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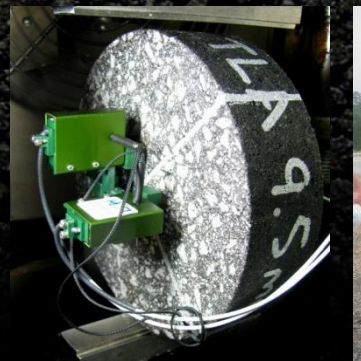
Warm Mix Asphalt Experiments on the NCAT Test Track


Presentation Overview

- Background on the NCAT Test Track
- Results from current and past WMA sections
- New Experiments

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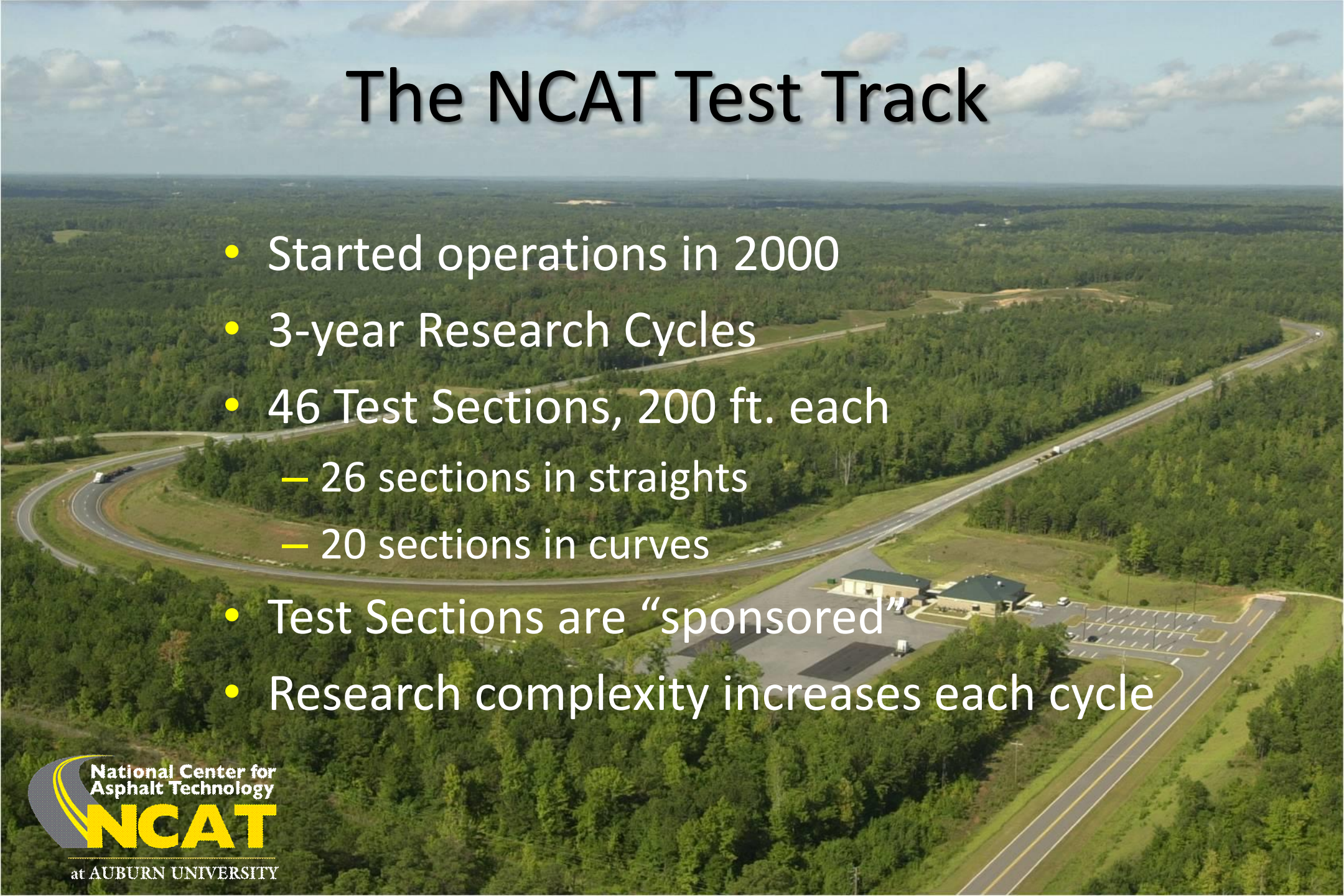
The NCAT Test Track



- Started operations in 2000
- 3-year Research Cycles
- 46 Test Sections, 200 ft. each
  - 26 sections in straights
  - 20 sections in curves
- Test Sections are “sponsored”
- Research complexity increases each cycle

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Construction

- Competitive bids
- Complex coordination of materials
- Plant modifications
- Technical assistance
- Trial mix checks
- High quality construction

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NCAT Test Track

Types of Test Sections

1. Surface Layer Performance
2. Full-Depth Structural Studies

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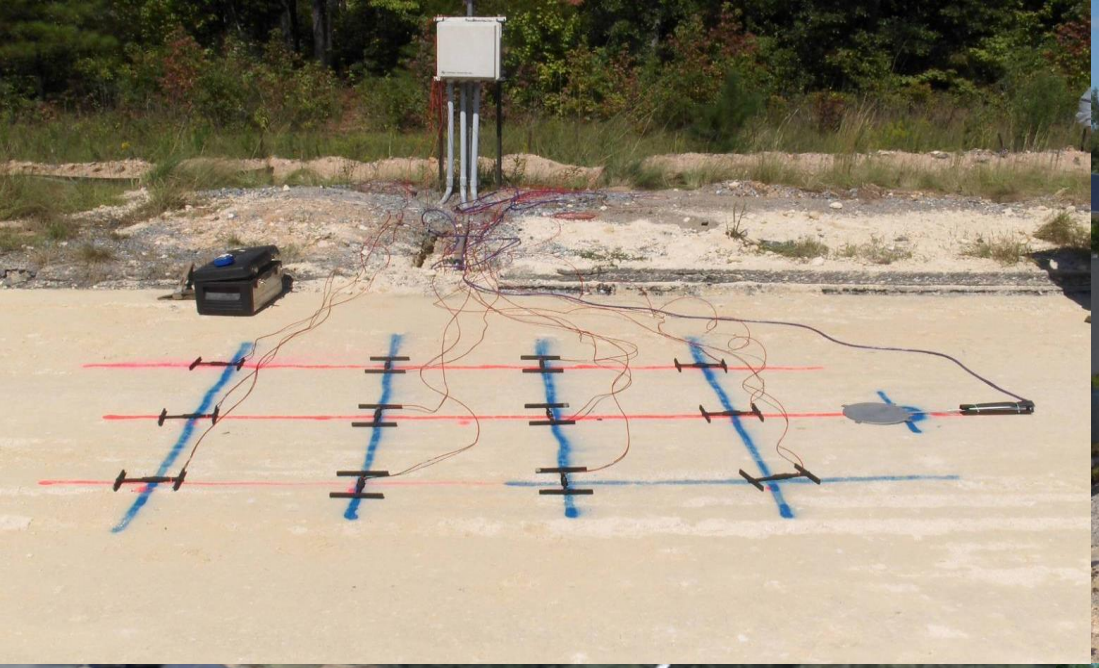

Critical Strain Data Acquisition

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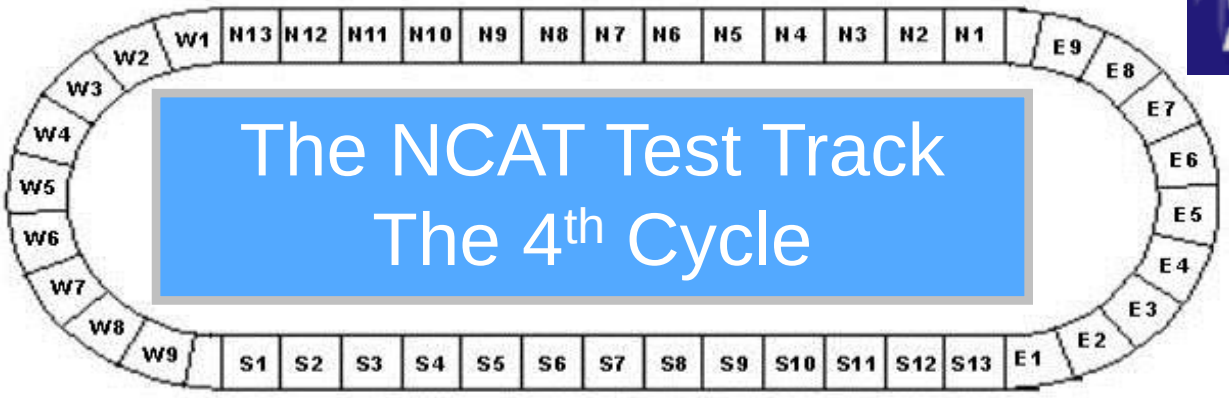
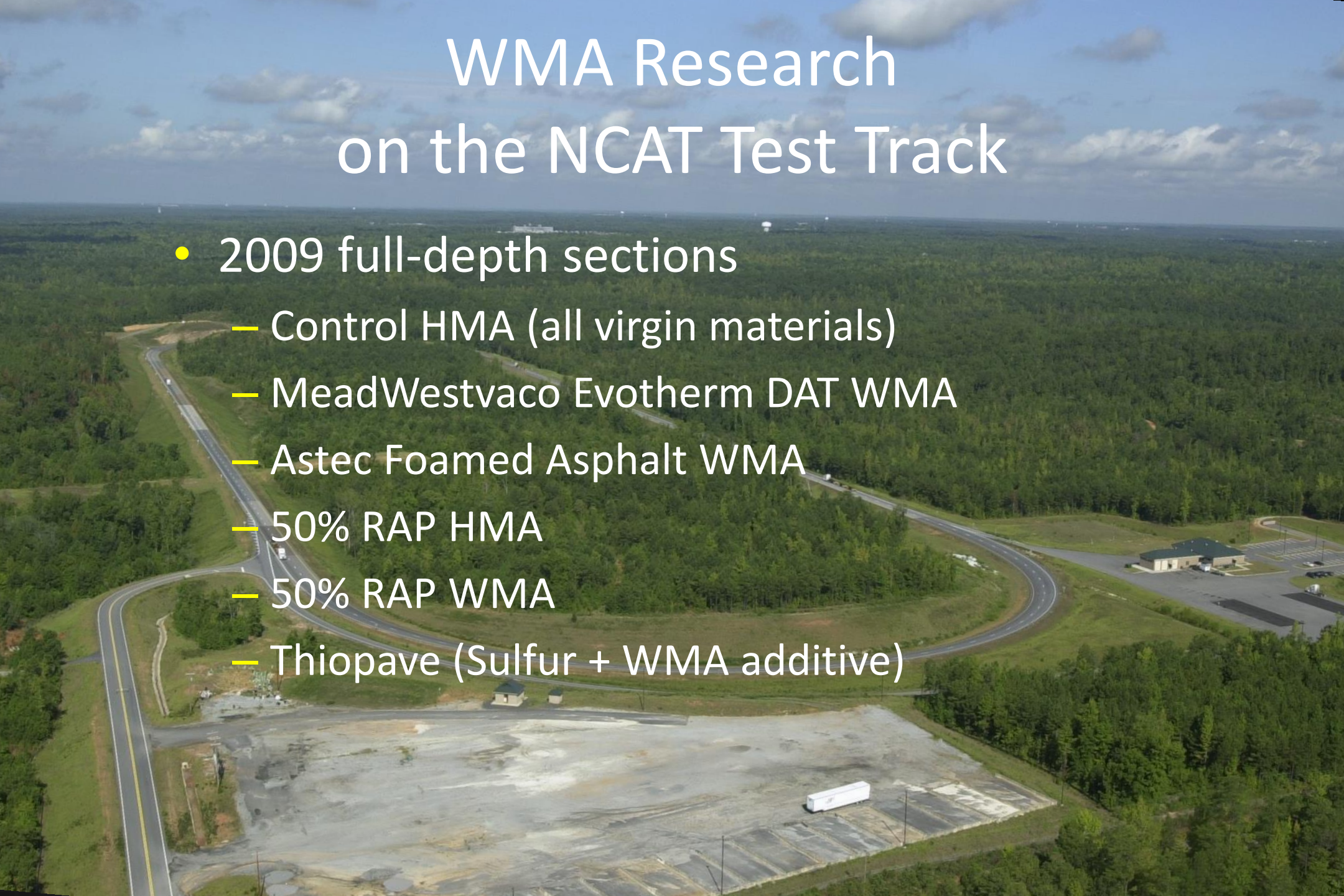
The NCAT Test Track
The 4th Cycle



WMA Research on the NCAT Test Track



- 2009 full-depth sections
  - Control HMA (all virgin materials)
  - MeadWestvaco Evotherm DAT WMA
  - Astec Foamed Asphalt WMA
  - 50% RAP HMA
  - 50% RAP WMA
  - Thiopave (Sulfur + WMA additive)

Full-Depth WMA and Control Test Sections

Layer	NMAS	Binder Grade	Target Thickness
Surface	9.5 mm	PG 76-22	1.25 in.
Intermediate	19.0 mm	PG 76-22	2.75 in.
Base	19.0 mm	PG-67-22	3.0 in.

- The same mix designs were used for HMA and WMA mixes of the same layer.
- All mixes were fine-graded

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Mix Information: QA Results

Property	Surface		
	Control	WMA-F	WMA-A
Plant Mix Temp. °F	335	275	250
Pb, %	6.1	6.1	6.4
Pbe, %	5.4	5.5	5.7
Lab Air Voids, %	4.0	3.3	3.4
Vol. of Eff. Binder, %	12.5	12.7	13.3
Rec. Binder Grade	81.7 -24.7	82.0 -25.7	80.3 -25.7
In-place Density, %	93.1	92.3	93.7

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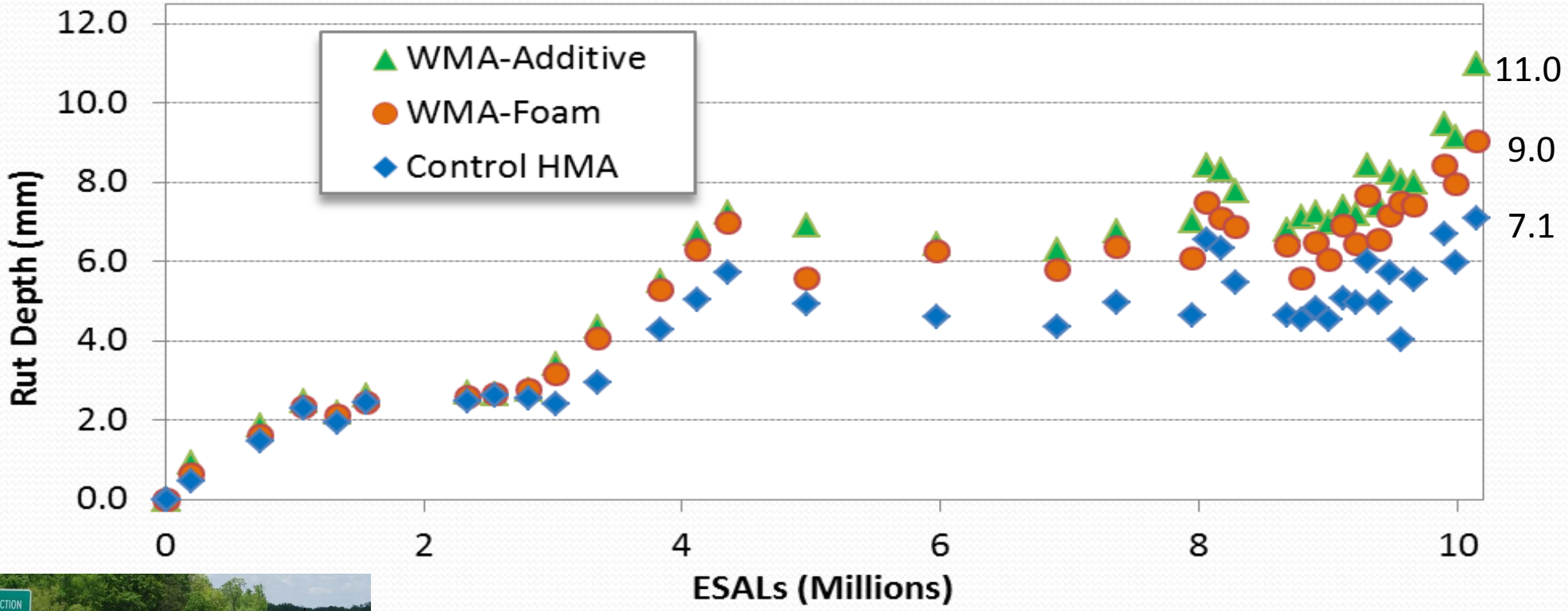
WMA Rutting Performance



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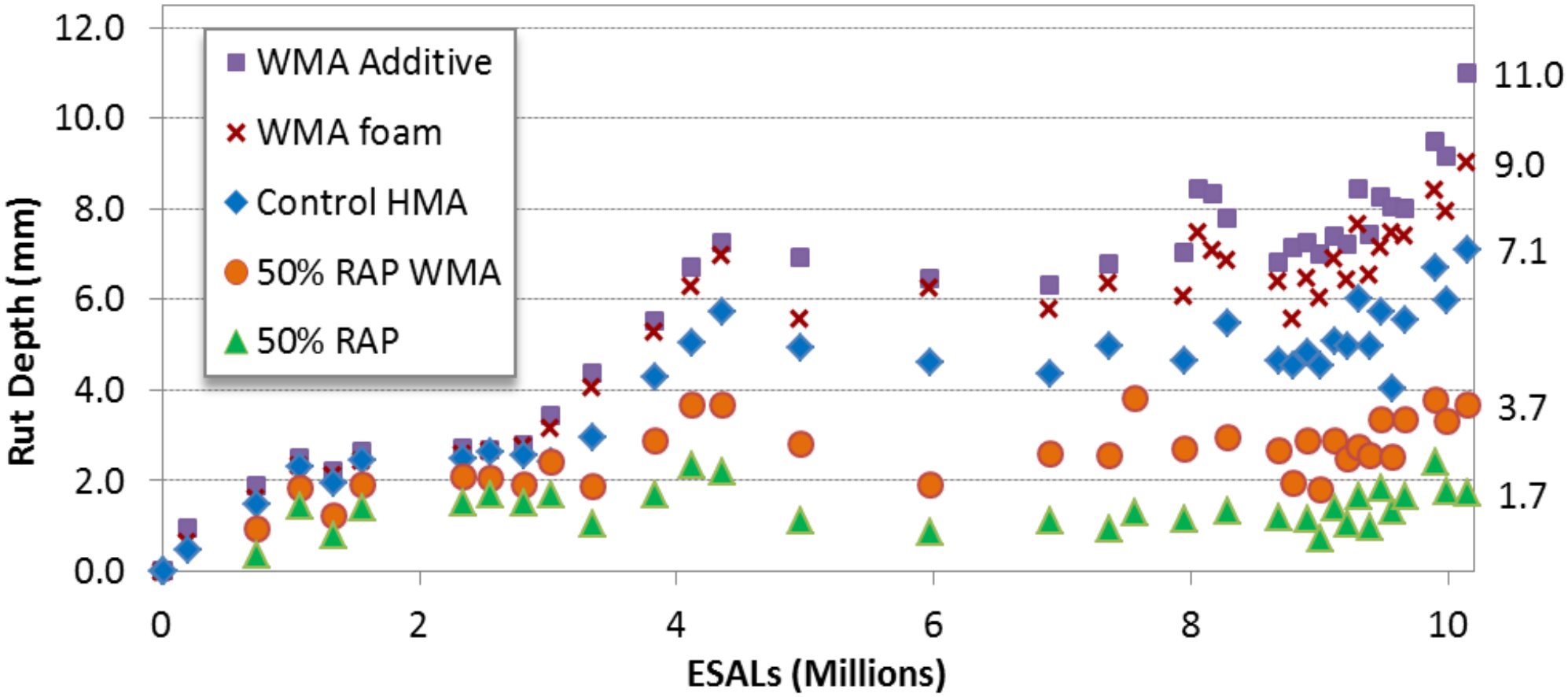
WMA Rutting Performance



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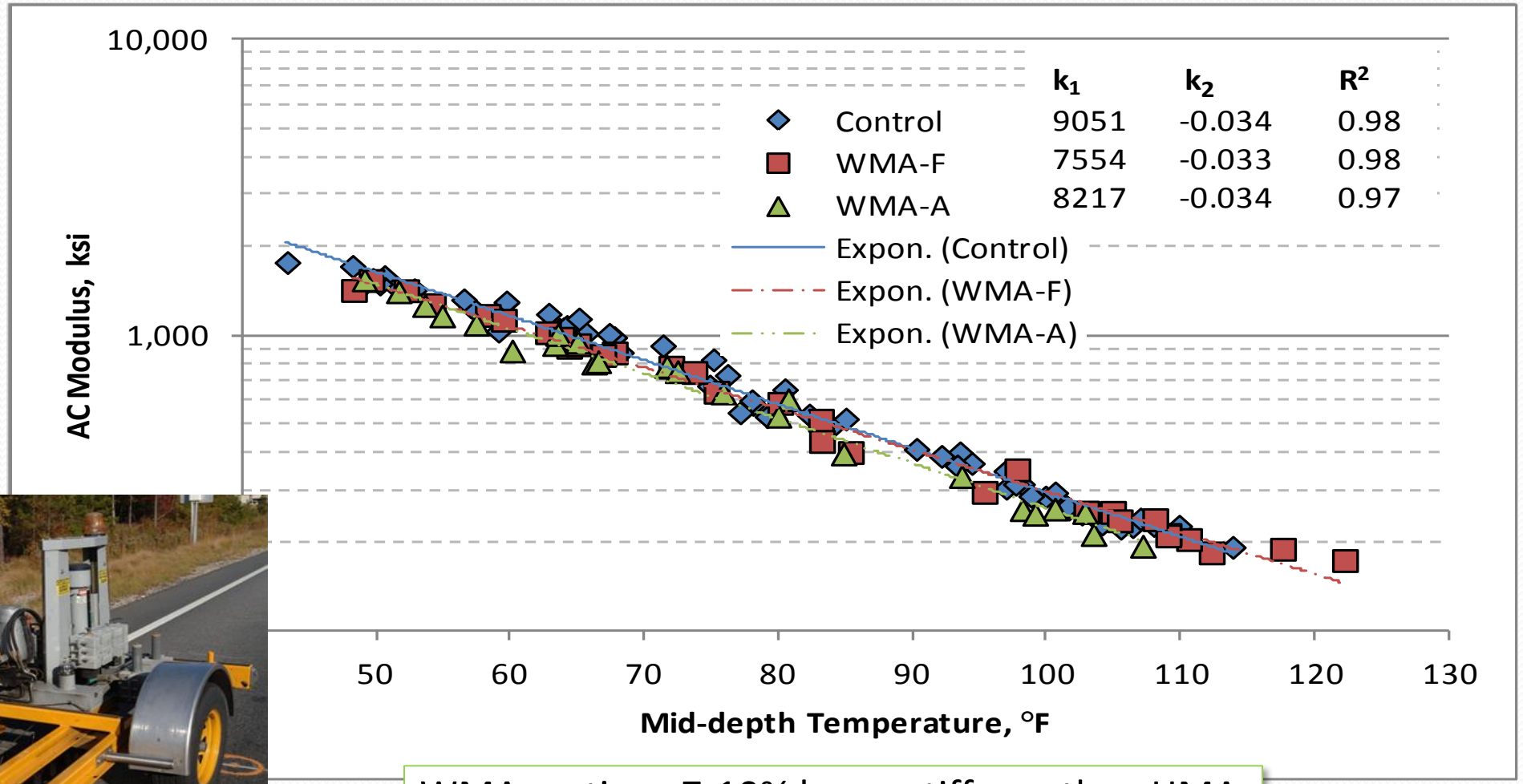
Back-calculated AC Modulus vs. Temp.



WMA sections 7-10% lower stiffness than HMA

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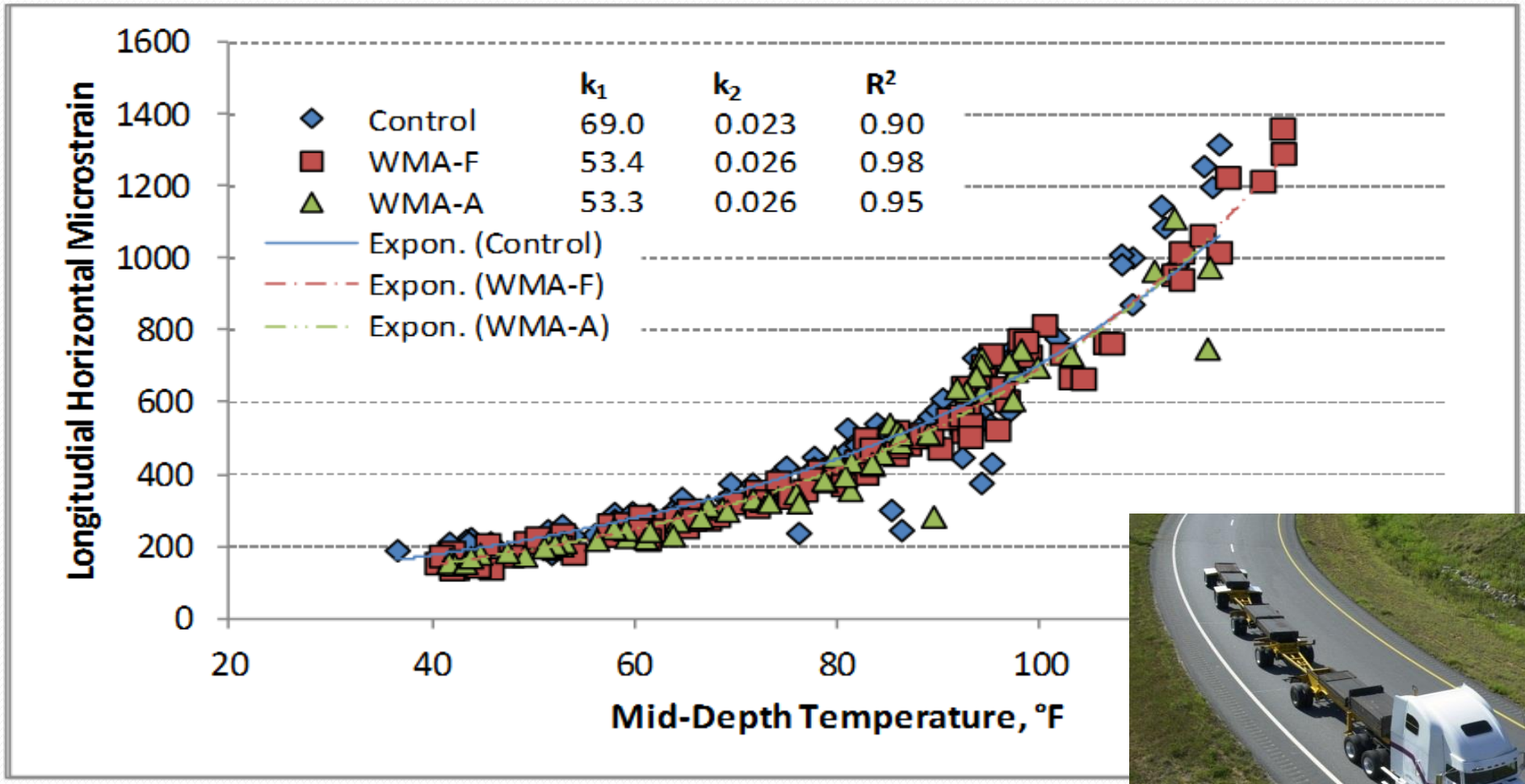
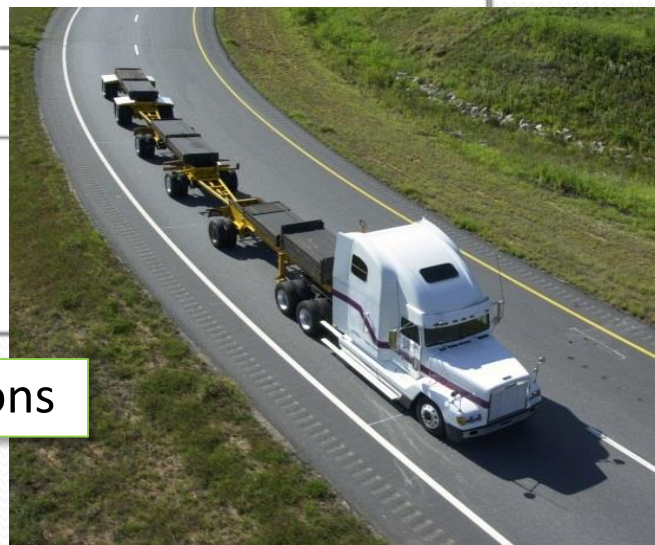
Critical Strain vs. Temperature





No Statistical Difference between WMA and HMA sections

Updated Field Performance

Section	15 Million ESALs	
	Cracking % of Lane Area	Rutting (mm)
Control HMA	2%	9 mm
WMA – Foam	11%	12 mm
WMA – Additive	18%	14 mm
50% RAP HMA	0%	4 mm
50% RAP WMA	3%	5 mm

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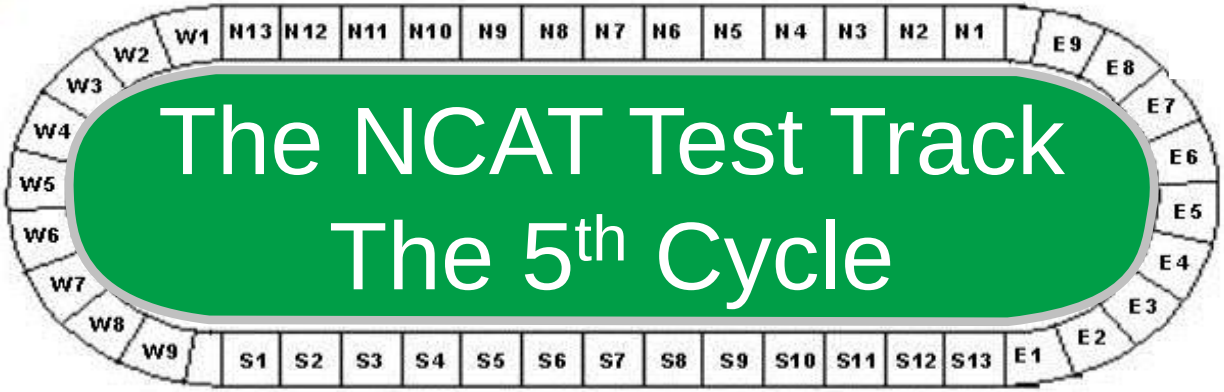
Summary of What We Know About WMA

- WMA provides numerous benefits for asphalt mix production and pavement construction
- Energy and emissions reductions with WMA are proportional to temperature reduction
- WMA and RAP work well together
- Structural response of WMA is similar to HMA
- WMA may have some lab properties that differ from HMA, but performs equal to HMA in the field

The NCAT Test Track
The 5th Cycle



2012 Green Group Experiment

- Rut resistant, durable surface layers
  - SMA with recycled materials, no fibers
- Stiff intermediate layers
  - High modulus mixes with high RAP, RAP & RAS
- Strain tolerant base layers
  - Arizona-type gap-graded asphalt rubber
  - High polymer content mix with RAP
  - Traditional rich-bottom mix with RAP
- Thinner Overall Cross Section

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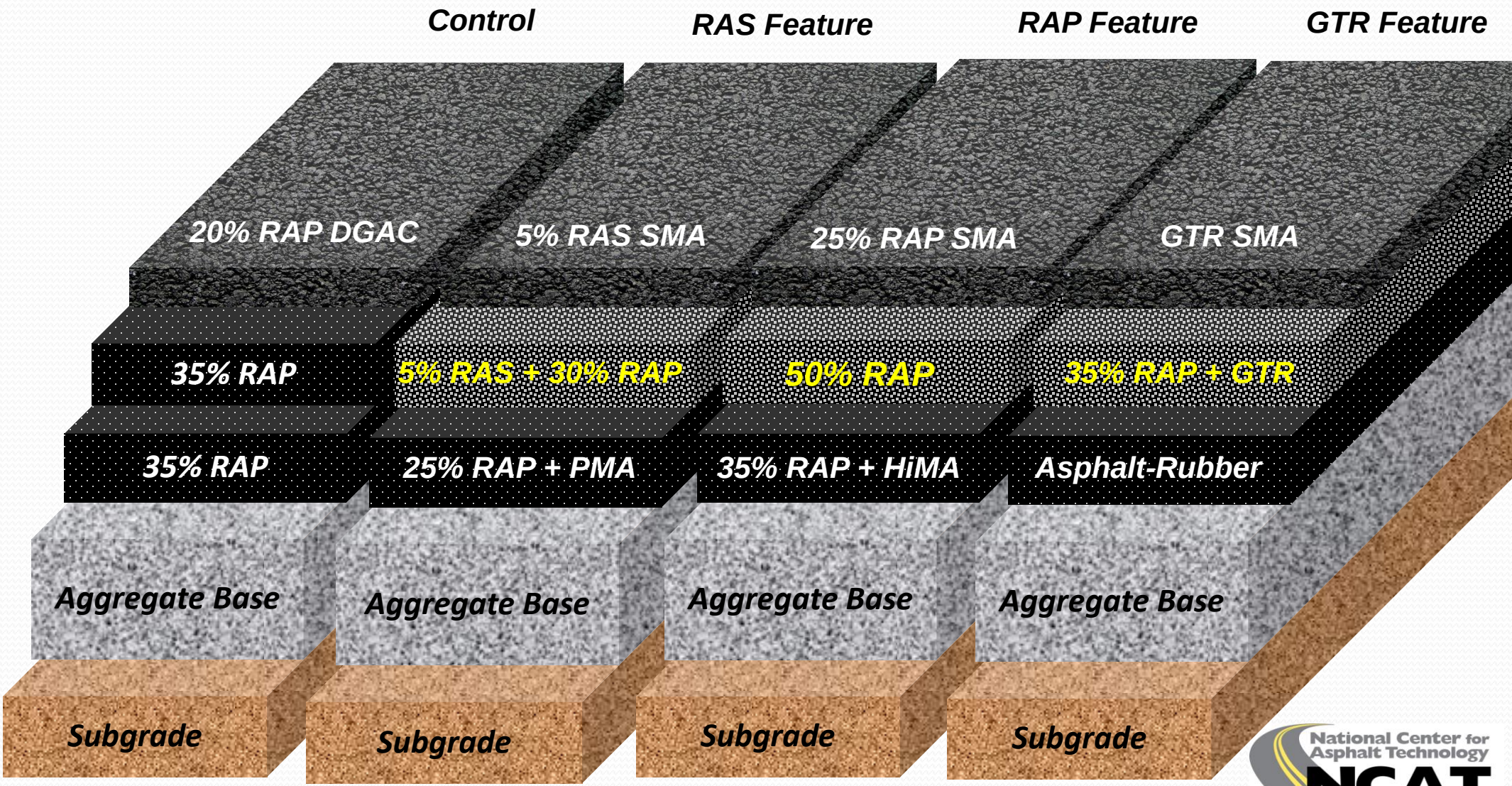
All Asphalt Mixes Produced with a WMA Technology



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End-of-Cycle Track Conference

- WMA & high RAP/RAS/GTR mixes
- Optimized structural design
- Pavement preservation
- Implementation

Pavement Test Track Conference

March 3-5, 2015

The Hotel at Auburn University and Dixon Conference Center

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Spotlight

Fall 2012 Newsletter Available

Upcoming Events

NCAT News

NCAT Recommendations on Characterizing RAS

Sold-Out Fifth Research Cycle Focuses on Reducing