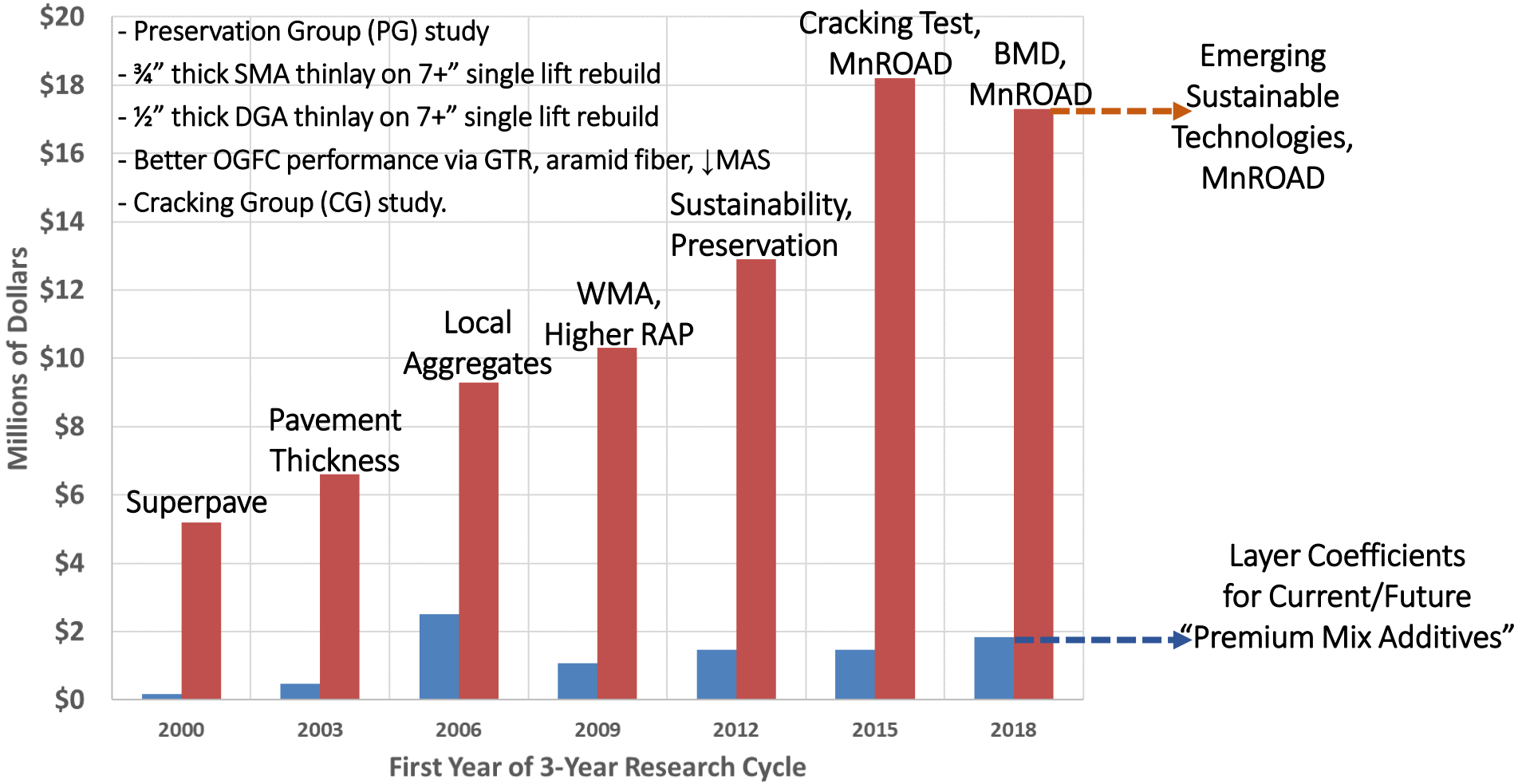
Alabama Department of Transportation Implementation of Findings from the NCAT Pavement Test Track Conference

June 22, 2021

Track/Partnership History



ALDOT Implementation from Past Research

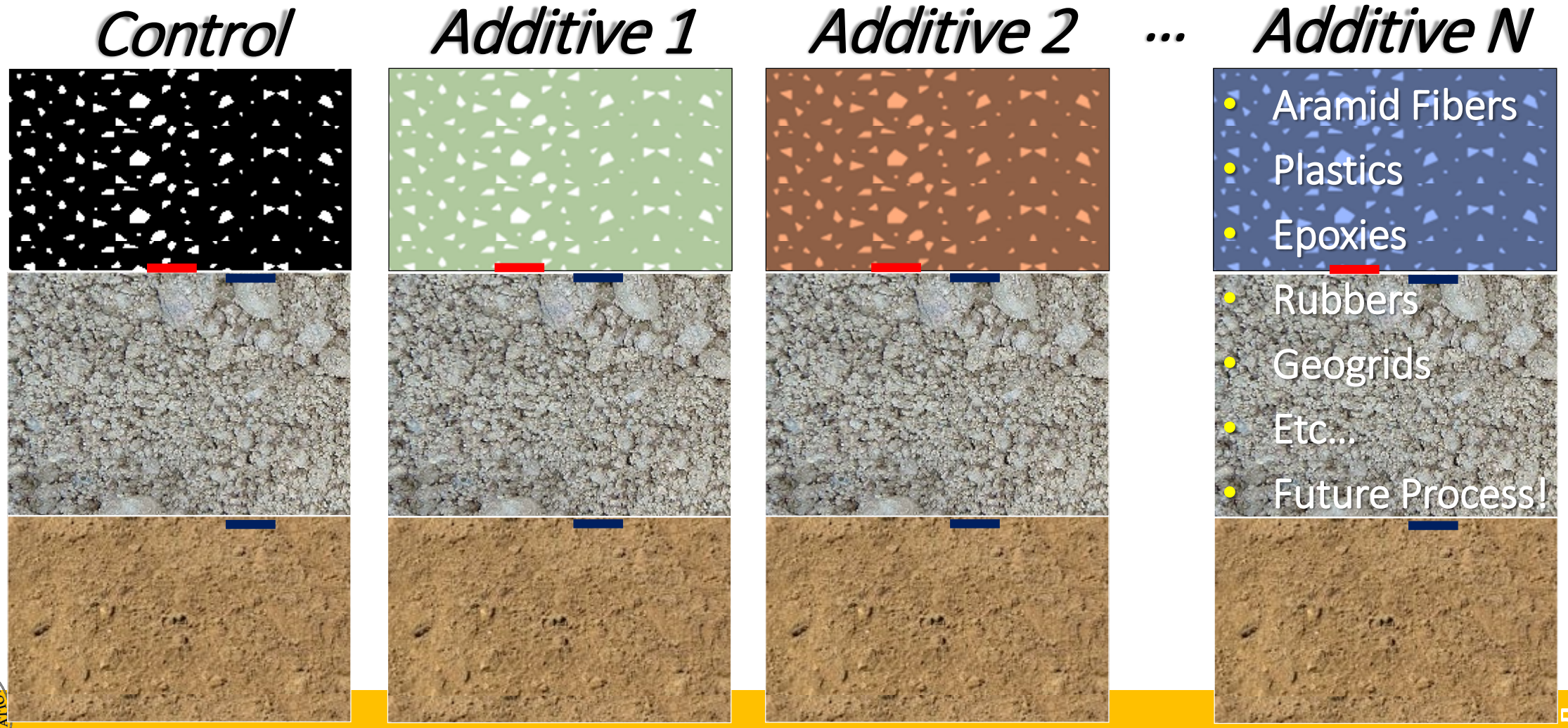
- Reducing design gyrations for Superpave (from 135 to 60)
- Good performance, reduced permeability for fine, dense gradations
- SMA and OGFC mix designs for local Alabama aggregates
- Best use of neat, polymer, and highly polymer modified binders
- Recalibrated layer coefficients for modern mix/material/methods
- Objective selection of preservation treatments/combinations
- BMD framework for mix design approval and construction quality.

Highest Impact Track Implementation

- Targeted utilization of polymer modified binders
- Improved mix designs by lowering gyration levels
- Improved durability through use of finer gradations
- Layer coefficient recalibration for modern asphalt mixes

2021 Additive Group (AG) Study

Are "premium mix additives" worth the additional cost per lane mile?



Critical Need for OGFC Improvements

NCAT Partnership History

Tennessee Department of Transportation

National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

TN TDOT Department of Transportation

2000

- 2 Sections of 125 Gyration Superpave Mix with a TDOT BM-2 binder (25-mm) and D surface(12.5-mm) lifts.
- High gyrations -> low AC –> poor fatigue life
- Conclusion: Tennessee is a Marshall State.

2003

- 3 Sections
  - 75-gyration surface
  - SMA
  - OGFC

- All performed well, leading to trial projects of SMA and OGFC.

- Eventual widespread use of OGFC statewide

2006

- Continued traffic on 2003 Sections
  - 75-gyration surface
  - SMA
  - OGFC

- New surface section utilizing RAP
  - Successful section: leading to adoption of limited RAP use in Tennessee Surface Mixes.

2009

- Multi-state WMA and High RAP Study

- Successful use of WMA encouraged approval of warm mix technologies for use on DOT projects in Tennessee.

2012

- Pavement Preservation Group Study Sponsor
- OGFC mixture with Shingles
- RAS approved for use in Tennessee limited at 5%, later reduced to 3%.
- Several Preservation methods adopted into growing Preservation Program.

2015

- Pavement Preservation Group Study Sponsor
- “Thick Thin-lift” Placed a typical TDOT TL mix (4.75mm) at a standard surface course thickness.
- Mix performed well (little cracking or rutting), possible use of TL mixes in a more expanded role.

2018

- Pavement Preservation Group Study Sponsor

- Continued traffic on the TL section, with half of the section fog sealed.
  - Quantifying the effect that preservation fog sealing will have on traffic lanes.

TN TDOT Department of Transportation

2021

- Additive Group Experiment

- BMD Section.
  - Design section at specification minimum to evaluate the specification limits.
  - Design section from a contractor's perspective, attempt to anticipate how the specification may be interpreted.
  - Run parallel BMD testing w/ Marshall Equipment

Implementing Test Track Research

Virginia Department of Transportation

Brian Diefenderfer, PhD, PE

June 23, 2021

VDOT Sponsored Sections (2012)

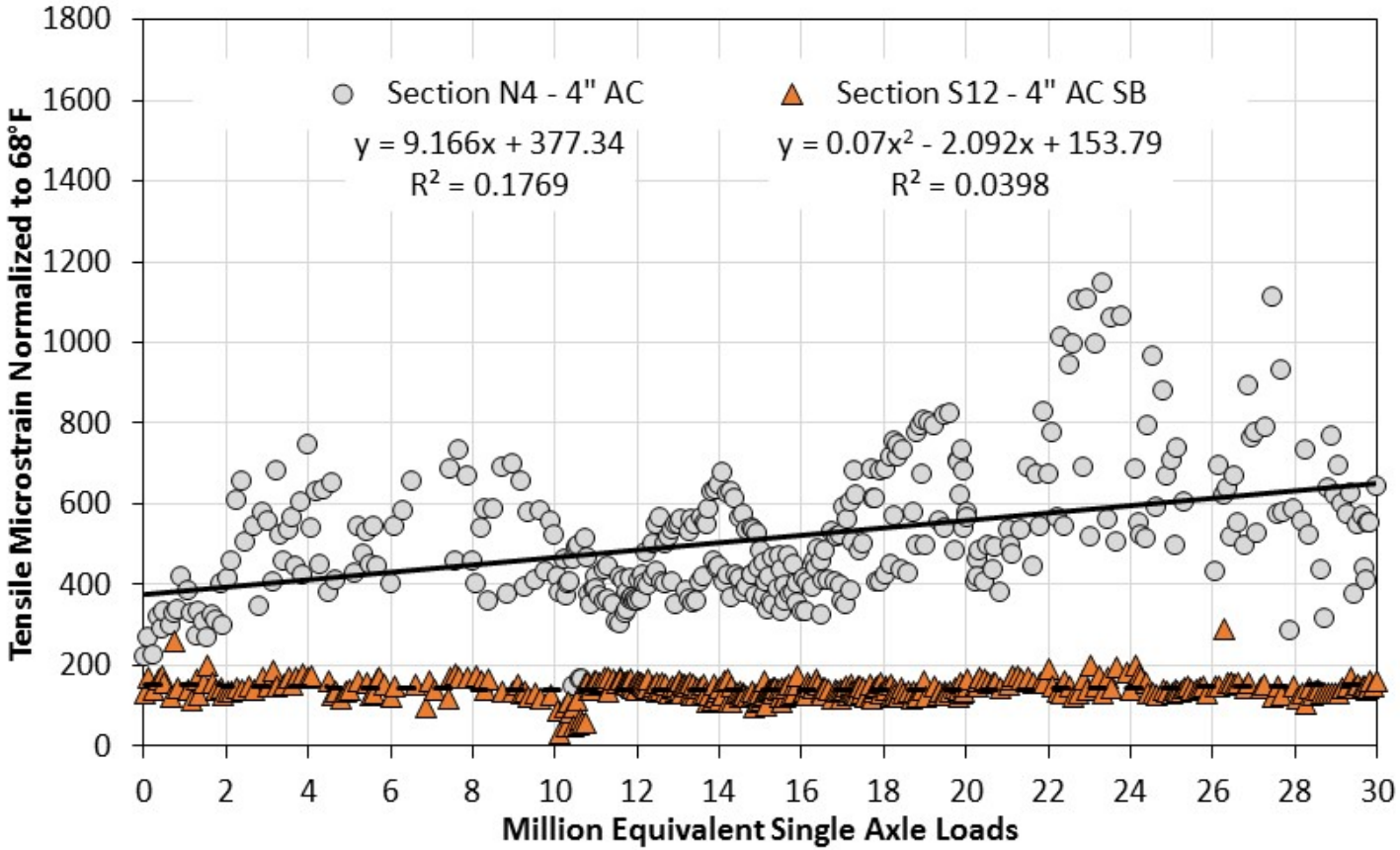
Some Results

N4

4-inch AC
5-inch CCPR
6-inch Agg Base
Subgrade

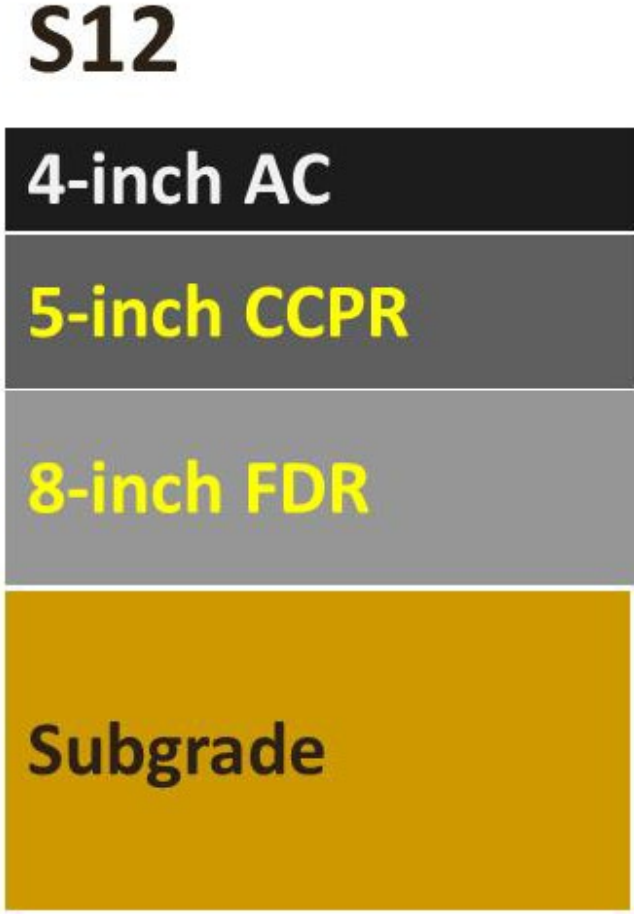
S12

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



Recycled Structures

- Recycled content
  - Layer 1 = 12.5% RAP
  - Layer 2 = 30% RAP
  - Layer 3 = 97% RAP
  - Layer 4 = 96% existing material
- Entire cross section
  - 76% recycled



I-64 Widening/Reconstruction

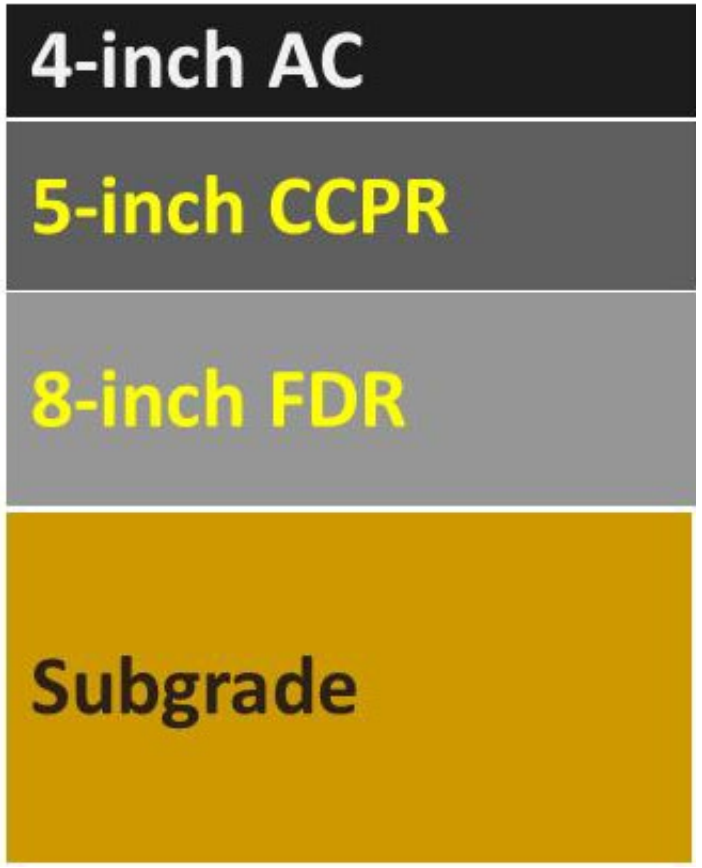
- Existing lanes
  - Remove 1960s era jointed concrete
  - Replace with new pavement
- New lanes
  - Add new 12 ft travel lane and 12 ft shoulders

- 2015ish, recycling design was proposed
- Based on S12, CCPR over FDR
- New lanes?
  - How to recycle material that doesn't exist yet?

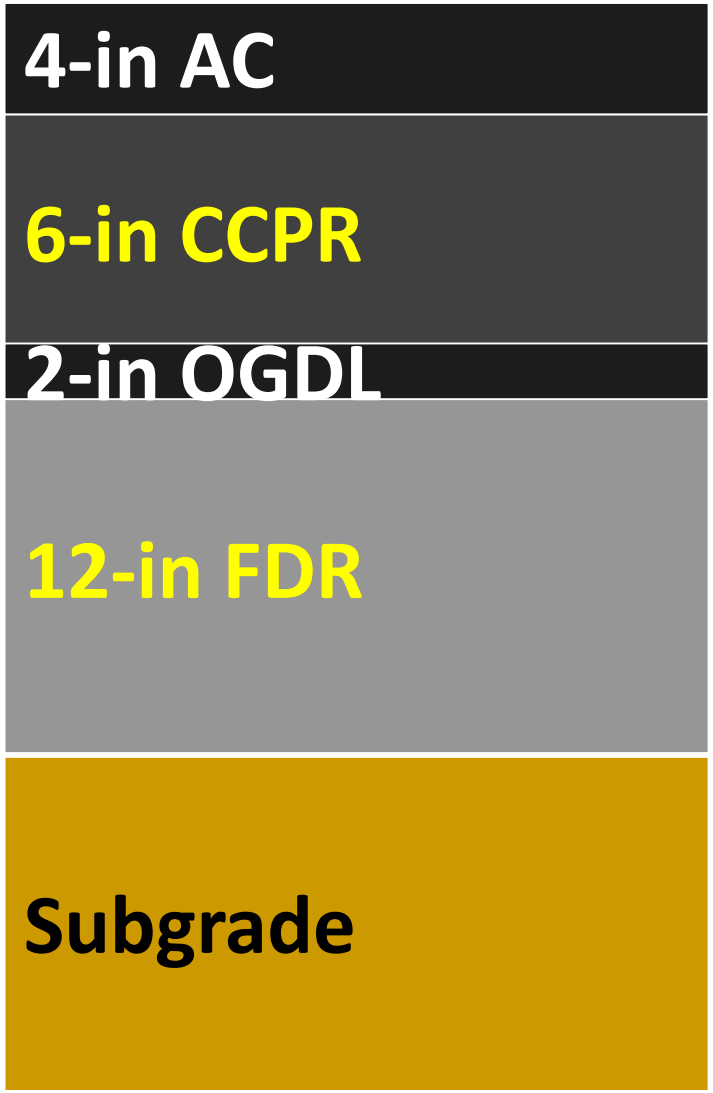
I-64 Widening/Reconstruction

- Existing lanes
  - Stabilize existing foundation with FDR
  - CCPR from existing RAP stockpiles
- New lanes
  - Import RCC or RAP, stabilize using FDR
    - Imported FDR
  - CCPR from existing RAP stockpiles

S12



I-64 Segment II

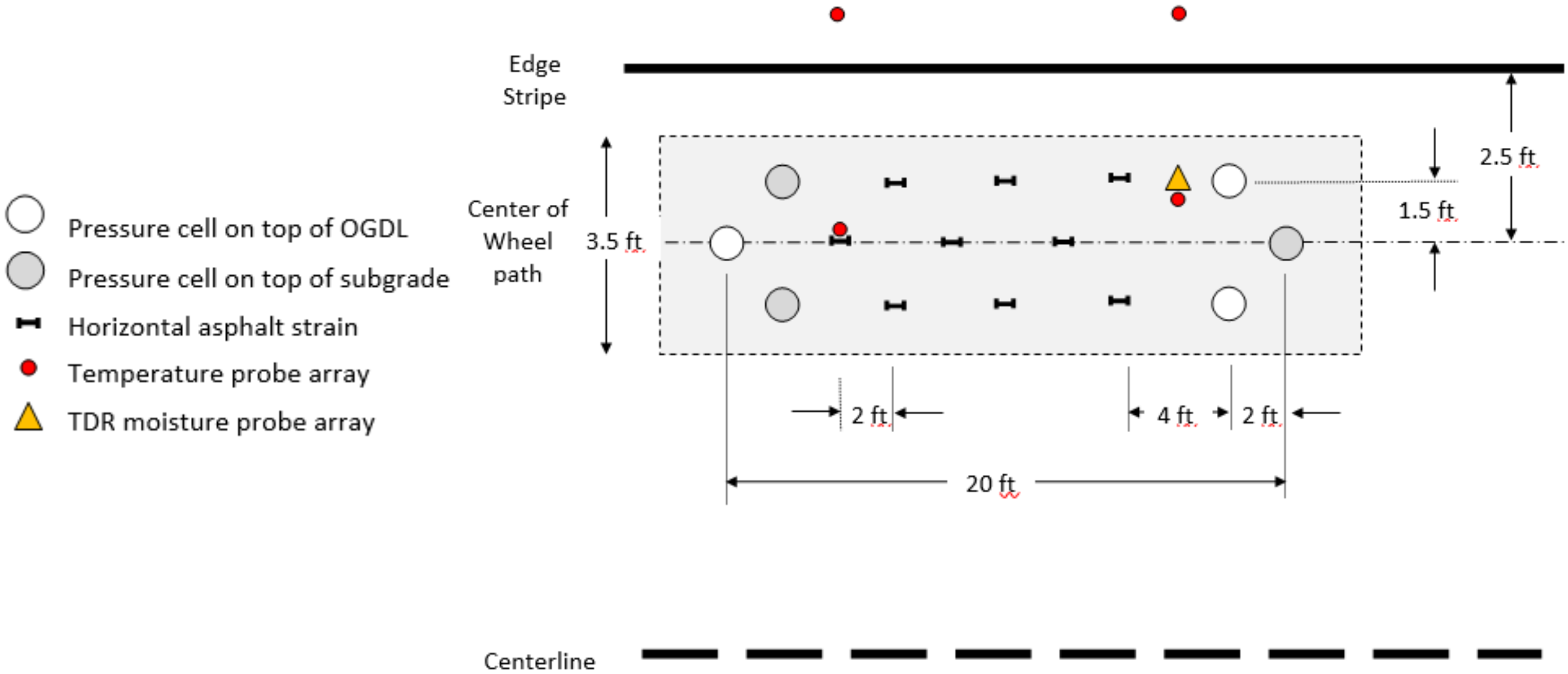


SN=7.06


MYERS

CCPR

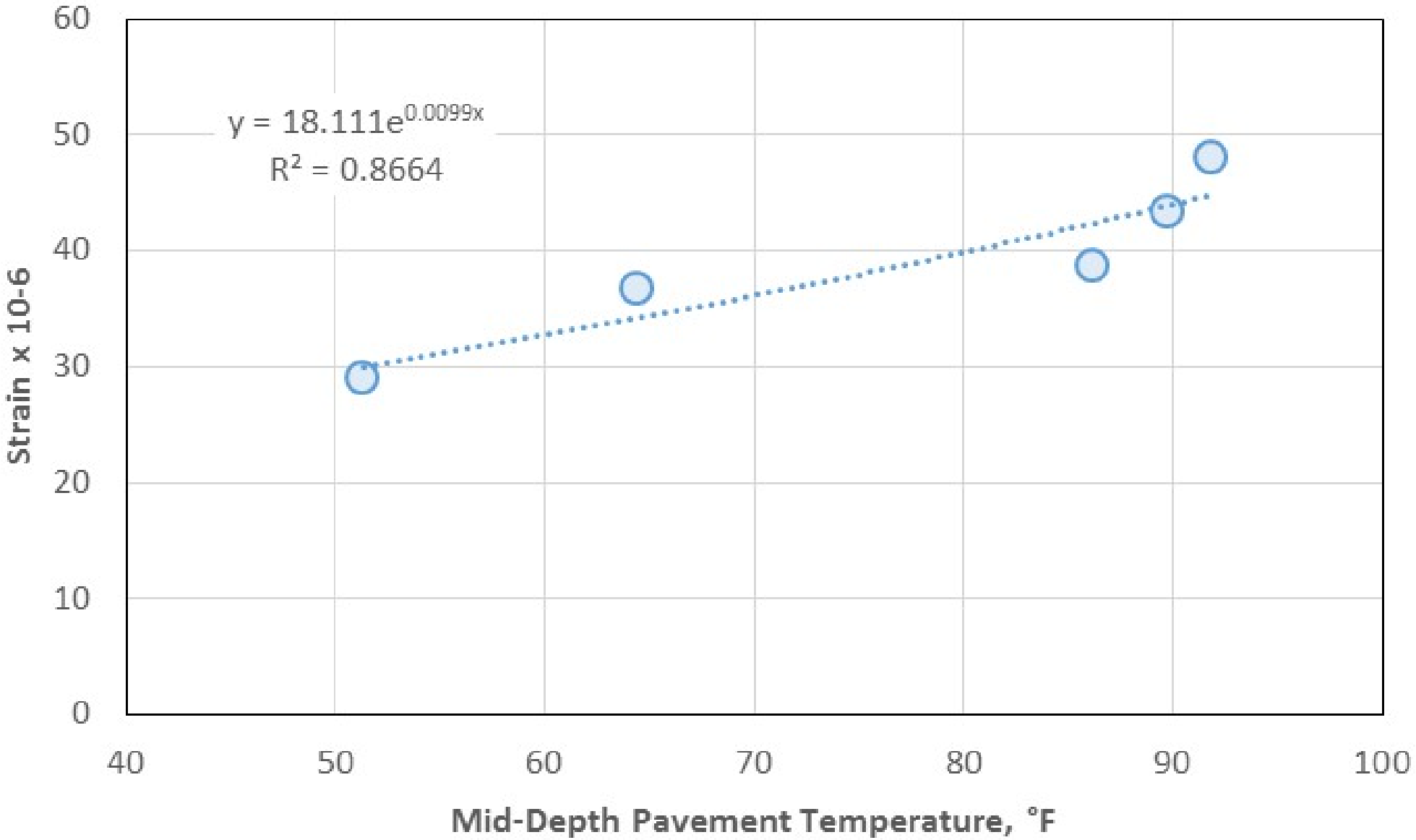
85% RAP, 15% #10s
2% foamed asphalt
1% cement
100% passing 12.5mm

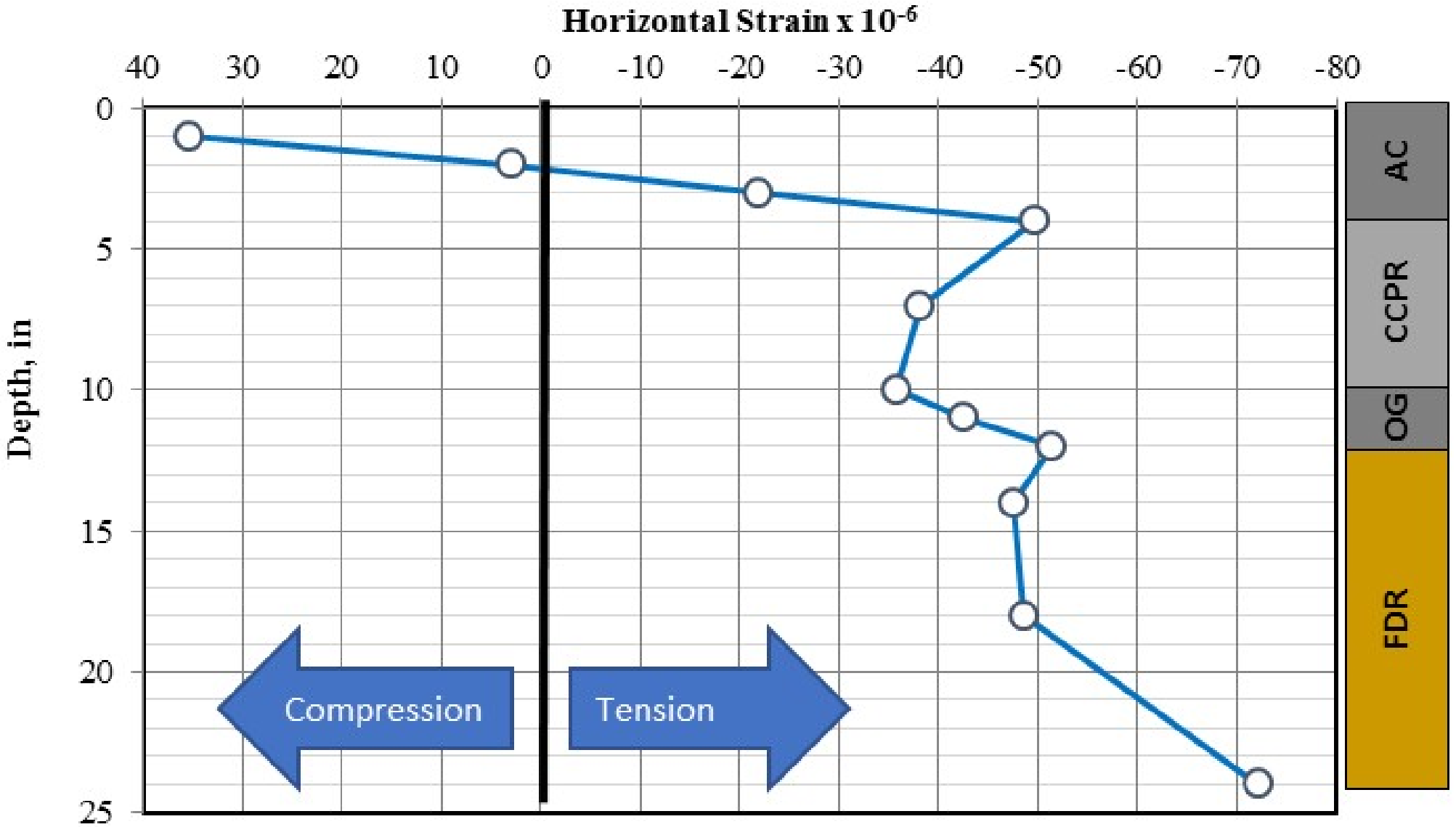

Pressure cell on top of OGDL
Pressure cell on top of subgrade
Horizontal asphalt strain
Temperature probe array
TDR moisture probe array
Edge Stripe
Center of Wheel path
3.5 ft
2.5 ft
1.5 ft
2 ft
4 ft
2 ft
20 ft
Centerline

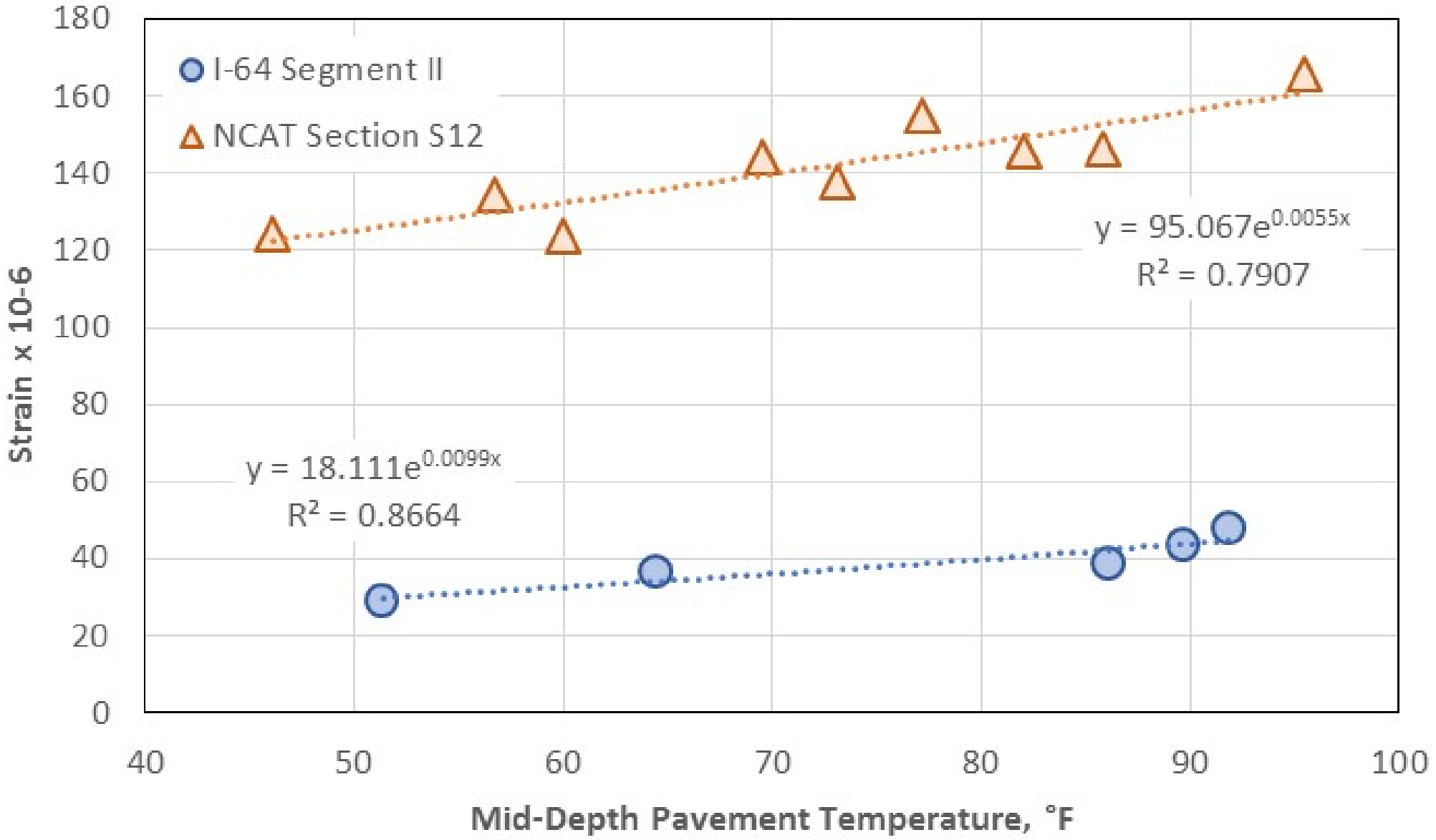

CAT


151687


RIDGID
66-706S
S1
S2
S3
S4
S5
S6
P5


y = 18.111e^0.0099x
R² = 0.8664
Strain x 10-6
0
10
20
30
40
50
60
40
50
60
70
80
90
100
Mid-Depth Pavement Temperature, °F


Horizontal Strain x 10-6
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Depth, in
0
5
10
15
20
25
Compression
Tension
AC
CCPR
OG
FDR


I-64 Segment II
NCAT Section S12
y = 95.067e^0.0055x
R² = 0.7907
y = 18.111e^0.0099x
R² = 0.8664
Strain x 10-6
Mid-Depth Pavement Temperature, °F
0
20
40
60
80
100
120
140
160
180
40
50
60
70
80
90
100

I-64 Widening/Reconstruction

- Segment II
  - 2016-2019
  - 7.08 miles x 10 lanes
- Segment III
  - 2018-2021
  - 8.4 miles x 10 lanes
- Each project was largest recycling job in US at the time

I-64 Recycle Design Benefits

- Saved $15 million
- Used 1 million tons of recycled material
  - More than 360,000 tons of RAP
- Reduced total primary energy demand by 25-45%
- Reduced global warming potential ($CO_{2\text{-}eq}$) by 15-40%

VDOT Benefits from Track Research

- Verified performance of CCPR over FDR design
  - Perpetual-type performance
- Knowledge transfer
  - Instrumentation, analysis methods

Thank you!

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