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VDOT Experiences with Traffic Speed Deflectometer Testing

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Southeastern States Pavement Conference
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Overview

1. Background
2. Previous research
    1. FHWA
    2. SHRP2
    3. Pooled Fund Study, 2013-2017
    4. VDOT
    5. Pooled Fund Study, 2018-2021
3. Summary

Traffic Speed Deflectometer

- What is it?
  - A specialized truck with a 20-22kip rear axle load
  - Can measure traditional surface-observable condition
  - Doppler lasers measure deflection slope
- What can we do with it?
  - Assess the structural capacity of pavements at traffic speed (~50mph)
  - …and measure rutting, ride quality, cracking, pavement and roadway images, cross slope

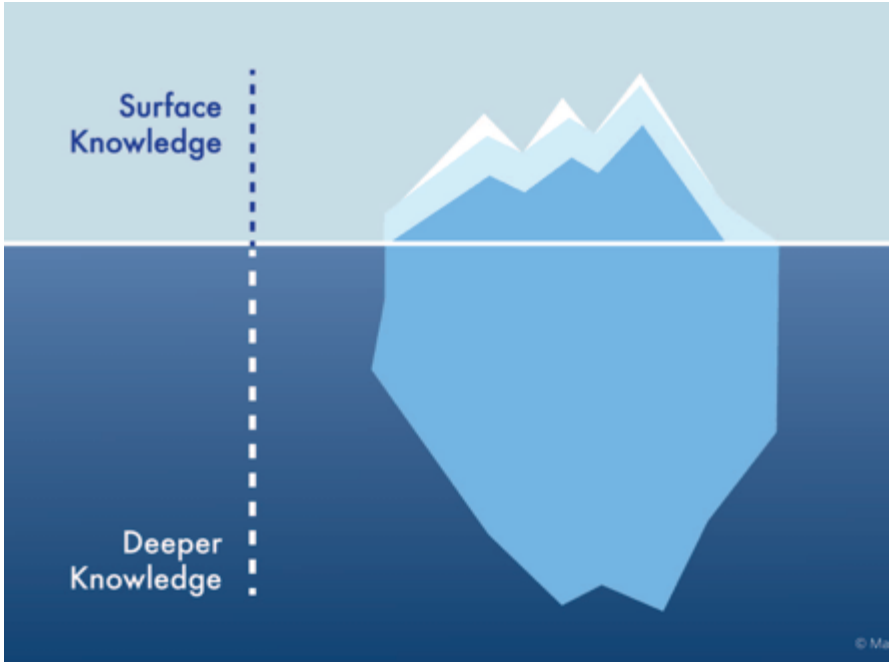
Benefits to Agencies

- Allow realistic production for network-level testing
  - Significant portions of a network can be covered daily
  - Include structural properties in PMS decision-making
- All this with…
  - Increased operator and public safety
  - Continuous (nearly) rather than discrete measurements


Measuring your road network
Traffic Speed Deflectometer
GREENWOOD ENGINEERING
US DOT# 2781554

Background

- Pavement decision making
  - Based on surface observed distresses
  - Structural capacity data on a pavement network is rare
- Structural testing
  - Current state of the practice is FWD
    - Lane closures
    - Discrete data



Background

- FHWA study, 2011 & SHRP2 study, 2013
  - Identified several traffic speed deflection devices
- Benefits included
  - Continuous collection
  - Collection at near highway speeds
- Future work should study accuracy and analysis methods

Background

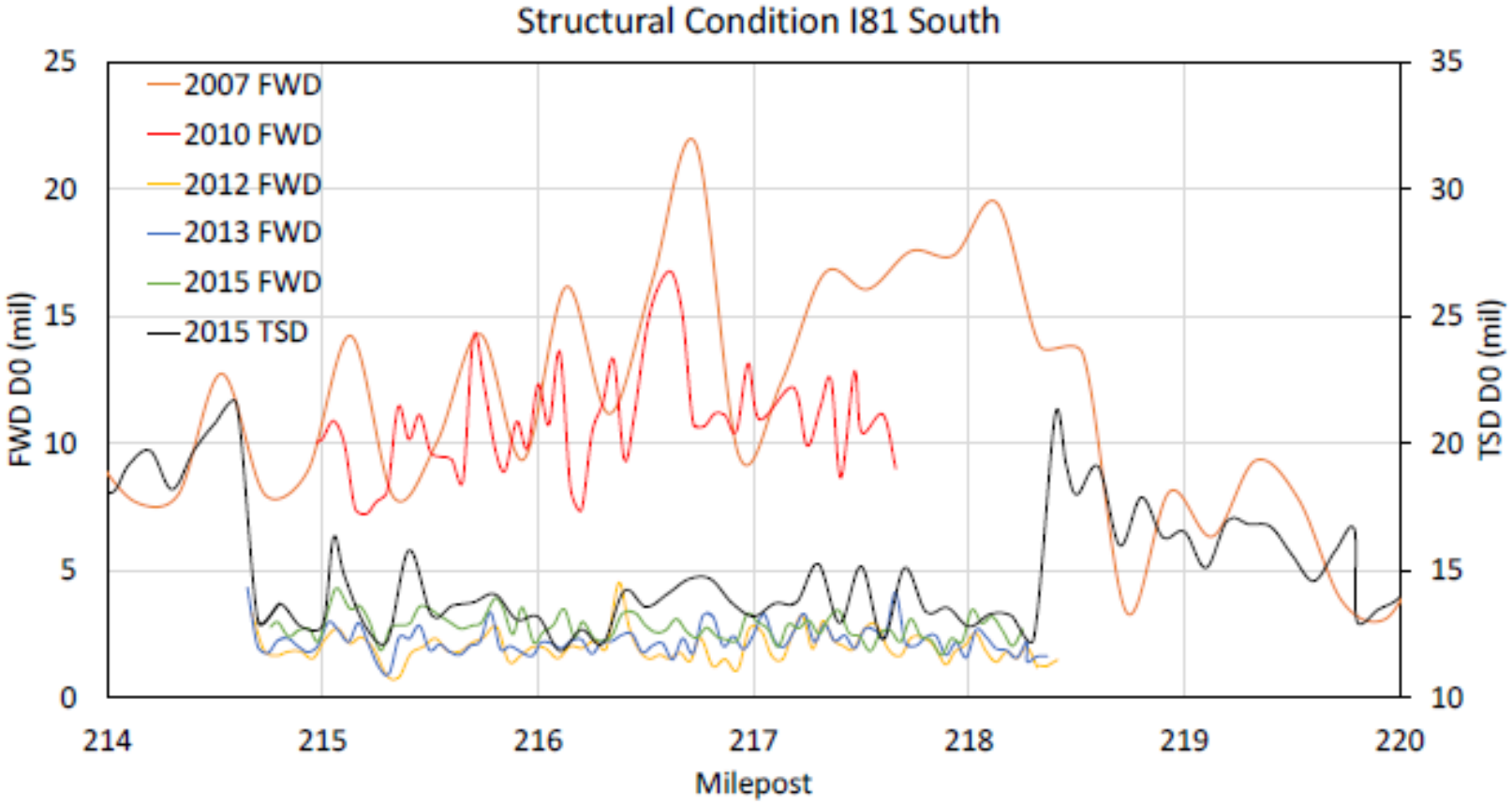
- FHWA study, 2012-2015 & TPF-5(282), 2013-2017
  - Focused on the devices identified previously
- Further studied TSDD data
  - Compared vehicle-measured pavement deflection with embedded sensors
  - Compared qualitative ranking of structural condition with FWD
  - Identified analysis parameters

TPF-5(282)

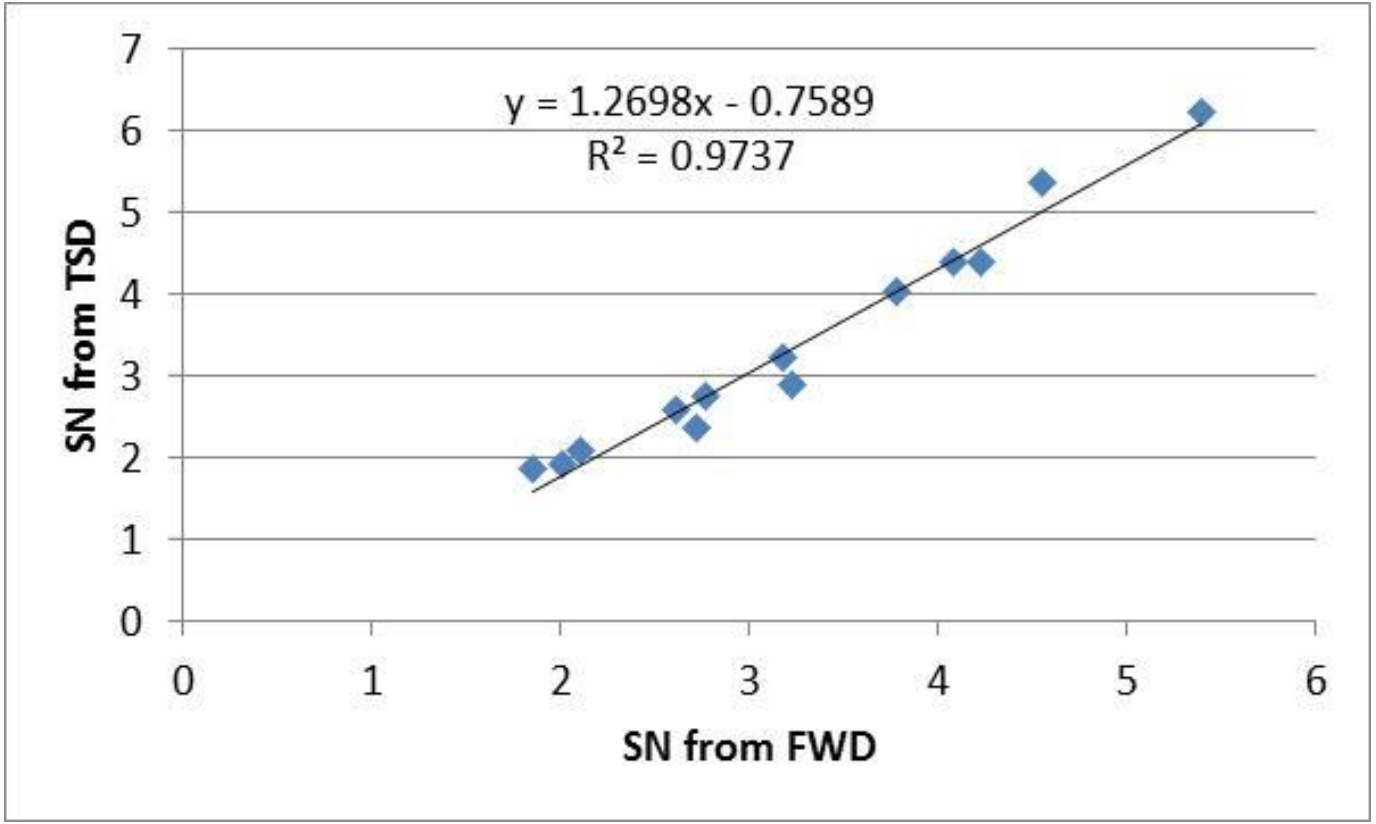
- Demonstrate network-level TSD testing
  - Two testing cycles
  - Two days per cycle
  - 9 agencies
- Agencies selected test routes

State	Miles
California	980
Georgia	646
Idaho	1,040
Illinois	400
Nevada	352
New York	595
Pennsylvania	567
South Carolina	726
Virginia	622
Total	5,928

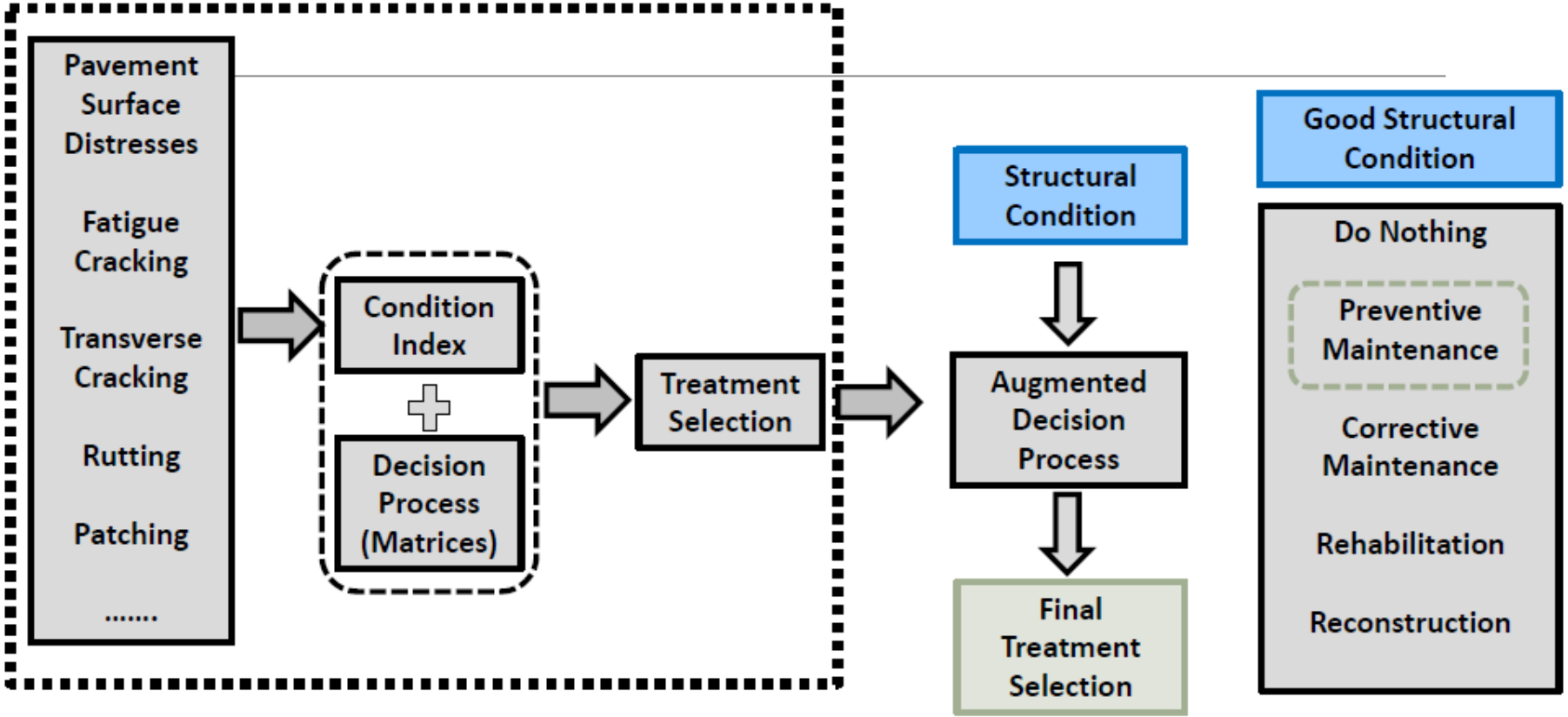
TPF-5(282) Data Example



TPF-5(282) Data Example



TPF-5(282) Implementation Example



Idaho DOT Implementation Example

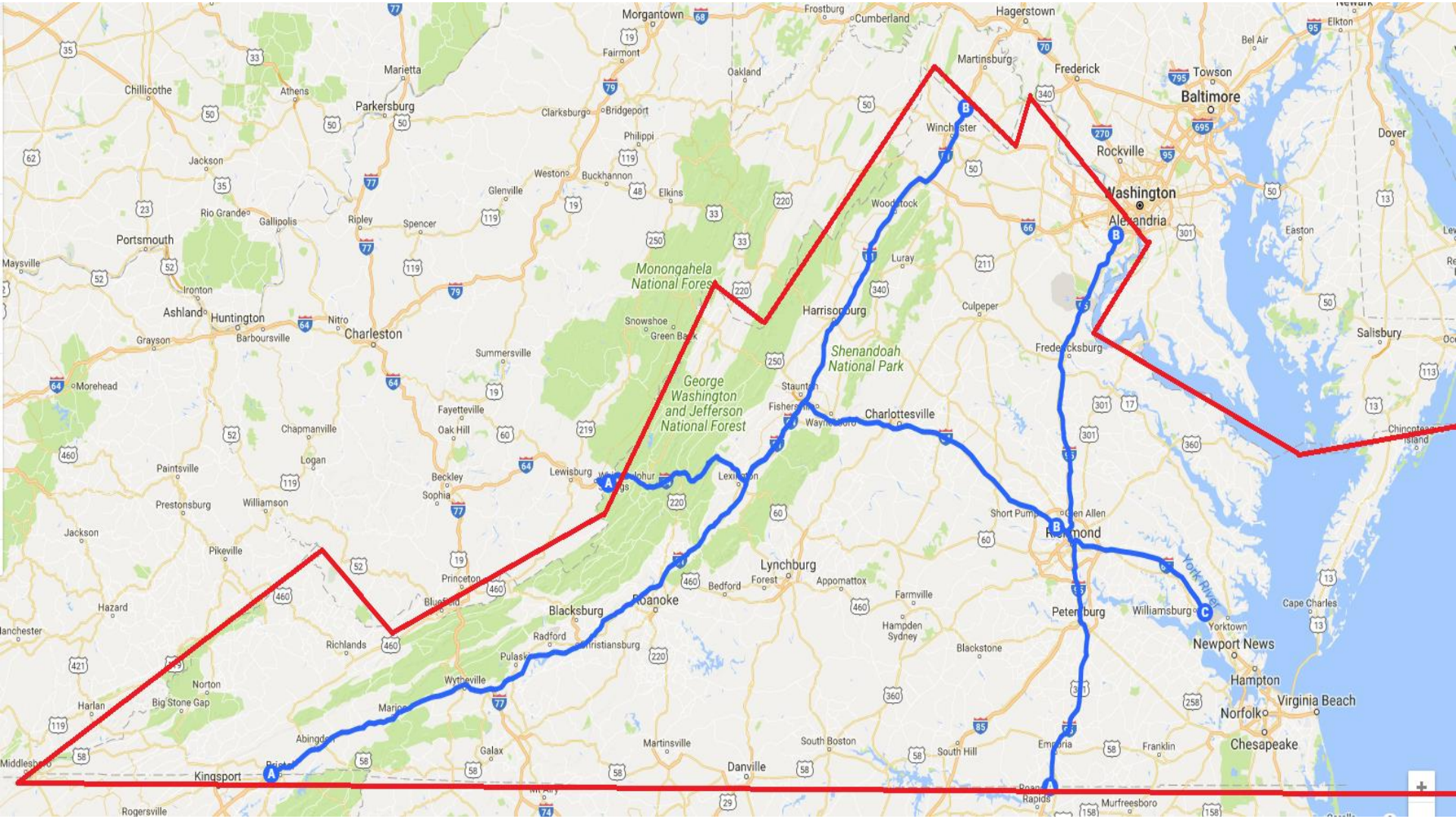
- Developing process for corridor management
- Combining network structural performance and ME performance predictions to estimate future maintenance schedules
  - Planned versus reactive maintenance

TPF-5(282) Findings

- Short- and long-term repeatability is good
  - More work needed for temperature correction
- TSD and FWD followed similar trends
  - But not a one-to-one replacement as expected
- Little relationship between TSD results and PMS surface condition
  - Shows need for structural testing

2017 Testing in Virginia

- 4,000+ miles of testing on interstate and primary routes)
- Study impact to PMS results by including TSD-based structural response
- Deflection indices, rutting, ride quality, cracking, pavement and roadway images, cross slope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Parkersburg
Clarksburg
Bridgeport
Philippi
Winchester
Rockville
Dover
Jackson
Weston
Buckhannon
Elkins
Glenville
Woodstock
Washington
Alexandria
Rio Grande
Gallipolis
Ripley
Spencer
Portsmouth
Luray
Easton
Maysville
Ironton
Monongahela National Forest
Ashland
Huntington
Nitro
Charleston
Barboursville
Grayson
Snowshoe
Green Bank
Harrisonburg
Culpeper
Salisbury
Fredericksburg
Summersville
Shenandoah National Park
Morehead
George Washington and Jefferson National Forest
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Fayetteville
Oak Hill
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Prestonsburg
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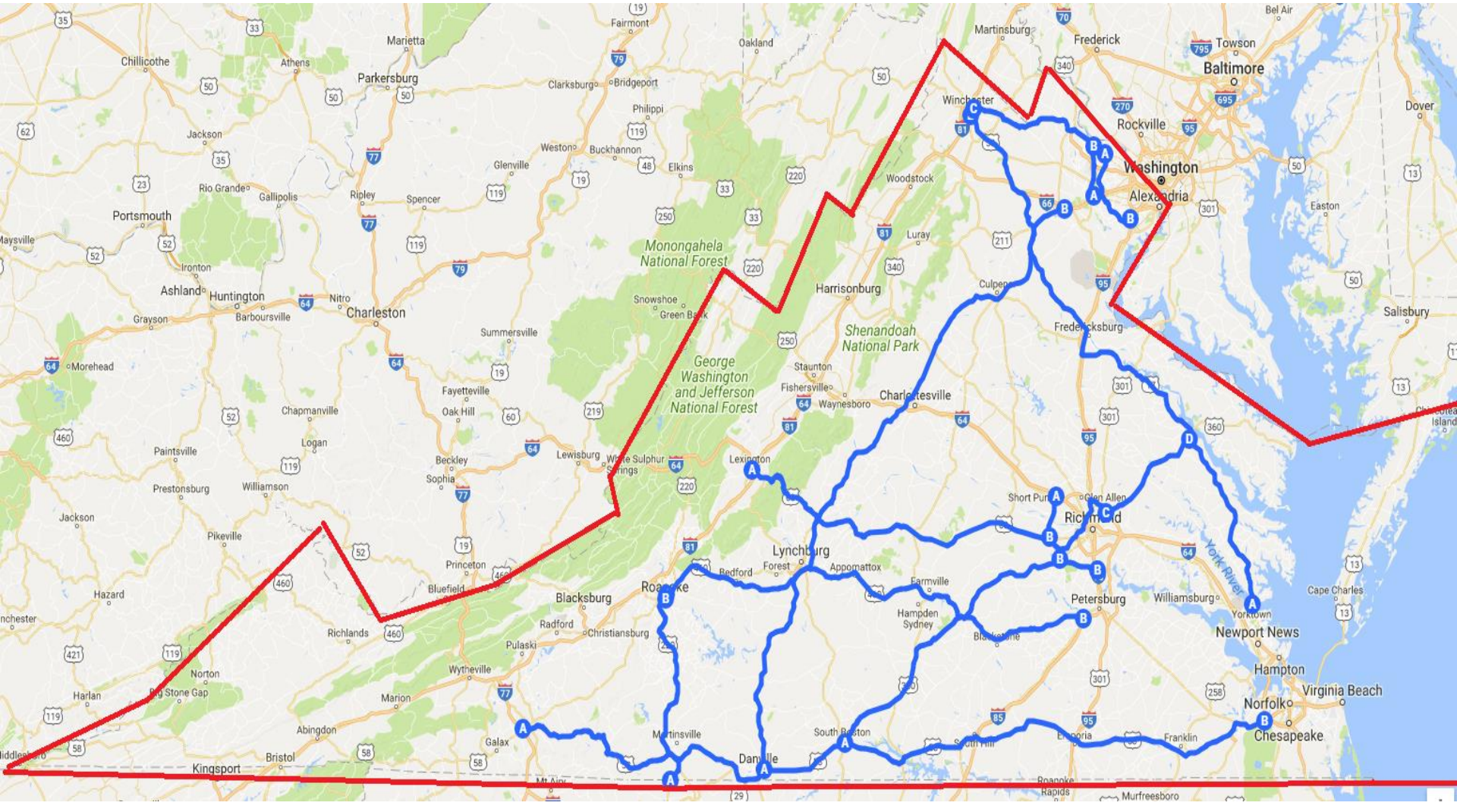
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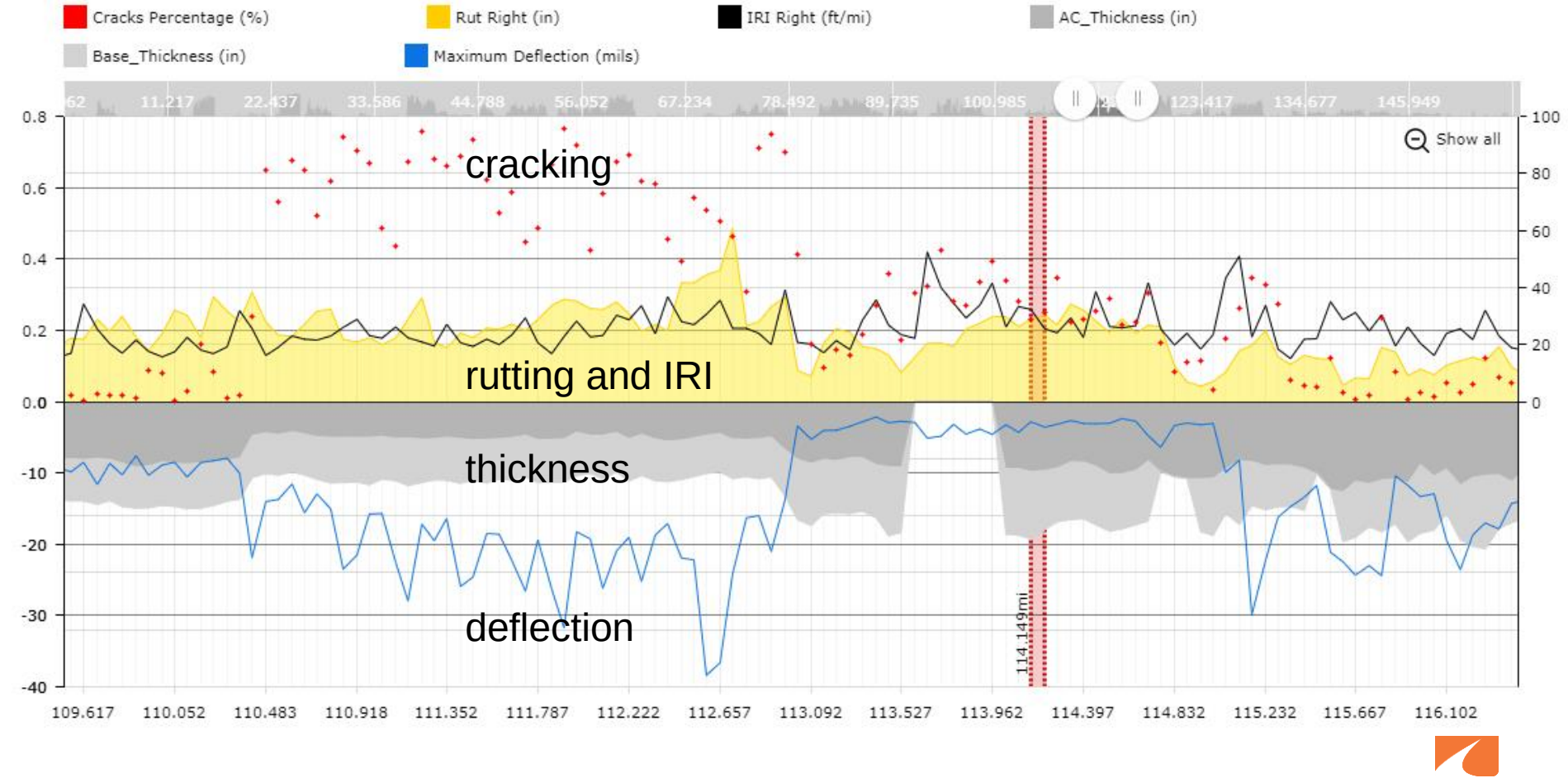
Newport News
Richlands
Radford
Christiansburg
Hampden Sydney
Pulaski
Norton
Big Stone Gap
Wytheville
Hampton
Harlan
Marion
Virginia Beach
Norfolk
Abingdon
Martinsville
South Boston
Emporia
Franklin
Chesapeake
Galax
Danville
Kingsport
Bristol
Mt Airy
Roanoke Rapids
Murfreesboro

VDOT 2017, Remaining Work

- Identify strong vs weak sections and compare to PMS previous decision making and rehab history
- Determine ranges of calculated indices that identify good vs poor structural condition
  - Structural sufficiency vs design
  - Similar budget output from PMS
  - Combination?


Cracks Percentage (%)
Rut Right (in)
IRI Right (ft/mi)
AC_Thickness (in)
Base_Thickness (in)
Maximum Deflection (mils)
Show all
cracking
rutting and IRI
thickness
deflection
114.149mi
0.8
0.6
0.4
0.2
0.0
-10
-20
-30
-40
100
80
60
40
20
0
109.617
110.052
110.483
110.918
111.352
111.787
112.222
112.657
113.092
113.527
113.962
114.397
114.832
115.232
115.667
116.102

Pooled Fund Study, 2018-2021

- TPF 5(385), Pavement Structural Evaluation with Traffic Speed Deflection Devices

- State partners
  - FHWA, Arkansas, Idaho, Illinois, Indiana, Kansas, Louisiana, Minnesota, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Vermont

Pooled Fund Study Objectives/Scope

- Provide means to conduct demonstration testing
  - ARRB Group TSD & Dynatest Raptor
- Develop specifications for data collection and guidelines for PMS application
- Demonstrate
  - How to use data to support project level decision-making
  - Costs (and any savings) through case studies
- Conduct workshops and prepare training

Pooled Fund Study Commitment Levels

- Option 1
  - Participation in the study for one agency rep (no testing) = $15,000 / year
- Option 2a
  - Option 1 plus one day of testing on agency designated routes (~100-200 miles) = $45,000 / year
- Option 2b
  - Option 2a plus additional days of testing = $32,000 / day / year

Pooled Fund Study Status

- Project stated October 1, 2018
- Working with agencies for fall 2018 and spring 2019 testing
- Virginia
  - Likely one district per year and cover untested high priority routes within each

Thank you!

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