Improving FHWA's Ability to Assess Highway Infrastructure Health

Defining Pavement Condition

Amy L. Simpson, Ph.D., P.E.
Principal Engineer
AMEC Environment & Infrastructure, Inc.

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Outline

- Project Objective
- Pilot Study Approach
- Options for Condition Evaluation
- Summary of Findings
- Conclusions and Questions

Project Objectives

- Define a consistent and reliable method of assessing infrastructure health on the IHS
- Develop tools to provide FHWA and State DOTs ready access to key information that will allow for a better and more complete view of infrastructure health nationally
- Focus on pavements and bridges

Goals of the Pilot Study

- Pavement
  - Validate IRI as a Tier 1 measure
  - Advance potential Tier 2 and 3 measures
- Key questions
  - Do different data sources tell us the same thing?
  - Do different metrics help us better understand pavement condition?

Tier Definitions

- Based on NCHRP 20-24 (37)G
- Tier 1 – Tier 1 measures are considered complete or nearly complete and ready for use at the national level. They meet the criteria of having:
  - General consensus on the measure's definition,
  - A common or centralized approach to data collection in place, and
  - Established availability of consistent data.
- Tier 2 – Meet one or two of the above criteria and require further work before being ready for deployment
- Tier 3 – Generally still in the proposal stage and require further work before being ready for deployment.

Pilot Approach

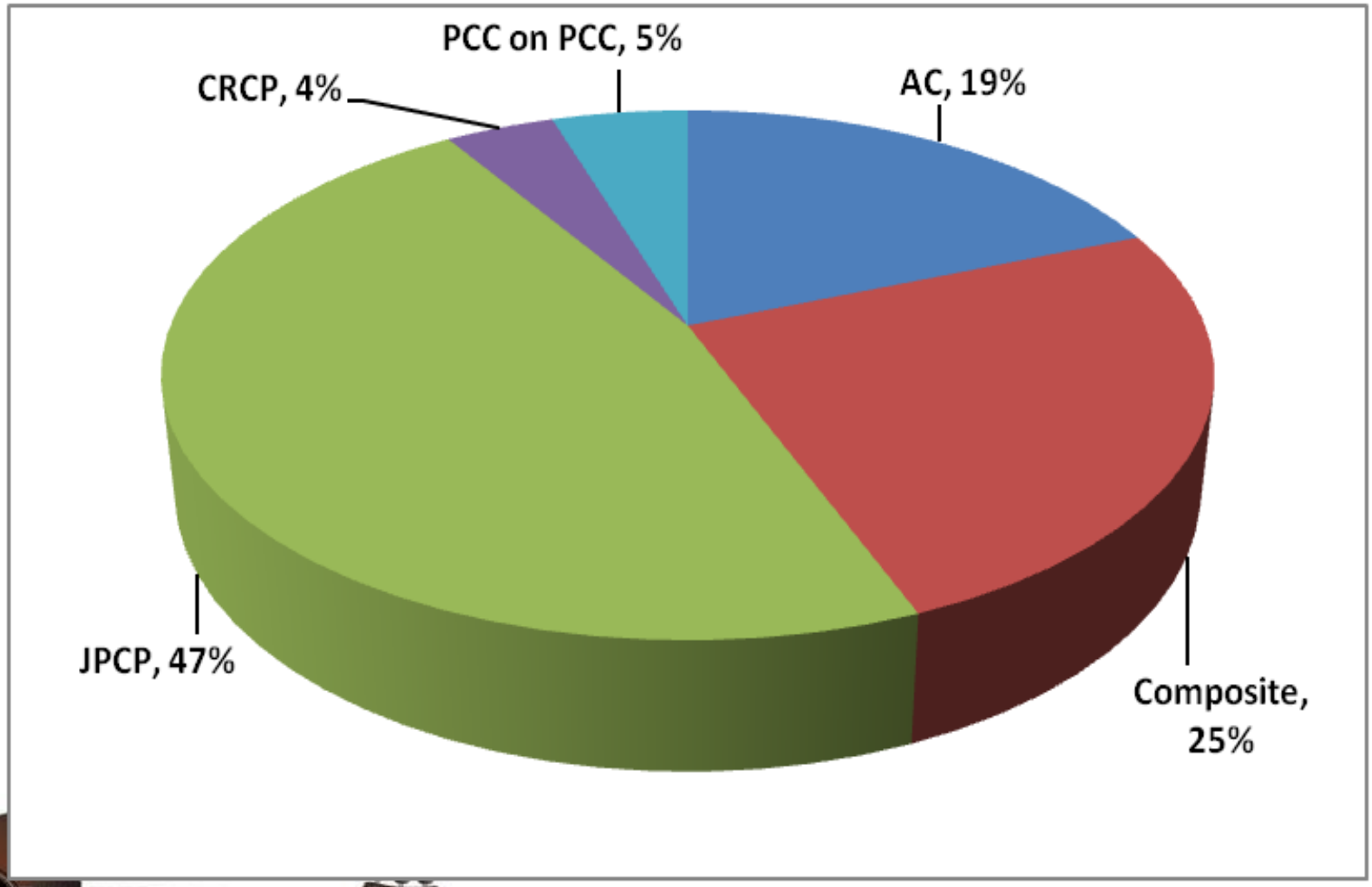
- Select a three-state pilot corridor
- Collect data sets
  - Federal data for pavements and bridges
  - State pavement data
  - Field collection for pavement data
- Compare data and measures resulting from data
- Identify issues and recommend improvements

Pilot Study Corridor

Corridor Statistics

- 874 centerline miles
  - SD = 411
  - MN = 275
  - WI = 188
- Wide range of pavement types
- AADT range from 5,000 to 90,000
- Urban and rural interstate

Distribution of Pavement Types



Pavement G/F/P Options

	G/F/P Scale	Tier 1	Tier 2	Tier 3
1. IRI	√	√		
2. Functional condition index based on HPMS data	√		√	
3. Structural condition based on RWD	√			?

Pavement Pilot Data Items

- Roughness
  - IRI
- Additional distress data for a functional condition index
  - Cracking
  - Faulting
  - Rutting
- Structural condition index
  - Rolling wheel deflectometer (RWD)
- Also gathered documentation, visual ratings, and other information from state pavement management systems

Pavement Pilot
Data Gathering / Collection Summary

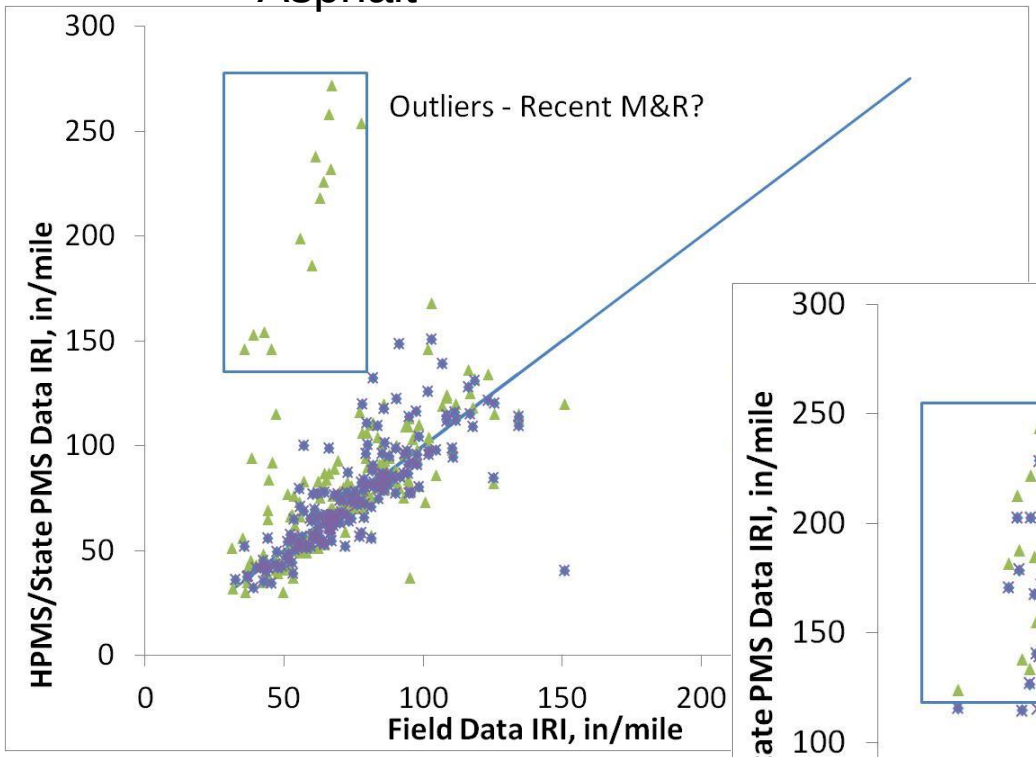
	National	State	Field	
	HPMS	PMS	Condition	RWD
MN	2009	2010	2011 (No RWD for WI)	
SD	2010	2010		
WI	2009	2010		

Objective 1 – Validating IRI

IRI Comparison - Summary

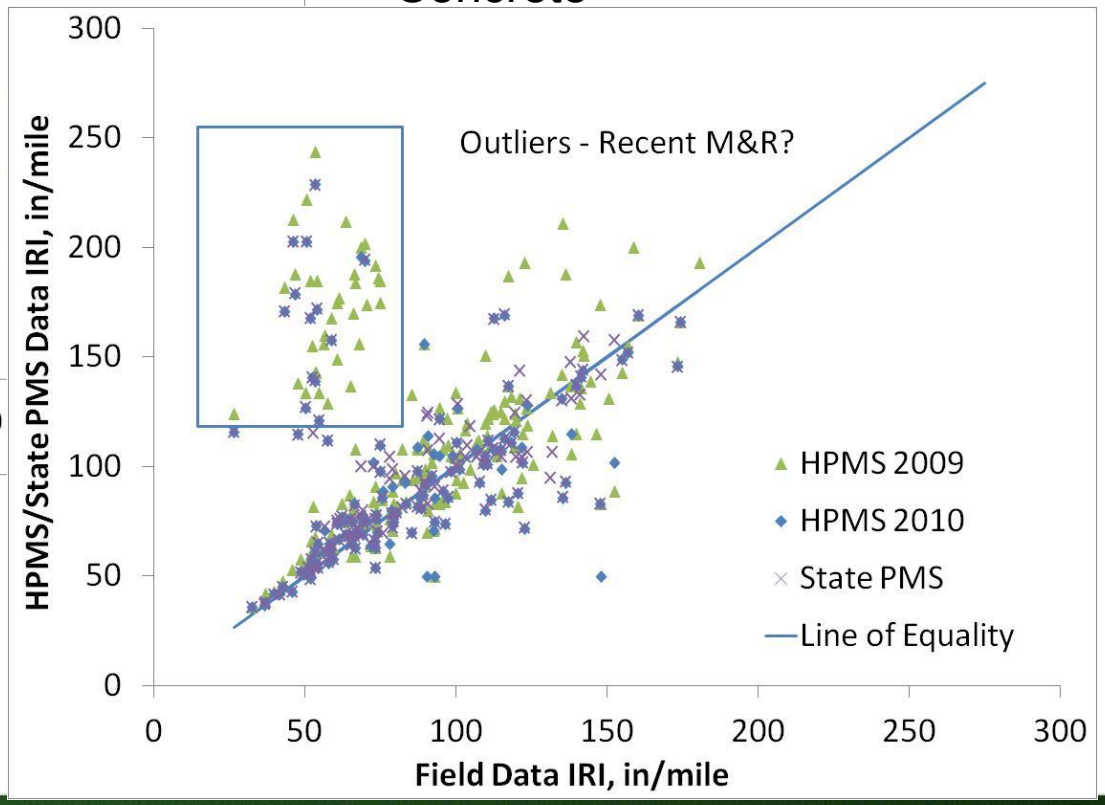
IRI Comparison - Segments

Asphalt



Data collected in different years

Concrete



Observations

- IRI from all of the data sets are fairly well correlated and theoretically any of the data sets could yield G/F/P

- The differences observed are within the realm of what happens when you look at different equipment and operators in different years of data collection

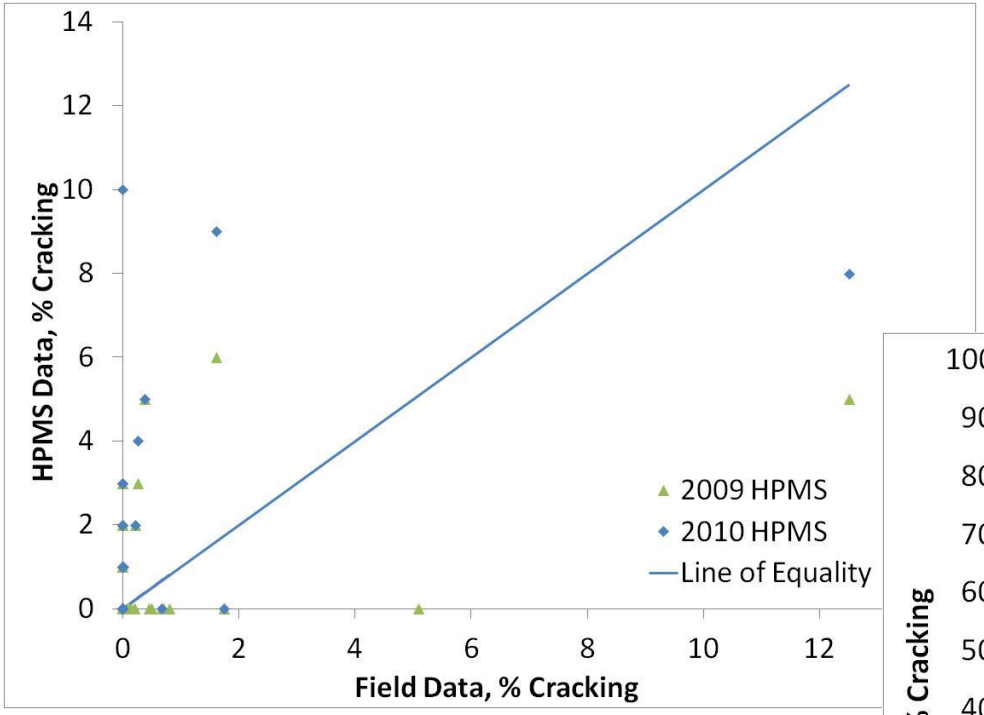
Objective 2 – Advancing Tier 2 Measures – Functional Condition Index

Functional Condition Index Components

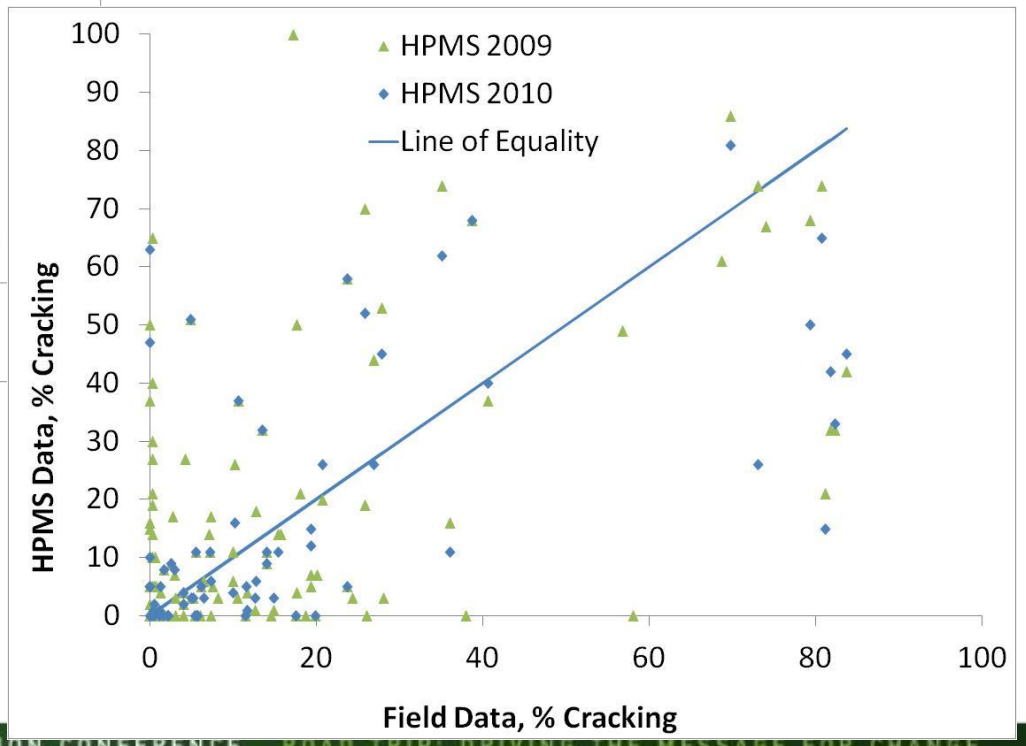
- IRI
- Cracking
- Faulting
- Rutting

Percent Cracking

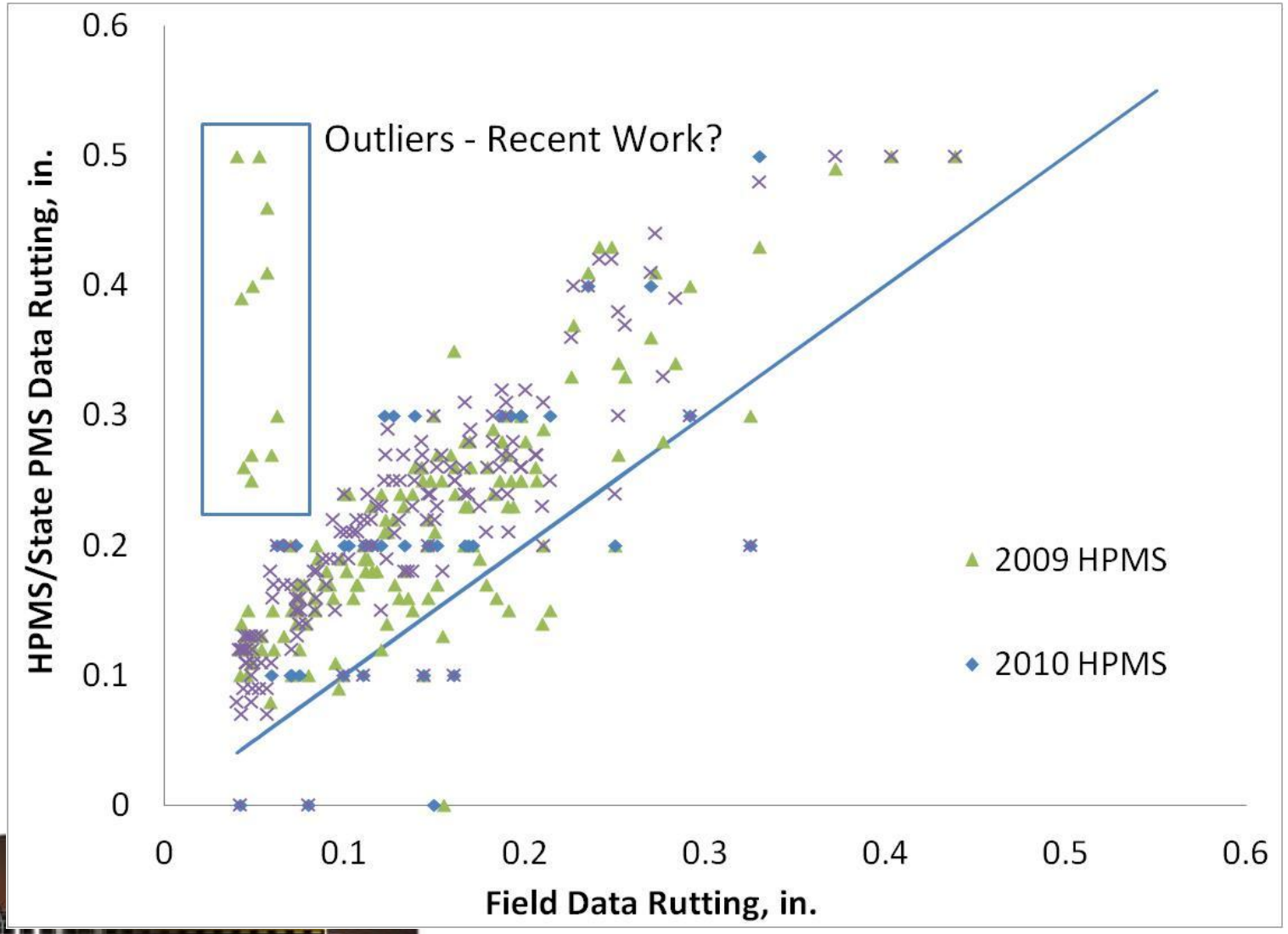
Asphalt



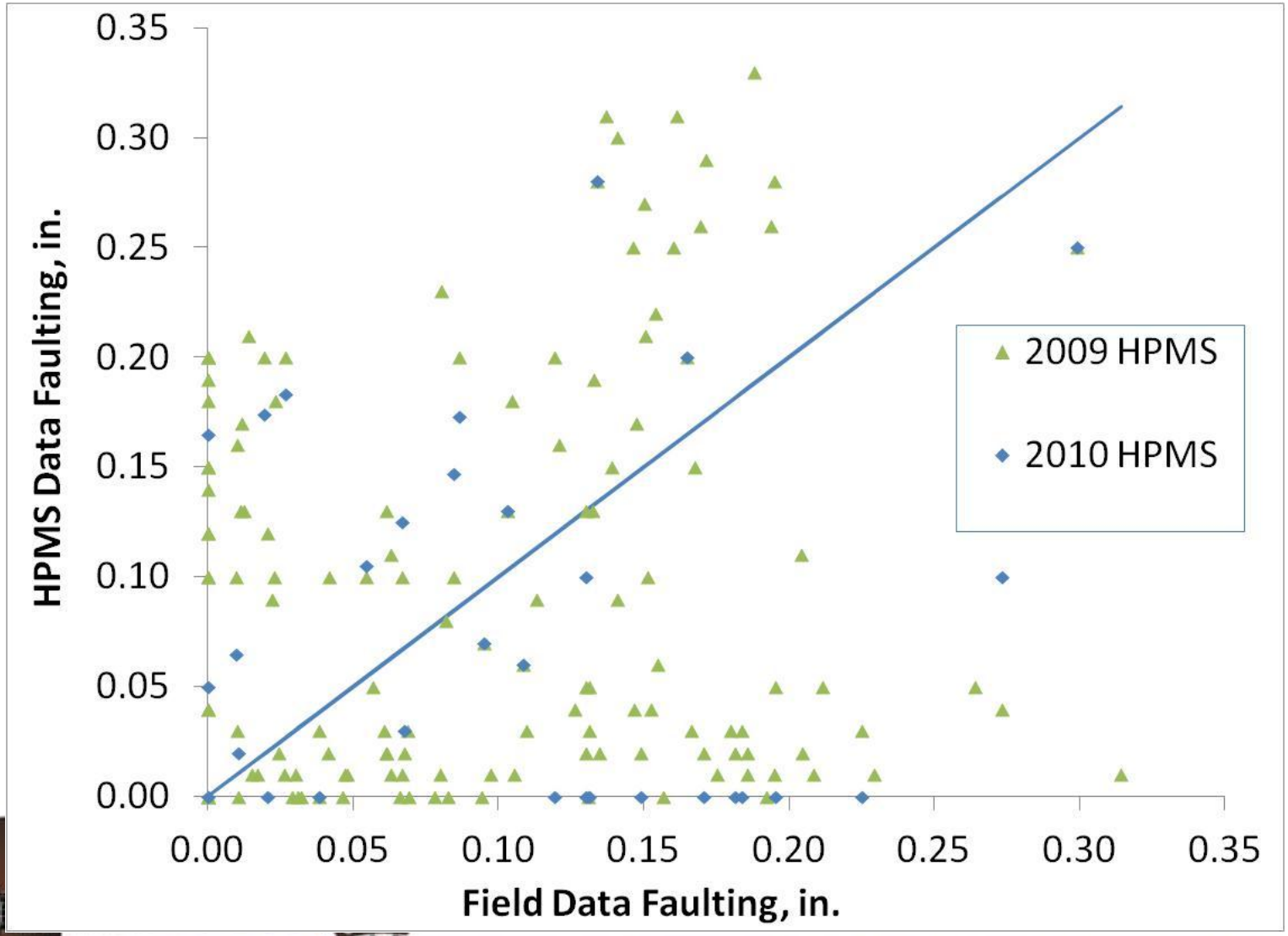
Concrete



Rutting


HPMS/State PMS Data Rutting, in.
0.6
0.5
0.4
0.3
0.2
0.1
0
Outliers - Recent Work?
2009 HPMS
2010 HPMS
0
0.1
0.2
0.3
0.4
0.5
0.6
Field Data Rutting, in.

Faulting


HPMS Data Faulting, in.
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
Field Data Faulting, in.
2009 HPMS
2010 HPMS

Confidence Level

	Confidence in Data
IRI	High
Cracking %	Low/Med
Cracking Length	Low
Rutting	Medium
Faulting	Low

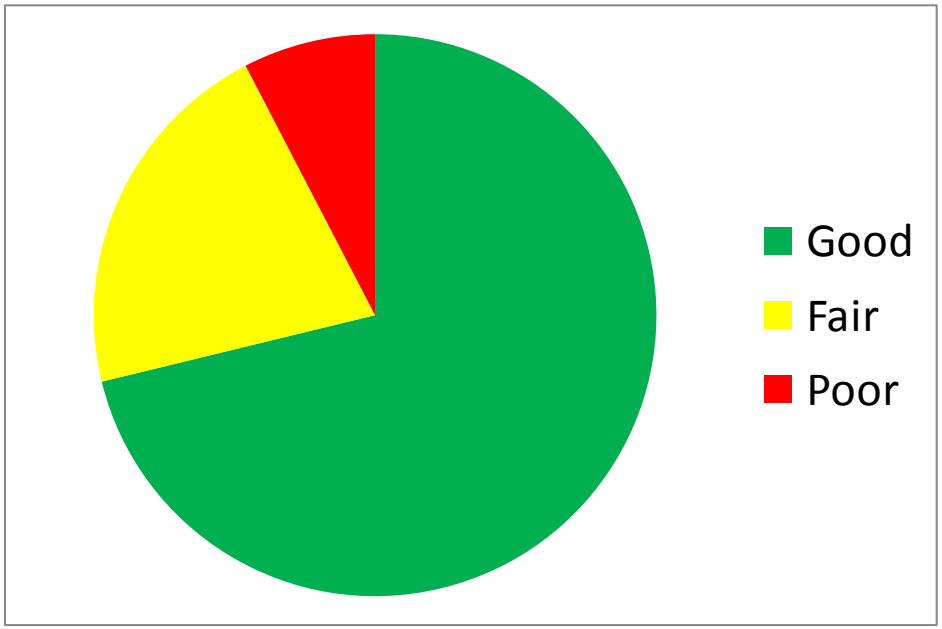
Objective 3 – Advance Tier 3 Metrics – Begin to Define a Structural Condition Index

Rolling Wheel Deflectometer

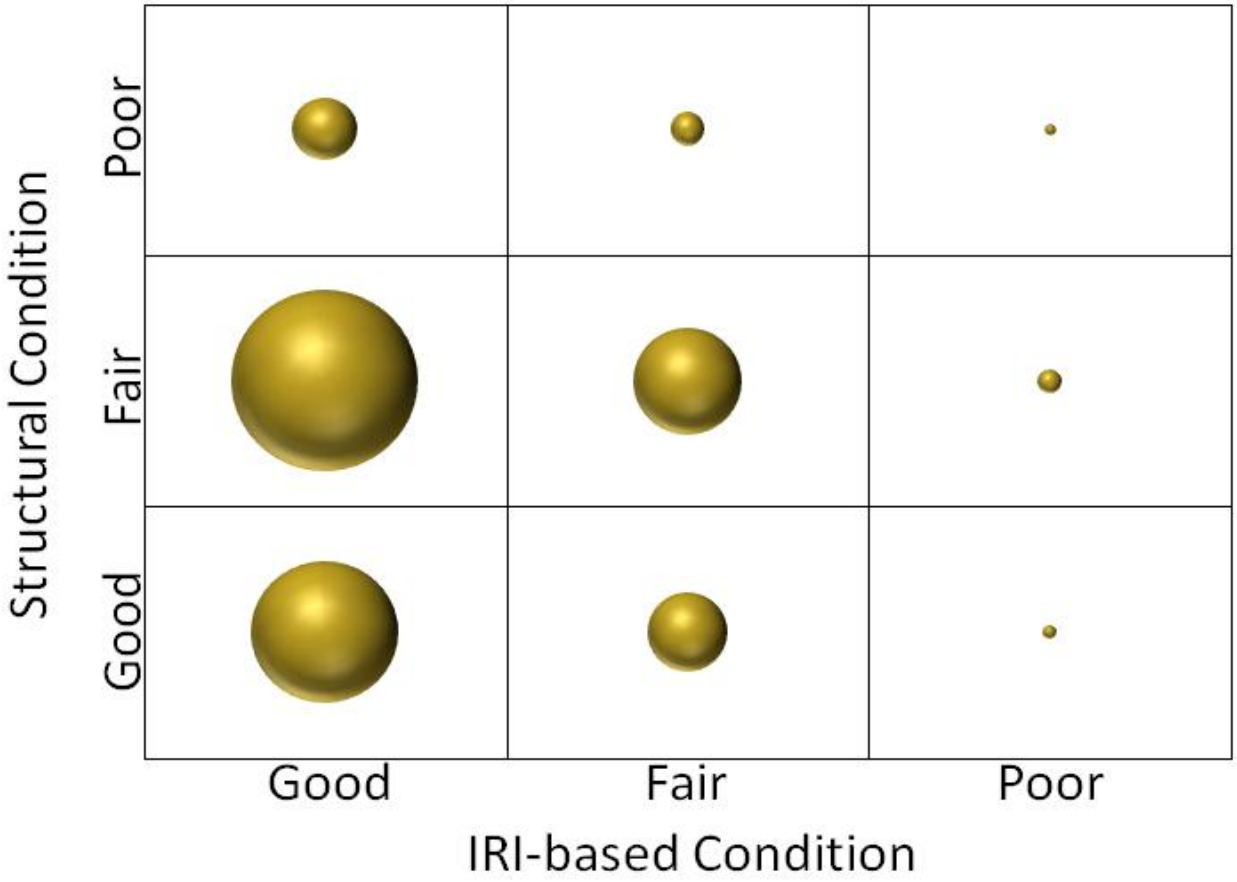
- RWD data collected on the entire corridor in June 2011
- No structure information available in WI so results are for MN and SD only
- D0 and D15 (max deflection and 15 inches away from max deflection)
- Data collected at 15-mm intervals

Structural Condition

- No industry accepted methods for using RWD to assign condition
- Condition assessment based on the D0
  - Good, D0 ≤ 6
  - Fair, 6 < D0 ≤ 10
  - Poor, D0 > 10



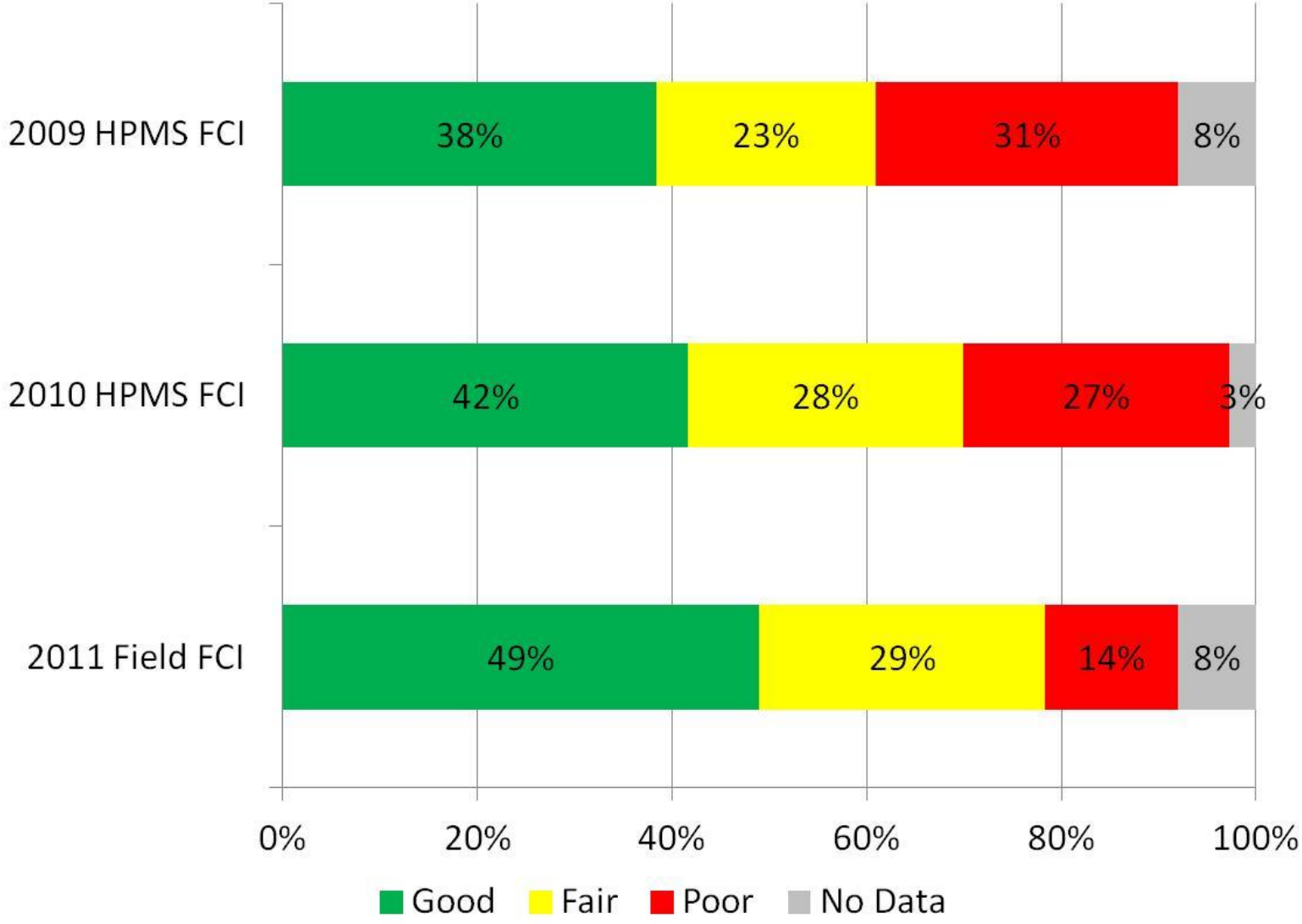
Relationship Between Structural Condition and IRI-based Condition



Observations – Data Sources

- HPMS section lengths may create issues
- Rutting data appear reasonable to use
- Cracking and faulting data need closer examination
- Structural condition – Need RWD calibration, data collection and processing standards

Cracking-Based Condition



Observations - Pavement

- IRI is feasible for use as a Tier 1 G/F/P indicator
  - Acceptable correlation between HPMS, State and field sources
- While IRI does not provide a complete picture of condition, the Tier 2 and 3 measures require significant work
- Rutting and cracking data could be used as primary or “flag” G/F/P indicator
  - Flag for safety concern
  - Cracking data only useful for concrete
- Faulting data cannot be used for G/F/P – work needed here

Contact Information

Amy Simpson
AMEC Environment and Infrastructure, Inc.
12000 Indian Creek Court, Suite F
Beltsville, Maryland 20705
Phone: (410)718-0513
Email: amy.simpson@amec.com
www.amec.com