TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

Installation Damage Testing of Coated PET Geogrid: 40 kN/m In Silty Sand

March 2013

Submitted to:
Mr. Mr. Amit Agarwal
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Submitted by:
TRI/Environmental, Inc.
9063 Bee Caves Road
Austin, TX 78733

C. Joel Sprague
Project Manager

March 20, 2013

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205 New Cloth Market
Ahmedabad
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Email: amit@ctmgeosynthetics.com

SUBJECT: **Installation Damage Testing of 40 kN/m Coated PET Geogrid In Silty Sand**

Dear Mr. Agarwal:

TRI/Environmental, Inc. (TRI) is pleased to present this final report for installation damage testing of soil reinforcement geosynthetics. 40 kN/m coated PET geogrid was submitted for exposure to silty sand (Type 3). Testing was performed in the machine direction.

Technical Approach

A convenient method for applying installation damage to geosynthetics that allows for exhumation of the test samples while avoiding unintended damage was initially developed by Watts and Brady of the Transport Research Laboratory (TRL) in the United Kingdom. The BBA has developed a standard laboratory simulation of installation damage based on this procedure. The procedure generally conforms to ASTM D 5818 requirements. TRI used this procedure along with available TRI soils/aggregates to obtain the results reported herein. A short review is provided below.

Exposure Procedure

Since compaction typically occurs parallel to the face of retaining walls and the contour lines of slopes, TRI placed the machine direction perpendicular to the running direction of the compaction equipment. To initiate the exposure procedure, four steel plates each measuring 42-inches x 52-inches (1.07 m x 1.32 m), equipped with lifting chains, were placed on a flat clean surface of hardened limestone rock. The longer side of the plates is parallel to the running direction of the compaction equipment. A layer of soil/aggregate was then placed over the adjacent plates to an approximate compacted thickness of 8 inches (0.20 m). Next, each of four coupons of the tested geosynthetic sample was placed on the compacted soil over an area corresponding to an underlying steel plate. To complete the installation, the second layer of soil was placed and compacted over the coupons to a thickness of 8 inches (0.20 m) using a vibratory compactor. To guide and contain the compaction process, braced railroad ties defined the long (208+ in. / 5.28 m) edges of the installation.

Compaction was accomplished using a 4550 kg (10,000 lb) ride-on steel-wheeled roller with vibratory capability. All compaction and exhumation procedures, as well as laboratory soil classification and field thickness measurements, were performed under the supervision of TRI's Lead Geotechnical Technician. Density measurements were made by a qualified geotechnical technician.

The following construction quality control measures are typically followed during exposure.

- Proctor and sieve analyses were performed on each soil/aggregate, when possible. (Proctors could not be performed on Types 1 and 2)
- Lift thickness measurements were made after soil/aggregate compaction.
- When possible, moisture and density measurements were made on each lift using a nuclear density gage to confirm that densities >90% of modified Proctor (per ASTM D 1557) were being achieved.

In addition to the above, the number of compaction equipment loadings (i.e. passes) was recorded for each exposure and corresponding soil compaction effort.

To exhume the geosynthetic, railroad ties were removed and one end of each plate was raised with lifting chains. After raising the plate to about 45°, soil located near the bottom of the leaning plate was removed and, if necessary, the plate was struck with a sledgehammer to loosen the fill. The covering soil/aggregate was then carefully removed from the surface while "rolling" the geosynthetic away from the underlying soil/aggregate. This procedure assured a minimum of exhumation stress.

Photographs representative of the procedures are included in the Appendix of this report.

Gradation of backfill material

Each geosynthetic was exposed to soils/aggregates chosen by the client from a range of available stockpiles having different gradations. The soil/aggregate used in this testing was silty sand (Type 3). Soil gradation curves may be found in the Appendix of this report.

Specimen Preparation and Wide Width Tensile Testing

Upon removal from the exposure site, exposure coupons were allowed to dry. Coupons were then cleaned by removing surface soil via light hand sweeping. Soil trapped within the geosynthetic structure was not removed by washing or otherwise stressing the geosynthetic. No additional cleaning was performed and specimens were cut and tested in their soiled condition.

The evaluation of RF_{ID} for the geogrid was based on the results of wide width tensile tests per ISO 10319, *Geosynthetics -- Wide-width tensile test*. The multi-rib specimens were tested using an Instron Model 5589 tension/compression machine equipped with Demgen hydraulic grips and Instron Bluehill data acquisition software. Strain was monitored using an Instron non-contacting video extensometer. After exposure was complete, all baseline and exposed wide width tensile tests were performed during the same testing period.

Sampling and Specimen Selection

Each set of tensile tests of an exposed style of geosynthetic were compared with tensile tests of the same style of the geosynthetic in an unexposed, or "baseline" condition. It should be noted that tensile specimens were not representative of the roll width, but instead were specific to a defined region within the roll width. This approach was accomplished by cutting five coupons (four for exposure and one for baseline) measuring approximately 42 inches x 52 inches (1.07 m x 1.32 m) in sequence along the length of the geosynthetic. This technique captured common yarns and/or ribs in the tested specimens to minimize variation.

<u>Tensile tests of the product before exposure to installation conditions:</u> The specific sampling procedure as described above was followed to assure that individual baseline specimen populations were developed from the same region of the roll width as those specimens dedicated to installation damage exposure.

<u>Tensile tests of specimens taken from the damaged material after installation:</u> The coupons and candidate specimens to be exposed to installation stresses were selected prior to exposure and installed in accordance with a defined sampling plan (via ASTM D 5818). Exposure coupons were laid within the exposure lane in consecutive order, each representing five specimens. Thus, the exposure lane was constructed with specimens 1 through 20 as shown below.

Exposure Coupon 1					Exposure Coupon 2					Exposure Coupon 3					Exposure Coupon 4				
1	2	3	4	5	11	12	13	14	15	6	7	8	9	10	16	17	18	19	20

Upon exhumation of the exposed coupons, specimens were cut and tested in numerical order. A minimum of ten exposed specimens from each testing condition was systematically selected for testing from the twenty candidate specimens. The test results were averaged and compared to the average of the baseline specimens.

<u>Tensile test results for both virgin (i.e. baseline) and damaged (i.e. exhumed) specimens:</u> All tensile test results have been tabularized and may be found in the Appendix of this report.

Test Results

Retained strengths for each of the tested geosynthetic styles are presented in Table 1.

Table 1. Retained Strength for Tested Geosynthetics

Style	Gradation Type 3 (Silty Sand)	
	% Retained	RF_{ID}
40 kN/m - MD	92.3	1.08

MD = machine direction;

Conclusion

TRI is very pleased to present this report for installation damage testing of soil reinforcing geosynthetics. If you have any questions or require any additional information, please call me at 1-864-242-2220.

Sincerely,

C. Joel Sprague, P.E.
Senior Engineer

cc: Jarrett Nelson

APPENDIX OF TEST RESULTS

Installation Damage Results

Soil / Aggregate Gradations

Construction Quality Control Summary

Representative Pictures

9063 Bee Caves Road ▪ Austin, TX 78733-6201 ▪ (512) 263-2101 ▪ FAX 263-2558 ▪ 1-800-880-TEST

INSTALLATION DAMAGE
TEST RESULTS

CTM Technical Textiles
INSTALLATION DAMAGE TESTING - WIDE WIDTH TENSILE (ISO 10319)
40 kN/m

Machine Direction

Sample Identification	Specimen Number	Ribs per Foot Width	Number of Ribs Tested	Maximum Load (lbs)	Maximum Load (lbs/ft)	Maximum Load (kN/m)	Elongation @ Break (%)	Load @ 2% lbs	Load @ 2% (lbs/ft)	Load @ 2% (kN/m)	Load @ 5% lbs	Load @ 5% (lbs/ft)	Load @ 5% (kN/m)	Load @ 10% lbs	Load @ 10% (lbs/ft)	Load @ 10% (kN/m)
40 kN/m Baseline	1	10.2	7	2172	3165	46.2	12.0	384	560	8.2	605	881	12.9	1733	2525	36.9
	2	10.2	7	2297	3348	48.9	12.5	386	562	8.2	612	891	13.0	1763	2569	37.5
	3	10.2	7	2140	3120	45.5	12.3	373	544	7.9	587	856	12.5	1728	2518	36.8
	4	10.2	7	2213	3225	47.1	12.7	377	549	8.0	593	865	12.6	1691	2464	36.0
	5	10.2	7	2244	3271	47.8	12.4	374	545	8.0	596	869	12.7	1746	2545	37.2
Average				2213	3226	47.1	12.4	379	552	8.1	598	872	12.7	1732	2524	36.9
Standard Deviation				61.3	89.3	1.3	0.3	5.8	8.5	0.1	9.7	14.1	0.2	26.8	39.0	0.6
% COV				2.8	2.8	2.8	2.4	1.5	1.5	1.5	1.6	1.6	1.6	1.5	1.5	1.5

Machine Direction

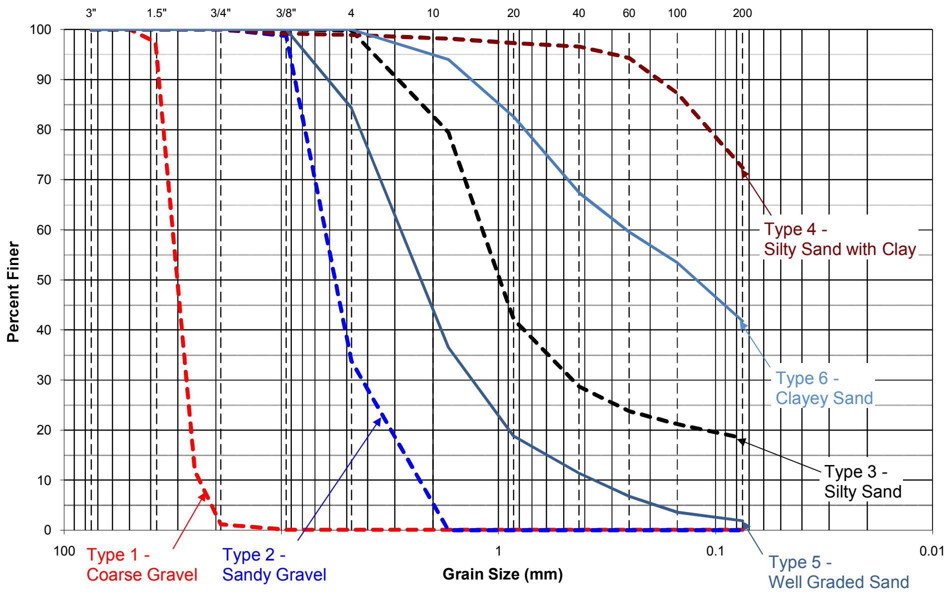
Sample Identification	Specimen Number	Ribs per Foot Width	Number of Ribs Tested	Maximum Load (lbs)	Maximum Load (lbs/ft)	Maximum Load (kN/m)	Elongation @ Break (%)	Load @ 2% lbs	Load @ 2% (lbs/ft)	Load @ 2% (kN/m)	Load @ 5% lbs	Load @ 5% (lbs/ft)	Load @ 5% (kN/m)	Load @ 10% lbs	Load @ 10% (lbs/ft)	Load @ 10% (kN/m)
40 kN/m installed in Gradation 3 (Sand)	1	10.2	7	2048	2984	43.6	11.4	376	548	8.0	590	860	12.6	1695	2471	36.1
	2	10.2	7	2128	3101	45.3	11.8	384	559	8.2	606	883	12.9	1745	2544	37.1
	3	10.2	7	2145	3126	45.6	12.1	380	554	8.1	588	857	12.5	1725	2514	36.7
	4	10.2	7	1953	2847	41.6	10.7	385	562	8.2	617	899	13.1	1800	2624	38.3
	5	10.2	7	2029	2957	43.2	11.0	372	542	7.9	598	872	12.7	1794	2615	38.2
	6	10.2	7	2076	3025	44.2	11.8	374	545	7.9	594	866	12.6	1760	2565	37.4
	7	10.2	7	2040	2973	43.4	11.9	382	557	8.1	602	877	12.8	1744	2542	37.1
	8	10.2	7	1879	2739	40.0	10.3	387	564	8.2	609	887	13.0	1803	2628	38.4
	9	10.2	7	2123	3095	45.2	11.6	377	549	8.0	592	862	12.6	1762	2568	37.5
	10	10.2	7	2014	2935	42.9	11.1	385	561	8.2	606	883	12.9	1750	2551	37.2
Average				2043	2978	43.5	11.4	380	554	8.1	600	875	12.8	1758	2562	37.4
Standard Deviation				82.4	120.1	1.8	0.6	5.2	7.7	0.1	9.2	13.4	0.2	34.3	50.0	0.7
% COV				4.0	4.0	4.0	5.2	1.4	1.4	1.4	1.5	1.5	1.5	2.0	2.0	2.0

Percent Retained			92.3	92.3	92.3	91.7	100.3	100.3	100.3	100.3	100.3	100.3	101.5	101.5	101.5
RFid			**1.08**	**1.08**	**1.08**										

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

SOIL/AGGREGATE GRADATIONS

Grain Size Distribution - 2012 Standard Soils



INSTALLATION DAMAGE SOILS							
US Sieve No.	Sieve Size (mm)	Percent Passing					
		Type 1 (Coarse Gravel)	Type 2 (Sandy Gravel)	Type 3 (Silty Sand)	Type 4 (Silty Sand with Clay)	Type 5 (Well Graded Sand)	Type 6 (Clayey Sand)
3 - in.	75	100.0	100.0	100.0	100.0	100.0	100.0
2 - in.	50	100.0	100.0	100.0	100.0	100.0	100.0
1.5 - in.	38	97.5	100.0	100.0	100.0	100.0	100.0
1 - in.	25	11.8	100.0	100.0	100.0	100.0	100.0
3/4 - in.	19	1.2	100.0	100.0	100.0	100.0	100.0
3/8 - in.	9.5	0.1	98.7	100.0	99.2	100.0	100.0
No. 4	4.75	0.1	33.8	99.8	98.9	84.3	100.0
No. 10	1.7	0.1	0.0	79.5	98.2	36.5	94.0
No. 20	0.85	0.1	0.0	42.1	97.3	18.8	82.6
No. 40	0.425	0.1	0.0	28.7	96.6	11.4	67.4
No. 60	0.25	0.1	0.0	23.8	94.3	6.8	59.6
No. 100	0.15	0.1	0.0	21.2	87.3	3.6	53.4
No. 200	0.075	0.1	0.0	18.4	72.4	1.9	41.8
Liquid Limit, %		-	-	-	28	-	25
Plasticity Index, %		-	-	-	14	-	9
Angularity		Angular to Subangular	Angular	Angular to Subangular	-	Angular to Subangular	-
USCS Classification		GP	GP	SM	CL-ML	SW	SC
		Poorly Graded Gravel	Poorly Graded Gravel with Sand	Silty Sand	Silty Sand with Clay	Graded Sand	Sand with Clay

CONSTRUCTION QUALITY CONTROL DURING INSTALLATION DAMAGE EXPOSURE

SUMMARY OF OBSERVATIONS AND MEASUREMENTS

				FIRST LIFT				SECOND LIFT			
DATE	CLIENT	MATERIAL	SOIL TYPE	LOCATION	DENSITY	MOISTURE	# PASSES	LOCATION	DENSITY	MOISTURE	# PASSES
06-Mar-13	CTM	40 kN/m	1	NA NA	NA NA	NA NA	4	NA NA	NA NA	NA NA	4
06-Mar-13	CTM	80 kN/m	1	NA NA	NA NA	NA NA	4	NA NA	NA NA	NA NA	4
06-Mar-13	CTM	40 kN/m	3	NA NA	NA NA	NA NA	6	NA NA	NA NA	NA NA	6
06-Mar-13	CTM	80 kN/m	3	NA NA	NA NA	NA NA	6	NA NA	NA NA	NA NA	6

REPRESENTATIVE PICTURES
OF
EXPOSURE PROCEDURE

(Typical Pictures from Testing a Range of Geosynthetics)


LIFTING PLATES POSITIONED BETWEEN TIES AND COVERED WITH FIRST LIFT OF COMPACTED SOIL/AGGREGATE


GEOSYNTHETIC POSITIONED OVER COMPACTED BASE AND COVERED

COVER SOIL/AGGREGATE IS UNIFORMLY SPREAD AND COMPACTED USING FIELD-SCALE EQUIPMENT AND PROCEDURES

THE DENSITY OF COMPACTED SOIL IS MEASURED

THE STEEL PLATES ARE TILTED TO FACILITATE EXHUMATION

Installation Damage Testing of Coated PET Geogrid: 80 kN/m In Silty Sand

March 2013

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C. Joel Sprague
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March 20, 2013

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Since compaction typically occurs parallel to the face of retaining walls and the contour lines of slopes, TRI placed the machine direction perpendicular to the running direction of the compaction equipment. To initiate the exposure procedure, four steel plates each measuring 42-inches x 52-inches (1.07 m x 1.32 m), equipped with lifting chains, were placed on a flat clean surface of hardened limestone rock. The longer side of the plates is parallel to the running direction of the compaction equipment. A layer of soil/aggregate was then placed over the adjacent plates to an approximate compacted thickness of 8 inches (0.20 m). Next, each of four coupons of the tested geosynthetic sample was placed on the compacted soil over an area corresponding to an underlying steel plate. To complete the installation, the second layer of soil was placed and compacted over the coupons to a thickness of 8 inches (0.20 m) using a vibratory compactor. To guide and contain the compaction process, braced railroad ties defined the long (208+ in. / 5.28 m) edges of the installation.

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Photographs representative of the procedures are included in the Appendix of this report.

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Each geosynthetic was exposed to soils/aggregates chosen by the client from a range of available stockpiles having different gradations. The soil/aggregate used in this testing was silty sand (Type 3). Soil gradation curves may be found in the Appendix of this report.

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<u>Tensile tests of the product before exposure to installation conditions:</u> The specific sampling procedure as described above was followed to assure that individual baseline specimen populations were developed from the same region of the roll width as those specimens dedicated to installation damage exposure.

<u>Tensile tests of specimens taken from the damaged material after installation:</u> The coupons and candidate specimens to be exposed to installation stresses were selected prior to exposure and installed in accordance with a defined sampling plan (via ASTM D 5818). Exposure coupons were laid within the exposure lane in consecutive order, each representing five specimens. Thus, the exposure lane was constructed with specimens 1 through 20 as shown below.

Exposure Coupon 1					Exposure Coupon 2					Exposure Coupon 3					Exposure Coupon 4				
1	2	3	4	5	11	12	13	14	15	6	7	8	9	10	16	17	18	19	20

Upon exhumation of the exposed coupons, specimens were cut and tested in numerical order. A minimum of ten exposed specimens from each testing condition was systematically selected for testing from the twenty candidate specimens. The test results were averaged and compared to the average of the baseline specimens.

<u>Tensile test results for both virgin (i.e. baseline) and damaged (i.e. exhumed) specimens:</u> All tensile test results have been tabularized and may be found in the Appendix of this report.

Test Results

Retained strengths for each of the tested geosynthetic styles are presented in Table 1.

Table 1. Retained Strength for Tested Geosynthetics

Style	Gradation Type 3 (Silty Sand)	
	% Retained	RF_{ID}
80 kN/m - MD	90.2	1.11

MD = machine direction;

Conclusion

TRI is very pleased to present this report for installation damage testing of soil reinforcing geosynthetics. If you have any questions or require any additional information, please call me at 1-864-242-2220.

Sincerely,

C. Joel Sprague, P.E.
Senior Engineer

cc: Jarrett Nelson

APPENDIX OF TEST RESULTS

Installation Damage Results

Soil / Aggregate Gradations

Construction Quality Control Summary

Representative Pictures

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INSTALLATION DAMAGE
TEST RESULTS

CTM Technical Textiles
INSTALLATION DAMAGE TESTING - WIDE WIDTH TENSILE (ISO 10319)
80 kN/m

Machine Direction

Sample Identification	Specimen Number	Ribs per Foot Width	Number of Ribs Tested	Maximum Load (lbs)	Maximum Load (lbs/ft)	Maximum Load (kN/m)	Elongation @ Break (%)	Load @ 2% lbs	Load @ 2% (lbs/ft)	Load @ 2% (kN/m)	Load @ 5% lbs	Load @ 5% (lbs/ft)	Load @ 5% (kN/m)	Load @ 10% lbs	Load @ 10% (lbs/ft)	Load @ 10% (kN/m)
80 kN/m Baseline	1	9.2	7	4140	5442	79.4	13.8	709	932	13.6	952	1251	18.3	2106	2769	40.4
	2	9.2	7	4220	5548	81.0	14.3	686	902	13.2	910	1197	17.5	1981	2605	38.0
	3	9.2	7	4197	5517	80.5	14.4	691	908	13.3	936	1230	18.0	2020	2655	38.8
	4	9.2	7	4224	5552	81.1	14.2	687	902	13.2	913	1200	17.5	1991	2618	38.2
	5	9.2	7	4061	5338	77.9	14.0	690	907	13.2	911	1198	17.5	1912	2514	36.7
Average				4168	5479	80.0	14.1	693	910	13.3	924	1215	17.7	2002	2632	38.4
Standard Deviation				68.8	90.4	1.3	0.2	9.3	12.3	0.2	18.6	24.4	0.4	70.3	92.5	1.4
% COV				1.7	1.7	1.7	1.8	1.3	1.3	1.3	2.0	2.0	2.0	3.5	3.5	3.5

Machine Direction

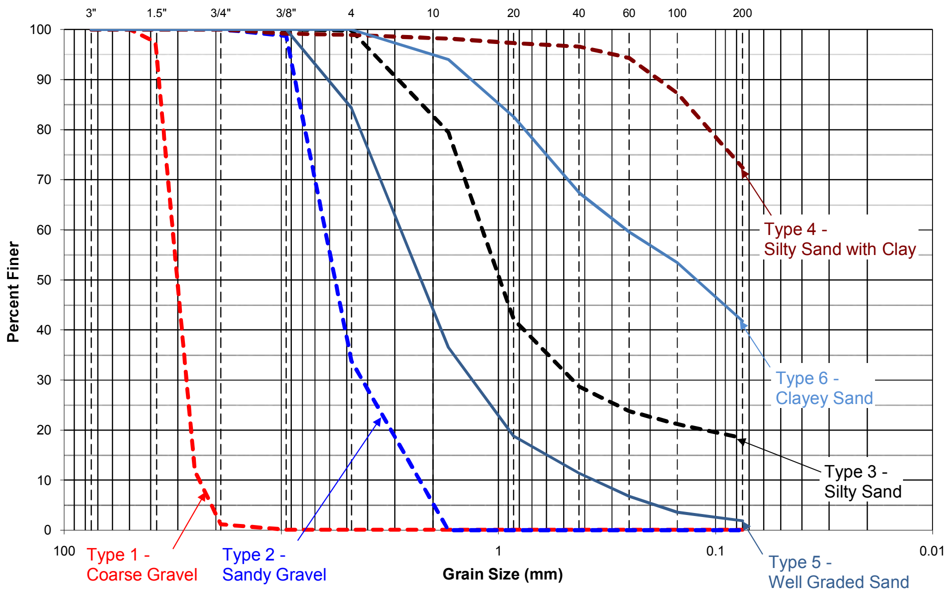
Sample Identification	Specimen Number	Ribs per Foot Width	Number of Ribs Tested	Maximum Load (lbs)	Maximum Load (lbs/ft)	Maximum Load (kN/m)	Elongation @ Break (%)	Load @ 2% lbs	Load @ 2% (lbs/ft)	Load @ 2% (kN/m)	Load @ 5% lbs	Load @ 5% (lbs/ft)	Load @ 5% (kN/m)	Load @ 10% lbs	Load @ 10% (lbs/ft)	Load @ 10% (kN/m)
80 kN/m installed in Gradation 3 (Sand)	1	9.2	7	3879	5099	74.4	13.1	692	910	13.3	923	1213	17.7	2150	2826	41.3
	2	9.2	7	3825	5028	73.4	13.2	678	891	13.0	914	1202	17.5	2051	2696	39.4
	3	9.2	7	3794	4987	72.8	13.1	697	916	13.4	941	1237	18.1	2094	2752	40.2
	4	9.2	7	3407	4478	65.4	12.4	689	906	13.2	927	1219	17.8	2071	2723	39.8
	5	9.2	7	3639	4784	69.8	12.8	694	912	13.3	950	1249	18.2	2088	2745	40.1
	6	9.2	7	3827	5031	73.5	13.3	697	916	13.4	933	1226	17.9	2033	2673	39.0
	7	9.2	7	3814	5013	73.2	13.1	701	921	13.4	943	1240	18.1	2063	2712	39.6
	8	9.2	7	3725	4897	71.5	13.0	693	912	13.3	927	1219	17.8	2030	2668	39.0
	9	9.2	7	3793	4986	72.8	13.0	698	917	13.4	943	1239	18.1	2099	2759	40.3
	10	9.2	7	3879	5099	74.4	13.1	692	909	13.3	923	1213	17.7	2150	2826	41.3
Average				3758	4940	72.1	13.0	693	911	13.3	932	1226	17.9	2083	2738	40.0
Standard Deviation				142.6	187.4	2.7	0.2	6.3	8.3	0.1	11.4	15.0	0.2	42.5	55.8	0.8
% COV				3.8	3.8	3.8	1.9	0.9	0.9	0.9	1.2	1.2	1.2	2.0	2.0	2.0

Percent Retained			90.2	90.2	90.2	92.1	100.1	100.1	100.1	100.9	100.9	100.9	104.0	104.0	104.0
RFid			**1.11**	**1.11**	**1.11**										

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

SOIL/AGGREGATE GRADATIONS

Grain Size Distribution - 2012 Standard Soils



INSTALLATION DAMAGE SOILS

US Sieve No.	Sieve Size (mm)	Percent Passing					
		Type 1 (Coarse Gravel)	**Type 2 (Sandy Gravel)**	**Type 3 (Silty Sand)**	**Type 4 (Silty Sand with Clay)**	**Type 5 (Well Graded Sand)**	**Type 6 (Clayey Sand)**
3 - in.	75	100.0	100.0	100.0	100.0	100.0	100.0
2 - in.	50	100.0	100.0	100.0	100.0	100.0	100.0
1.5 - in.	38	97.5	100.0	100.0	100.0	100.0	100.0
1 - in.	25	11.8	100.0	100.0	100.0	100.0	100.0
3/4 - in.	19	1.2	100.0	100.0	100.0	100.0	100.0
3/8 - in.	9.5	0.1	98.7	100.0	99.2	100.0	100.0
No. 4	4.75	0.1	33.8	99.8	98.9	84.3	100.0
No. 10	1.7	0.1	0.0	79.5	98.2	36.5	94.0
No. 20	0.85	0.1	0.0	42.1	97.3	18.8	82.6
No. 40	0.425	0.1	0.0	28.7	96.6	11.4	67.4
No. 60	0.25	0.1	0.0	23.8	94.3	6.8	59.6
No. 100	0.15	0.1	0.0	21.2	87.3	3.6	53.4
No. 200	0.075	0.1	0.0	18.4	72.4	1.9	41.8
Liquid Limit, %		-	-	-	28	-	25
Plasticity Index, %		-	-	-	14	-	9
Angularity		Angular to Subangular	Angular	Angular to Subangular	-	Angular to Subangular	-
USCS Classification		GP	GP	SM	CL-ML	SW	SC
		Poorly Graded Gravel	Poorly Graded Gravel with Sand	Silty Sand	Silty Sand with Clay	Graded Sand	Sand with Clay

CONSTRUCTION QUALITY CONTROL DURING INSTALLATION DAMAGE EXPOSURE

SUMMARY OF OBSERVATIONS AND MEASUREMENTS

REPRESENTATIVE PICTURES
OF
EXPOSURE PROCEDURE

(Typical Pictures from Testing a Range of Geosynthetics)

				FIRST LIFT				SECOND LIFT			
DATE	CLIENT	MATERIAL	SOIL TYPE	LOCATION	DENSITY	MOISTURE	# PASSES	LOCATION	DENSITY	MOISTURE	# PASSES
06-Mar-13	CTM	40 kN/m	1	NA NA	NA NA	NA NA	4	NA NA	NA NA	NA NA	4
06-Mar-13	CTM	80 kN/m	1	NA NA	NA NA	NA NA	4	NA NA	NA NA	NA NA	4
06-Mar-13	CTM	40 kN/m	3	NA NA	NA NA	NA NA	6	NA NA	NA NA	NA NA	6
06-Mar-13	CTM	80 kN/m	3	NA NA	NA NA	NA NA	6	NA NA	NA NA	NA NA	6

LIFTING PLATES POSITIONED BETWEEN TIES AND COVERED WITH FIRST LIFT OF COMPACTED SOIL/AGGREGATE

GEOSYNTHETIC POSITIONED OVER COMPACTED BASE AND COVERED

COVER SOIL/AGGREGATE IS UNIFORMLY SPREAD AND COMPACTED USING FIELD-SCALE EQUIPMENT AND PROCEDURES

THE DENSITY OF COMPACTED SOIL IS MEASURED

THE STEEL PLATES ARE TILTED TO FACILITATE EXHUMATION