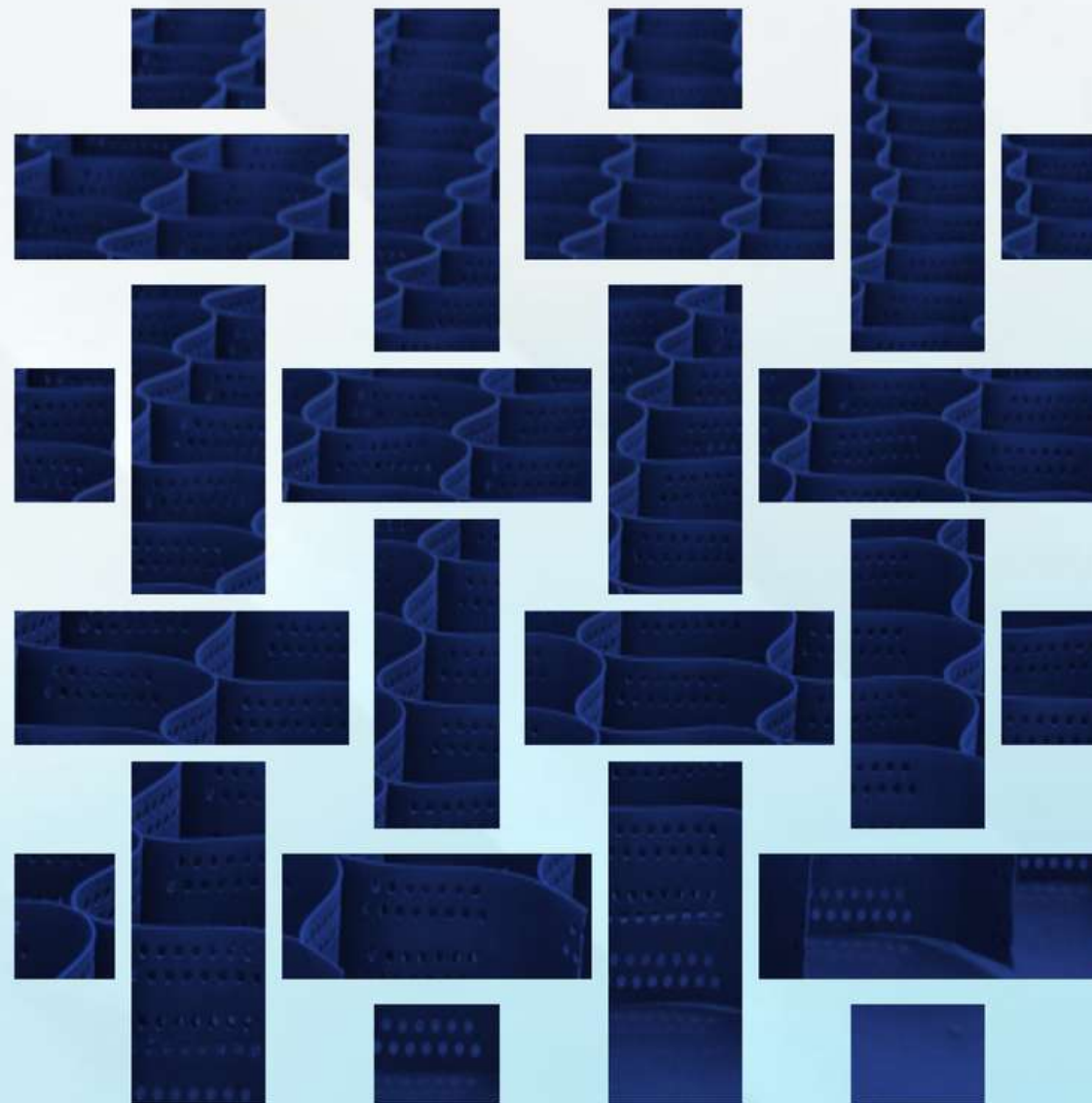


GEOSYTHETICS IN OPTIMIZING REAL ESTATE PROJECTS

NOV. 2023



Nigeria's #ONE soil stabilization
solutions provider

A Geo Foundations & Structures Ltd
presentation

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About GFS

One stop shop for soil/road stabilization, erosion and flood control across estate sites.



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Stabilization, Erosion & Flood Challenges Across Sites

The soil stabilization conundrum

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Soil Stabilization Market Report

Thinking of exploring more environmentally friendly & sustainable solutions?



06

Our Solutions

Sole proprietary local manufacturing & sales licence for all product ranges.

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Why Choose Us

Quality turnkey products, safe, & timely with speedy delivery.



Our Vision

Our vision is to be Africa's number ONE soil stabilization products & solutions company.

Our Core Values

P.R.I.C.E.D

- Professionalism
- Resourcefulness
- Integrity
- Community
- Excellence
- Drive

Our Approach

We take a holistic approach through the application of our geosynthetic products and solutions to soil stabilization needs.

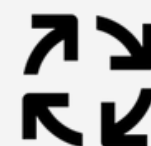
Our designs and applications are environmentally friendly, cost effective and durable. We manufacture, distribute and install our products and solutions.



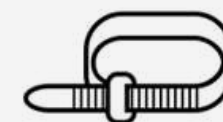
Quality



Cost effective



Environmentally friendly



Quick installation



Retaining walls



Shoreline protection



Channel protection



Road Stabilization



Soil/building protection



Slope protection

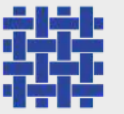


Base stabilization

Our Market

- Civil Infrastructure
- Agriculture
- Water and Waste Water Management
- Government MDAs (Ministries, Department and Agencies) of: Work and Infrastructure, Housing, Water Resources, Environment,
- Waterfront Infrastructure Development.
- Oil and Gas
- Mining

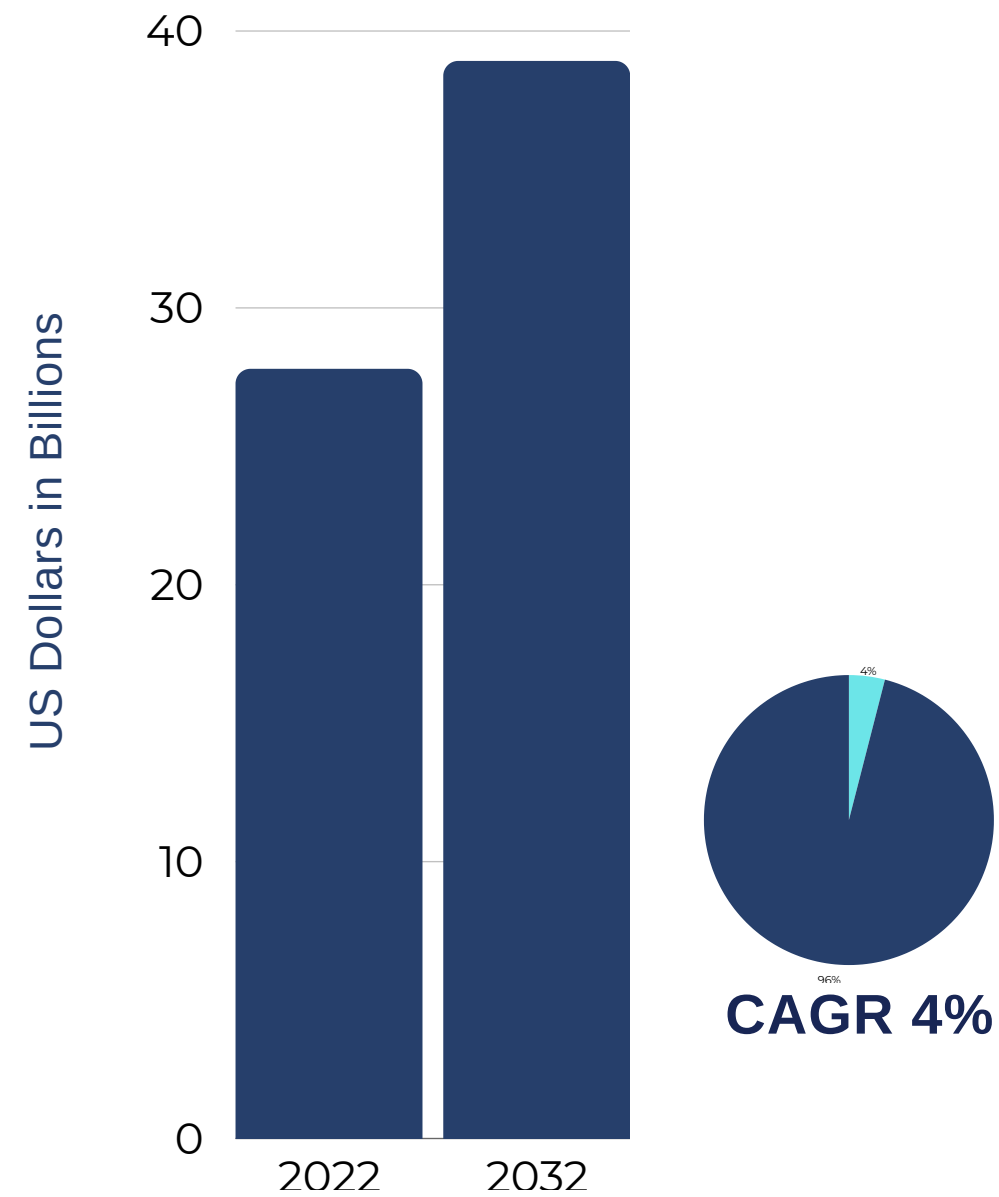
ABOUT GFS



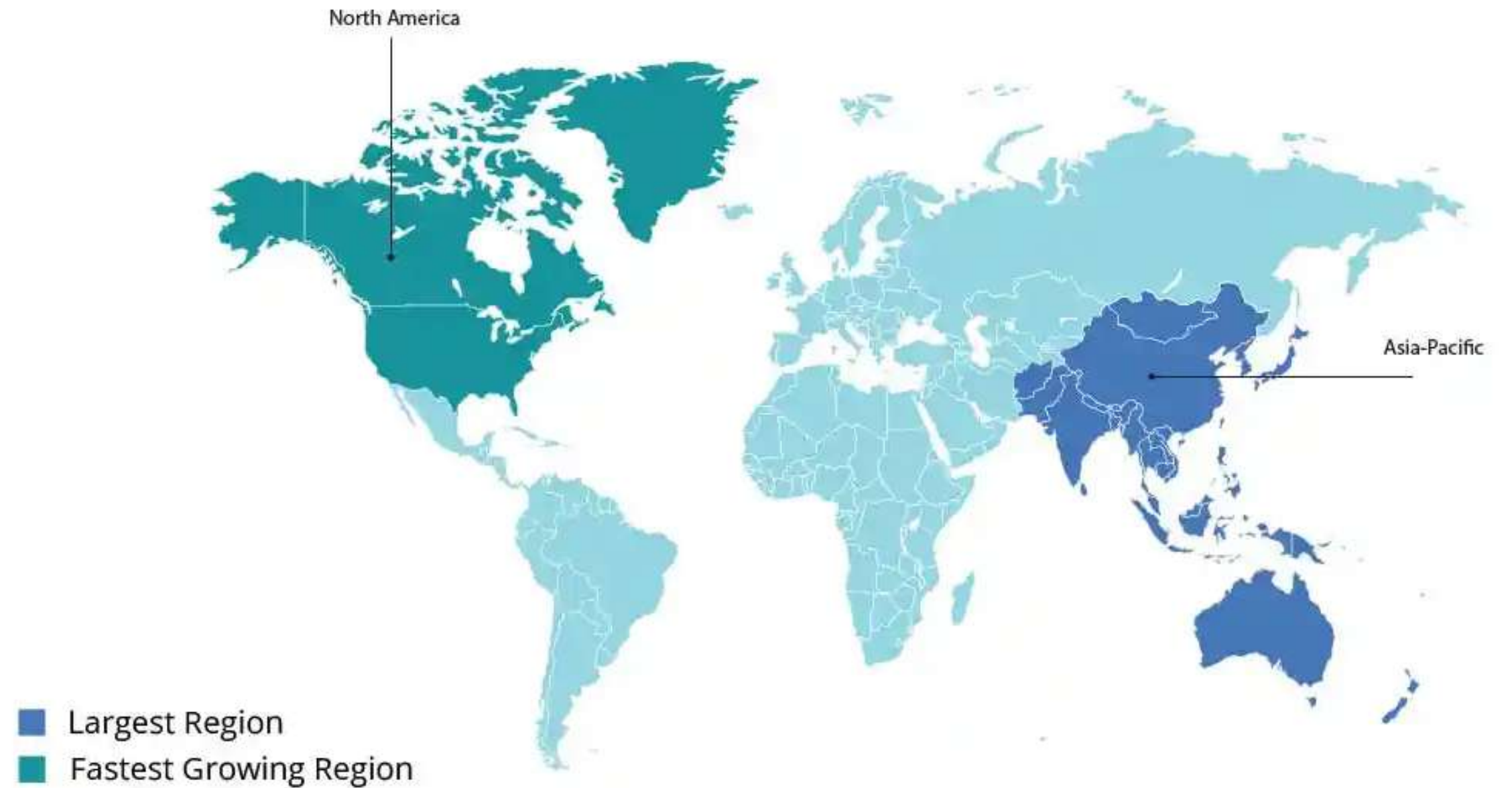
- Soil erosion is a gradual process that occurs when the impact of water or wind detaches and removes soil particles, causing the soil to deteriorate. Soil deterioration and low water quality due to erosion and surface runoff have become severe problems worldwide.
- Flooding is an overflowing of water onto land that is normally dry. Floods can happen during heavy rains and are one of the agents of soil erosion.
- Unstable soil can be caused by poor soil compaction which leads to structural failures. They can also be caused by organic decomposition, freeze/thaw cycles, and soil erosion.
- Soil stabilization is an important technique that maintains or improves the stability of weak soils to achieve engineering goals.
- Sloped terrains are incredibly exciting as well as challenging for architects. They offer you the perfect opportunity to explore complex sites and engage with dynamic natural landscapes.
- These landscapes can also serve as great testing beds for innovative approaches and concept ideas. The complexity and challenges of sloped sites, erosion control, flooding and channels across sites are perfectly mitigated by the application of geocells and other products that will be discussed in this slide.

STABILIZATION, EROSION & FLOOD CHALLENGES ACROSS SITES





Soil Stabilization Market- Regional outlook, 2022-2032



SOIL STABILIZATION MARKET REPORT

Source: Reports and Data, 2022

OUR PRODUCTS & SOLUTIONS




- Geocells were invented in the early 80's and patented by the United States Army Corps of Engineers. The early use of the technology was for the construction of roads over soft soils for military use. Today, GeoCells are not only used for base stabilization, but also for erosion control of slopes and channels as well as in construction of retaining walls.
- GeoCells are made from high density polyethylene (HDPE).
- HDPE has been used for the most demanding industrial products since 1955. The three-dimensional cells impede lateral movement of the infill material, increasing structural strength and locking in materials for erosion protection.
- The cell walls are perforated to allow water flow through the system, creating improved root zone between cells for vegetated applications.
- On concrete filled GeoCells, the HDPE matrix becomes the form for the concrete. There is no need for wood forms or rebar. The panels are expanded and the concrete poured directly into the GeoCell.

GEOCELLS

APPLICATION & BENEFITS



Base/soil
Stabilization



Retaining
Walls



Channel
Protection



Slope
Reinforcement



Cost effective



Environmentally
Friendly



Multi-Purpose



Efficient & Easy to
Install

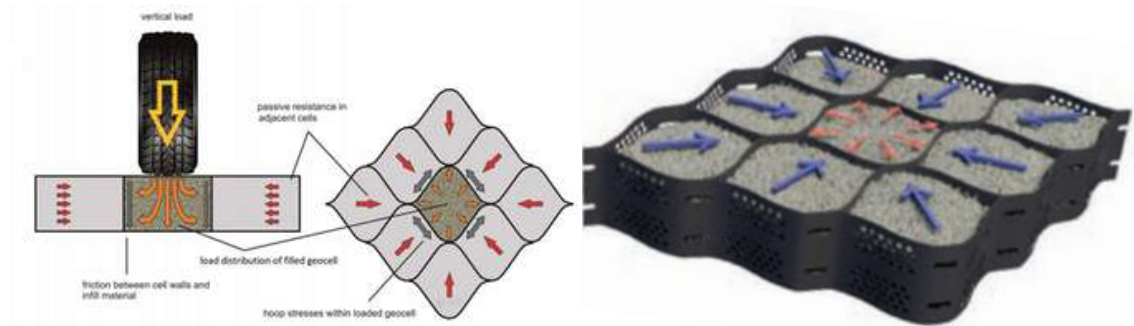


3D Cross-Section

GEOCELLS

HOW IT WORKS

- GeoCells impede lateral movement of the infill material by distributing the load to surrounding cells. The confinement reduces the stress on the underlying subgrade which effectively reduces the required base thickness, extends the service life of the section, reduces operational costs and minimizes maintenance.
- GeoCells also increase the shear resistance of infill materials, allowing the use of lower quality infill materials to carry the loads.



Geocell with different Infill

BASE/SOIL STABILIZATION

PAVEMENT STRENGTHENING

Early failure is common in paved areas due to weakening of the granular base course and progressive lateral displacement.

GFS GeoCell confines the fill material under pavement structures, reducing the depth of the layer and increasing the structural number below the pavement layer. The greater structural number reduces the asphalt layer and increases the life of the asphalt, reducing maintenance costs on both rigid and flexible pavements.

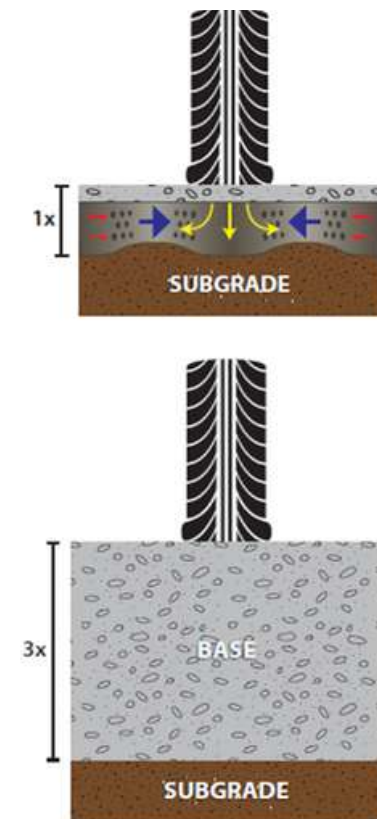


BASE STABILIZATION – UNPAVED ROADS

The GFS GeoCell is a confinement system that performs better than conventional crushed stone sections, and it provides an expedient construction technique for access roads over soft ground without being adversely affected by wet weather conditions.

Application

- Haul Roads
- Access Roads
- Laydown Yards
- Pipe Yards
- Parking Lots



BENEFITS

- Use of on-site materials significantly reduce cost.
- Construction possible on soils with CBR's less than 1.
- Maintenance cost reduction 25% + on surface & equipment.
- GeoCell confinement allows for the reduction of the base layer.
- Reduction of typical excavation depth.
- Immediate access to areas once GeoCells are filled.
- GeoCell panels are easy to install without specialized equipment and their extra-large, one-piece panels increase installation rates by 40% +.



SLOPE REINFORCEMENT

On slope applications, GeoCells can be filled with angular rock, concrete or with vegetated soil.

The GeoCells confine the infill material, creating a stable layer protecting the slope from erosion.

GeoCells are flexible system that will contour to the sub-grade of a slope, reducing preparation time. When filled with vegetated soil or rock, the system is permeable reducing water runoff.



Shelton Gardens, Cincinnati,
OH.



Application

- Slopes/ Embankments
- Pond Slopes
- Containment Berms
- Geomembrane Protection
- Shoreline Protection
- Landfill Caps

BENEFITS

- Construction possible on slopes greater than 1:1.
- For shore protection, the GeoCell allows for the use of a smaller aggregate vs costly rip rap.
- On a concrete application the individual blocks become a flexible system that can conform to sub-grade settlement.
- When filled with vegetative soil or aggregate, GeoCells becomes a permeable system that reduces water runoff.

CHANNEL PROTECTION

Application

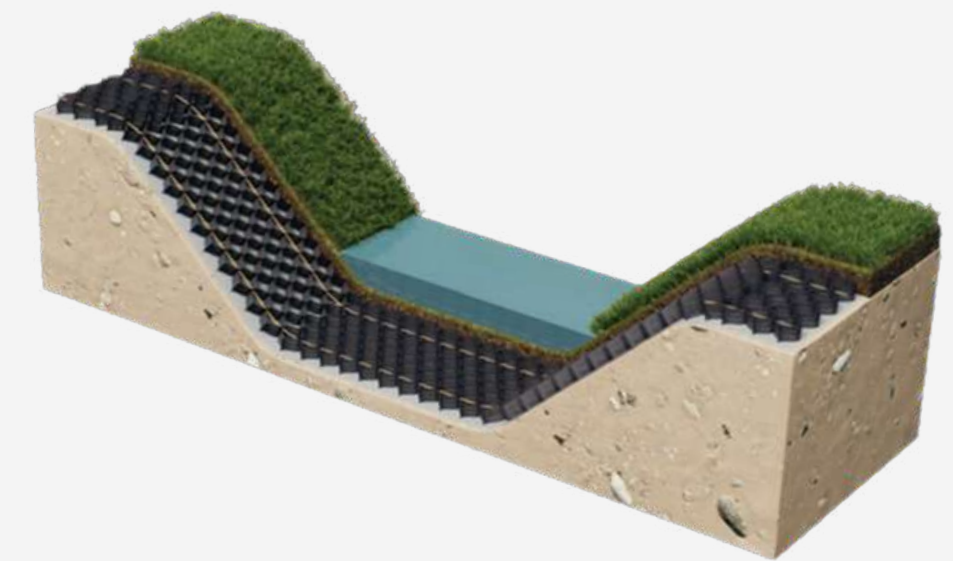
- Geomembrane Lined Channel Protection
- Storm Water Channels
- Ditch Protection
- Spillways
- Shoreline Protection
- Concrete Channels



BENEFITS

- Reduces formation of reefs by confining top layer of the material and protection from sheet flow.
- When filled with top soil, creates a layer for vegetation and healthy root zone.
- GeoCell can be filled with angular rock, vegetated soil or concrete.
- On channel applications multiple infill materials can be used on the same panel based on flows. For example, the bottom can be filled with concrete to withstand high flows (+20ft/s (6 m/s)) and transition to vegetated soil on the walls to provide a natural appearance.
- Angular rock is used for velocities up to 10 ft/s (3 m/s), vegetated soil up to 20 ft/s (6 m/s) and concrete for velocities greater than 20 ft/s (6 m/s).

- Channel protection with stacked layers replacing gabion baskets. GeoCell panels can be filled with aggregate or concrete for high flows and transition to vegetated soil.
- Allows for the use of a smaller confined aggregate vs large and costly rip rap.
- On a concrete infill, eliminates the use of wood forms and rebar.
- On a concrete application, the individual blocks become a flexible system that can conform to subgrade settlement.



CHANNEL PROTECTION

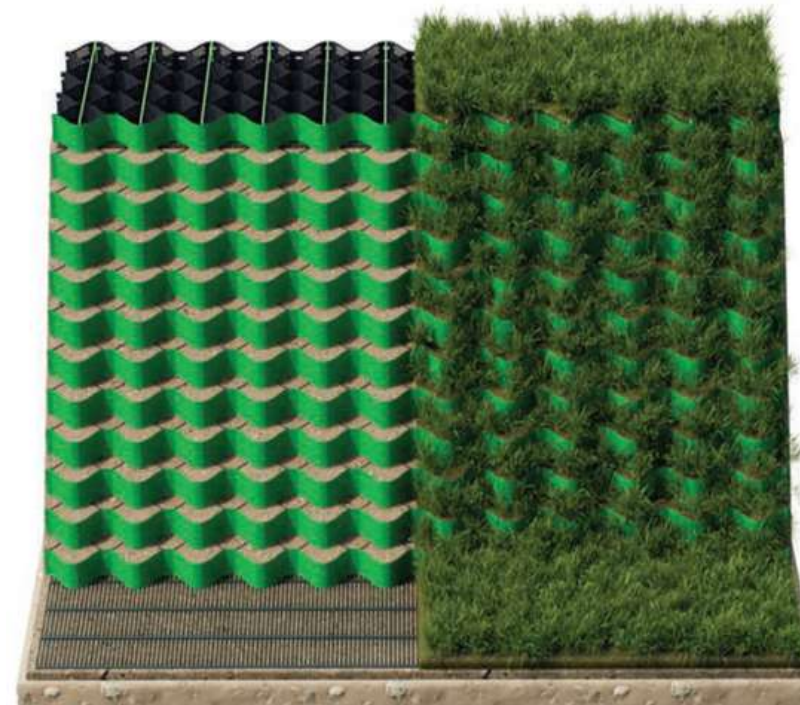
For retaining walls, GeoCells can be used for both cut and fill applications. The flexible HDPE panels are custom made to the front & back dimensions required by the project engineer. The panels are 6" (15 cm) or 8" (20" cm) tall and typically expand 2.85' (0.87 m) into the wall. The walls are further reinforced using a uniaxial grid embedded further into the wall every 3-4 layers of GeoCell. The GeoCells can be easily installed around curves and pipes or other structures.

The GeoCell panels are constructed with the front facing strip colored green or tan to blend in with the surroundings. The GeoCell panels can be stacked to create a 90 degree wall, or they can be stair stepped at every layer to create 3-4 (7-10 cm) inches of exposed cell for vegetation. GFS GeoCells are the perfect green wall solution.



Application

- Gravity Walls
- Reinforced Steepened Slopes
- Vegetated Wall
- Non-Vegetated Walls
- Blast Protection Walls
- Highway Embankments
- Channel Wall Protection
- Gabion Replacement
- MSE Block Wall Replacement



BENEFITS

- GeoCell panels can be filled with on site soils.
- No need for rock or other expensive materials.
- GeoCell walls are flexible and contour to curves, around structures and are capable to adjust to settlement.
- With our professional engineered recommendations and use of various reinforcing geosynthetic materials, walls can be built in excess of 50 feet (15 m) in height.
- Front fascia strip can be green or tan to match surroundings. Installation +30% faster than conventional wall systems.
- Does not require heavy equipment for installation.
- GeoCell panels are portable and can be carried by hand to installation area.
- Installation crew of five (5) laborers and one (1) supervisor.



GFS geotextiles are non-woven permeable fabrics made from high-quality polypropylene stable fibers. They are commonly used for stabilization, filtration, separation, drainage, and protection in civil engineering and construction projects.



GEOTEXTILES

USES

Filtration: Effective in preventing soil particles from entering drainage systems, while allowing water passage.

Separation: Used in road construction to separate different layers, ensuring material integrity and extending road lifespan.

Protection: Provides a protective layer, preventing punctures or damage to geomembranes in landfill liners or other containment systems.

Drainage: Enhances water flow, reducing hydrostatic pressure in structures like retaining walls.

Erosion Control: Installed to stabilize soil on slopes or in areas prone to erosion.

BENEFITS

High Permeability: Efficiently allows water flow while retaining soil or sand, preventing clogging

Flexibility: Conforms to the landscape, ensuring intimate contact with irregular surfaces.

Durable: Resistant to a variety of factors like UV radiation, chemicals, and microbial degradation, ensuring longevity.

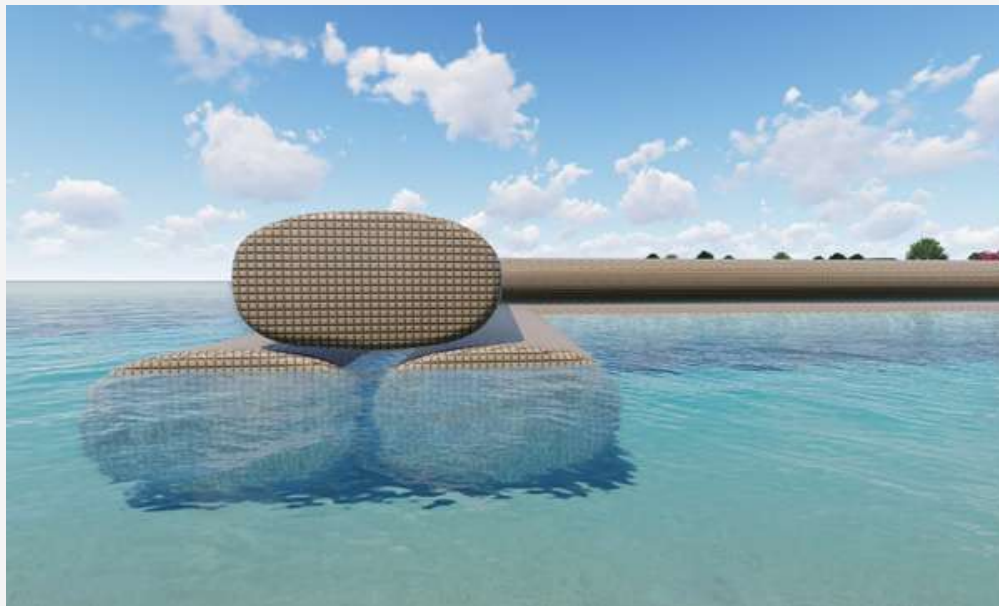
Cost-Effective: Provides economical solutions for multiple geotechnical challenges without compromising performance.

Versatility: Suitable for a diverse range of applications due to its adaptability and range of available specifications.





Geotubes are large, tubular bags made from high-strength permeable geotextiles. When filled with materials, typically sludge, sediment, or sand, they undergo a dewatering process to remove excess water and compact the contained material.



GEOTUBES

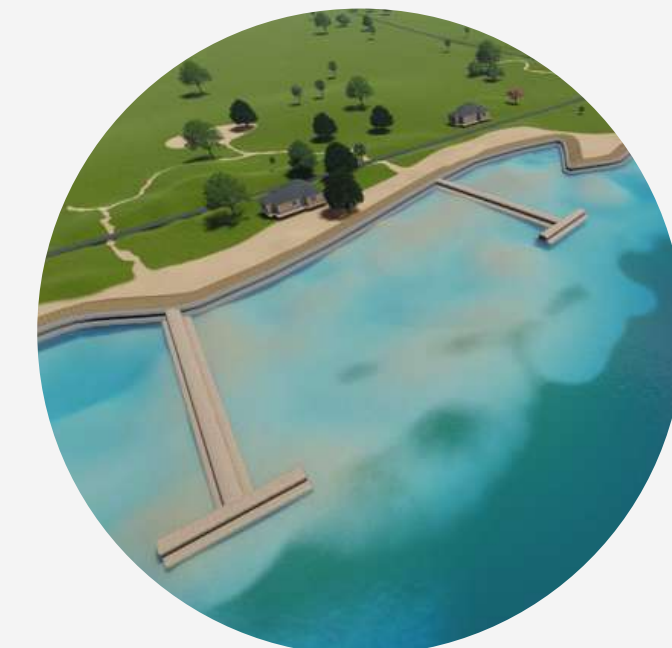
USES

Dewatering: Commonly used to dewater sludge, industrial waste, and other wet materials.

Shoreline Protection: Act as breakwaters or protective barriers against erosion.

Environmental Remediation: Used for containment and dewatering of contaminated sediments.

Marine Structures: Serve as foundations or cores for jetties, groins, and other marine structures



BENEFITS

Efficient Dewatering: Provides a cost-effective method for removing excess water from various materials.

Erosion Control: Offers an eco-friendly and durable solution against shoreline erosion.

Flexibility: Can be tailored to specific project sizes or requirements.

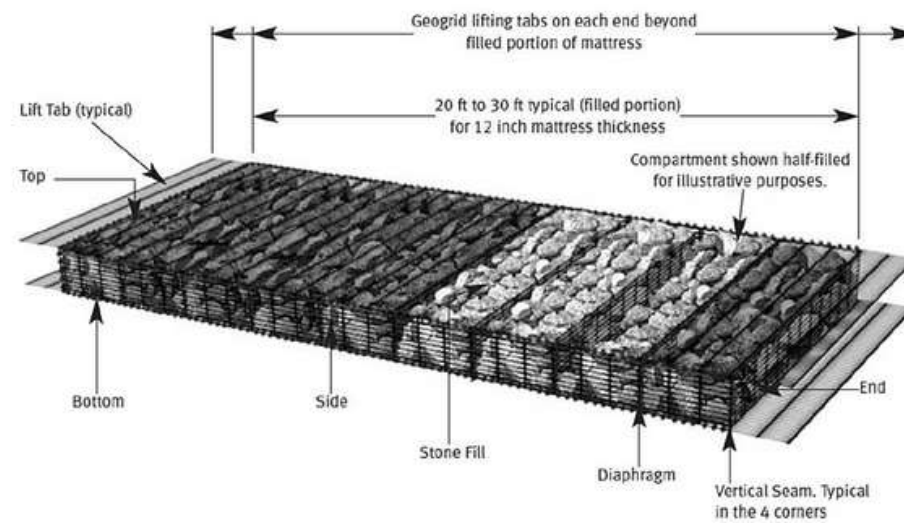
Environmentally Friendly: Can be used for environmental cleanup and remediation projects.

COASTAL/MARINE MATTRESSES



USES

Coastal or marine mattresses are large, flat, rectangular structures, typically filled with stones or concrete materials and encapsulated within a durable geotextile fabric. They are designed to provide protection, stabilization, and reinforcement in aquatic or marine environments.



Shoreline Protection: They prevent erosion by dissipating the energy of waves and tidal movements, thus safeguarding coastlines and riverbanks.

Underwater Foundations: Serve as a stable foundation or platform for installations like jetties, piers, or other marine structures.

Revetments: Used to stabilize slopes or banks against erosion.

Scour Protection: Placed around bridge pillars or other structures to prevent scouring caused by flowing water.

Artificial Reefs: When designed for this purpose, they can support marine life and promote the growth of natural habitats.

BENEFITS

Durability: Designed to withstand harsh marine conditions, offering a long lifespan.

Flexibility: Can conform to the natural contours of the sea or riverbed, ensuring full contact and effective protection.

Eco-friendly: The materials used are often non-toxic and do not adversely affect marine ecosystems. In some cases, they even promote marine life growth.

Cost-Efficient: Provide a long-term solution that often requires less maintenance compared to traditional methods.

Ease of Installation: Prefabricated and can be swiftly deployed, even in challenging marine conditions.



TRAPBAGS®

TrapBags® are likened to large sandbags but with a unique design. They are essentially semi-circular, interconnected bags made from high-strength textile material. Once filled with material like sand, soil, or aggregate, TrapBags® create a robust and flexible barrier to flooding.



USES

Flood Control: TrapBags® can be rapidly deployed in emergency situations, such as during floods, to act as barriers or levees, preventing water from inundating vital areas.

Erosion Control: They can be installed to protect eroding shorelines, riverbanks, or slopes.

Containment: Used for containing hazardous or waste materials in specific sites, especially during spill incidents.

Construction Support: Provide support in construction areas, like trenches, or serve as temporary dams.

Protection: They can act as protective barriers around infrastructure or other assets during natural disasters or other events.

BENEFITS

Rapid Deployment: Designed for quick and easy installation, making them especially valuable in emergencies.

Cost-Effective: Often more affordable than traditional methods like concrete walls or large sandbag operations.

Versatility: Suitable for a wide range of applications, from flood control to construction.

Durable: Made from high-strength materials, they can withstand severe conditions and can be used for both short-term and long-term applications.

Environmentally Friendly: Once filled with natural materials, they have minimal environmental impact and can even be used to support vegetation growth in some settings.



SAND/GROUT/ BULK BAGS

Sand, grout, and bulk bags, often referred to as Flexible Intermediate Bulk Containers (FIBCs) or big bags, are large, durable bags designed to transport and store a wide range of materials. Made typically from woven polypropylene or other robust fabrics, these bags offer a versatile and efficient solution for handling, transporting, and storing bulk materials.



USES

Construction Sites: Used for transporting and storing sand, gravel, cement, or other construction materials.

Flood Control: Filled with sand, these bags can act as temporary flood barriers.

Agriculture: Ideal for storing and transporting seeds, fertilizers, and harvested crops.

Waste Management: Used for collecting and moving waste materials, especially in construction or industrial sites.

Industrial Applications: Transport and storage of bulk products like chemicals, minerals, and food grains.

Infrastructure: Grout bags specifically can be used underwater or in moist environments to provide foundational support or fill voids, such as providing Pipeline/Cable protection and support.

BENEFITS

Cost-Efficient: Provides a cost-effective means of transporting and storing bulk materials compared to other methods.

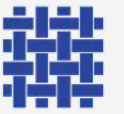
Versatile: Suitable for a wide range of materials, from fine powders to large aggregates.

Space-Saving: When not in use, the bags can be folded and stored, consuming minimal space.

Durable: Made from high-strength materials, ensuring longevity even under rough handling or adverse conditions.

Eco-friendly: Many bags are reusable, reducing waste and the need for single-use containers.

Safety: Many bags come equipped with loops for forklifts or cranes, ensuring safe and easy lifting and transportation.





Geogrids are two-dimensional grid-like structures made from robust polymer materials. The grids consist of intersecting tensile ribs with large apertures (open spaces) between them.

Geogrids are mainly used for reinforcement, as the openings in the grid allow for soil or aggregate interlock, which strengthens the entire structure.



GEOGRIDS

USES

Soil Reinforcement: Geogrids are placed between soil layers, strengthening the overall structure, especially beneficial for roads, railways, and embankments.

Retaining Walls & Slopes: They act as primary reinforcement, providing stability and preventing failures in these structures.

Pavement Optimization: By distributing loads, they reduce rutting and extend the lifespan of pavements.

Foundation Stabilization: Geogrids improve load distribution, making them valuable for building foundations, especially on weaker soils.

Erosion Control: In conjunction with other materials, geogrids can aid in preventing soil erosion, particularly on slopes.

BENEFITS

Structural Enhancement: Provides significant improvement to the tensile strength of soil, ensuring stability.

Cost Savings: Reduces the need for thick soil layers or expensive fill materials, leading to cost-effective construction.

Longevity: Enhances the lifespan of roads, retaining walls, and other structures by preventing premature wear and deformation.

Versatility: Suitable for a variety of applications, catering to diverse construction and engineering needs.

Ease of Installation: Lightweight and flexible, allowing for swift and efficient deployment on-site.





Geonets are two-dimensional net-like geosynthetic materials, typically made from polyethylene or other suitable polymers. Like geogrids, they are also grid-like, but they are characterized by their intersecting ribs that create a network of channels. These channels facilitate the movement of fluids or gases.

Renowned for their excellent drainage properties, geonets are predominantly used for drainage and gas venting.



GEONETS

USES

Landfills: Geonets, when used as part of a composite liner system, facilitate the collection and removal of leachate, reducing the risk of groundwater contamination.

Gas Venting: In landfill covers, geonets can help in gas venting, allowing for the safe dispersion of gases generated within the landfill.

Drainage Layer: Geonets can act as a drainage layer beneath roads, pavements, or other structures, ensuring efficient removal of water and reducing the risk of structural damage.

Erosion Control: In conjunction with geotextiles, they can be used in slopes and embankments to prevent soil erosion by facilitating controlled water flow.

Retaining Walls: Employed behind retaining walls, geonets ensure effective drainage, reducing hydrostatic pressure and increasing the stability of the structure.

BENEFITS

Efficient Drainage: Designed specifically for high flow rates, geonets are often more effective than conventional drainage solutions.

Durability: Resistant to chemical degradation and UV radiation, ensuring a long service life, especially in challenging environments like landfills.

Versatility: Adaptable to a variety of applications, ranging from landfill designs to road construction

Space-Saving: Thin profile allows for effective drainage without significantly increasing construction thickness.

Cost-Effective: Reduces the need for traditional drainage materials, leading to potential cost savings and reduced construction times.





Geomembranes are impermeable barriers made from synthetic materials like polyethylene or PVC. Their primary purpose is to act as barriers to prevent the movement of liquids or gases.



GEOMEMBRANES

USES

Landfills: Used as liners to prevent leachate from seeping into the ground and contaminating groundwater.

Ponds and Reservoirs: Act as liners to prevent water seepage.

Mining: Used in heap leach pads.

Agriculture: As pond liners for aquaculture or water storage.

Containment: Capture hazardous or waste materials, preventing contamination of surroundings.



BENEFITS

Leak Prevention: Highly effective in preventing fluid or gas migration.

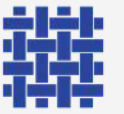
Durability: Resistant to environmental degradation, ensuring a long lifespan.

Chemical Resistance: Can handle a range of chemicals, making them ideal for industrial or waste containment.

Cost-Efficient: Offers a long-term solution that often requires minimal maintenance.



SELECTED PROJECTS



Channel protection works for NEWMAP, Calabar



Road stabilization works for EDMoRB



Yard stabilization for Emval



Geocells beneath interlock finishing



Product brands of tested and proven international standard, quality and reputation.



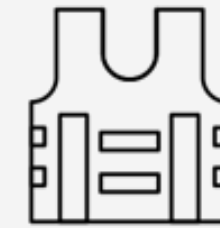
Sole proprietary local manufacturing and sales licence for all product ranges.



Technically sound team of sales, production, installation and maintenance personnel



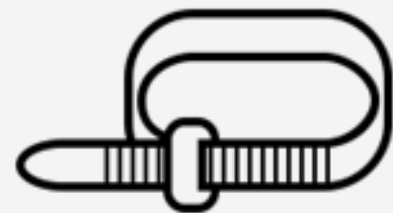
Quality guarantee



Execution of projects related to Soil; Flood & Erosion works including Road Works



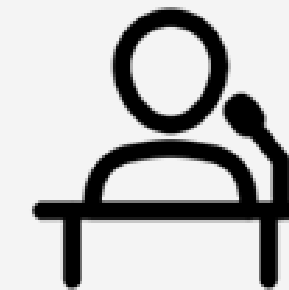
Facility/Yard Stabilization and other related civil engineering works



Installation of products on site for contractors involved in erosion, road works and other forms of stabilization



Project Management services with keen attention to details of client needs



Organized Training/Seminars on Soil, Flood & Erosion control and related works



Quality Turnkey production; safe and timely

WHY CHOOSE US

Discover why choosing our company for your soil stabilization needs is the smart choice:



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**GET IN
TOUCH**

*We look forward to working
with you*