**ASSURED QUALITY FOR A LIFETIME**

GSE drainage products have been manufactured for over 30 years. Millions of square feet of drainage products are produced every year for landfill applications.

GSE starts with the highest quality resin blended with carbon black, UV stabilizers and antioxidants to ensure the product will have a long life. The material must pass stringent testing requirements and inspection prior to shipment.

**SUPERIOR PRODUCT COMPOSITION**

GSE geonets are manufactured to form a three-dimensional biplanar drainage structure that is used to replace a sand or gravel subsurface drainage system. GSE geocomposite will be needed if the drainage structure will be in contact with a soil type. This is accomplished by heat laminating a needle punched nonwoven geotextile to either one or both sides to prevent soil particles from clogging the drainage core. Geotextiles are also laminated to geonet cores when there is a need to increase frictional characteristics with another geosynthetic type.

GSE developed new advantage drainage product lines, which are targeted specifically towards the high performance application range. GSE HyperNet TRx geonets and GSE FabriNet TRx geocomposites have significantly improved the hydraulic transmissivity of regular biplanar geonets under low to medium loading conditions for landfill cover drainage systems. GSE PermaNet geonets and geocomposite have a unique round-strand structure designed for providing high flow under heavy to extremely heavy loads that are expected in many landfill base liner systems and in mining projects.

In 2008, GSE was awarded a patent on the strand structure of GSE PermaNet biplanar geonets. GSE BioDrain geocomposite blanket system is another GSE patented product as a cost-effective solution to the bioreactor landfill leachate recirculation. The special woven filter design of GSE BioDrain will provide better clogging resistance and distribute liquid more uniformly.

**LEACHATE COLLECTION AND REMOVAL SYSTEM**

The leachate collection and removal system (LCRS) is a lateral drainage system that is used to remove leachate from the lining system to maintain less than or equal to 1 ft head of liquid as required by Subtitle D. Drainage geocomposites are used in this application in place of natural soils because natural soils require extra preparation of the sub-grade and consume valuable airspace (typically 1 ft of soil). Geosynthetic drainage products are installed by simply rolling the product down the slope. Drainage geosynthetics require less sub-grade preparation and occupy far less airspace than natural drainage soils (0.20 in to 0.30 in). Drainage geocomposites provide excellent long-term hydraulic performance and creep resistance to ensure the leachate collection system will continue working over the life of the project.

**LEAK DETECTION SYSTEM (LDS)**

Subtitle C hazardous waste landfills regulations require a double liner system consisting of two HDPE geomembrane liners with a geonet in the middle to comprise a leak detection system. This system is used to warn of any failures in the primary liner system. The use of a biplanar drainage geonet provides high transmissivity which will continue to limit the head on the secondary liner to 1 ft as required by regulations. Biplanar geonets will also move leachate quickly through the system to leak detection locations.

The landfill gas collection system is used to collect gases such as methane (CH4) and carbon dioxide (CO2) that can build up underneath the geomembrane. Gases can be collected and used for energy production or distributed to a venting or capturing...
system to avoid air pollution. Landfill gas collection systems are used to prevent gas from accumulating underneath the liner system which could cause the liner to rupture. Instead of using a layer of sand for gas collection, a biplanar geonet or geocomposite can be utilized to accomplish the same task. The thickness of the geonet depends on the amount of gas generation expected during waste decomposition.

SUB-GRaDE GAS REMOVAL
Gas pressure, due to the biodegradation of organic materials, can cause the subgrade to release gasses that will build up underneath a geomembrane and potentially cause a failure in the geomembrane liner system. In a final cover system, gas pressure, due to the release of gasses from the waste, can accumulate underneath the geomembrane causing slope instability or slope failure. In order to effectively reduce gas build-up, biplanar geocomposite strips, commonly called strip drains, can be installed to discharge gas to a gas venting system or gas collection system. Spacing between strip drains and the thickness of the geocomposite used is based on the amount of gas production released from the landfill surface and the maximum anticipated field load expected during the life of the project.

EASE OF INSTALLATION AND PRODUCT SUCCESS
GSE drainage products have been used in the above applications for many years with great success. Drainage geosynthetics require less excavation, allow for more airspace and are easy to handle. GSE drainage products are provided in roll form and can be installed with a limited amount of crew personnel and equipment.

COMPLETE INSTALLATION SERVICES
No other company offers more experience installing geosynthetic products than GSE. GSE Installation Services is your one-stop source that offers the experience, training, expertise and complete range of geosynthetic products, fabrication and technical support on any project.

THE GSE DRAINAGE DESIGN MANUAL
This comprehensive design manual provides the project engineer with the material properties and design procedures pertaining to drainage geonets and geocomposites for a wide range of applications. For a free copy, please contact GSE.

ADDITIONAL INFORMATION
If you have an upcoming project please give us a call. We will provide you with recommendations for material and installation.