
Stability, Protection
& Innovation
We've Fought the Same Battle. Now You Don't Have To.
ClosureTurf®
U.S. Patent Nos. 7,682,105 & 8,585,322 • Canada
Patent No. 2,663,170 • Other Patents Pending
MADE WITH
agru
STRUCTURED MEMBRANES

Soil slopes don't work, although they keep you working

Soil erosion continually plagues the ongoing management of landfills, industrial waste sites, CCR storage areas, and other environmental containment applications requiring constant rebuilding of slopes weakened by rain and wind. In addition to ongoing maintenance headaches, traditional systems utilizing soil as their main component are costly to maintain, slow to install, and introduce unwanted slope instabilities.

There is an alternative solution available for these challenging applications which address the lessons learned by the industry since the implementation of Subtitle D. The innovative solution is called ClosureTurf® which meets and/or exceeds the requirements set forth by the EPA in Subtitle D. A three component system, ClosureTurf is revolutionizing the way engineers, owners, government agencies and many others solve containment challenges. The ClosureTurf system offers exceptional durability and pleasing aesthetics at a lower cost than traditional practices.

ClosureTurf® makes fast, cost-efficient erosion control so easy—it's virtually install and that's all.

ClosureTurf is a patented three component system comprised of a structured geomembrane, an engineered synthetic turf, and a specialized infill. The ClosureTurf system provides many advantages over a typical Subtitle D landfill cover such as:

- Reduces construction and long-term maintenance costs
- Improves short term and long term slope stability
- Excellent performance in extreme weather conditions
- Provides for enhanced gas collection (when applicable)
- Improves stormwater quality
- Incremental closures for gas control, odor control and leachate reduction (close as you go)

With several square miles of installed product, ClosureTurf has proven to be superior in performance when compared to other cover solutions—not only in the laboratory but also in real life applications where it counts. The system has a proven track record to significantly outperform traditional vegetative closure methods with regard to installation, maintenance and environmental compliance.

Berkeley County Landfill, SC

A Simplified and Sustainable Subtitle D Closure Method

Performance:

- Prevents common erosion, storm water and siltation problems—even during severe weather events.
- Utilizes the highest interface friction geomembrane available in the market which provides greater stability on steeper grades and reduces the need to rebuild slopes.
- With a design life of 100+ years, the lifespan of the ClosureTurf system extends well beyond the required 30-year post-closure maintenance period. It protects against driving forces, severe weather conditions, heat and wind uplift.

Crazy Horse Landfill, CA

Cost Savings:

- Significantly lowers upfront capital costs.
- Dramatically reduces maintenance costs.
- Reduces the cost associated with the repair of significant failures.

ClosureTurf withstood a historical, 500-year storm event at Saufley Landfill totaling 5.68 inches of rain in a single hour (and 26 inches in 24 hours) with minimal impact. Maintenance was completed in three days with a three-man crew.

Saufley Landfill, FL

Pre- and Post-Construction Benefits:

- Installs at least 50% faster than traditional soil caps.
- Eliminates risk with less vehicles traveling to and from site.
- Easily adapted during or after construction for solar field development.

Portola Landfill, CA

Environmental Benefits:

- Obtain control over gas collection sooner than later ("close as you go").
- Reduces overall surface emissions.
- Lowers the production of leachate by allowing incremental closures.
- Durable system construction designed to safely convey internal gas pressures, reduce unwanted releases and avoid slope stability issues.
- The ClosureTurf system requires no irrigation, fertilizing, seeding or mowing.
- Provides filtration resulting in clean storm water runoff.
- Reduces environmental carbon footprint by up to 75% during construction.

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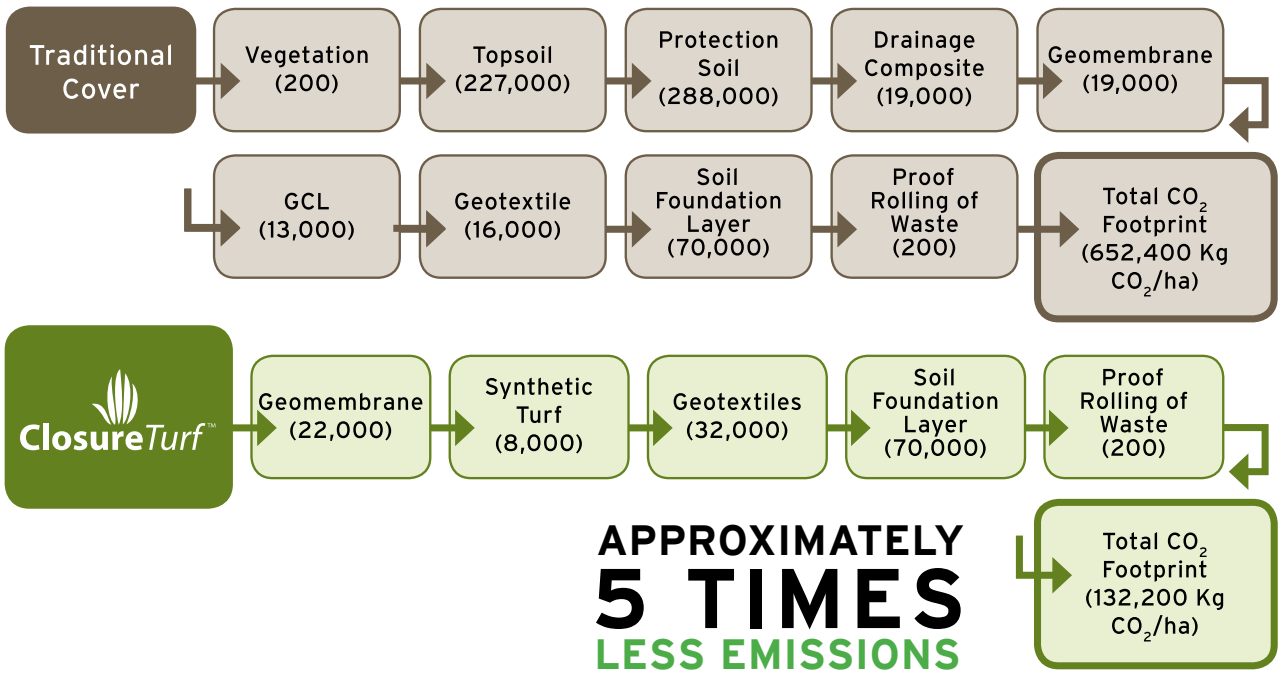
Runoff from a typical 1" rainfall (same site); ClosureTurf (left); traditional soil cover (right)

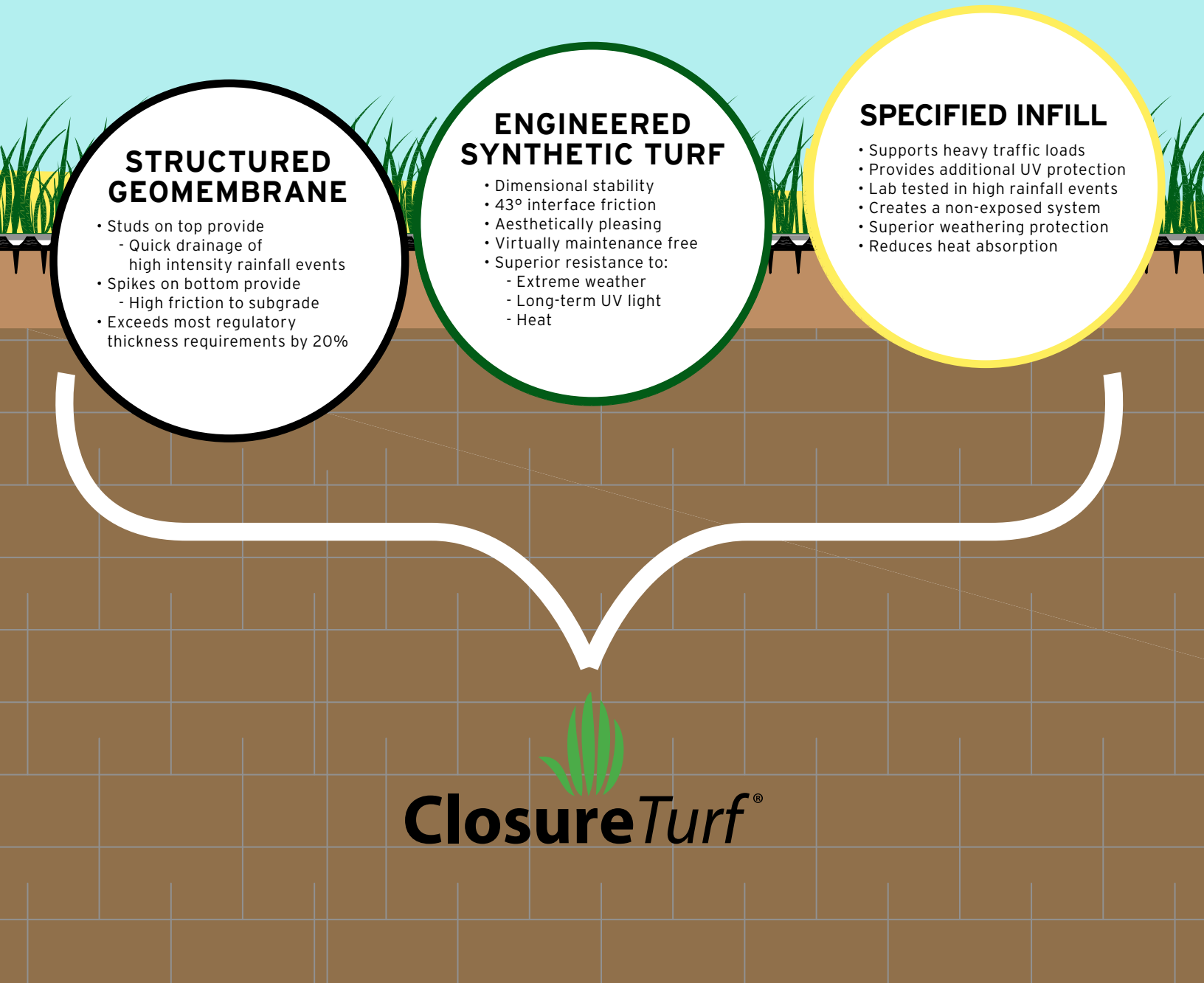
CO_2 Footprint: Traditional vs. ClosureTurf®



APPROXIMATELY 5 TIMES LESS EMISSIONS

Take a closer look at ClosureTurf®

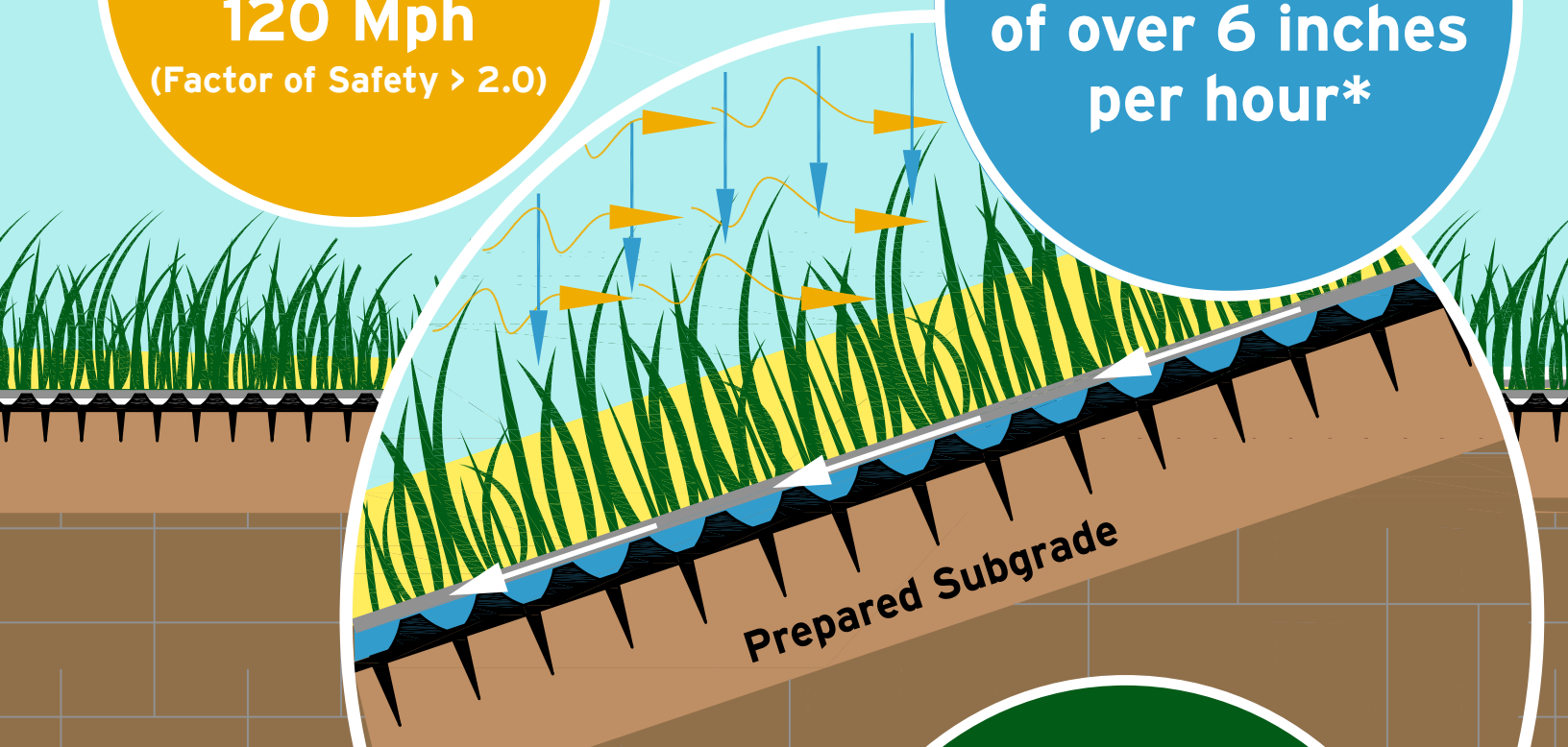
ClosureTurf is a patented, three component system comprised of a structured geomembrane, an engineered synthetic turf, and a specialized infill. The foundation of the system is an impermeable, highly transmissive structured geomembrane. It provides for the highest interface friction values available in the market. The engineered synthetic turf component gives the system its natural look and feel of grass while protecting the geomembrane from extreme weather conditions for the long term. The specialized infill component is placed between the blades of the engineered turf and allows the system to be trafficked while also providing additional protection from weathering. When required, ClosureTurf's patented surficial gas system is included with the system to vent landfill gas emissions. ClosureTurf is fast and easy to install for an aesthetically pleasing, cost-effective landfill closure solution.



ClosureTurf®

GTRI Wind Tunnel Tested Up To 120 Mph
(Factor of Safety > 2.0)

Tested at Storm Intensities of over 6 inches per hour*



ClosureTurf is specifically designed for long-term slope stability in the wake of severe weather events such as intense rainfall, hurricane force winds and earthquakes.

Waste

* Most significant rainfall event to date is 22 inches over 24 hours with no damage to the ClosureTurf system.

More engineered solutions...

CLOSURETURF® SURFICIAL GAS COLLECTION SYSTEM

ClosureTurf's patented surficial gas collection system reduces, and in some cases, eliminates the need for traditional gas wells and piping. It can function as a standalone system or in conjunction with a traditional system. Underneath the ClosureTurf system, gas is generated and rises to the surface where a vacuum created by the differential pressures is vented through the surficial gas collection foot. This method provides an efficient method of gas collection while reducing the amount of condensate that needs to be managed.

The unique design of the ClosureTurf Surficial Gas Collection System resulted in one landfill winning an International Achievement Award for a combined gas collection and closure system and the Solid Waste Association of North America (SWANA) Gold Excellence Award for landfill gas collection in 2012.

VERSACAP®

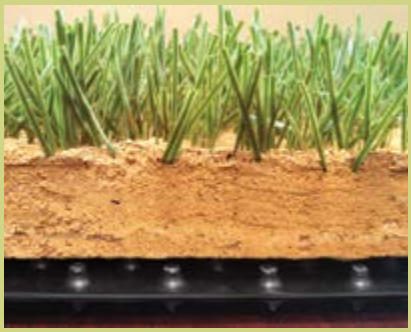
VersaCap is a low-cost, intermediate landfill cover solution designed to help prevent erosion, infiltration, runoff and gas emissions during the operational phases of the landfill.

Fast and easy to install, VersaCap is a wind-resistant membrane comprised of a synthetic turf and specially-formulated polymer backing that improves the quality of surface water runoff and eliminates downstream siltation by preventing erosion of the cover soils. VersaCap does not require tires or sandbags to keep it in place and can easily be taken up and reused in future areas.

HYDROTURF®

HydroTurf is an economical, environmentally-friendly alternative revetment to rock riprap and piped channels. It is a patented three component system made up of a structured geomembrane, an engineered synthetic turf and a specialized pozzolanic infill (HydroBinder™). Created specifically for bench drains, downchutes and perimeter channels on landfill covers, HydroTurf will flex and move with typical differential settlements that occur on landfill covers. It provides superior hydraulic performance capable of handling high sheer stress and large flows resulting in very high velocities.

Delivering the same advantages as ClosureTurf, HydroTurf offers rapid, low impact installation that's significantly less costly than hard armor and piping, and is projected to last more than 100 years when properly maintained. Best of all, unlike hard armor riprap channels, HydroTurf improves the environment by producing cleaner storm water runoff.




ClosureTurf®


VersaCap®


HydroTurf®

Solar Development

SolarTurf® is a proprietary, zero-impact system that combines ClosureTurf® technology with solar energy, turning an environmental liability into an environmental asset. ClosureTurf's unique cover system enables solar panels to operate in a clean environment free of dust, grass clippings and potential damage from lawn mowing equipment for the highest possible efficiency.

Why Siting Solar on Landfills is Superior to Other Sites, Including Greenfields:

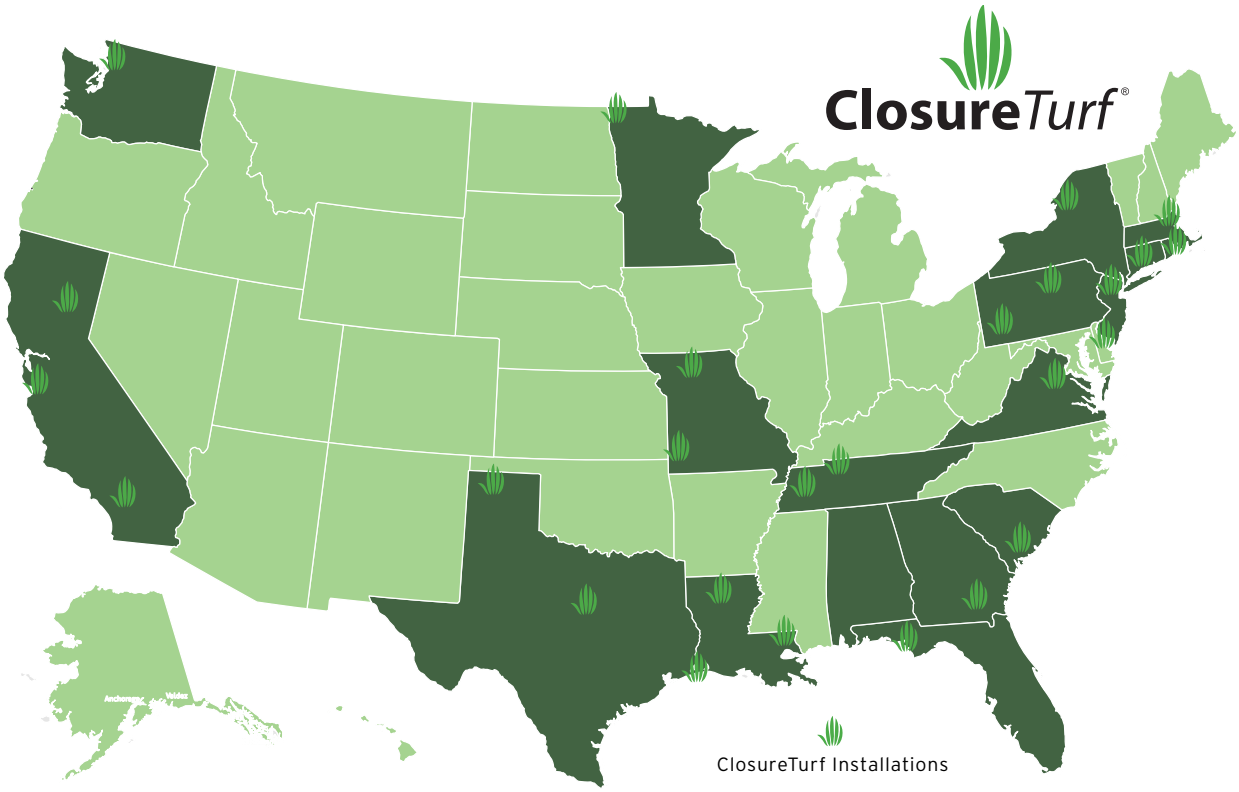
› Productive use—financially and environmentally—of wasted land resource
› Receives superior financial incentives in some jurisdictions
› Prevents clear-cutting and grading of forests and greenfields
› Makes use of existing access roads, storm water management, and security perimeters
› Hidden from public view

Why ClosureTurf is More Well-Suited to Host Solar than even Traditional Landfills:

› Zero vegetative maintenance and soiling from clippings and dust—increases durability and efficiency, reduces risk of damage
› Provides superior access and support for maintenance equipment
› Significantly less site prep required
› Significantly reduced risk of washout

Over 25 million square feet installed and closing...

ClosureTurf® exceeds requirements of EPA Subtitle D and has been approved and installed in many states



AFFILIATIONS:

Geosynthetic Institute (Partner)

Georgia Tech Research Institute (Partner)

Industrial Fabrics Association International (Member)

Colorado State University - Engineering Research Center (Partner)

CLOSURETURF IS TESTED IN ACCORDANCE WITH:

GTRI-SSWT - Aerodynamic Shear & Uplift
CSU USACE - Hydaullic Shear - Levee Overtop Simulation
ASTM D5261 - Mass per Unit Area
ASTM D4632 - Grab Tensile Properties
ASTM D4595 - Wide - Tensile
ASTM D2256 - Tensile and Elongation
ASTM D4716 - Hydraulic Trasmissivity
ASTM D5321 - Interface Shear
ASTM D6460 - Large Scale Channel Hydraulics
ASTM D6241 - CBR Puncture
ASTM D6459 - InFill Stability
ASTM D4884 - Seam Strength
G147(02) & G145/G7 - UV Resistance & Stability
UL94 Modifiers - Flammability

For more information on ClosureTurf, visit watershedgeo.com, email us at info@watershedgeo.com or call 770-777-0386. ALL CLOSURETURF COMPONENTS ARE PROUDLY MADE IN THE USA.

ClosureTurf®

WG WatershedGeo® Unearthing Solutions

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