

Building Sustainable Pavements In Virginia Using In-Place Recycling

Brian Diefenderfer, PhD, PE



National **Pavement Preservation** Conference 2016

Outline

- What is pavement recycling?
- Benefits of recycling
- Design inputs
- Performance examples
- Next steps

What is Pavement Recycling

- A series of processes where existing paving materials can be reused in a new or rehabilitated pavement structure
 - Full-depth reclamation
 - Cold in-place recycling
 - Cold central-plant recycling

Pavement Recycling Benefits

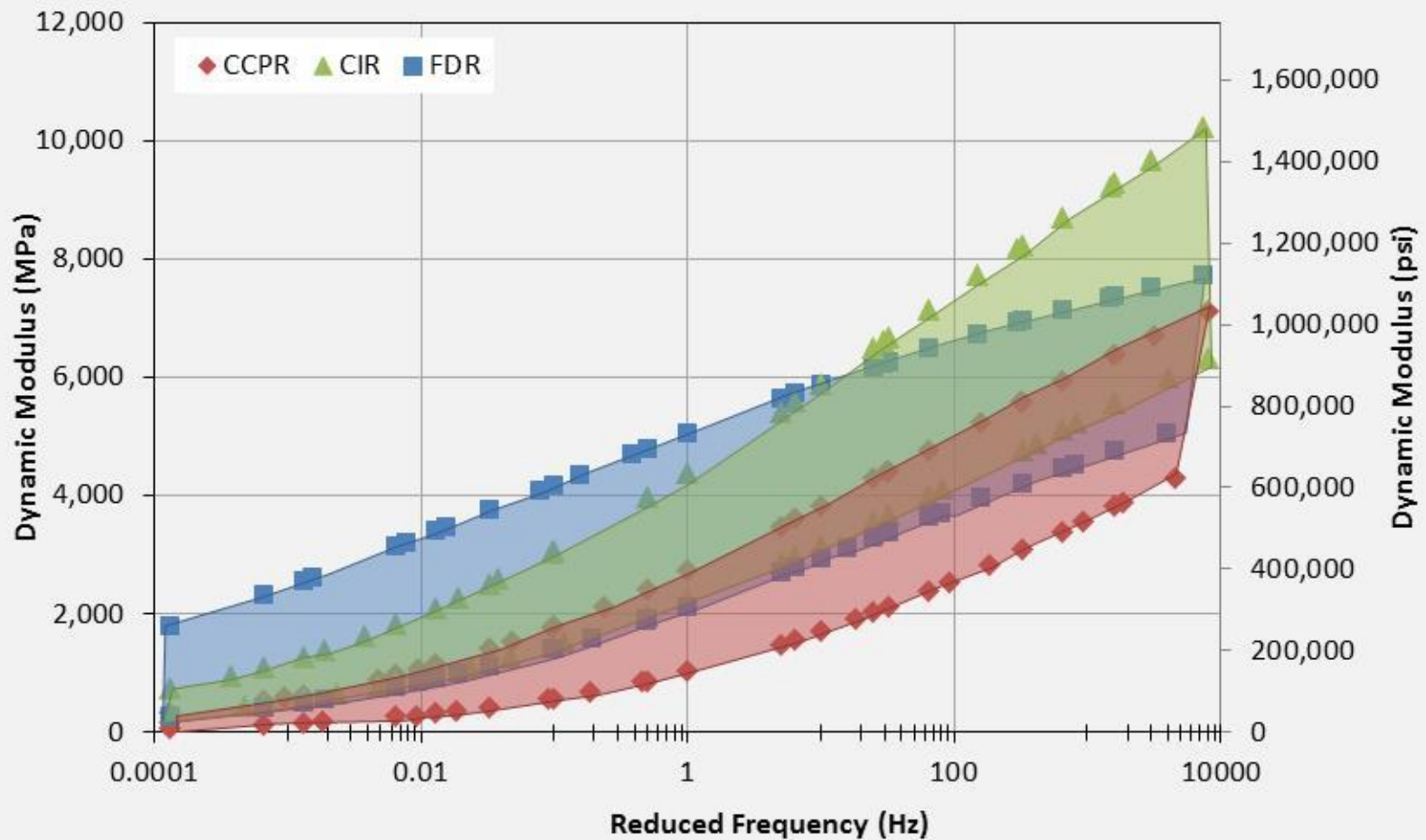
- 30 to 50 percent cost savings
- >50 percent less greenhouse gases emitted
- Fix deterioration causes rather than symptoms
- Can be quicker than full reconstruction

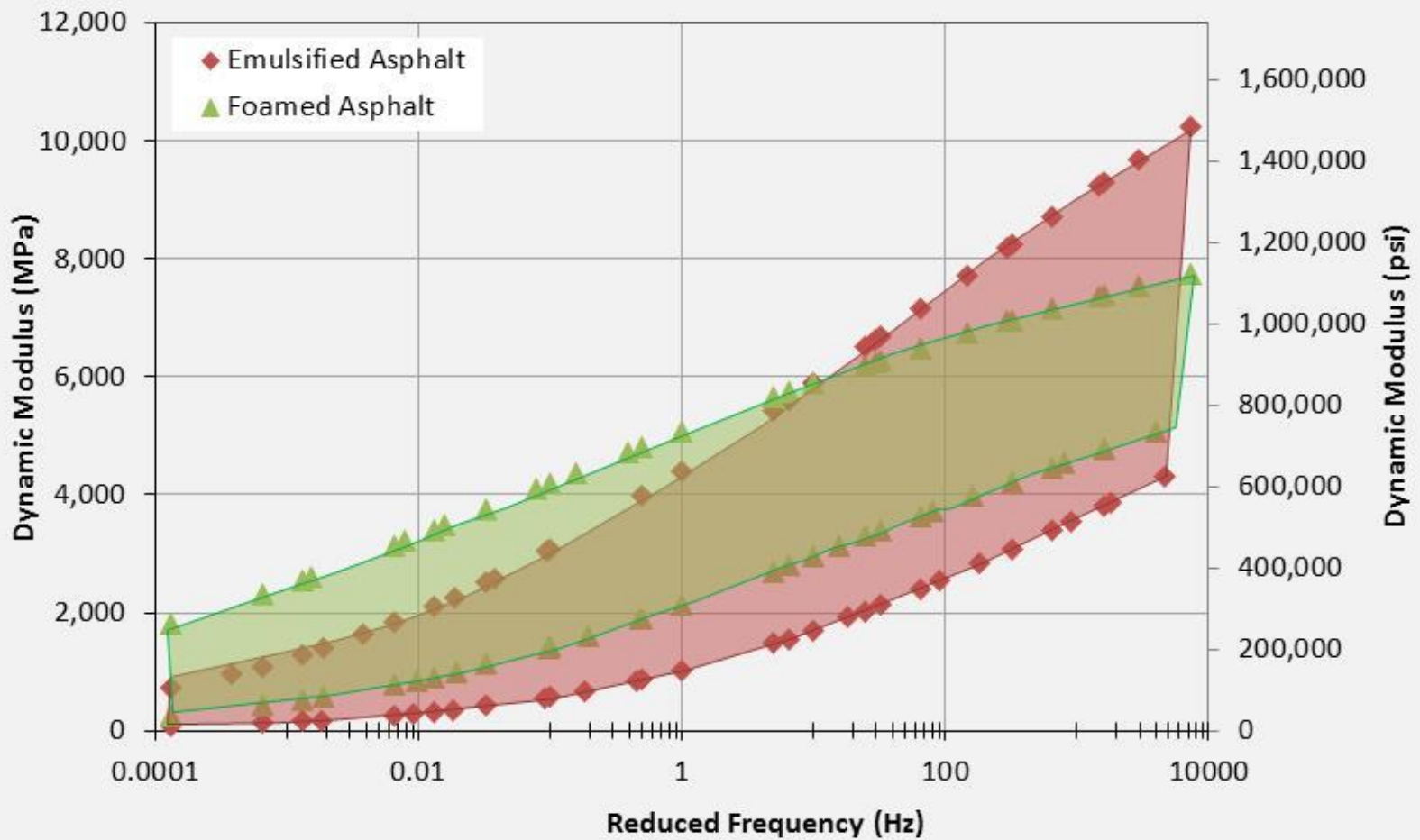
Pavement Recycling Needs

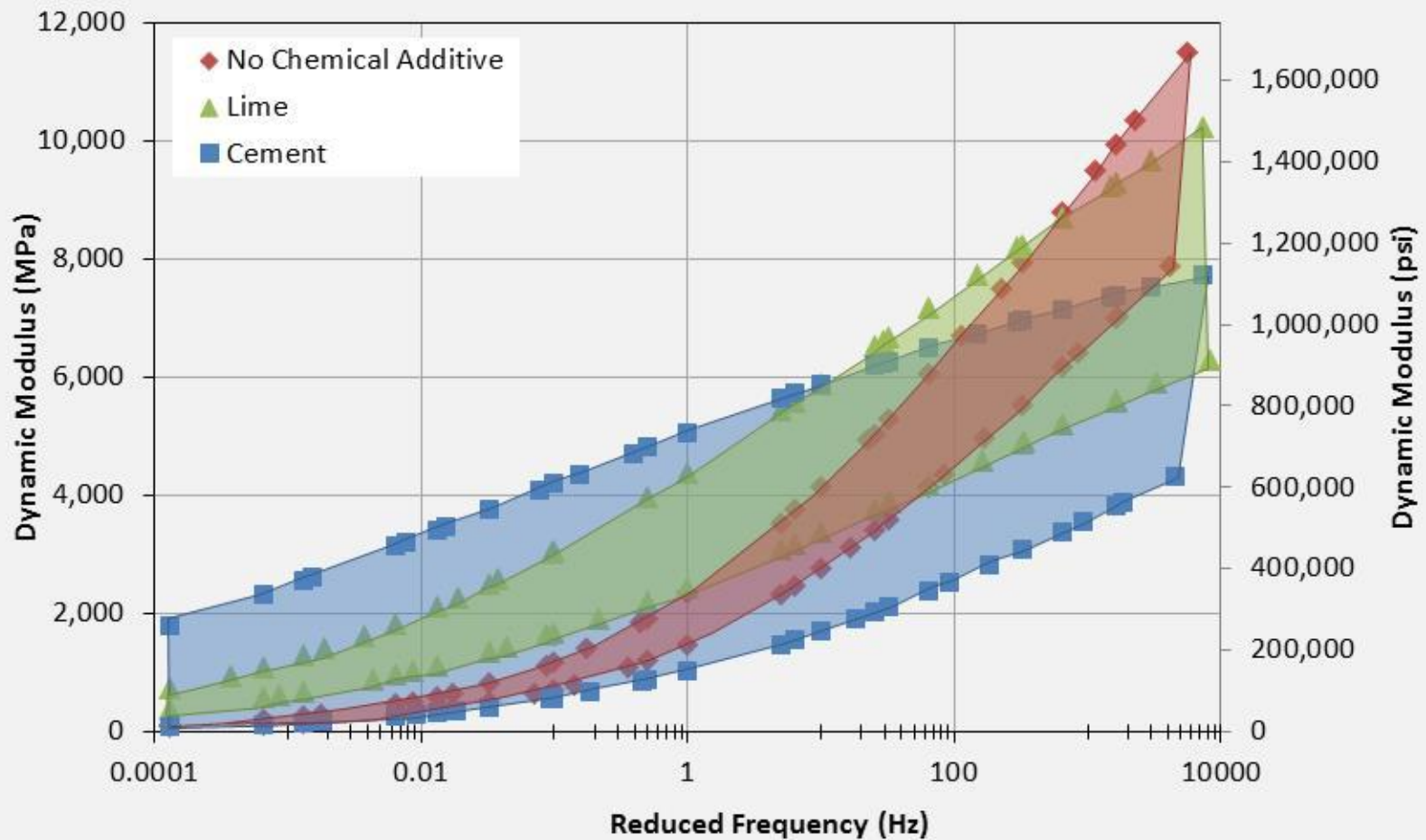
- Design
 - Familiarity with processes
 - M-E material property inputs
- Construction
 - Rapid quality assessment
 - Long-term performance assessment

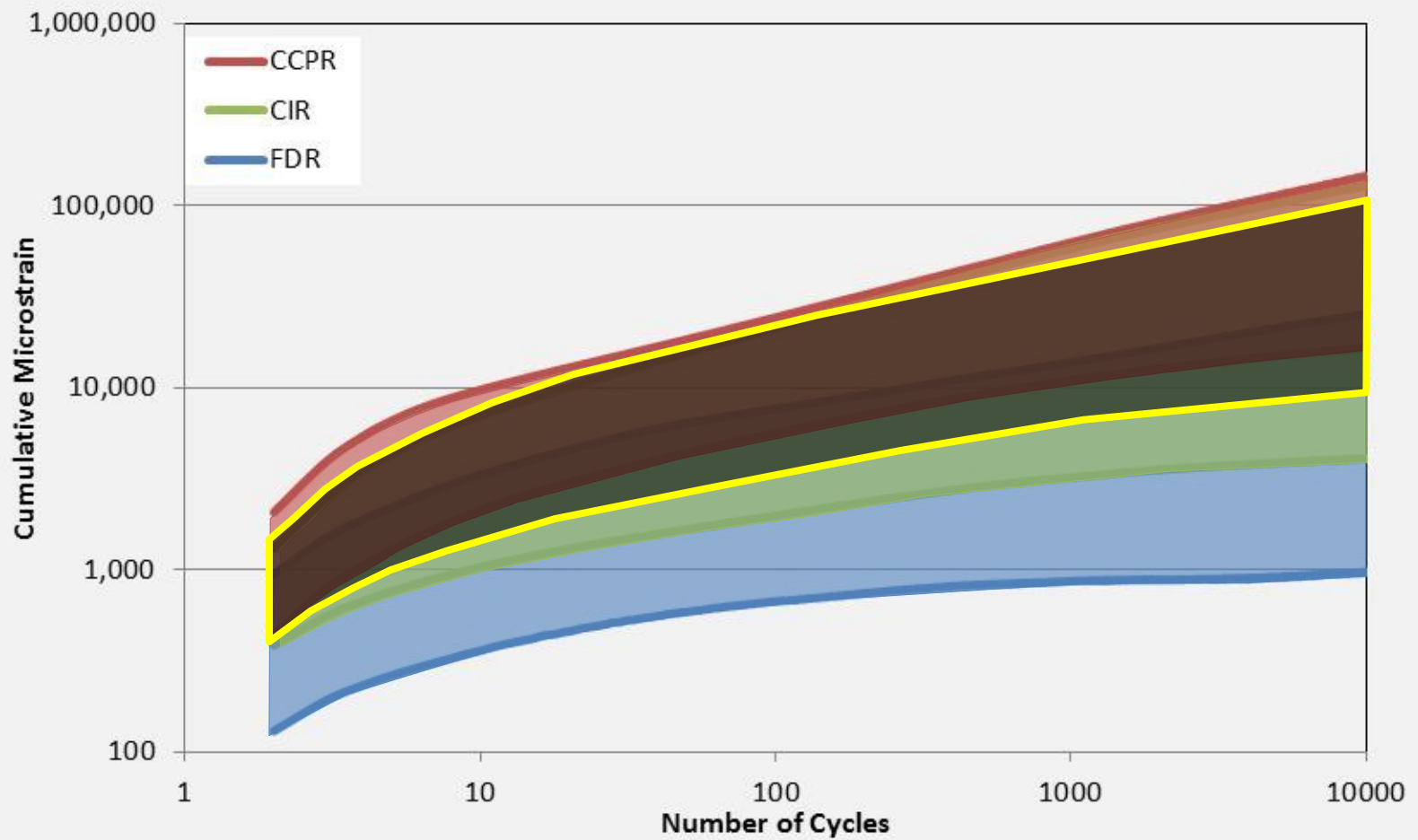
M-E Material Property Inputs

- NCHRP 9-51
 - University of Maryland, Virginia Transportation Research Council, Wirtgen GmbH, Colas Solutions
- Characterization
 - Stiffness, dynamic modulus
 - Rutting, repeated load-permanent deformation









Virginia Performance Examples

- Interstate 81
 - Constructed 2011
 - 24,000 AADT w/ 28% trucks
- National Center for Asphalt Technology Track
 - Constructed 2012
 - 10 million ESALs per cycle

Virginia I-81

- Right lane
 - FDR, CCPR, asphalt surface
- Summer 2016
 - 10 million ESALs
 - 0.10 inches rutting
 - IRI 44 inches per mile

4 & 6-in AC

6-in CCPR

12-in FDR

Subgrade

NCAT Test Track

S12 N3 N4



An aerial photograph of the NCAT Test Track, a multi-lane highway winding through a dense forest. The track features several curves and straight sections. Three specific areas are highlighted with yellow arrows and labels: S12 points to a curve on the left side of the track; N3 and N4 point to a straight section on the right side of the track. In the bottom right corner, there is a small building with a dark roof and a parking lot with several spaces. A few vehicles are visible on the track.

NCAT Test Track

N3

6-in AC
5-in CCPR
6-in Agg
Subgrade

N4

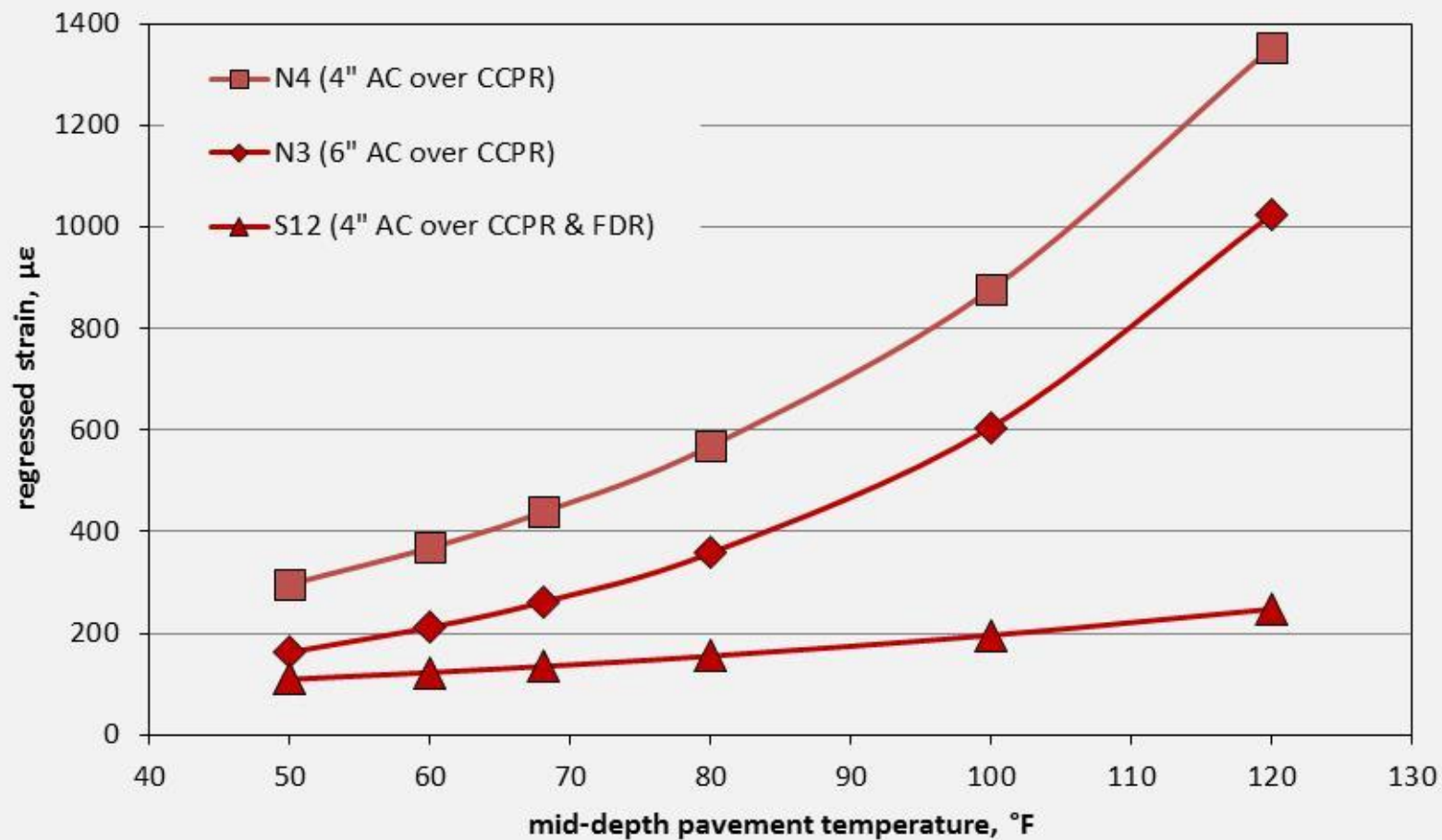
4-in AC
5-in CCPR
6-in Agg
Subgrade

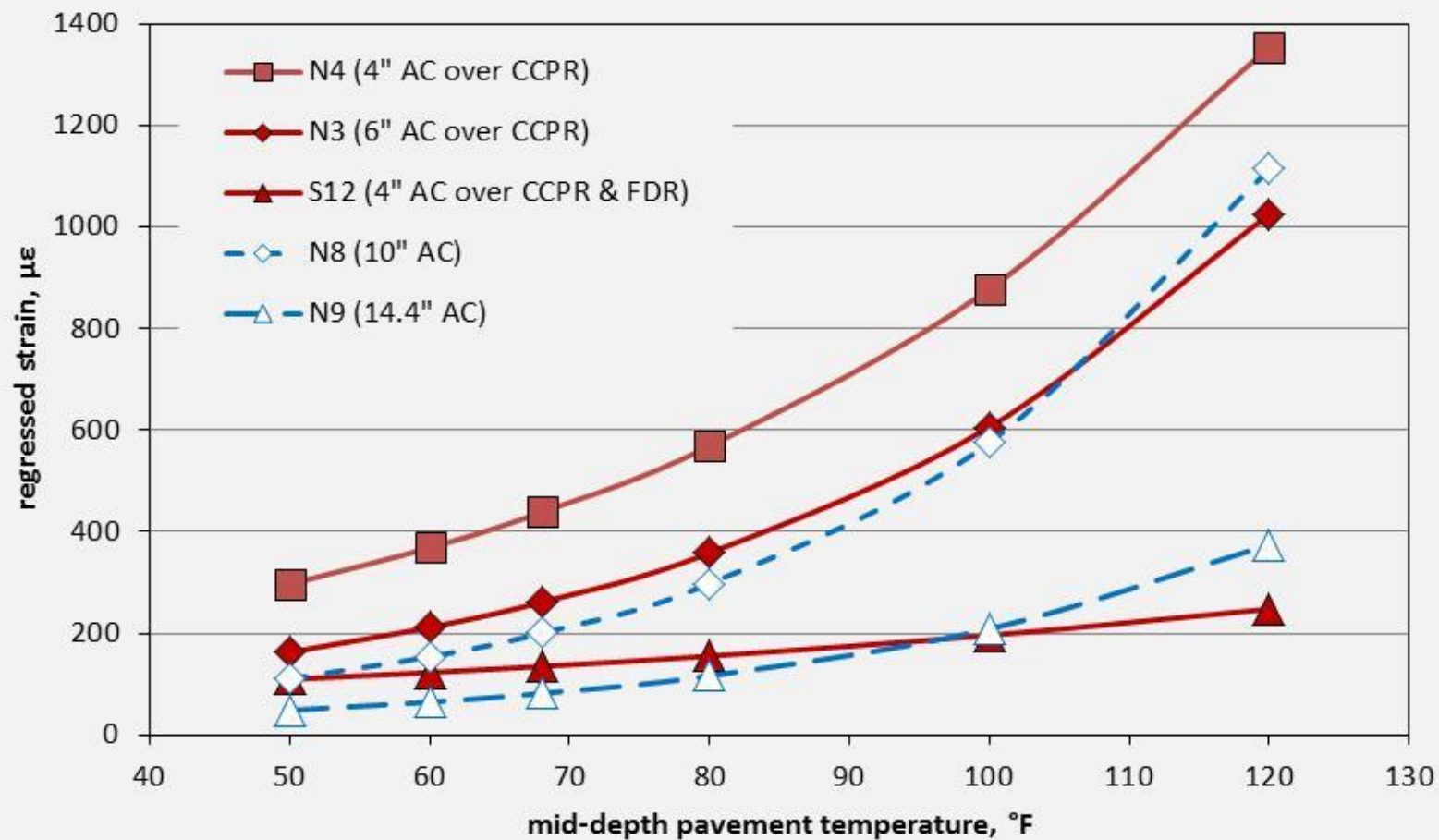
S12

4-in AC
5-in CCPR
8-in FDR
Subgrade

NCAT Test Track

- August 2016
 - 14 million ESALs
 - 0.15 – 0.25 inches rutting
 - no cracking





NCAT Test Track

S12

- Perpetual recycled design?
 - Average 81% recycled content

4-in AC

5-in CCPR

8-in FDR

Subgrade

Interstate 64 Lane Widening

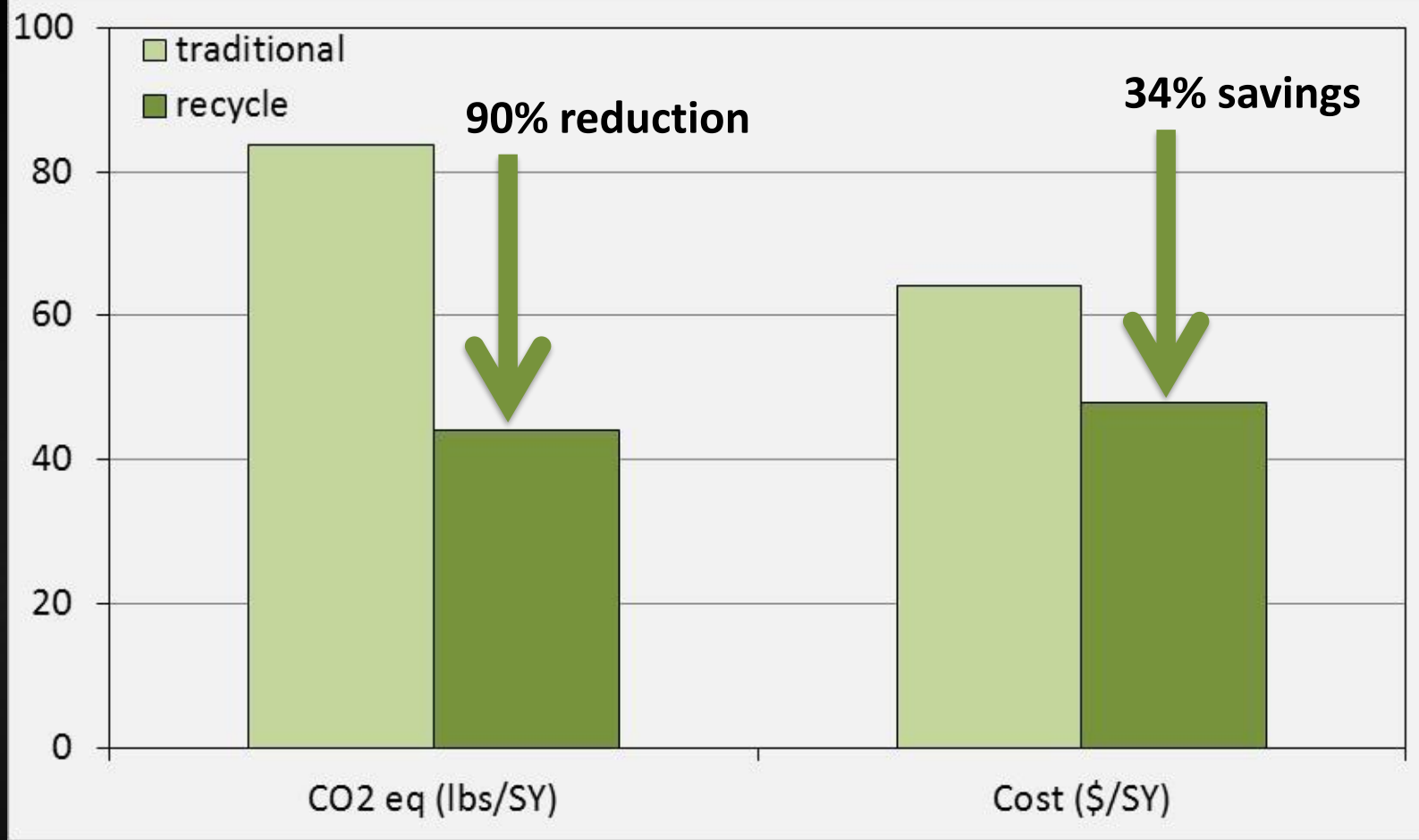
- Add 2 lanes to inside
- Reconstruct existing 2 lanes
- Design-build
- 7.08 miles (56 lane miles)
- Awarded January 2016

4-in AC

6-in CCPR

12-in CTA / FDR

Subgrade



Using Virginia's Existing RAP

- 4.7+ million tons statewide



Using Virginia's Existing RAP

**With CCPR, we could pave a 12-foot wide lane
6 inches thick for about 2,100 miles**





Brian Diefenderfer, Ph.D., P.E.
Associate Principal Research Scientist

434 293-1944

brian.diefenderfer@vdot.virginia.gov

530 Edgemont Road
Charlottesville, VA 22903

A division of the Virginia Department of Transportation