



June 22, 2012

Our Ref.: 11-1415-0013.2000

Mr. Troy Meyer, P.E., P.Eng  
120 West Park Drive  
Suite 204  
Grand Junction, CO 81505

Attention: Mr. Troy Meyer

**RE: LABORATORY TEST RESULTS FOR TETRA TECH, PROJECT – YUKON**

Dear Mr. Meyer:

Golder Associates Inc. (Golder) has prepared this report to present the results of geotechnical laboratory testing conducted on samples submitted from the Golder Office in Burnaby, British Columbia, Canada. The samples were tested at Golder's Soils Laboratory in Lakewood, Colorado. This report presents the results of liner load testing on Agru Americas 80mil microspike liner sample and "BGC-GD-01 (38mm)". All pending laboratory tests results will be forwarded when completed. Hard copies of test results will be mailed to you under separate cover.

Thank you for the opportunity to provide these laboratory testing services and we look forward to assisting you on any future projects.

Should you have any questions or comments, please do not hesitate to call.

Sincerely,

**GOLDER ASSOCIATES INC.**

A handwritten signature in black ink that reads 'Matt Barrett'.

Matt Barrett  
Lab Manager

MB/MB

Attachments

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**Golder Associates Inc.**  
9197 West 6<sup>th</sup> Ave, Building C Suite 100  
Lakewood, CO 80215 USA  
Tel: (303) 980-0540 Fax: (303) 985-2080 [www.golder.com](http://www.golder.com)



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**ATTACHMENTS**

**12 inch Liner Load Test**

JOB NUMBER: 11-1415-0013/2000  
 JOB NAME: Tetra Tech/Aggregate/Yukon  
 DATE TESTED: 06/16/12

UNDERLINER: Silt  
 OVERLINER: BGC-GD-01 (38mm)

Clay Liner		Overliner		Initial Height Determination (Inches)		Density		Clay liner	Overliner
Initial Moisture Content	Tare:	Initial Moisture Content	Tare:	Clay Liner	Overliner	Wet Weight:	Dry Weight:		
Wet Weight & Tare, g:	463.28	Wet Weight & Tare, g:	692.31	1.	4.000	2.698	14,125.50	g	24699.60
Dry Weight & Tare, g:	419.63	Dry Weight & Tare, g:	690.83	2.	4.000	2.691	12,298.17	g	24634.75
Tare Weight, g:	125.86	Tare Weight, g:	128.65	3.	4.000	2.694	113.10	in <sup>2</sup>	12.000
Moisture, %:	14.9	Moisture, %:	0.3	4.	4.000	2.697	4.000	in	113.10
				5.	4.000	2.703	4.000	in	9.470
				6.	4.000	2.698	0.262	ft <sup>3</sup>	7.001
<b>Final Moisture Content</b>	<b>SCI</b>	<b>Final Moisture Content</b>	<b>TDM-2</b>	Average	4.000	2.697	0.262	ft <sup>3</sup>	0.46
Wet Weight & Tare, g:	591.98	Wet Weight & Tare, g:	748.00	Cell Height	--	16.250	119.0	pcf	87.9
Dry Weight & Tare, g:	535.27	Dry Weight & Tare, g:	746.03	Sample Height	4.000	9.470	119.0	pcf	118.9
Tare Weight, g:	123.48	Tare Weight, g:	128.28				103.6	pcf	87.7
Moisture, %:	13.8	Moisture, %:	0.3				103.6	pcf	118.6

**General Test Notes:**  
 Consolidate @ 640 psi for 48 hours

**Remold Instructions**  
 Compact subgrade to 95% & +/- 2% of the Standard  
 Proctor density at optimum moisture.

Liner Thickness (in)	Remold Instructions
1. 0.085	Compact subgrade to 95% & +/- 2% of the Standard Proctor density at optimum moisture.
2. 0.081	
3. 0.081	
4. 0.086	
5. 0.085	
6. 0.082	
Average 0.083 (in)	
83.33 (mls)	

Post-Test: No visual puncturing of geomembrane. No penetrations observed during the vacuum test.

Approximately 20 notable, rounded dimples on the surface of the membrane.

## GEOMEMBRANE LINER LOAD TEST SUMMARY

**JOB NAME:** Tetra Tech/Aggregate/Yukon  
**JOB NUMBER:** 11-1415-0013/2000  
**DATE:** 6/16/2012

**Underliner (Bedding) Source:** Silt  
 Underliner Classification: --      Atterberg Limits: --  
 Maximum Dry Density (pcf): 107.8      Optimum Moisture: 15.2

**Overliner Material Source:** BGC-GD-01 (38mm)  
 Overliner Classification: GP      Atterberg Limits: --  
 Dry Density (pcf): 87.7

**Geosynthetic Manufacturer/Supplier:** Agru America (80 mil LLPDE T/T)

Liner Type	Ave. Liner Thickness (mls)	Duration of Test (hrs.)	Underliner Compaction %	Moisture %	Load Applied (psi)	Change in total sample height (in)	Test Results	
							Visual	Vacuum
LLDPE Microspike 80 mil	83.33	50	96.1	14.9	640	2.469	PASS	PASS

**General Test Notes:** Test was conducted using a 12" diameter cell. The 80 mil texture/texture LLDPE liner was placed on top of moistened GCL which was placed on top of 4.0 inches of underliner soil, then covered with approximately 9.5 inches of overliner material. Approximately 12 rocks were hand placed with points downward on the liner prior to placement of remaining overliner material. A hydraulic jack was used to apply a load of 640 psi to the sample over a period of 14 hours. The load was maintained for 50 hours. A dial gage was used to monitor deformation of the sample. At the conclusion of the test, the liner was inspected and tested for punctures both visually and by application of a vacuum. The vacuum pressure was approximately 465 mmHG.

**Liner observations:** No punctures were present, but numerous rounded dimples.

Underliner was remolded to 96.1% of maximum dry density at approximately optimum moisture. Overliner was loosely placed and slightly tamped.

**Date:** 6/16/12  
**Tech:** JAM  
**Review:** MB



11/14/15

12 —

10 —

80 ml

LPDE T/T

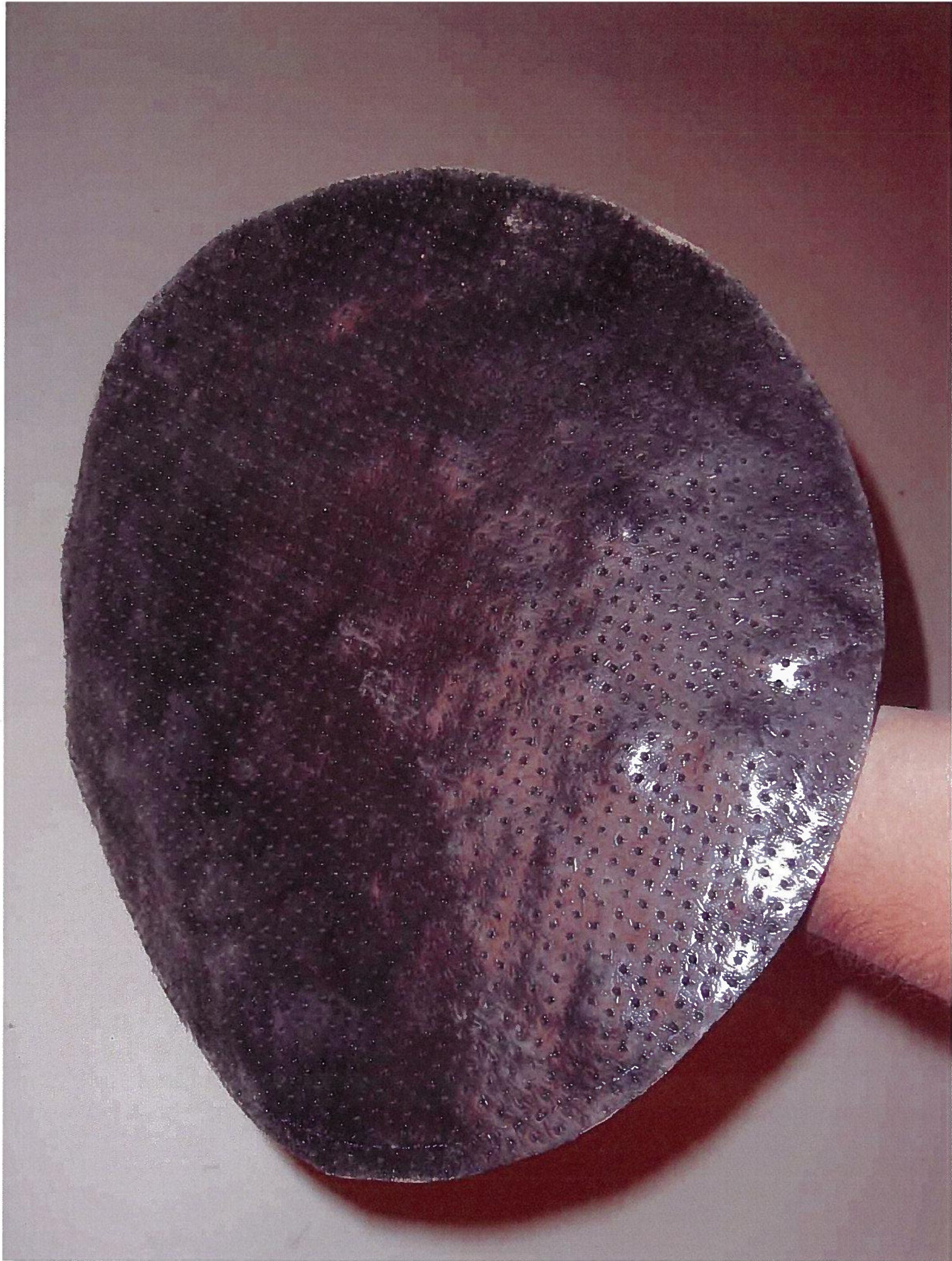
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Enate Gold/Yukon

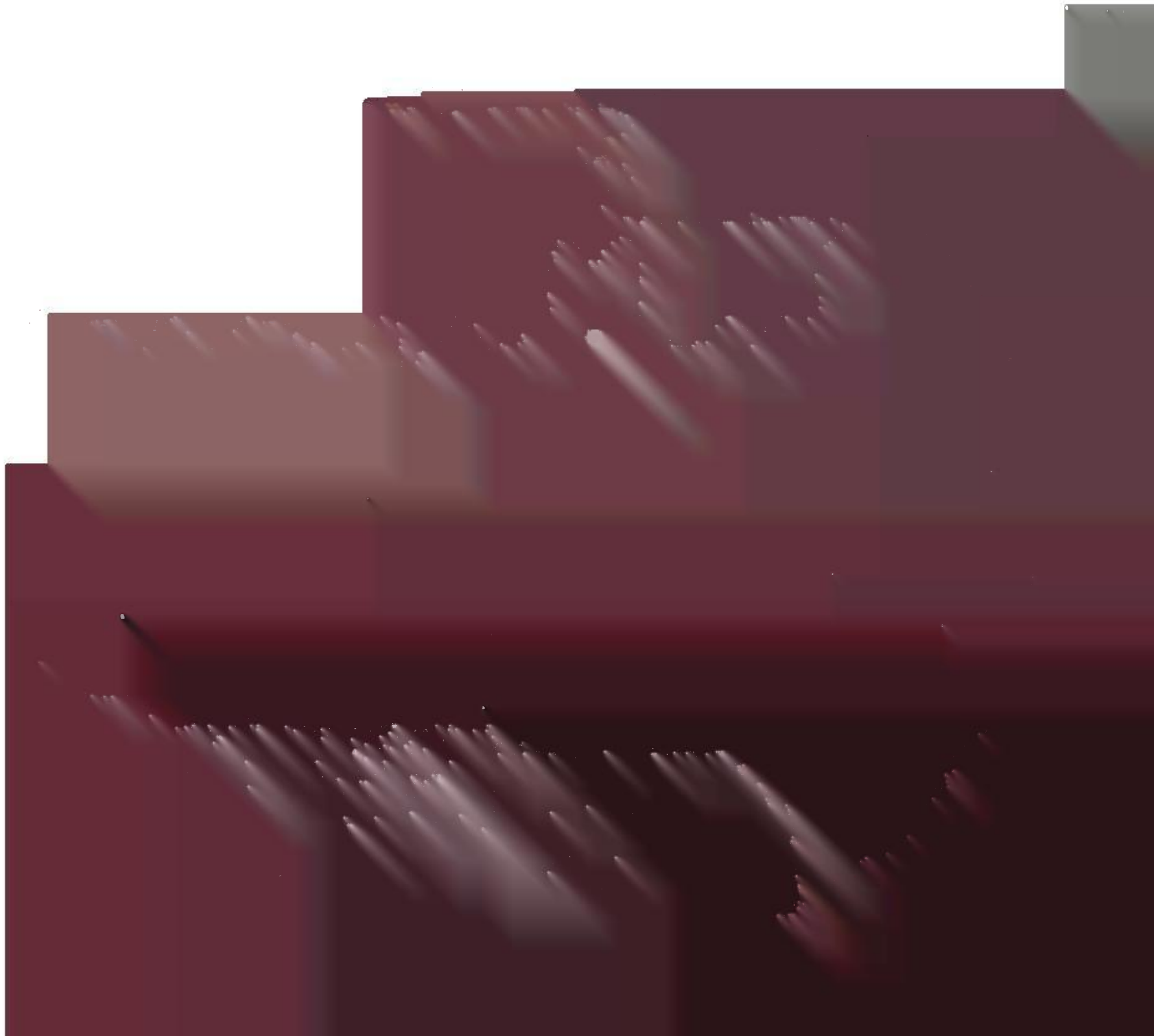


800 MI T  
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11-1415-0013/2000 <sup>6/21/12</sup>  
Eagle Gold/Yukon  
4" slit @ 107.8 pcf  
80 mil LLFDE T/T  
TEST COMPLETE





June 26, 2012

Our Ref.: 11-1415-0013.2000

Mr. Troy Meyer, P.E., P.Eng  
120 West Park Drive  
Suite 204  
Grand Junction, CO 81505

Attention: Mr. Troy Meyer

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Dear Mr. Meyer:

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Thank you for the opportunity to provide these laboratory testing services and we look forward to assisting you on any future projects.

Should you have any questions or comments, please do not hesitate to call.

Sincerely,

**GOLDER ASSOCIATES INC.**

*Matt Barrett*

Matt Barrett  
Lab Manager

MB/MB

Attachments

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## ATTACHMENTS

**12 inch Liner Load Test**

JOB NUMBER: 11-1415-0013/2000      Section 2 Silt  
 UNDERLINER: BGC-GD-01 (50mm)  
 JOB NAME: Tetra Tech/Aggregate/Yukon  
 OVERLINER  
 DATE TESTED: 06/21/12

Clay Liner		Overliner		Initial Height Determination (Inches)		Density		Clay liner		Overliner	
Initial Moisture Content		Initial Moisture Content		Clay Liner	Overliner	Wet Weight:	Dry Weight:	Wet Weight:	Dry Weight:	Diameter:	Area:
Tare:	SCI	Tare:	KD-35	1.	4.030	2.313	14,125.50	g	26704.40	g	
Wet Weight & Tare, g:	591.98	Wet Weight & Tare, g:	712.90	2.	4.038	2.073	12,415.67	g	26609.33	g	
Dry Weight & Tare, g:	535.27	Dry Weight & Tare, g:	710.81	3.	4.010	2.033	12,000	in	12,000	in	
Tare Weight, g:	123.48	Tare Weight, g:	125.83	4.	4.120	2.163	113.10	in <sup>2</sup>	113.10	in <sup>2</sup>	
Moisture, %:	13.8	Moisture, %:	0.4	5.	3.970	2.413	4.030	in	9.889	in	
				6.	4.010	2.503	4.022	in	8.326	in	
				Average	4.030	2.250	0.264	ft <sup>3</sup>	0.65	ft <sup>3</sup>	
				Cell Height	--	16.250	0.263	ft <sup>3</sup>	0.54	ft <sup>3</sup>	
				Sample Height	4.030	9.889	118.2	pcf	91.0	pcf	
							118.4	pcf	108.1	pcf	
							103.9	pcf	90.7	pcf	
							104.1	pcf	107.7	pcf	

General Test Notes:		Remold Instructions	
Consolidate @ 640 psi for 48 hours.		Compact subgrade to 95% & +/- 2% of the Standard Proctor density at optimum moisture.	
Post-Test: No visual puncture of geomembrane. No penetrations observed during the vacuum test.			
Approximately 10 notable, rounded dimples on the surface of the membrane.			

Liner Thickness (in)		Remold Instructions	
1.	0.081	Compact subgrade to 95% & +/- 2% of the Standard Proctor density at optimum moisture.	
2.	0.081		
3.	0.083		
4.	0.078		
5.	0.080		
6.	0.083		
Average	0.081 (in)		
	81.00 (mls)		





**GEOMEMBRANE LINER LOAD TEST SUMMARY**

**JOB NAME:** Tetra Tech/Aggregate/Yukon  
**JOB NUMBER:** 11-1415-0013/2000  
**DATE:** 6/21/2012

**Underliner (Bedding) Source:** Section 2 Silt  
**Underliner Classification:** --  
**Maximum Dry Density (pcf):** 107.8

**Atterberg Limits:** --  
**Optimum Moisture:** 15.2

**Overliner Material Source:** BGC-GD-01 (50mm)  
**Overliner Classification:** GP  
**Dry Density (pcf):** 90.7

**Atterberg Limits:** --

**Geosynthetic Manufacturer/Supplier:** Agru America LLDPE Microspike (80mil)

Liner Type	Ave. Liner Thickness (mls)	Duration of Test (hrs.)	Underliner Compaction %	Moisture %	Load Applied (psi)	Change in total sample height (in)	Test Results	
							Visual	Vacuum
LLDPE Microspike 80	81.00	70	96.4	13.8	640	2.373	PASS	PASS

General Test Notes: Test was conducted using a 12" diameter cell. The 80 mil texture/texture LLDPE microspike liner was placed on top of moistened GCL which was placed on top of 4.0 inches of underliner soil, then covered with approximately 9.75 inches of overliner material. Approximately 12 rocks were hand placed with points downward on the liner prior to placement of remaining overliner material. A hydraulic jack was used to apply a load of 640 psi to the sample over a period of 89 hours. The load was maintained for 70 hours. A dial gage was used to monitor deformation of the sample. At the conclusion of the test, the liner was inspected and tested for punctures both visually and by application of a vacuum. The vacuum pressure was approximately 465 mmHG.

**Liner observations:** No punctures were present but numerous dimples and scratches.

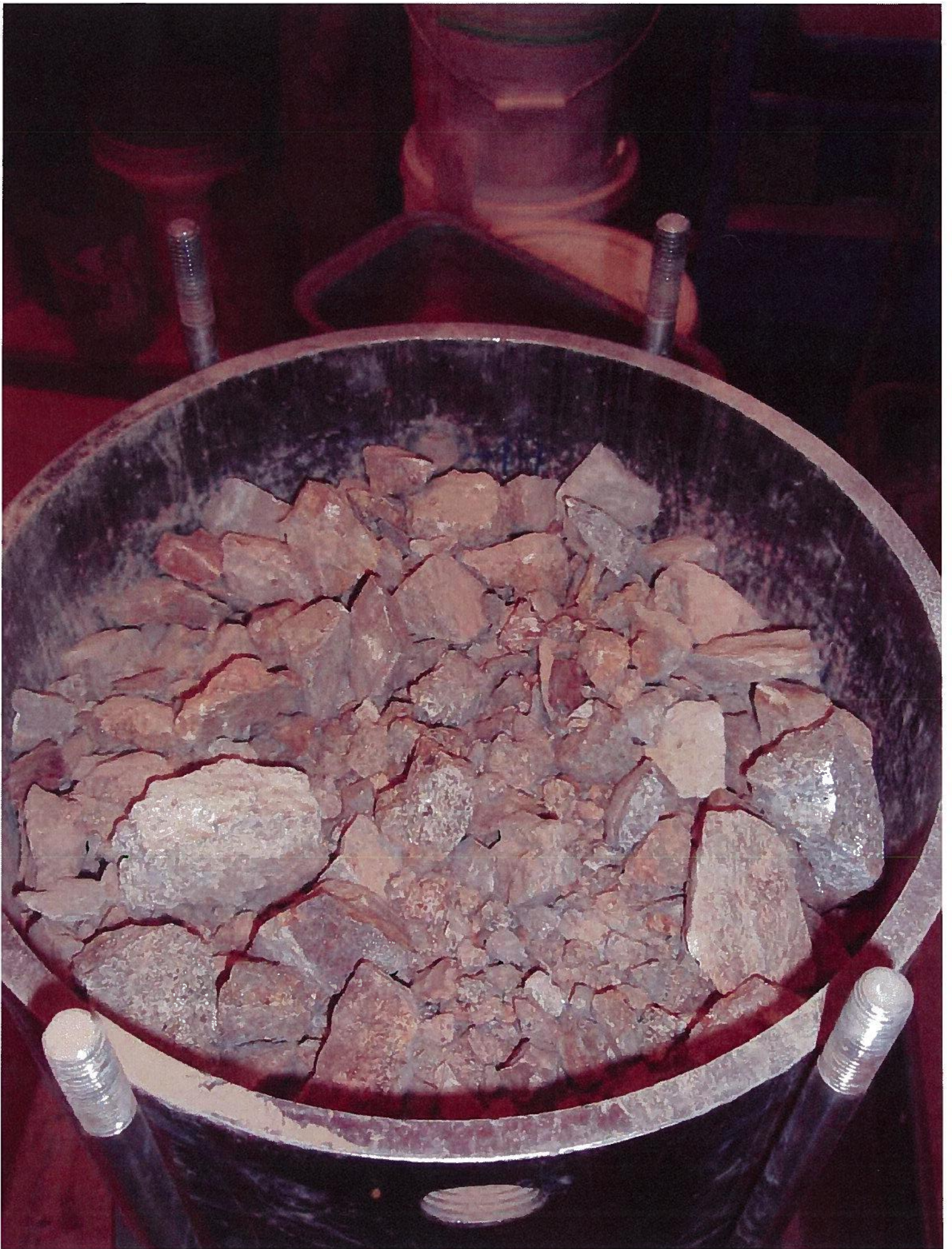
Underliner was remolded to 95% of maximum dry density at approximately optimum moisture. Overliner was loosely placed and slightly tamped.

**Date:** 6/21/12  
**Tech:** JAM  
**Review:** MB

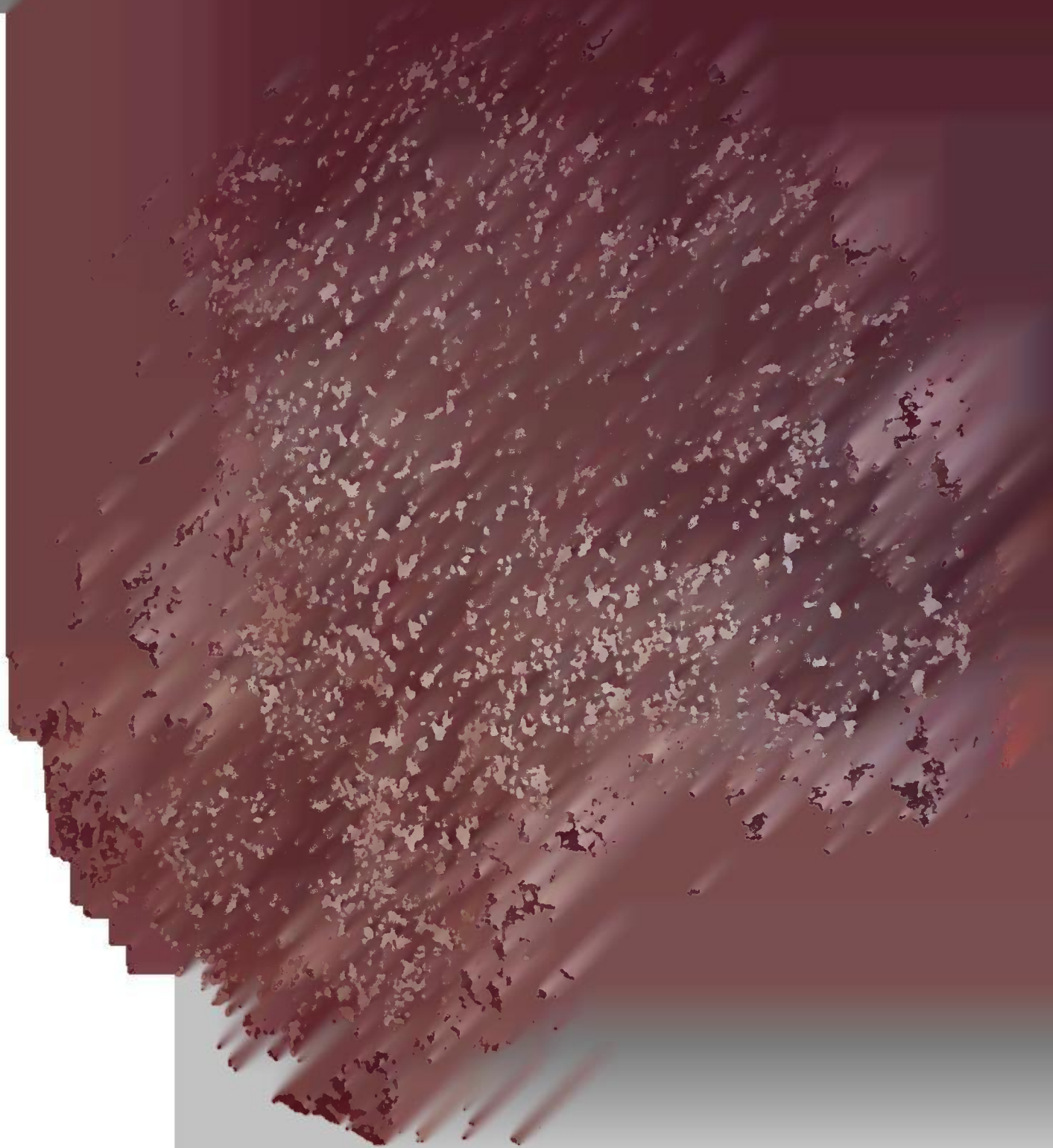


80 mil  
LLPDE T/T  
11-1415-0013/2000  
Eagle Gold/Yukon  
6/2/17





80 mi!  
LLPDE T/T  
11-1415-0013/2000  
Eagle Gold/Yukon  
6/1/15







80 mill T  
CLADE

11-14/5-00/3/2000

Eagle Gold Yukon

62112

80 mil

LLPDE

TT

11-1415-0013/2000

Eagle Gold Yukon

6/21/12





11-1415-0013/2000 <sup>6/25/12</sup>

Eagle Gold/Yukon

+ @ 107.8 pcf

OmiLLADE T/T

TEST COMPLETE

