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# Applied Research Activities

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Associate Principal Scientist

VAA Fall Conference - October 2013



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## **Quiet(er) Pavements (Code of Virginia § 33.1- 223.2:21)**



# Asphalt Technologies

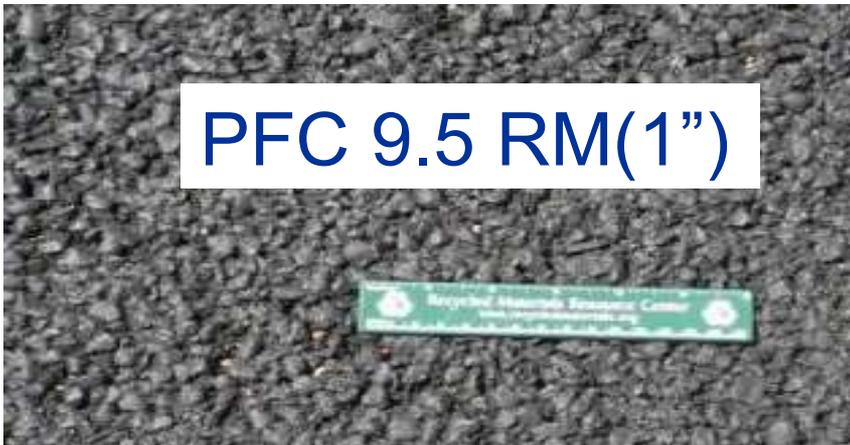
PFC 9.5 (1")



PFC 12.5/12.5RM(2")



PFC 9.5 RM(1")



Control - SMA-9.5



# Demonstration Projects 2011/12

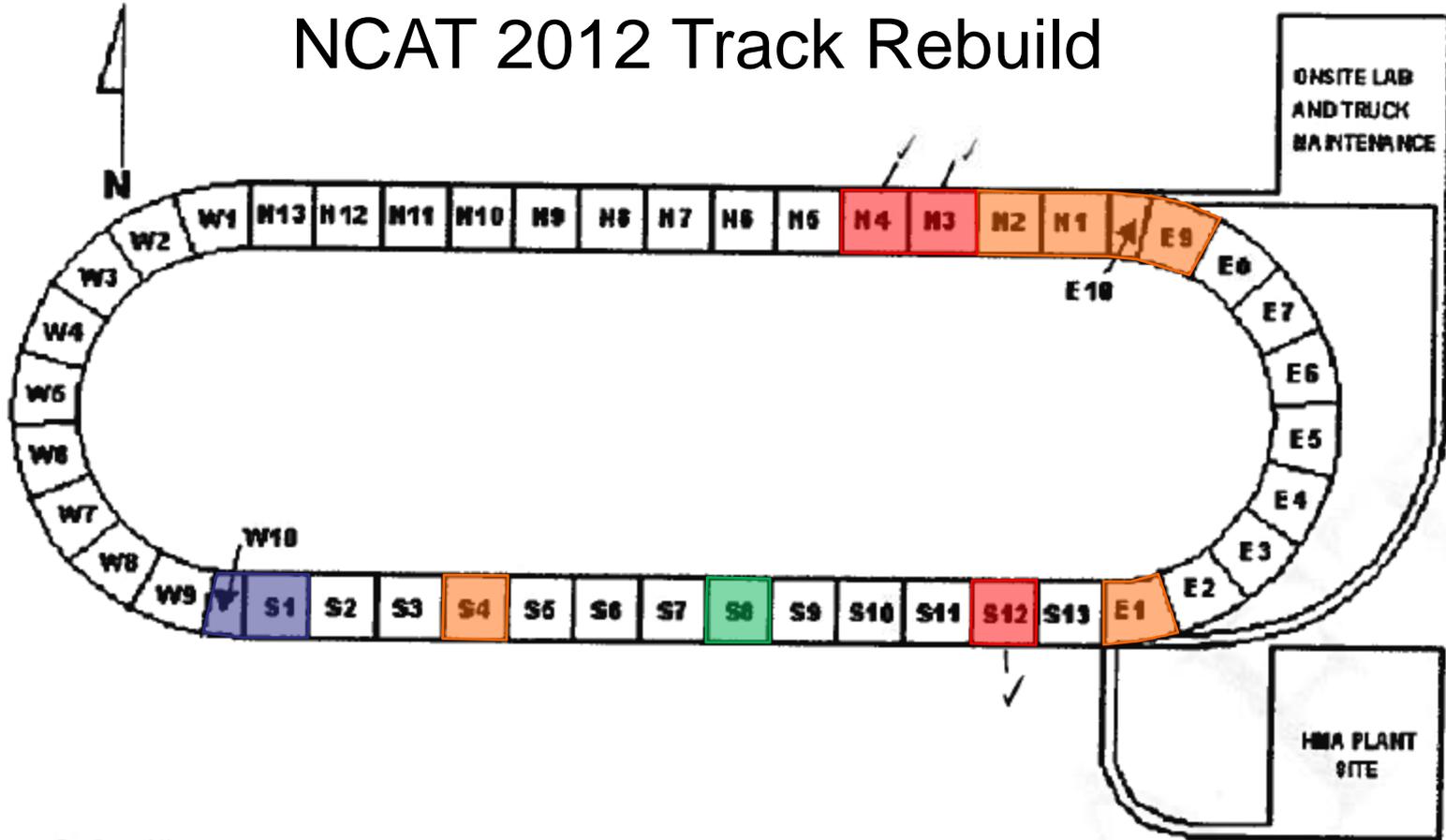
8 NCAT



- 1 SR 7 By-Pass in Leesburg (A)
- 2 SR199 west of Williamsburg (A)
- 3 SR 288 near Chester (A)
- 4 I-64 Virginia Beach (C)
- 5 SR 76 Richmond (C)
- 6 Fairfax County Parkway near Chantilly (A)
- 7 US 17 Near Marshall (A)



# NCAT 2012 Track Rebuild



 - 2012 Virginia PFC

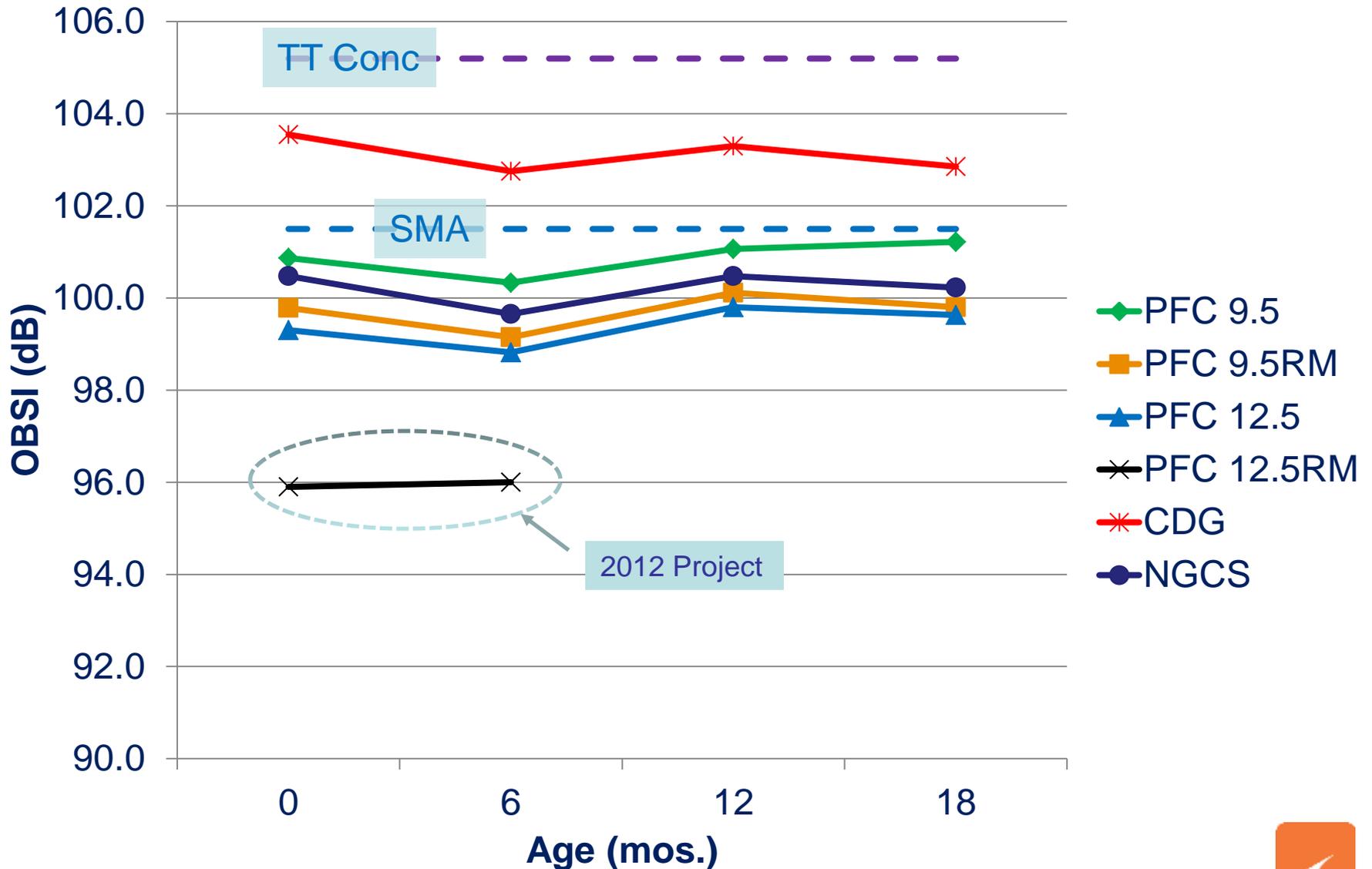
 - 2012 Other PFC

 - 2009 Other PFC

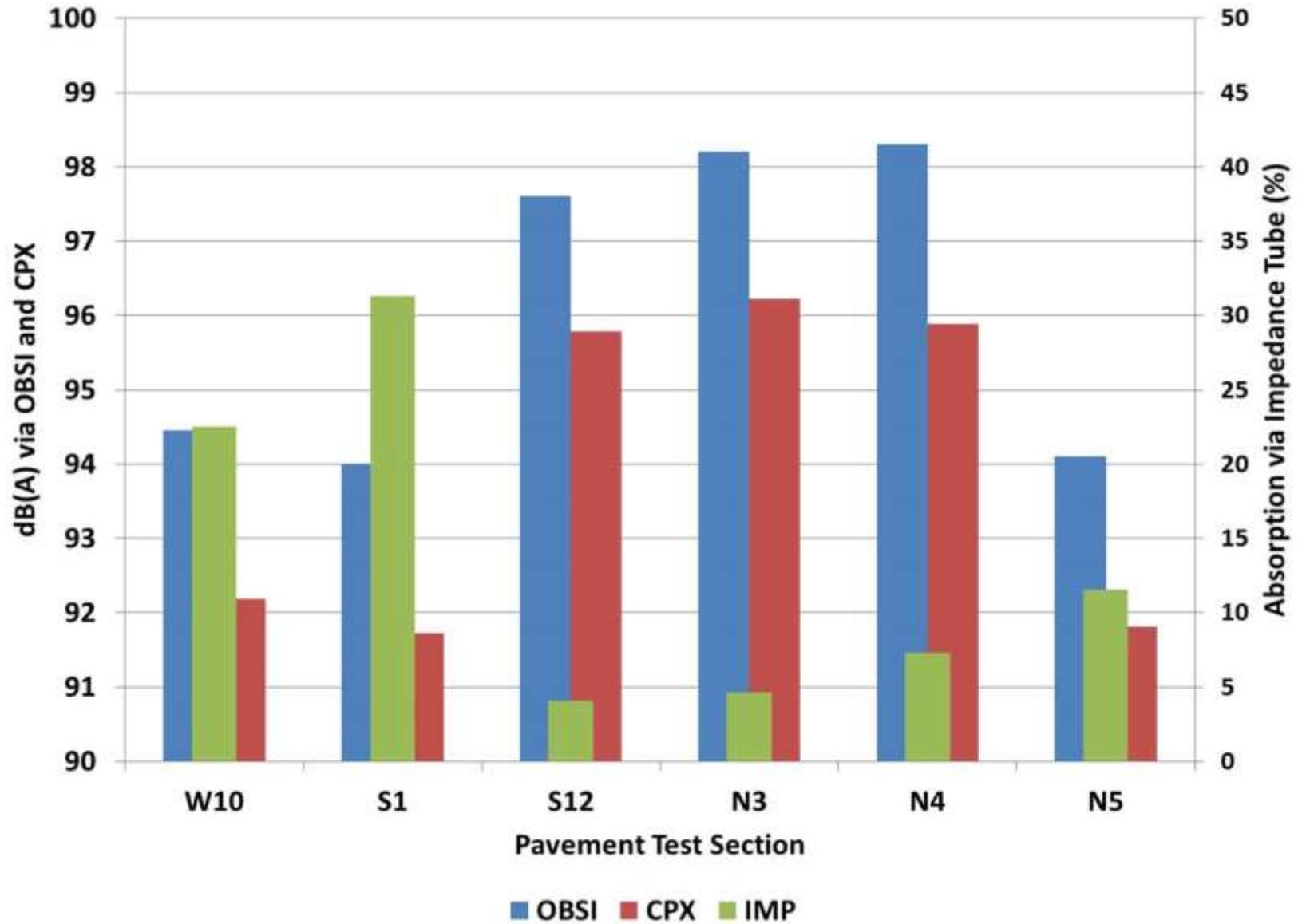
 - 2012 Virginia SMA/DGA/Recycle



# Noise Intensity vs. Time (VA Sites)



# NCAT Sections – Fall 2012



# Status of Program

- Difference between lowest-noise QP and control surfaces - readily noticeable after one winter ( $\geq 5\text{dB}$  difference)
- Ongoing:
  - Functional Testing (noise, ride, friction)
  - Winter performance/maint. requirements
  - Structural Condition (spring coring?)
  - Monitor related national/international activities





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**Final Report - [Now due June 2015 \(2013 Legislation\)](#)**

**Interim Report 2013:**

**[http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/HD92013/\\$file/HD9.pdf](http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/HD92013/$file/HD9.pdf)**



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## Fiber-less SMA



# SMA without Fiber – SP

- Section 248 – SMA Concrete
  - “Fiber Additive” references deleted
  - Table II-25 (SMA Composition) – amended to reduce minimum AC from 6.3% to 6.0%
  - Mixing Temps – “recommendations of WM additive supplier”
- Section 317 – SMA Pavement
  - “Fiber Additive” references deleted
  - Haul/Placement temps – “recommendations of WM additive supplier”



# Mix Design

## Control

- SMA 12.5 (76-22)
- 15% RAP
- 6.3% Asphalt Cement
- Additives – 0.6%  
Evotherm
- Comp. Temp - 300° F

## No-Fiber

- SMA 12.5 (76-22)
- 15% RAP
- 6.3% (and 6.0%?)  
Asphalt Cement
- Additives – 0.6%  
Evotherm
- Comp. Temp - 275° F



# Notes on Mix Design (w/o fibers)

- Standard lab procedures → a “Screamin’ Mess!”
- Procedure that worked:
  - Mixed at 320° F
  - Compacted at 275° F (~5 minutes later)
- Drain down (6.3% AC):
  - 0.19% (300° F), 0.13 (275° F), 0.0 (250° F)

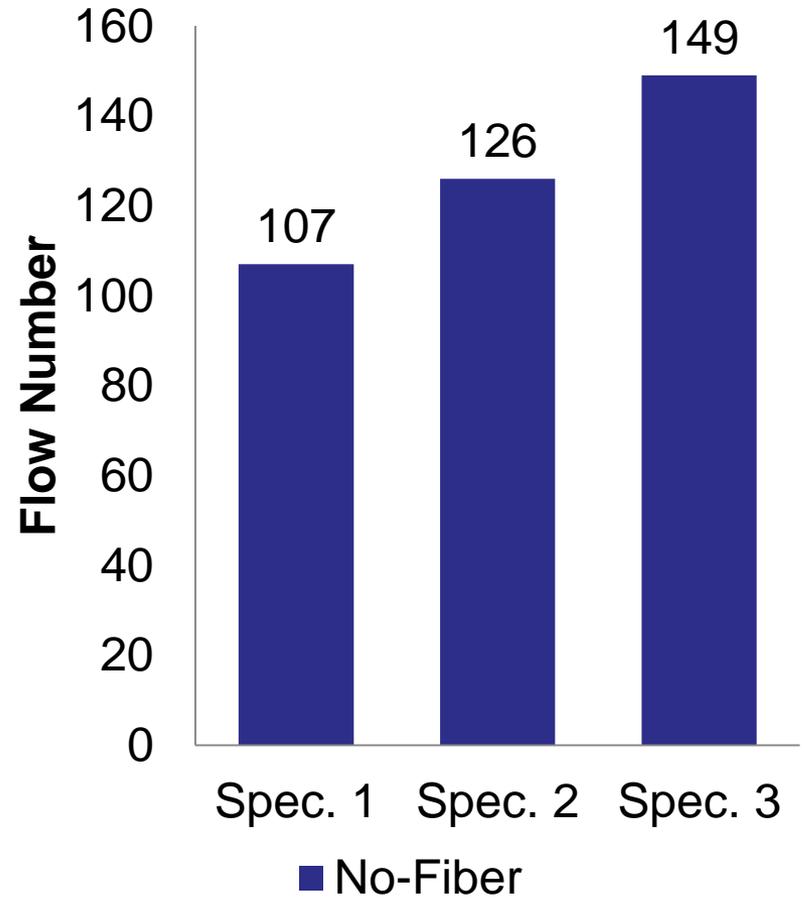
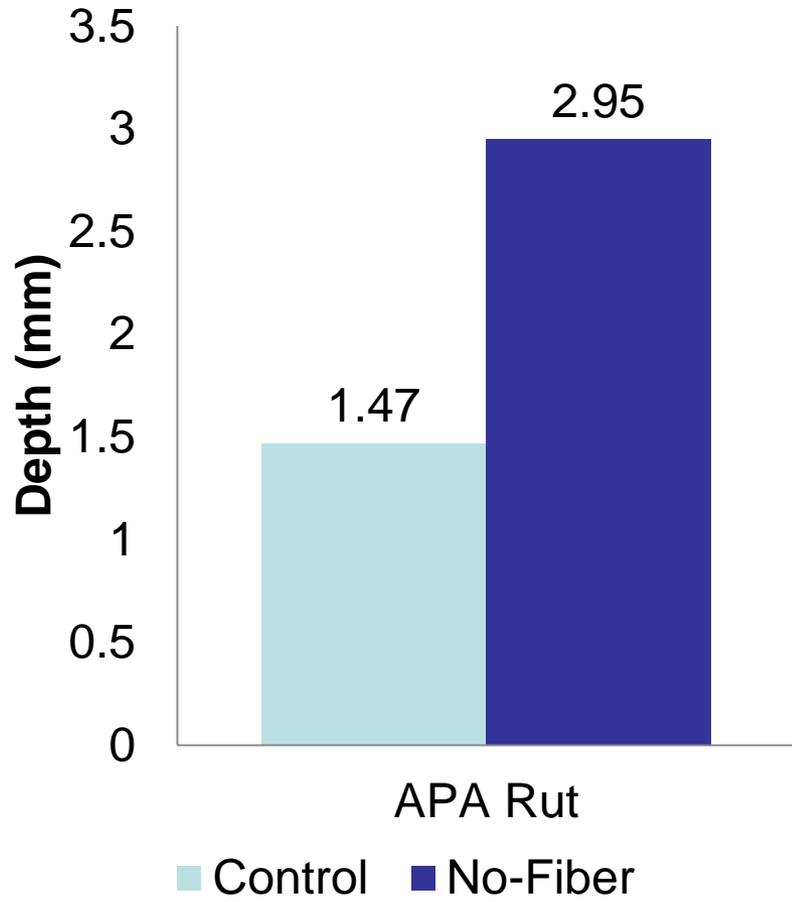


# Notes on Production (w/o fibers)

- Original Plan → divide day/night into half with 6.0% and half with 6.3% AC
- Actual (July 23/24) → 1,202 tons at 6.0%
- Shipped/sampled/specimen prep:
  - 275° F – all good
  - 250° F – slow feed
- Visual observation – thicker liquid asphalt coating



# Preliminary Lab Results



# Saved 0.3% liquid and fibers, but...

- Long-term performance?
- QA/monitoring – reheats not “business as usual”
- Production → haul → placement:
  - **Continuous** process @ uniform temps
  - Reasonable haul distances
  - Sufficient trucks
- Storage – not for long
- General fault tolerance – not much



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# Scaled Accelerated Testing



# Research Objective

- Evaluate stability and durability of:
  - SM-4.75 mixture (HR) – 1" (lab and field)
  - THMACO mixtures –  $\frac{3}{4}$ " (1")
  - SM-9.5 A & D mixtures (HR) - 1  $\frac{1}{2}$ "
  - SM-12.5 D (HR) – 2" (1  $\frac{3}{4}$ " )
- Assess capability of MMLS3 - 1/3 scaled accelerated trafficking machine



# “Field” & Laboratory Testing



FHWA ALF Pads



Un-trafficked



Trafficked

Lab Testing  
Frames



# Conclusions - Preliminary

- SM 4.75 mixes very rut resistant (when adequately compacted)
- Rut-resistance of dense-graded mixes inadequate when void level  $> 10\%$
- THMACO (gap-grade mix) exhibited good stone-on-stone contact despite high voids
- The MMLS3 – good tool to assess relative performance of thin wearing course materials





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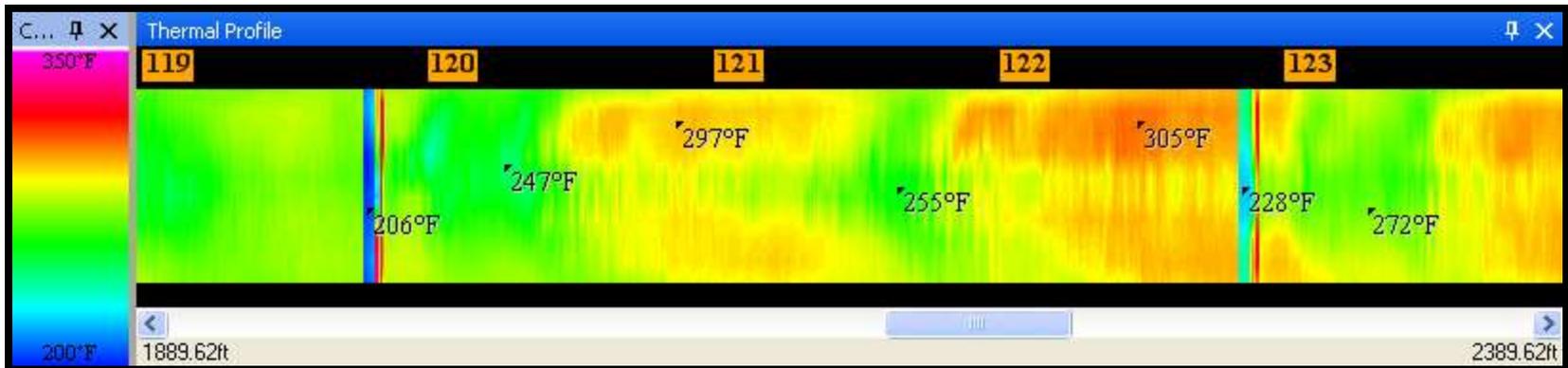
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# Uniformity – Virginia Case Studies (Support for Asphalt Quality Task Force)



# Thermal Profile – Operation A

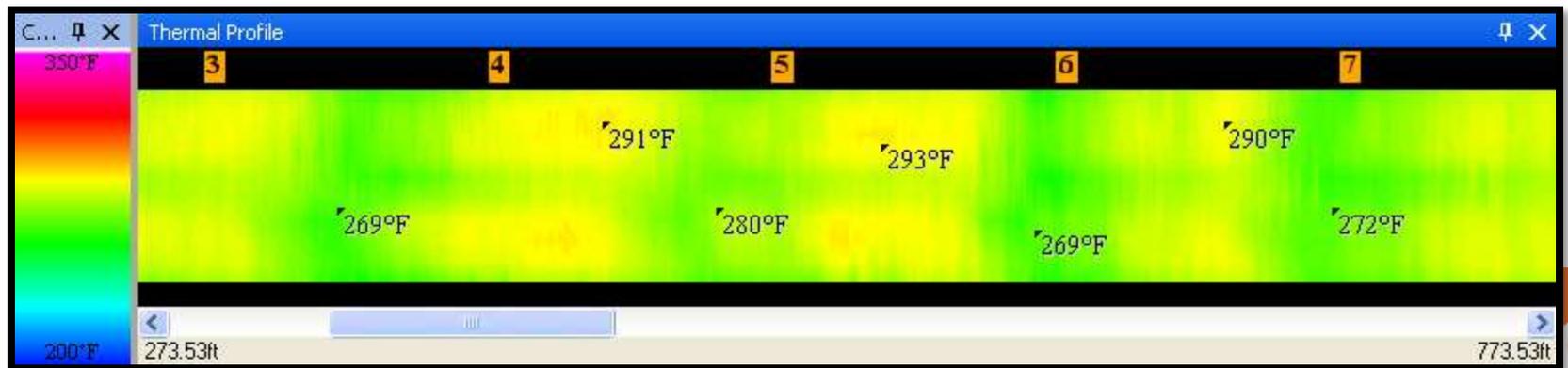
- Blaw-Knox MTV
- Paver ~ 50% idle time
- Truck-end patterns
- Temp. diff 40-60 F
- 46% of profiles > 50 F



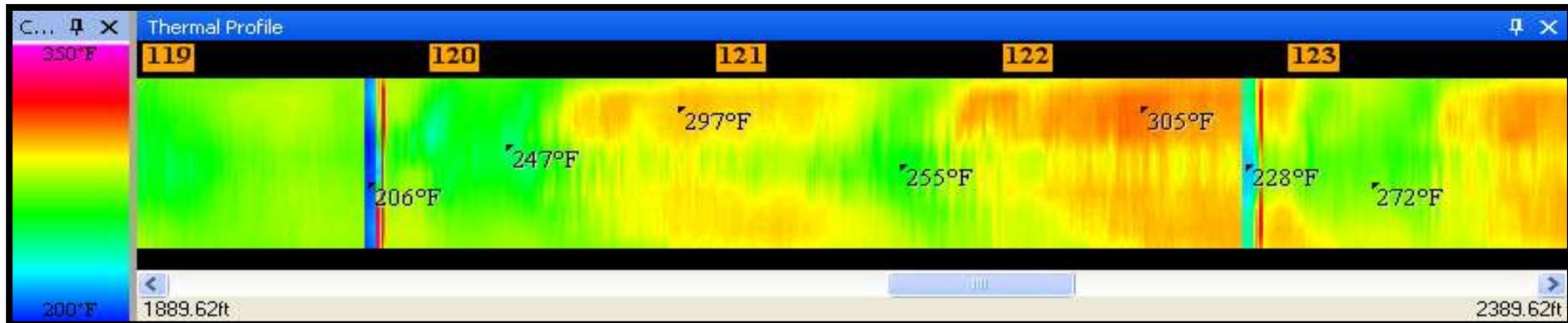
Example 500' of Thermal Profile from Operation A

# Thermal Profile – Operation B

- Roadtec MTV
  - Capacity ~ 1 truck
- Truck patterns visible
- Paver ~ 12% idle time
- Temp diff 23 – 32 F
- 45% of profiles < 25



# Thermal Profile – Operation A



# Thermal Profile – Operation B





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**Stay Tuned...**