2026 RAP Tech: Recycle More, Spend Less

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Minnesota County Engineers Association MCEA

51 years ago at Cragun's…

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Why is RAP given away today?

- Lower the cost of HMA by providing HMA producer a free source of RAP.
- Owner doesn't have a place to put it (stockpile).
- Potential regulatory issues for a stockpile (SWPPP, permits, etc.)
- Owner does not have the equipment/staff to process RAP for reuse.
- RAP management (Inconsistent quality from different roadways).
- Maybe we should consider keeping it…

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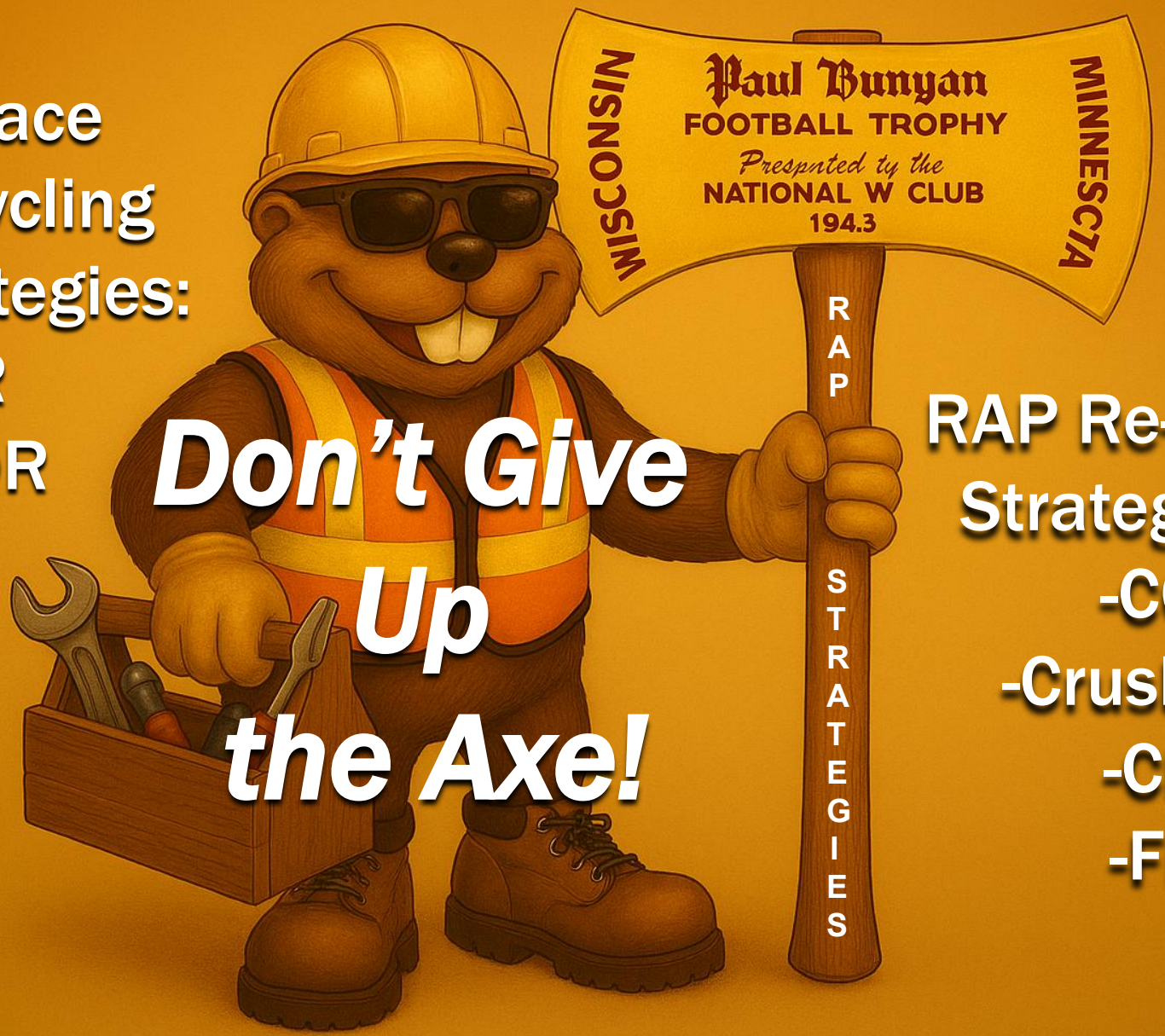
Unlock your RAP's Potential



In-place Recycling Strategies:
-FDR
-SFDR
-CIR

Don't Give Up the Axe!

RAP Re-Use Strategies:
-CCPR
-Crushing
-Chips
-Fines

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
Recycle and Re-Use

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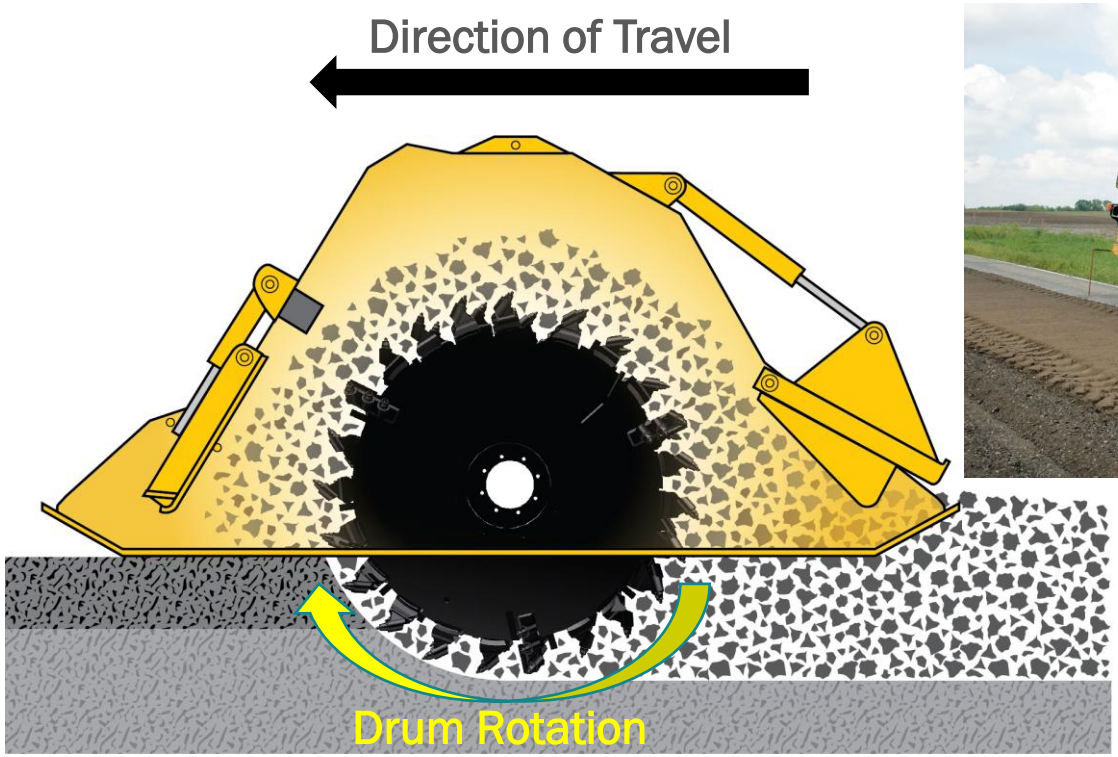
IN-PLACE: Full Depth Reclamation (FDR)



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IN-PLACE: Stabilized Full Depth Reclamation (SFDR)

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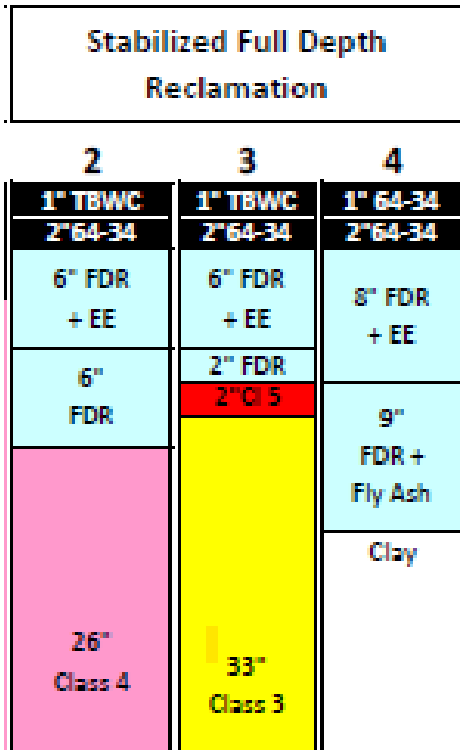
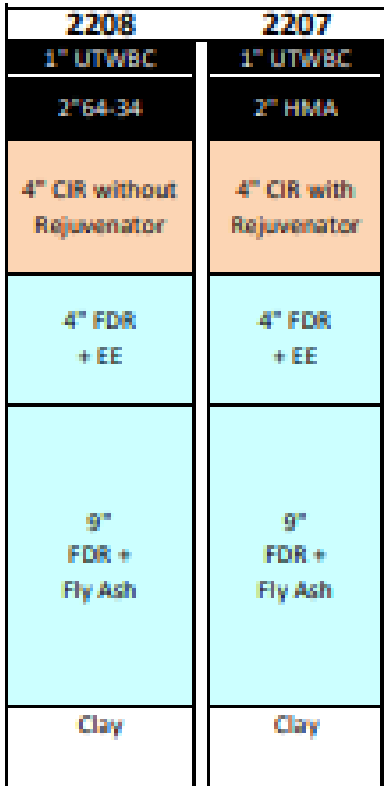
MnROAD SFDR Test Cells

- Built in 2008, SFDR with Engineered Emulsion
- Designed for 3.5 million ESALs
- 8.5 Million ESALs in 2019 (looked brand new)
- Gave up on the chance they'd fail in 2022 and started new experiment by re-recycling SFDR with CIR

2008



2022



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Keys to a successful SFDR project

- Pulverize existing asphalt pavement structure prior to stabilization
- Compact and shape pulverized material to desired cross-slope prior to injection
- Ensure pulverized layer is 1 to 2 points below OMC prior to injection
- Great way to build additional structure into a roadway
- Stabilization additives vary in price and strengths

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IN-PLACE: Cold In-Place Recycling (CIR)

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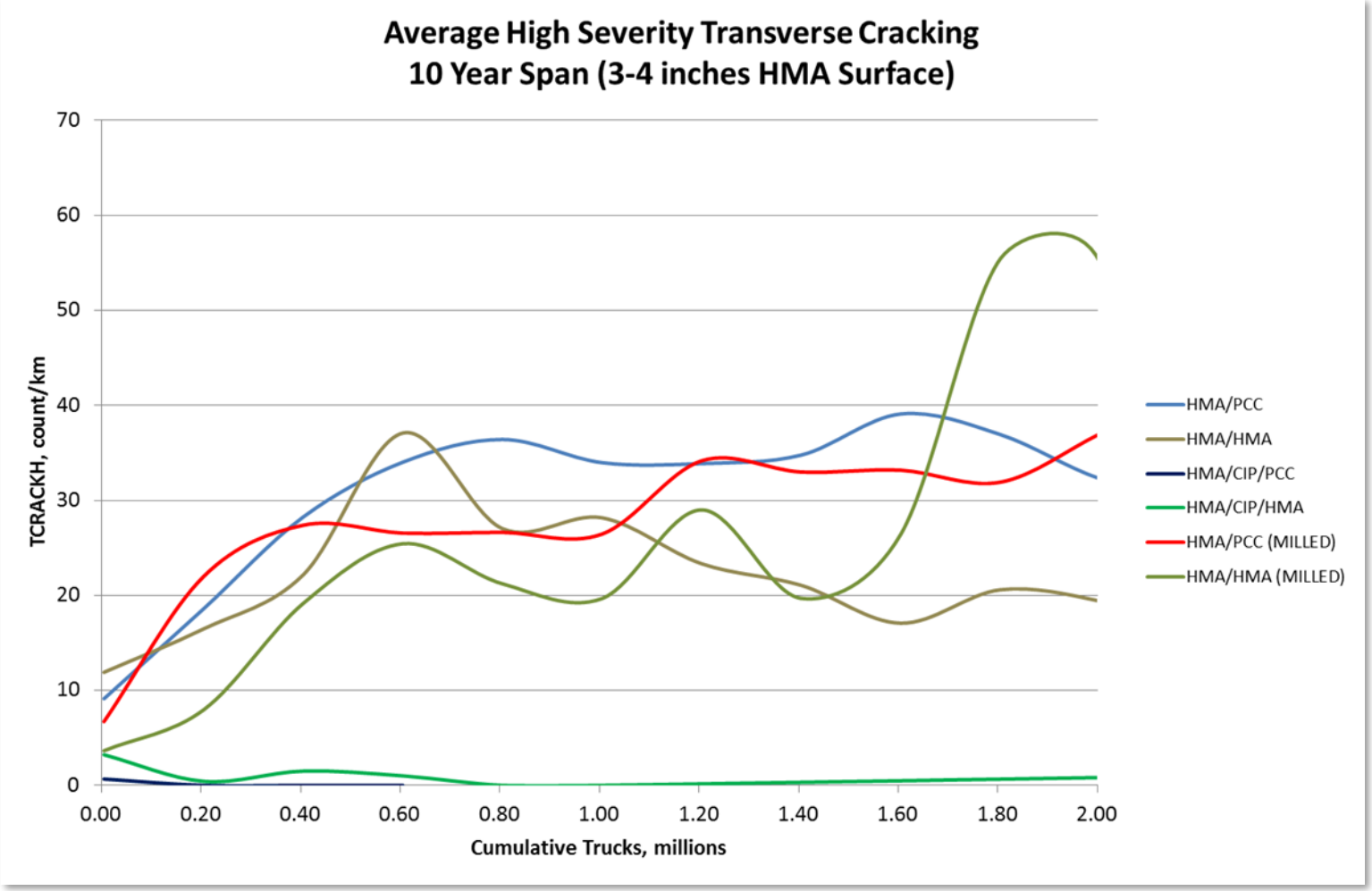
IowaDOT Research on CIR Crack Resistance, 100 CIR Roads included in the Research



Source: Long-Term Evaluation of Cold In-Place Recycling and Factors Influencing Performance, Ashley Buss, Ph.D.1; Marie Grace Mercado2; and Scott Schram, Ph.D., P.E.3, DOI: 10.1061/(ASCE)CF.1943-5509.0000985. © 2016 American Society of Civil Engineers.

Maximize Benefits of CIR

-CIR reduces cracking frequency
-CIR roads are able to maintain their smoothness for longer periods of time (better IRI numbers)
-Lower Maintenance Costs over time
-Research shows increased crack resistance and lower IRI values at CIR depths of 4 inches vs. 3 inches (deeper CIR treatment leads to: fewer cracks, better IRI, longer service life)
-<u>REMINDER:</u> Right Tool, Right Place, Right Time

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RE-USE: Cold Central Plant Recycling (CCPR)

CCPR (Cold Mix) Use

- Replacement of base course HMA
- Pothole Repair
- Trench Backfill
- Yard Surfacing (Midstate has had our heavy haul yard surfaced with cold mix for 20 years)
- Customize Mix Design for Use Case, High Performance vs. Stockpile Time

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RE-USE: Custom Crushing of RAP

RAP Chips – Chip Seal
RAP Fines – Micro-Surfacing

RAP Chips

Fines

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AUTOMATED MACHINE GUIDANCE (AMG) MILLING

Fine RAP gradation from AMG Milling is a great material to use on shoulders, especially if you place and compact.

Use the design phase to determine exact quantities for removals, improve ride and roadway geometry prior to pavement preservation treatment.

Environmental Benefits of RAP Use

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Environmental Process Declaration (EPD)

-Product vs. Process
-Construction Emissions Reduction
-CIR – 15 TNs of cold mix = 1 metric tonne of CO_2 saved
-CCPR – 18 TNs of cold mix = 1 metric tonne of CO_2 saved
-SFDR – 25 TNs of cold mix = 1 metric tonne of CO_2 saved

EPD "Nutrition" Label

Your Building Product

Amount per Unit

LCA IMACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO^2 eq)	0.96
Ozone Depletion (kg CFC- 11 eq)	1.80E-08
Acidification Potential (mol H^+ eq)	0.93
Eutrophication Potential (kg N^- eq)	6.43E-04
Photo-Oxidant Creation Potential (kg O3 eq)	0.121

Your Product's Ingredients: Listed Here

EPD "nutrition label" for concrete mixes

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Metric Tonnes of Emissions saved in 2021 with CIR in Minnesota (County and DOT projects)

Mower - 3,975 TN

Hennepin – 922 TN

Brown – 4,899 TN

Martin – 1,012 TN

St. Louis – 2,950 TN

Clay – 1,037 TN

Pine – 502 TN

Scott – 2,004 TN

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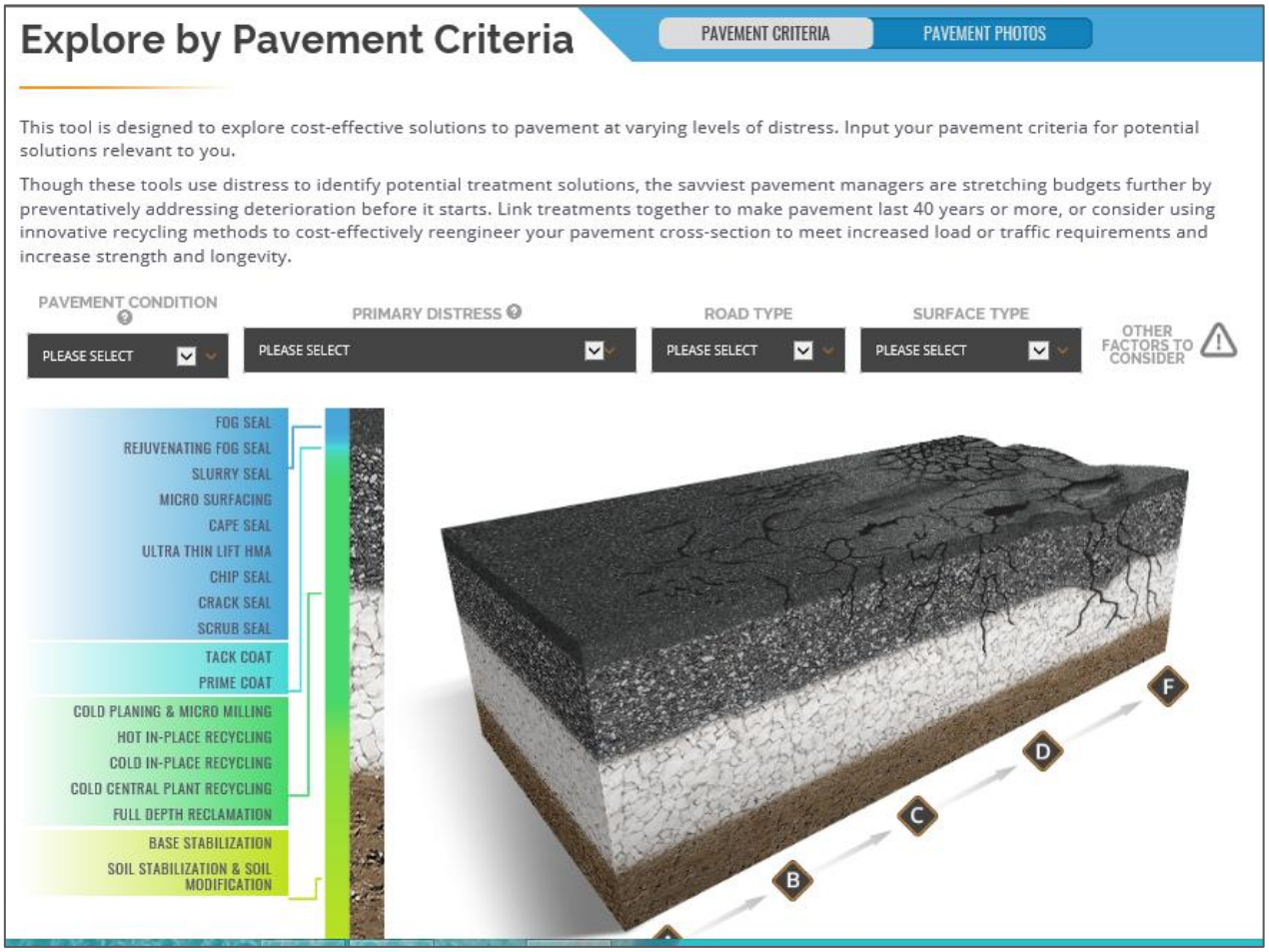
Additional Resources

- RoadResource.org
  - ✓ PPRA
    - ✓ AEMA/ISSA/ARRA
  - ✓ Information on All Treatments
  - ✓ Success Stories



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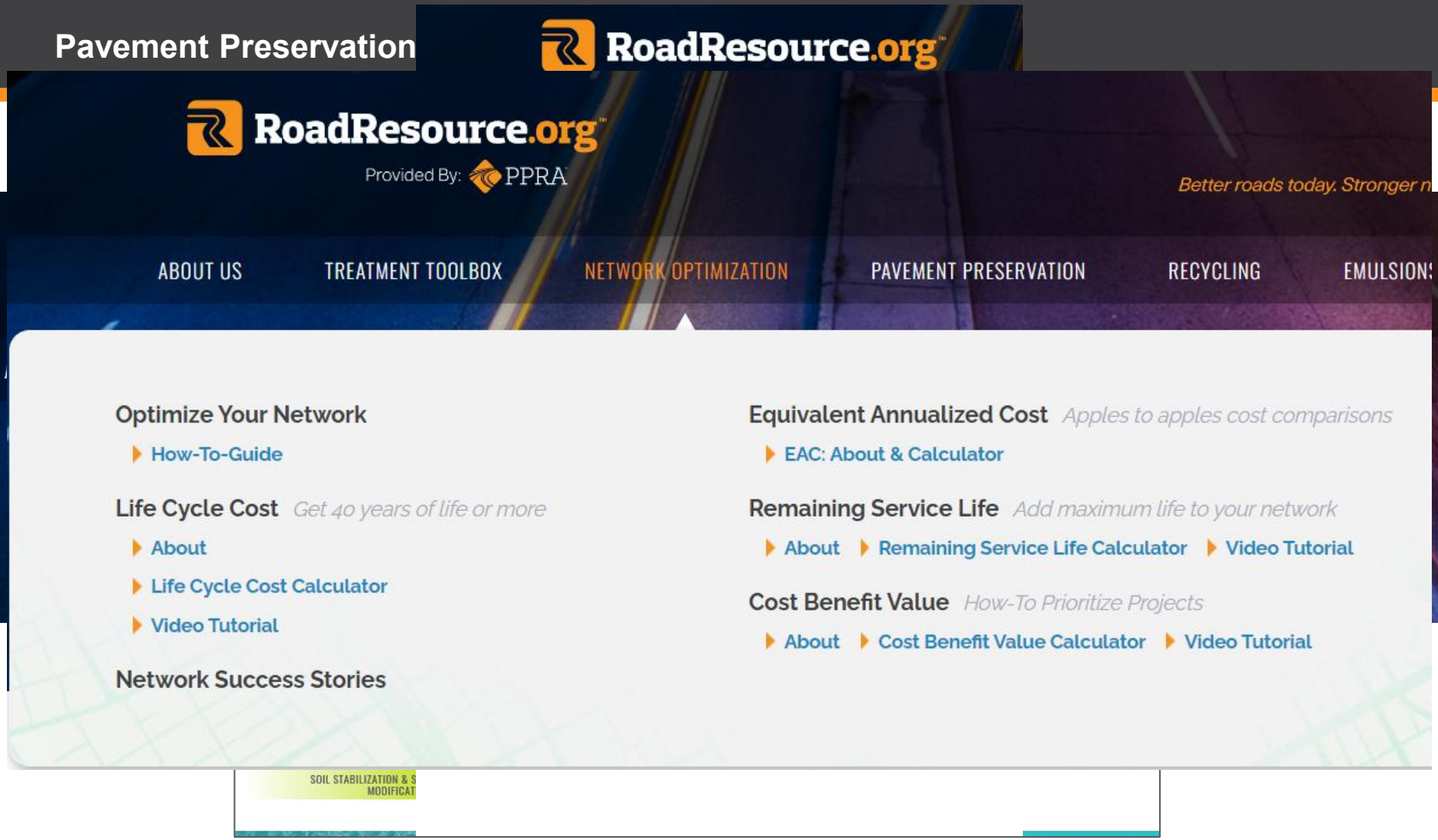
Pavement Preservation



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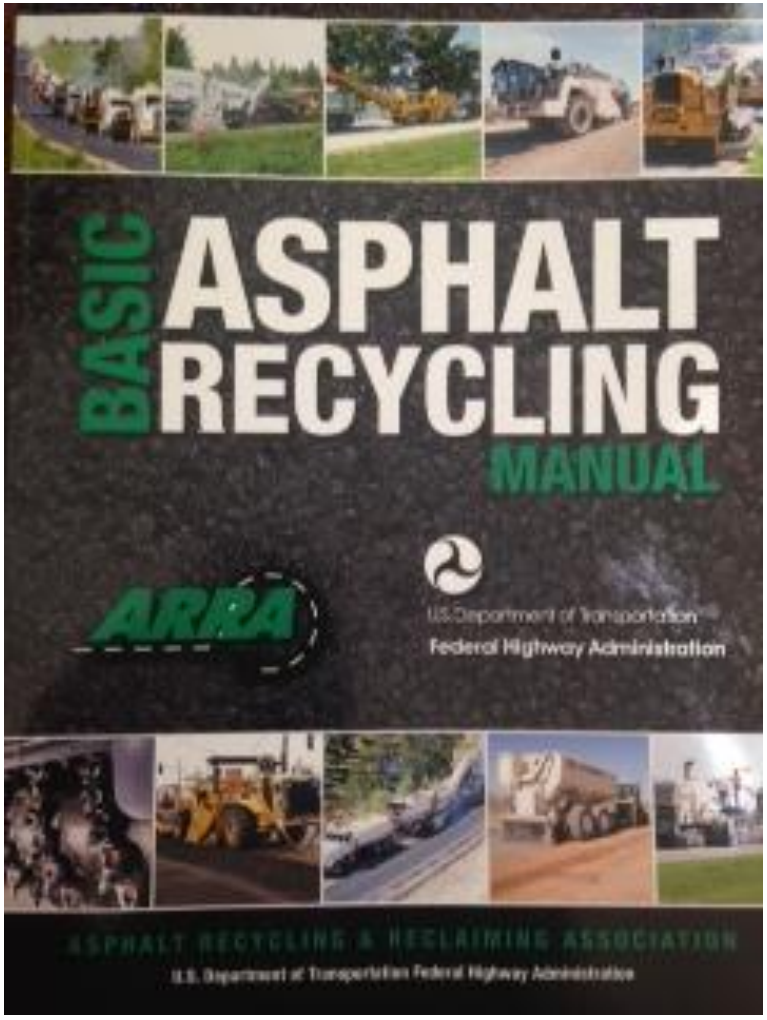
Join the Asphalt Recycling and Reclaiming Association for FREE



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QUESTIONS?

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