



# **Network-Wide Pavement Surface Condition Data**

## **Design Basic Training**

**August 18, 2020**

**Dan Sokolnicki, P.E.**

**Pavement Data Unit**

**Data Inventory and Integration Division**

**Planning Bureau**

# Pavement Data Unit

Greg Guikema, Planner (GIS, Data QA, Coord.)

Jim Moomey, Engineering Technician (Data QA)

Jason Redlinger, Dept. Specialist (Data Manage.)

Dan Sokolnicki, Supervisor

(Van Wagoner, 3<sup>rd</sup> Floor, Column A21)

Collection Vendor = ? (Currently between contracts)

# Collected Data

- International Roughness Index (IRI)
- Wheelpath Rutting (Asphalt)
- Transverse Joint Faulting (Concrete)
- Cracking Percent (HPMS-Specific metric)
- Roadway & Pavement Images

# Network-Wide Data Collection Supports...

- *Network View (Asset Management)*
- **Determining Needs**
- **Decision-Making**
- **Accountability**
- **Federal Reporting Requirements**





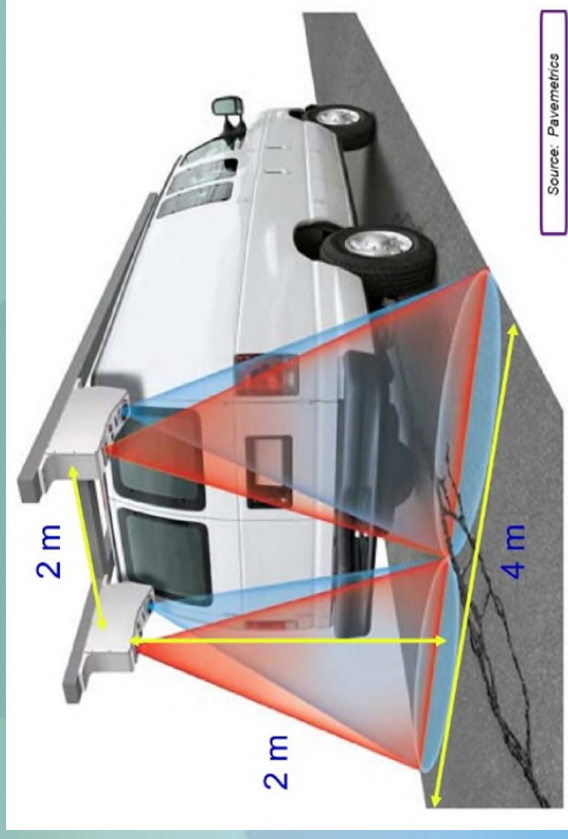
# Vendor Collection Contract

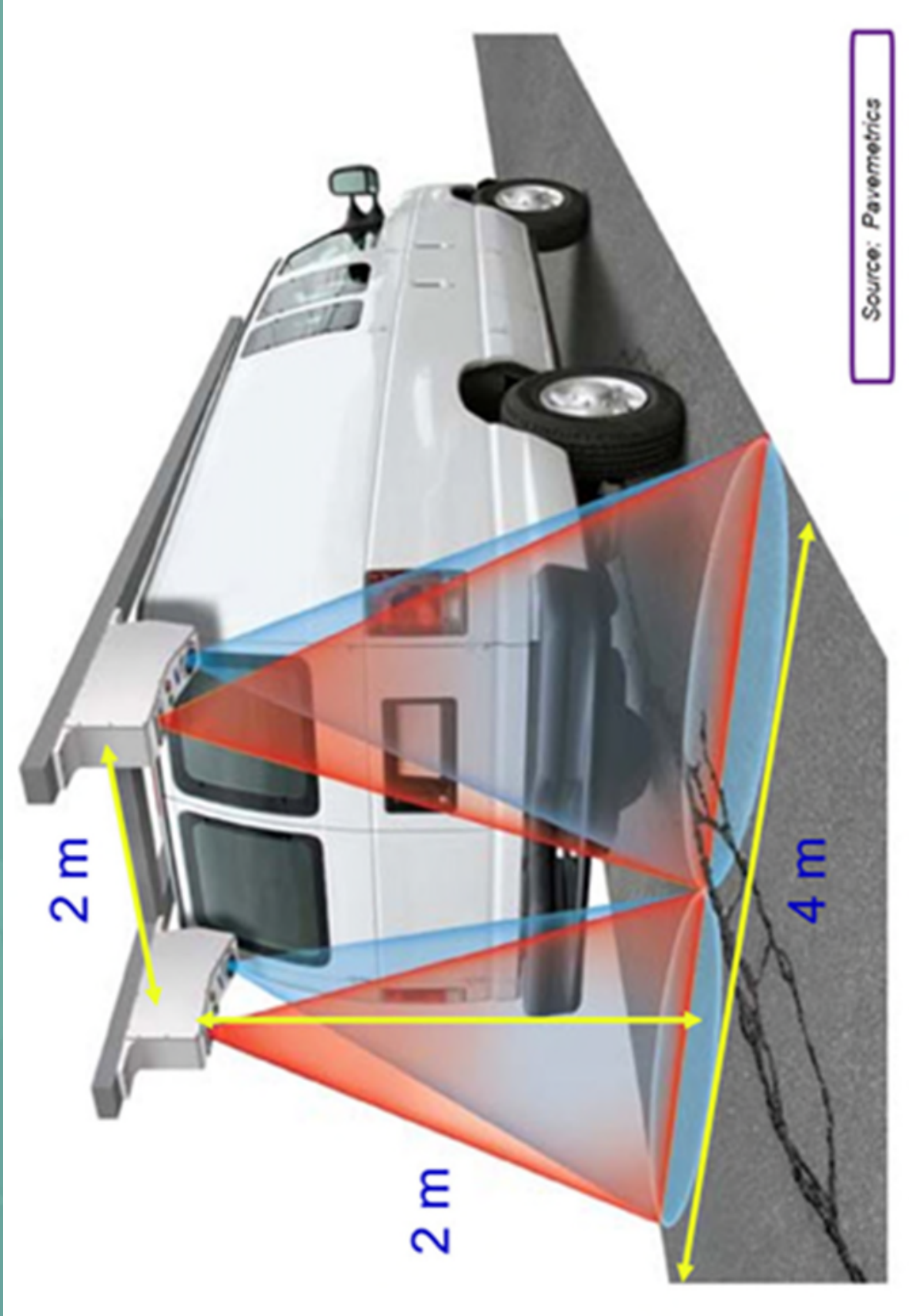
- 4-Year contract term
- 7,000–9,000 annual miles
- One pass per roadbed  
(far right through lane)
- 2-year frequency  
(Annual on Interstate; 1 dir.)
- Late April thru August



# 3-D Laser Measuring System

- IRI
- Rut
- Fault
- Crack orientation & depth detection

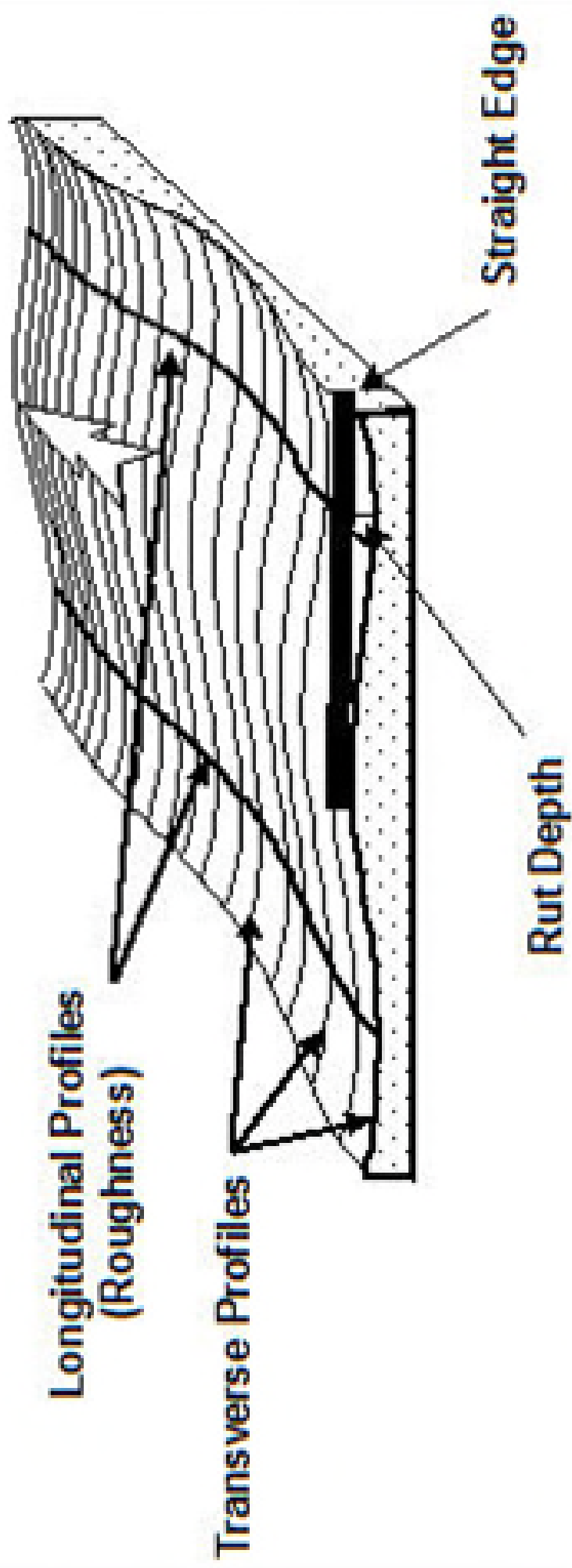




Source: Pavemetrics



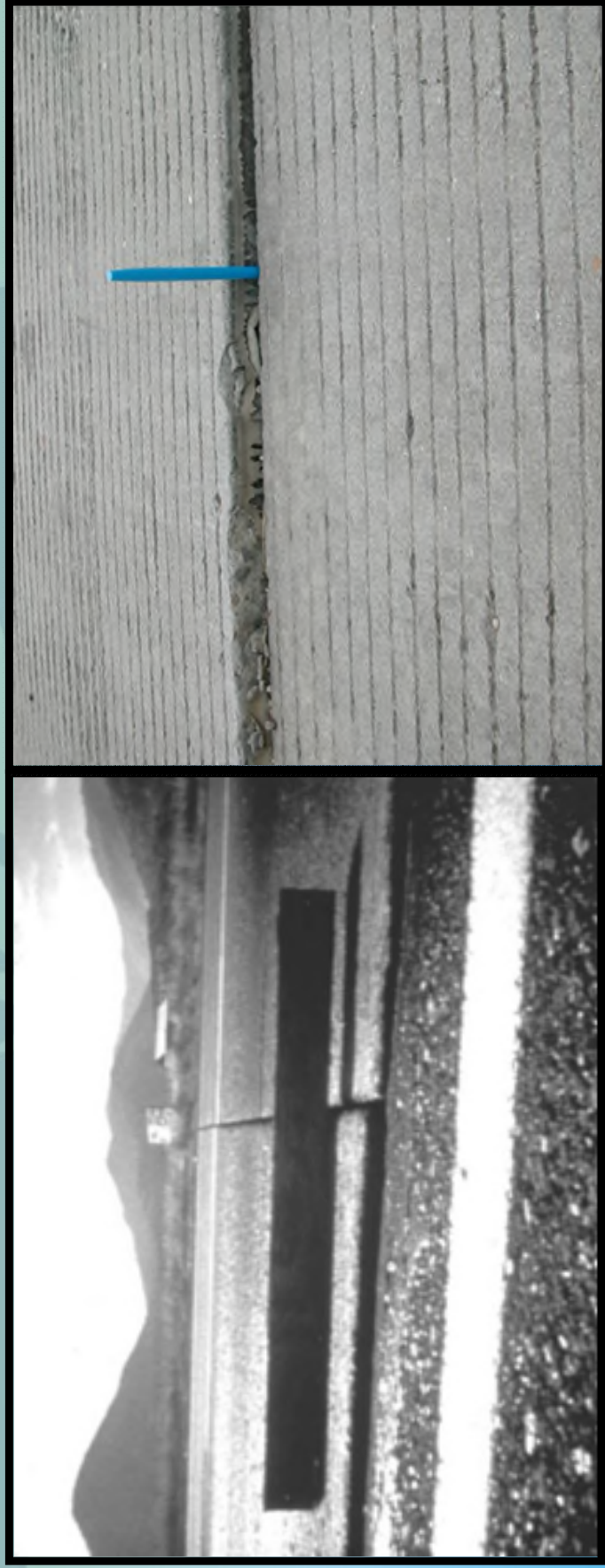
# Surface Profile Measurements



*South Africa National Roads Agency*



# Joint Faulting (Concrete)



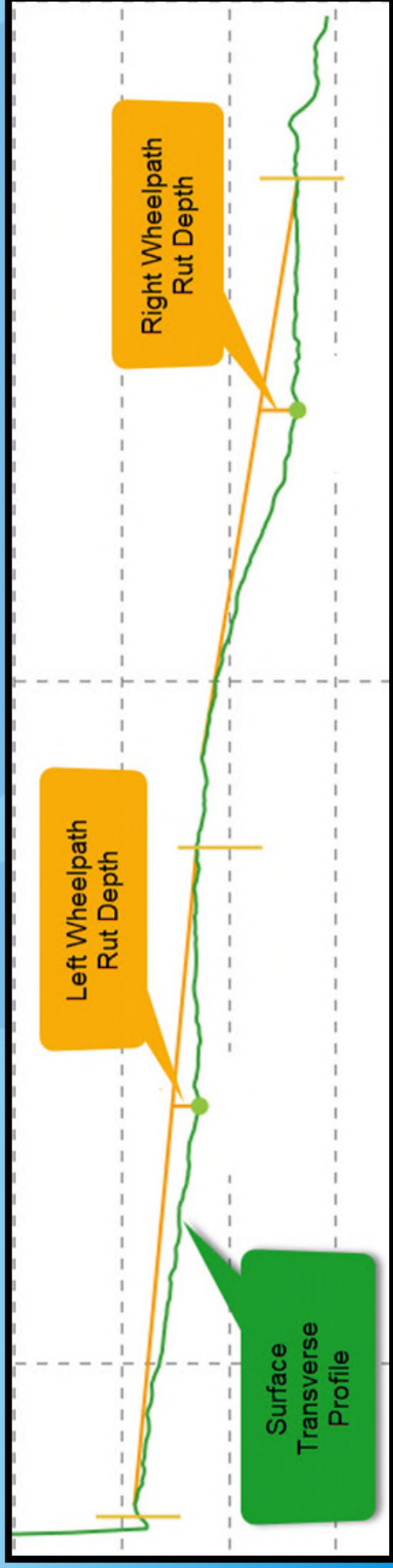
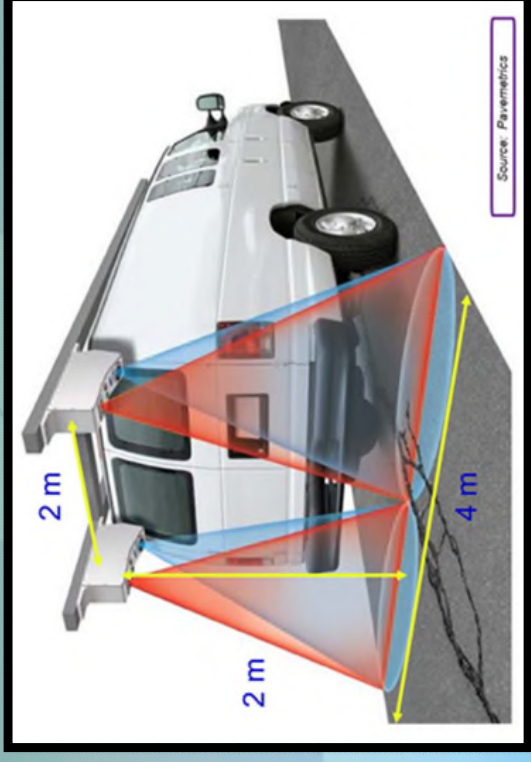
Source: [fhwa.dot.gov](http://fhwa.dot.gov)

(Detected from Laser-Measured Longitudinal Profile)

# Wheelpath Rutting (Asphalt)



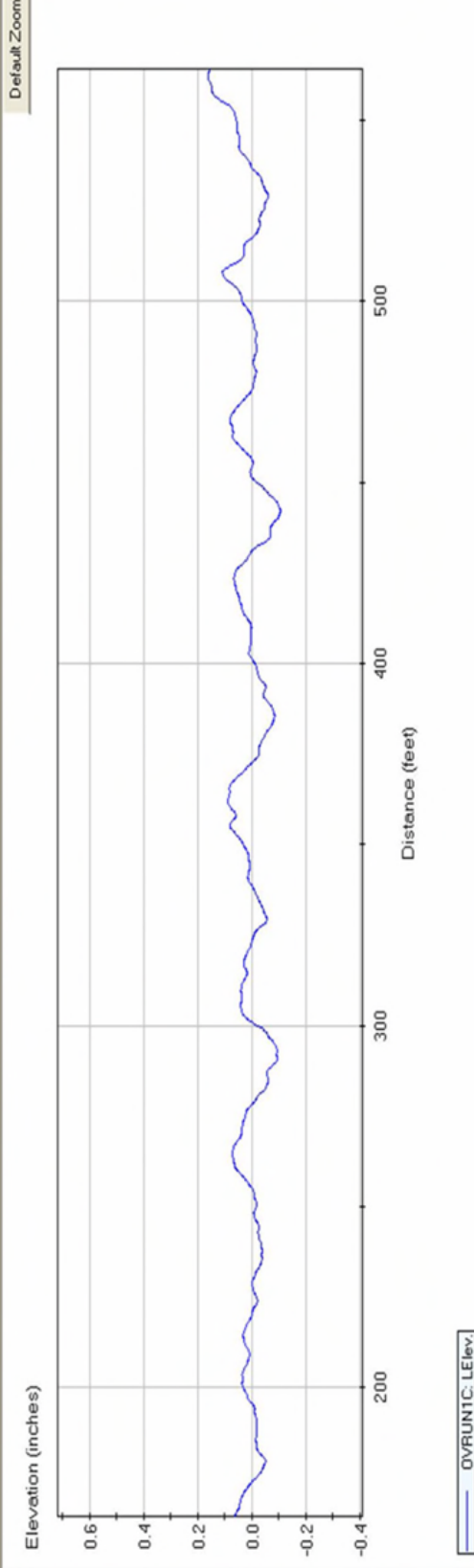
# Wheelpath Rutting (Asphalt)



# International Roughness Index (IRI)

(Longitudinal Profile Capture)

**Typical Profile Measured  
with an Inertial Profiler**





# International Roughness Index (IRI)

Widely-used reference statistic of pavement surface roughness

*Simulated* passenger vehicle suspension response to driving over a laser-measured longitudinal profile at 50 mph

Reported Units: inches/mile

## General Qualitative Thresholds

Good:

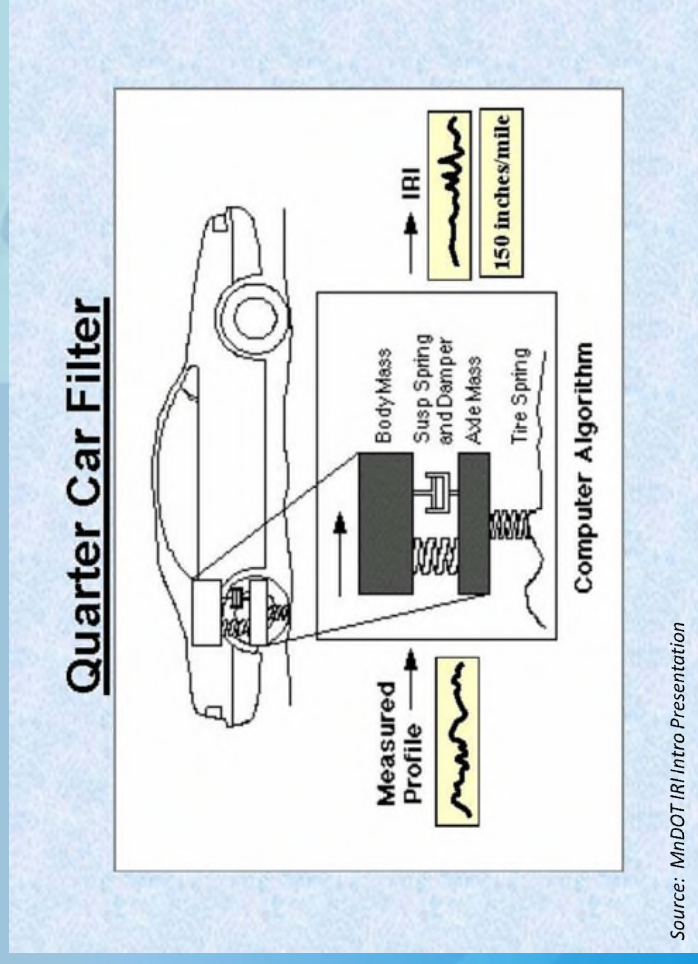
0 - 94

Fair:

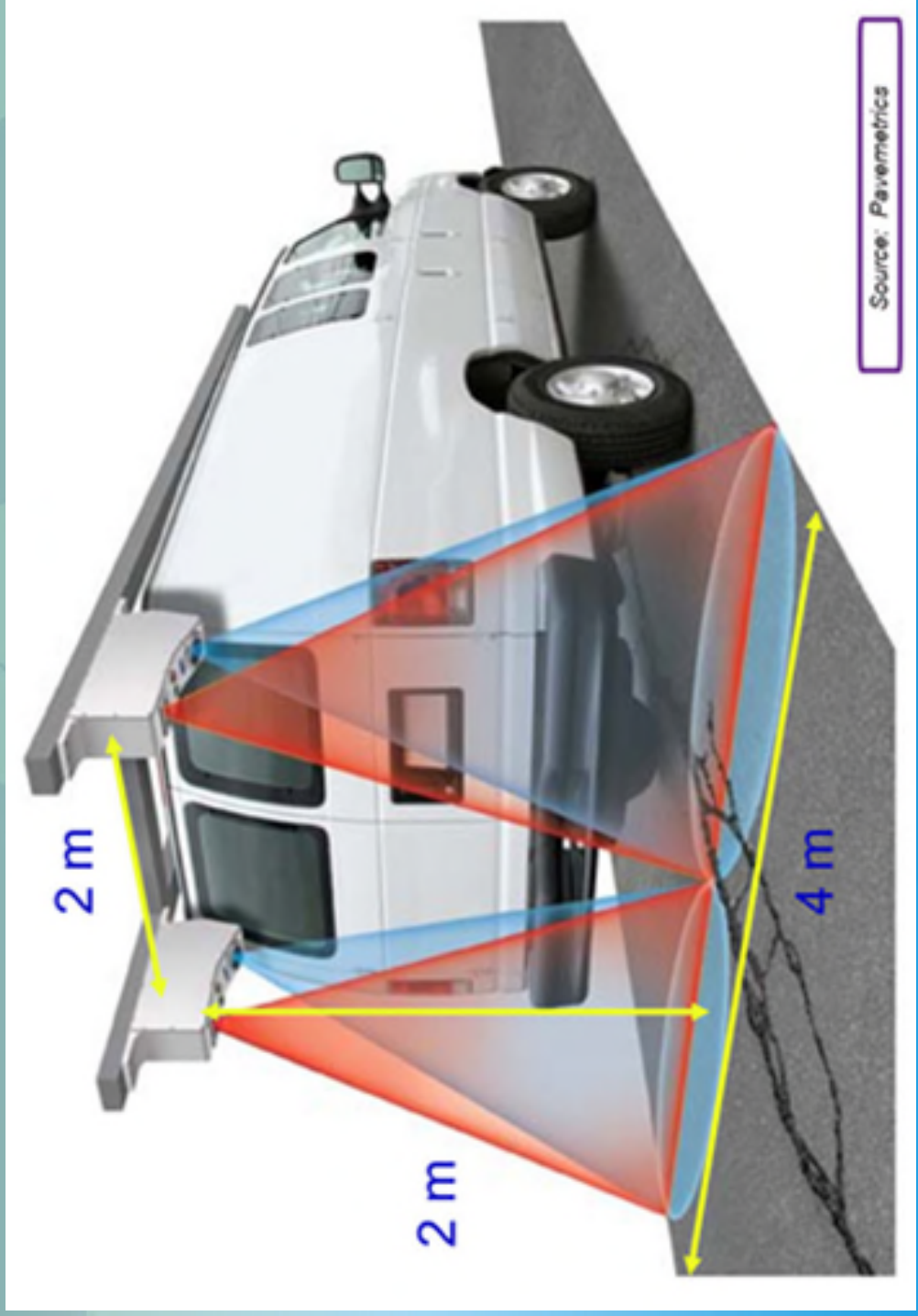
95 to 170

Poor:

> 170



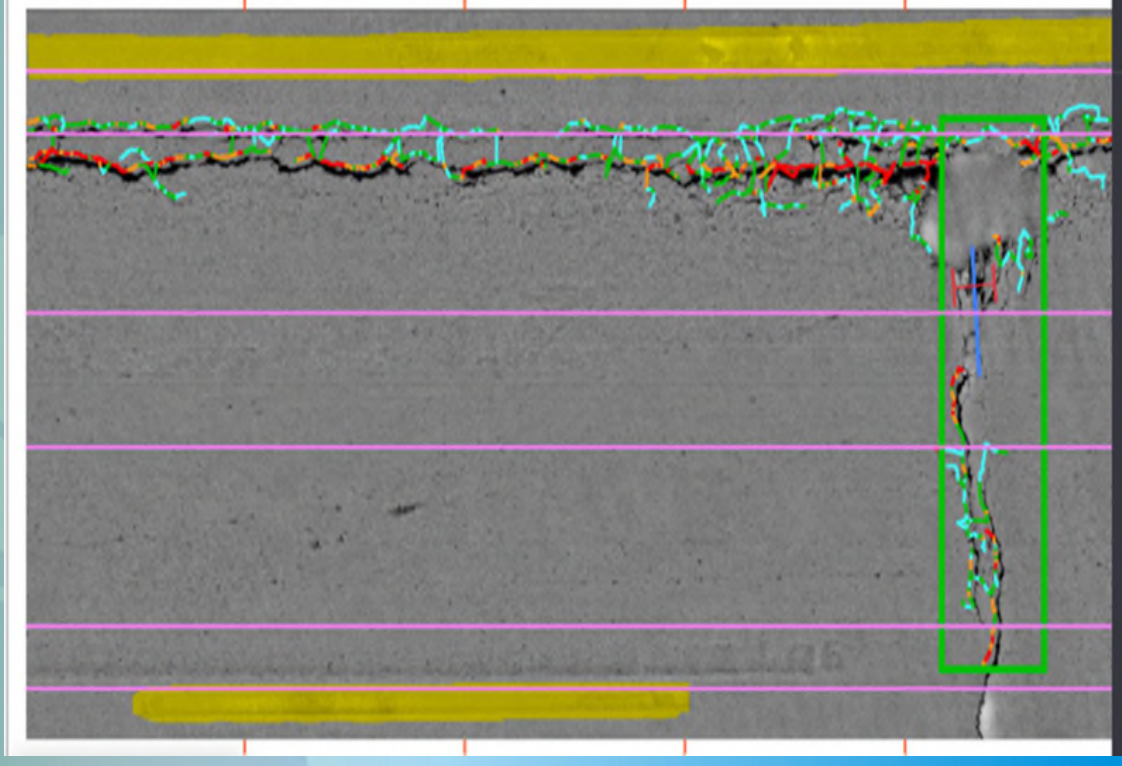
# Cracking Orientation/Depth Detection



# Cracking Orientation/Depth

## Detection

Determined from Laser-Measured Elevation Data and Software





# Imagery Capture

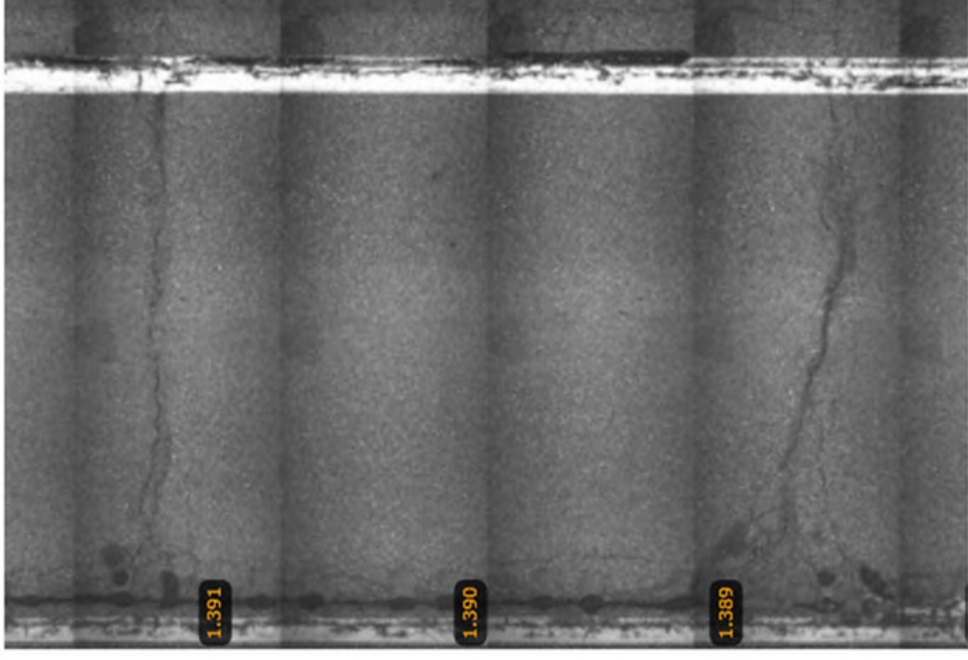
ROW

▼ X



Pavement

▼ X





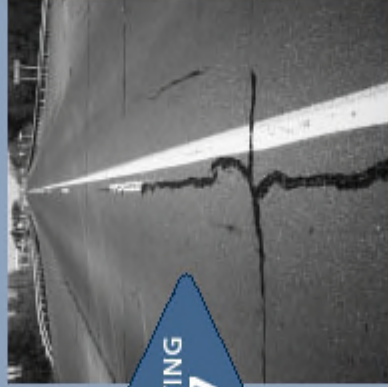
Pavement Surface Evaluation and Rating

# PASER Asphalt Roads Manual

RATING  
10



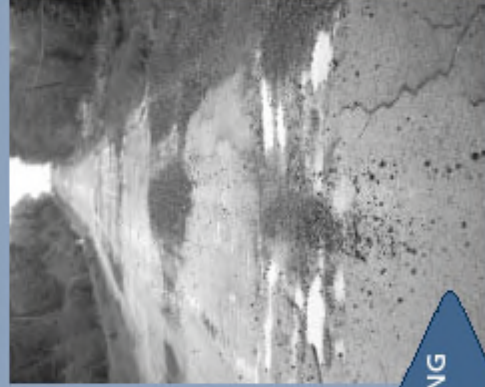
RATING  
7



RATING  
4



RATING  
1



# PASER

(PAvement Surface Evaluation & Rating)

- Developed by Univ. of Wisconsin's TIC
- Windshield Survey
- Rating Scale (1 to 10):
  - 10 = Excellent Condition
  - 1 = Failed Condition
- Administered by MTAMC
- Mich. Federal-Aid Roadways (2-yr. cycle)
- Performed by Cross-Jurisdictional Groups

# For Network “Health” Monitoring

## Remaining Service Life (RSL)

### MDOT’s Working Definition of RSL:

*Estimated time in years until major rehabilitation or reconstruction would be more effective economically than preventive maintenance*

Longevity / Investment Tool (Beyond Surface Snapshots)

# RSL ESTIMATION

## Primary Inputs:

- History of Project Types and Timings
- “Service Life” Benefit Expectation per Project
- Time-Series Analysis of Historical Distress Measures

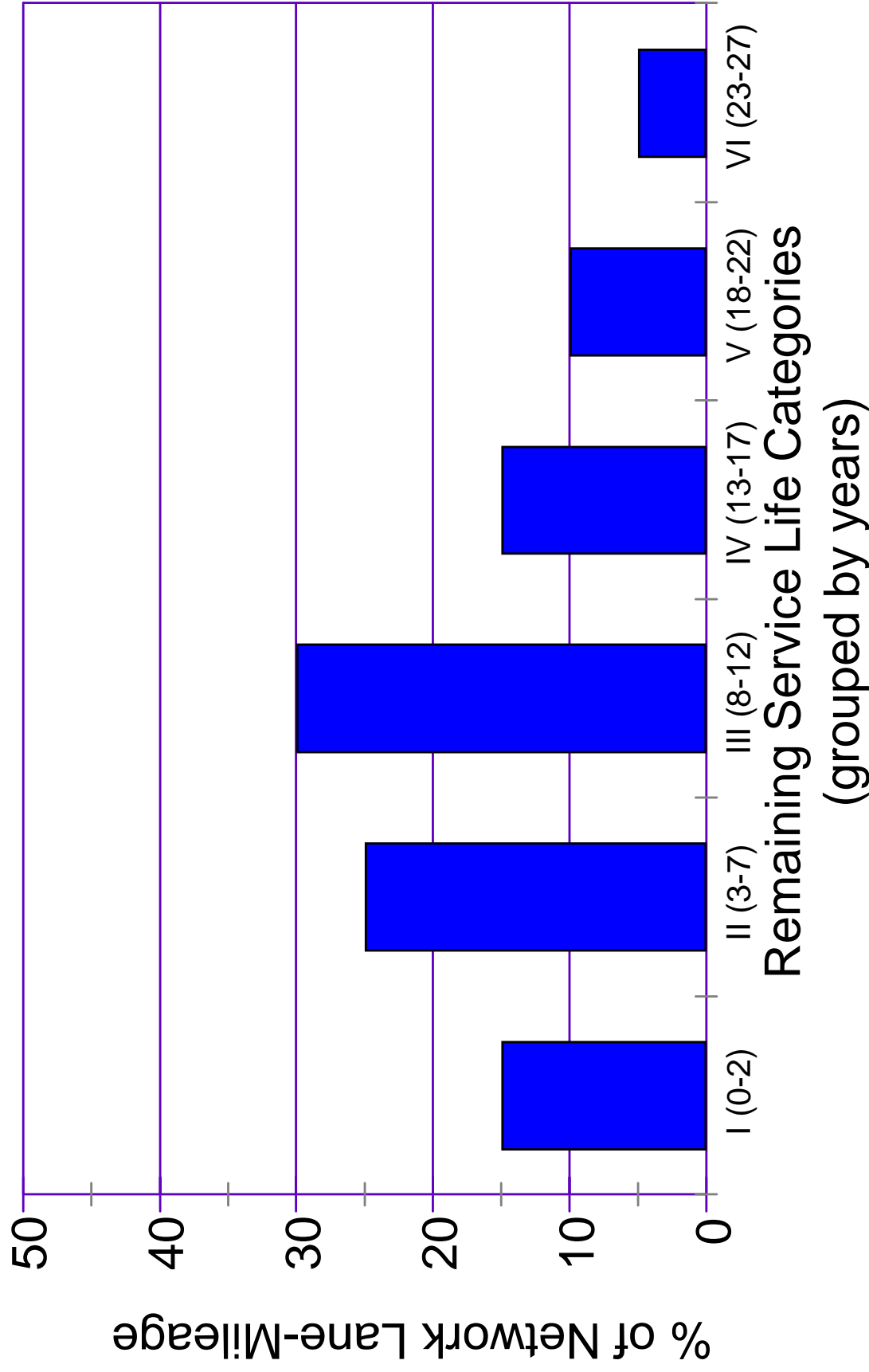


# Remaining Service Life Categories

Category	RSL Range
I	0-2 years
II	3-7 years
III	8-12 years
IV	13-17 years
V	18-22 years
VI	23-27 years

# Network RSL Distribution

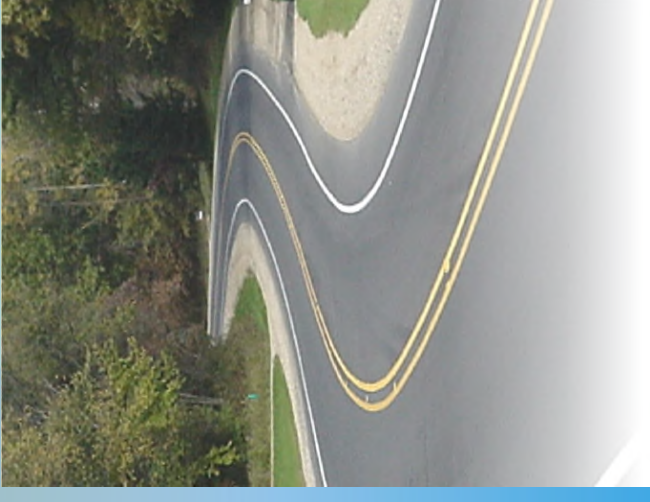
Example Current Condition



# MDOT

## Uses of Pavement Condition Data

- Network Condition Monitoring/Forecasting
- Construction Program Development
- Pavement Design
- Pavement Warranties
- Pavement Fix Performance Analysis
- Federal Reporting



# Federal HPMS Reporting

- State DOTs Required to Report Annually  
(60+ Data Items Reported)
- Pavement Condition Metrics Reported (per 0.1.Mile):
  - IRI
  - Rut or Fault
  - Cracking\_Percent
    - Asphalt: Portion of Total Area with Wheelpath Cracking
    - Concrete: Portion of All Slabs that Contain Trans. Cracks

(Basis for New Perf. Measures Monitoring)



# Data Publication & Access

- Annual Pavement Condition File (PCF)
  - Excel file Stored at <U:\PMSPUB\PaveCondFiles>

A	B	C	D	E	F	G	H	I	J	L	M	N	P	S	T	U
REGION	CS NUM	CS DIR	CS BMP	CSEMP	PR NUM	PR BMP	PR EMP	ROUTE	DIVIDED	COUNTY	LANES	INT	NHS	RSL	ZERO YEAR	LATEST PROJECT YR
North	1011	I	0.000	4.073	3010827	0.000	4.073	M65	N	Alcona	2	N	N	7	1998	2017
North	1011	I	4.073	10.953	3010827	4.073	10.953	M65	N	Alcona	2	N	N	9	2001	2019
North	1012	I	0.000	4.360	1725010	0.000	4.360	M65	N	Alcona	2	N	N	4	2002	2009
North	1012	I	4.360	9.417	1725010	4.360	9.417	M65	N	Alcona	2	N	N	9	2002	2019
North	1012	I	9.417	9.852	1725010	9.417	9.852	M65	N	Alcona	2	N	N	3	2002	2014

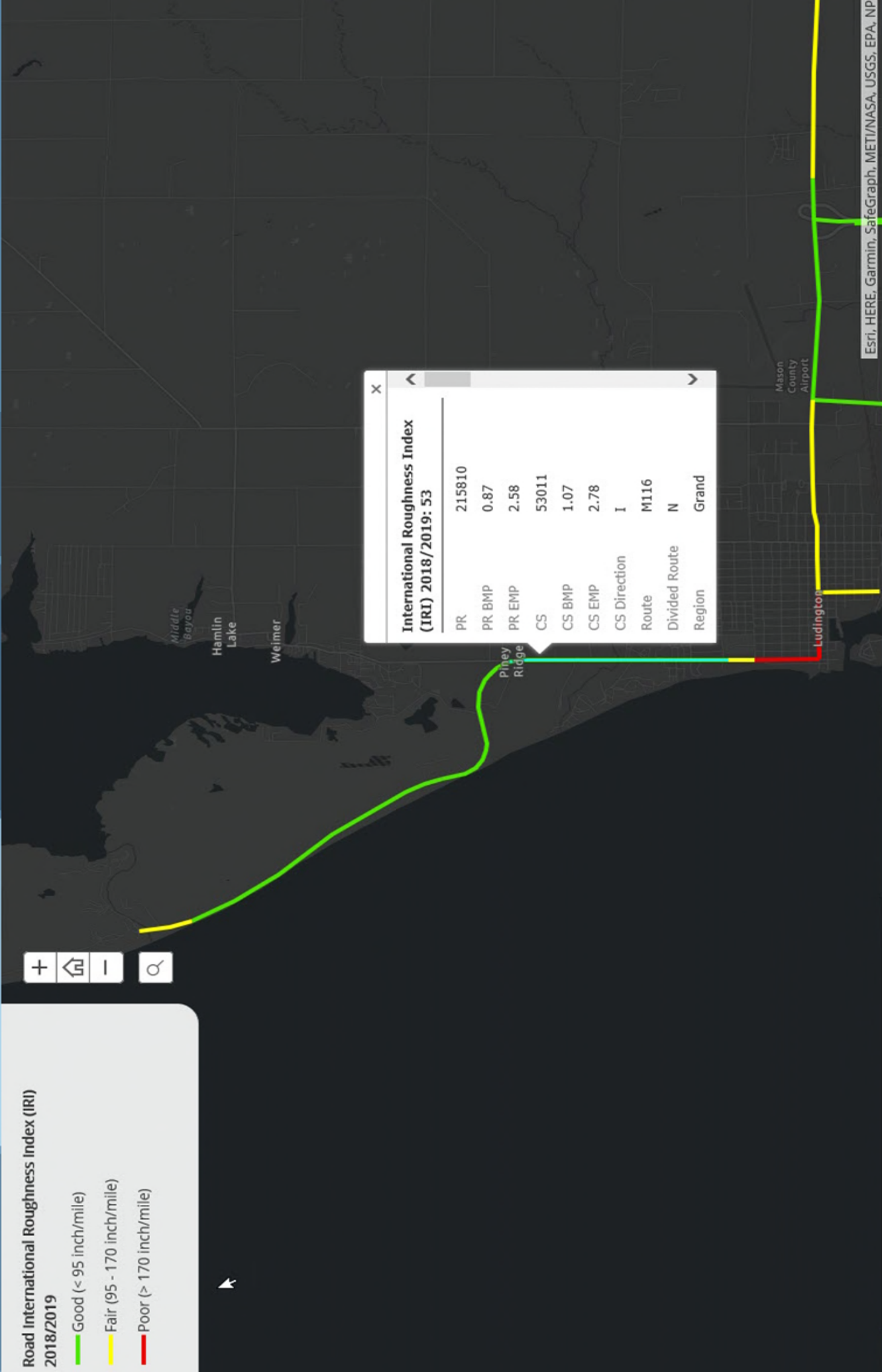
# Data Publication & Access

- MDOT GIS Data Viewer Link (ArcOnline)
  - *Maps of Latest Data on RSL segmentation*
- NHS Condition Analysis Link (ArcOnline)
  - *Maps of Federal Performance Measures 0.1-Mile Data*





# Pavement Condition Measures Viewer



# Federal HPMS Reporting

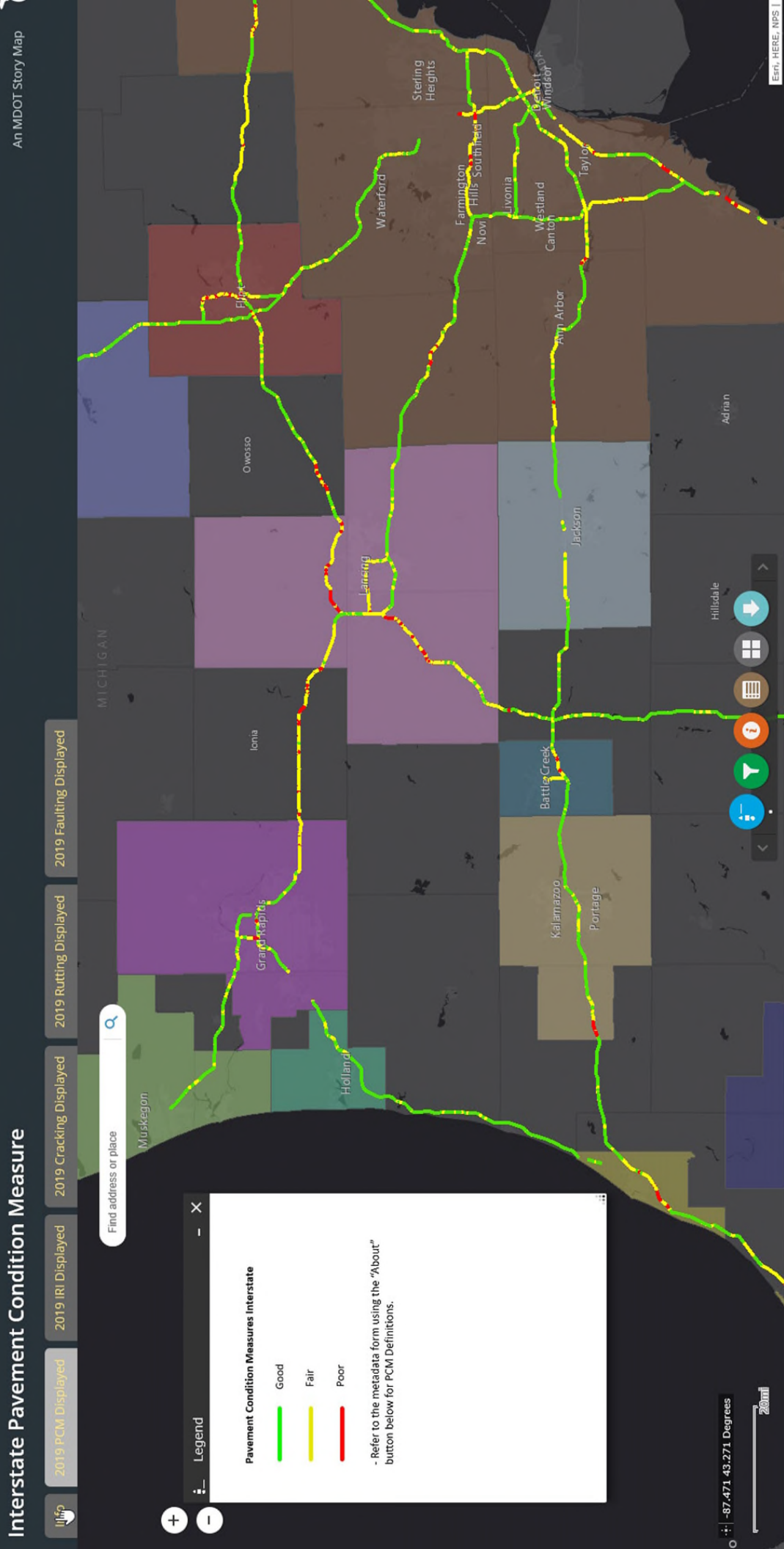
## Transportation Performance Measures MDOT Pavement Condition Measure (PCM)

PCM Metric Thresholds			
	Good	Fair	Poor
IRI (Inches/mile)	<95	95-170	>170
Cracking Percent (%)	<5	CRCP: 5-10 JCP: 5-15 Asphalt: 5-20	>10 >15 >20
Rutting (Inches)	<0.20	0.20-0.40	>0.40
Faulting (Inches)	<0.10	0.10-0.15	>0.15

Calculation of Pavement Measures (490.313) (For Each 0.1-Mile Pavement Section)		
Overall Section Condition Rating	3 metric ratings (IRI, Cracking and faulting/rutting)	Measures
Good	All three metrics rated "Good"	Percentage of lane miles in "Good" condition
Poor	≥ 2 metrics rated "Poor"	Percentage of lane miles in "Poor" condition



# Public-Access Link: NHS Inventory and Condition Analysis (Federal Performance Measures Monitoring)



<https://mdot.maps.arcgis.com/apps/MapSeries/index.html?appid=45ae978115da47c495cd402335f9a4a5>

# Imagery Viewing Access

- via TAMS *Road Video Viewer* & *Road Analyzer*

The screenshot shows the 'MI Login for Workers' portal. At the top, there is a navigation bar with links for HOME, REQUEST ACCESS, UPDATE PROFILE, and LOGOUT. Below this, the user's name 'Home Page of Dan Sokolnicki' is displayed, along with a sub-header 'Department of Technology, Management and Budget (DTMB)'. A list of application links is provided, including 'Clarity Project and Portfolio Management', 'Michigan ID Card Access Request Process (MICARP)', 'SIGMA Employee Self-Service', and 'SIGMA Manager Self Service'. Below this list, the 'Michigan Department of Transportation (MDOT)' section is visible, containing links for 'MDOT Pavement Historical Database', 'MDOT Pavement Management Process Plan', 'MDOT Program Development Portal (JobNet/SMART)', and 'SAM - Systems Access Manager'. The 'TAMS-TSS' link is highlighted with a red box, and 'TAMS-VueWorks' is listed below it.

**MI Login for Workers**

HOME REQUEST ACCESS UPDATE PROFILE LOGOUT

**Home Page of Dan Sokolnicki**  
Access your applications by clicking on the application links below

**DTMB** Department of Technology, Management and Budget (DTMB)

- Clarity Project and Portfolio Management
- Michigan ID Card Access Request Process (MICARP)
- SIGMA Employee Self-Service
- SIGMA Manager Self Service

**Michigan Department of Transportation (MDOT)**

- MDOT Pavement Historical Database
- MDOT Pavement Management Process Plan
- MDOT Program Development Portal (JobNet/SMART)
- SAM - Systems Access Manager
- TAMS-TSS**
- TAMS-VueWorks

# Imagery Viewing Access

- via TAMS *Road Video Viewer* & *Road Analyzer*

The screenshot displays the 'Application Manager' website. At the top, it says 'Welcome to the Transportation Data Server application manager.' with a 'LEARN MORE »' button. Below this, a section titled 'Apps 5 Available' lists several products, each with a brief description and a 'Learn More' link. The products are: Road Analyzer (blue box), Road Video Viewer (yellow box), Validation Assistant (green box), Segment Analyzer (purple box), and Report Engine (red box). The 'Road Analyzer' and 'Road Video Viewer' boxes are circled in red. The background of the website features a city skyline at sunset with a hot air balloon.

## Application Manager

Welcome to the **Transportation Data Server** application manager.

[LEARN MORE »](#)

### Apps 5 Available

- Road Analyzer**  
Road Analyzer™ is Transcend's industry leading straight-line diagramming product, to help you visualize and interact with your LRS data.
- Road Video Viewer**  
Combine and view multiple video log imagery from multiple vendors in the same UI, with the ability to seamlessly swap between vendors and imagery collections years, with browser-based annotations.
- Validation Assistant**  
Analyze and resolve data discrepancies with Transcend's Validation Assistant™. VA provides cross-app integrations to resolve your data issues using standard business processes.
- Segment Analyzer**  
Segment Analyzer™ provides the ability to combine road characteristic data that has been modeled in un-segmented relational
- Report Engine**  
Report Engine™ is a web-based report builder and printing tool that allows users to create and print dynamic real-time





# Imagery Viewing Access

- via TAMS *Road Video Viewer & Road Analyzer*

The screenshot displays the Road Analyzer software interface. The main window shows a street view with a Burger King restaurant on the right. The interface includes a top menu bar with options like 'Route', 'Styling', 'Draw', 'More', and 'Help'. Below the main view, there are navigation controls and a 'CAMERAS' button. A detailed road analysis overlay is visible on the right side, showing a scale from 0.00 to 1.20. The analysis includes a legend with the following items:

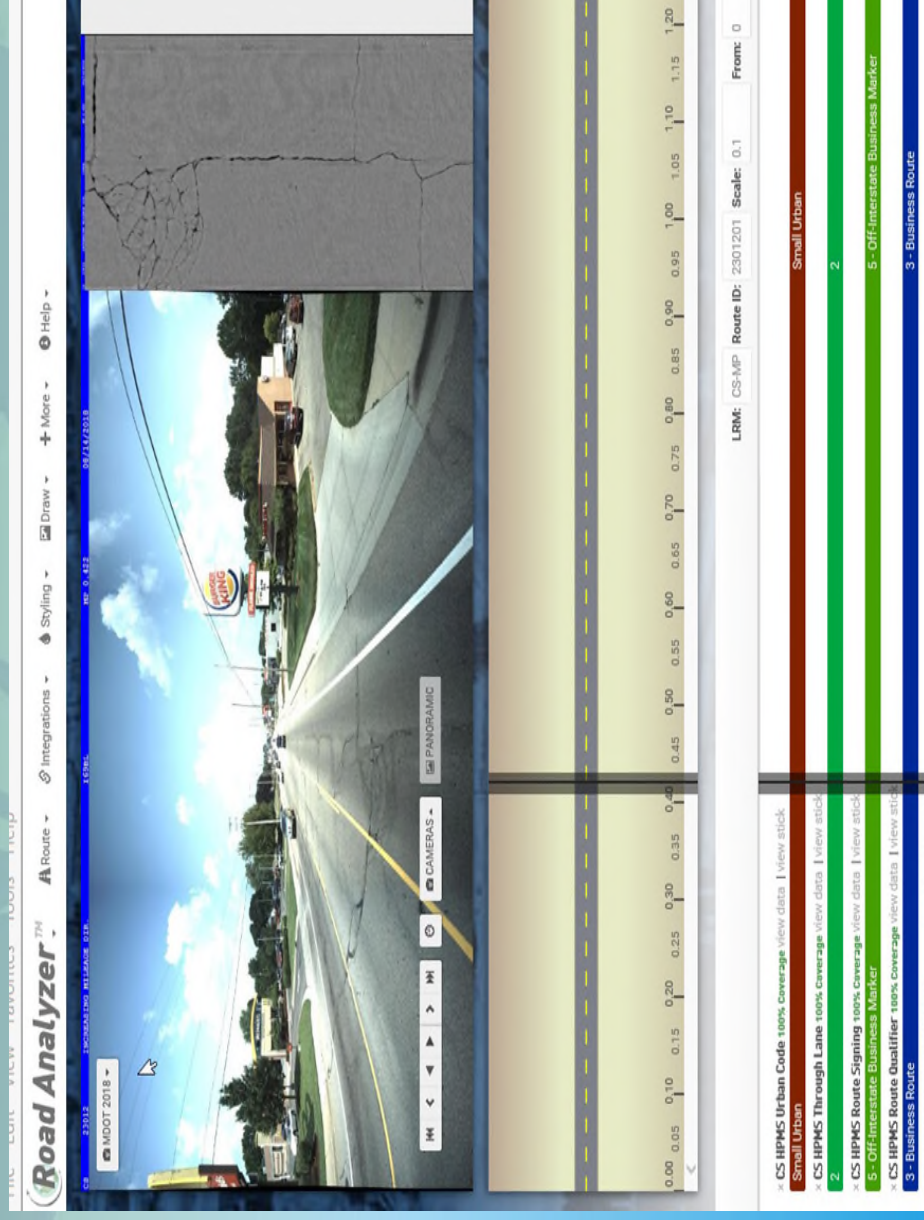
- CS HPMS Urban Code 100% Coverage view data | view stick
- Small Urban
- CS HPMS Through Lane 100% Coverage view data | view stick
- 2
- CS HPMS Route Signing 100% Coverage view data | view stick
- 5 - Off-Interstate Business Marker
- CS HPMS Route Qualifier 100% Coverage view data | view stick
- 3 - Business Route

Additional information at the bottom right includes: LRM: CS-MP, Route ID: 2301201, Scale: 0.1, From: 0.



# Imagery Viewing Access

- via TAMS *Road Video Viewer* & *Road Analyzer*



...Consult with Design Services Section

# Re-Cap of Data Items

- International Roughness Index (IRI)
- Wheelpath Rutting (Asphalt)
- Joint Faulting (Concrete)
- Cracking Percent (HPMS-specific metric)
- Remaining Service Life (RSL) Estimates
- Roadway and Pavement Images



# **Network-Wide Pavement Surface Condition Data**

## **Design Basic Training**

**August 18, 2020**

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