APPENDIX G.1
GCL

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

September 24, 2008

Re: International Paper – Riegelwood Mill Industrial LF
Riegelwood, NC
GCL Specification Review

To whom it may concern:

Bentomat DN, our reinforced GCL consisting of a layer of sodium bentonite needlepunched together between two nonwoven geotextiles will meet or exceed the project specifications, with the following clarifications:

- **In-Field Needle Detection and Removal.** Paragraph D.4 Our manufacturing facility goes to great measures to ensure that the geosynthetic clay liners are free from broken needles. All of the Bentomat® DN GCL manufactured for the International Paper landfill project will be monitored for the presence of needles by an in-line metal detector and passed under a magnet in order to remove detected needles. We request an exception to the in-field needle detection and removal requirement
- **Warranty.** Paragraph 1.08.A of the specification requests that the manufacturer provide a 5-year warranty for manufacturing defects and material degradation from the date of installation. CETCO will provide a standard 5 year warranty as per attached. We request an exception to the warranty requirement.

We appreciate your interest in CETCO products. Please call me at (706) 377-3809 if you have any questions.

Sincerely,

Gerri Ortiz

Gerri Ortiz
Technical Sales Manager
CETCO Lining Technologies Group

CETCO®

LINING TECHNOLOGIES
Certified Properties

BENTOMAT® DN CERTIFIED PROPERTIES

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY ft²(m²)	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2) min
GCL Grab Strength[3]	ASTM D 6768	200,000 ft^2 (20,000 m^2)	50 lbs/in (88 N/cm) MARV
GCL Peel Strength[3]	ASTM D 6496	40,000 ft^2 (4,000 m^2)	3.5 lbs/in (6.1 N/cm) min
GCL Index Flux[4]	ASTM D 5887	Weekly	1×10^{-8} m^3/m^2/sec max
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly	5×10^{-9} cm/sec max
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typ @ 200 psf

Bentomat DN is a reinforced GCL consisting of a layer of sodium bentonite between two nonwoven geotextiles, which are needlepunched together.

Notes

[1] Bentonite property tests performed at a bentonite processing facility before shipment to CETCO's GCL production facilities.

[2] Bentonite mass/area reported at 0 percent moisture content.

[3] All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request, tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.

[4] Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5×10^{-9} cm/sec for typical GCL thickness. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.

[5] Peak values measured at 200 psf (10 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

CETCO has developed an edge enhancement system that eliminates the need to use additional granular sodium bentonite within the overlap area of the seams. We call this edge enhancement, SuperGroove™, and it comes standard on both longitudinal edges of Bentomat® DN. It should be noted that SuperGroove™ does not appear on the end-of-roll overlaps and recommend the continued use of supplemental bentonite for all end-of-roll seams.

800.527.9948 Fax 847.577.5566
For the most up-to-date product information, please visit our website, www.cetco.com.

A wholly owned subsidiary of AMCOL International Corporation. The information and data contained herein are believed to be accurate and reliable, CETCO makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information.

BENTOMAT® & CLAYMAX® PANEL & ROLL SPECIFICATIONS

Panel Specifications

PRODUCTS	DIMENSIONS WIDTH x LENGTH	AREA	EFFECTIVE AREA
BENTOMAT® ST	15 ft x 150 ft (4.6 m x 45.7 m)	2,250 ft^2 (209 m^2)	2,145 ft^2 (200 m^2)
BENTOMAT SDN	14.5 ft x 150 ft (4.4 m x 45.7 m)	2,175 ft^2 (202 m^2)	2,071 ft^2 (193 m^2)
BENTOMAT DN	14.5 ft x 150 ft (4.4 m x 45.7 m)	2,175 ft^2 (202 m^2)	2,071 ft^2 (193 m^2)
BENTOMAT CL	15 ft x 150 ft (4.6 m x 45.7 m)	2,250 ft^2 (209 m^2)	2,070 ft^2 (193 m^2)
BENTOMAT CLT	15 ft x 150 ft (4.6 m x 45.7 m)	2,250 ft^2 (209 m^2)	2,070 ft^2 (193 m^2)
CLAYMAX® 200R	15 ft x 150 ft (4.6 m x 45.7 m)	2,250 ft^2 (209 m^2)	2,040 ft^2 (190 m^2)

Roll Specifications

PRODUCTS	DIMENSIONS Length x Diameter (Avg.)	NOMINAL WEIGHT	ROLLS / TRUCKLOAD
BENTOMAT ST	16 ft x 24 in (4.9 m x 610 mm)	2,650 lbs (1204 kg)	17 rolls per truckload
BENTOMAT SDN	16 ft x 24 in (4.9 m x 610 mm)	2,650 lbs (1204 kg)	16 rolls per truckload
BENTOMAT DN	16 ft x 24 in (4.9 m x 610 mm)	2,700 lbs (1227 kg)	16 rolls per truckload
BENTOMAT CL	16 ft x 25 in (4.9 m x 635 mm)	2,750 lbs (1250 kg)	15 rolls per truckload
BENTOMAT CLT	16 ft x 26 in (4.9 m x 660 mm)	2,950 lbs (1340 kg)	15 rolls per truckload
CLAYMAX 200R (Lovell)	16 ft x 20 in (4.9 m x 510 mm)	3,000 lbs (1363 kg)	15 rolls per truckload
CLAYMAX 200R (Cartersville)	16 ft x 20 in (4.9 m x 510 mm)	3,300 lbs (1500 kg)	13 rolls per truckload

Unloading and handling equipment for all GCL products:

- Spreader bar and core pipe: Spreader bar 17 ft (5.2 m) long; core pipe 20 ft (6.1 m) long, nominal pipe size, XXH.
- A solid 3.5 in. (90 mm) O.D. x 14.5 ft (4.4 m) solid steel pipe stinger attachment for a forklift.
- Slings: 2 Polyester slings are required, approximately 12 ft (3.7 m) long x 2 in (50 mm) wide each.
- Vehicle needed: Front end loader or forklift (are typical).

Standard Roll Specifications:

- Packaging: U.V. resistant polyethylene sleeve.

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BENTOMAT®
THE GCL WITH THE "WINNING EDGE™ "

Available now and standard on all Bentomat products, the "Winning Edge™" is a new overlapped seam enhancement system that brings higher levels of performance and convenience to the world's best-selling GCL. The patented SuperGroove™ eliminates the need for accessory bentonite in the overlapped seam. Available only on Bentomat products, the SuperGroove will increase performance and decrease GCL installation headaches.

The SuperGroove™

All Bentomat products have at least one nonwoven needlepunched geotextile. In comparison to woven geotextiles, needlepunched nonwovens are thicker and can transmit flow in the plane of the geotextile. Planar flow can cause excessive leakage in the overlapped seam of a GCL. The addition of granular bentonite within the overlap area can eliminate this preferential flow by sealing the nonwoven geotextile, which has been the standard of practice for many years.

The SuperGroove is a precision cut in the nonwoven geotextile of Bentomat that allows bentonite to more freely extrude into the overlap zone (Figure 1). Upon hydration, a seal is formed, eliminating the possibility of preferential seam flow (Figure 2). Supplemental bentonite is not required.

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Figure 1. The SuperGroove on Bentomat.

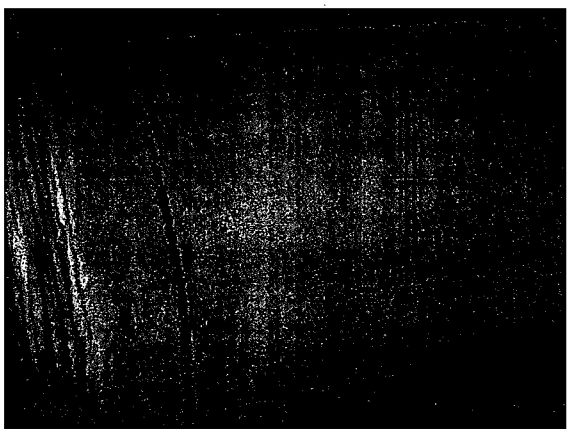
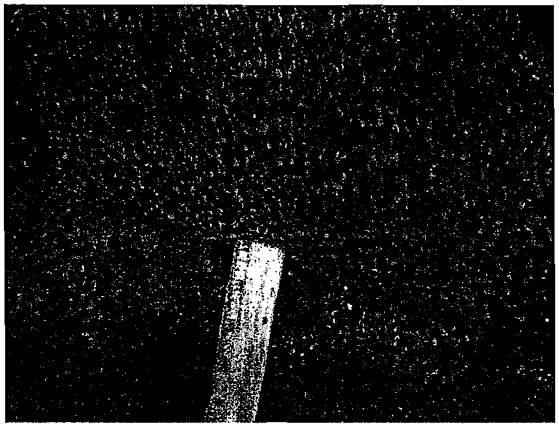


Figure 2. A test overlap showing bentonite "stain" on the surface of the woven geotextile, indicating extrusion from the non-woven.



The SuperGroove ensures that the hydraulic performance of the entire seamed GCL system is equal to that of unseamed portions. Added benefits include:

- No need for supplemental bentonite
- No concerns over improper seaming technique
- Eliminates labor associated with adding bentonite
- Simplifies CQA/CQC procedures
- Eliminates a source of geomembrane seam contamination

The SuperGroove is located approximately 3 inches (75 mm) inside the outermost limit of the bentonite clay component of the GCL, about 4 inches (100 mm) outside the first lap line (Figure 3). The SuperGroove is placed on both longitudinal edges of the Bentomat product.

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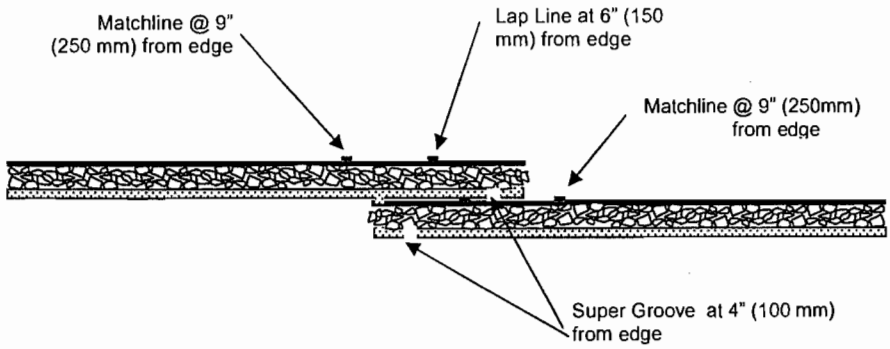

Figure 3. Location of the SuperGroove on Bentomat panels.

Performance of the SuperGroove seam was evaluated in comparison to a traditional bentonite-enhanced seam. Third-party laboratory tests were performed under a variety of head pressures and confining pressures. A test at low confining pressure is a "worst-case" scenario because the volume of void spaces in the overlap is larger than when a higher confining pressure is applied. Even in low-stress conditions, test data shows that the SuperGroove still allowed extrusion to completely seal the overlap (Table 1).

Table 1. Comparative performance of Bentomat ST with traditional bentonite-enhanced seam and with new SuperGroove™.

Hydraulic Pressure (psi)	Unseamed Flux ($m^3/m^2/s$)	Seamed Flux ($m^3/m^2/s$)	Flux difference ($m^3/m^2/s$)	Seam correction factor*	Seam flux ($m^3/m^2/s$)**	Seam flux, % of total flux of seamed sample
2	4.4×10^{-10}	5.28×10^{-10}	8.8×10^{-11}	13.7	6.42×10^{-12}	1.2%
5	1.37×10^{-9}	1.63×10^{-9}	2.6×10^{-10}	13.7	1.90×10^{-11}	1.2%
10	3.41×10^{-9}	3.85×10^{-9}	4.4×10^{-10}	13.7	3.21×10^{-10}	0.8%

*Laboratory tests are performed with 13.7 times more seam length (per unit area of GCL) than in field seams.
**Flux difference divided by seam correction factor results in estimated preferential flow per unit area through field seam.

The test data shows that in all test conditions, there is a very small component of the total flux that is attributable to the overlapped seams. Expressed as a percentage of total seam area (3.9% on full-size GCL rolls laid in a large area, it can be seen that the percentage of total seam flux is proportionally less than the percentage of seamed area. Thus, it can be concluded that SuperGroove seams function effectively.

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It should be noted that the SuperGroove does not appear on end-of-roll overlaps. CETCO recommends the continued use of supplemental bentonite for all end-of-roll overlaps of Bentomat.

Bentomat—the GCL with the Winning Edge™

The Winning Edge, featuring the SuperGroove, comes on all orders of Bentomat ST, Bentomat DN, Bentomat SDN and Bentomat YSDN. For more information about the Winning Edge, contact your local CETCO representative.

References

SGI Project No. SGI1029, Document No. SGI 01071, "Final Report, Large-Scale Flow Rate Testing, Seamed and Unseamed Bentomat GCL," 3 August 2001.

SGI Project No. SGI1029, Document No. SGI 01071, SGI02037, "Final Report, Large-Scale Flow Rate Testing, Seamed and Unseamed Bentomat GCL," 4 February 2002.

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FAQs ABOUT THE WINNING EDGE

Does the bentonite fall out of the SuperGroove during handling? No. CETCO's production process allows most of the bentonite to remain within the SuperGroove. Even if small amounts of bentonite are lost during installation, the resulting void spaces are rapidly filled by swelling bentonite particles immediately adjacent to the SuperGroove.

Will the SuperGroove affect the strength of the Bentomat? No. The narrow groove affects a tiny percentage of one geotextile component of Bentomat. The nonwoven geotextile is still securely needlepunched on either side of the SuperGroove and therefore does not affect the shear or tensile strength of the product.

Will bentonite extrusion from the SuperGroove leave a void where preferential leakage can occur downward through the GCL? No. The bentonite does not leave a large void, and the SuperGroove is located only where there is already a double layer of bentonite (in the overlap), so there is no possibility of a "short circuit" around or through it.

How do I know the SuperGroove is really present? The SuperGroove is on the bottom of the Bentomat, such that it faces the installer and inspector as the roll is unrolled and installed. The SuperGroove is in plain sight throughout the deployment process. Random checks after installation can also be included in a CQA plan as needed to document its continuous presence.

Is the SuperGroove present in the upper geotextile component of Bentomat also? No. It is only present in the lower geotextile.

How do I specify the Winning Edge? CETCO has modified its GCL specification guidelines to include generic language regarding GCL edge treatment. Please visit our GCL engineering website for the latest Bentomat specification document.

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SGI TESTING SERVICES, LLC

19 June 2002

Mr. William Urchik
Colloid Environmental Technologies Co.
1500 West Shure Drive
Arlington Heights, IL 60004-1440

Subject: Laboratory Test Results Transmittal
Large-Scale Flow Rate Testing
Bentomat DN GCL Seamed with Groove

Dear Mr. Urchik,

SGI Testing Services, LLC (SGI®) is pleased to present the attached large-scale flow rate test results of Bentomat DN GCL seamed with groove and no bentonite. For each test, a total normal stress of 132 psf was applied over a seamed Bentomat DN GCL specimen using steel plates as shown in Figure A-1. The note section below addresses sample preparation, sample disposal and a disclosure statement.

SGI® appreciates the opportunity to provide laboratory testing services to CETCO. Should you have any questions regarding the attached document(s), or if you require additional information, please do not hesitate to contact the undersigned.

Sincerely,

Zehong Yuan, Ph.D., P.E.
Chief Technical Officer

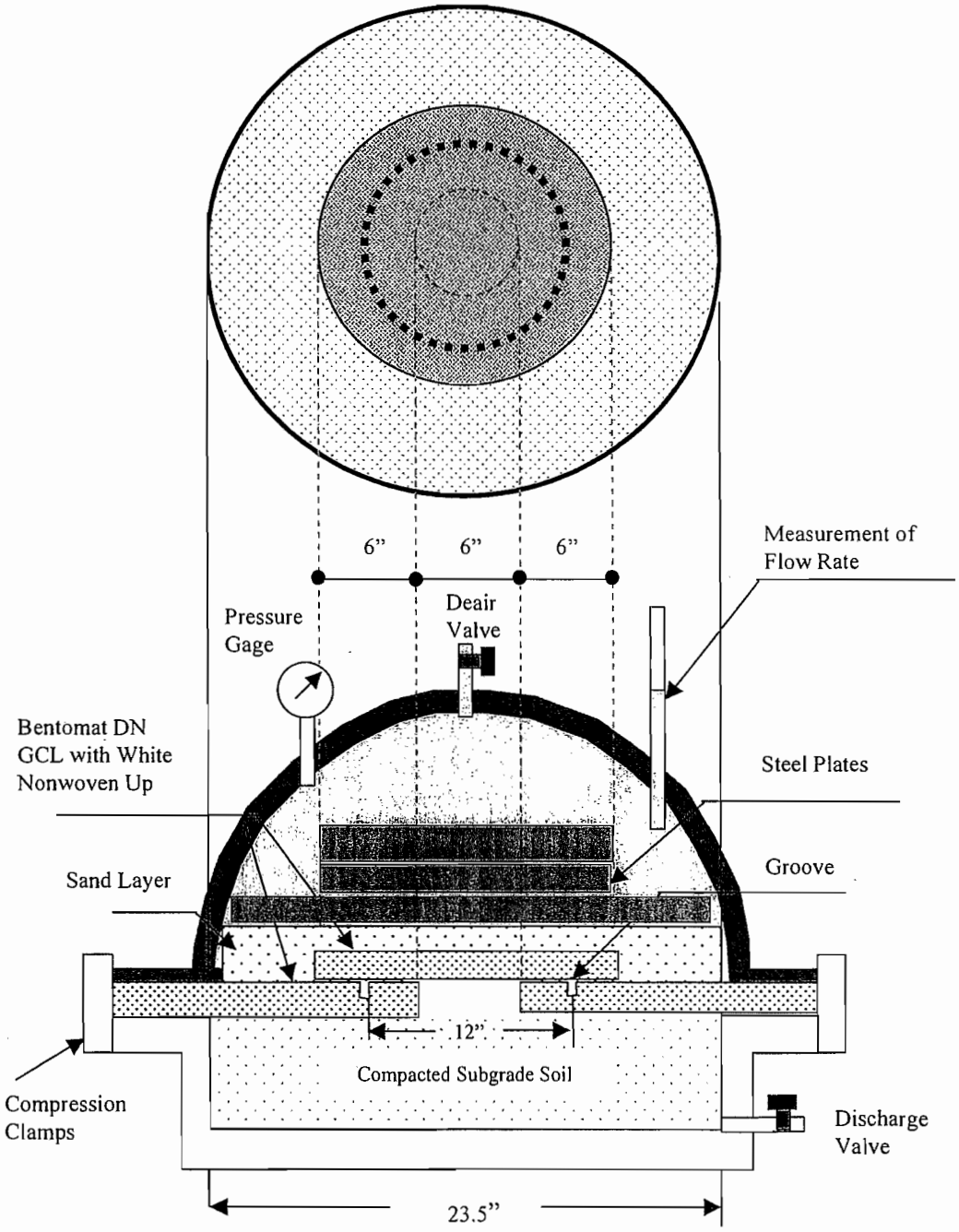
Attachment

Notes:
(1) Unless otherwise noted in the test results the sample(s)/specimen(s) were prepared in accordance with the applicable test standards or generally accepted sampling procedures.
(2) Contaminated/chemical samples and all related laboratory generated waste (i.e., test liquids, PPE, absorbents, etc.) will be returned to the client or designated representative(s), at the client's cost, within 60 days following the completion of the testing program, unless special arrangements for proper disposal are made with SGI®.
(3) Materials that are not contaminated will be discarded after test specimens and archived specimens are obtained. Archived specimens will be discarded 60 days after the samples are received at the laboratory, unless long-term storage arrangements are specifically made with the laboratory.
(4) The reported results apply only to the materials and test conditions used in the laboratory testing program. The results do not necessarily apply to other materials or test conditions. The test results should not be used in engineering analysis unless the test conditions model the anticipated field conditions. The testing was performed in accordance with general engineering testing standards and requirements. The reported results are submitted for the exclusive use of the client to whom they are addressed.

SGI1029

SGI® Testing Services, LLC
5775 PEACHTREE DUNWOODY ROAD
SUITE 11D
ATLANTA, GEORGIA 30342
PHONE : 404.256.9939 FAX: 404.705.9300
WEB SITE: WWW.INTERACTIONSPECIALISTS.COM

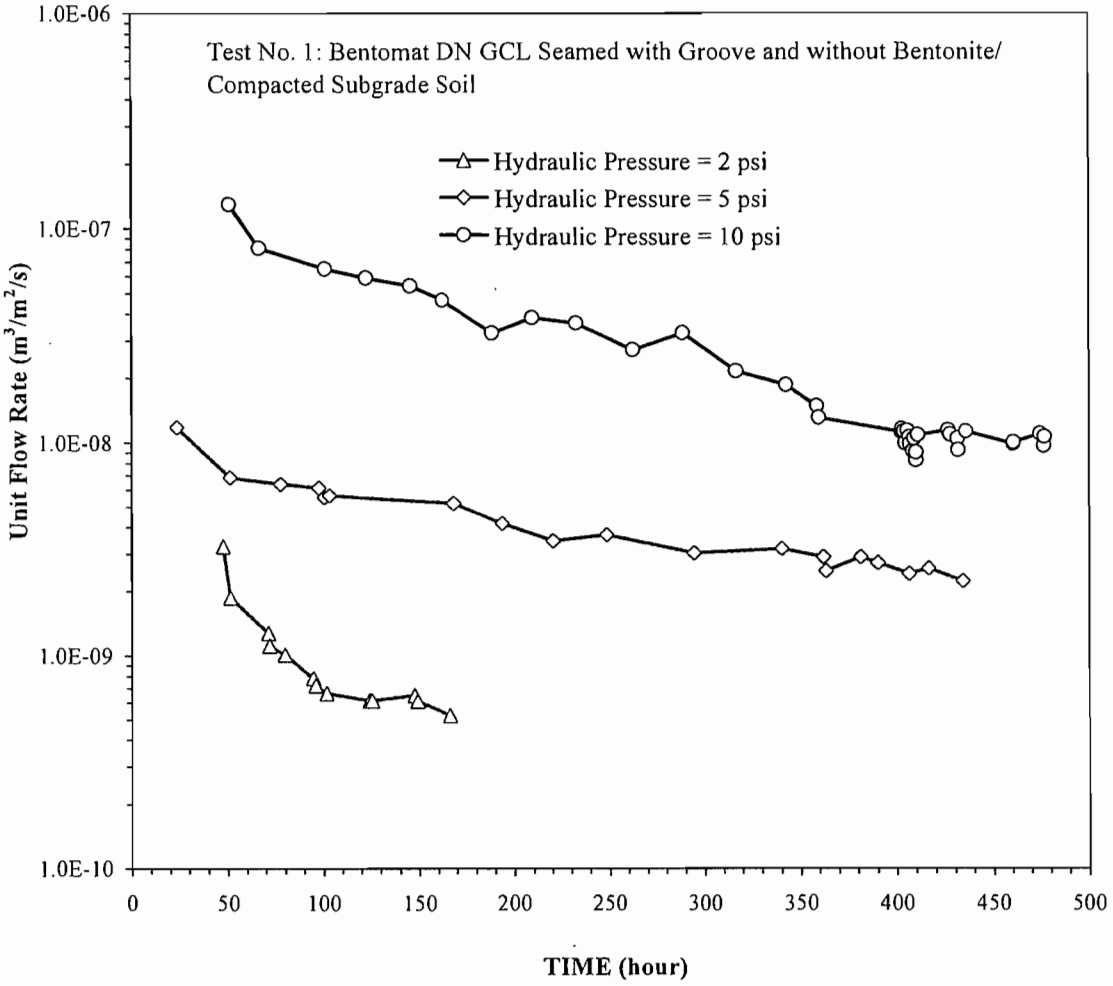
FIGURE A-1. SCHEMATIC DIAGRAM OF TEST CONFIGURATION
LARGE-SCALE FLOW RATE TESTING ON GCL SEAMED WITH GROOVE



Total Normal Stress Over Test Specimen: 132 psf

TESTING SERVICES

COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
LARGE-SCALE FLOW RATE TESTING
BENTOMAT DN GCL SEAMED WITH GROOVE AND WITHOUT BENTONITE



Test No.	Diameter of Test Specimen (in.)	Total Normal Stress [1] (psf)	Hydraulic Pressure (psi)	Equivalent Hydraulic Head (ft)	Test Duration (hours)	Flow Rate at Completion of Testing ($m^3/m^2/s$)
1	23.5	132	2.0	4.6	167	5.24E-10
2	23.5	132	5.0	11.5	434	2.25E-09
3	23.5	132	10.0	23.1	477	1.06E-08

NOTES:

(1) total normal stress = surchage load (steel plates and sand layer) above the seamed GCL specimen divided by the entire test specimen area.

DATE TESTED: 18 April to 2 June 2002

SGI TESTING SERVICES, LLC

FIGURE NO.	A-2
PROJECT NO.	SGI1029
DOCUMENT NO.	SGI02054
FILE NO.	

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APPENDIX G.2
MQC GCL

ENVIRONMENTAL SPECIALTIES INTERNATIONAL, INC.

7943 PECUE LANE SUITE A BATON ROUGE, LA 70809 TEL (225) 291-2700 FAX (225) 291-2788

TO: Saiia Construction, LLC

324 Commons Drive

Birmingham, AL 35209

Tel # : (205) 290 - 0400

ATTENTION: Gary Wilford

DATE: October 30, 2008

JOB NAME: International Paper Riegelwood

Cell 1 South Expansion

TRANSMITTAL NUMBER: 06

ESI PROJECT NUMBER: 08-08-1240

WE ARE SENDING YOU [X] ATTACHED [ ] UNDER SEPARATE COVER VIA _____ THE FOLLOWING ITEMS:

[ ] SHOP DRAWINGS [ ] PRINTS [ ] PLANS [ ] SAMPLES [ ] SPECIFICATIONS

[ ] COPY OF LETTER [ ] CHANGE ORDER [ ] _____

COPIES	DATE	DRAWING NO.	REV.	DESCRIPTION	ACTION (*)
1	10/30/08			Bentomat DN GCL certs for Bill of Lading # 24486701	

ACTION (*)

[ ] AS - AS REQUESTED [X] FA - FOR APPROVAL [ ] _____

[ ] F – FILE [ ] RC - REVIEW & COMMENT [ ] _____

COMMENTS: _____

SENT VIA:

[X] E-MAIL [ ] MAIL [ ] OVERNIGHT [ ] HAND DELIVERY [ ] OTHER

COPY TO: _____ BY: Kevin Simms

If enclosures are not as noted, please notify us at once.....

LINING TECHNOLOGIES
800.527.9948 www.cetco.com

Date: 10/29/2008
Purchase Order: 10275
ORDER NUMBER: 024486701

Kevin Simms
ESI
7943 Pecue Lane
Baton Rouge, LA 70809
ksimms@esiliners.com cc. jland@esiliners.com

To Whom it May Concern:

Please find enclosed the MQA/MQC test data package for Geosynthetic Clay Liner shipments to ESI. The shipments left our Cartersville, Georgia plant on 10/28/2008.

If you have any questions regarding this information, please contact
Chris Athanassopoulos, Technical Support Engineer, at (847) 818-7945.

Sincerely,

Melanie King

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant

GEOSYNTHETIC CLAY LINER
MANUFACTURING QUALITY ASSURANCE DATA PACKAGE

PROJECT NAME: IP-Riegelwood LF
CUSTOMER P.O.: 10275
ORDER NUMBER: 024486701
PREPARED FOR: ESI

CONTENTS:

- Daily production and needle detection certification
- GCL property specifications
- Order packing list
- GCL MQA tracking form
- GCL manufacturing quality control test data
- Bentonite clay certification
- Raw material test results

PREPARED BY: Melanie King
Quality Assurance Coordinator
CETCO
218 Industrial Park

Cartersville, GA 30121

Telephone: (770) 387-7773
Fax:
E-Mail: melanie.king@cetco.com

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

PRODUCTION CERTIFICATION

PROJECT NAME: IP-Riegelwood LF
CUSTOMER P.O.: 10275
PREPARED FOR: ESI

CETCO affirms that these products meet the physical and chemical criteria listed on the attached GCL property specification sheet.

NEEDLE REMOVAL AND DETECTION PROCEDURE

CETCO hereby affirms that all Bentomat® geosynthetic clay liner material manufactured for this project is continually passed under a magnet for needle removal and then screened with a metal detection device. CETCO certifies Bentomat® to be essentially free of broken needles and fragments of needles that would negatively effect the performance of the final product.

Melanie King
Quality Assurance Coordinator
Colloid Environmental Technologies Co. (CETCO)

CETCO LINING TECHNOLOGIES
800.527.9948 www.cetco.com

Ship Date: 10/28/2008
Order Number: 024486701
Prepared For: ESI

The GCL raw materials and GCL finished product manufactured for the above-referenced order number(s) are hereby certified to achieve the properties listed in the tables below.

GCL PROPERTY SPECIFICATIONS FOR BENTOMAT DN

Test Method	Test Method Property	Test Frequency	Certified Value
ASTM D 5891	Bentonite Fluid Loss	1 per 50 Tons	18 ml Max
ASTM D 5993	Bentonite Mass/Area	40,000 sq ft (4000 sq m)	0.75 lb /sq ft (3.6 kg/sq m) Min
ASTM D 5890	Bentonite Swell Index	1 per 50 Tons	24 ml/2g Min
ASTM D 4632	GCL Grab Strength	200,000 sq ft (20,000 sq m)	150 lbs (660 N) MARV
ASTM D 6768	GCL Grab Strength	200,000 sq ft (20,000 sq m)	50 lbs/in MARV
ASTM D 6243	GCL Hydrated Internal Shear Strength	Periodic	500 psf (48 kPa) typ @ 200 psf
ASTM D 5887	GCL Hydraulic Conductivity	Weekly	5 x 10^-9 cm/ sec Max
ASTM D 5887	GCL Index Flux	Weekly	1 x 10^-8 m^3/m^2/sec Max
ASTM D 6496	GCL Peel Strength	40,000 sq ft (4000 sq m)	3.5 lbs/in Min
ASTM D 4632	GCL Peel Strength	40,000 sq ft (4000 sq m)	15 lbs (65 N) Min

Bentonite property tests are performed at a bentonite processing facility before shipment to CETCO's production facility.
All tensile testing is in the machine direction.

FABRIC SUPPLIER REQUIREMENTS FOR BENTOMAT DN

Raw Material	test method	mass per area	units
Nonwoven Cover Fabric	ASTM D 5261	6.0	oz/yd2
Bentomat DN Base Nonwoven Fabric	ASTM D 5261	6.0	oz/yd2

Fabric certifications from our raw material suppliers are on file at our production facility.

CETCO's MQA laboratory is GAI-accredited (www.geosynthetic-institute.org/gai/lab.html).

Melanie King

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

GCL ORDER PACKING LIST

GCL shipped for certification package number 024486701

Order #	Product	Lot Number	Roll Number	Length (ft)	Width (ft)	Square Ft	Weight (lbs)
024486701	CV-BENTOMAT DN	200844CV	00006641	150	14.5	2175	2752
024486701	CV-BENTOMAT DN	200844CV	00006642	150	14.5	2175	2730
024486701	CV-BENTOMAT DN	200844CV	00006648	150	14.5	2175	2736
024486701	CV-BENTOMAT DN	200844CV	00006661	150	14.5	2175	2940
024486701	CV-BENTOMAT DN	200844CV	00006662	150	14.5	2175	2930
024486701	CV-BENTOMAT DN	200844CV	00006673	150	14.5	2175	2766
024486701	CV-BENTOMAT DN	200844CV	00006677	150	14.5	2175	2744
024486701	CV-BENTOMAT DN	200844CV	00006688	150	14.5	2175	2750
024486701	CV-BENTOMAT DN	200844CV	00006689	150	14.5	2175	2756
024486701	CV-BENTOMAT DN	200844CV	00006690	150	14.5	2175	2750
024486701	CV-BENTOMAT DN	200844CV	00006691	150	14.5	2175	2790
024486701	CV-BENTOMAT DN	200844CV	00006694	150	14.5	2175	2724
024486701	CV-BENTOMAT DN	200844CV	00006697	150	14.5	2175	2732
024486701	CV-BENTOMAT DN	200844CV	00006698	150	14.5	2175	2710
024486701	CV-BENTOMAT DN	200844CV	00006702	150	14.5	2175	2730
024486701	CV-BENTOMAT DN	200844CV	00006704	150	14.5	2175	2738
024486701	CV-BENTOMAT DN	200844CV	00006705	150	14.5	2175	2740
			Totals:	**2550**	**246.5**	**36975**	**47018**

Total Number of Rolls Certified: **17**

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GCL MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 024486701

GCL			Geotextiles				Clay
CV-BENTOMAT DN			CV-N/W-WHITE-DN			CV-N/W-BLACK-DN-6 OZ	CV-CG 50-DN
GCL Lot #	**GCL Roll #**	**Roll # Tested**	**Cap Lot #**	**Cap Roll #**	**Roll # Tested**	**Base Roll #**	**Clay Lot #**
200844CV	00006641	00006637	200843CV	00004798	00004797	2010945529	889270A
200844CV	00006642	00006637	200843CV	00004798	00004797	2010945529	889270A
200844CV	00006648	00006637	200843CV	00004801	00004797	2010945519	889270B
200844CV	00006661	00006655	200844CV	00004810	00004810	2010945519	889270B
200844CV	00006662	00006655	200843CV	00004806	00004802	2010953483	889270B
200844CV	00006673	00006673	200843CV	00004779	00004723	2010953486	889270B
200844CV	00006677	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006688	00006673	200843CV	00004803	00004802	2010953487	889270B
200844CV	00006689	00006673	200844CV	00004814	00004810	2010953487	889270B
200844CV	00006690	00006673	200844CV	00004814	00004810	2010953487	889270B
200844CV	00006691	00006691	200844CV	00004814	00004810	2010953487	889270B
200844CV	00006694	00006691	200844CV	00004814	00004810	2010953487	889276A
200844CV	00006697	00006691	200844CV	00004812	00004810	2010953487	889276A
200844CV	00006698	00006691	200844CV	00004812	00004810	2010953487	889276A
200844CV	00006702	00006691	200844CV	00004812	00004810	2010953477	889276A
200844CV	00006704	00006691	200844CV	00004815	00004810	2010953477	889276A
200844CV	00006705	00006691	200844CV	00004815	00004810	2010953477	889276A

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GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 024486701 have been tested in our production facility lab.

Product	Lot # Tested	Roll # Tested	Mass Area	Grab Strength	Peel Strength
		Standard Test Method:	ASTM D 5993	ASTM D 6768	ASTM D 6496
		Standard Specification:	0.75 lb/sq ft MARV	50lbs/in MARV	3.5lbs/in Min
CV-BENTOMAT DN	200844CV	00006637	0.96	91.1	8.8
CV-BENTOMAT DN	200844CV	00006655	0.94	91.1	9.3
CV-BENTOMAT DN	200844CV	00006673	0.90	91.1	8
CV-BENTOMAT DN	200844CV	00006691	0.87	91.1	8.2

ASTM test methods and property specifications per CETCO standard unless non-standard specifications were requested.
Any non-standard property specifications requested for this order are noted on the attached GCL property specifications sheet.

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BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 024486701 has been tested by American Colloid Company and yeilded the following test results.

Reference	Moist	Swell	Fluid Loss
Test Method:	ASTM D 2216	ASTM D 5890	ASTM D 5891
Specification:	12% Max	24 ml/2g Min	18 ml Max
889270A	8.8	29.0	16.0
889270B	8.9	29.0	16.0
889276A	8.1	27.0	16.4

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GEOTEXTILE TEST RESULTS FOR RAW MATERIAL SUPPLIED BY A CETCO FACILITY

The GCL in certification package number 024486701 was manufactured using these geotextiles:

Material	Lot #	Roll #	Mass Area	Grab Strength
CV-NON-WOVEN	200843CV	00004723	6.3	30.8
CV-NON-WOVEN	200843CV	00004797	7.4	42.9
CV-NON-WOVEN	200843CV	00004802	6.8	36.1
CV-NON-WOVEN	200844CV	00004810	6.2	21.6

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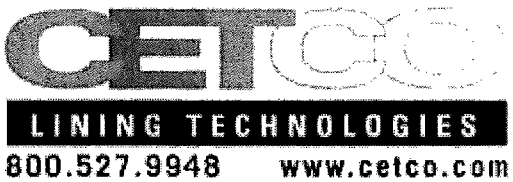

GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 024486701 was manufactured with geotextiles which were tested with the following results.

BASE

Material	Roll Number	Mass Area oz/yd2	Grab Strength lbs
PPX HH65L	2010945519	6.6	199.3
PPX HH65L	2010945529	6.9	198.4
PPX HH65L	2010953477	7.1	199.3
PPX HH65L	2010953483	6.7	173.5
PPX HH65L	2010953486	6.9	202.9
PPX HH65L	2010953487	6.9	202.9

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ENVIRONMENTAL SPECIALTIES INTERNATIONAL, INC.

7943 PECUE LANE SUITE A BATON ROUGE, LA 70809 TEL (225) 291-2700 FAX (225) 291-2788

TO: Saiia Construction, LLC

324 Commons Drive

Birmingham, AL 35209

Tel # : (205) 290 - 0400

ATTENTION: Gary Wilford

DATE: October 31, 2008

JOB NAME: International Paper Riegelwood

Cell 1 South Expansion

TRANSMITTAL NUMBER: 07

ESI PROJECT NUMBER: 08-08-1240

WE ARE SENDING YOU [X] ATTACHED [ ] UNDER SEPARATE COVER VIA _____ THE FOLLOWING ITEMS:

[ ] SHOP DRAWINGS [ ] PRINTS [ ] PLANS [ ] SAMPLES [ ] SPECIFICATIONS

[ ] COPY OF LETTER [ ] CHANGE ORDER [ ] _____

COPIES	DATE	DRAWING NO.	REV.	DESCRIPTION	ACTION (*)
1	10/31/08			Bentomat DN GCL certs for Bill of Lading # 24486702, 703 & 704	

ACTION (*)

[ ] AS - AS REQUESTED [X] FA - FOR APPROVAL [ ] _____

[ ] F – FILE [ ] RC - REVIEW & COMMENT [ ] _____

COMMENTS: _____

SENT VIA:

[X] E-MAIL [ ] MAIL [ ] OVERNIGHT [ ] HAND DELIVERY [ ] OTHER

COPY TO: _____ BY: Kevin Simms

If enclosures are not as noted, please notify us at once.....

LINING TECHNOLOGIES
800.527.9948 www.cetco.com

Date: 10/30/2008
Purchase Order: 10275
ORDER NUMBERS: 024486702, 024486703

Kevin Simms
ESI
7943 Pecue Lane
Baton Rouge, LA 70809
ksimms@esiliners.com cc. jland@esiliners.com

To Whom it May Concern:

Please find enclosed the MQA/MQC test data package for Geosynthetic Clay Liner shipments to ESI. The shipments left our Cartersville, Georgia plant on 10/29/2008.

If you have any questions regarding this information, please contact
Chris Athanassopoulos, Technical Support Engineer, at (847) 818-7945.

Sincerely,

Melanie King

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant

GEOSYNTHETIC CLAY LINER
MANUFACTURING QUALITY ASSURANCE DATA PACKAGE

PROJECT NAME: IP-Riegelwood LF
CUSTOMER P.O.: 10275
ORDER NUMBERS: 024486702, 024486703
PREPARED FOR: ESI

CONTENTS:

- Daily production and needle detection certification
- GCL property specifications
- Order packing list
- GCL MQA tracking form
- GCL manufacturing quality control test data
- Bentonite clay certification
- Raw material test results

PREPARED BY: Melanie King
Quality Assurance Coordinator
CETCO
218 Industrial Park

Cartersville, GA 30121

Telephone: (770) 387-7773
Fax:
E-Mail: melanie.king@cetco.com

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

PRODUCTION CERTIFICATION

PROJECT NAME: lP-Riegelwood LF
CUSTOMER P.O.: 10275
PREPARED FOR: ESI

CETCO affirms that these products meet the physical and chemical criteria listed on the attached GCL property specification sheet.

NEEDLE REMOVAL AND DETECTION PROCEDURE

CETCO hereby affirms that all Bentomat® geosynthetic clay liner material manufactured for this project is continually passed under a magnet for needle removal and then screened with a metal detection device. CETCO certifies Bentomat® to be essentially free of broken needles and fragments of needles that would negatively effect the performance of the final product.

Melanie King

Melanie King
Quality Assurance Coordinator
Colloid Environmental Technologies Co. (CETCO)

CETCO
LINING TECHNOLOGIES
800.527.9948 www.cetco.com

Ship Date: 10/29/2008
Order Numbers: 024486702, 024486703
Prepared For: ESI

The GCL raw materials and GCL finished product manufactured for the above-referenced order number(s) are hereby certified to achieve the properties listed in the tables below.

GCL PROPERTY SPECIFICATIONS FOR BENTOMAT DN

Test Method	Test Method Property	Test Frequency	Certified Value
ASTM D 5891	Bentonite Fluid Loss	1 per 50 Tons	18 ml Max
ASTM D 5993	Bentonite Mass/Area	40,000 sq ft (4000 sq m)	0.75 lb /sq ft (3.6 kg/sq m) Min
ASTM D 5890	Bentonite Swell Index	1 per 50 Tons	24 ml/2g Min
ASTM D 4632	GCL Grab Strength	200,000 sq ft (20,000 sq m)	150 lbs (660 N) MARV
ASTM D 6768	GCL Grab Strength	200,000 sq ft (20,000 sq m)	50 lbs/in MARV
ASTM D 6243	GCL Hydrated Internal Shear Strength	Periodic	500 psf (48 kPa) typ @ 200 psf
ASTM D 5887	GCL Hydraulic Conductivity	Weekly	5 x 10^-9 cm/ sec Max
ASTM D 5887	GCL Index Flux	Weekly	1 x 10^-8 m^3/m^2/sec Max
ASTM D 6496	GCL Peel Strength	40,000 sq ft (4000 sq m)	3.5 lbs/in Min
ASTM D 4632	GCL Peel Strength	40,000 sq ft (4000 sq m)	15 lbs (65 N) Min

Bentonite property tests are performed at a bentonite processing facility before shipment to CETCO's production facility.
All tensile testing is in the machine direction.

FABRIC SUPPLIER REQUIREMENTS FOR BENTOMAT DN

Raw Material	test method	mass per area	units
Nonwoven Cover Fabric	ASTM D 5261	6.0	oz/yd2
Bentomat DN Base Nonwoven Fabric	ASTM D 5261	6.0	oz/yd2

Fabric certifications from our raw material suppliers are on file at our production facility.

CETCO's MQA laboratory is GAI-accredited (www.geosynthetic-institute.org/gai/lab.html).

Melanie King

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant

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GCL ORDER PACKING LIST

GCL shipped for certification package number 024486702

Order #	Product	Lot Number	Roll Number	Length (ft)	Width (ft)	Square Ft	Weight (lbs)
024486703	CV-BENTOMAT DN	200844CV	00006639	150	14.5	2175	2730
024486703	CV-BENTOMAT DN	200844CV	00006640	150	14.5	2175	2742
024486702	CV-BENTOMAT DN	200844CV	00006647	150	14.5	2175	2730
024486703	CV-BENTOMAT DN	200844CV	00006654	150	14.5	2175	2724
024486703	CV-BENTOMAT DN	200844CV	00006656	150	14.5	2175	2736
024486703	CV-BENTOMAT DN	200844CV	00006657	150	14.5	2175	2740
024486703	CV-BENTOMAT DN	200844CV	00006658	150	14.5	2175	2720
024486703	CV-BENTOMAT DN	200844CV	00006664	150	14.5	2175	2766
024486703	CV-BENTOMAT DN	200844CV	00006665	150	14.5	2175	2748
024486702	CV-BENTOMAT DN	200844CV	00006666	150	14.5	2175	2750
024486702	CV-BENTOMAT DN	200844CV	00006667	150	14.5	2175	2720
024486703	CV-BENTOMAT DN	200844CV	00006669	150	14.5	2175	2730
024486703	CV-BENTOMAT DN	200844CV	00006670	150	14.5	2175	2732
024486703	CV-BENTOMAT DN	200844CV	00006671	150	14.5	2175	2740
024486702	CV-BENTOMAT DN	200844CV	00006672	150	14.5	2175	2738
024486702	CV-BENTOMAT DN	200844CV	00006674	150	14.5	2175	2728
024486703	CV-BENTOMAT DN	200844CV	00006675	150	14.5	2175	2738
024486703	CV-BENTOMAT DN	200844CV	00006676	150	14.5	2175	2740
024486703	CV-BENTOMAT DN	200844CV	00006678	150	14.5	2175	2746
024486702	CV-BENTOMAT DN	200844CV	00006679	150	14.5	2175	2728
024486702	CV-BENTOMAT DN	200844CV	00006680	150	14.5	2175	2744
024486703	CV-BENTOMAT DN	200844CV	00006681	150	14.5	2175	2726
024486703	CV-BENTOMAT DN	200844CV	00006682	150	14.5	2175	2758
024486702	CV-BENTOMAT DN	200844CV	00006683	150	14.5	2175	2748
024486702	CV-BENTOMAT DN	200844CV	00006684	150	14.5	2175	2770
024486703	CV-BENTOMAT DN	200844CV	00006685	150	14.5	2175	2758
024486702	CV-BENTOMAT DN	200844CV	00006686	150	14.5	2175	2748

Order #	Product	Lot Number	Roll Number	Length (ft)	Width (ft)	Square Ft	Weight (lbs)
024486702	CV-BENTOMAT DN	200844CV	00006687	150	14.5	2175	2758
024486702	CV-BENTOMAT DN	200844CV	00006693	150	14.5	2175	2790
024486702	CV-BENTOMAT DN	200844CV	00006695	150	14.5	2175	2736
024486702	CV-BENTOMAT DN	200844CV	00006696	150	14.5	2175	2732
024486702	CV-BENTOMAT DN	200844CV	00006700	150	14.5	2175	2738
024486702	CV-BENTOMAT DN	200844CV	00006701	150	14.5	2175	2734
024486702	CV-BENTOMAT DN	200844CV	00006703	150	14.5	2175	2766
			Totals:	**5100**	**493**	**73950**	**93232**

Total Number of Rolls Certified: **34**

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GCL MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 024486702

GCL			Geotextiles				Clay
CV-BENTOMAT DN			CV-N/W-WHITE-DN			CV-N/W-BLACK-DN-6 OZ	CV-CG 50-DN
GCL Lot #	**GCL Roll #**	**Roll # Tested**	**Cap Lot #**	**Cap Roll #**	**Roll # Tested**	**Base Roll #**	**Clay Lot #**
200844CV	00006639	00006637	200843CV	00004798	00004797	2010945529	8890270A
200844CV	00006640	00006637	200843CV	00004798	00004797	2010945529	889270A
200844CV	00006647	00006637	200843CV	00004801	00004797	2010945519	889270B
200844CV	00006654	00006637	200843CV	00004802	00004802	2010945519	889270B
200844CV	00006656	00006655	200843CV	00004802	00004802	2010945519	889270B
200844CV	00006657	00006655	200844CV	00004810	00004810	2010945519	889270B
200844CV	00006658	00006655	200844CV	00004810	00004810	2010945519	889270B
200844CV	00006664	00006655	200843CV	00004806	00004802	2010953483	889270B
200844CV	00006665	00006655	200843CV	00004806	00004802	2010953483	889270B
200844CV	00006666	00006655	200843CV	00004806	00004802	2010953483	889270B
200844CV	00006667	00006655	200843CV	00004806	00004802	2010953483	889270B
200844CV	00006669	00006655	200843CV	00004779	00004723	2010953483	889270B
200844CV	00006670	00006655	200843CV	00004779	00004723	2010953483	889270B
200844CV	00006671	00006655	200843CV	00004779	00004723	2010953483	889270B
200844CV	00006672	00006655	200843CV	00004779	00004723	2010953483	889270B
200844CV	00006674	00006673	200843CV	00004779	00004723	2010953486	889270B
200844CV	00006675	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006676	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006678	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006679	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006680	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006681	00006673	200843CV	00004804	00004802	2010953486	889270B
200844CV	00006682	00006673	200843CV	00004803	00004802	2010953486	889270B
200844CV	00006683	00006673	200843CV	00004803	00004802	2010953486	889270B
200844CV	00006684	00006673	200843CV	00004803	00004802	2010953486	889270B
200844CV	00006685	00006673	200843CV	00004803	00004802	2010953486	889270B
200844CV	00006686	00006673	200843CV	00004803	00004802	2010953486	889270B
200844CV	00006687	00006673	200843CV	00004803	00004802	2010953487	889270B
200844CV	00006693	00006691	200844CV	00004814	00004810	2010953487	889276A

GCL Lot #	GCL Roll #	Roll # Tested	Cap Lot #	Cap Roll #	Roll # Tested	Base Roll #	Clay Lot #
200844CV	00006695	00006691	200844CV	00004814	00004810	2010953487	889276A
200844CV	00006696	00006691	200844CV	00004812	00004810	2010953487	889276A
200844CV	00006700	00006691	200844CV	00004812	00004810	2010953477	889276A
200844CV	00006701	00006691	200844CV	00004812	00004810	2010953477	889276A
200844CV	00006703	00006691	200844CV	00004815	00004810	2010953477	889276A

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GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 024486702 have been tested in our production facility lab.

Product	Lot # Tested	Roll # Tested	Mass Area	Grab Strength	Peel Strength
		Standard Test Method:	ASTM D 5993	ASTM D 6768	ASTM D 6496
		Standard Specification:	0.75 lb/sq ft MARV	50lbs/in MARV	3.5lbs/in Min
CV-BENTOMAT DN	200844CV	00006637	0.96	91.1	8.8
CV-BENTOMAT DN	200844CV	00006655	0.94	91.1	9.3
CV-BENTOMAT DN	200844CV	00006673	0.90	91.1	8
CV-BENTOMAT DN	200844CV	00006691	0.87	91.1	8.2

ASTM test methods and property specifications per CETCO standard unless non-standard specifications were requested.
Any non-standard property specifications requested for this order are noted on the attached GCL property specifications sheet.

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BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 024486702 has been tested by American Colloid Company and yeilded the following test results.

Reference	Moist	Swell	Fluid Loss
Test Method:	ASTM D 2216	ASTM D 5890	ASTM D 5891
Specification:	12% Max	24 ml/2g Min	18 ml Max
889270A	8.8	29.0	16.0
889270B	8.9	29.0	16.0
889276A	8.1	27.0	16.4

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GEOTEXTILE TEST RESULTS FOR RAW MATERIAL SUPPLIED BY A CETCO FACILITY

The GCL in certification package number 024486702 was manufactured using these geotextiles:

Material	Lot #	Roll #	Mass Area	Grab Strength
CV-NON-WOVEN	200843CV	00004723	6.3	30.8
CV-NON-WOVEN	200843CV	00004797	7.4	42.9
CV-NON-WOVEN	200843CV	00004802	6.8	36.1
CV-NON-WOVEN	200844CV	00004810	6.2	21.6

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GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 024486702 was manufactured with geotextiles which were tested with the following results.

BASE

Material	Roll Number	Mass Area oz/yd2	Grab Strength lbs
PPX HH65L	2010945519	6.6	199.3
PPX HH65L	2010945529	6.9	198.4
PPX HH65L	2010953477	7.1	199.3
PPX HH65L	2010953483	6.7	173.5
PPX HH65L	2010953486	6.9	202.9
PPX HH65L	2010953487	6.9	202.9

CETCO
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Date: 10/30/2008
Purchase Order: 10275
ORDER NUMBER: 024486704

Kevin Simms
ESI
7943 Pecue Lane
Baton Rouge, LA 70809
ksimms@esiliners.com cc. jland@esiliners.com

To Whom it May Concern:

Please find enclosed the MQA/MQC test data package for Geosynthetic Clay Liner shipments to ESI. The shipments left our Cartersville, Georgia plant on 10/29/2008.

If you have any questions regarding this information, please contact Chris Athanassopoulos, Technical Support Engineer, at (847) 818-7945.

Sincerely,

Melanie King

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant

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GEOSYNTHETIC CLAY LINER
MANUFACTURING QUALITY ASSURANCE DATA PACKAGE

PROJECT NAME: IP-Riegelwood LF
CUSTOMER P.O.: 10275
ORDER NUMBER: 024486704
PREPARED FOR: ESI

CONTENTS:

- Daily production and needle detection certification
- GCL property specifications
- Order packing list
- GCL MQA tracking form
- GCL manufacturing quality control test data
- Bentonite clay certification
- Raw material test results

PREPARED BY: Melanie King
Quality Assurance Coordinator
CETCO
218 Industrial Park

Cartersville, GA 30121

Telephone: (770) 387-7773
Fax:
E-Mail: melanie.king@cetco.com

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PRODUCTION CERTIFICATION

PROJECT NAME: IP-Riegelwood LF
CUSTOMER P.O.: 10275
PREPARED FOR: ESI

CETCO affirms that these products meet the physical and chemical criteria listed on the attached GCL property specification sheet.

NEEDLE REMOVAL AND DETECTION PROCEDURE

CETCO hereby affirms that all Bentomat® geosynthetic clay liner material manufactured for this project is continually passed under a magnet for needle removal and then screened with a metal detection device. CETCO certifies Bentomat® to be essentially free of broken needles and fragments of needles that would negatively effect the performance of the final product.

Melanie King

Melanie King
Quality Assurance Coordinator
Colloid Environmental Technologies Co. (CETCO)

CETCO
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Ship Date: 10/29/2008
Order Number: 024486704
Prepared For: ESI

The GCL raw materials and GCL finished product manufactured for the above-referenced order number(s) are hereby certified to achieve the properties listed in the tables below.

GCL PROPERTY SPECIFICATIONS FOR BENTOMAT DN

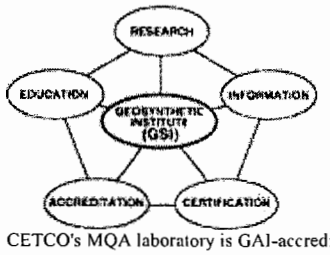
Test Method	Test Method Property	Test Frequency	Certified Value
ASTM D 5891	Bentonite Fluid Loss	1 per 50 Tons	18 ml Max
ASTM D 5993	Bentonite Mass/Area	40,000 sq ft (4000 sq m)	0.75 lb /sq ft (3.6 kg/sq m) Min
ASTM D 5890	Bentonite Swell Index	1 per 50 Tons	24 ml/2g Min
ASTM D 4632	GCL Grab Strength	200,000 sq ft (20,000 sq m)	150 lbs (660 N) MARV
ASTM D 6768	GCL Grab Strength	200,000 sq ft (20,000 sq m)	50 lbs/in MARV
ASTM D 6243	GCL Hydrated Internal Shear Strength	Periodic	500 psf (48 kPa) typ @ 200 psf
ASTM D 5887	GCL Hydraulic Conductivity	Weekly	5 x 10^-9 cm/ sec Max
ASTM D 5887	GCL Index Flux	Weekly	1 x 10^-8 m^3/m^2/sec Max
ASTM D 6496	GCL Peel Strength	40,000 sq ft (4000 sq m)	3.5 lbs/in Min
ASTM D 4632	GCL Peel Strength	40,000 sq ft (4000 sq m)	15 lbs (65 N) Min

Bentonite property tests are performed at a bentonite processing facility before shipment to CETCO's production facility.
All tensile testing is in the machine direction.

FABRIC SUPPLIER REQUIREMENTS FOR BENTOMAT DN

Raw Material	test method	mass per area	units
Nonwoven Cover Fabric	ASTM D 5261	6.0	oz/yd2
Bentomat DN Base Nonwoven Fabric	ASTM D 5261	6.0	oz/yd2

Fabric certifications from our raw material suppliers are on file at our production facility.



CETCO's MQA laboratory is GAI-accredited (www.geosynthetic-institute.org/gai/lab.html).

Melanie King

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant

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GCL ORDER PACKING LIST

GCL shipped for certification package number 024486704

Order #	Product	Lot Number	Roll Number	Length (ft)	Width (ft)	Square Ft	Weight (lbs)
024486704	CV-BENTOMAT DN	200844CV	00006637	150	14.5	2175	2766
024486704	CV-BENTOMAT DN	200844CV	00006638	150	14.5	2175	2750
024486704	CV-BENTOMAT DN	200844CV	00006643	150	14.5	2175	2734
024486704	CV-BENTOMAT DN	200844CV	00006644	150	14.5	2175	2740
024486704	CV-BENTOMAT DN	200844CV	00006645	150	14.5	2175	2748
024486704	CV-BENTOMAT DN	200844CV	00006646	150	14.5	2175	2728
024486704	CV-BENTOMAT DN	200844CV	00006651	150	14.5	2175	2728
024486704	CV-BENTOMAT DN	200844CV	00006652	150	14.5	2175	2732
024486704	CV-BENTOMAT DN	200844CV	00006653	150	14.5	2175	2742
024486704	CV-BENTOMAT DN	200844CV	00006655	150	14.5	2175	2764
024486704	CV-BENTOMAT DN	200844CV	00006659	150	14.5	2175	2716
024486704	CV-BENTOMAT DN	200844CV	00006663	150	14.5	2175	2814
024486704	CV-BENTOMAT DN	200844CV	00006668	150	14.5	2175	2712
024486704	CV-BENTOMAT DN	200844CV	00006692	150	14.5	2175	2732
024486704	CV-BENTOMAT DN	200844CV	00006699	150	14.5	2175	2726
			Totals:	**2250**	**217.5**	**32625**	**41132**
				Total Number of Rolls Certified: **15**			

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GCL MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 024486704

GCL			Geotextiles				Clay
CV-BENTOMAT DN			CV-N/W-WHITE-DN			CV-N/W-BLACK-DN-6 OZ	CV-CG 50-DN
GCL Lot #	**GCL Roll #**	**Roll # Tested**	**Cap Lot #**	**Cap Roll #**	**Roll # Tested**	**Base Roll #**	**Clay Lot #**
200844CV	00006637	00006637	200843CV	00004798	00004797	2010945529	889270A
200844CV	00006638	00006637	200843CV	00004798	00004797	2010945529	889270A
200844CV	00006643	00006637	200843CV	00004798	00004797	2010945529	889270B
200844CV	00006644	00006637	200843CV	00004801	00004797	2010945529	889270B
200844CV	00006645	00006637	200843CV	00004801	00004797	2010945529	889270B
200844CV	00006646	00006637	200843CV	00004801	00004797	2010945529	889270B
200844CV	00006651	00006637	200843CV	00004802	00004802	2010945519	889270B
200844CV	00006652	00006637	200843CV	00004802	00004802	2010945519	889270B
200844CV	00006653	00006637	200843CV	00004802	00004802	2010945519	889270B
200844CV	00006655	00006655	200843CV	00004802	00004802	2010945519	889270B
200844CV	00006659	00006655	200844CV	00004810	00004810	2010945519	889270B
200844CV	00006663	00006655	200843CV	00004806	00004802	2010953483	889270B
200844CV	00006668	00006655	200843CV	00004779	00004723	2010953483	889270B
200844CV	00006692	00006691	200844CV	00004814	00004810	2010953487	889270B
200844CV	00006699	00006691	200844CV	00004812	00004810	2010953487	889276A

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GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 024486704 have been tested in our production facility lab.

Product	Lot # Tested	Roll # Tested	Mass Area	Grab Strength	Peel Strength
		Standard Test Method:	ASTM D 5993	ASTM D 6768	ASTM D 6496
		Standard Specification:	0.75 lb/sq ft MARV	50lbs/in MARV	3.5lbs/in Min
CV-BENTOMAT DN	200844CV	00006637	0.96	91.1	8.8
CV-BENTOMAT DN	200844CV	00006655	0.94	91.1	9.3
CV-BENTOMAT DN	200844CV	00006691	0.87	91.1	8.2

ASTM test methods and property specifications per CETCO standard unless non-standard specifications were requested.
Any non-standard property specifications requested for this order are noted on the attached GCL property specifications sheet.

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BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 024486704 has been tested by American Colloid Company and yeilded the following test results.

Reference	Moist	Swell	Fluid Loss
Test Method:	ASTM D 2216	ASTM D 5890	ASTM D 5891
Specification:	12% Max	24 ml/2g Min	18 ml Max
889270A	8.8	29.0	16.0
889270B	8.9	29.0	16.0
889276A	8.1	27.0	16.4

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GEOTEXTILE TEST RESULTS FOR RAW MATERIAL SUPPLIED BY A CETCO FACILITY

The GCL in certification package number 024486704 was manufactured using these geotextiles:

Material	Lot #	Roll #	Mass Area	Grab Strength
CV-NON-WOVEN	200843CV	00004723	6.3	30.8
CV-NON-WOVEN	200843CV	00004797	7.4	42.9
CV-NON-WOVEN	200843CV	00004802	6.8	36.1
CV-NON-WOVEN	200844CV	00004810	6.2	21.6

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GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 024486704 was manufactured with geotextiles which were tested with the following results.

BASE

Material	Roll Number	Mass Area oz/yd2	Grab Strength lbs
PPX HH65L	2010945519	6.6	199.3
PPX HH65L	2010945529	6.9	198.4
PPX HH65L	2010953483	6.7	173.5
PPX HH65L	2010953487	6.9	202.9

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APPENDIX G.3
GCL Inventory

INTERNATIONAL PAPER CELL 1 EXTENSION

GEOSYNTHETICS INVENTORY LOG
GEOSYNTHETIC CLAY LINER

Project Name: IP Cell 1 Extension
Project Number: IP-08-4
Contractor: SAIIA
Geosynthetics Installer: ESI

Total Rolls: 64
Total Lots: 1
Total SF: 141,375
Storage Area: Unlined Landfill Access
Inventory Monitor(s): RMS

Geosynthetic Material Type: GCL
Geosynthetic Product Identification: CETCO BENTOMAT DN

Material		Material Dimensions		Conformance Sample	Remarks
Roll No.	Batch/Lot No.	Length (Feet)	Width (Feet)		
6637	200844CV	150	14.5	CQA	MQC
6638	200844CV	150	14.5		
6639	200844CV	150	14.5		
6640	200844CV	150	14.5		
6641	200844CV	150	14.5		
6642	200844CV	150	14.5		
6643	200844CV	150	14.5		
6644	200844CV	150	14.5		
6645	200844CV	150	14.5		
6645	200844CV	150	14.5		
6646	200844CV	150	14.5		
6647	200844CV	150	14.5		
6648	200844CV	150	14.5		
6652	200844CV	150	14.5		
6653	200844CV	150	14.5		
6654	200844CV	150	14.5		
6655	200844CV	150	14.5		MQC
6656	200844CV	150	14.5		
6658	200844CV	150	14.5		
6659	200844CV	150	14.5		
6661	200844CV	150	14.5		
6662	200844CV	150	14.5		
6663	200844CV	150	14.5		
6664	200844CV	150	14.5		
6665	200844CV	150	14.5		
6666	200844CV	150	14.5		
6667	200844CV	150	14.5		
6668	200844CV	150	14.5		
6669	200844CV	150	14.5		
6670	200844CV	150	14.5		
6671	200844CV	150	14.5		
6672	200844CV	150	14.5		
6673	200844CV	150	14.5		MQC
6674	200844CV	150	14.5		
6675	200844CV	150	14.5		
6676	200844CV	150	14.5		
6677	200844CV	150	14.5		
6678	200844CV	150	14.5		
6679	200844CV	150	14.5		
6680	200844CV	150	14.5		

INTERNATIONAL PAPER CELL 1 EXTENSION

Material		Material Dimensions		Conformance Sample	Remarks
Roll No.	Batch/Lot No.	Length (Feet)	Width (Feet)		
6681	200844CV	150	14.5		
6682	200844CV	150	14.5		
6683	200844CV	150	14.5		
6684	200844CV	150	14.5		
6685	200844CV	150	14.5		
6686	200844CV	150	14.5		
6687	200844CV	150	14.5		
6688	200844CV	150	14.5		
6689	200844CV	150	14.5		
6690	200844CV	150	14.5		
6691	200844CV	150	14.5		MQC
6692	200844CV	150	14.5		
6693	200844CV	150	14.5		
6694	200844CV	150	14.5		
6695	200844CV	150	14.5		
6696	200844CV	150	14.5		
6697	200844CV	150	14.5		
6698	200844CV	150	14.5		
6699	200844CV	150	14.5		
6700	200844CV	150	14.5		
6701	200844CV	150	14.5		
6702	200844CV	150	14.5		
6703	200844CV	150	14.5		
6704	200844CV	150	14.5		
6705	200844CV	150	14.5		

APPENDIX G.4
GCL CQA

Geotechnics
.....GEOTECHNICAL AND
GEOSYNTHETIC SERVICES

November 11, 2008

Project No.: L08102-03

REC'D NOV 20 2008

Mr. Greg Mills
Richardson, Smith, Gardner & Associates
14 N. Boylan Ave.
Raleigh, NC 27603

Transmittal
Laboratory Test Results
IP Riegelwood Mill – Cell 1 South Expansion

Please find attached the laboratory test results for the above referenced project. The tests were performed in general accordance with the procedures referenced on the data tables as well as industry practice. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to be of service and trust that our efforts have contributed to the success of your project. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

J.P. Kline, P.E.
Laboratory Director

GAI-LAP
Initials: JPK #: 14-96
Date: 11-11-08

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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CONFORMANCE TEST RESULTS

CLIENT: RICHARDSON, SMITH, GARDNER & ASSOCIATES, INC
CLIENT PROJECT: IP RIEGELWOOD MILL
CELL 1 SOUTH EXPANSION
PROJECT NO.: L08102-03
LAB ID NO.: L08102-03-01
MATERIAL: CETCO BENTOMAT DN GCL
ROLL NO.: 6637

	SPECIMEN	TOTAL WT. AS REC'D grams	TOTAL WT. DRY grams	TOTAL WT. AS REC'D psf	TOTAL WT. DRY psf	WT. BACKING psf (1)	AS REC'D Bent Cont psf	DRY Bent Cont psf	MOISTURE CONTENT %	Bent Cont 12% m.c. psf
BENTONITE	1	66.4	53.3	1.32	1.06	0.100	1.22	0.956	27.2	1.071
CONTENT	2	73.9	59.4	1.47	1.18	0.100	1.37	1.078	26.7	1.208
ASTM D3776 &	3	57.7	45.3	1.14	0.90	0.100	1.04	0.797	30.8	0.893
ASTM D5993	4	55.3	44.1	1.10	0.87	0.100	1.00	0.774	28.8	0.867
	5	76.8	61.0	1.52	1.21	0.100	1.42	1.110	28.2	1.243
							AVERAGE:	**0.943**	**28.3**	**1.056**

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVG	STD
GRAB STRENGTH	D 4632	MD-lbs/in	280.3	240.4	338.4	324.1	311.9	**299.0**	39.15

* NOTES:1) Weight of carrier (geotextile) provided by CETCO spec. info: .

CHECKED BY: BF DATE: 11-6-08

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GCL INDEX FLUX & PERMEABILITY TEST

ASTM D 5887
(SOP-G52)

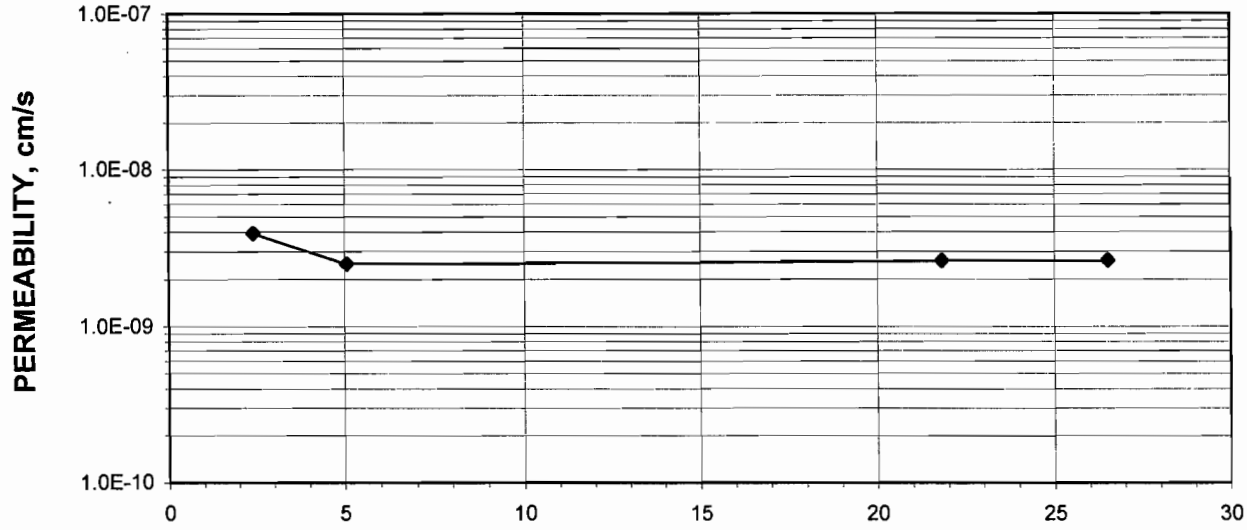
geotechnics
INTEGRITY IN TESTING

Lab ID No.	L08102-03-01	Material	CETCO Bentomat DN
Client	Richardson Smith Gardner & Assoc.	Roll I.D.:	6637
Client Project	IP Riegelwood Mill - Cell 1 South	Lot No.:	NA
Project No.	L08102-03	Sample No.	NA

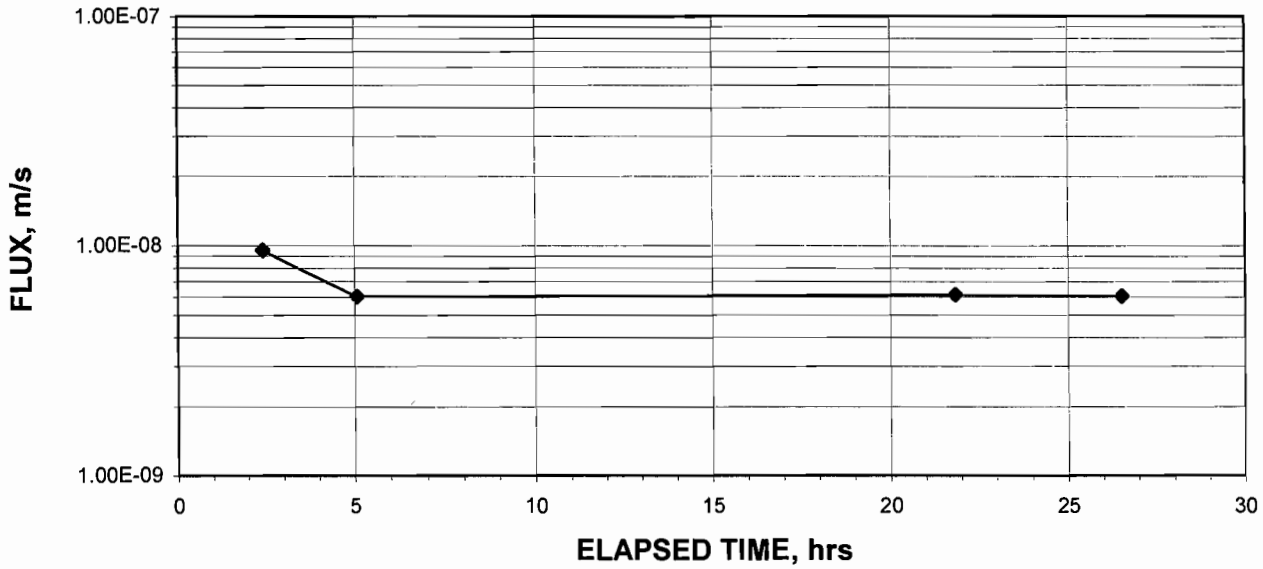
AVERAGE FLUX = 6.06E-09 m/s

AVERAGE PERMEABILITY = 2.58E-09 cm/s @ 20°C

PERMEABILITY VS. ELAPSED TIME



FLUX VS. ELAPSED TIME



Checked By: JPK Date: 11-11-08

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GCL INDEX FLUX & PERMEABILITY TEST

ASTM D 5887
(SOP-G52)

geotechnics
INTEGRITY IN TESTING

Lab ID No.	L08102-03-01	Tested by: JB	Date: 11/3/2008
Client	Richardson Smith Gardner & Assoc.		
Client Project	IP Riegelwood Mill - Cell 1 South	Checked by: TPK	Date: 11-11-08
Project No.	L08102-03		
Material	CETCO Bentomat DN		
Roll I.D.:	6637		
Lot No.:	NA		
Sample No.	NA		

Permeant: DEAIRED, DEIONIZED WATER

MOISTURE CONTENT:	**BEFORE TEST**	**AFTER TEST**
Tare Number	13	913
Wt. of Tare & GCL[2] (gm.)	85.80	197.07
Wt. of Tare & Dry GCL [2] (gm.)	71.27	150.41
Wt. of Tare (gm.)	10.99	110.70
Wt. of Water (gm.)	14.53	46.66
Wt. of Dry GCL (gm.) [2]	60.28	39.71
GCL Moisture Content (%)	**24.1**	**117.5**

SPECIMEN:	**BEFORE TEST**	**AFTER TEST**
Wt. of GCL (gm.) [2]	61.56	107.89 (Calculated)
Clay Component Thickness 1 (in.) [1]	0.112	0.268
Clay Component Thickness 2 (in.) [1]	0.095	0.234
Clay Component Thickness 3 (in.) [1]	0.109	0.253
Average Clay Component Thickness (in.)	na	0.251
Average Clay Component Thickness (mm)	na	**6.384**
Specimen Dia. (in)	4.000	4.000
Specimen Area ($in.^2$)	12.57	12.57
Specimen Area (m^2)	0.00811	0.00811
Mass/Unit Area of GCL($gm./m^2$) [2]	7,591	13,303
Mass/Unit Area of GCL(psf) [2]	1.55	2.72
Mass/Unit Area of Dry GCL($gm./m^2$) [2]	6,116	
Mass/Unit Area of Dry GCL(psf) [2]	1.25	

NOTES: 1) Direct visual measurement of exposed clay at specimen perimeter.
2) Includes weight of the textile carriers.

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GCL INDEX FLUX & PERMEABILITY TEST

ASTM D 5887
(SOP-G52)

Geotechnics
INTEGRITY IN TESTING

Lab ID No.	L08102-03-01
Client	Richardson Smith Gardner & Assoc.
Client Project	IP Riegelwood Mill - Cell 1 South
Project No.	L08102-03
Material	CETCO Bentomat DN
Roll I.D.:	6637
Sample No.	NA

Pressure Heads (Constant)

Top Cap (psi)	75.0
Bottom Cap (psi)	77.0
Cell (psi)	80.0
Total Head (cm)	140.6

Final Sample Dimensions

Sample Length (cm), L	0.638
Sample Diameter (cm)	10.16
Sample Area (cm^2), A	**78.50**
Inflow Burette Area (cm^2), a-in	0.856
Outflow Burette Area (cm^2), a-out	0.855

AVERAGE FLUX = 6.06E-09 m/s
AVERAGE PERMEABILITY = 2.58E-09 cm/s @ 20oC

DATE	ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	RATIO ΔIN/ΔOUT	TOTAL HEAD h	TEMP.	INCREMENTAL FLUX @ 20°C	INCREMENTAL PERMEABILITY @ 20°C
(m-d-y)	(hr)	(cm^3)	(cm^3)	(3 readings)	(cm)	(°C)	(m/sec)	(cm/sec)
11/6/2008	0.0	0.0	0.0	NA	150.4	21.4	NA	NA
11/6/2008	2.4	0.6	0.7	NA	148.9	21.4	9.52E-09	3.91E-09
11/6/2008	5.1	1.1	1.1	1.00	147.9	21.4	6.01E-09	2.49E-09
11/7/2008	21.8	4.1	3.9	1.09	141.1	21.2	6.12E-09	2.62E-09
11/7/2008	26.5	4.8	4.8	1.00	139.3	21.8	6.04E-09	2.63E-09

Checked By: JGK Date: 11-11-08

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