Intelligent Compaction

FHWA/TPF Intelligent Compaction Study

By

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The Transtec Group

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DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

Transportation Pooled Fund #954

- “Accelerated implementation of intelligent compaction for embankment subgrade soil, aggregate base, and asphalt pavement material”
- 3-year IC study for all the above materials
- 12 participating States
- 12+ field demonstration

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Objectives

- Accelerated development of QC/QA specifications for subgrade soils, aggregate base and asphalt pavement materials
- Develop an experienced and knowledgeable IC expertise base within Pool Fund participating State DOTs
- Identify and prioritize needed improvements to and/or research of IC equipment and field QC/QA testing equipment

Prioritization of IC Improvements

- Simplifying IC usage
- Achieving greater IC value, cost benefit, etc.
- Improved accuracy

Task Working Group (TWG)

Pooled Fund State Representatives

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FHWA
COTR

IC Roller Vendor Representatives

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Project Management Support

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Mr. Dennis Turner
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Technical Writers

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IC Roller Requirements

- Continuous roller-integrated measurement system
- Real-Time Kinematic (RTK) Global Position System (GPS) based mapping
- Real-time onboard display and integrated software reporting system
- (Optional) Feedback control

Participating Soil/SB Rollers

Ammann/Case

Caterpillar

Dynapac

Bomag America

Sakai America

Participating Asphalt Rollers

Ammann/Case

Caterpillar

Dynapac

Bomag America

Sakai America

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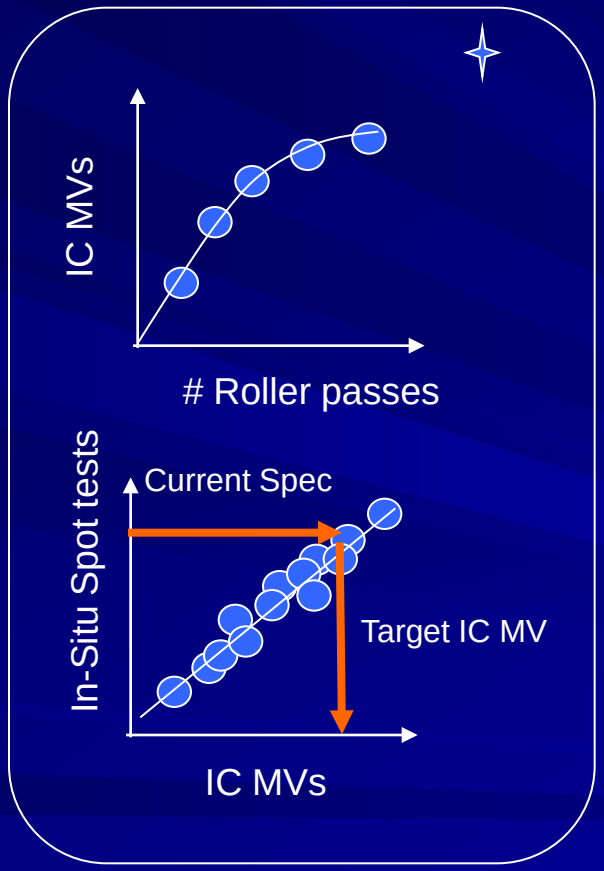
Application of Material Types

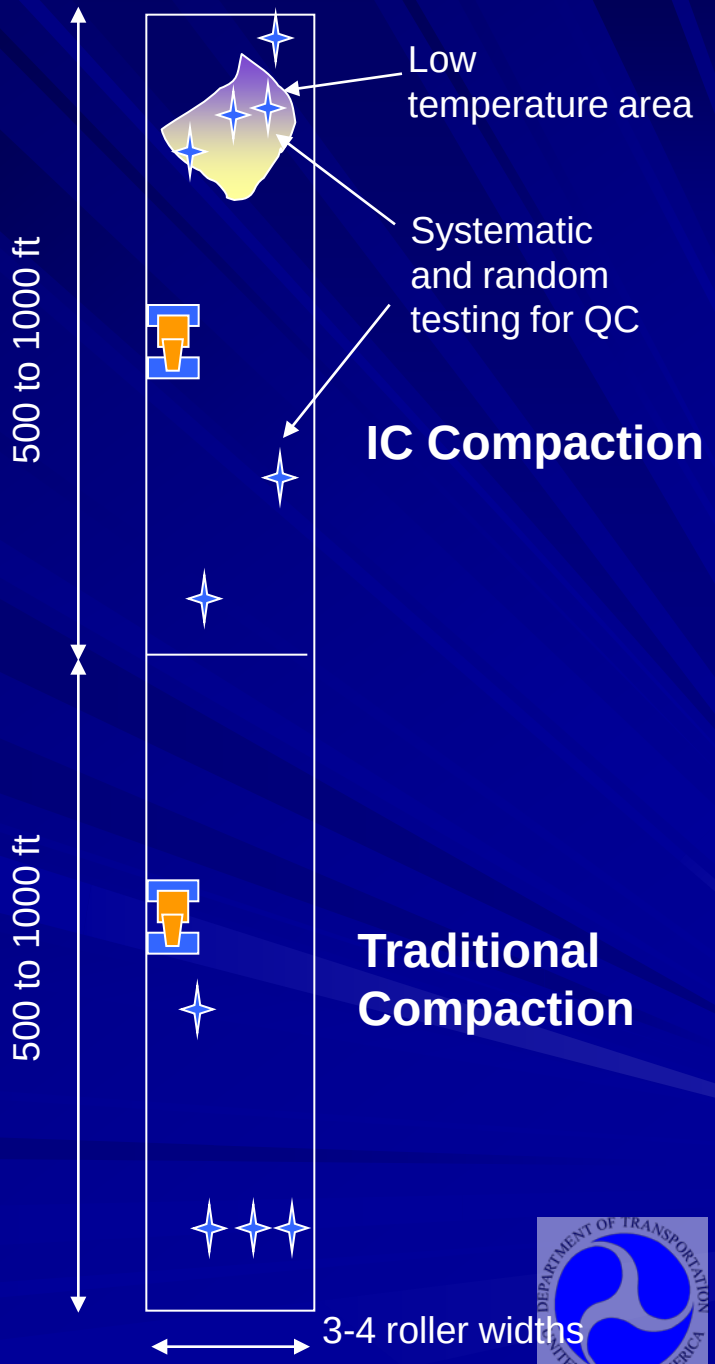
- Type I : Non-cohesive subgrade soil
- Type II : Cohesive subgrade soils
- Type III : Aggregate base material
- Type IV : Asphalt pavement material
- Type V : Stabilized base material

Asphalt

Correlation Tests

Correlation test strip with 20 in-situ spot test measurement
Can be done after selected roller passes (e.g. 1, 2, 4, 8 passes) to build **compaction curve**. Also used to establish **IC target value.**





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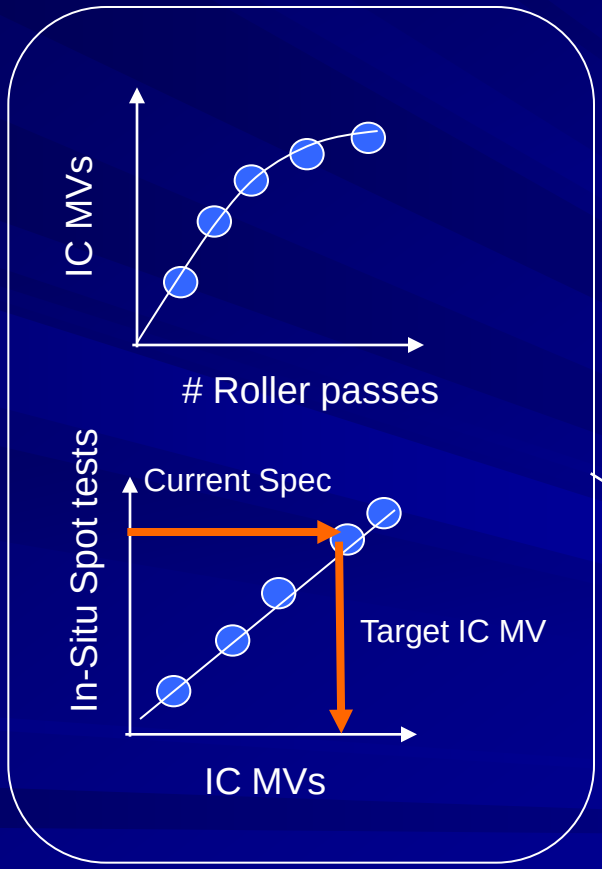
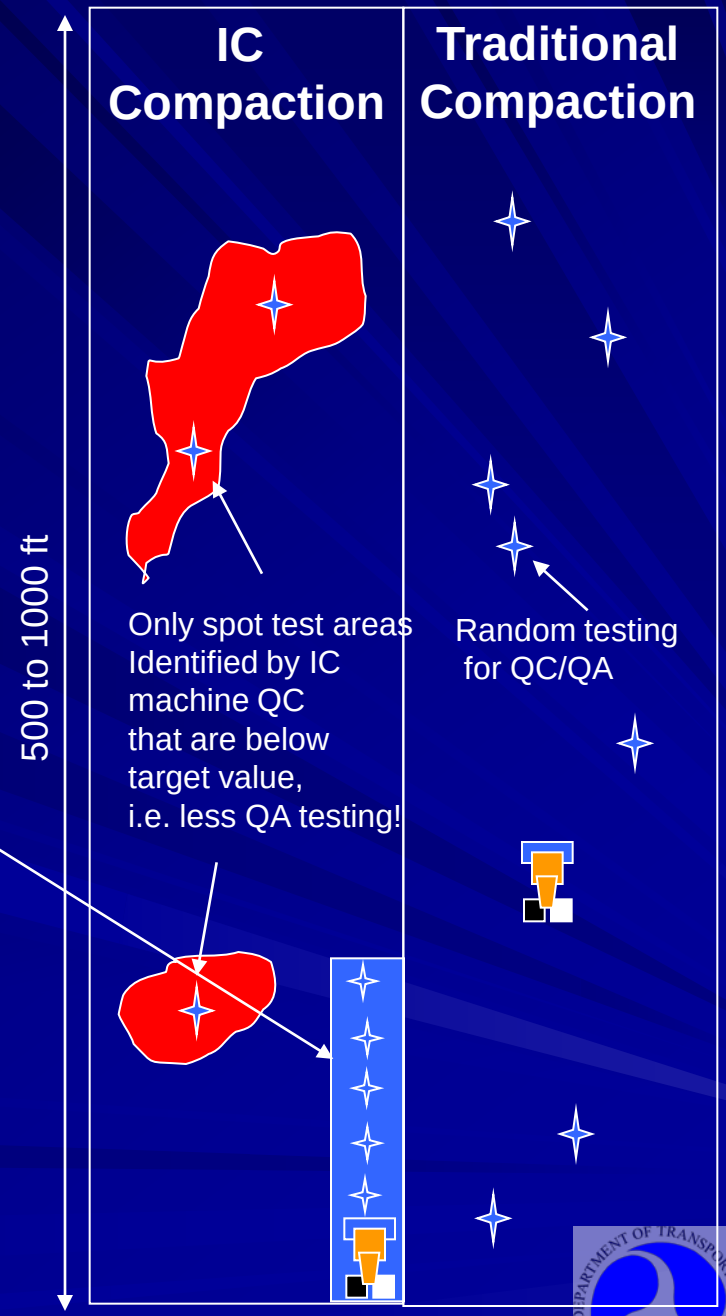
Soil/SB

Correlation Tests

Correlation test strip (~300ft) with 5 to 10 in-situ spot test measurement
Can be done after selected roller passes (e.g. 1, 2, 4, 8 passes) to build **compaction curve**. Also used to establish **IC target value.**





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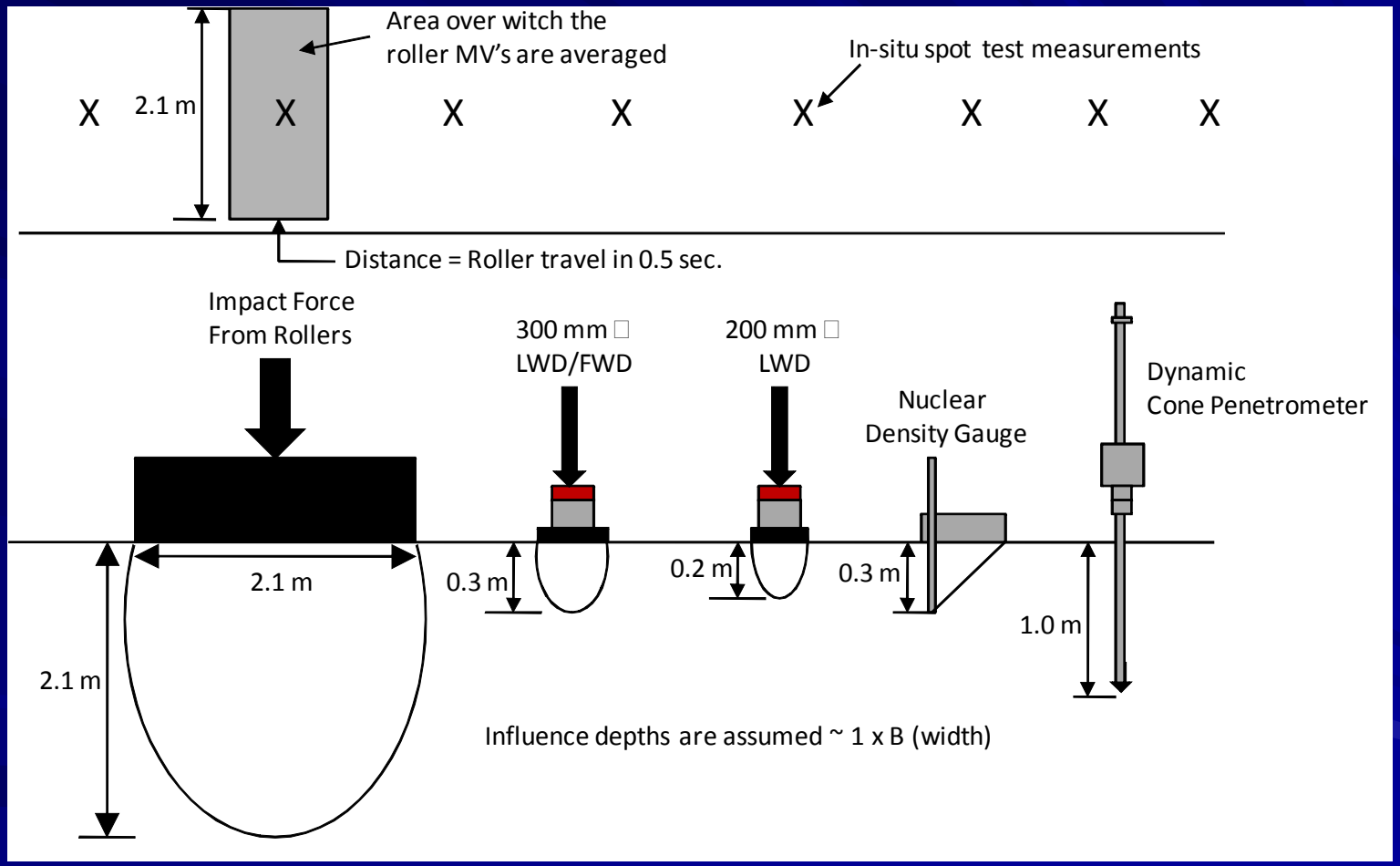
In-Situ Testing Methods



Courtesy of Dr. David White

Which tests can be used as companion tests to RMV?

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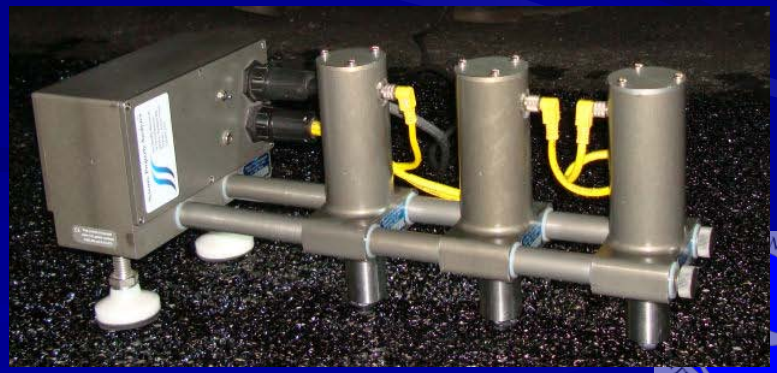
In-Situ Test Methods for HMA

NG

LWD-a

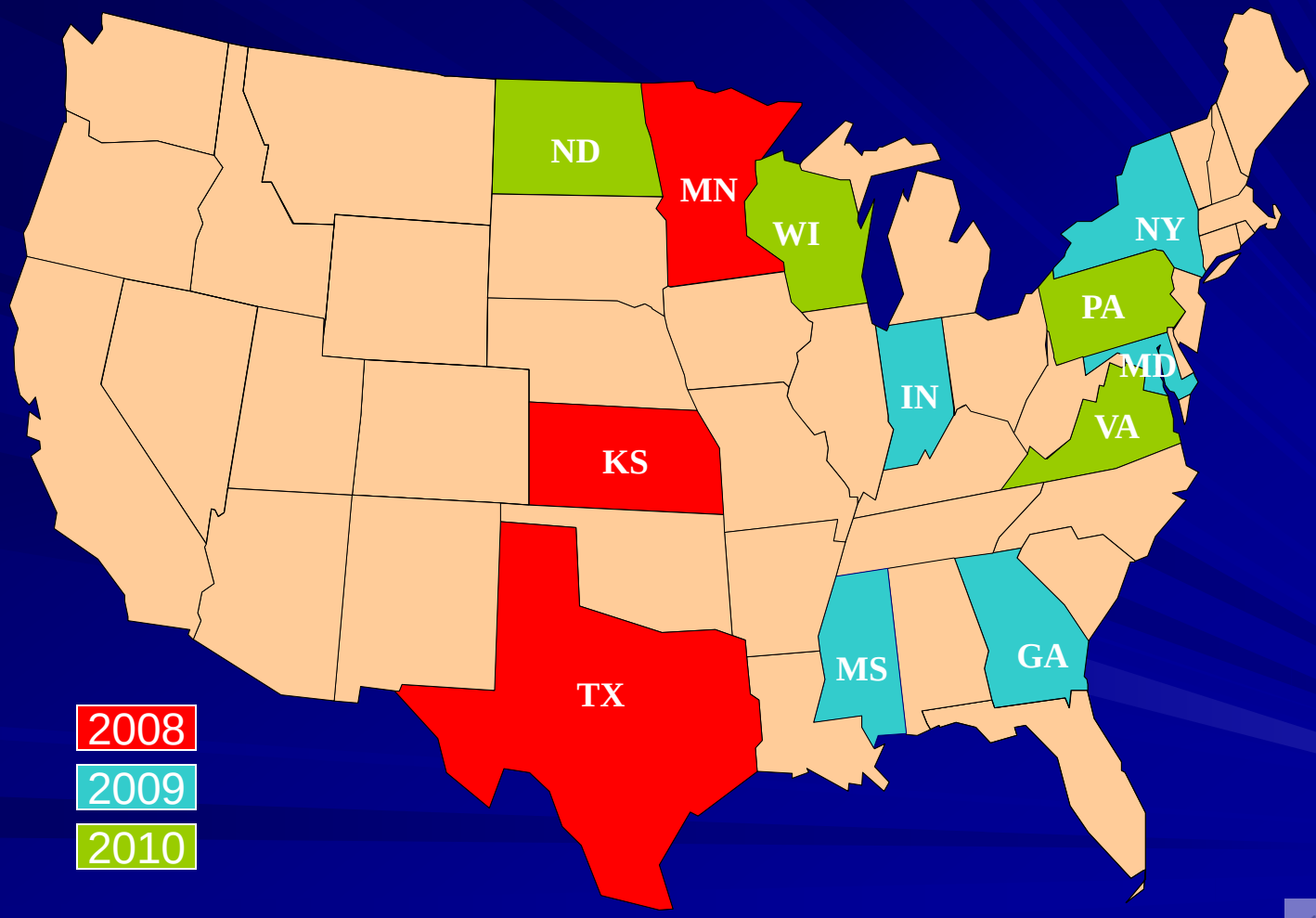
NNG

PSPA



In Situ Test Methods for Soils/SB/STB

IC Field Demo Schedule



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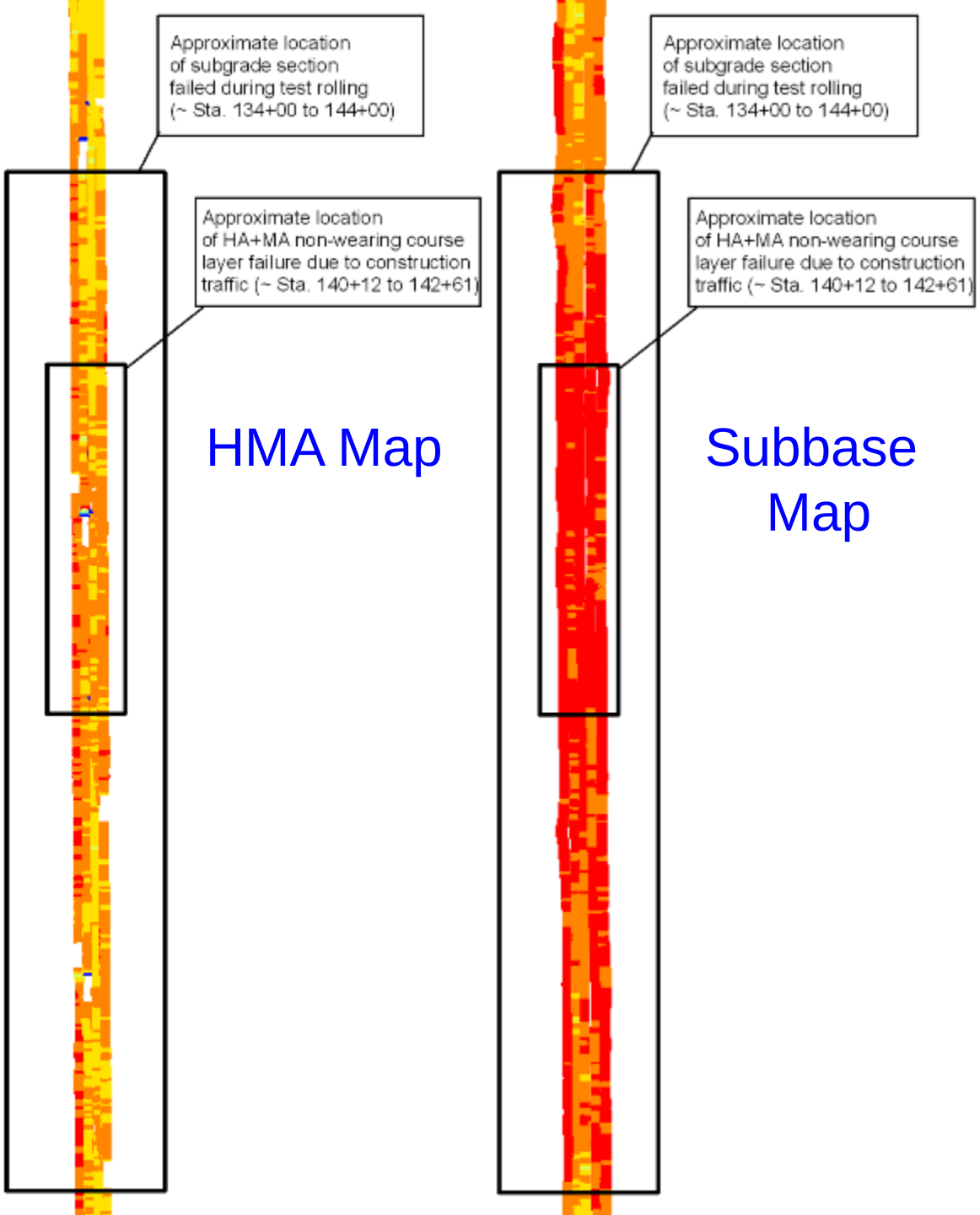
Key Findings

- Values of mapping existing support before construction or overlay
- Significant improvements of rolling patterns, thus, consistent products
- Improvement of roller operators' acountability

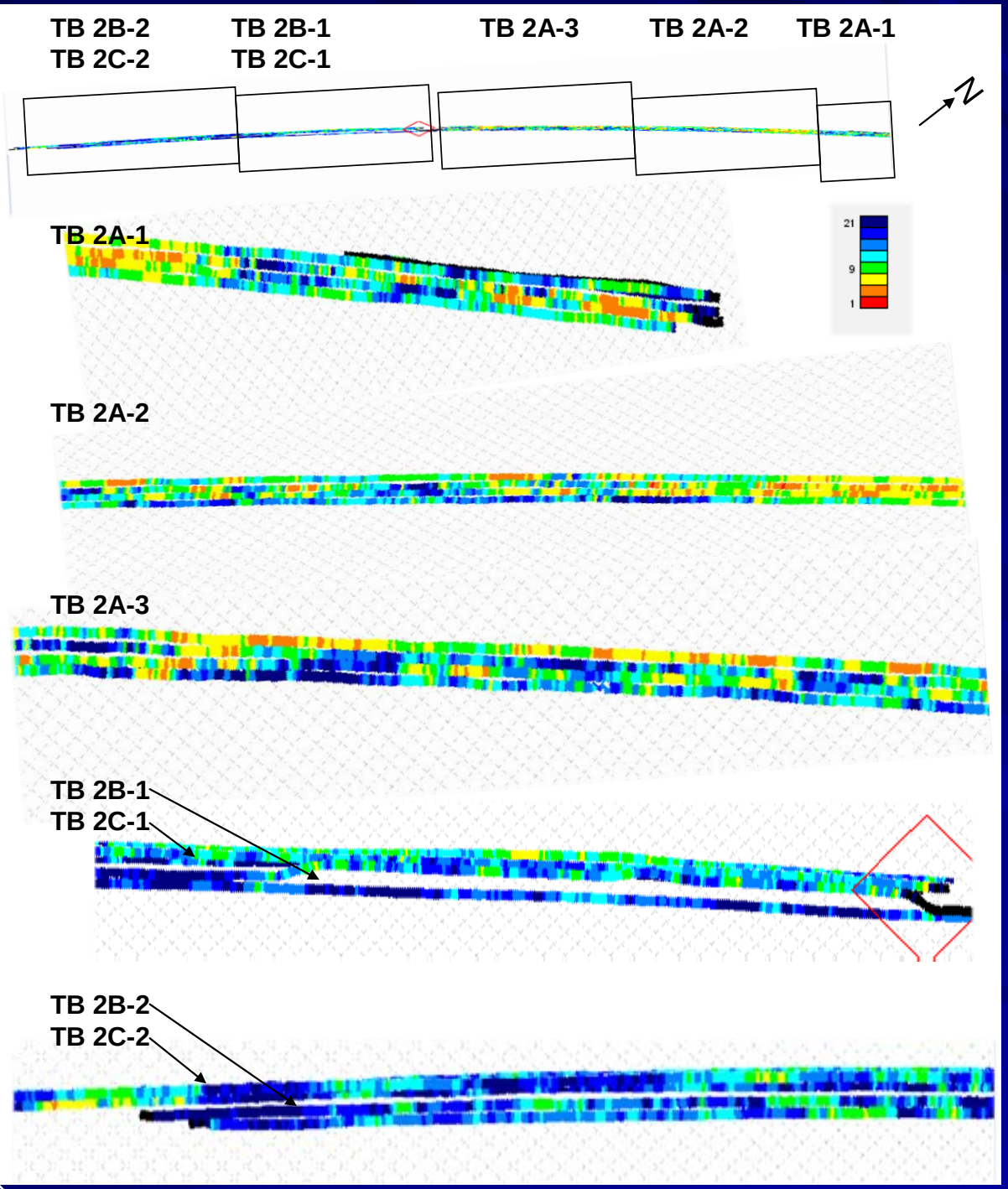
Key Findings (cont'd)

- Construction process-control greatly improved
- IC-MVs correlate to various in-situ point measurements
- Measurement influence depth varies depending on technology and site conditions
- Machine operation parameters influence MVs

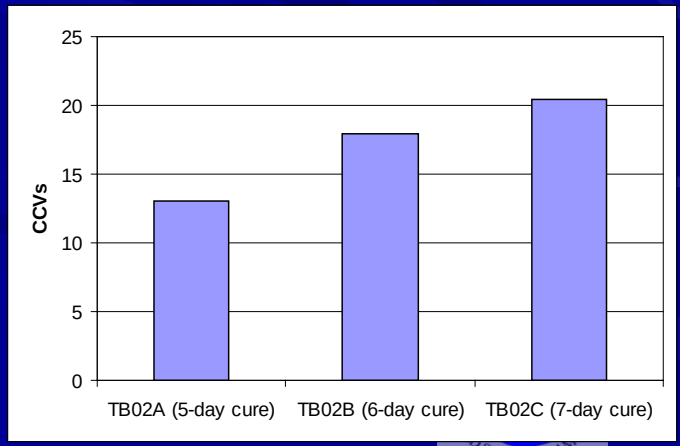


Premature Failure

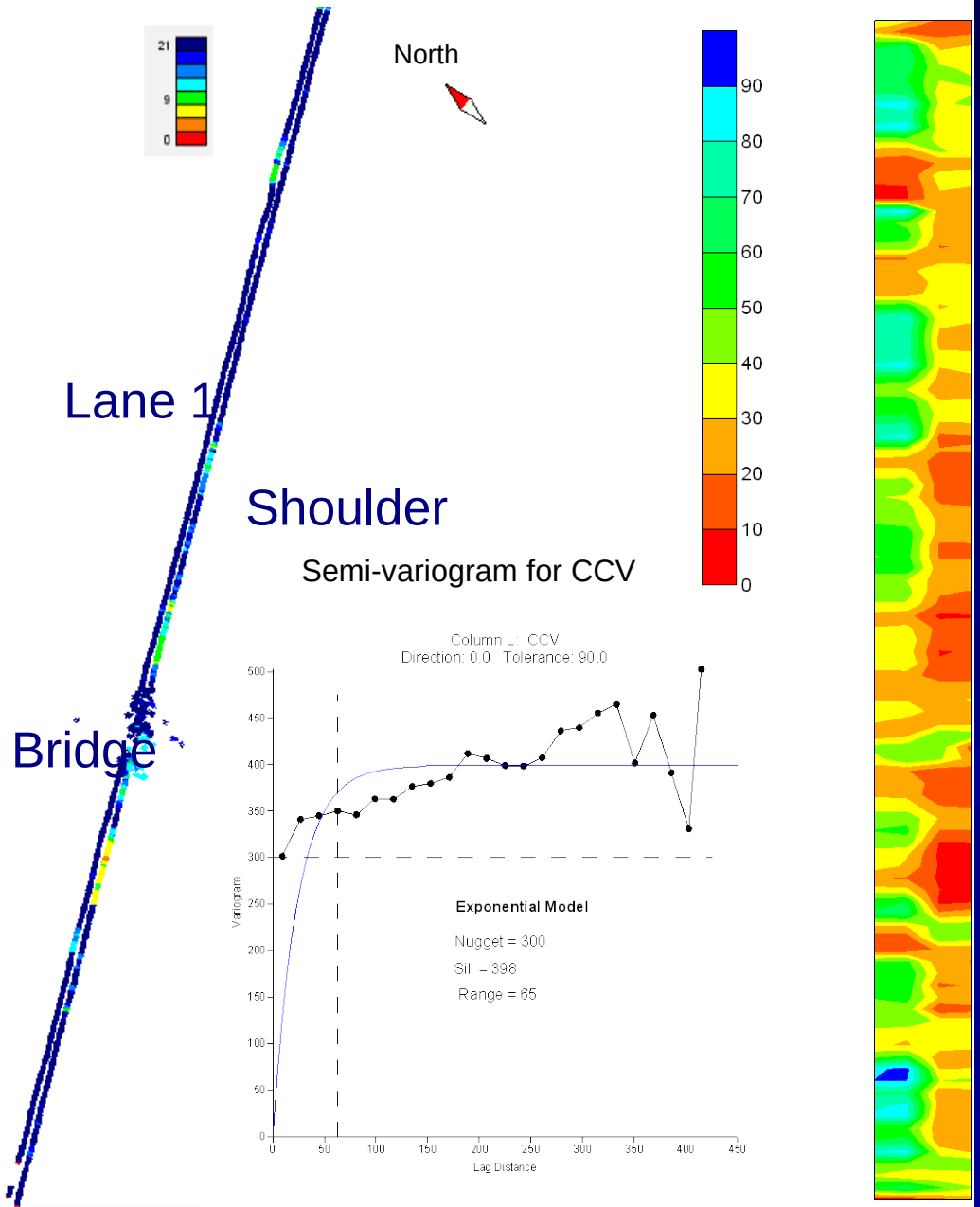
Mapping STB


TB 2B-2
TB 2C-2
TB 2B-1
TB 2C-1
TB 2A-3
TB 2A-2
TB 2A-1
N
TB 2A-1
21
9
1
TB 2A-2
TB 2A-3
TB 2B-1
TB 2C-1
TB 2B-2
TB 2C-2

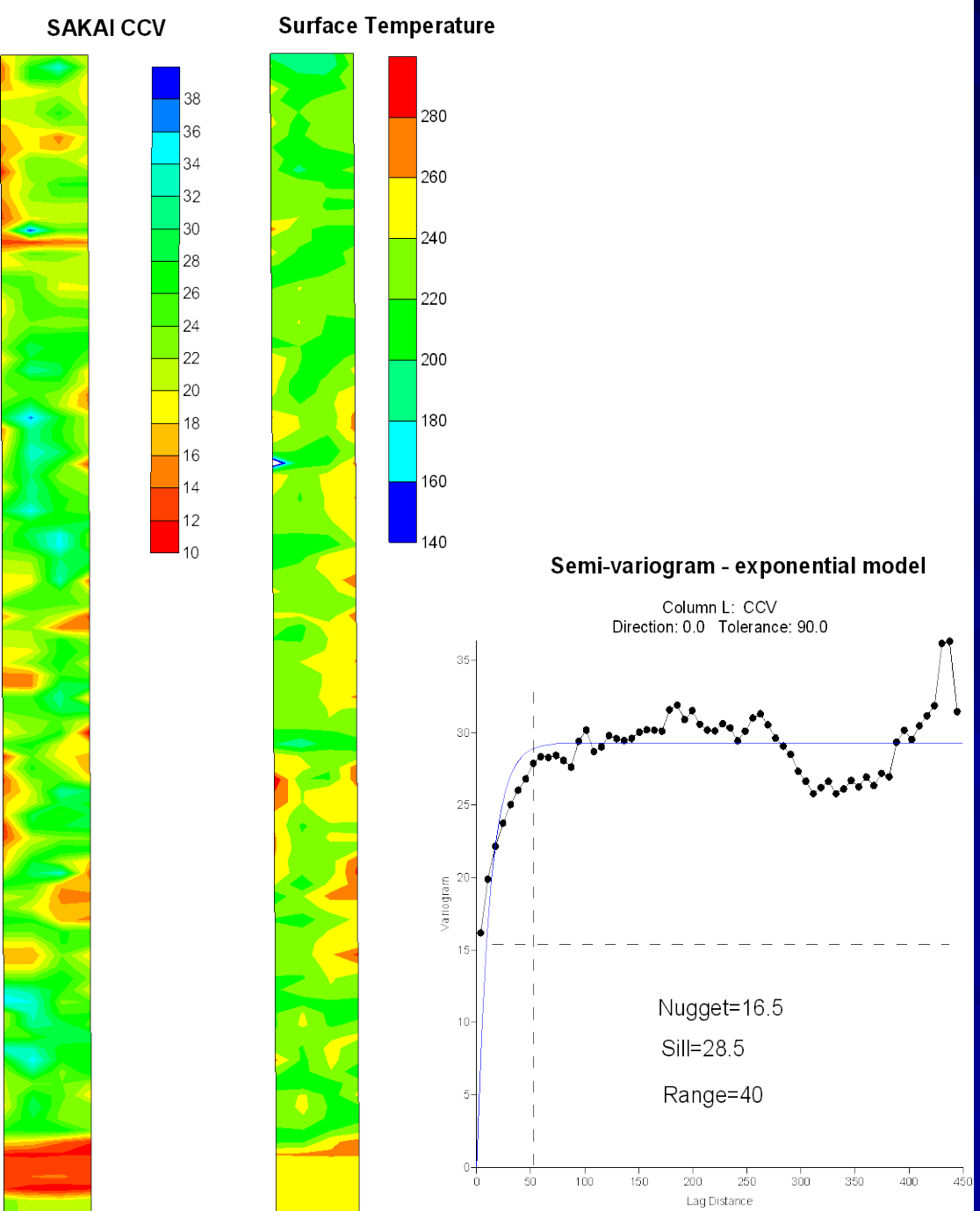

Mapping w/
Sakai double-drum
IC roller


25
20
15
10
5
0
CCVs
TB02A (5-day cure)
TB02B (6-day cure)
TB02C (7-day cure)

Mapping Milled ACP

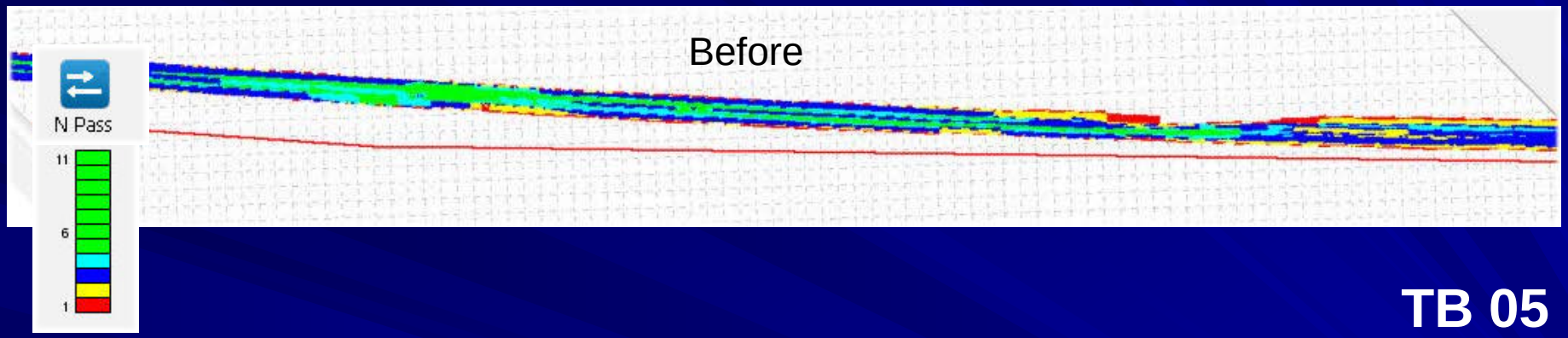


Accessing Uniformity

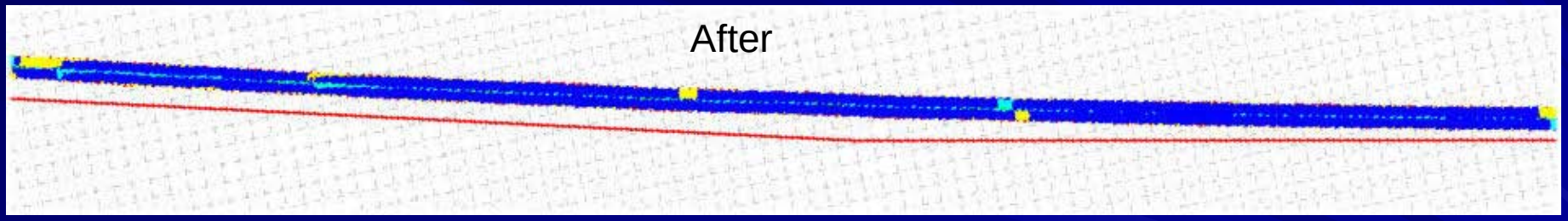


Improved Rolling Pattern

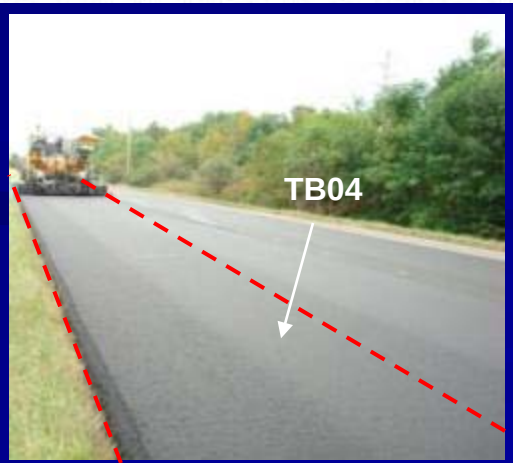
TB 04



TB 05



Sakai Double-drum IC roller



IC Clearing House

www.IntelligentCompaction.com

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