

Exposed Geomembrane Cover Systems

Wind Defender

Outline

- ▶ Dura Skrim - Elliot Pugh
- ▶ Wind Defender - Elliot Pugh
- ▶ Installation Techniques - Ryan Kamp
- ▶ Case Study - Hoover Mason Recycling - Sam Kelly

Presentation Overview

- ▶ Introduce Wind Defender, LLC
 - ▶ Focus of Business
 - ▶ Background of Product
- ▶ Benefits of Exposed Geomembrane Cover Systems
 - ▶ Temporary Caps
 - ▶ Rain Covers
- ▶ Types of Geomembranes Used in Exposed Applications
 - ▶ Raven Industries - Dura Skrim
 - ▶ Compare and Contrast Membranes
- ▶ Wind Defender Ballast System
 - ▶ Comparison to Traditional Ballast Systems
 - ▶ How it Works, Benefits

Wind Defender

- ▶ Privately held Limited Liability Corporation
- ▶ Incorporated February 2014 in Maryland
- ▶ Wind Defender, LLC is the sole provider of Wind Defender for the United States
- ▶ Focus of business is selling geosynthetics to the solid waste, power, construction and agriculture industries



Product History

- ▶ Borne out of European market
- ▶ Agricultural Stockpile Covers
- ▶ 11 years as ballast system on landfills



Exposed Geomembrane Trends

Typical exposed membranes on landfills

Cell Rain Covers



Exposed Geomembrane Trends

Typical exposed membranes on landfills

Temporary/Interim Caps



Exposed Geomembrane Trends

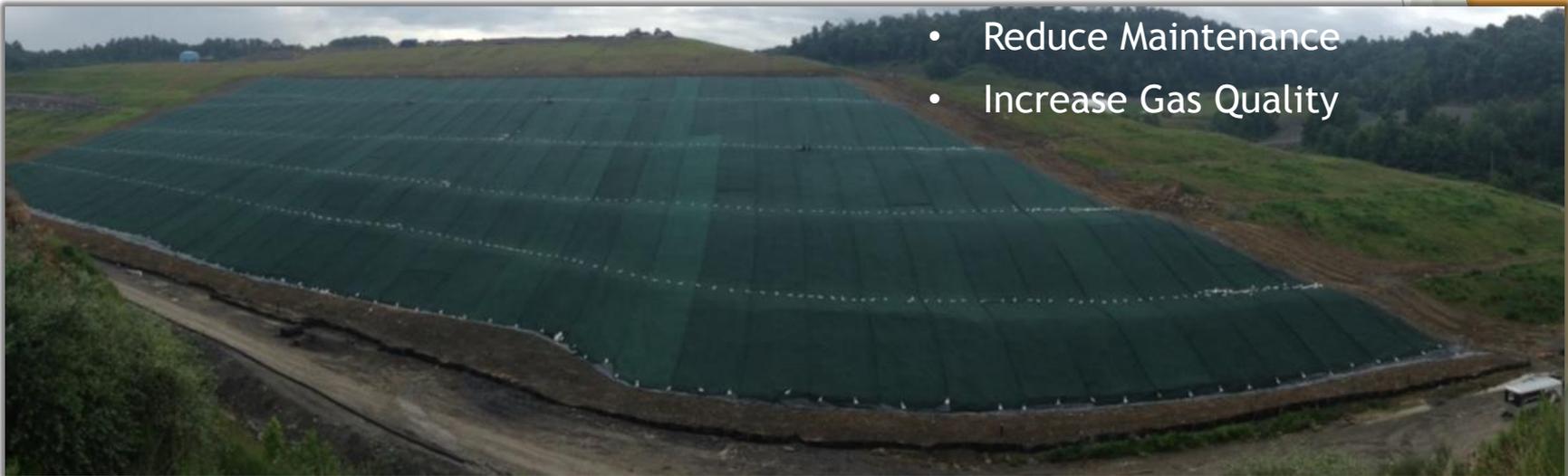
Key benefits of exposed membranes

Cell Rain Covers

- Reduce Leachate Generation
- Control Erosion

Temporary/Interim Caps

- Same Benefits of a Final Closure
 - Reduce Leachate Generation
 - Control Odors
 - Control Erosion
 - Reduce Maintenance
 - Increase Gas Quality



Typical Exposed Membrane Materials

Raven Industries

8, 12, 20, 24 mil Dura-Skrim

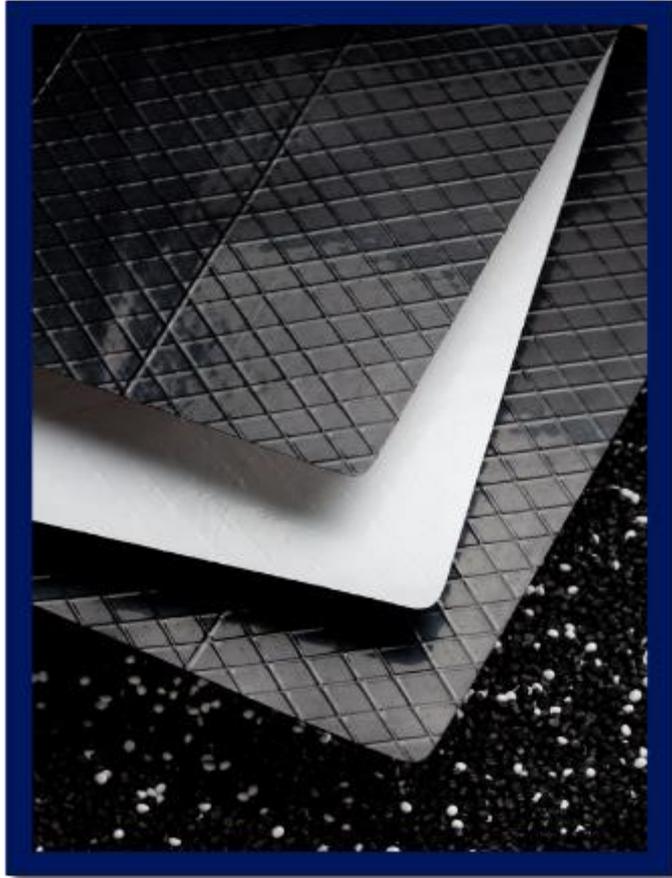


What is Dura-Skrim?

- Raven Industries
 - Dura-Skrim consists of two sheets of virgin polyethylene film joined together by a third layer of molten polyethylene. A heavy duty scrim applied between the plies increases the materials tear and puncture resistance and gives the material a longer service life.



Available in 6, 8, 12, 20, and 24 mil's Thick



Dura Skrim Material Comparison

<u>Type</u>	<u>Pros</u>	<u>Cons</u>
8 mil	Elongation, very flexible, skrim reinforced, cheaper cost material	heavy ballast system, sewn seamed, limited puncture and tear resistance, thin material
12 mil	Elongation, very flexible, skrim reinforced, cheaper cost material	heavy ballast system, sewn seamed, limited puncture and tear resistance, thin material
20 mil	Elongation, higher puncture and tear resistance, flexible, skrim reinforced, less ballast required	more expensive material, smaller panels
24 mil	Elongation, higher puncture and tear resistance, flexible, skrim reinforced, less ballast required	more expensive material, smaller panels

Dura Skrim Material Warranty

<u>Type</u>	<u>Standard Exposed Warranty</u>	<u>Exposed Warranty With Wind Defender Ballast</u>
8mil	5 years	7 years
12mil	5 years	7 years
20mil	5 years	10 years
24mil	10 years	15 years

Exposed Geomembrane Risk

Exposed liners (whether permanent or temporary) can be extremely susceptible to loadings generated by wind:



This damage can be costly to repair, disruptive to site operations, and potentially a hazard to health and safety of personnel and property.

Wind Loading

Wind loading is created from 2 main effects:

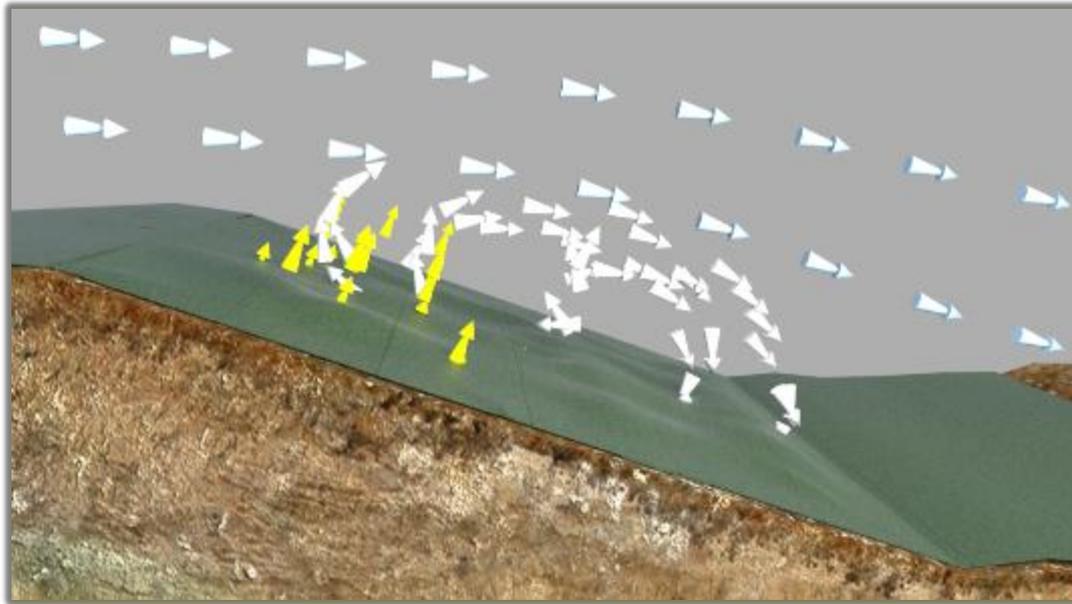
- Cross Wind
- Wind Uplift or Negative Pressure

Cross wind pushes air trapped under the liner until it creates a larger bubble. This bubble then acts as a sail catching more wind that creates a tensile force which can then rip/tear the liner.



Theory of Wind Uplift

Wind blowing over a land form where the geometry expands (such as a landfill), will generate a recirculation pattern, as shown below:



This causes the recirculating air to be ‘sucked’ back into the main flow at the top of the slope creating negative pressure (or uplift of the liner).

Theory of Wind Uplift

So what we need is something that can either withstand this uplift force or cancel it out. Traditional methods of anchoring liners withstand this force through a downward force to pin/hold down the liner. But this can be unpredictable, time consuming and expensive.



Traditional Methods of Anchoring Geomembrane Liners



Sandbags & Rope



Tires



Soil Windrows



Ground Anchors

Wind Defender Ballast System



How It Works

- During a period of negative pressure - the air is drawn up from the surface of the liner causing it to want to lift.
- Wind Defender allows the air which is creating this negative pressure or uplift to be replaced by an equal and opposite downward force of air.
- Thus, effectively cancelling out the uplift force.



Wind Defender



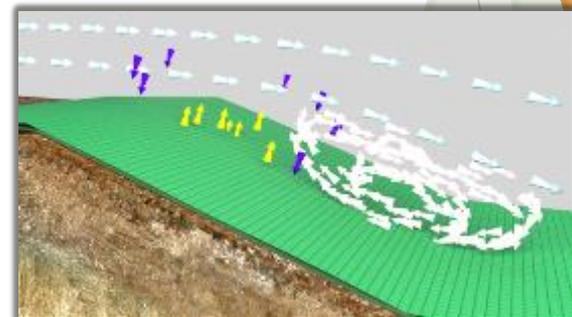
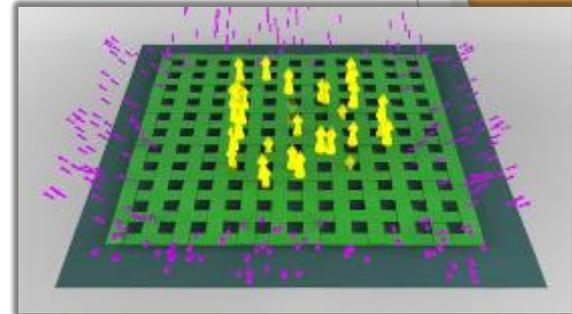
Geomembrane Liner



Upward Force/Air



Downward Force/Air



Wind Defender Ballast System

40mil Membrane with Windscreen Ballast System vs. Unballasted 40mil Membrane

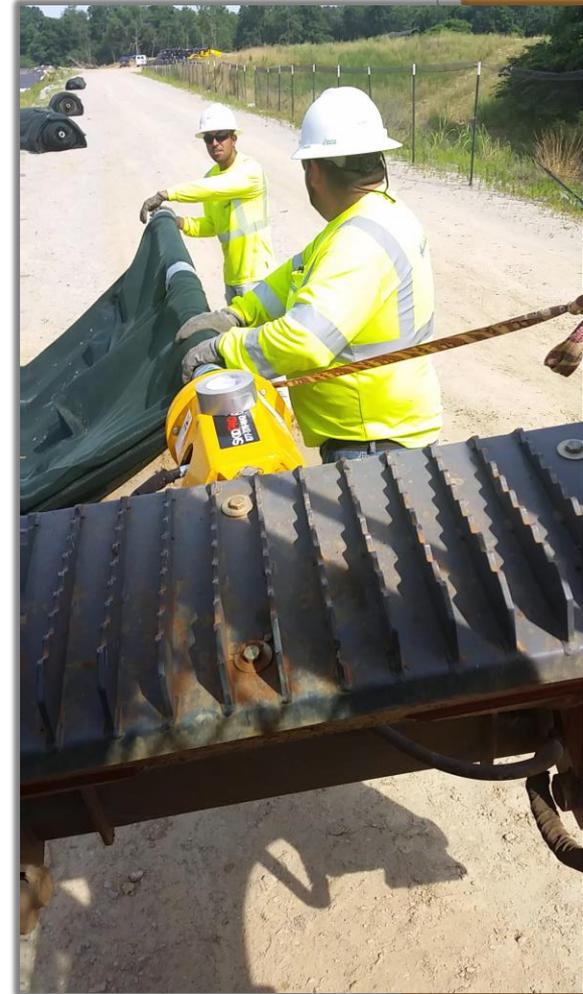


Wind Defender

- Features:
 - Material - Knitted UV Stabilized HDPE Geotextile
 - Roll size - 10ft long x 1.5ft diameter
 - Panel Size - 328ft long x 20ft wide
- Benefits:
 - Superior Performance
 - Fast Install
 - Low maintenance
 - Reusable
 - 60% UV blocking material
 - 10 year prorated material warranty
 - Aesthetics



Wind Defender Removal for Reuse



Wind Defender Projects

Bull Run - Clinton, TN
Client: TVA
Application: Rain Cover
Area: 392,000 SF



Wind Defender Projects

Curley Hollow Landfill - St. Paul, VA
Client: Dominion Virginia Power
Application: UV Protection
Area: 1,087,000 SF



Wind Defender Projects

Bethel Landfill - Hampton, VA
Client: Waste Management
Application: Temp. Cap
Area: 1,000,000 SF



Who is Chesapeake Containment Systems?

- Privately held Subchapter S Corporation
- Incorporated March 2007 in Maryland
- Headquartered in Middle River, MD
- Regional offices in Union City, TN and Mooresville, NC
- Currently employ over 150 office and field personnel

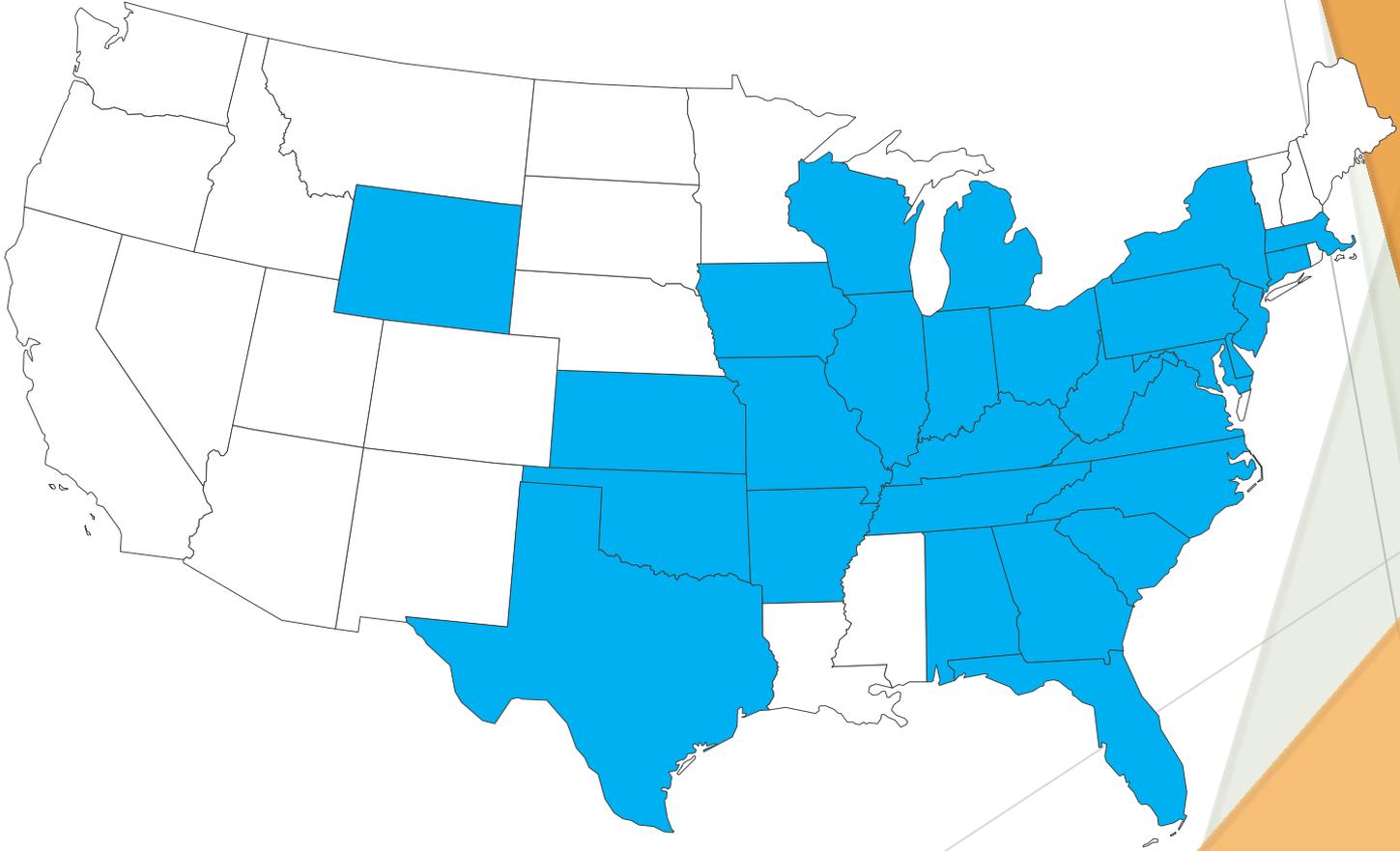




Specialties

- Supply and Installation of geosynthetics including:
Geomembranes, Geotextiles, Geocomposites, GCL's, Geogrids, and Rain Covers
- Supply and installation of HDPE LFG piping system
- Supply and installation of HDPE leachate collection systems

Where We Work





Markets Served

- Solid Waste
- Power Generation
- Water and Wastewater
- Renewable Energy
- Remediation
- Aqua Culture
- Oil and Gas

Why Wind Defender?

- #1 Safety, one roll of WD (6,560 SF, 315 lbs) is equivalent to 1 ton of sandbags (5' x 10' bag grid w/ 30 lb sandbags)
- #2 We HATE sandbags!!!!!!
- #3 Tired of rope and sandbag failures
- #4 Tired of seeing our customers paying to fix wind damage to exposed geomembrane covers
- #5 This is 2016, there has to be a better way

Cut tires filled with stale water, mosquitos and with exposed steel belting to shred your hands



42,000 Sandbags and 198,000 LF of rope



Wind Damage to exposed geomembrane cover



Snow damage to sandbag and rope lines



Installation of Wind Defender

- **Must** comply with all local, state, federal and site specific safety standards
- Deploy off of a piece of equipment capable of handling the weight of a roll of wind defender (315 lbs/roll)
- Use rigging that is OSHA approved and compatible with the deployment equipment you are using
- Unfold material so the center ridge is facing upward
- Manually set overlap (+/- 6”)



Seaming

- Seams are sewn together
- Prayer seams are most common but can be “j” seamed as well
- Union Special sewing machines are preferred
- 277 Bonded Polyester Thread



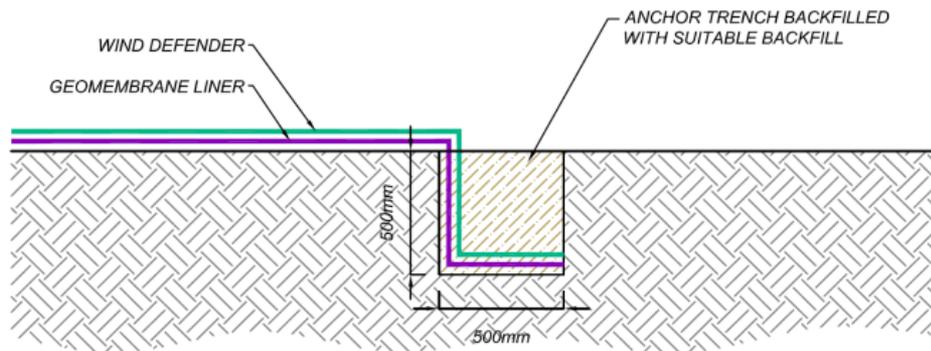
Tensioning

- After materials are deployed and seamed, the material needs to be hand tensioned to remove any slack



Perimeter Anchoring

- Anchor trench is the preferred method, minimum 2' x 2'



ANCHOR TRENCH FOR PERIMETER TRENCHING



Alternative Anchoring Methods

- For areas where you are terminating above geosynthetics or concrete you can use a sandbag line sewn into the material, heavy weight chain or water filled jersey barriers.
- For soil areas without geosynthetics below, you can use earth anchors



Post Installation Considerations

Issues

- Animal damage
- Gas build up and/or gas system shut down
- Settlement and slack in material



Solutions

- Animals- Inspect for animal damage and repair holes by sewing the material back together
- Gas- install strip drains underneath the system to draw gas
- Gas- install passive vents to reduce gas pressure build up
- Gas- install an weighted valve to release under a predetermined pressure
- Settlement/Slack- Inspect system and re-tension the material as necessary, after re-tensioning sew the material to itself or cut out excess material and re-sew



Wind Defender Case Study:

Hoover Mason Recycling

Mt. Pleasant, TN

Outline

- History of Hoover Mason Recycling
- Project Initiation
- Site Considerations
- Prepping of Areas
- Installation of Tarp and Wind Defender
- Post Installation
- Benefits attained

Hoover Mason Recycling Facts:

- ▶ Located within the city limits of Mt. Pleasant
- ▶ Formed in 2010
- ▶ Owned by Tennessee Aluminum Processors and Smelter Service Corporation
- ▶ Class II Landfill
- ▶ Only accepts aluminum waste from the two plants located in Mt. Pleasant
- ▶ Began Accepting Waste in 2012

Mt. Pleasant



10/2013

1988

2016

Bowling Green

Clarksville

Nashville

Murfreesboro

Knoxville

Mt Pleasant

Jackson

Tennessee

Chattanooga

Decatur Huntsville
Image USDA Farm Service Agency

Google earth

35°53'08.92" N 86°21'15.04" W elev 763 ft eye alt 312.19 mi

Mt. Pleasant, TN



Hoover Mason Recycling - 2010



Hoover Mason Recycling - 2013



Project Initiation

- Erosion Control
 - Phosphate Wash Pond Clay

Hoover Mason Recycling - 2013



Project Initiation

- Erosion Control
 - Phosphate Wash Pond Clay
 - Soil Analysis

Project Initiation

- Erosion Control
 - Phosphate Wash Pond Clay
 - Soil Analysis
 - Different Grasses

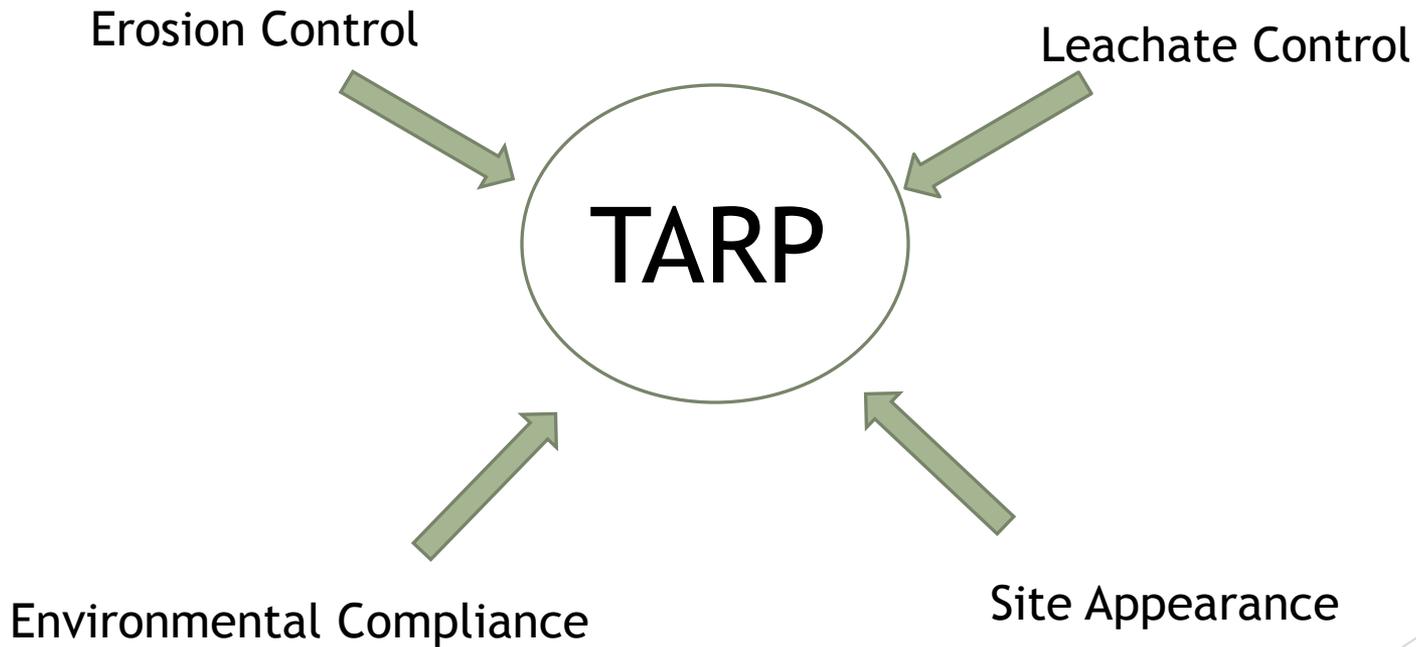
Seed Plots



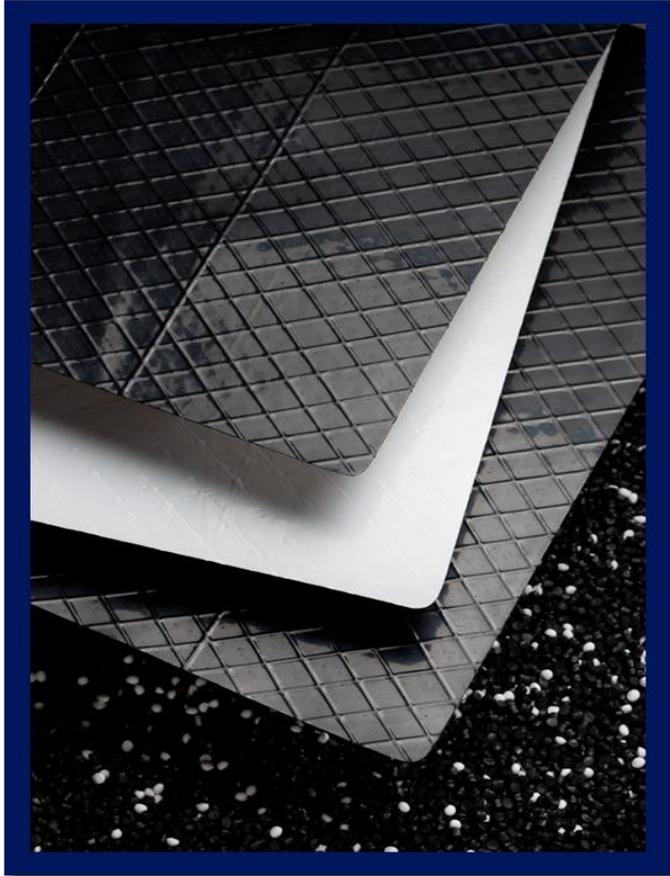
Project Initiation

- Erosion Control
 - Phosphate Wash Pond Clay
 - Soil Analysis
 - Different Grasses
 - Straw Mats w/seeding
 - Mulch
 - Tarp
- Leachate Control
- Site Appearance
- Permit Compliance

Decision Making Process



Types of Dura-Skrim Tarps 8, 12, 20, and 24 mil's Thick



Ballast Systems

Sandbags



WindDefender



Project Implementation

- Site Preparation
- Receiving of Materials
- Staging Areas
- Mobilization
- Installation
- Demobilization
- Post Mobilization

Hoover Mason Recycling



Untitled Map
Write a description for your map.

Legend
M Pleasant, TN



Benefits

- Significantly reduced erosion
- Reduced Leachate
- Enhanced the visual appearance of the site
- Maintained environmental compliance











