North Dakota Association of County Engineers:

Cement Stabilization

DAN SCHELLHAMMER, P.E.

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Midstate Reclamation and Trucking

- Founded in 1984
- In 1991, Midstate brought the first reclaimer into the state of Minnesota
- Emphasis on asphalt recycling techniques (milling, reclaiming, SFDR, CIR, CCPR), soil stabilization, and heavy haul trucking
- Focus on technologies that do more, with less, and extend the life of pavement systems
- ARRA member since 1994
- Offices in Lakeville, MN and Spearfish, SD with a satellite office in Tioga, ND. Owned by SurfaceCycle with sister companies in Salina, KS, Denver, CO, Saint George, UT, Pittsburgh, PA, Haw River, NC, and San Antonio, TX
- Perform work throughout the US
  - We're going to work on Monday…

Overview – Cement Stabilization

- Right Tool, Right Time, Right Place
- Value
- Construction Process
- Planning
- Market and Pricing

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Right Tool, Right Place, Right Time

Save Money

Save Time

Reset Pavement Design Process

Extend the Life of Pavement

Reduce Maintenance Costs

Reduce Carbon Emissions

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Maximizing the Structural Capacity of Subgrade

12 inches of Engineered Soil Cement

=

18 inches of Compacted Gravel

12”

18”

12 inches of engineered cement soil stabilization equals the structural capacity of 18 inches of compacted gravel

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Cement Stabilization

Use proven engineering practices and modern equipment to design and blend in-place materials (clay, silt, clay) with Portland cement powder to create an engineered soil cement layer.

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Vane Spreader

- ***Modern Cement Vane Spreader***
  - Material application rate controlled by onboard computer that is constantly collecting GPS and ground radar data to apply the proper amount of Portland cement regardless of conditions or the ground speed of the spreader

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How a Reclaimer Works

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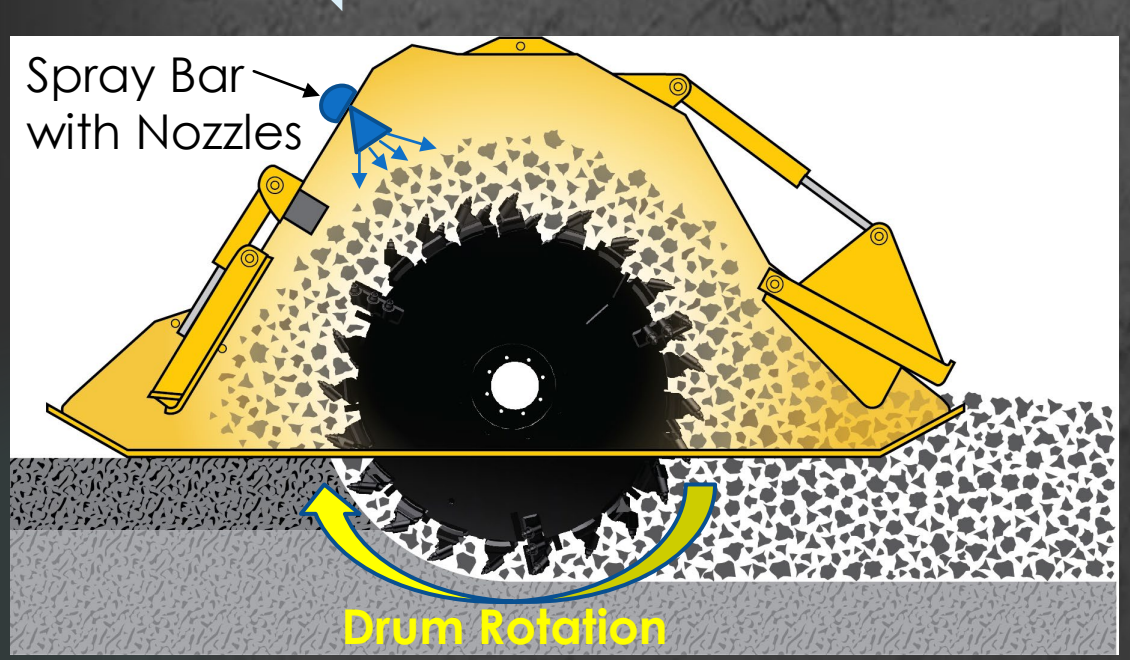

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Construction Keys

- Uniform Distribution of Cement
- Thorough Blending and Moisture
- Compaction Best Practices
- Proper Quality Control with Onsite Technician

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Cure of the Stabilized Layer

- Portland Cement
  - Keep surface moist to prevent shrinkage cracks at the top of the stabilized layer
  - Cure time is dependent on weather conditions, 24 to 48 hours
  - Utilize a DCP when available
  - Work your way out on a freshly stabilized surface, push the gravel out onto the layer to distribute the load
  - When wet, clay fines will make the surface slippery, be careful

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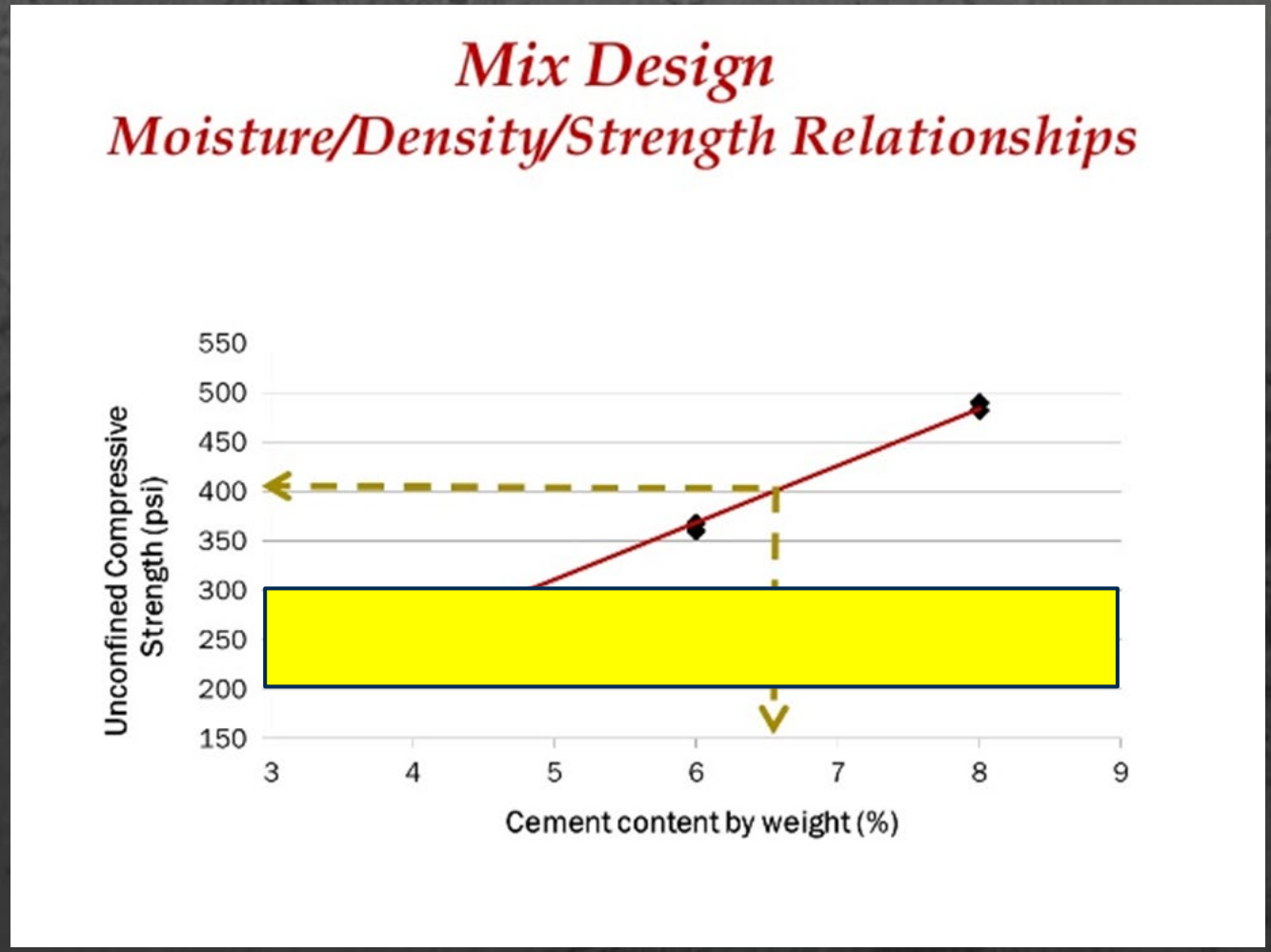
Planning Tools for an Engineered Solution

- Geotechnical Report
  - Proctor
  - Identify Insitu Soil Types
  - DCP's
- Mix Design
  - Understand relationship between moisture content, insitu soil, and amount of cement needed for stabilization and long-term durability
- Pavement Design
  - 7-day break, 200-300 psi



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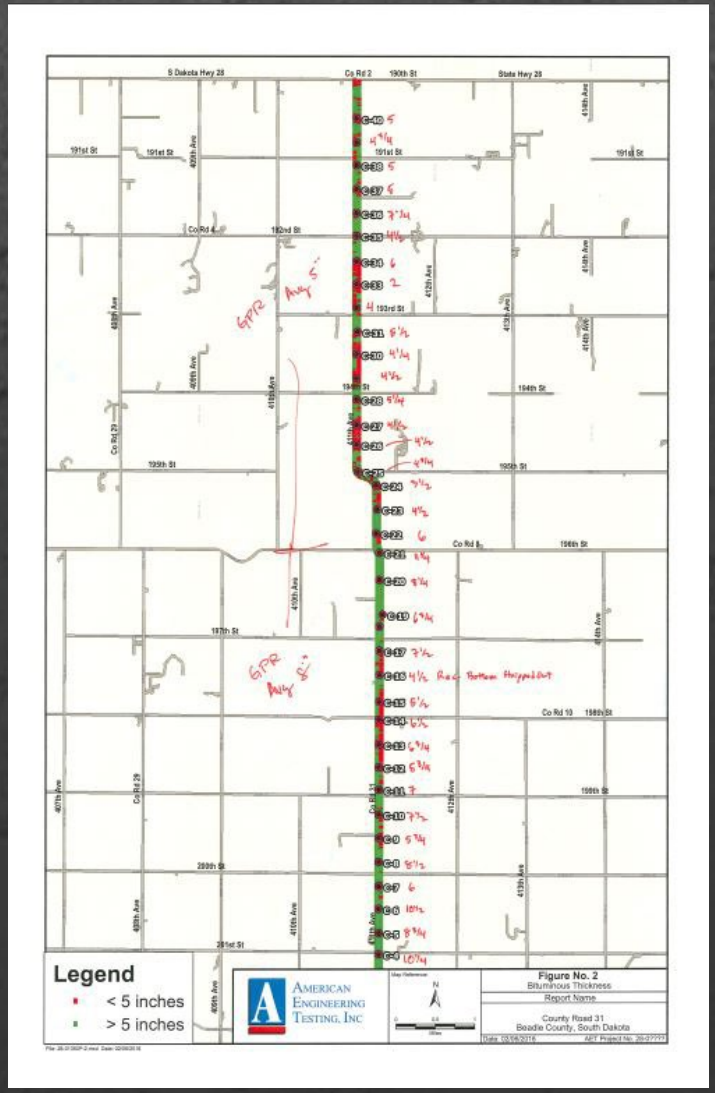
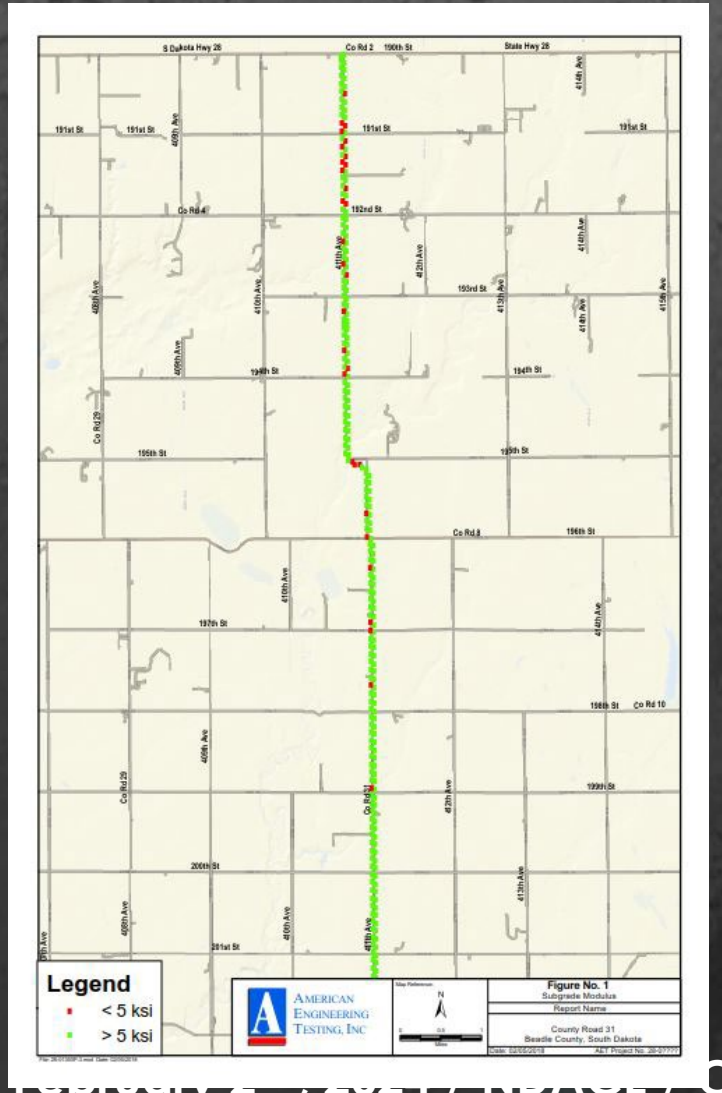
Planning Tools continued…

- GPR – Confirm Pavement Thickness
- FWD – Identify Stability Issues





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Mod vs. Stab, Rules of Thumb

- Modification (also known as drying)
  - 1% Cement will consume about 2% of water
  - 1% Quicklime Fines will consume about 3% of water
  - Quicklime Fines are a more efficient drying agent
  - Evaluate total cost and then select additive (Quicklime Fines are more expensive by the Ton)
  - Lime Kiln Dust works great too and costs less than Quicklime Fines
- Stabilization
  - Fat, expansive clay = 6% plus cement
  - Lean clays = 5-5.5% cement
  - Gravel = 3-4.5% cement
  - Gravel/RAP Blend = 3-4% cement
  - 95% of the cement stabilization work is performed at a depth of 12 inches

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Quality Control - TRUST but VERIFY

Material Properties

- QC Technician onsite all day, every day
- Gradation
- Depth Checks
- Moisture
- Density
  - ✓Compaction is KEY
- DCPs
  - ✓Simple but effective!

Additives

- Calibration Checks
  - ✓Monitor Yields
- Summarize Load Tickets Daily

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Cement Stabilization

- Benefits
  - Proven Freeze/Thaw Durability
  - Performs well in both dry **AND** soaked conditions
    - Won't weaken or experience performance issues through the spring thaw
  - Engineered Solution
  - Save money by importing less gravel
  - Accelerate Construction Schedules
  - Significant cost savings when the technique is used on the right road, at the right time, with the right pavement condition.

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Productions / Bidding / Cost

- By the Day
  - 300 TN Additive
  - 12,500 SY
- Bidding
  - SY to be stabilized
  - TN of additive
- Variables
  - Depth of Stabilized Layer
  - Unit Weight of Material to be Stabilized
  - Area to be Stabilized
  - Market Price of Additive
  - Distance from Terminal to Project
- $4.50 to $7.50 per SY (12-inch depth)
- 24 foot road
  - $63,360.00 to $105,600.00 per lane mile

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Key Take-Aways

Maximize Benefits

- Allow the structural benefits of cement stabilization to influence the overall pavement design.
  - Reduce thickness of surface treatment
  - Consider use of high performance thin-lift asphalt
- Paving contractors should be able to achieve higher densities in the mix above the cement stabilized layer.
  - Rock-hard material to compact against.
  - When properly designed and installed, the pavement system can last longer

Ensure Results

- Make the investment in mix design
- Pay specific attention to the OMC of the blended layer
  - Similar to water-cement ratio of concrete
- Compaction, Compaction, Compaction!!

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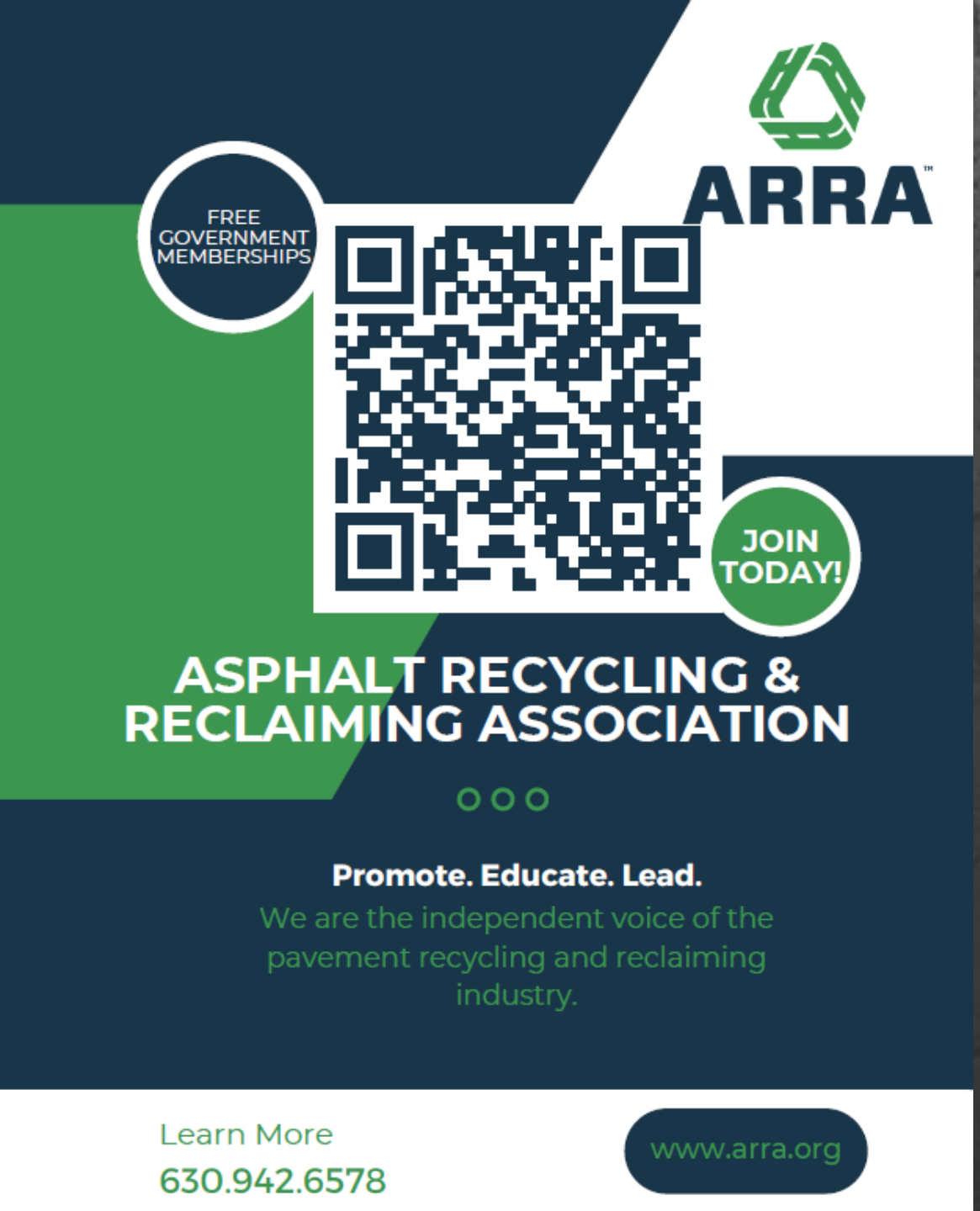

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Join ARRA today!

-FREE memberships for government employees.
-Access to a digital copy of the BARM (Basic Asphalt Recycling Manual)
-Access to a catalog of video recordings from past presentations on asphalt recycling and soil stabilization
-Discounted training and association fees

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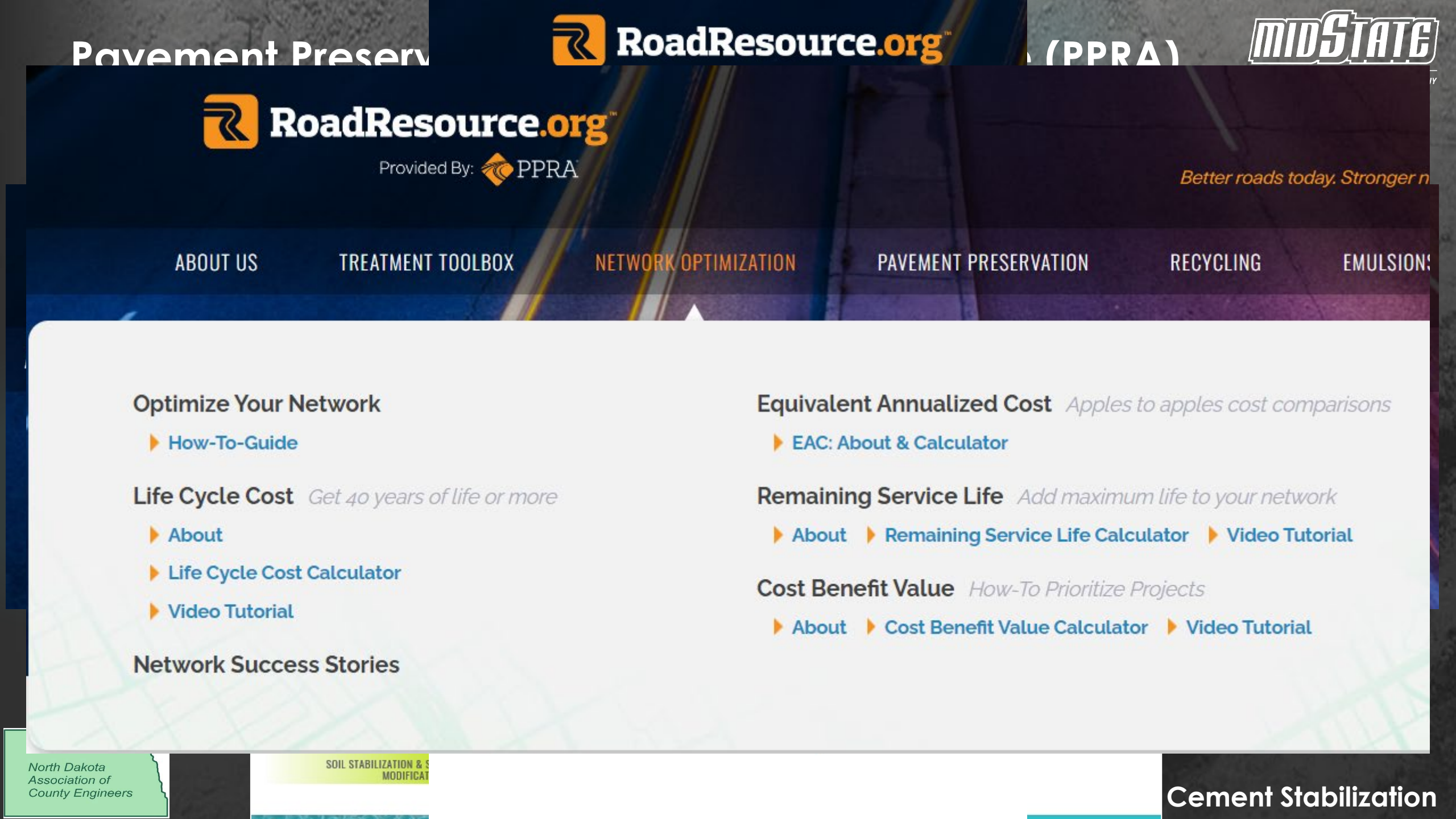
RoadResource.org
Provided By: PPRA
Better roads today. Stronger n
ABOUT US
TREATMENT TOOLBOX
NETWORK OPTIMIZATION
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RECYCLING
EMULSIONS
Optimize Your Network
How-To-Guide
Life Cycle Cost
Get 40 years of life or more
About
Life Cycle Cost Calculator
Video Tutorial
Network Success Stories
Equivalent Annualized Cost
Apples to apples cost comparisons
EAC: About & Calculator
Remaining Service Life
Add maximum life to your network
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How-To Prioritize Projects
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HENNEPIN COUNTY TRANSPORTATION DEPARTMENT

COUNTY STATE AID HIGHWAY NO. 60 (BAKER RD) COLD IN PLACE RECYCLING PROJECT

This project showcased innovative construction methods in the rehabilitation of approximately 10.75 lane-miles (4” depth) of CSAH 60. The cold in place recycling process, executed by Midstate Reclamation and Trucking, Inc., successfully prevented the emission of 930.73 metric tonnes of CO2e into the atmosphere.

If traditional road construction techniques, involving mill and fill with hot mix asphalt, were employed, the project would have contributed an estimated 1,053.86 metric tonnes of CO2e to the atmosphere.

By embracing the environmentally-conscious cold in place recycling process, which emphasizes resource reuse and efficiency, the project's emissions were significantly reduced to 123.13 tonnes of CO2e. This amounted to an impressive 88.3% reduction in emissions.

The carbon accounting procedures adhered to the Verra Verified Carbon Standard VM0039 Methodology for Use of Foam Stabilized Base and Emulsion Asphalt Mixtures in Pavement Application, v1.0, following a cradle-to-gate assessment principle (Sinden, 2008). This assessment covers emissions arising from raw material acquisition, raw material transport, in-plant production, to-site transport, and installation. In the case of cold in place recycling, emissions from in-plant production and to-site transport are eliminated as the existing roadway is recycled in place during the CIR train's progress down the road.

Midstate Reclamation and Trucking, Inc. meticulously documented all requisite information and enlisted the assistance of Global Emissionairy, LLC, to quantify the emission reductions linked to the project. To ensure the accuracy of emission reduction claims, a third-party validation and verification body was engaged. They audited and certified these claims using the ISO 14064-3:2006 standard.

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