INTERFACE FRICTION TEST RESULTS
ASTM D 5321

geotechnics
INTEGRITY IN TESTING

Permit No.	Date	Document ID No.
96-06	May 28, 2013	19023

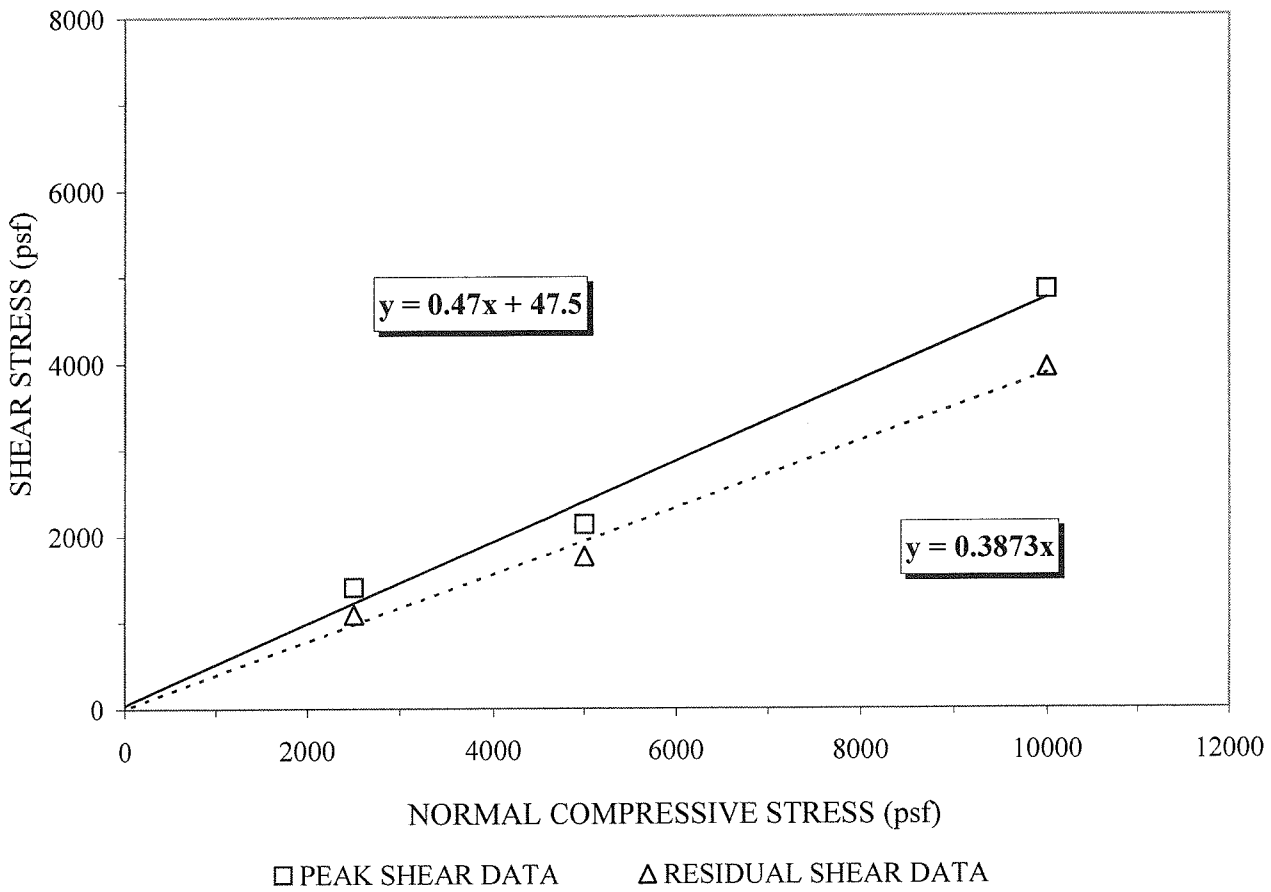
Received by an e-mail
Date: May 28, 2013
Solid Waste Section
Raleigh Central Office

CLIENT : MESCO
CLIENT PROJECT : Wayne County Landfill
PROJECT NO. : L13046-01
LAB I. D. NO.: Soil (L13046-01-03)
Agru 60 mil HDPE Microspike (L13046-01-01)

INTERFACE : **Soil @ 110 pcf & 13.8 % M.C.**
vs. 60 mil HDPE Microspike (Bottom Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	25.2	Φ =	21.2
COEFFICIENT OF FRICTION :	=	0.470	=	0.387
ADHESION [Calculated] (psf):	a =	48	a =	0

NOTES:
1.) Soil placement was provided by client.
2.) The interface was loaded, inundated with water and consolidated for 24 hours prior to shearing.
3.) The peak friction angle was calculated using linear regression on the three data points.
4.) The residual friction angle was calculated using linear regression on the end of test values.



APPROVED BY :

DATE : 5-28-13

\\GEOSERVER\Data Drive\Ryan\Finished Reports\L13\046\[L13046-01 INT 1.xls]3 Points

L13046-01

5/28/2013

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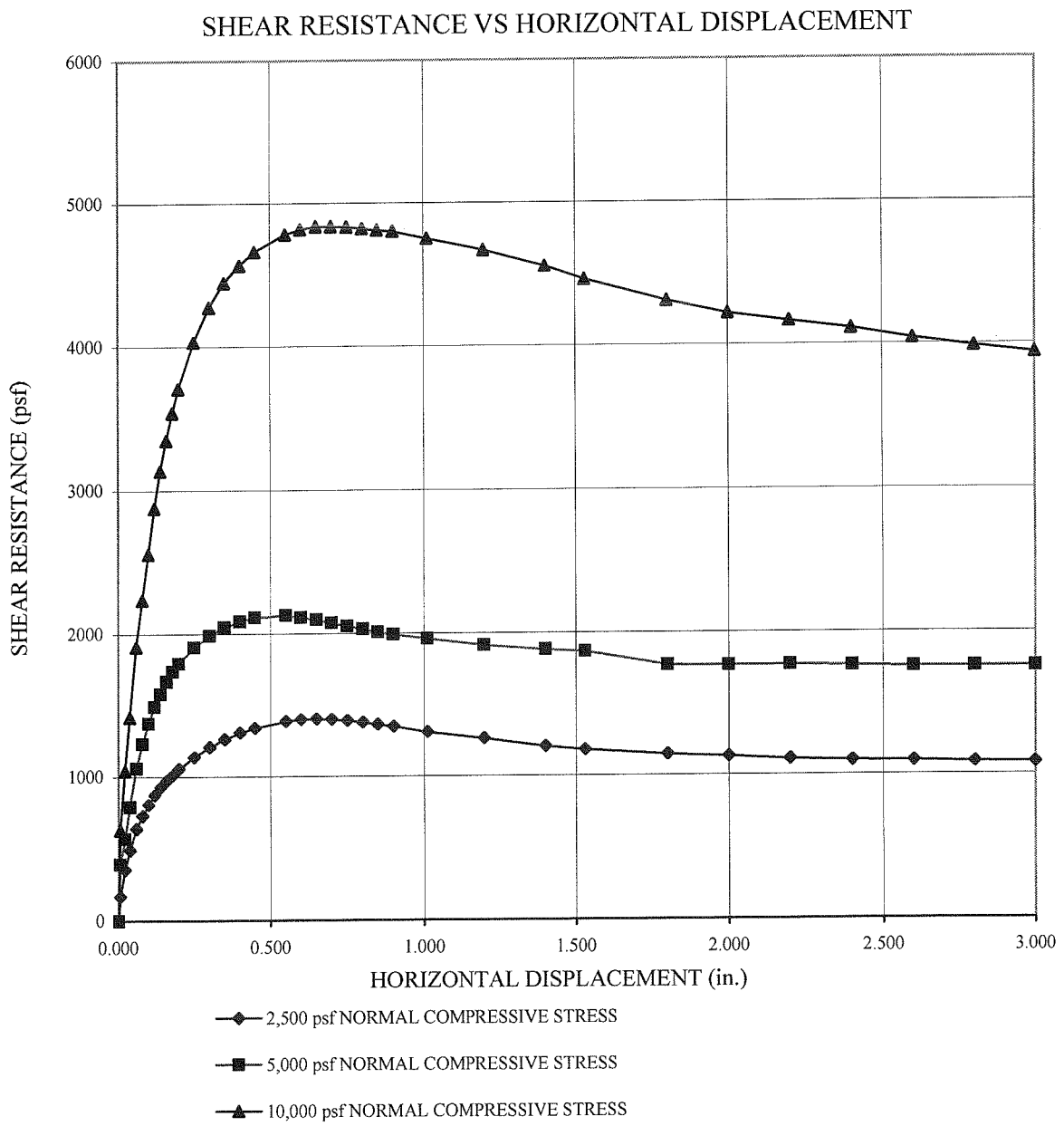

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Agru 60 mil HDPE Microspike (L13046-01-01)

INTERFACE : **Soil @ 110 pcf & 13.8 % M.C.**
vs. 60 mil HDPE Microspike (Bottom Side)

STRAIN RATE (in / min) : 0.04
PLACEMENT CONDITION: Inundated
DIRECT SHEAR UNIT: Durham Geo
NORMAL LOAD: Bladder System

NORMAL LOAD (psf)	2500		NORMAL LOAD (psf)	5000		NORMAL LOAD (psf)	10000
PEAK SHEAR STRESS (psf)	1402		PEAK SHEAR STRESS (psf)	2128		PEAK SHEAR STRESS (psf)	4837
PEAK SECANT ANGLE (deg)	29.3		PEAK SECANT ANGLE (deg)	23.1		PEAK SECANT ANGLE (deg)	25.8
RESIDUAL SHEAR (psf)	1083		RESIDUAL SHEAR (psf)	1753		RESIDUAL SHEAR (psf)	3936
RESID. SECANT ANGLE (deg)	23.4		RESID. SECANT ANGLE (deg)	19.3		RESID. SECANT ANGLE (deg)	21.5
ASPERITY	37		ASPERITY	36		ASPERITY	36
HORIZONTAL			HORIZONTAL			HORIZONTAL	
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	167	167	0.005	390	390	0.005	628	628
0.023	350	350	0.023	565	565	0.023	1042	1042
0.038	488	488	0.038	791	791	0.038	1419	1419
0.060	635	635	0.060	1059	1059	0.060	1909	1909
0.080	728	728	0.080	1229	1229	0.080	2238	2238
0.100	805	805	0.100	1375	1375	0.100	2559	2559
0.120	872	872	0.120	1491	1491	0.120	2877	2877
0.140	925	925	0.140	1582	1582	0.140	3138	3138
0.160	973	973	0.160	1667	1667	0.160	3348	3348
0.180	1013	1013	0.180	1737	1737	0.180	3541	3541
0.200	1054	1054	0.200	1794	1794	0.200	3708	3708
0.250	1137	1137	0.250	1907	1907	0.250	4033	4033
0.300	1207	1207	0.300	1990	1990	0.300	4272	4272
0.350	1263	1263	0.350	2045	2045	0.350	4445	4445
0.400	1307	1307	0.400	2086	2086	0.400	4568	4568
0.450	1340	1340	0.450	2115	2115	0.450	4659	4659
0.550	1387	1387	0.550	2128	2128	0.550	4781	4781
0.600	1399	1399	0.600	2112	2112	0.600	4816	4816
0.650	1402	1402	0.650	2098	2098	0.650	4834	4834
0.700	1399	1399	0.700	2074	2074	0.700	4837	4837
0.750	1390	1390	0.750	2050	2050	0.750	4831	4831
0.800	1378	1378	0.800	2031	2031	0.800	4821	4821
0.850	1363	1363	0.850	2009	2009	0.850	4809	4809
0.900	1346	1346	0.900	1992	1992	0.900	4801	4801
1.010	1307	1307	1.010	1962	1962	1.010	4749	4749
1.200	1261	1261	1.200	1916	1916	1.200	4667	4667
1.400	1204	1204	1.400	1884	1884	1.400	4555	4555
1.530	1180	1180	1.530	1868	1868	1.530	4462	4462
1.800	1144	1144	1.800	1770	1770	1.800	4309	4309
2.000	1127	1127	2.000	1764	1764	2.000	4220	4220
2.200	1111	1111	2.200	1770	1770	2.200	4165	4165
2.400	1098	1098	2.400	1762	1762	2.400	4111	4111
2.600	1092	1092	2.600	1755	1755	2.600	4041	4041
2.800	1087	1087	2.800	1754	1754	2.800	3986	3986
3.000	1083	1083	3.000	1753	1753	3.000	3936	3936

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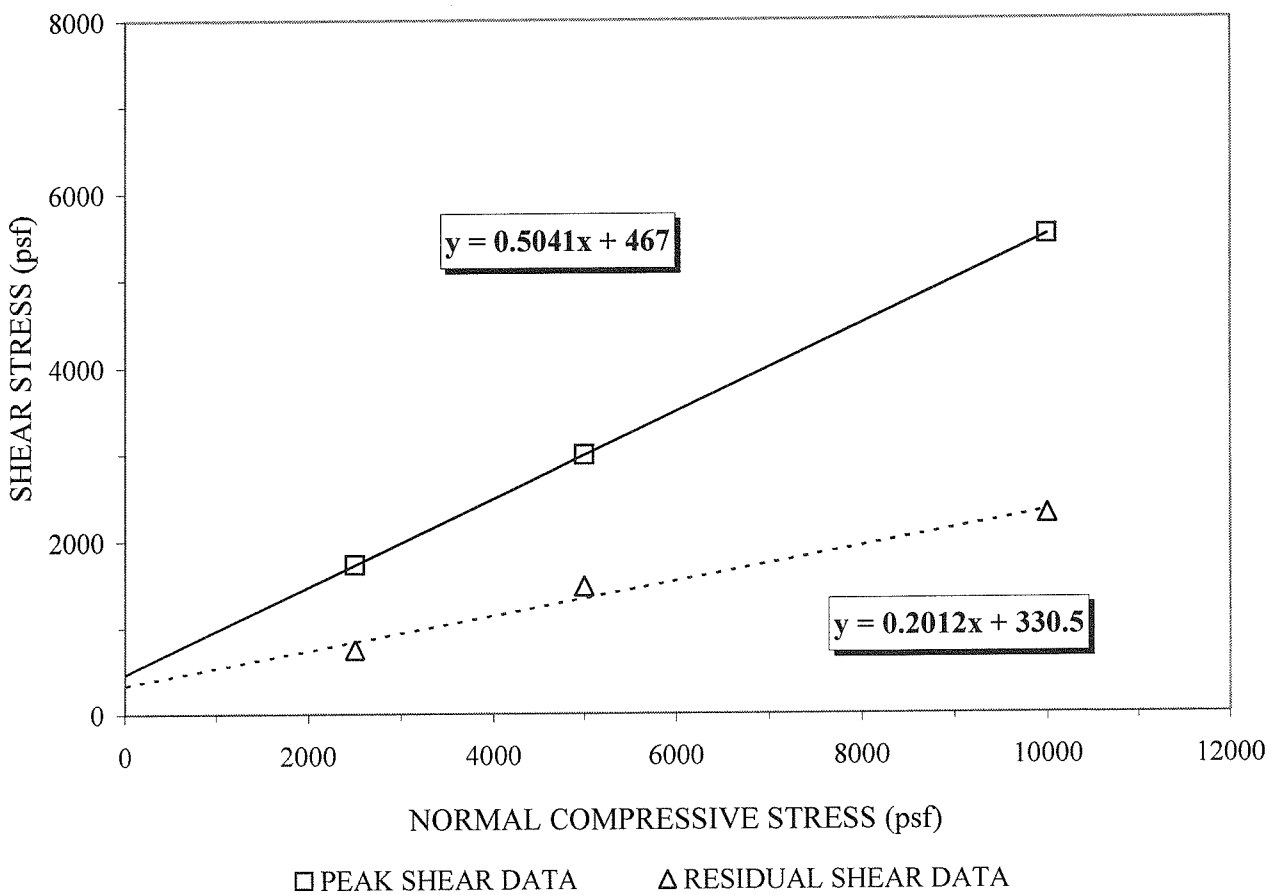
CLIENT : MESCO
CLIENT PROJECT : Wayne County Landfill
PROJECT NO. : L13046-01
LAB I. D. NO.: SKAPS Geocomposite (L13046-01-02)
Agru 60 mil HDPE Microspike (L13046-01-01)

INTERFACE : **Geocomposite**
vs. 60 mil HDPE Microspike (Top Side)

	PEAK SHEAR		RESIDUAL SHEAR	
FRICTION ANGLE (deg) :	Φ =	26.8	Φ =	11.4
COEFFICIENT OF FRICTION :	=	0.504	=	0.201
ADHESION [Calculated] (psf):	a =	467	a =	331

NOTES:
1.) The interface was loaded, inundated with water seated for 1 hour prior to shearing.
2.) The peak friction angle was calculated using linear regression on the three data points.
3.) The residual friction angle was calculated using linear regression on the end of test values.



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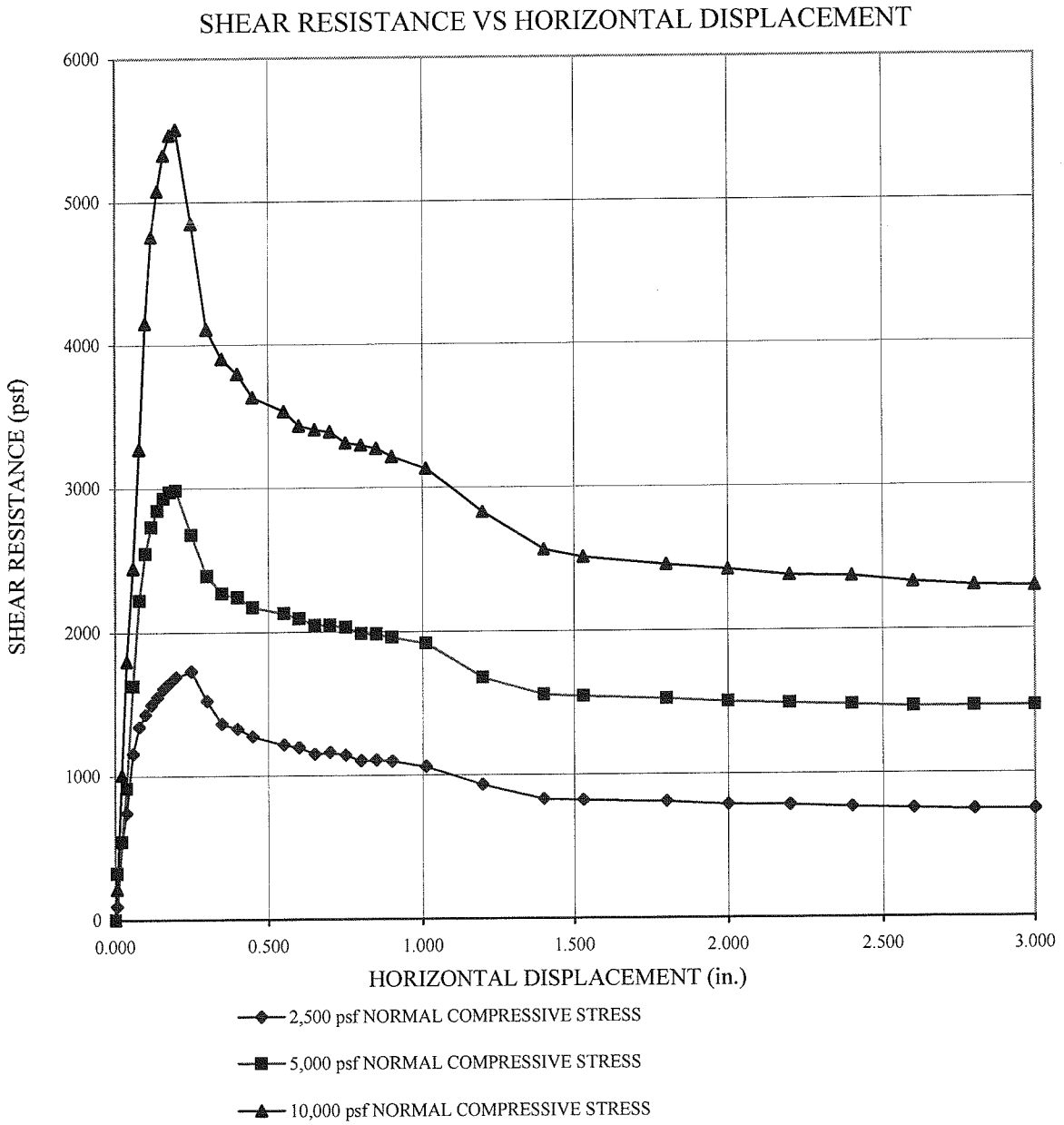

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Agru 60 mil HDPE Microspike (L13046-01-01)

INTERFACE : **Geocomposite**
vs. 60 mil HDPE Microspike (Top Side)

STRAIN RATE (in / min) : 0.20
DIRECT SHEAR UNIT: Durham Geo
PLACEMENT CONDITION: Inundated
NORMAL LOAD: Bladder System

NORMAL LOAD (psf)		2500	NORMAL LOAD (psf)		5000	NORMAL LOAD (psf)		10000
PEAK SHEAR STRESS (psf)		1729	PEAK SHEAR STRESS (psf)		2985	PEAK SHEAR STRESS (psf)		5509
PEAK SECANT ANGLE (deg)		34.7	PEAK SECANT ANGLE (deg)		30.8	PEAK SECANT ANGLE (deg)		28.9
RESIDUAL SHEAR (psf)		745	RESIDUAL SHEAR (psf)		1469	RESIDUAL SHEAR (psf)		2298
RESID. SECANT ANGLE (deg)		16.6	RESID. SECANT ANGLE (deg)		16.4	RESID. SECANT ANGLE (deg)		12.9
ASPERITY		28	ASPERITY		27	ASPERITY		27
HORIZONTAL			HORIZONTAL			HORIZONTAL		
DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)	DISPLACE. (in.)	SHEAR FORCE (lbs)	STRESS (psf)
0.000	0	0	0.000	0	0	0.000	0	0
0.005	94	94	0.005	323	323	0.005	215	215
0.023	538	538	0.023	542	542	0.023	1009	1009
0.038	744	744	0.038	915	915	0.038	1802	1802
0.060	1156	1156	0.060	1627	1627	0.060	2447	2447
0.080	1344	1344	0.080	2223	2223	0.080	3275	3275
0.100	1430	1430	0.100	2547	2547	0.100	4154	4154
0.120	1495	1495	0.120	2732	2732	0.120	4759	4759
0.140	1551	1551	0.140	2843	2843	0.140	5078	5078
0.160	1610	1610	0.160	2928	2928	0.160	5330	5330
0.180	1654	1654	0.180	2974	2974	0.180	5469	5469
0.200	1691	1691	0.200	2985	2985	0.200	5509	5509
0.250	1729	1729	0.250	2676	2676	0.250	4848	4848
0.300	1522	1522	0.300	2389	2389	0.300	4108	4108
0.350	1364	1364	0.350	2269	2269	0.350	3904	3904
0.400	1327	1327	0.400	2243	2243	0.400	3798	3798
0.450	1273	1273	0.450	2172	2172	0.450	3634	3634
0.550	1216	1216	0.550	2128	2128	0.550	3535	3535
0.600	1194	1194	0.600	2092	2092	0.600	3435	3435
0.650	1150	1150	0.650	2048	2048	0.650	3407	3407
0.700	1161	1161	0.700	2048	2048	0.700	3389	3389
0.750	1139	1139	0.750	2031	2031	0.750	3311	3311
0.800	1100	1100	0.800	1988	1988	0.800	3296	3296
0.850	1104	1104	0.850	1986	1986	0.850	3275	3275
0.900	1098	1098	0.900	1962	1962	0.900	3215	3215
1.010	1058	1058	1.010	1919	1919	1.010	3134	3134
1.200	931	931	1.200	1678	1678	1.200	2830	2830
1.400	828	828	1.400	1559	1559	1.400	2565	2565
1.530	820	820	1.530	1545	1545	1.530	2510	2510
1.800	808	808	1.800	1526	1526	1.800	2457	2457
2.000	785	785	2.000	1504	1504	2.000	2422	2422
2.200	781	781	2.200	1494	1494	2.200	2379	2379
2.400	765	765	2.400	1481	1481	2.400	2373	2373
2.600	753	753	2.600	1464	1464	2.600	2327	2327
2.800	746	746	2.800	1469	1469	2.800	2304	2304
3.000	745	745	3.000	1469	1469	3.000	2298	2298

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From:	Wayne Sullivan
To:	Chao, Ming-tai
Cc:	"Tim Rogers"
Subject:	Wayne Co. CQA Item 19 (i)
Date:	Tuesday, May 28, 2013 11:03:15 AM
Attachments:	CQA Item 19 i.pdf

Ming,

Hope you had a nice Memorial Day weekend. Please find attached the friction angle test results. If you have any questions, just let me know.

Thanks and have a nice day.

D. Wayne Sullivan
Municipal Engineering Services Co., Inc.
Phone: (919) 772-5393
Fax: (919) 772-1176
email: wsullivan@mesco.com