

The GSI Newsletter/Report



Vol. 36, No. 4

December, 2022

This quarterly newsletter, now in its 36th year, presents the activities of GSI and its related institutes to all who are interested. It is available on the institute's home page at www.geosynthetic-institute.org. It also serves as a quarterly report to its member organizations. Details are available by contacting George R. Koerner or Jamie Koerner at phone (610) 522-8440; or e-mail at gsigeokoerner@gmail.com or Jamie@geosynthetic-institute.org.

Activities of GSI's Officers and Board of Advisors (BOA)

2023-2025 Board of Advisors

Votes for the International representative position for the BOA were tabulated on December 15 and announced shortly thereafter. We are pleased to report that Henning Ehrenberg, from NAUE GmbH, is the newly elected International representative. We congratulate Henning on his new position and look forward to working with him in this regard.

Term Ends 2023

- Te-Yang Soong - CTI Co.
(Consultants and Testing Labs)
email: tsoong@cticompanies.com
- Brian Fraser - Layfield Group
(Barrier Group)
email: brian.fraser@layfieldgroup.com
- Mathieu Cornellier - Solmax
(International - 2)
e-mail: mcornellier@solmax.com

Term Ends 2024

- Burrill (Bo) McCoy - Waste Management Inc.
(Owners and Operators)
e-mail: bmccoy2@wm.com
- Rene Laprade - Tencate Geosynthetics
(Geotextiles and Geogrids)
e-mail: r.laprade@tencategeo.com
- Sam Allen – TRI Environmental Inc.
(At-Large)
e-mail: Sallen@tri-env.com

Term Ends 2025

- Henning Ehrenberg – NAUE GmbH & Co. KG
(International-1)
email: hehrenberg@naue.com
- Miranda Rine – C.P. Chemical
(Resin and Additives Group)
email: Miranda.rine@cpchem.com
- David Carson – U.S. EPA
(Agencies)
email: carson.david@epa.gov

GSI has continued to have virtual quarterly meetings with the Board of Advisors throughout 2022 via Zoom. The Fourth Quarter BOA meeting was held on December 21, 2022 at 11:00 am. Topics that were discussed during the meeting were: ongoing research projects, technical papers, upcoming conferences, specifications and the GAI-LAP Program. The BOA approved a \$100K USD expenditure over the next year to investigate polyethylene specifications beyond GRI GM13 and GM17. This is the first time we have funded such an outside effort. These are exciting times.

We thank the BOA for sharing their time and talent to fulfill the GSI mission.

IN THIS ISSUE

- Activities of GSI's Officers and BOA
- Overview of GRI (Research) Projects
- Progress within GII (Information)
- Progress within GEI (Education)
- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliate Institutes
- GSI's Member Organizations

Overview of GRI Projects (Research)

The following projects are all funded by GSI membership dues unless specifically noted. Most are long-term projects for which we are well positioned to accomplish. In an attempt not to repeat information in the quarterly newsletters, we will merely list the ongoing projects that have been written about in previous newsletters and will only provide details of new research. For details and/or discussion of ongoing projects contact:

George Koerner (gsigeokoerner@gmail.com)

Grace Hsuan (hsuanyg@drexel.edu)

1. Durability of Exposed Geosynthetics (GM, GT, GG, HPTRM, Turf, WD & GCCM)

GSI is using two outdoor exposure racks and four UV fluorescent devices to estimate the projected exposed lifetime of a litany of different geosynthetics. The newest material added to the repertoire are GCCM which are tested before and after exposure via ASTM D8058 Flexural Strength.

2. GSI wall, pH and durability of PET GGs

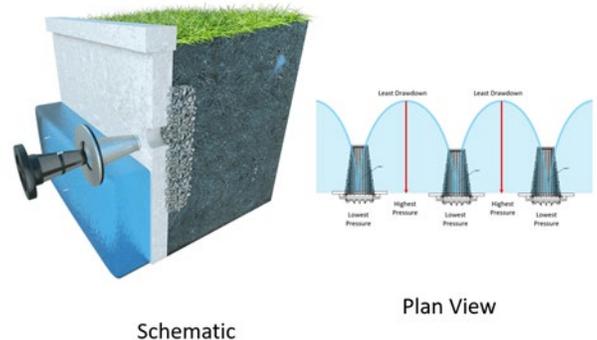
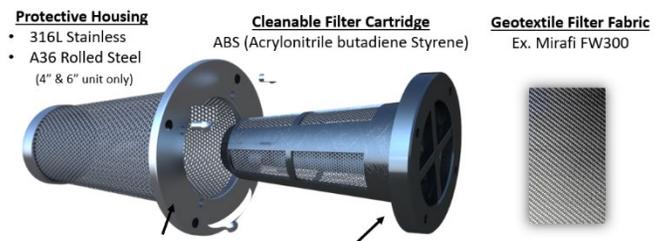
We continue to measure the pH between three types of dry cast masonry retaining wall blocks for over fourteen years. Concern here is over PET geogrids which are known to be sensitive to very high alkalinity environments. Indeed, the PH values started high, but over time they are now down below eight. It is nice to know that Mother Nature likes to buffer things from a pH perspective and we are always trying to reach equilibrium. Good news for geosynthetics

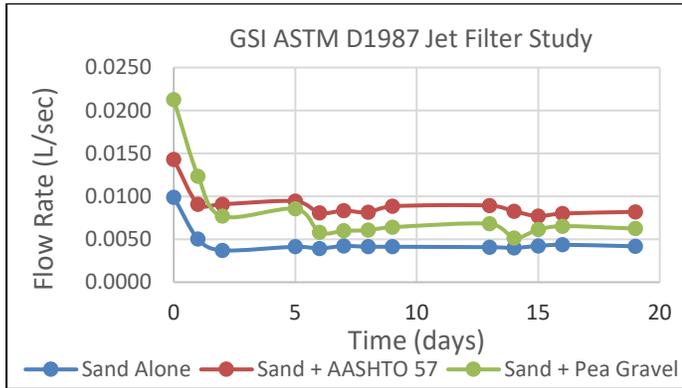
3. Creep axisymmetric behavior of HDPE and LLDPE GM's

ASTM D5716 method of testing geomembranes in a 3-D axisymmetric mode uses a pressure rate of 6.9 kPa/min (1.0 psi/min). While such a rate is appropriate for most geomembrane types, it is very fast for HDPE which is semi-crystalline and cannot readily stress relax so as to accommodate the applied pressure. To investigate slower rates, we have initiated a project with rates as low as 6.9 kPa/six months (1.0 psi/six months) and will conclude in 2023. This work should culminate in a nice paper.

4. Long term filtration (Jetfilter)

GSI has a new member in JetFilter Inc. As you can see by the photographs below the three-part Jet Filters system are maintainable weep holes that provide drainage and soil filtration when installed through the face of new or existing retaining walls. Jetfilters alleviate stress on structures (retaining walls and culverts) by dissipating hydrostatic pressure while preventing soil loss. GSI has developed a new long term filtration test which will hopefully be incorporated into ASTM D1987. Photos below show the apparatus and peeling test results.





In the summer of 2001, an exposed geomembrane cover (EGC) made of 1.5 mm (60-mil) high density polyethylene (HDPE) green/black textured geomembrane was installed as a cap at the Polk County Florida MSW disposal facility. It covers approximately 4 hectares (16 acres) on both flat and side sloped sections of the landfill. The EGC has performed extremely well and has exceeded the designed lifespan expectations despite being subjected to severe weather events. A summary of lab testing (like shown in the figure below) is contrasted with performance of the geomembrane in the field. This offers answers to exposed service life questions.

5. Drainage (Maccaferri) tests

Maccaferri provides an entire line of geocomposite product for removing ground water near adjacent infrastructure. A properly designed drainage geocomposite can often replace traditional soil drains saving time, space and money. Maccaferri has a new MacDrain “W” which it has asked GSI to evaluate via the ASTM D4716 Transmissivity method. They wanted to know the uncertainty associated with such testing and the long term creep behavior of the product at high loads (400kPA). GSI is well on the way of completing its testing and will have the GAI-LAP do reproducibility testing on the product for the Proficiency Test Program (PTP) cycle in 2023.

6. Leakage through holes in geomembranes

Leakage minimization through a geomembrane is of utmost importance for environmental protection, water resource management, and industrial solution recovery. Quantifying leakage through composite liner system is not easy and the objective of this work. GSI has constructed large scale pressure vessels to evaluate engineered barrier system performance and detail how it can be improved through proper installation. This work will be presented in 2023 at Jeju Island Korea, ICGEE 23.

7. Multicomponent geomembranes & service life projection (Polk County)

The days when geomembranes were constructed as only one thick monolithic layer are gone. They currently can be made of different colors, conductivity, diffusion characteristics etc. to meet the needs of clients for different applications all over the world. This work describes a case history of a MSW cover in Polk County Florida designed by Jones Edmunds Consultants Inc. We have collaborated on the evaluation of the exposed geomembrane cover (EGC) as it ages over time.

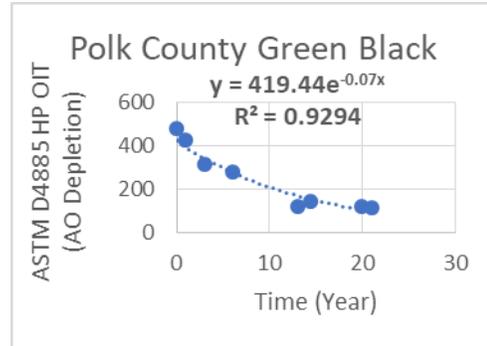


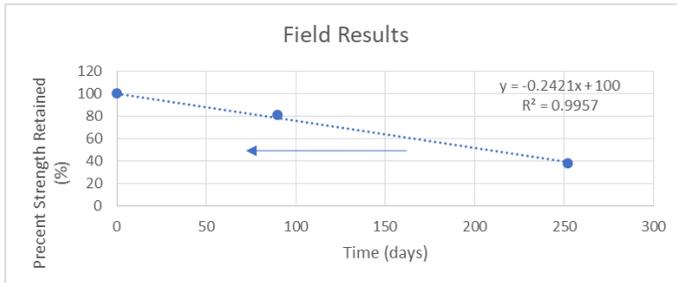
Figure 1, HPOIT depletion over time at Polk Co. EGC



Figure 2, Sampling zone at Polk Co.

8. Pearce Creek Exposed Geotextile Study

Exposed needle punched nonwoven (NPNW) Geotextiles are uncommon in Civil Engineering applications. Most specifications limit their exposure to a few weeks after installation due to the threat of UV degradation. This very unusual case history allowed us to evaluate an exposed NPNW geotextile over a long period of time (8 months). In addition, we performed laboratory UV exposure tests to counterpoint field versus lab performance and develop correlations between different methods of exposure. We worked with Texel on this project as well as the US ACOE. The results will be presented at ATA’s GS23 conference in KC MO next February.



9. GS survivability in ultra-light weight aggregate (ULWA)

Several large-scale laboratory tests were conducted on multi geosynthetic specimens to assess damage effects from ultra-light weight foamed glass aggregates versus ASSHTO #57 stone. Geotextile and geogrid were evaluated via ASTM D4595 or D6637 respectively before and after field loading. A paper on this topic will be presented at the 12th ICG in Roma Italy September 2023.

10. Wicking Geotextiles (capillary action)

Several manufactures have devised innovative geosynthetics that promote the capillary movement of water within their plane. There is therefore a need to monitor this behavior. GSI developed such a testing in GRI Test Method GS27 Standard Test Method for "Determining the Rate of Capillary "Wicking" Within Geosynthetics" This test method is used to determine the wicking capability within geosynthetics. The method is applicable to all geosynthetics and is used to determine a rate of capillary wicking. The method covers the measurement of liquid transport on a specimen of as it is exposed to Distilled Deionized Deaired (DDD) water at a known temperature and pressure. The method is available to all institute members on our website.

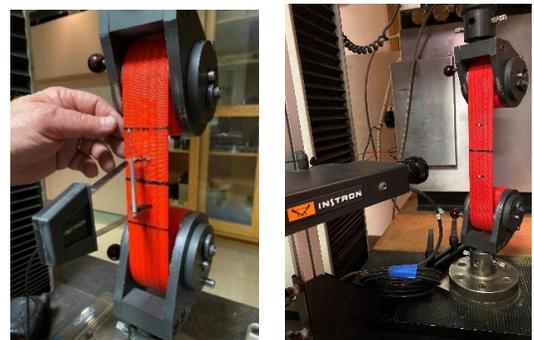
11. Anchorage and connection strength of HP-TRMS

GSI has completed work on a new anchorage and connection strength tests applicable to geosynthetics. This new test methods has applicability to exposed geomembrane covers, closure turf, HP-TRMs, GCLs, Wind Defender, GCCM's etc. The first test is a field test where the second is a lab test. It is heavy work, but yielding very practical results that have direct field applicability which are needed for design with exposed geosynthetics. The new GRI test methods are available on our website under the member's section.

12. Stress cracking with respect to Strain Hardening Modulus (SHM)

Strain hardening behavior of HDPE geomembranes seems to be a good predictor of stress crack performance. We are working with Mahmoud Ali of Queen's University to compare and contrast SHM with (ASTM D5397) lab results. Strain hardening modulus determination has been used with success in the pipe industry to predict field failures. We will soon be writing a new ASTM D35 consensus test method based of the GRI Test Method GM33 "Standard Test Method for Determination of the Strain Hardening Modulus as it relates to Stress Crack Resistance Characteristics of HDPE Geomembranes"

13. Determination of the tensile force and elongation values of geo straps



The determination of the tensile force-elongation values of geo straps provides index property values. This is a quality control-conformance test for commercial shipments and determines the tensile strength properties of geo straps by subjecting the material to tensile loading on a CRE machine. We use a set of Instron Nautilus Grips at the institute for this task with both contact and noncontact

extensometers. Robert Lazono of RECO will head this effort going forward in ASTM D35.

14. Geomembrane anchored in concrete or mortar

Embedment high-density polyethylene (HDPE) liner are often used for concrete protection. Studs in these geomembranes create a product with exceptional pull-out strength and high resistance to mechanical, chemical, and environmental threats. Such embedment liners can be used in a wide range of civil applications. To date, there has not been a standard test method to determine the design strength for such systems. This has changed with the advent of GRI Method GS-31, Standard Test Method for “Measuring the connection strength of Geosynthetic to concrete or mortar”.

We feel that there now exists a new tool to evaluate embedment geomembranes. It allows us to explore different stud styles and configurations as well and different mix designs. It does not purport to simulate full field conditions of embedment liners or the group effect of multiple studs or configurations. However, this method is a first step in conformance testing to a specification or establishment of saturated process control (SPC) database for materials used in such applications.

15. UV, Methane and stress simultaneous aging

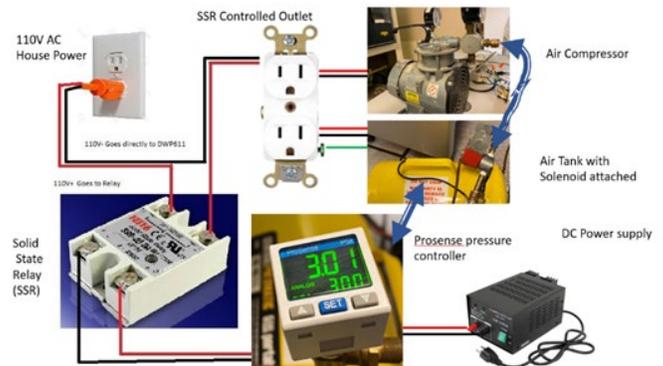
GSI has developed and written GRI GM-35 Standard Test Method for “Measuring the durability of geomembranes that are exposed to Ultra-Violet Radiation, Condensation, Methane and 3-D Stress” This standard covers the specific procedure and test conditions that are applicable for exposure of polyolefin geomembranes to fluorescent UV radiation, condensation, methane and three-dimensional stress simultaneously. This laboratory simulation mimics that of the covered digesters as shown in the figures below.



Ring Wall Anaerobic Digester



Animal Feed Lot Lagoon Type Digester



16. PVE-EIA/KEE Specification Development

GSI has a long history of writing specifications for geosynthetics. Like all engineered materials, geosynthetics are used in many applications and need general requirements for plans and specifications. Our latest effort is on a specification which covers Polyvinyl Chloride (PVC) - Ethylene Interpolymer Alloy (EIA) geomembranes. Like our other material specifications, this document sets forth a set of minima, physical, mechanical, chemical and endurance properties that must be met, or exceeded by the geomembrane being manufactured. It is written in the context of quality systems for management and represents a manufacturing quality control (MQC) document.

After much testing and six revisions we are getting close with this standard specification. It incorporates a few new endurance tests and also includes ASTM D8154 Standard Test Methods for H-NMR Determination of Ketone-Ethylene-Ester and Polyvinyl Chloride Contents in KEE-PVC Roofing Fabrics.” In short it will determine the amount of EIA in the geomembrane formulation. We look forward to finally publish the specification in 2023.

17. Beyond GRI GM13 and GM17

GM-13 and GM-17 have achieved acceptance and adaption in many markets and countries throughout the world. The documents have been modified over time with 16 and 14 modifications/revisions, respectively. However, the barrier market has significantly expanded in scope, range and expected performance over the past decade. A “one size fits all” approach, while appropriate in the past, is no longer adequate to address the industry’s needs.

For this reason, GSI has contracted a group of talented engineers and scientist with a wealth of knowledge on formulating and manufacturing PE geomembranes to prepare new specifications for geomembrane barriers based on application requirements including, but not limited to durability, lifespan, barrier properties and other factors. This process would include investigation of existing databases from multiple sources and review and discussion of the proposed levels and values. This process will be somewhat lengthy and, of course, a proposed output will need review by a larger group.

The contract is for \$100K USD and will last a year. A contract was awarded to a group from TRI environmental. The project team consists Rick Thomas, Amber Douglas, Sam Allen and Boyd Ramsey. There will be monthly Zoom calls to discuss status, findings, and efforts within the group. There will also be quarterly meetings open to the GSI committee for the purpose of transparency. The project starts on December 2022 and will end on December of 2023.

Progress within GII (Information)

Our GSI Home Page is accessed as follows:

www.geosynthetic-institute.org

Everyone (members and nonmembers) can access the open part, which has the following menu:

**Newsletter
Prospectus
Specifications
White Papers
Bookstore
Keyword Search
Members Only**

**Research
Certification
Information
Education
Accreditation
Personnel
Contacts
Upcoming
Webinars**

To go further one needs a members-only password. Your contact person (names beneath member company) must obtain a password from Jamie Koerner. Jamie can be reached by e-mail at Jamie@geosynthetic-institute.org. When you get into this section, the following information is then available.

- **GRI Test Methods (all)**
- **GRI Reports**
- **GRI Technical Papers (419 Citations)**
- **Notes of GSI Meetings**
- **Links to the GSs World**
- **Keyword Search for Generic Papers**
- **Example Problems**
- **Frequently Asked Questions (FAQs)**

GRI White Paper #45 “Chemical versus Geosynthetic Stabilization used in Roadways” was published in December of 2022. This white paper counterpoints geosynthetic stabilization with several chemical techniques (chlorides, polymers, pozzolanic (lime and or cement) and fly ash) to stabilize problematic subgrade soils for roadways. Chemical stabilization can be beneficial to a roadway but may have limited efficacy due to the nature of the subgrade soil (plasticity and organic content.) In all cases, lab tests are required to categorize the soil in question and determine the effectiveness of the candidate chemical stabilization technique.

Unlike geosynthetic options, chemical stabilization techniques require the right amount of water and can be thwarted by insitu moisture and or precipitation. They may need reapplication and there may be environmental concerns with the migratory nature of many admixtures. Mixing can be messy, inconsistent and residual disposal may be difficult. However, all of this is insignificant compared to potential health risks to construction workers from several admix chemicals.





The white paper ends with a master table comparing the technical equivalency of the techniques. The table highlights when geosynthetic stabilization is superior to chemical stabilization in the areas of, physical, mechanical, hydraulic and endurance properties. It then contrasts many construction advantages and disadvantages when considering stabilization of roadway subgrades.

In short, it is believed that geosynthetics can enhance the performance of paved and unpaved roadways, parking lots, airports, loading docks, and storage areas through stabilization of the soil subgrade more effectively and at a better benefit cost than chemical stabilization methods. Geosynthetics help minimize rutting and improve performance of the roadway by combining several functions simultaneously. The geosynthetic serves as a permeable separation layer, preventing the aggregate and subgrade soils from intermixing while allowing the passage of water. They can be installed during most weather conditions and do not crack or shrink. It is our belief that geosynthetics are often superior (more versatile, longer lasting, greater benefit/cost, more sustainable, easier to construct etc.) options when compared to chemical stabilization of roadway subgrades. This white paper highlights the attributes of geosynthetic stabilization and is a good start in championing their proven performance. For more information, White Paper #45 is available on the GSI website

<https://geosynthetic-institute.org/papers/paper45.pdf>

GRI Reports

To date, we have 48 GRI Reports available to members and associate members. These reports vary in length from 30 to 200 pages. They are in the password protected section of our home page at www.geosynthetic-institute.org/member/reports.html.

White papers are available for free to everyone, however GRI reports are only free to members (located in the member's only section of the website). Non-members can purchase the reports from the online GSI bookstore.

- **HP-TRM's**
- **Polk Co. EGC**
- **Closure Turf Durability and Freeze Thaw**
- **Pearce Creek Exposed Geotextile**
- **GAI-LAP: A 25-year Retrospective**
- **Alternative for ASTM D5397 Testing Stress Crack**
- **Survivability of GS with Aeroaggregates**
- **GG Seepage induced Flow in Levees**

Progress within GEI (Education)

ATA Geosynthetic Conference 2023



Schedule for Tuesday February 7th, 2023

- 8-9:30 AM RM Koerner Award and Lecture
- 3:15-4:45 PM Special Session on Exposed GS Performance
- 4:45-5:15 PM GSI's Annual Meeting
- 5:15-6 PM GSI's BOA Meeting
- 6-6:15 PM IGS North America General Meeting

The four Speakers for this session on Exposed Geosynthetic performance are:

David Beaumier, Eng., M. A. Sc.
Director of Technological Innovation
Polymer CTT Group SAGEOS
"Laboratory Predicted Performance of Exposed Geosynthetics"

George A. Reinhart, III, PhD, PE
Senior Engineer / Vice President
Jones Edmunds Consultants Inc.
“Exposed Geomembrane Cover Performance at Polk County Landfill in Florida”

Stephan Fourmont, Eng., M. A. Sc.
Business Development Manager
Afitex-Textel Geosynthetics inc.
“Exposed NPNW GT performance at a large surface impoundment for over one year”

Bryan Scholl, Ph. D., P.E.
Director of Engineering
Watershed Geo Inc.
“Closureturf - a ten-year retrospective of UV performance”

We expect a strong turnout for the conference and hope to see many GSI members there.

3rd GMA Koerner Lecture

On October 18, the Delaware Valley Geo-Institute (DVGI) hosted the 3rd annual GMA Koerner Lecture. This year’s honored recipient was Dr. Jie Han. Dr. Jie Han, a Roy A. Roberts Distinguished Professor at The University of Kansas, gave an excellent presentation on “Geosynthetic-Reinforced Column – Supported Embankments: Bridging Theory and Practice”.



There were more than 80 people in attendance, which was exceptional, especially due to the fact that there were several Philadelphia sporting events running simultaneously that evening. We thank DVGI for hosting the event and Dr. Jie Han for spending time with us in Philadelphia.

Visitors at GSI

On November 17th GSI had a visit from Elif Callan (Director of Strategic Planning and Business Development) of IZOMAS in Istanbul Turkey and her son Berkay Brandon. Voltite’s bentonite waterproofing system and BentoShield are part of the Geomas Geocomposite product line. Geomas Geocomposite provides engineering solutions to various environmental lining and construction projects throughout Europe, the Middle East and Asia. Geomas Geocomposite is a subsidiary of the Izomas Corporate Group, an industry leader in providing containment solutions. It was great to see them and give both a tour of the Institute. Berkay could be a third generation geoprofessional. He is currently touring engineering schools in the Philadelphia Metro area.



George Koerner, Elif Callan and Berkay Brandon

“The Federal Highway Administration Launches Geosynthetics Field Installation Mobile Application”

The Federal Highway Administration (FHWA) Local Aid Support Team announces the release of the Geosynthetics Field Installation Notes Tracker Mobile Application. The new mobile app is a collaborative effort with the Geosynthetic Materials Association (GMA) to provide instant access to information on the various types and functions of geosynthetic material for use in road construction and maintenance projects. The

handheld technology is geared towards transportation industry professionals. The mobile app provides on-demand information that can be used onsite at Highway construction and maintenance projects. Construction and maintenance workers can download the Mobile App for information on specification requirements and site inspection guidance for walls, slopes, pavements, erosion control and drainage. The field inspection checklist outlines the general steps for installation and can be re-used per project or visit. Other key features include quick searches, notes tracker, bookmarks, shared documents, and informational videos.

Download Now on the App Store and Google Play Store.



For any questions contact fhwageosyntheticsappsupport@dot.gov or visit https://bit.ly/Geo_App

“GSI Fellowships for Graduate Students”

Every year GSI awards several fellowships to support research in various fields, all involving geosynthetics. The program recognizes and supports outstanding students from around the world who are studying geosynthetics. GSI’s Board of Advisors (BOA) have reviewed this year’s proposals and the following 10 students have been chosen to receive a GSI Fellowship. Each student will be awarded \$5,000 to be used towards expenses related to their research proposal.

We congratulate the following 10 students and their advisors. Everyone at GSI and the BOA wish them continued success.

If you are interested in additional information about any of the GSI fellows, please contact Jamie@geosynthetic-institute.org.

No.	Name	University	Advisor(s)	Research Topic
1-22	Daniel Adeleke	Villanova USA	Kristin M. Sample-Lord	Coupled Hydraulic-Mech.-Chem. Behavior of Bentonite Polymer Composite in Waste Containment Applications
2-22	Mahmoud Ali	Queens University Canada	Kerry Rowe	Brittle Stress Crack of HDPE GM Caused by Extrusion Weld
3-22	Pourya Alidoust	Temple University USA	Joseph Coe	Advancement in Quality Control of GCLs using Full Waveform Inversion of Seismic Data
4-22	Mehran Azizian	University of Texas Arlington USA	Xinbao Yu	Analysis of Geocells-Reinforced Percussion Anchors under Static Uplift Load by Experimental and Numerical Methods
5-22	Yunhui Fan	Queens University Canada	Kerry Rowe	Geomembrane Physical Response and Leakage for Waste Covers due to Differential Settlement
6-22	Li He	University of Massachusetts-Amherst USA	Guoping Zhang	Water Drainage and Harvesting in Soils via Wicking Geotextile with Super Hydrophilic and Super Hydrophobic Patterns
7-22	Kasra Salemi Kouchesfahani	Queens University Canada	Richard Brachman	Physical Modelling of Geosynthetic Waste Covers under Differential Settlement
8-22	Rishneswar Ramineni	Texas A&M USA	Anand J. Puppala	Performance Evaluation of the Geosynthetic Reinforced Unpaved Pavement Sections Constructed over Weaker Subgrade Conditions Based on Large-Scale Repeated Load Tests
9-22	Kairen Shen	Rutgers University USA	Hao Wang	Numerical Modeling and Performance Analysis of Geogrid-Reinforced Airfield Flexible Pavement
10-22	Md. Wasif Zaman	University of Kansas USA	Jie Han	Investigation of Moisture Reduction in Unsaturated Soils using Geotextiles

New - Webinar Wednesdays for 2023

Starting on January 4, 2023, the Geosynthetic Institute will be giving **FREE 20 minute webinars** every Wednesday. This is open to everyone (members and non-members). It is an effort to educate everyone, even those not familiar with geosynthetics.

Links will be posted 1 day prior to the “mini” webinar. The current schedule can be seen on our website under the Education tab. <https://geosynthetic-institute.org/free.html>

Pre-recorded GSI webinars (1 ½ hours in duration) will be available for purchases on our website. Jamie will provide links once payment is received. To see a list of pre-recorded webinars available for purchase, go to:

www.geosynthetic-institute.org/webinar.htm

Each webinar provides 1.5 Professional Development Hours available upon completion of a short quiz

GSI Members Cost - \$200
(unlimited number of attendees for GSI Members)
Nonmembers Cost - \$250

Recap of 2022 Webinars

Date	GSI #	Title	# Portals
1/12/2022	W5	Geosynthetics in Hydraulic Applications	12
2/09/2022	W6	Geosynthetics in Heap Leach Mining	21
3/16/2022	W7	Geosynthetics in Agriculture/Aquaculture	9
4/20/2022	W9	Behavior of 20 Landfill Failures	7
5/11/2022	W12	Landfill Covers: Past-Present-Emerging	17
6/08/2022	W14	Lifetime Predictions of Geosynthetics	4
7/20/2022	W17	Geosynthetics in Erosion Control	cancelled
8/10/2022	W20	Geosynthetic Drainage Materials	4
9/07/2022	W26	Applications and Design of Geotextile Tubes	11
10/12/2022	W27	Stability Design of Landfill Cover Soils	4
11/09/2022	W29	QA/QC of Geosynthetics	5
12/07/2022	W34	Geosynthetics in Roadways	7

Courses

We have abandoned our in-house, one-day, courses (which have been given for the past 30-years) and are presently delivering two of them in six segments over three consecutive days, one each morning and then afternoon. They are the following:

1. Quality Assurance/Quality Control of Geosynthetic in Waste Containment Facilities
(Recordings are available)
2. Construction Inspection of Mechanically Stabilized Earth (MSE) Walls, Berms and Slopes
(Recordings are available)

The third and newest of GSI courses is an On-Line "Designing with Geosynthetics (DwG)" course. Please go to www.geosynthetic-institute.org/courses.htm and scroll down to Course #3. Here you will see the requisite details. The course itself is completely synchronized with the 6th Edition of the DwG textbook. It consists of 1540 slides with \approx 18 hours of voice over; about one minute for each slide.

Contact Jamie Koerner at jamie@geosynthetic-institute.org if you want additional information.

Activities within GAI (Accreditation)

As of December 2022, the following laboratories are accredited by the GAI-LAP for the number of test methods listed in parenthesis. Contact personnel, telephone numbers and e-mails are also listed.

- 1^A - TRI/Environmental Inc. (155 tests)
Jarrett Nelson -- (512) 263-2101
jnelson@tri-env.com
- 3^A - Golder Associates (43 tests)
Henry Mock -- (770) 492-1893
Henry_Mock@golder.com
- 4^C - Geosynthetic Institute (108 tests)
George Koerner -- (610) 522-8440
gsigeokoerner@gmail.com
- 8^B - Propex Operating Co., Ringgold (18 tests)
Todd Nichols -- 438-553-3757
todd.nichols@propexglobal.com
- 9^B - Lumite (17 tests)
Rebecca Kurek -- (770) 869-1787
rkurek@lumiteco.com
- 13^A - Precision Geosynthetic Labs (TRI Env.) (77 tests)
Chad Blackwell -- (714) 520-9631
cblackwell@tri-env.com
- 14^A - Geotechnics (55 tests)
J. P. Kline -- (412) 823-7600
JPKline@geotechnics.net
- 20^A - GeoTesting Express, MA (62 tests)
Barbara Sanchez-- (978) 635-0424
bsanchez@geotesting.com
- 22^B - CETCO Hoffman Estates (11 tests)
Minerals Technologies Inc.
Dennis Wind -- (847) 851-1904
Dennis.wind@mineralstech.com
- 24^B - CETCO Lovell (11 tests)
Minerals Technologies Inc.
Stuart Yates -- (307) 548-6521
stuart.yates@mineralstech.com
- 25^B - Ten Cate, Pendergrass (13 tests)
Melissa Medlin -- (706) 693-2226
m.medlin@tencategeo.com
- 26^B - Agru America Inc. (27 tests)
Maria Coffey -- (843) 546-0600
mcoffey@AgruAmerica.com
- 29^E - FITI Testing and Research Institute (80 tests)
Hang Won-Cho -- 82-2-3299-8071
hwcho@fitiglobal.com
- 31^D - NYS Dept. of Transportation (8 tests)
Tom Burnett -- (518) 485-5707
tburnett@dot.ny.gov
- 34^B - Solmax (GSE) - Houston, TX USA (29 tests)
Jeremy Stephenson
Jstephenson@solmax.com
- 38^C - CTT Group SAGEOS (120 tests)
Oliver Vermeersch -- (450) 771-4608
overmeersch@gcttg.com
- 40^B - Solmax (GSE) - Kingstree, SC USA (20 tests)
Thomas Harrelson -- (843) 382-4603
tharrelson@solmax.com
- 41^A - SGI Testing Service, LLC (19 tests)
Zehong Yuan -- (770) 931-8222
ZYuan@sgilab.com
- 43^A - Ardaman & Associates (22 tests)
George DeStefano -- (407) 855-3860
gdestafano@ardaman.com

- 44^B - Berry Global Inc. (9 tests)
Julie Solarz -- (615) 847-7299
juliesolarz@berryglobal.com
- 45^B - Ten Cate Geosynthetics Malaysia SDN Bhd. (24 tests)
Boon Kean Tan -- (603) 519 28576
BK_tan@tencategeo.com
- 46^B - TAG Environmental Inc. (13 tests)
Ryan Ackerman -- (705) 725-1938
ryan_ackerman@tagenv.com
- 49^B - Engepol Geosintéticos (16 tests)
Patricia Natali -- (55) 51 3303-3901
patricia@engepol.com
- 50^B - ADS, Inc. Hamilton (7 tests)
Justin Elder -- (513) 896-2065
justin.elder@ads-pipe.com
- 51^B - SOLMAX - Canada (22 tests)
Claude Cormier -- (450) 929-1234
ccormier@solmax.com
- 53^B - Polytex Autofagasta (18 tests)
Mario Contreras Cardenas -- 011 55-288-3308
mcontreras@polytex.cl
- 55^B - Atarfil Geomembranas (21 tests)
Gabriel Martin Sevilla -- 34 958 439 200
gmartin@atarfil.com
- 56^B - Polytex Santiago (14 tests)
Sebastian Iturríta Monroe-- 011 56-2-677-1000
Siturríta@polytex.cl
- 57^B - Ten Cate Cornelia (22 tests)
Randy Johnson -- (706) 778-9794
r.johnson@tencategeo.com
- 58^B - Propex Furnishing Solutions - Hazlehurst (10 tests)
Lee Branch -- (912) 375-6180
Lee.Branch@propexglobal.com
- 59^B - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641
SimpsonJanie@firestonebp.com
- 60^B - TDM Geosintéticos S.A. (19 tests)
Henry De La Cruz -- 051-1-6300330
Hdelacruz@tdmgeosinteticos.com.pe
- 61^B - Raven Industries (24 tests)
Clint Boerhave -- (605) 335-0288
Clint.Boerhave@ravenind.com
- 62^B - SOLMAX - Selangor - Malaysia (16 tests)
Pei Ching Teoh -- (450) 929-1234
pcteoh@solmax.com
- 63^A - TRI-SC Labs (12 tests)
Jay Sprague -- (864) 346-3107
Jesprague@tri-env.com
- 64^B - Agru America (NV) (14 tests)
Ryan Steele -- (775) 835-8282
RSteele@AgruAmerica.com
- 65^C - Bombay Textile Research Assoc. (BTRA) (23 tests)
PK Panda (0) 022-25003651
geotech@btraindia.com
- 66^B - Rowad International Geosynthetics Co. Ltd (13 tests)
Saleh Al-Qubaisi -- +966-3-812-1360
A.alqubaisi@rowadplastic.com
- 69^B - Solmax (GSE) - Rayong - Thailand (18 tests)
Siriporn Chayaporenler -- 66-386-36758
siripornc@solmax.com
- 70^A - RSA Geo Lab LLC (48 tests)
Rasheed Ahmed -- (908) 964-0786
geolab13@yahoo.com
- 71^B - Plásticos Agrícolas y Geomembranas S.A.C. (24 tests)
Manuel Constantino Olivares Espinoza --
073-511814-511829
calidad@pqaperu.com
- 72^B - Tensar Corp. GA (5 tests)
Lynn Cassidy-Potts (770) 968-3255
lcassidy@tensarcorp.com
- 73^B - Gai Loi JSE (10 tests)
Paul Wong 84-650-362-5825
paul905677@gmail.com
- 74^B - Agru America Inc. (9 tests)
Mark Locklear - (843) 221-4121
mlocklear@agruamerica.com
- 75^B - GeoMatrix S.A.S. (42 tests)
Javier Diaz Cipagauta (571) 424-9999
jdiaz@geomatrix.com.co
- 76^B - Tehmco (Chile) (15 tests)
Rodrigo Campoy 56-22-580-2852
rcampoym41@gmail.com
- 78^B - PQA Mexico (16 tests)
Cesar Augusto Arcila (669) 954-8202
directorcalidad@pqagag.com
- 79^A - TRI Geosynthetic Testing and Services (32 tests)
Chad Blackwell 86-512-6283-1396
c.blackwell@tri-env.com
- 80^B - Texel Technical Materials (10 tests)
Eric Trudel (418) 387-4801
Etrudel@alkegen.com
- 81^B - Solmax (GSE) - Rechlin - Germany (18 tests)
Evelyn Kroeger 49-40-767420
ekroeger@solmax.com
- 83^B - Solmax Geosynthetics S.A.E. (13 tests)
Ahmed Abdel Tawab - 202-2-828-8888
atawab@solmax.com
- 84^B - Owens Corning (18 tests)
Ashutosh Dixit - 1-778-945-2888
Ashutosh.dixit@owenscorning.com
- 85^B - PAG Tacna (17 tests)
Manuel Constantino Olivares Espinoza --
073-511814-511829
calidad@pqapag.com
- 86^B - BOSTD China (29 tests)
Zheng Hong - 86-532-8780-6917
zhenghong@bostd.com
- 87^B - Willacoochee Industrial (19 tests)
Miranda Adams - 912-534-5757
miranda@winfabusa.com
- 88^B - Geosynthetic Testing Services Pvt. Ltd. (16 tests)
Ravi Kant - 02717-250019
rkant@gts-pl.com
- 89^B - Megaplast India Pvt. Ltd. (13 tests)
Tatwadarsi Tripathy - 91-937404-4620
geo_sqc@megaplast.in
- 90^B - Techfab (India) Industries Ltd. - Daman (10 tests)
Anant Kanoi - 91-22-2287-6224
anant@techfabindia.com
- 91^B - Techfab (India) Industries Ltd. - Rakholi (3 tests)
Rajendra Chavan - 91-982-593-9922
geogrid.qualitylab@techfabindia.com
- 92^B - Techfab (India) Industries Ltd. - Khadoli (2 tests)
Navir Kumar - 91-22-229-76224
woven.qualitylab@techfabindia.com
- 93^B - Garware Technical Fibres (19 tests)
Rajendra K. Ghadge - 0-932-601-8083
rghadge@garwarefibres.com
- 95^B - Mexichem Colombia (Pavco) (8 tests)
Jenny Colmenares Chavez - 57-1-782-5100 (ext. 1534)
jjenny.colmenares@wavin.com
- 96^B - Tensar China (6 tests)
Zhu Shaolian - 603-6148-3276
zsl@tensar.com.cn
- 97^A - TUV SUD PSB Singapore (17 tests)
CHA Ming Yang - 65-6885-1514
ming-yang.CHA@tuv-sud.psb.sg
nathalia.santos@neoplastic.com.br
- 99^B - Atarfil Middle East (16 tests)
Mohammad Hneine - 971-564-33-1271
mhneine@atarfil.com
- 100^B - Atarfil Geomembranas USA (12 tests)
Alejandro Carreras - 757-263-4057
acarreras@atarfil.com
- 101^B - Solmax (GSE) - Spearfish, SD USA (7 tests)
Chuck Taylor - 605-642-8531
ctaylor@solmax.com
- 102^B - SKAPS Industries (12 tests)
Sadhi Arora - 706-336-7000
sadhi.Arora@skaps.com

- 103^B - STRATA Geosystems Pvt. Ltd. (6 tests)
C. V. Kanade - 91-22-4063-5100
cv.kanade@strataindia.com
- 104^A - Advanced Terra Testing (32 tests)
William Rausch - 303-232-8308
wraush@terratesting.com
- 105^B - Pavco Wavin - Peru (6 tests)
Nestor Sifuentes Boggio - 51 990 277 136
nestor.sifuentes@wavin.com
- 106^C - Auburn University-Erosion & Sediment Control Testing Facility (1 test)
Michael Perez - 334-844-6267
Mike.perez@auburn.edu
- 107^A - TRI Australasia PTY LTD (38 tests)
Warren Hornsey - +617-5535 7227
Whornsey@tri-env.com.au
- 108^B - Solmax Geosynthetic Co. Ltd. Suzhou (13 tests)
Tony Xia - 86512-66667-6100
Txia@solmax.com
- 109^B - Hock Technology Co. Ltd. (17 tests)
Song Binghong - 186-7873-9722
Binghong.Song@sdhock.com
- 110^C - Geofabrics Australia Pty. Ltd. - GRID (53 tests)
Ryan Hackney - 61-42-781-0392
r.hackney@geofabrics.com.au
- 111^B - Huesker Inc. - Shelby (9 tests)
Jamie Honeycutt - 704-406-8308
jhoneycutt@huesker.com
- 112^C - Instituto Mauá Tecnologia Brazil (7 tests)
Henrique Nelson Satkunas
Henrique.satkunas@maua.br
- 113^B - Minas Pack Filmes - Studio Tech (7 tests)
Camila Nicoletti Brito
Camila.brito@azulpack.com.br
- 114^B - Lonax Industria Brasileira DeLonas Ltda. (12 tests)
Felipe Diniz
qualidade@lonax.com.br
- 115^B - Doha Waterproof Factory (18 tests)
Ahmed Al-Masre
infor@dohawaterproof.com
- 116^B - Soleno Textile Techniques Inc. (6 tests)
Kathie Fleury
kfleury@soleno.com
- 117^B - Reinforced Earth India Pvt Ltd. (4 tests)
Robert Lozano
Rlozano@reinforcedearth.com
- 118 - Layfield Canada (IN PROCESS)
Richard Langford
Richard.Langford@layfieldgroup.com

^AThird Party Independent ^CInstitute
^BManufacturers QC ^DGovernment

6 new laboratories joined the GAI-LAP program this year. If anyone desires more information on the GAI-LAP program, its test methods, the associated laboratories, etc., please go to our website www.geosynthetic-institute.org/gai/lab.htm or contact George Koerner.

Activities within GCI (Certification)

GSI presently has three separate inspector certification programs. One (began in 2006) is focused on QA/QC of field inspection of waste containment geosynthetics and compacted clay liners. The second (began in 2011) is focused on MSE Wall, Berm and Slope field inspection. The third, on Geosynthetic Designer Certification began on September 1, 2016. See our website at

www.geosynthetic-institute.org under “certification” for a description and information on all three of them.

Applications to sit for the GCI-ICP exams need to be submitted to the Geosynthetic Institute for approval prior to taking the exams. Applications and payment information for the exams can be found at:

<https://geosynthetic-institute.org/applications.htm>

Program #1 - Inspection of Liner Systems for Waste Containment Facilities

The certification program for certified inspectors of geosynthetic materials and compacted clay liners started in 2006.

There are currently 558 practicing certified inspectors, 426 inspectors (2018-2022) and 132 inspectors (2006-2017) who have renewed to keep their certification current.

The following chart recaps the program from 2006 to the present:

Inspector Certification Test Results 2006-2022

Year	Geosynthetic Materials		Compacted Clay Liners	
	No. of people taking exam	No. of people failing exam	No. of people taking exam	No. of people failing exam
2006	141	5 (3%)	128	12 (9%)
2007	82	11 (13%)	73	12 (16%)
2008	95	25 (26%)	89	20 (22%)
2009	36	7 (19%)	36	2 (5%)
2010	59	12 (20%)	54	7 (13%)
2011	54	6 (11%)	53	3 (6%)
2012	34	5 (15%)	28	3 (11%)
2013	32	4 (12%)	30	1 (3%)
2014	45	1 (3%)	42	3 (7%)
2015	56	6 (11%)	51	6 (12%)
2016	36	3 (10%)	35	5 (18%)
2017	78	5 (6%)	66	3 (4%)
2018	53	5 (10%)	51	1 (3%)
2019	114	20 (18%)	119	15 (13%)
2020	100	14 (14%)	92	10 (11%)
2021	70	14 (20%)	61	8 (13%)
2022	89	15 (17%)	80	13 (16%)
Total	1174	158 (13%)	1088	124 (11%)

GSI has a pre-recorded “QA/QC of geosynthetics in waste containment facilities” course that can be purchased by anyone wanting to take the course online (accommodates your schedule) in preparation for the GCI-ICP certification exams. More information can be found at: www.geosynthetic-institute.org/courses.htm

Program #2 - Inspection of MSE Walls, Berms and Slopes

While a field inspector cannot require proper design or direct a contractor how to build a wall, flaws can be identified for possible design modification or mitigation action. Furthermore, and at minimum, construction practices can be observed and corrected if inadequate or improper. The official launch of this inspection program was on December 1, 2011 with a course and the examination afterward. A somewhat revised course on November 29, 2012 was presented. Presently, the corresponding course for this certification program has been transferred into a series of six presentations that have been recorded and can be viewed at your leisure.

Program #3 - Geosynthetic Designer Certification

Please see www.geosynthetic-institute.org/gdcpintro.pdf for the requisite details. Included are introduction (rationale behind the program was given in a recent GSI Column called "We're Losing the Battle"), disclaimer, requirements, application, reference material, sample questions, proctor manual and proctor application. You must have six-months geosynthetic designer experience to take the exam.

The GSI Affiliated Institutes

It has long been realized that the information generated within the GSI group should have a timely outlet to all countries, and in all languages. To this end, GSI has created affiliated institutes in three countries (Korea, Taiwan and India), and potentially others in the future. These affiliated institutes are full members of GSI and are empowered to translate and use all available information so as to create similar institutes and activities in their respective countries.

GSI-Korea was formed on February 9, 1998 as a collaborative effort between FITI Testing and Research Institute (a quasi-government organization) and INHA University (through its Geosynthetics Research Laboratory). It is presently held entirely within INHA University. **INHA University** is located in Incheon and the geosynthetics laboratory is led by Professor Han-Yong Jeon. Dr. Jeon has 10-students working on geosynthetic-related projects and is extremely active both nationally and internationally. His active participation at conferences worldwide is very admirable. He has provided research and development in many geosynthetic subjects including geotextiles, geomembranes, geocells, and additives for GCLs, recycled plastics for improved formulations, etc.

GSI-Taiwan was formed on August 18, 2000 and is wholly contained within the National Pingtung University of Science and Technology in Nei Pu, Pingtung (southern Taiwan). The Director is Dr. Chiwan Wayne Hsieh who is a Professor in the Department of Civil Engineering and Dean of the R & D Office. The **7th Asian Regional Conference on Geosynthetics (GeoAsia7) & IGS First**

Young Engineers Conference was held on October 31-November 4, 2022 at the Taipei International Conference Center (TICC), Taipei, Taiwan. The conference was considered a success. GeoAsia7 is organized by the Chinese Taipei Chapter of the International Geosynthetics Society and Dr. Hsieh is Chairman of the GeoAsia7 Organizing Committee.

GSI-India under the direction of Dr. T.V. Sreekumar was formed in 2015. The hosting organization is the Bombay Textile Research Association (BTRA) which is a premier textile research institute providing testing, research, training and consultancy services. BTRA is located in Mumbai, India and is accredited as per ISO 17025. The Geosynthetic test lab is also GAI-LAP accredited. Testing at BTRA is performed as per the latest EDANA, ASTM, INDA, AATCC, ISO, EN and AASHTO international standards. BTRA is known for its excellence in textile R & D and is currently branching out into all forms of geosynthetics with a fantastic R & D laboratory. BTRA has a quarterly publication called "BTRA scan" and is worth checking out if you haven't seen it. The latest news report was issued January 2022 and can be found at www.btraindia.com/btrascan.html

GSI Member Organizations

GSI's next Member Meeting will take place at the ATA Geosynthetics Conference in Kansas City on **Tuesday, February 7, 2023 at 4:45pm – 5:15 pm.**

We sincerely thank all of our sponsoring organizations for their continued support. Without members, GSI could not exist. The current GSI member organizations and their contact members are listed below.

Solmax

*Mark Harris/Jacques Cote/Simon Gilbert St-Pierre/
Jimmy Youngblood/Mathieu Cornellier [BOA]*

U.S. Environmental Protection Agency

David A. Carson (BOA)

Federal Highway Administration

Silas Nichols/Daniel Alzamora

Golder Associates Inc.

Frank Adams/Paul Whitty/Linda Grover

Tensar International Corporation

Mark H. Wayne/Joseph Cavanaugh/Doug Brown

TenCate Geosynthetics

John Henderson/John Lostumbo/Rene Laprade [BOA]

Minerals Technology/CETCO

Reza Gorakhki/Stacy Byrd/Michael Donovan/Hilary Walker

Huesker, Inc.

Flavio Montez/Andreas Elsing

NAUE GmbH & Co. KG

Alexander Naue/Kent von Maubeuge [BOA]

Propex Operating Company LLC

Drew Loizeaux/Noah Nichols

Berry Global Inc.

Keith Misukanis/Monica Baker

TRI Environmental Inc.

Sam R. Allen [BOA]/C. Joel Sprague

U. S. Army Corps of Engineers

Kevin Pavlik/Richard DePasquale

Chevron Phillips Chemical Co.

Ashish Sukhadia/Lawrence Szmuto/Miranda Rine[BOA]

CARPI, Inc.

Alberto M. Scuero/Massimo Bugliosi/John A. Wilkes

Civil & Environmental Consultants, Inc.

Tony Eith

AGRU America, Inc.

Tom Nichols/Markus Haager

INHA (GSI-Korea)

H.-Y. Jeon

Waste Management Inc.

Greg Cekander/Burrill (Bo) McCoy [BOA]

NPUST (GSI-Taiwan)

Chiwan Wayne Hsieh

GeoComp/GeoTesting Express

W. Allen Marr/Gary T. Torosian

ATARFIL

Emilio Carreras Torres/Jorge Fernandez Lopez/

Gabriel Martin/Alejandro Carreras Torres

Republic Services Inc.

Joe Benco/Mike Beaudoin/Dave Vladic

InterGEO Services Co.

Şükrü Akçay/Archie Filshill

Raven Industries, Inc.

Clint Boerhave/Stacy Coffin/Greg Anderson

CTI and Associates, Inc.

Te-Yang Soong [BOA] / Kevin Foye

Advanced Earth Sciences, Inc.

Kris Khilnani/Suji Somasundaram

Carlisle Syntec, Inc.

Paul Markel/Vivian Zhang

EPI, The Liner Co.

Daniel S. Rohe/Paul Livingston

Weaver Consultants Group, Inc.

Mark Sieracke

Aquatan (Pty) Ltd.

Piet Meyer/ Sanet van der Merwe

Jones Edmunds, Inc.

George Reinhart/Tobin McKnight

Afitex-Textel

Pascal Saunier/Stephan Fourmont/Jocelyne Grenier

BTRA (GSI-India)

T. V. Sreekumar

Watershed Geosynthetics LLC

Michael Ayers/Steve Mayes/ Bryan Scholl

Maccaferri

Moreno Scotto/Sachin Mandavkar/Pietro Rimoldi

Jones & Wagener (Pty) Ltd.

Jabulile Msiza/Angelique Grieve

Ardaman & Assoc.

Mohamad Al-hawaree/Thomas S. Ingra/Deborah Scott

American Wick Drain

Scott Morris/Craig Phelps/Seth Marlow

INOVA Geosynthetics/AERO Aggregates

Archie Filshill/Theresa Loux

Owens Corning Science & Technology LLC

Katie Hill/Jason Woodall

SKAPS Industries

Nilay Patel/Anurag Shah

Duke Energy

Asha Sree/Ken Karably

Chesapeake Containment Systems (CCS)

Ryan Kamp

Layfield Group

Deepaksh Gulati/Mark Simpson/Brian Fraser [BOA]

Engepol Geossineticos Ltda

Patricia Ferreira/Andréia Machado/Ildo Oliveira

Concrete Canvas

Lee Church/Melanie Fuhrman/Nathan Ivy

Jet Filter System

Doug Stoutin/Greg Heilman

Cooley Inc.

Lance Reed/Ray Peebles

Associate Members

Delaware Solid Waste Authority

Robin Roddy/Jason Munyan

Nebraska Department of Environmental Quality

Michael Behrens

New York Department of Environmental Conservation

Jaime Lang

Maine Department of Environmental Protection

Victoria Eleftheriou

New York Department of Transportation

Steve Heiser

California Water Resource Control Board

Scott Couch/ Brianna St. Pierre/Joshua Munn

New Jersey Department of Environmental Protection

Mary Anne Goldman

Pennsylvania Department of Environmental Protection

Jason Dunham

Florida Department of Environmental Protection

Joe Dertien

U.S. Bureau of Reclamation

Brian Baumgarten/Peter Irey

Michigan Dept. of Environmental Quality

Margie Ring/Xuede (Dan) Qian

Environment Agency of U. K.

Darren Legge

Florida Department of Transportation

David Horhota

Virginia Department of Environmental Quality

Jenny Poland

Massachusetts Department of Environmental Protection

Tom Adamczyk

Dept. of Water Affairs of South Africa

Kelvin Legge

Pennsylvania Department of Transportation

Beverly Miller