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Changing your Disposal Model: Utilization of E & P-Generated Recycled Solids

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DeepRiver
GROUP

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What is Recycling

A methodology for converting oil and gas solid waste streams into a specified material using a defined and permitted manufacturing process

What Can Be Recycled

Solids & Liquids



How Do You Get There

The Texas Roadmap

The Regulatory Pathway

Complying with Rules

Texas Administrative Code, TITLE 16 (Economic Regulation),
PART 1 (Railroad Commission of Texas), CHAPTER 4
(Environmental Protection), SUBCHAPTER B
(Commercial Recycling) in December 2006

The Regulatory Pathway

Compliance Requirements for Cold-Mix Recycled Materials

- Meet the Parameters
 - EPA: E&P Waste ruled Non- Hazardous
- Meet the Definitions
 - TxDot Special Specification 3157
 - TxDot DMS-11000 Specification
 - Salts, Metal and Oils
- Monitor, Evaluate, Quantify

Change Your Model

Recycle:
Retask - Reuse

Resource Treatment Options

Disposal

- Confines Contaminants
- Future Liability for Residuals
- Disposal:
 - No value
 - Landfills
 - Pits
 - Land Farms
 - Incineration

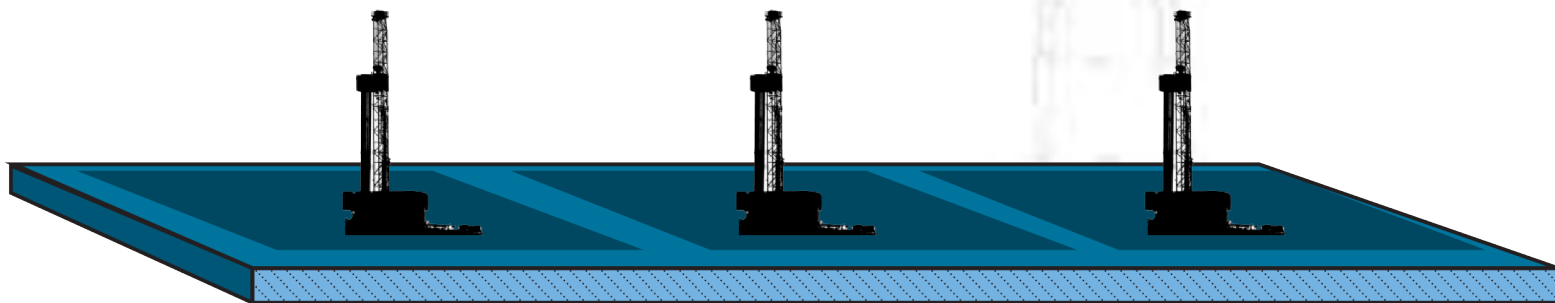
Recycling

- Manufacturing Process
 - New Product
 - Elimination of Liability
 - Waste Becomes:
 - Key feedstock resource
 - Useful commodity
 - Economic value
 - Environmentally safe

Benefits

- Transforms waste stream into manufactured cost-saving resources
- Creates structurally superior and environmentally-sound materials
- Severs contingent liability for oilfield waste
 - Removes cradle-to-grave environmental concerns

Changing the Model to Match the New Reality



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Rapid Industry Transformation

Transition to multi-borehole pad drilling for asset development

- Larger
- Used longer
- Includes walking or skidding rigs
- Supports multiple concurrent operations

Developing All Drilling Operation Resources

Turn Waste into Resources

Drilling solids and micro-fine solids:

- The backbone for superior structural load-bearing material
- Dramatically reduces construction material and replacement drilling fluid requirements

Understanding Your Resource Potential

Case Study

Eagle Ford Shale Trend Operator:

- Transportation Cost Reduction
- Material Use Reduction
- Construction Time Reduction
- Product Replacement Reduction
- Improved Safety
- Long Term Stability
- Responsible Environmental Stewardship

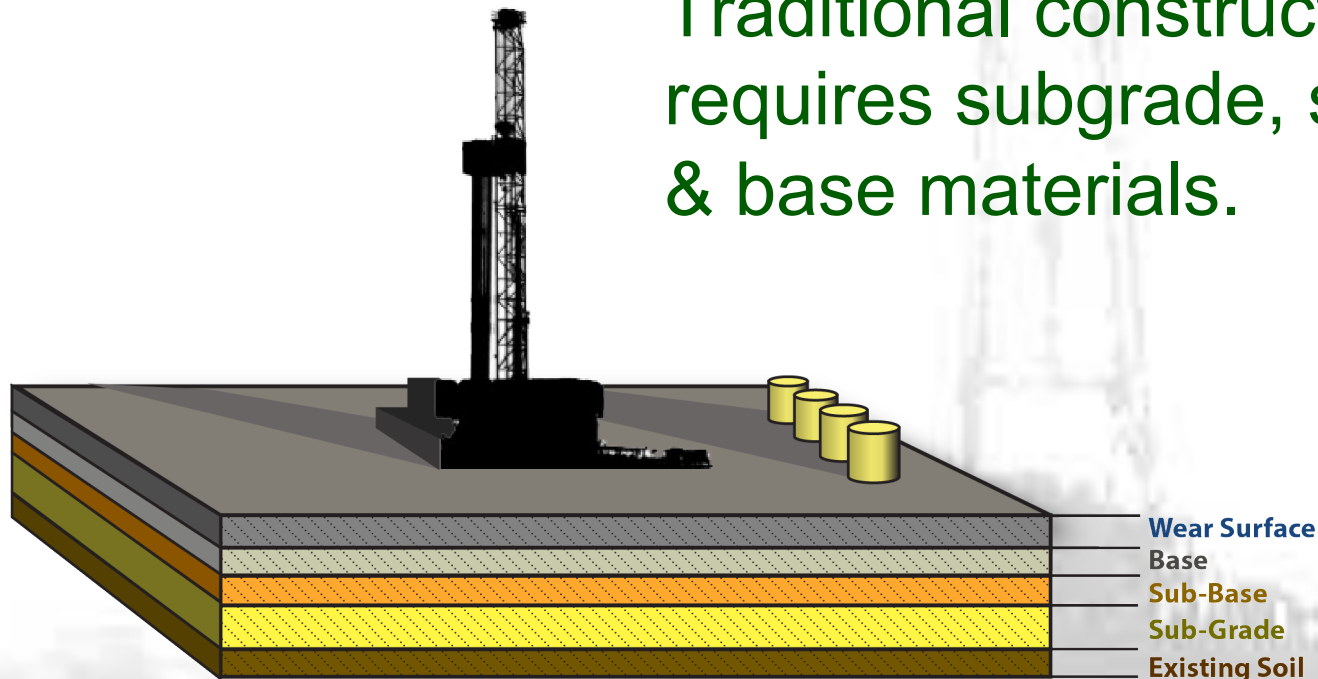
Recycle and Reuse Drilling Waste

- Standard 4-borehole pad:
 - ~ 1,800 Y³ of solids
 - ~ 800 barrels of spent OBM generated
- Recycling process converts 1,800 Y³ of waste into approximately 3,600 Y³ of load-bearing manufactured base
- With drilling pad dimension of ~200,000 ft², recycled base material can contribute ~ 60% of required fill material ($3,600/5,000 \text{ Y}^3 = 60\%$)

Waste recycled from one pad will generate the construction material for the next pad

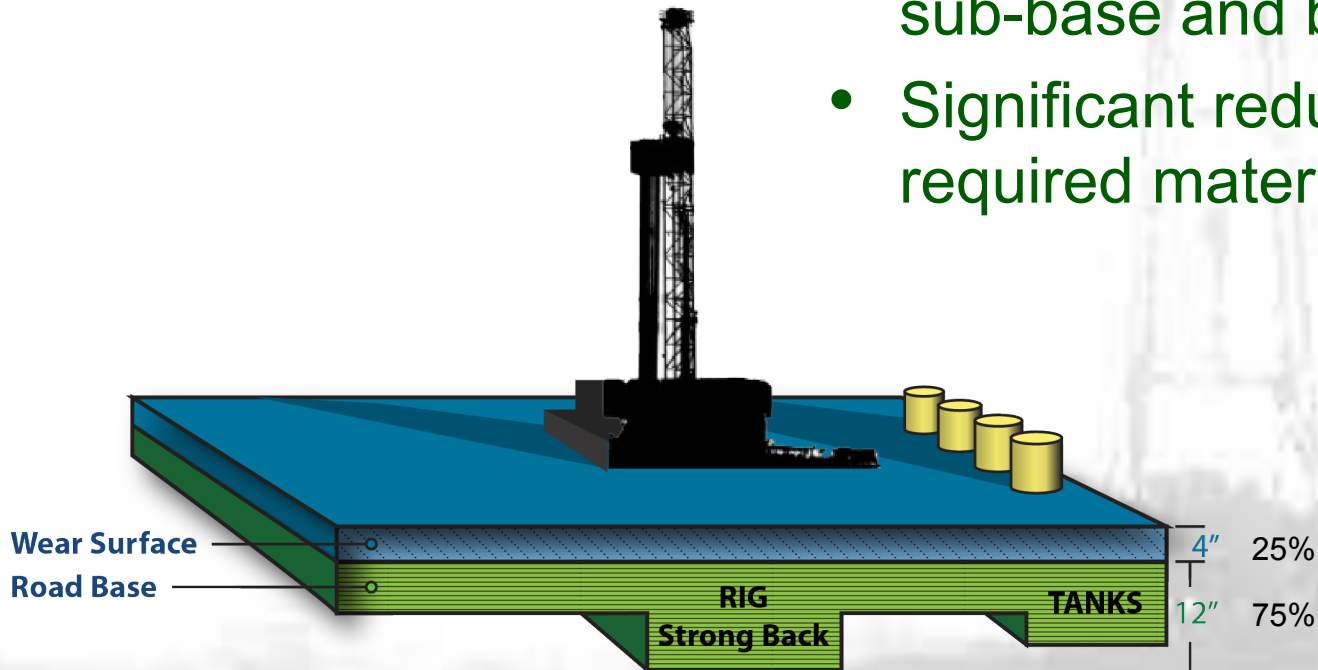
Understanding Your Resource Potential

Traditional construction requires subgrade, sub-base & base materials.



Change Your Model

- Recycled base material displaces traditional subgrade, sub-base and base materials
- Significant reduction of required materials (>30%)



Stewardship + Innovation = Greening

- Use or Donation of Recycled Solids
- Tax Credits
- Sever Contingent Liability
- LEED-equivalent scoring matrix

Impacts your bottom line



Leveraging LEED “Green” Credit

Using LEED standards as a pathway for E&P industry to demonstrate and communicate our environmental leadership.

- LEED program = method to score building construction and sustainability using products with content exceeding 40% recycled material sourced within 500 miles
- LEED method can be used by E&P industry to score the construction of load bearing structures like drilling pads, lease roads, production facilities, public highways, and state and county roadways

6 LEED credit categories (100 points total):

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation in Design

Four levels of LEED certification in building construction:

- Certified: 40–49 points
- Silver: 50–59 points
- Gold: 60–79 points
- Platinum: 80 points and above



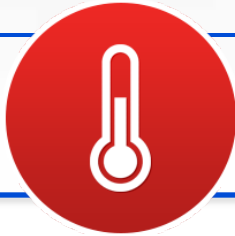
Recycled aggregate materials constitute the majority of base scoring within the Materials and Resources category

| Industrial Materials Recycling & LEED Credits | | Points |
|--|--|--------|
| Using construction and building products containing recycled content | | 1-2 |
| Reusing construction and building products | | 1-2 |
| Diverting C&D materials and products | | 1-2 |
| Using materials extracted, processed and manufactured locally | | 1-2 |
| Total possible points | | 8 |



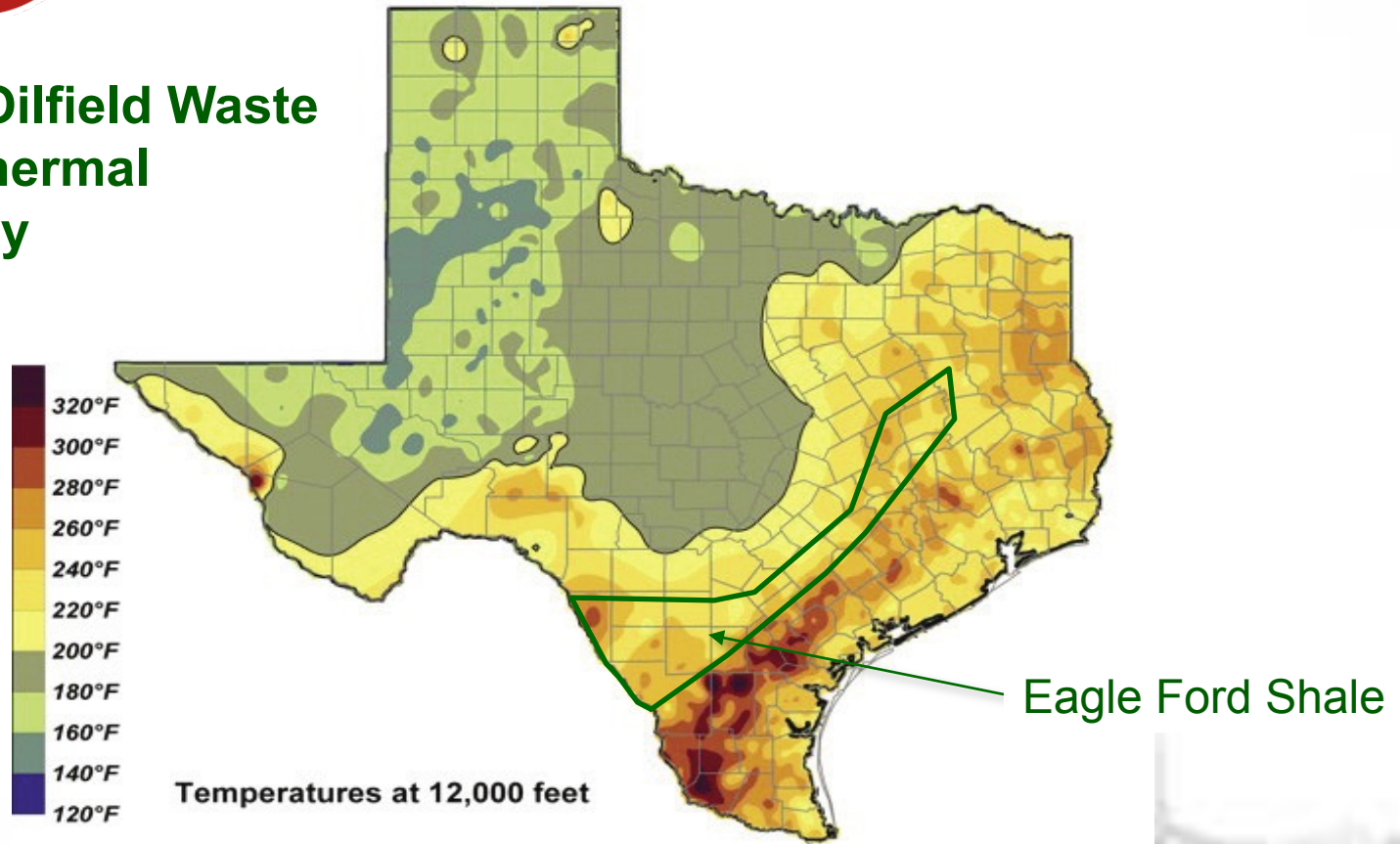
This EPA conservative scoring of 8 points is 20% of the required 40 points for certified status.

Additional points could be scored within the Sustainable Sites, Water Efficiency, Energy and Atmosphere, and Innovation in Design categories.



Geothermal Opportunity

Cleaning Oilfield Waste with Geothermal Technology





Cleaning Solids with Local Hot Water

- Processing facility in geothermal, geo-pressured area of the Eagle Ford uses hot water to clean cuttings and drilling muds
- Closed-loop system recovers hydrocarbons, removes chlorides from solids
- Creates 10-pound brine concentrate for resale and fresh water supplies for internal process fluids
- Reduces material handling for oil-laden waste



Recycling = Strength & Safety

**Utilization of recycled materials
creates stronger and safer
infrastructure for roads, drilling pads
and facility work areas.**

Thank you AADE

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