cycle Wt. Sample & Drum (g)	1670.9	1712.4	1658.6
Wt. of Drum (g)	1125.7	1184.9	1144.5
Initial Wt Dry Sample (g)	548.1	534.4	517.2
1st Cycle Wt. Sample (g)	546.4	530.1	515.2
2nd Cycle Wt. Sample (g)	545.2	527.5	514.1
1st Cycle Durability (%)	99.70	99.19	99.62
2nd Cycle Durability (%)	99.47	98.70	99.39
Moisture Content (%)	0.09	0.94	0.21
Type (I, II, III)	I	I	I

Comments:

Data Entered By: BKL Date: 08/03/2010
Data Checked By: HN Date: 08/03/2010
Filename ARSD22AA

ADVANCED TERRA TESTING, INC. ATT

AXIAL POINT LOAD TEST
ASTM D 5731

CLIENT: AMEC Earth & Enviromental

JOB NO.: 2399-22

PROJECT: Rosemont Copper Co.

DATE TESTED: 07/23/10 BL

Page 1 of 1

Specimen ID Drill hole, Depth, Lith	Length (in.)	Diameter (in.)	De^2 (in^2)	Gauge Failure Load (psig)	P (lb)	Is	F	Is(50)	C	Compressive Strength (psi)	Loading with respect to Fracture/Bedding	Failure Mode
AR-2033, 1208-1209.9, Abrigo	2.237	2.391	6.810	1046	2165.2	317.9	1.1	358.4	24.9	8,920	Perpendicular	C

Notes:
L: Sample Length
D: Sample Diameter
De^2: Exquivalent Diameter = 4*L*D/pi
Piston Area (in^2): 2.07
P: Gauge Failure Load * Piston area (2.07 in^2)
Is: Point Load Index Strength = P/De^2
F: Size Correction Factor to 2.0 in = (De/2.0)^0.45
Is(50): Size Corrected Index Strength = F* Is
C: Factor to Estimate Compressive Strength related to Core Diameter
Compressive Strength in psi = C * Is(50)

Failure Modes:
F: Fracture/ Bedding Controlled
S: Substance Controlled
C: Combination Substance & Fracture

Data Entered By: BKL Date: 08/03/2010
Data Checked By: HN Date: 08/03/2010
Filename: ARPA22AA

DIAMETRAL POINT LOAD TEST
ASTM D 5731

CLIENT: AMEC Earth & Enviromental JOB NO.: 2399-22

PROJECT: Rosemont Copper Co. DATE TESTED: 07/23/10 BL

Specimen ID Drill hole, Depth, Lith	Length (in.)	Diameter (in.)	De^2 (in^2)	Gauge Failure Load (psig)	P (lb)	Is	F	Is(50)	C	Compressive Strength (psi)	Loading with respect to Fracture/ Bedding	Failure Mode
A-819, 1351.2-1351.5, Horquilla	2.011	1.716	2.945	3248	6723.4	2283.2	0.9	2131.2	21.7	46,320	Perpendicular	S
1919, 483.6-483.9, Horquilla	2.490	1.990	3.960	3160	6541.2	1651.8	1.0	1648.1	23.0	37,940	N/A	S
AR-2049, 601.8-603.5, Glance	2.991	2.407	5.794	1447	2995.3	517.0	1.1	561.9	25.0	14,030	Perpendicular	C
AR-2027, 126-127, Glance	3.058	2.498	6.240	1270	2628.9	421.3	1.1	465.6	25.4	11,830	Perpendicular	C
AR-2027, 380.2-380.5, Concha	2.997	2.493	6.215	810	1676.7	269.8	1.1	297.9	25.4	7,560	Parallel	C
AR-2044, 499.7-500, Concha	3.156	2.398	5.750	864	1788.5	311.0	1.1	337.5	24.9	8,410	Parallel	C
AR-2051A, 1315.2-1317, Epitaph	3.126	2.390	5.712	381	788.7	138.1	1.1	149.6	24.9	3,720	Parallel	F
AR-2051B, 1315.2-1317, Epitaph	2.561	2.390	5.712	661	1368.3	239.5	1.1	259.5	24.9	6,460	Parallel	C
AR-2053, 190.9-192.8, Willow Canyon	2.974	2.514	6.320	176	364.3	57.6	1.1	63.9	25.5	1,630	Parallel	F
AR-2052, 592-593.9, Willow Canyon	2.970	2.404	5.779	37	76.6	13.3	1.1	14.4	25.0	360	Parallel	F

Notes:

L: Sample Length
D: Sample Diameter
De^2: Exquivalent Diameter = D^2
Piston Area (in^2): 2.07
P: Gauge Failure Load * Piston area (in^2)
Is: Point Load Index Strength = P/De^2
F: Size Correction Factor to 2.0 in = (De/2.0)^0.45
Is(50): Size Corrected Index Strength = F* Is
C: Factor to Estimate Compressive Strength related to Core Diameter
Compressive Strength in psi = C * Is(50)

Failure Modes:
F: Fracture/ Bedding Controlled
S: Substance Controlled
C: Combination Substance & Fracture

Data Entered By: BKL Date: 08/03/2010
Data Checked By: HN Date: 08/03/2010
Filename: ARPA22AA

ADVANCED TERRA TESTING, INC. ATT

DIAMETRAL POINT LOAD TEST
ASTM D 5731

CLIENT: AMEC Earth & Enviromental JOB NO.: 2399-22

PROJECT: Rosemont Copper Co. DATE TESTED: 07/23/10BL

Specimen ID Drill hole, Depth, Lith	Length (in.)	Diameter (in.)	De^2 (in^2)	Gauge Failure Load (psig)	P (lb)	Is	F	Is(50)	C	Compressive Strength (psi)	Loading with respect to Fracture/ Bedding	Failure Mode
AR-2033, 1337-1339, Abrigo	3.049	2.403	5.774	2408	4984.6	863.2	1.1	937.6	25.0	23,400	Parallel	C
AR-2050, 328.4-330.4, Tertiary Gravel (Gila)	3.005	2.487	6.185	275	569.3	92.0	1.1	101.5	25.3	2,570	N/A	S
AR-2050, 228.8-230.7, Tertiary Gravel (Gila)	3.131	2.382	5.674	72	149.0	26.3	1.1	28.4	24.9	710	N/A	S

Notes:

L: Sample Length
D: Sample Diameter
De^2: Exquivalent Diameter = D^2
Piston Area (in^2): 2.07
P: Gauge Failure Load * Piston area (in^2)
Is: Point Load Index Strength = P/De^2
F: Size Correction Factor to 2.0 in = (De/2.0)^0.45
Is(50): Size Corrected Index Strength = F* Is
C: Factor to Estimate Compressive Strength related to Core Diameter
Compressive Strength in psi = C * Is(50)

Failure Modes:
F: Fracture/ Bedding Controlled
S: Substance Controlled
C: Combination Substance & Fracture

Data Entered By: BKL Date: 08/03/2010
Data Checked By: HN Date: 08/03/2010
Filename: ARPD22AB

ADVANCED TERRA TESTING, INC. ATT

CTC-GEOTEK, INC.
155 South Navajo Street
Denver, Colorado 80223

Date: 7-30-2010
Technician: JW

Project Name: Advance Terra Testing
Quarry Source: Rosemont Copper Co. (ATT Job No. 2399-22)
Project Number: 103016

ASTM C 131, "Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine"

Grading Used: Grading "A"

Sieve Size		Required Grading (gm)	Actual Grading Weights			
Passing	Retained		Horquilla (1350.9-1352.8 & 481.0-484.3)	Concha (379.5-381.5 & 498.6-500.0)		
1 1/2 in. (37.5 mm)	1.0 in. (25.0 mm)	1250 ± 25	1256.4	1249.4		
1.0 in. (25.0 mm)	3/4 in. (19.0 mm)	1250 ± 25	1253.4	1250.3		
3/4 in. (19.0 mm)	1/2 in. (12.5 mm)	1250 ± 10	1248.4	1254.5		
1/2 in. (12.5 mm)	3/8 in. (9.5 mm)	1250 ± 10	1248.0	1244.1		
Total Aggregate Accumulated		5000 ± 10	5006.2	4998.3		

Initial Weight (gm)	5006.2	4998.3		
Unwashed Weight at 100 Rev. (gm)	4807.2	4607.7		
Washed Weight at 500 Rev. (gm)	4173.0	3351.2		

Percent Loss at 100 Revolutions	4.0	7.8		
Percent Loss at 500 Revolutions	16.6	33.0		
Uniform Hardness Ratio	0.239	0.237		

*No. 12 (1.70 mm) Sieve was used to determine "Percent Loss

CTC-GEOTEK, INC.
155 South Navajo Street
Denver, Colorado 80223

Date: 7-30-2010
Technician: JW

Project Name: Advance Terra Testing
Quarry Source: Rosemont Copper Co. (ATT Job No. 2399-22)
Project Number: 103016

ASTM C 131, "Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine"

Grading Used: Grading "A"

Sieve Size		Required Grading (gm)	Actual Grading Weights			
Passing	Retained		Willow Canyon (592.0-593.9 & 190.9-192.8)	Glance (601.8-603.5 & 126.0-127.0)	Tertiary Gravelels (228.8-230.7 & 328.4-330.4)	Abrigo (1280.8-1209.9 & 1337.0-1339.0)
1 1/2 in. (37.5 mm)	1.0 in. (25.0 mm)	1250 ± 25	1256.5	1250.5	1247.8	1253.6
1.0 in. (25.0 mm)	3/4 in. (19.0 mm)	1250 ± 25	1248.0	1252.4	1254.7	1252.7
3/4 in. (19.0 mm)	1/2 in. (12.5 mm)	1250 ± 10	1251.4	1250.9	1251.9	1248.1
1/2 in. (12.5 mm)	3/8 in. (9.5 mm)	1250 ± 10	1248.5	1251.7	1247.3	1249.0
Total Aggregate Accumulated		5000 ± 10	5004.4	5005.5	5001.7	5003.4

Initial Weight (gm)	5004.4	5005.5	5001.7	5003.4
Unwashed Weight at 100 Rev. (gm)	4665.0	4714.2	2101.5	4771.8
Washed Weight at 500 Rev. (gm)	3709.6	3833.4	466.1	4065.5

Percent Loss at 100 Revolutions	6.8	5.8	58.0	4.6
Percent Loss at 500 Revolutions	25.9	23.4	90.7	18.7
Uniform Hardness Ratio	0.262	0.249	0.639	0.247

*No. 12 (1.70 mm) Sieve was used to determine "Percent Loss"

Appendix A.6

Torvane Undrained Shear Strength

Knight Piésold CONSULTING

Moisture-Density Worksheet

Identification				Test Results (Summary)				Density Determination					Post Test Moisture Determination				
Years 4-7 Composite				Target % Moisture	Target Dry Density (pcf)	Solids Content, %	TORVANE VALUE, tsf	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Moisture %
Years 4-7 Composite				12.0	95.0	89.8	0.23	1.000	2.420			128.46	A723	146.33	133.54	20.81	11.3
Years 4-7 Composite				15.0	95.0	87.4	0.29	1.000	2.420			131.9	A18	149.78	133.43	20.21	14.4
Years 4-7 Composite				18.0	95.0	84.9	0.26	1.000	2.420			135.4	A15	154.43	134.20	20.61	17.8
Years 4-7 Composite				21.0	95.0	82.5	0.09	1.000	2.420			138.8	ZZ	156.06	132.05	18.84	21.2
Years 4-7 Composite				24.0	95.0	80.9	0.09	1.000	2.420			142.2	1	158.45	131.73	18.77	23.7
Years 4-7 Composite				12.0	110.0	90.2	0.28	1.000	2.420			148.75	A3	167.47	153.01	20.66	10.9
Years 4-7 Composite				15.0	110.0	87.9	0.31	1.000	2.420			152.73	A20	167.7	149.8	19.7	13.8
Years 4-7 Composite				18.0	110.0	85.8	0.38	1.000	2.420			156.7	A13	175.18	153.16	19.96	16.5
Years 4-7 Composite				21.3	109.7	84.1	0.45	1.000	2.420			160.7	TSER	171.66	147.45	18.92	18.8
Years 4-7 Composite				24.0	110.0	82.2	0.12	1.000	2.420			164.7	AZ	183.35	154.47	20.94	21.6

Project	**ROSEMONT DRY STACK TAILINGS FACILITY**	**JK**	**Lab No.**	**L2010-73**
Project No.	**DV108-00130.10**	**JDB**	**Date**	**8/12/2010**

Knight Piésold CONSULTING

Moisture-Density Worksheet

Identification				*Test Results (Summary)*				*Density Determination*					*Post Test Moisture Determination*				
EARP Tailings				Target % Moisture	Target Dry Density (pcf)	Solids Content, %	TORVANE VALUE, tsf	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Moisture %
EARP				12.0	95.0	89.8	0.21	1.000	2.420			128.46	A19	145.94	133.08	20.47	11.4
EARP				15.0	95.0	87.8	0.25	1.000	2.420			131.9	A14	143.91	128.83	19.94	13.8
EARP				18.0	95.0	84.7	0.12	1.000	2.420			135.4	P	151.19	130.91	18.71	18.1
EARP				21.0	95.0	82.4	0.12	1.000	2.420			138.8	4	156.60	132.47	19.66	21.4
EARP				24.0	95.0	81.3	0.10	1.000	2.420			142.2	L28	252.75	227.79	119.28	23.0
EARP				12.0	110.0	89.9	0.29	1.000	2.420			148.75	A24	163.31	148.97	20.75	11.2
EARP				15.0	110.0	87.4	0.40	1.000	2.420			152.73	A21	170.3	151.4	20.2	14.4
EARP				18.0	110.0	86.2	0.40	1.000	2.420			156.7	RIB	168.09	147.55	19.19	16.0
EARP				21.0	110.0	84.2	0.13	1.000	2.420			160.7	XXX	174.07	149.56	18.97	18.8
EARP				24.0	110.0	82.5	0.11	1.000	2.420			164.7	L26	281.65	253.56	120.85	21.2

Project	**ROSEMONT DRY STACK TAILINGS FACILITY**	**JK**	**Lab No.**	**L2010-73**
Project No.	**DV108-00130.10**	**JDB**	**Date**	**8/12/2010**

Knight Piésold CONSULTING

Moisture-Density Worksheet

Identification				Test Results (Summary)				Density Determination					Post Test Moisture Determination				
Escabrosa Tailings				Target % Moisture	Target Dry Density (pcf)	Solids Content, %	TORVANE VALUE, tsf	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Moisture %
Escabrosa				12.0	95.0	89.9	0.16	1.000	2.420			128.5	L26	247.39	234.61	120.85	11.2
Escabrosa				15.0	95.0	87.5	0.20	1.000	2.420			131.9	XXX	149.03	132.73	18.97	14.3
Escabrosa				18.0	95.0	85.2	0.23	1.000	2.420			135.4	A24	154.40	134.62	20.75	17.4
Escabrosa				21.0	95.0	83.0	0.13	1.000	2.420			138.8	A14	157.10	133.77	19.93	20.5
Escabrosa				24.0	95.0	81.4	0.06	1.000	2.420			142.23	A21	159.58	133.68	20.15	22.8
Escabrosa				12.0	110.0	90.0	0.20	1.000	2.420			148.8	L28	266.99	252.22	119.28	11.1
Escabrosa				15.0	110.0	87.8	0.31	1.000	2.420			152.7	RIB	170.14	151.66	19.04	13.9
Escabrosa				18.0	110.0	85.7	0.33	1.000	2.420			156.7	A19	175.48	153.24	20.48	16.8
Escabrosa				21.0	110.0	83.9	0.15	1.000	2.420			160.70	P	176.9	151.5	18.7	19.2
Escabrosa				24.0	110.0	81.9	0.09	1.000	2.420			164.69	4	180.04	151.03	19.65	22.1

Project	**ROSEMONT DRY STACK TAILINGS FACILITY**	**JK**	**Lab No.** **L2010-73**
Project No.	**DV108-00130.10**	**JDB**	**Date** **8/12/2010**

Knight Piésold CONSULTING

Moisture-Density Worksheet

Identification				*Test Results (Summary)*				*Density Determination*					*Post Test Moisture Determination*				
Epitaph Tailings				Target % Moisture	Target Dry Density (pcf)	Solids Content, %	TORVANE VALUE, tsf	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Moisture %
Epitaph				12.0	95.0	90.0	0.21	1.000	2.420			128.5	L26	247.55	234.93	120.85	11.1
Epitaph				15.0	95.0	87.5	0.41	1.000	2.420			131.9	XXX	142.49	127.02	18.98	14.3
Epitaph				18.0	95.0	85.1	0.14	1.000	2.420			135.4	A15	153.77	133.88	20.61	17.6
Epitaph				21.0	95.0	83.2	0.11	1.000	2.420			138.8	RIB	156.04	133.02	19.05	20.2
Epitaph				24.0	95.0	81.3	0.08	1.000	2.420			142.23	A20	160.27	134.02	19.70	23.0
Epitaph				12.0	110.0	89.9	0.38	1.000	2.420			148.8	L28	267.17	252.27	119.29	11.2
Epitaph				15.0	110.0	87.934	0.35	1.000	2.420			152.7	A3	169.1	151.2	20.7	13.7
Epitaph				18.0	110.0	85.9	0.17	1.000	2.420			156.7	B7	174.92	153.25	20.89	16.4
Epitaph				21.0	110.0	83.7	0.15	1.000	2.420			160.70	A723	179.78	153.81	20.81	19.5
Epitaph				24.0	110.0	81.9	0.09	1.000	2.420			164.69	A13	181.61	152.39	19.97	22.1

Project	**ROSEMONT DRY STACK TAILINGS FACILITY**	**RSH**	**Lab No.**	**L2010-73**
Project No.	**DV108-00130.10**	**JDB**	**Date**	**8/16/2010**

Knight Piésold CONSULTING

Moisture-Density Worksheet

Identification				Test Results (Summary)				Density Determination					Post Test Moisture Determination				
Horquila Tailings				Target % Moisture	Target Dry Density (pcf)	Solids Content, %	TORVANE VALUE, tsf	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Moisture %
Horquila				12.0	95.0	89.3	0.16	1.000	2.420			128.5	L20	247.88	234.25	120.75	12.0
Horquila				15.0	95.0	86.8	0.19	1.000	2.420			131.9	A21	150.94	133.72	20.15	15.2
Horquila				18.0	95.0	84.6	0.14	1.000	2.420			135.4	A15	154.44	133.85	20.58	18.2
Horquila				21.0	95.0	82.6	0.07	1.000	2.420			138.8	A13	157.49	133.54	19.95	21.1
Horquila				24.0	95.0	80.8	0.03	1.000	2.420			142.23	XXX	158.10	131.32	18.97	23.8
Horquila				12.0	110.0	89.4	0.25	1.000	2.420			148.8	A723	168.21	152.62	20.80	11.8
Horquila				15.0	110.0	87.244	0.31	1.000	2.420			152.7	A20	170.8	151.6	19.7	14.6
Horquila				18.0	110.0	85.2	0.18	1.000	2.420			156.7	B7	175.05	152.19	20.87	17.4
Horquila				21.0	110.0	83.1	0.11	1.000	2.420			160.70	A3	179.56	152.70	20.66	20.3
Horquila				24.0	110.0	81.1	0.04	1.000	2.420			164.69	RIB	177.63	147.60	19.03	23.4

Project	**ROSEMONT DRY STACK TAILINGS FACILITY**		**JK**	**Lab No.**	**L2010-73**
Project No.	**DV108-00130.10**		**JDB**	**Date**	**8/16/2010**

Knight Piésold CONSULTING

Moisture-Density Worksheet

Identification				*Test Results (Summary)*				*Density Determination*					*Post Test Moisture Determination*				
Colina Tailings				Target % Moisture	Target Dry Density (pcf)	Solids Content, %	TORVANE VALUE, tsf	Sample Length (in)	Sample Diameter (in)	Wet Wt. + Tare, g	Tare, g	Wet Soil Wt., g	Tare I.D.	Wet Wt. + Tare	Dry Wt. + Tare	Tare	Moisture %
Colina				12.0	95.0	89.4	0.20	1.000	2.420			128.5	ZZ	146.63	133.07	18.84	11.9
Colina				15.0	95.0	87.3	0.18	1.000	2.420			131.9	A18	150.89	134.31	20.14	14.5
Colina				18.0	95.0	84.8	0.26	1.000	2.420			135.4	A24	154.75	134.42	20.75	17.9
Colina				21.0	95.0	82.9	0.13	1.000	2.420			138.8	4	156.11	132.73	19.67	20.7
Colina				24.0	95.0	81.3	0.15	1.000	2.420			142.23	TSER	159.39	133.08	18.92	23.0
Colina				12.0	110.0	89.7	0.30	1.000	2.420			148.8	P	165.02	149.90	18.73	11.5
Colina				15.0	110.0	87.484	0.49	1.000	2.420			152.7	A19	170.1	151.3	20.5	14.3
Colina				18.0	110.0	85.4	0.50	1.000	2.420			156.7	A14	174.58	152.02	19.95	17.1
Colina				21.0	110.0	84.0	0.16	1.000	2.420			160.70	AZ	170.28	146.34	20.92	19.1
Colina				24.0	110.0	81.7	0.16	1.000	2.420			164.69	1	179.74	150.30	18.75	22.4

Project	**ROSEMONT DRY STACK TAILINGS FACILITY**	**Sheet Prep. By**	**JK**	**Lab No.**	**L2010-73**
Project No.	**DV108-00130.10**	**Checked By**	**JDB**	**Date**	**8/16/2010**

Appendix A.7

Moisture Retention

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT	Knight Piesold	JOB NO.	2061-126
SAMPLE DATE	--	TEST STARTED	07/16/10 DPM
SOIL DESCR.	74201191A	TEST FINISHED	08/17/10 DPM
LOCATION	Rosemont Dry Stack Tailings		

MASS DATA

Sample Description	Ring Mass g	As Rec. Mass g	Sat. Mass g	0.3 Bar Mass g	0.7 Bar Mass g	2 Bar Mass g	5 Bar Mass g	15 Bar Mass g	Dry Mass Filter, Ring, & Dish (g)	Dish Wt. g
Filter Mass g		0.321	1.090	0.491	0.461	0.442	0.438	0.432		
Escabrosa	10.520	50.081	51.400	49.455	49.086	48.324	46.782	45.586	46.628	2.362
Escabrosa - r	10.647	50.387	51.847	49.702	49.337	48.580	47.092	45.843	46.894	2.375
Composite	10.684	49.502	50.685	48.938	48.572	48.034	46.599	45.325	45.618	2.304
Composite - r	10.469	49.280	50.302	48.626	48.286	47.580	46.213	45.058	45.462	2.368

Data Entered By: MLM Date: 08/20/2010
Data Checked By: DLM Date: 8/20/10
Filename: KPK0ESCO

ADVANCED TERRA TESTING, INC. ATT

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT	Knight Piesold	JOB NO.	2061-126
SAMPLE DATE	--	TEST STARTED	07/16/10 DPM
SOIL DESCR.	74201191A	TEST FINISHED	08/17/10 DPM
LOCATION	Rosemont Dry Stack Tailings		

Moisture Content Data: % D.M. = Moisture Content By Dry Mass; % Vol. = Moisture Content By Volume

Sample Description	Sample Conditions						0.3 Bar			0.7 Bar		
	Dry Mass (g)	Unit Wt. (g/cc)	Sat. Mass (g)	Total H2O (g)	Sat. M.C. % D.M.	Sat. M.C. % Vol.	Retained H2O	% DM	% Vol.	Retained H2O	% DM	% Vol.
Escabrosa	33.425	1.729	39.790	6.365	19.04	32.92	5.019	15.02	25.96	4.680	14.00	24.20
Escabrosa - r	33.551	1.735	40.110	6.559	19.55	33.92	5.013	14.94	25.93	4.678	13.94	24.19
Composite	32.309	1.671	38.911	6.602	20.43	34.14	5.454	16.88	28.21	5.118	15.84	26.47
Composite - r	32.304	1.671	38.743	6.439	19.93	33.30	5.362	16.60	27.73	5.052	15.64	26.13

Data Entered By: MLM Date: 08/20/2010
Data Checked By: DPM Date: 8/20/10
Filename: KPK0ESCO

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT	Knight Piesold	JOB NO.	2061-126
SAMPLE DATE	--	TEST STARTED	07/16/10 DPM
SOIL DESCR.	74201191A	TEST FINISHED	08/17/10 DPM
LOCATION	Rosemont Dry Stack Tailings		

Moisture Content Data: % D.M. = Moisture Content By Dry Mass; % Vol. = Moisture Content By Volume

Sample Description	2 Bar			5 Bar			15 Bar		
	Retained H2O	% DM	% Vol.	Retained H2O	% DM	% Vol.	Retained H2O	% DM	% Vol.
Escabrosa	3.937	11.78	20.36	2.399	7.18	12.41	1.209	3.62	6.25
Escabrosa - r	3.940	11.74	20.38	2.456	7.32	12.70	1.213	3.62	6.27
Composite	4.599	14.23	23.78	3.168	9.81	16.38	1.900	5.88	9.83
Composite - r	4.365	13.51	22.57	3.002	9.29	15.53	1.853	5.74	9.58

Data Entered By: MLM Date: 08/20/2010
Data Checked By: DPM Date: 8/20/10
Filename: KPK0ESCO

ADVANCED TERRA TESTING, INC. ATT

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT Knight Piesold

JOB NO. 2061-126

SAMPLE DATE --
SOIL DESCR. 74201191A
LOCATION Rosemont Dry Stack Tailings

TEST STARTED 07/16/10 DPM
TEST FINISHED 08/17/10 DPM

	Vol. MC % Sat.	Vol. MC % 0.3 Bar	Vol. MC % 0.7 Bar	Vol. MC % 2 Bar	Vol. MC % 5 Bar	Vol. MC % 15 Bar
Escabrosa	32.92	25.96	24.20	20.36	12.41	6.25
Escabrosa - r	33.92	25.93	24.19	20.38	12.70	6.27
Composite	34.14	28.21	26.47	23.78	16.38	9.83
Composite - r	33.30	27.73	26.13	22.57	15.53	9.58

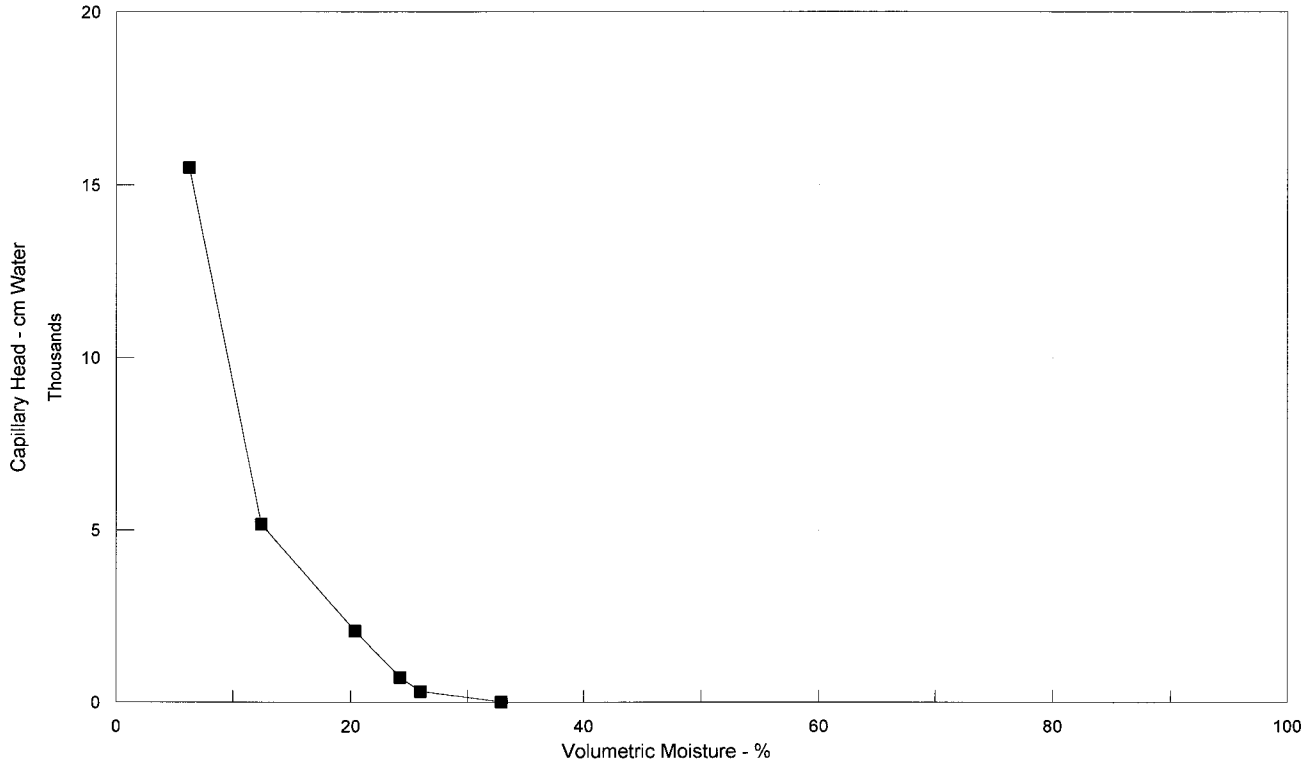
	% Saturation					
	Sat.	0.3 Bar	0.7 Bar	2 Bar	5 Bar	15 Bar
Escabrosa	100.00	78.85	73.53	61.85	37.69	18.99
Escabrosa - r	100.00	76.43	71.32	60.07	37.44	18.49
Composite	100.00	82.61	77.52	69.66	47.99	28.78
Composite - r	100.00	83.27	78.46	67.79	46.62	28.78

Data Entered By: MLM Date: 08/20/2010
Data Checked By: DPM Date: 8/20/10
Filename: KPK0ESCO

ADVANCED TERRA TESTING, INC. ATT

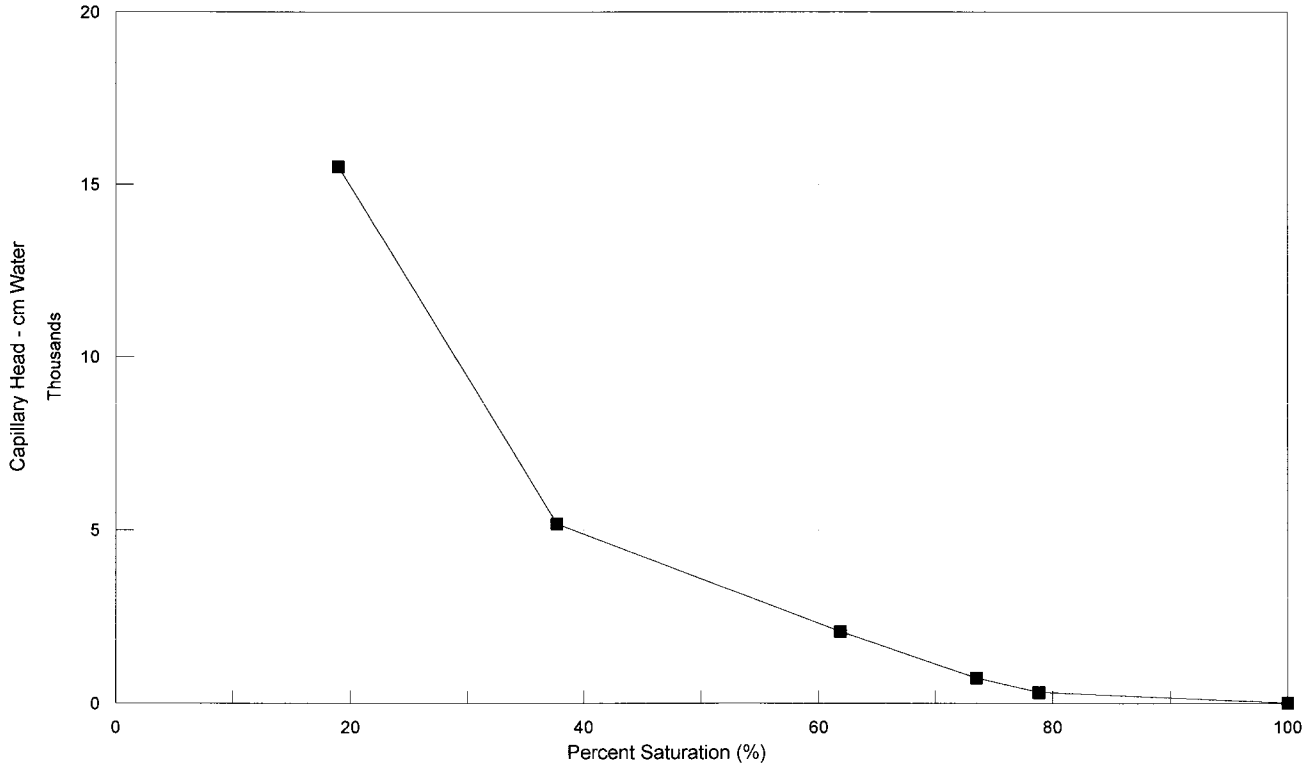
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Escabrosa



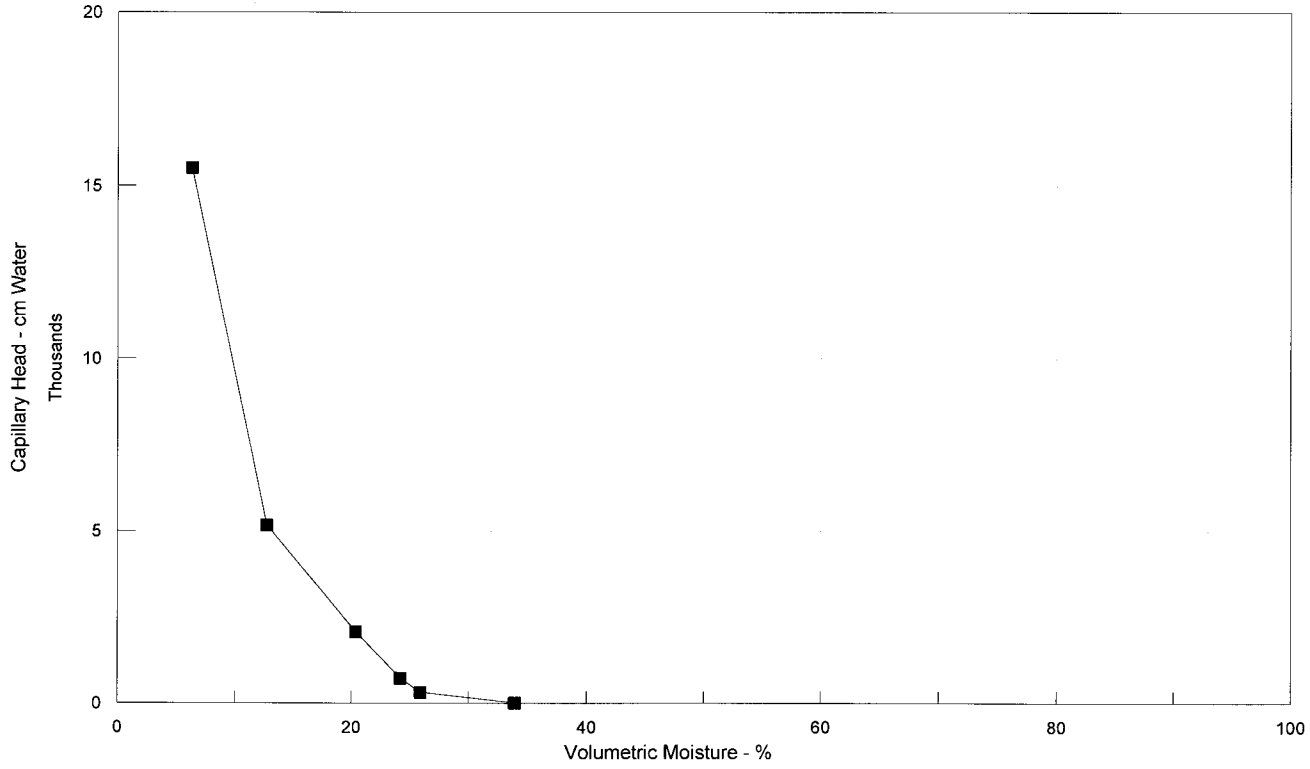
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Escabrosa



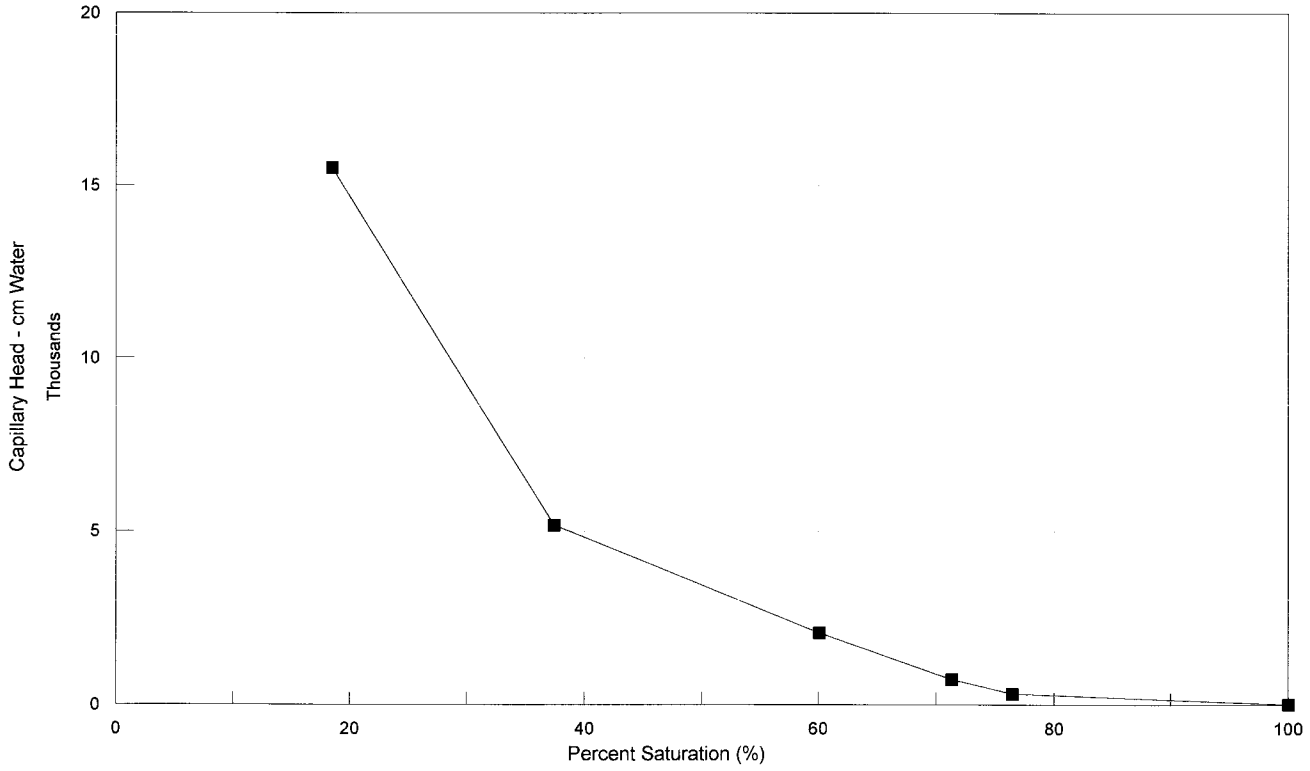
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Escabrosa - r



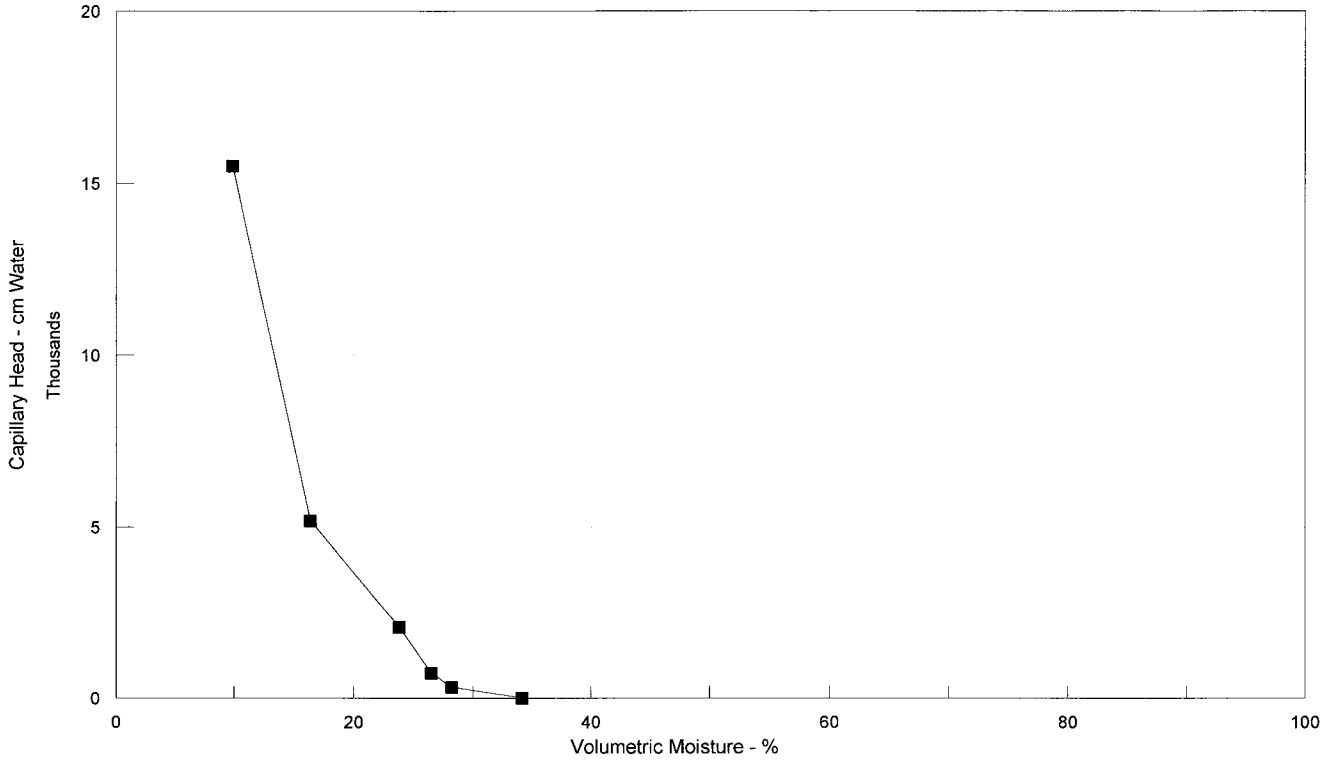
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Escabrosa - r



CAPILLARY MOISTURE CHARACTERISTIC CURVE

Composite



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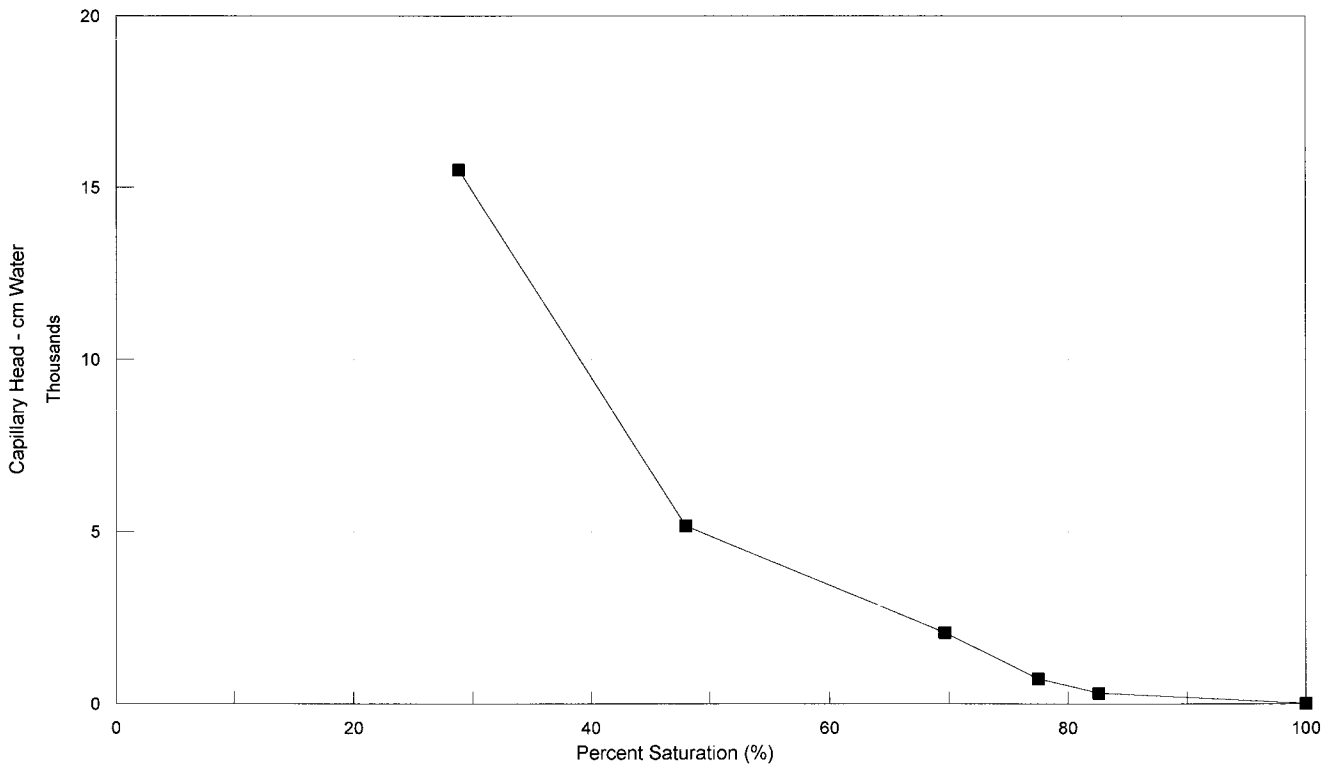
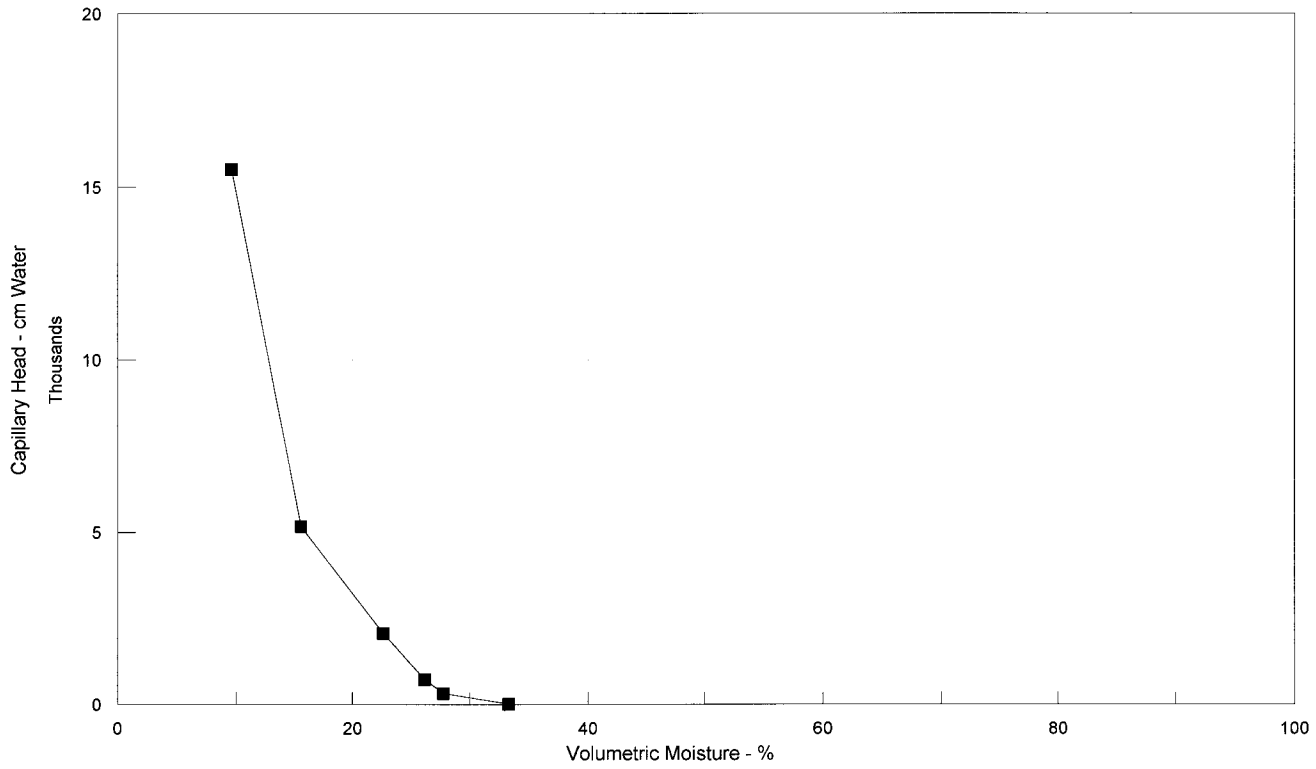


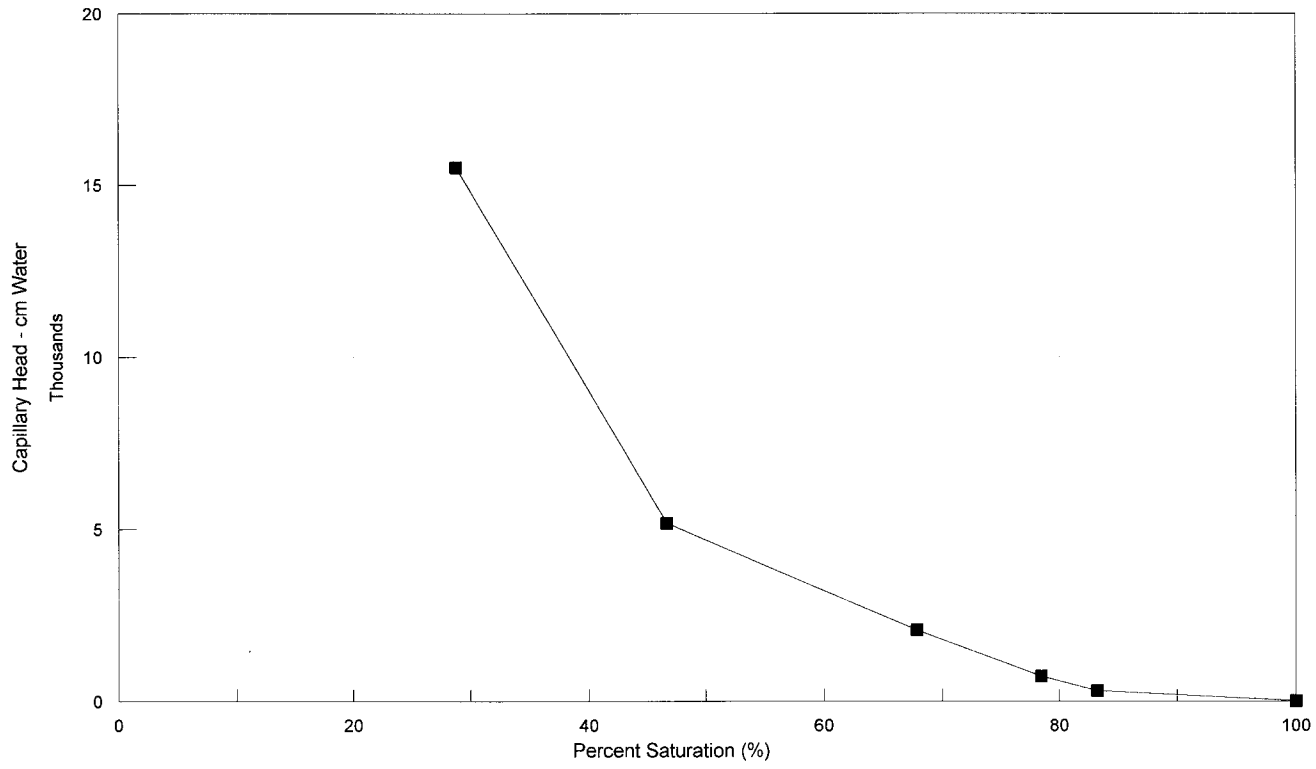
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Composite - r



CAPILLARY MOISTURE CHARACTERISTIC CURVE

Composite - r



CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT Knight Piesold

JOB NO. 2061-127

SAMPLE DATE
SOIL DESCR.
LOCATION Rosemont

TEST STARTED 07/26/10 DPM
TEST FINISHED 08/27/10 DPM

MASS DATA

Sample Description	Ring Mass g	As Rec. Mass g	Sat. Mass g	0.3 Bar Mass g	0.7 Bar Mass g	2 Bar Mass g	5 Bar Mass g	15 Bar Mass g		Dry Mass Filter, Ring, & Dish (g)	Dish Wt. g
Filter Mass g		0.335	1.095	0.558	0.490	0.477	0.451	0.438			
Epitaph Lithology 2	10.695	50.163	52.433	49.836	49.239	48.990	47.178	46.120		46.694	2.355
Epitaph Lithology 2-R	10.817	50.277	52.371	49.952	49.374	49.110	47.203	46.206		46.844	2.371
Earp Lithology 1	10.690	49.733	51.674	49.591	49.111	48.895	46.822	45.723		46.190	2.367
Earp Lithology 1-R	10.541	49.592	51.616	49.499	49.057	48.792	46.772	45.697		46.118	2.408

Data Entered By: DPM Date: 08/30/2010
Data Checked By: MM Date: 8/30/10
Filename: KPK0REE

ADVANCED TERRA TESTING, Inc. ATT

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT Knight Piesold

JOB NO. 2061-127

SAMPLE DATE
SOIL DESCR.
LOCATION Rosemont

TEST STARTED 07/26/10 DPM
TEST FINISHED 08/27/10 DPM

Moisture Content Data: % D.M. = Moisture Content By Dry Mass; % Vol. = Moisture Content By Volume

Sample Description	Sample Conditions						0.3 Bar			0.7 Bar		
	Dry Mass (g)	Unit Wt. (g/cc)	Sat. Mass (g)	Total H2O (g)	Sat. M.C. % D.M.	Sat. M.C. % Vol.	Retained H2O	% DM	% Vol.	Retained H2O	% DM	% Vol.
Epitaph Lithology 2	33.309	1.723	40.643	7.334	22.02	37.93	5.274	15.83	27.28	4.745	14.25	24.54
Epitaph Lithology 2-R	33.321	1.723	40.459	7.138	21.42	36.92	5.256	15.77	27.18	4.746	14.24	24.54
Earp Lithology 1	32.798	1.696	39.889	7.091	21.62	36.67	5.545	16.91	28.68	5.133	15.65	26.55
Earp Lithology 1-R	32.834	1.698	39.980	7.146	21.76	36.96	5.566	16.95	28.79	5.192	15.81	26.85

Data Entered By: DPM Date: 08/30/2010
Data Checked By: Date: 8/30/10
Filename: KPK0REE

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT	Knight Piesold	JOB NO.	2061-127
SAMPLE DATE		TEST STARTED	07/26/10 DPM
SOIL DESCR.		TEST FINISHED	08/27/10 DPM
LOCATION	Rosemont		

Moisture Content Data: % D.M. = Moisture Content By Dry Mass; % Vol. = Moisture Content By Volume

Sample Description	2 Bar			5 Bar			15 Bar		
	Retained H2O	% DM	% Vol.	Retained H2O	% DM	% Vol.	Retained H2O	% DM	% Vol.
Epitaph Lithology 2	4.509	13.54	23.32	2.723	8.17	14.08	1.678	5.04	8.68
Epitaph Lithology 2-R	4.495	13.49	23.25	2.614	7.84	13.52	1.630	4.89	8.43
Earp Lithology 1	4.930	15.03	25.50	2.883	8.79	14.91	1.797	5.48	9.29
Earp Lithology 1-R	4.940	15.05	25.55	2.946	8.97	15.24	1.884	5.74	9.74

Data Entered By: DPM Date: 08/30/2010
Data Checked By: Date: 8/30/10
Filename: KPK0REE

CAPILLARY MOISTURE RETENTION TEST
ASTM D 3152

CLIENT Knight Piesold

JOB NO. 2061-127

SAMPLE DATE

TEST STARTED 07/26/10 DPM

SOIL DESCR.

TEST FINISHED 08/27/10 DPM

LOCATION Rosemont

	Vol. MC % Sat.	Vol. MC % 0.3 Bar	Vol. MC % 0.7 Bar	Vol. MC % 2 Bar	Vol. MC % 5 Bar	Vol. MC % 15 Bar
Epitaph Lithology 2	37.93	27.28	24.54	23.32	14.08	8.68
Epitaph Lithology 2-R	36.92	27.18	24.54	23.25	13.52	8.43
Earp Lithology 1	36.67	28.68	26.55	25.50	14.91	9.29
Earp Lithology 1-R	36.96	28.79	26.85	25.55	15.24	9.74

	% Saturation					
	Sat.	0.3 Bar	0.7 Bar	2 Bar	5 Bar	15 Bar
Epitaph Lithology 2	100.00	71.91	64.70	61.48	37.13	22.88
Epitaph Lithology 2-R	100.00	73.63	66.49	62.97	36.62	22.84
Earp Lithology 1	100.00	78.20	72.39	69.52	40.66	25.34
Earp Lithology 1-R	100.00	77.89	72.66	69.13	41.23	26.36

Data Entered By: DPM Date: 08/30/2010

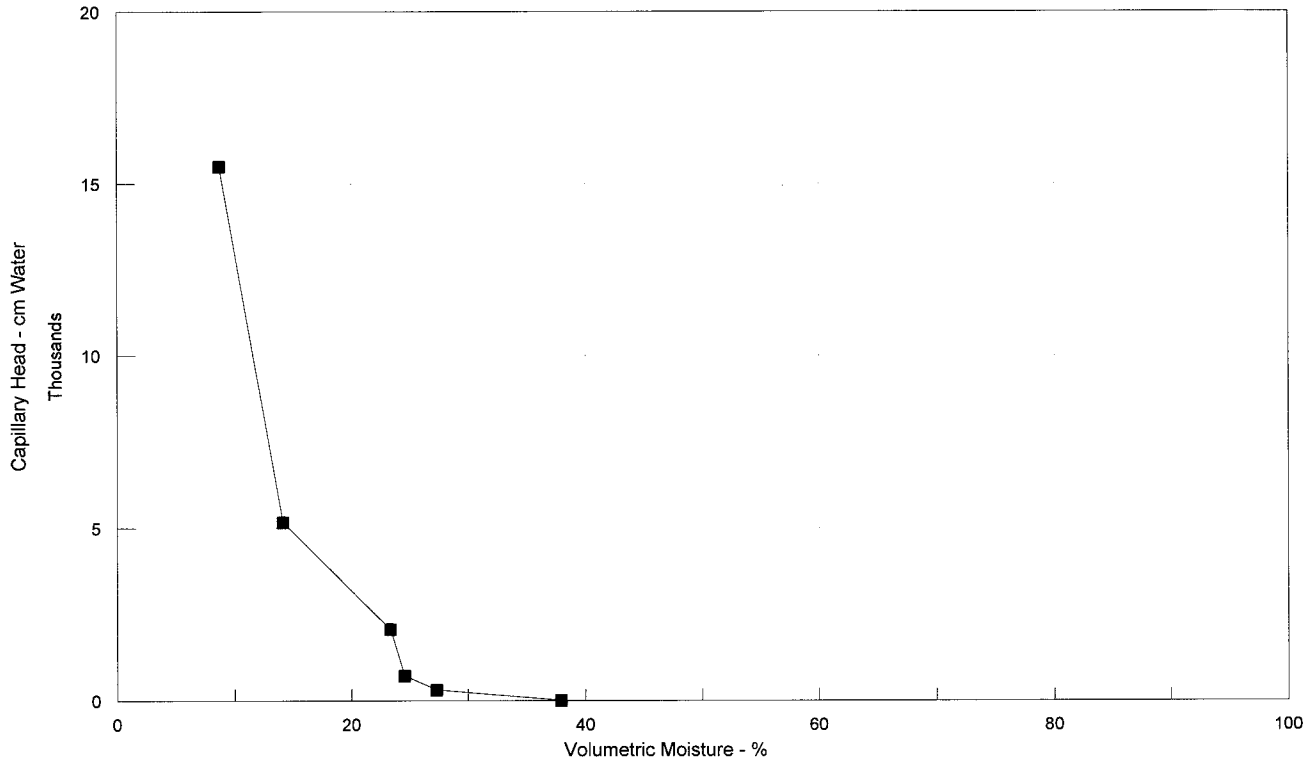
Data Checked By: DPM Date: 8/30/10

Filename: KPK0REE

ADVANCED TERRA TESTING, INC. ATT

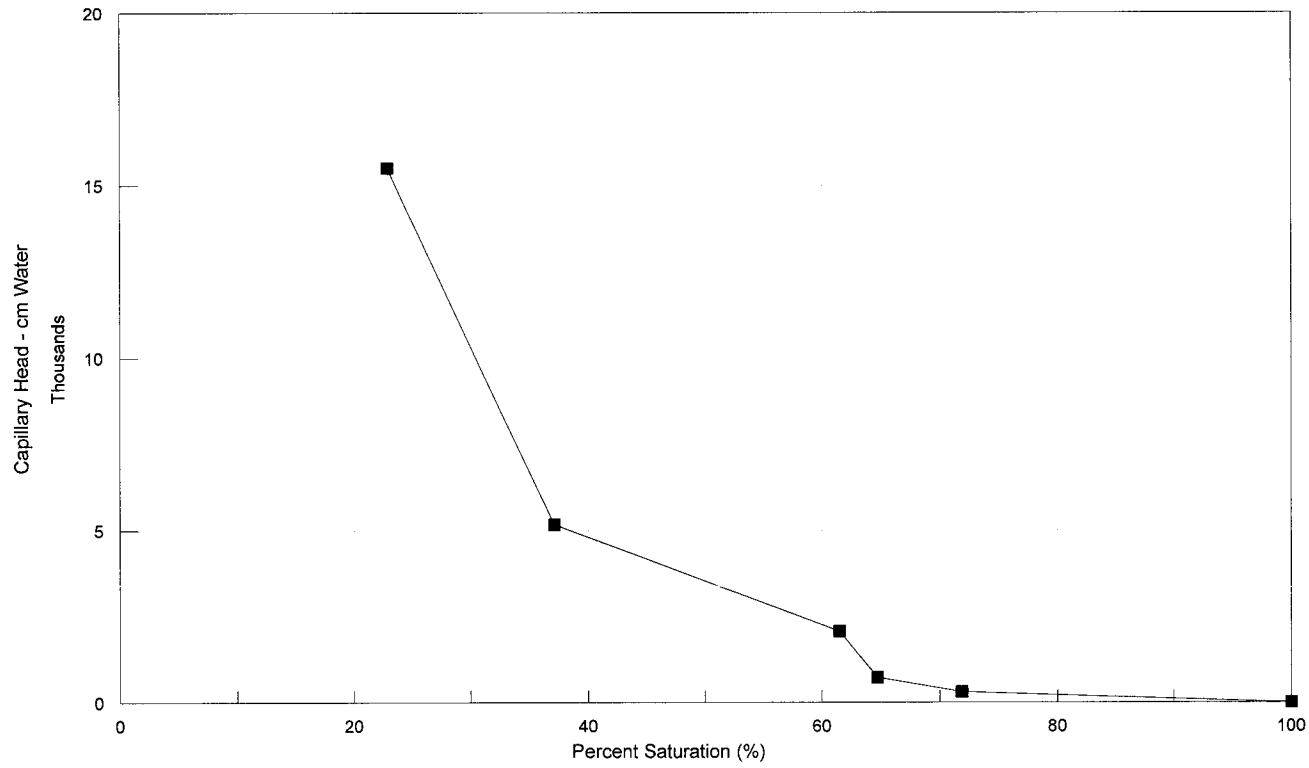
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Epitaph Lithology 2



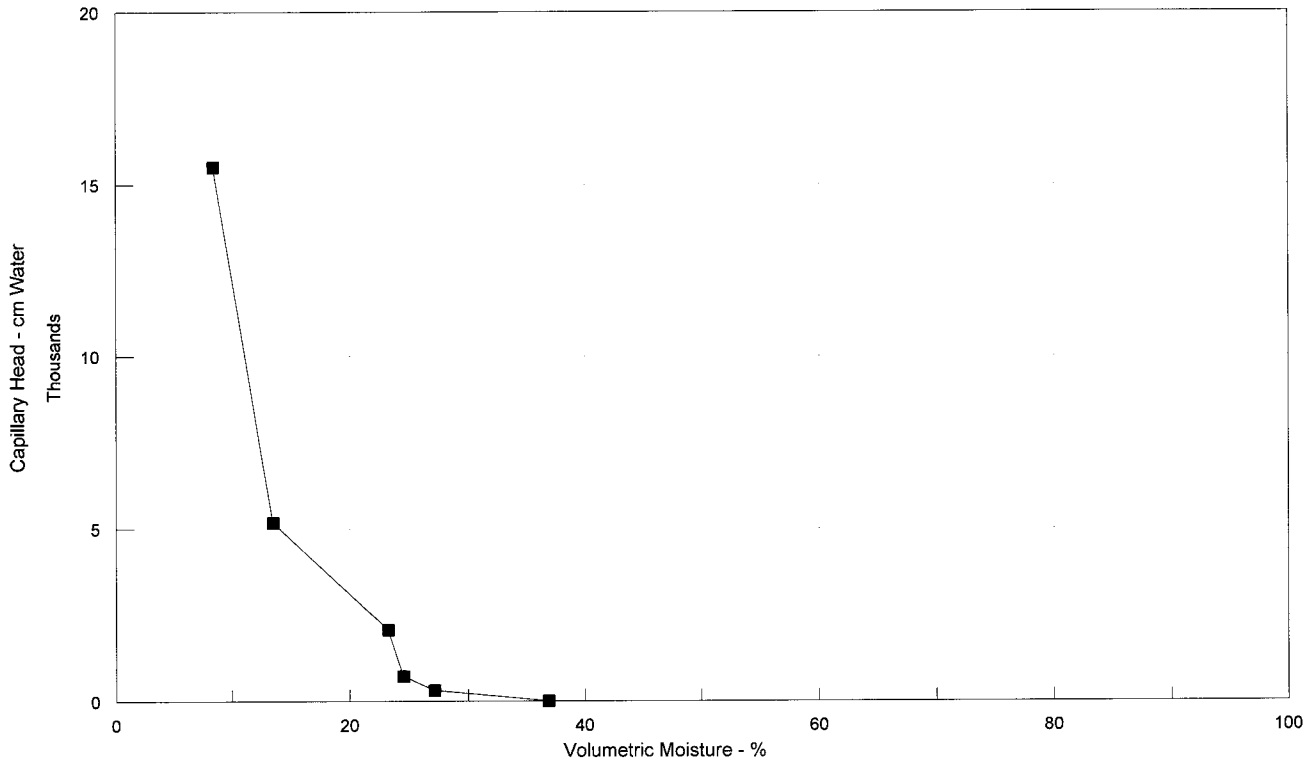
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Epitaph Lithology 2



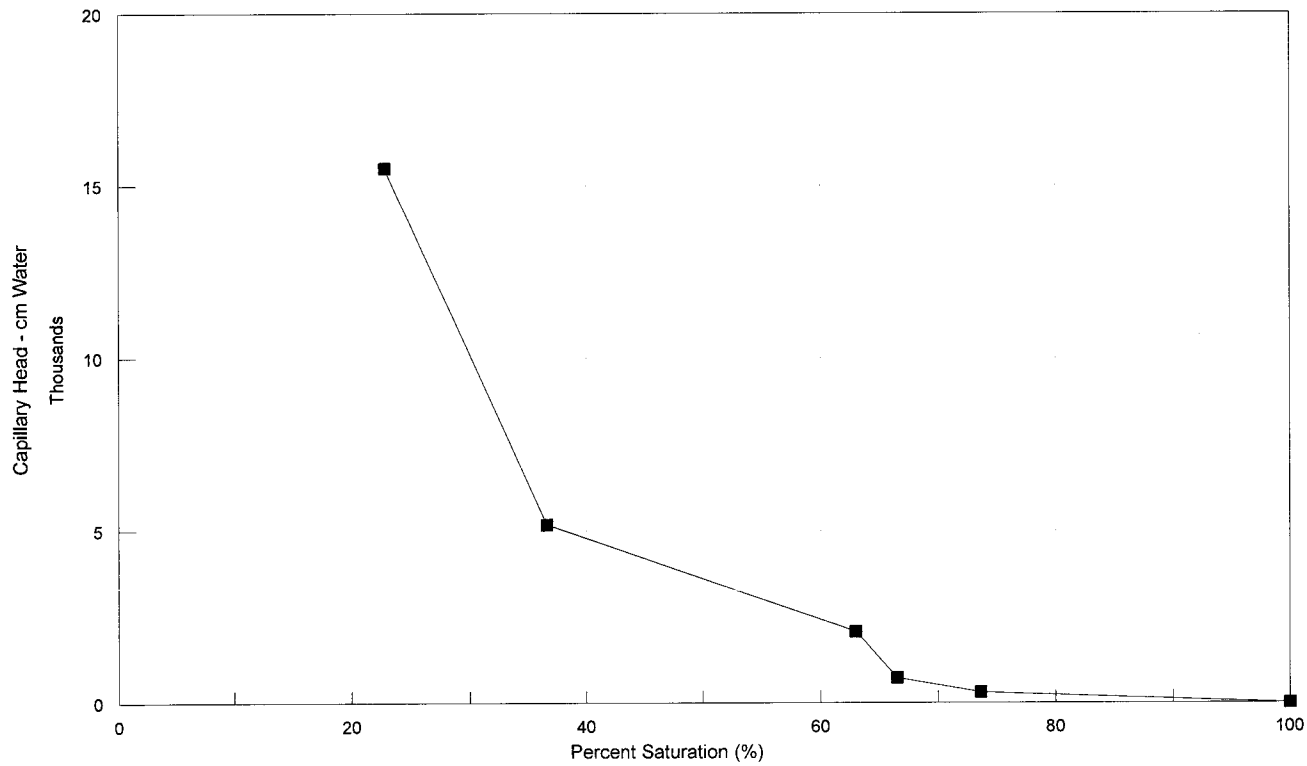
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Epitaph Lithology 2-R



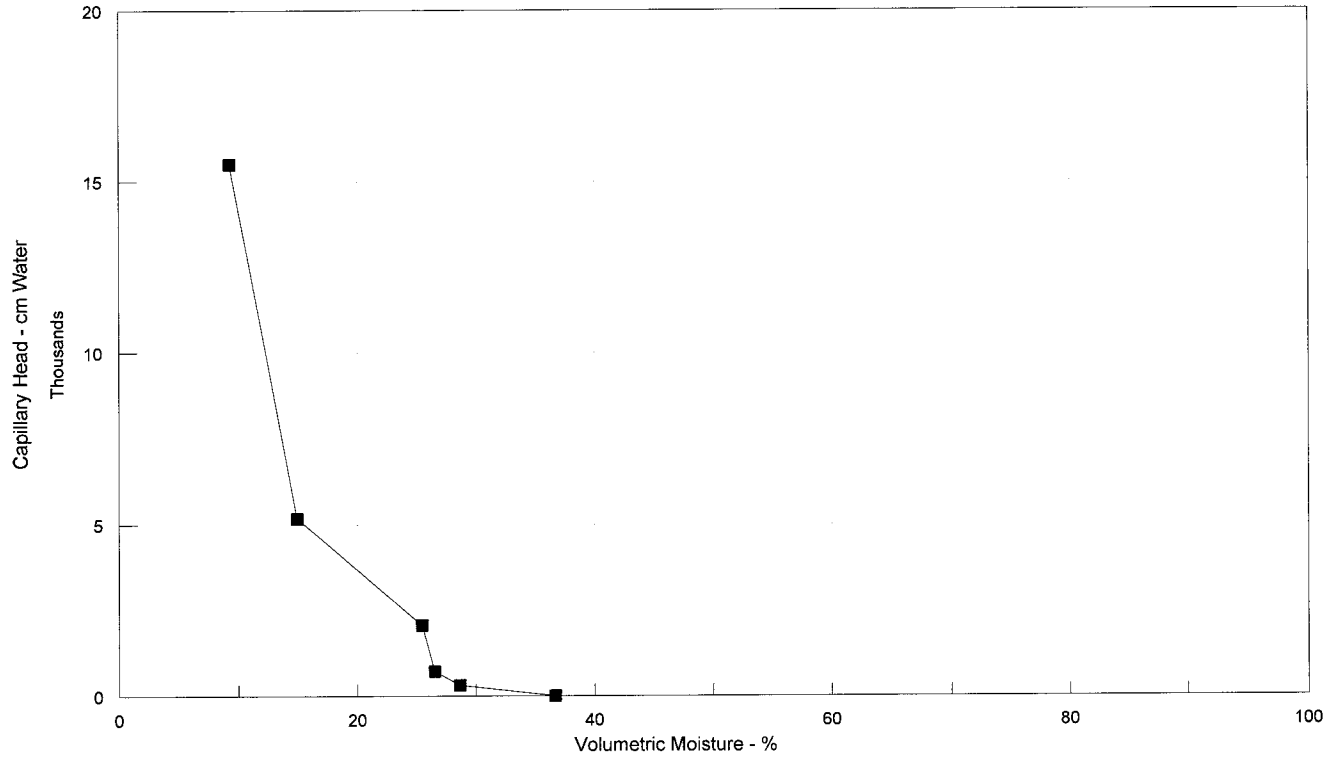
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Epitaph Lithology 2-R



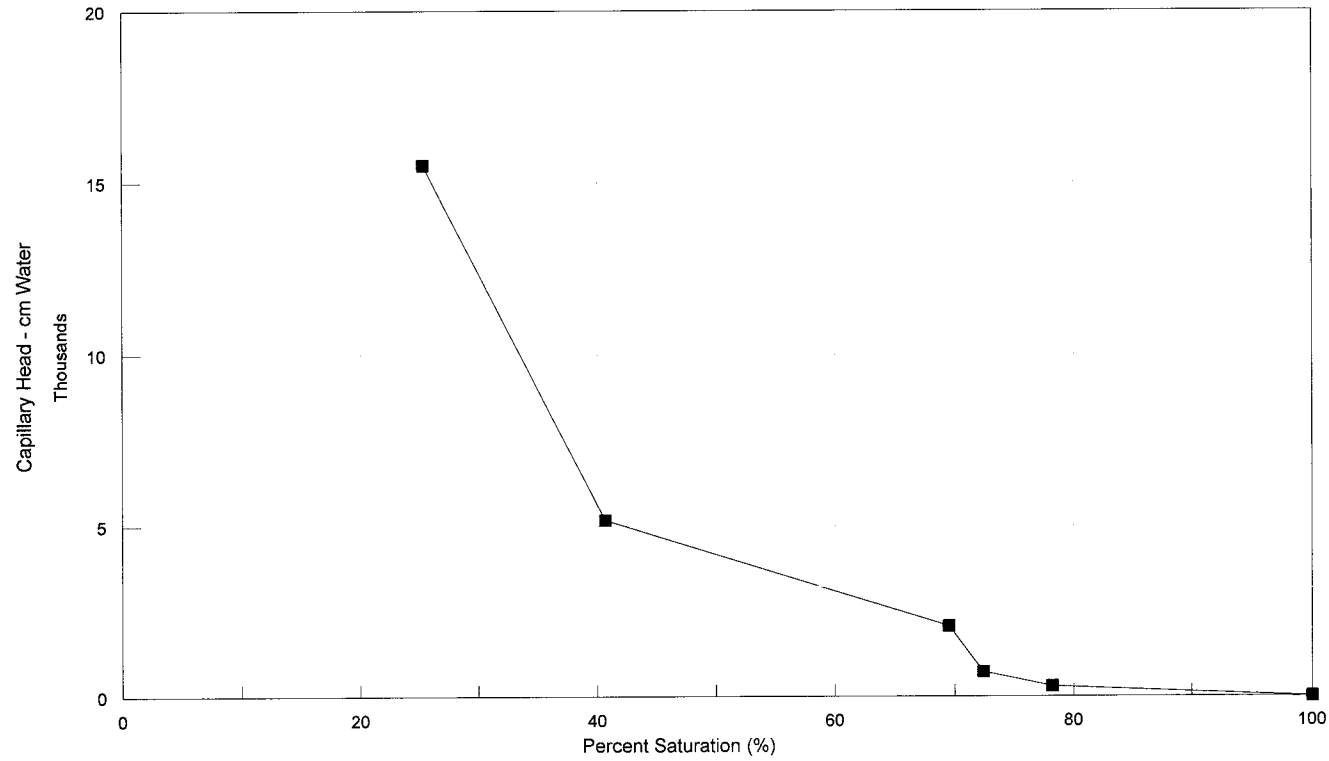
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Earp Lithology 1



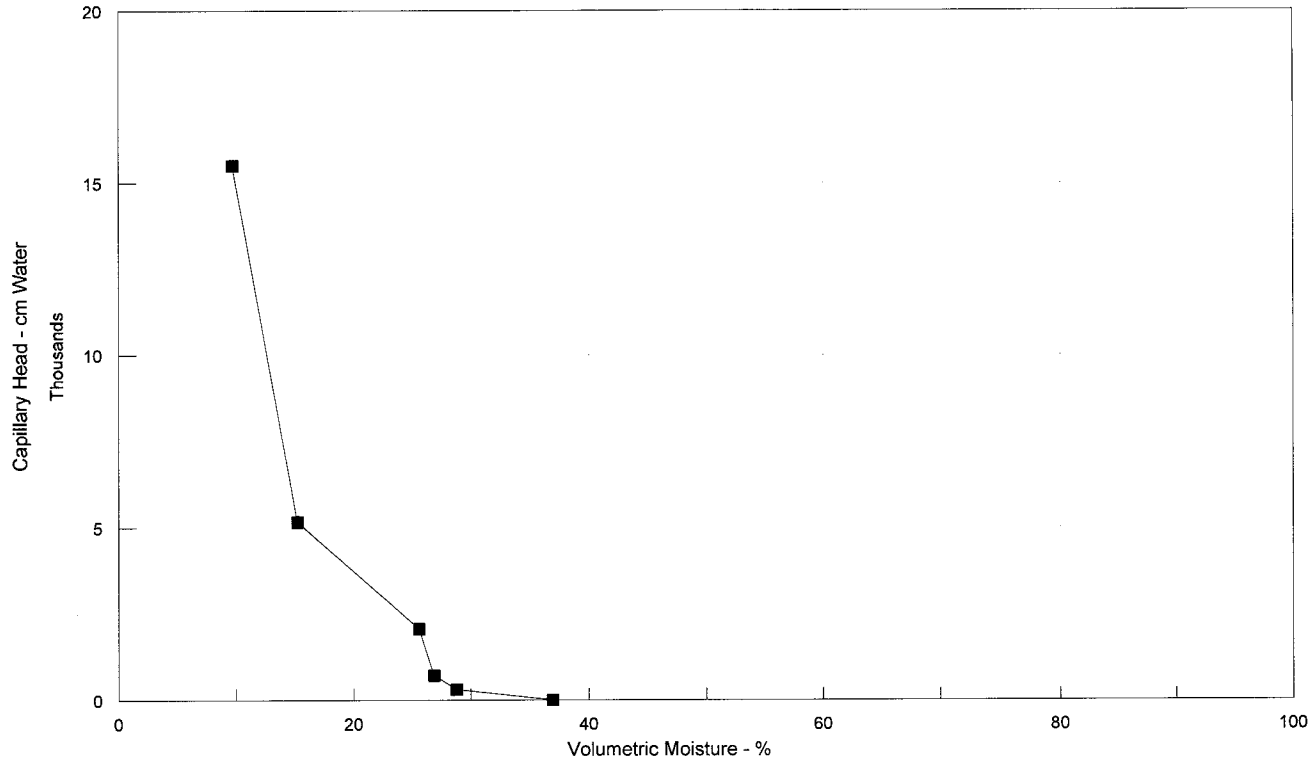
CAPILLARY MOISTURE CHARACTERISTIC CURVE

Earp Lithology 1



CAPILLARY MOISTURE CHARACTERISTIC CURVE

Earp Lithology 1-R



CAPILLARY MOISTURE CHARACTERISTIC CURVE

Earp Lithology 1-R