

# New Approaches to Site Access

May 8, 2014

# Discussion Topics

- Site work Challenges
- Alternative Technology
- Details of Working Surface Solutions
- Installation/Case Histories
- Experience From the Field
- Questions and Answers



# Site Challenges





# Site Challenges



# Alternative Technology



# Alternative Technology





# Alternative Technology



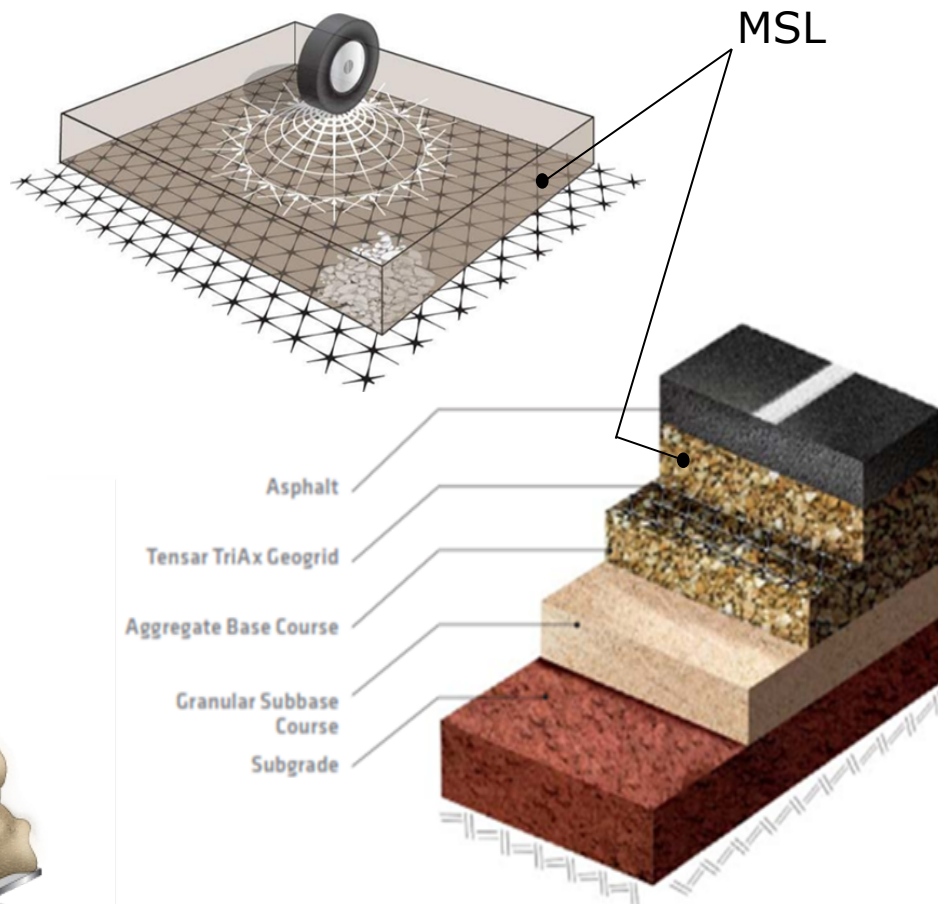
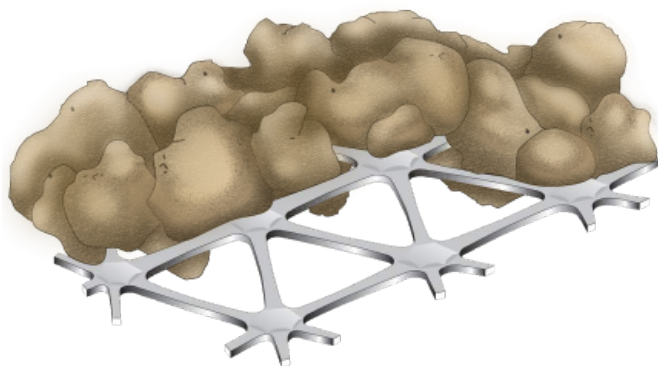
# Details of Working Surface Solutions

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## Mechanically Stabilized Layers (MSLs):

- Enhance resilient modulus (the stiffness of the aggregate layer)
- Provide uniform support
- Control long-term permanent deformation
- Use geogrid to introduce the mechanism of lateral restraint

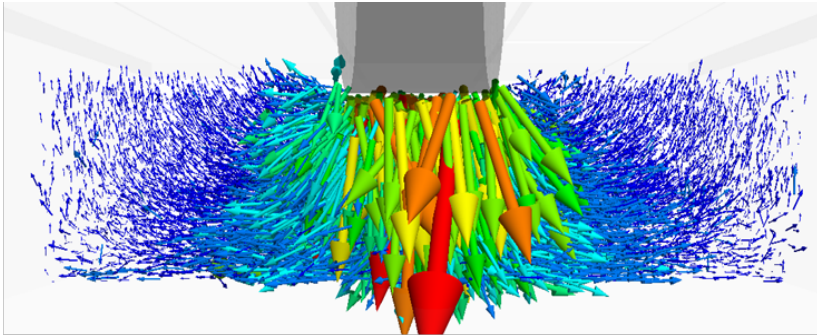
Note: Tensar TriAxial Geogrids lock in the aggregate during repeated loading cycles. The resulting confined aggregate provides more stiffness for the road base layer or working surface.



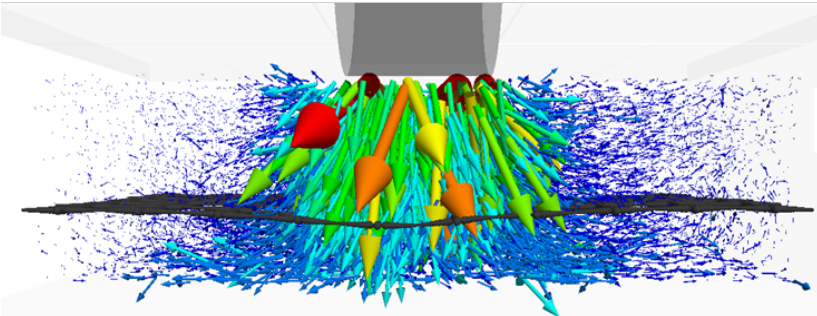


# Details of Working Surfaces

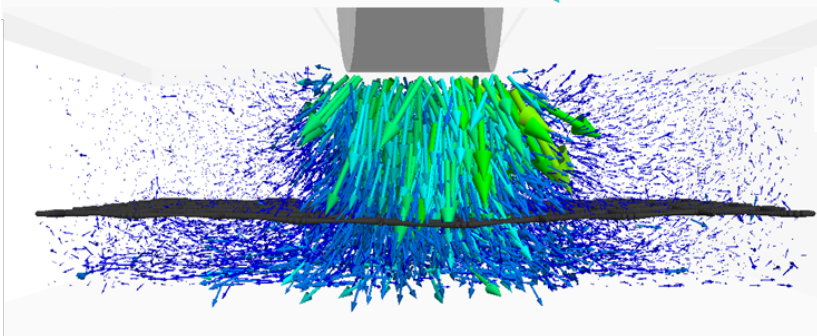
## Research - Finite Element Modeling



No grid



**BX geogrid**



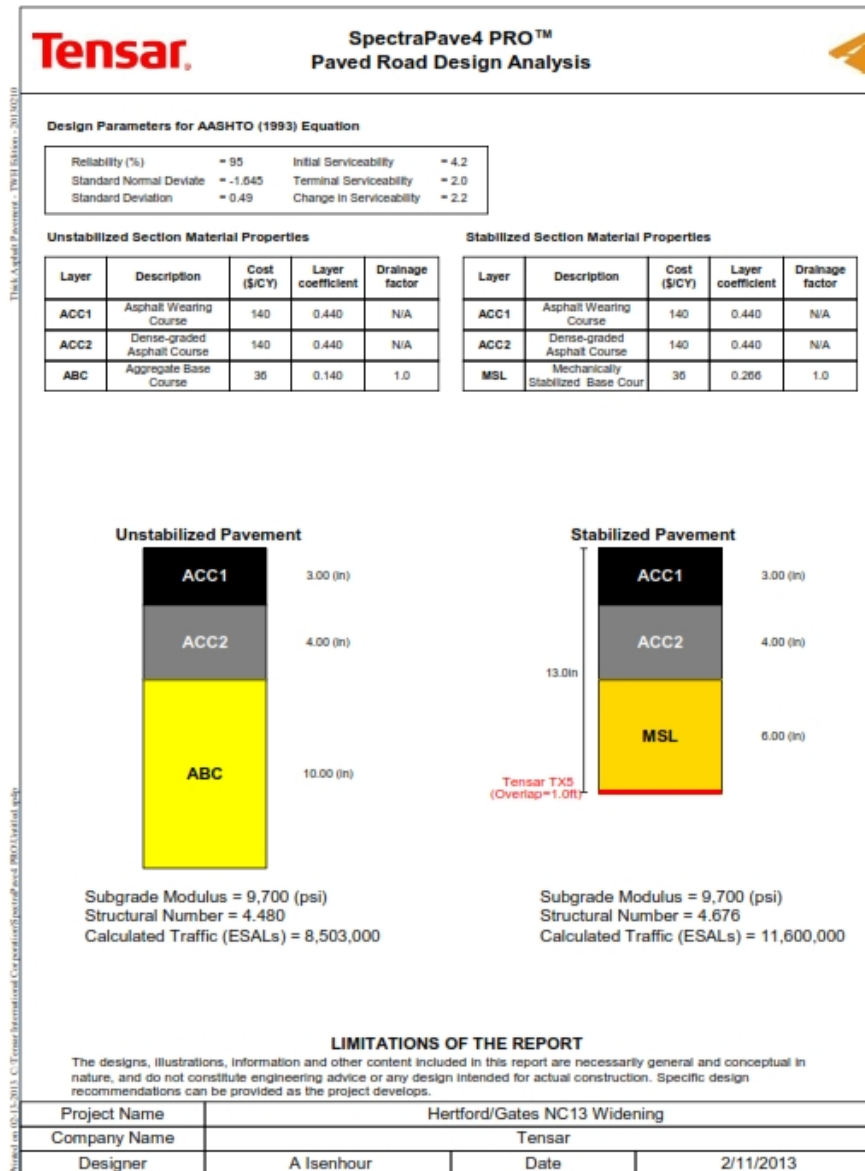
**TX geogrid**





# Details of Working Surface Solutions

## Design Output – SpectraPave4 PRO™



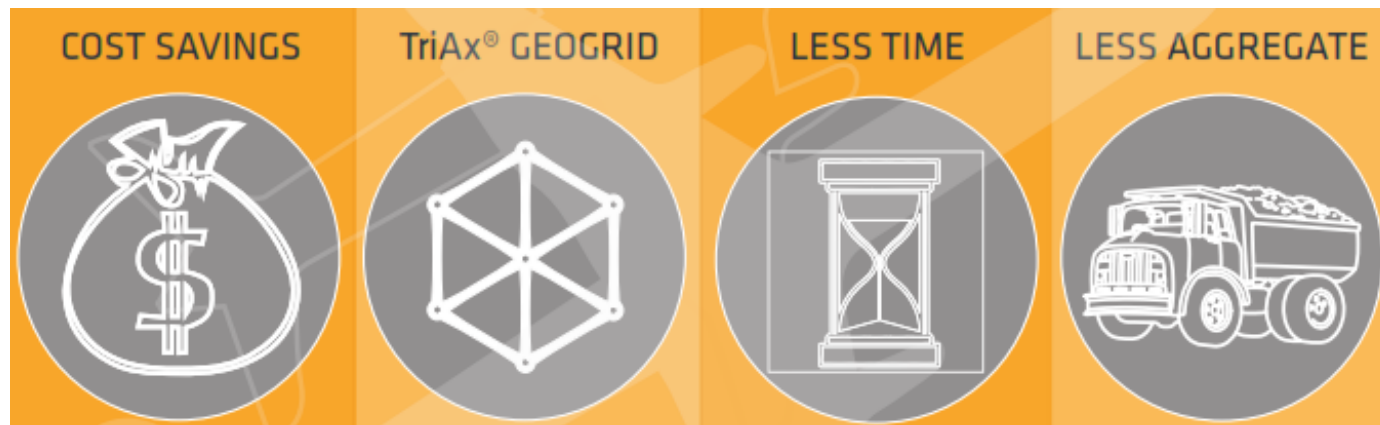
**Tensor**®



2. Further Geogrid details may be obtained from Derek Wiatrek of Tensar International Corporation at 512-757-6239.

# Working Surface Solutions Benefits

- **Cost Savings:** Materials (short-term), maintenance (long-term)
- **Increased Sustainability:** Long-term durability (challenging site conditions, aggressive loading conditions, water trucks, etc.) – multiple work overs (secondary and tertiary)
- **Less Time:** Reduced installation time and minimized maintenance of working surfaces (work overs)
- **Less Aggregate:** Environmental stewardship
- **Reduced Risk**



# Installation/Case Histories



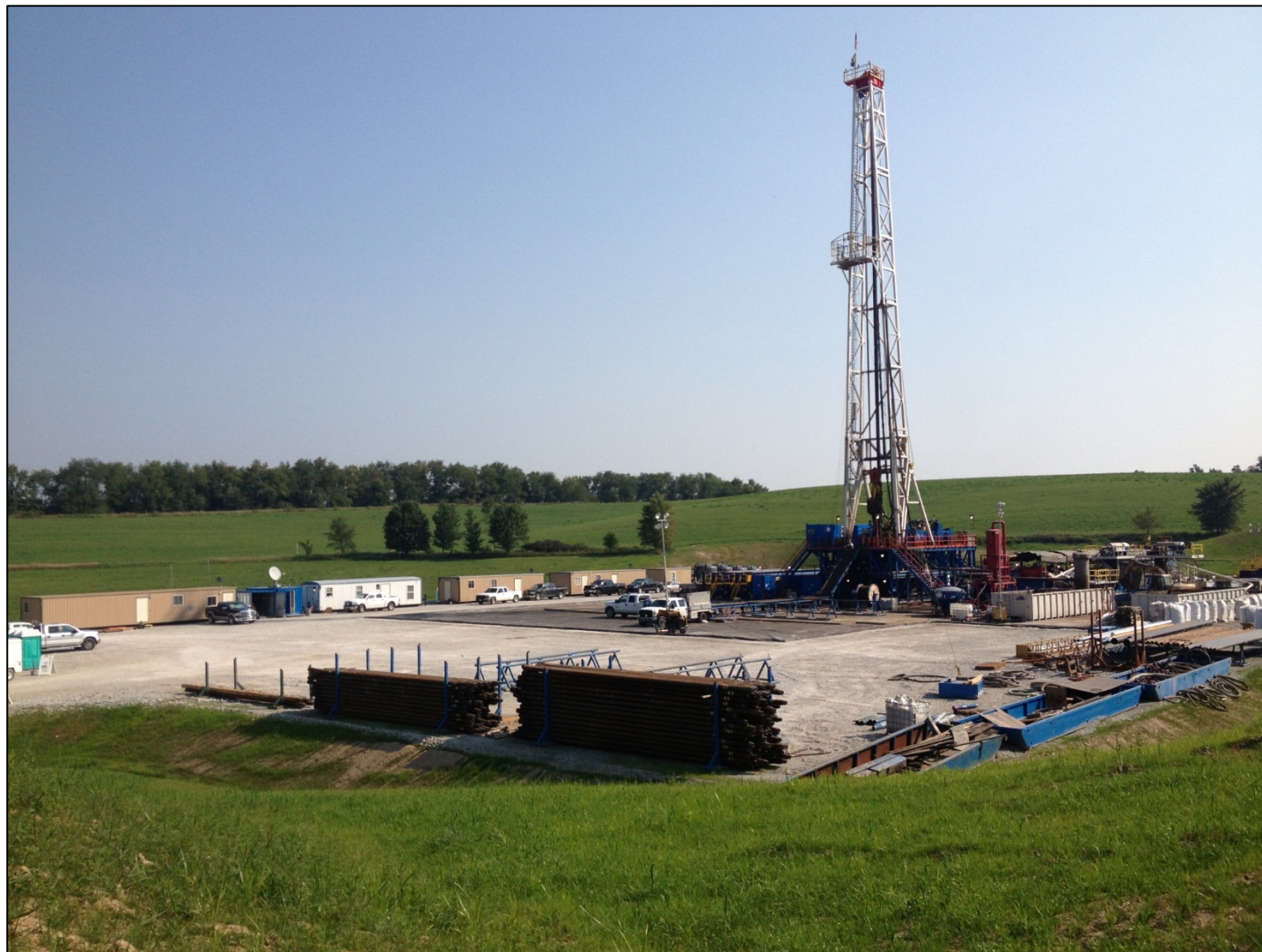
# Details of Working Surface Solutions Installation Sequence





# Case History - Upstream

## Rex Energy, Ocel Well Pad, Carrollton, OH











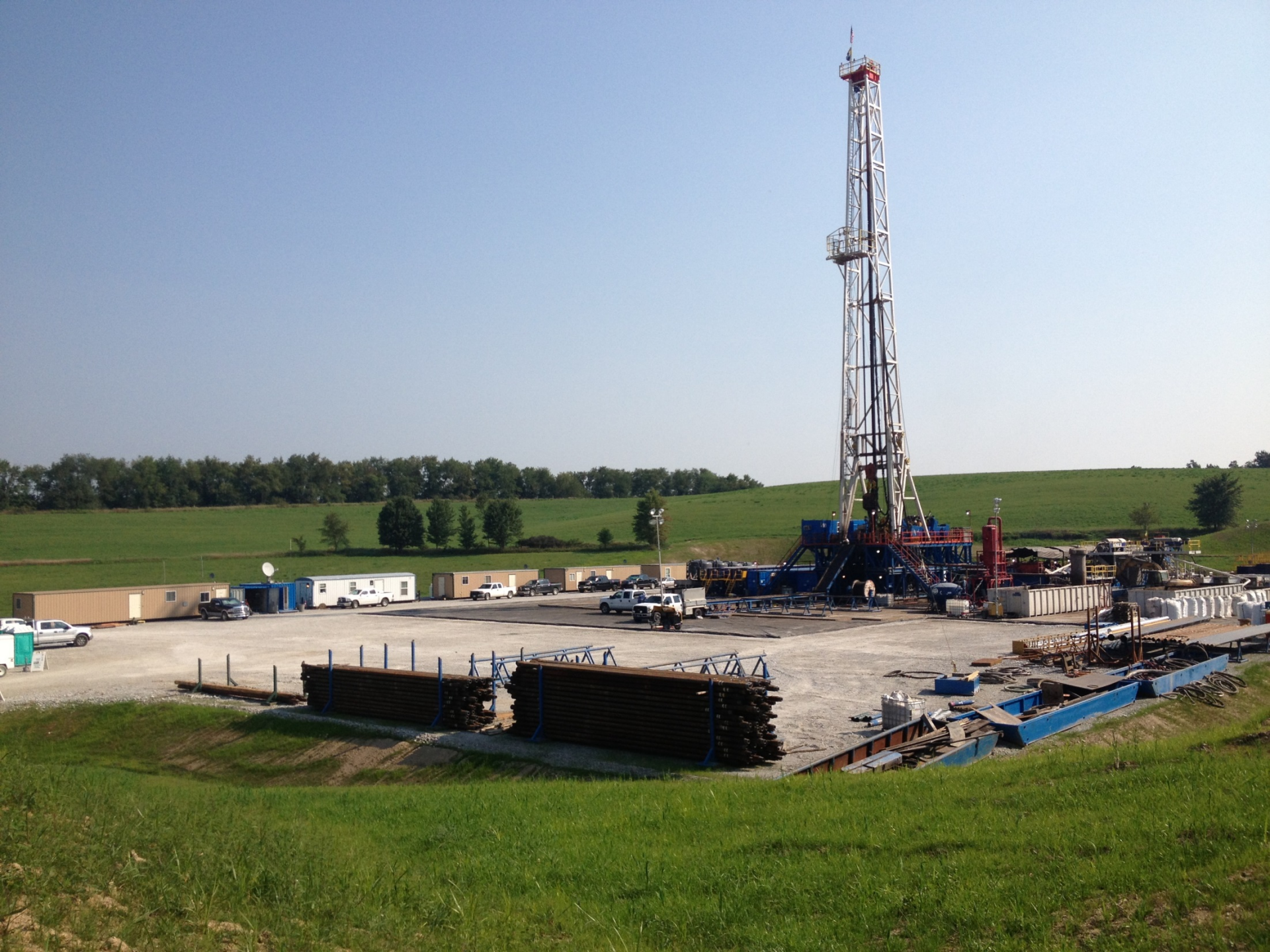














# Private Pipe Plant – Greater Houston Area

## Project Details:

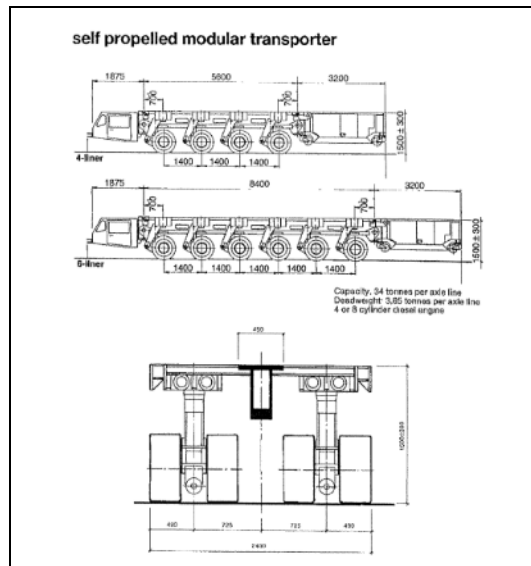
- 553,000 SY on phase 1
- 300,000 SY addition currently underway
- Additional adjacent site slated for early 2015
- Aggregate Savings in the 50 acre storage yard alone are 8" or 55,555 CY or 99,998 tons
- Aggregate Cost (delivered to the project site) = \$25/ton
- Geogrid Cost delivered to site = \$1.90/sy
- Total savings = \$2.025M

[REDACTED] Yard Design – REV01								
<b>Roadway Design Input Parameters</b> <ul style="list-style-type: none"> <li>▪ Traffic <ul style="list-style-type: none"> <li>- Hyster 700 Forklift</li> <li>- Axle loading laden w/ standard option configuration: 150,000-lb (Front Axle)</li> </ul> </li> <li>▪ Design subgrade CBR: 5.0%</li> </ul>								
<b>Roadway Design Method</b> <p>Tensor International Corporation (TIC) elected to use the Pavement-Transportation Computer Assisted Structural Engineering (PCASE) software and its design models to determine the performance of the various roadway sections. PCASE design software was developed by the U.S. Army Corps of Engineers and is used to determine the required thickness of flexible roadways.</p> <p>Full scale research has provided guidance, basic criteria and information for the use of geogrids in roadway design. Subgrade bearing capacity factors of the unstabilized and stabilized sections were determined using empirical data from full scale testing performed by the Engineering Research and Development Center (ERDC). The calculated bearing capacity factor of the geogrid stabilized section was more than double that of the unstabilized section. TIC has modeled the influence of Mechanically Stabilized Layer on pavement performance through the use of enhanced subgrade supports.</p>								
<b>Roadway Design Summary</b> <table border="1"> <thead> <tr> <th>Pavement Layer</th> <th>Option 1</th> <th>Option 2</th> </tr> </thead> <tbody> <tr> <td>TxDOT Item 247, Type A (Min. CBR 80%)</td> <td>16.0-in. and TX160 Geogrid</td> <td>18.0-in. and TX5 Geogrid</td> </tr> </tbody> </table>			Pavement Layer	Option 1	Option 2	TxDOT Item 247, Type A (Min. CBR 80%)	16.0-in. and TX160 Geogrid	18.0-in. and TX5 Geogrid
Pavement Layer	Option 1	Option 2						
TxDOT Item 247, Type A (Min. CBR 80%)	16.0-in. and TX160 Geogrid	18.0-in. and TX5 Geogrid						
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. The designs, illustrations, information and other content included in this Chart are necessarily general and conceptual in nature, and do not constitute engineering advice or any design intended for actual construction.</li> <li>2. Installation of Tensor Geogrid shall follow manufacturer's installation guide.</li> <li>3. Any areas where rutting is experienced should be filled with compacted aggregate and thickened (not just bladed out).</li> <li>4. Further Geogrid details may be obtained from <b>Derek Wiatrek</b> of Tensor International Corporation at <b>512-757-6239</b>.</li> <li>5. Any substitution of the specified geogrid products will invalidate this design.</li> </ol>								






# Local Project – Mont Belvieu



## Expansion Facility

### Roadway Design Input Parameters

- Traffic
  - Construction Road (3,000 vehicle pass)
    - o HS-20
    - o Front Axle: 8kip, Middle and Rear Axle: 32kips
  - Heavy Haul Road (20,000 vehicle pass)
    - o Self-propelled modular transporter
    - o Number of Line: 6 lines
    - o Axle Load: 34 Metric Ton capacity + 3.85 MT dead weight
- Design subgrade CBR:
  - Roads for construction vehicle: CBR = 2.4%
  - Heavy Haul Road: CBR = 2.4% and 6.0%



### Roadway Design Method

Tensar International Corporation (TIC) elected to use the Pavement-Transportation Computer Assisted Structural Engineering (PCASE) software and its design models to determine the performance of the various roadway sections. PCASE design software was developed by the U.S. Army Corps of Engineers and is used to determine the required thickness of flexible roadways.

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### Roadway Design Summary

Pavement Layer	Design Thickness (in)					
	Construction Road (HS 20)		Heavy Haul (Transporter) Subgrade CBR 2.4%		Heavy Haul (Transporter) Subgrade CBR 6.0%	
	Unstabilized Section	Stabilized Section	Unstabilized Section	Stabilized Section	Unstabilized Section	Stabilized Section
<b>Base (CBR 80%)</b>	16	10	36	17.5	18	11
<b>Geogrid *</b>	None	TENSAR TX160	None	TENSAR TX160	None	TENSAR TX160

\* Geogrid should be installed at the interface between base and subgrade

**Notes:**

1. Installation of Tensar Geogrid shall follow manufacturer's installation guide.
2. Further Geogrid details may be obtained from Derek Wiatrek of Tensar International Corporation at 512-757-6239.

## Local Project – Mont Belvieu

