



**RPUG 2024**  
Road Profile Users' Group

April 29 - May 2



**ST. AUGUSTINE**  
FLORIDA

*New Technology For An Old World*

# YEAR TO YEAR REPEATABILITY AND REPRODUCIBILITY OF DOT AND LARGE MUNICIPALITY DISTRESS DATA

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ICC-IMS



**RPUG**  
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# OUTLINE

- INTRODUCTION
- DOTs – HPMS REPORTS
- LARGE MUNICIPALITY - PCI
- CONCLUSIONS



# YEAR TO YEAR COMPARISON – CASE STUDY



Agency	Network Miles	Data Collection Company Year1	Data Collection Company Year2
State - 1		A	C
State - 2	~9600 (AVG)	B	C
State - 3		C	C
Municipality - 1	1700	B	C

# YEAR TO YEAR COMPARISON – DATA



	DOT	Municipality
Distress	HPMS Cracking	PCI (ASTM D6433)
	Rutting (AASHTO R87)	Rutting (Straightedge)
	IRI	IRI
	Faulting	Faulting
	DOT distress protocol	PCI distresses

- MOSTLY RURAL AREA
- FEW STOP AND GO SITUATIONS
- RARE TO HAVE OBSTACLES ON THE SIDES
- 0.1 MILE INTERVALS
- CLEAR COLLECTION RULE

- URBAN AREA
- FREQUENT STOP AND GO SITUATIONS
- COMMON TO HAVE OBSTACLES ON THE SIDES
- PMS SECTIONS
- LANE/DIRECTION NOT ALWAYS DEFINED

# DQMP

PRE-MOBILIZATION

PRE COLLECTION

ONGOING  
MONITORING AND  
PROJECT


TRACKING

FINAL VALIDATION



## DATA QUALITY ASSURANCE AND QUALITY CONTROL

### Pre-Mobilization




For each IRIS-ProPave:  
• **Validation loop** in Largo




### On Site Pre-Collection

**Entry Validations:**

- Local Sites to validate
  - Repeatability (Precision)
  - Reproducibility (Accuracy)



Establish and Approve DQMP 

### Collection

**Weekly Updates** **Daily Network Matching** **Exception Reports** **Ongoing Monitoring**



- Monthly Validations
- Bounce Test
- Block Check
- Accel Cal
- DMI Cal
- Equipment Checks

### Data Processing

Starts 2-3 weeks after data is collected



**Quality Control of all events**



**Quality Control of Sensor data and Distress Data**

- Manual review of a statistically significant data sample (ANSI/ASQ Z1.4)

### Reporting

Starts 1-2 weeks after data is processed

Manual Review of **distresses exceeding expected limits** (Ex. Rut, Fault >1in)

**Year to Year comparison** with historical data for all roads and distresses



Before Starting the Data Collection

Processing of the data will start while **collection is ongoing**. Usually there is a delay of 2-3 weeks from when the data is collected before it start processing. Similarly, there is a delay between processing and reporting

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### Reporting



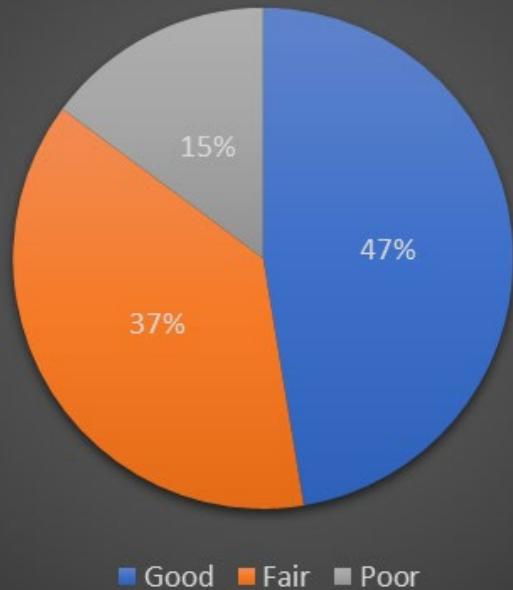
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# ANALYSIS METHOD

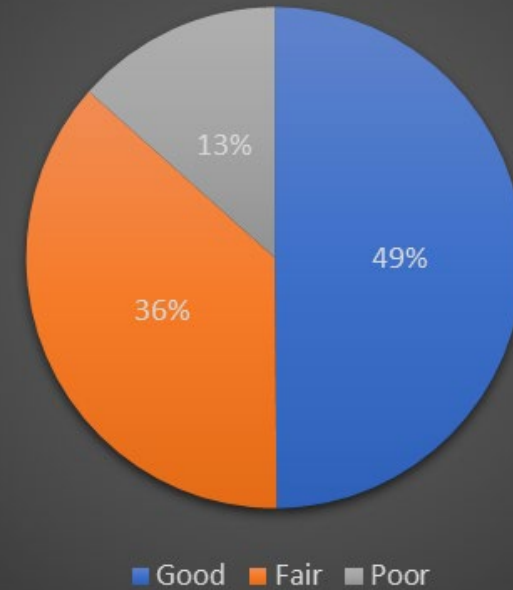
- NETWORK LEVEL COMPARISON IS **NOT SUFFICIENT**



2021 IRI

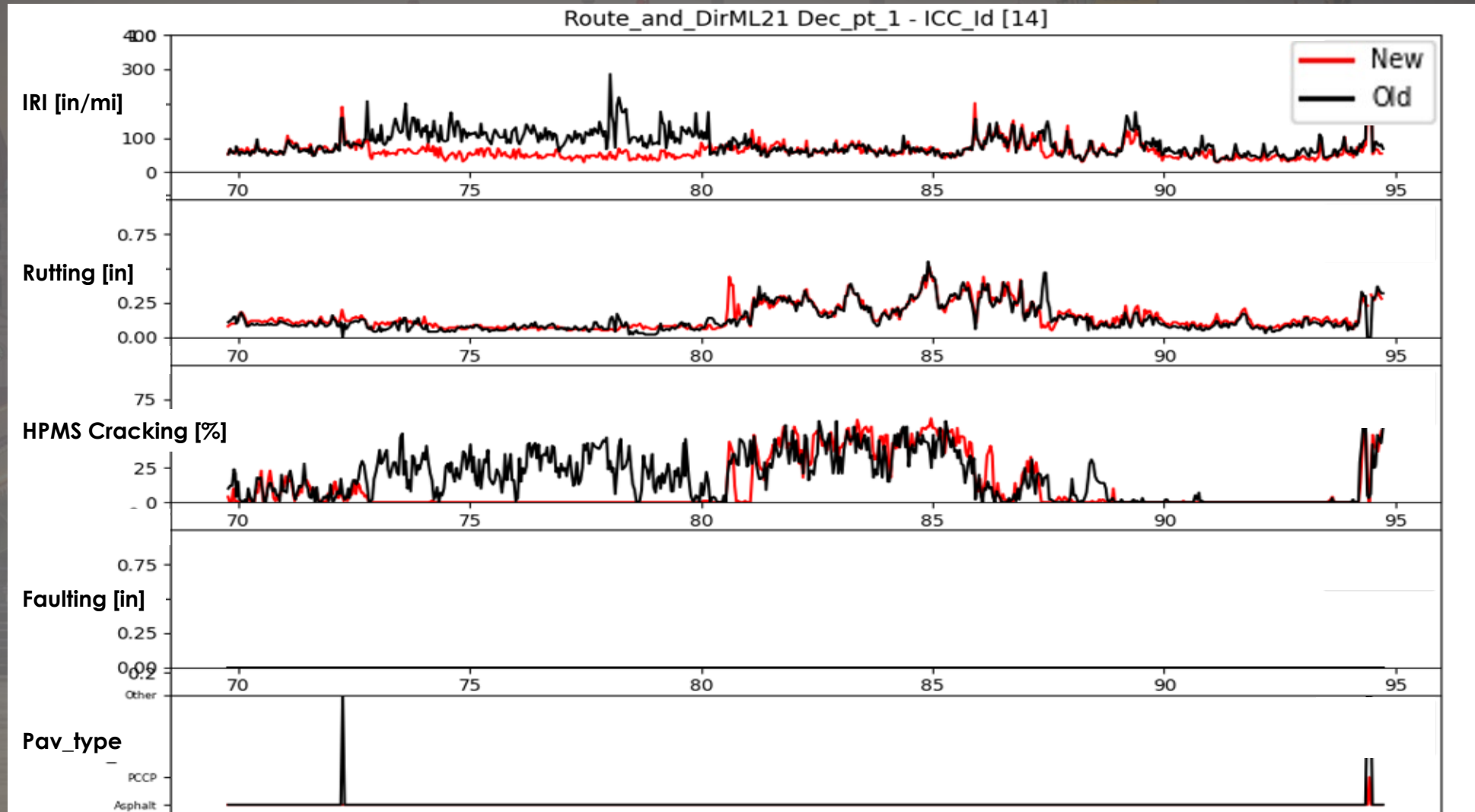


2022 IRI



# ANALYSIS METHOD

- ROAD BY ROAD ANALYSIS





# STATE DOT-1

-GIS LAYER

-COMPARISON OF NON  
HPMS DISTRESSES

-RUTTING METHOD

Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	A	C



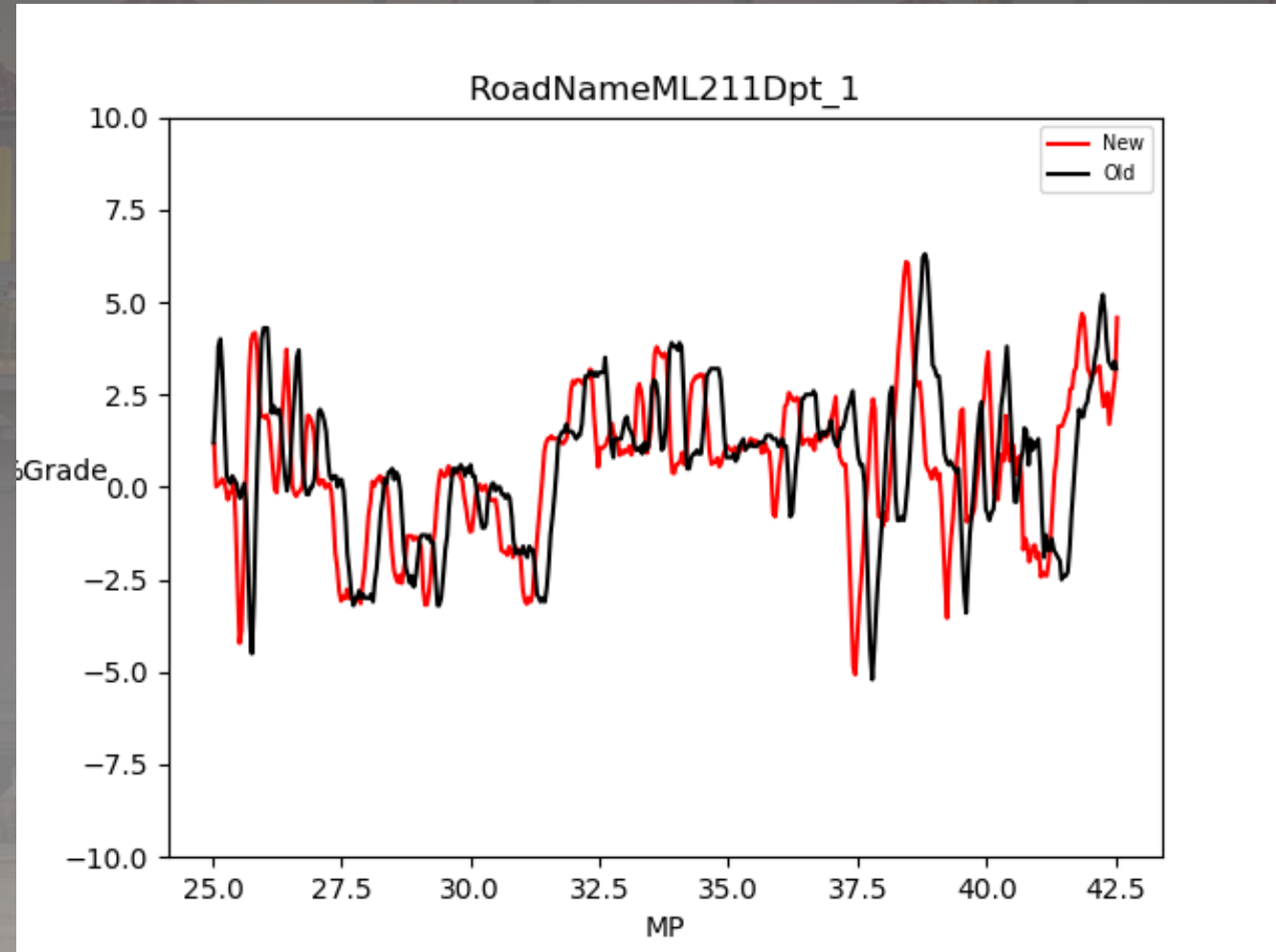
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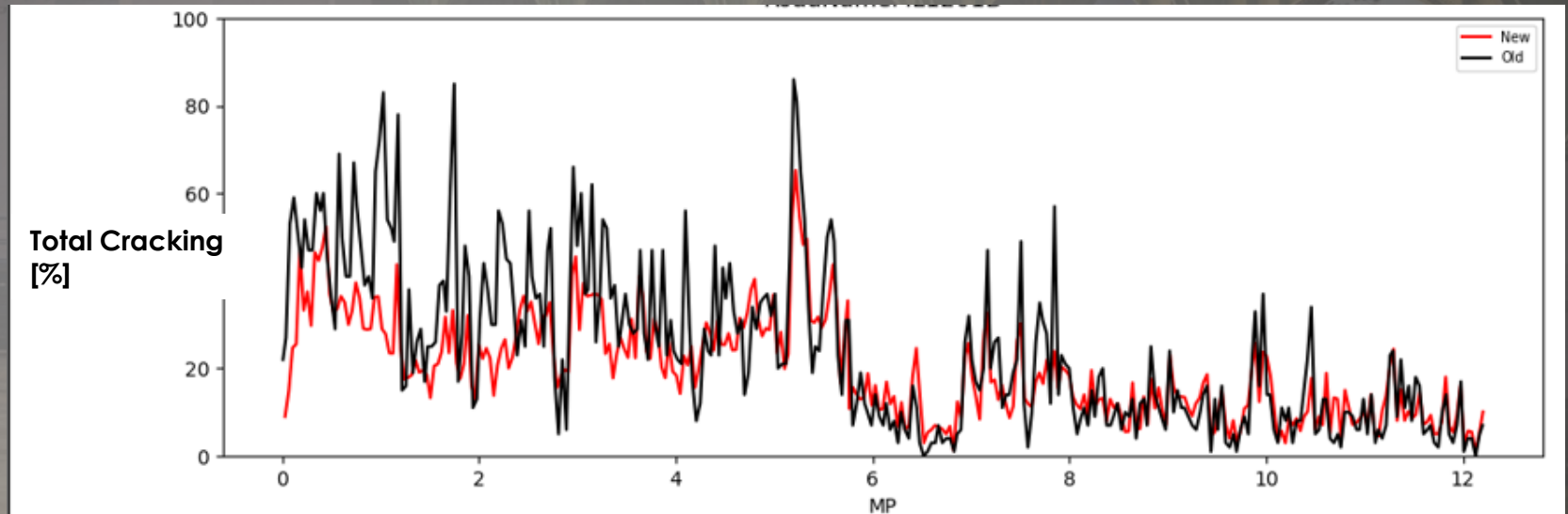
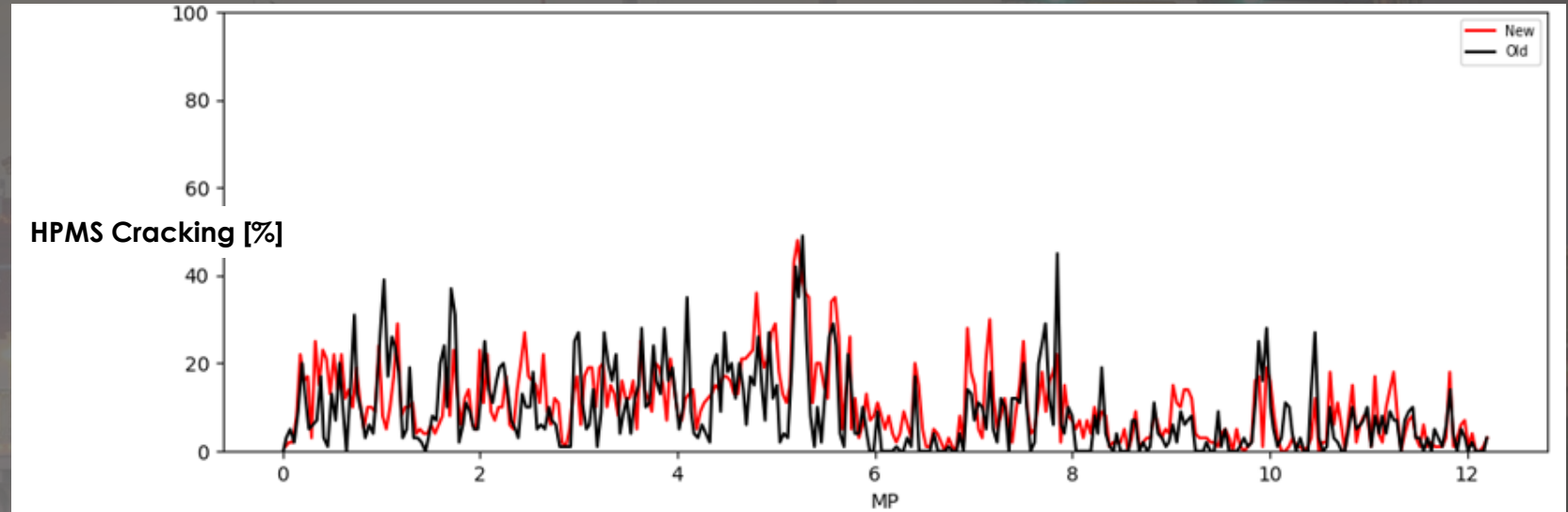
# STATE DOT-1

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-COMPARISON OF NON  
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-RUTTING METHOD

Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	A	C



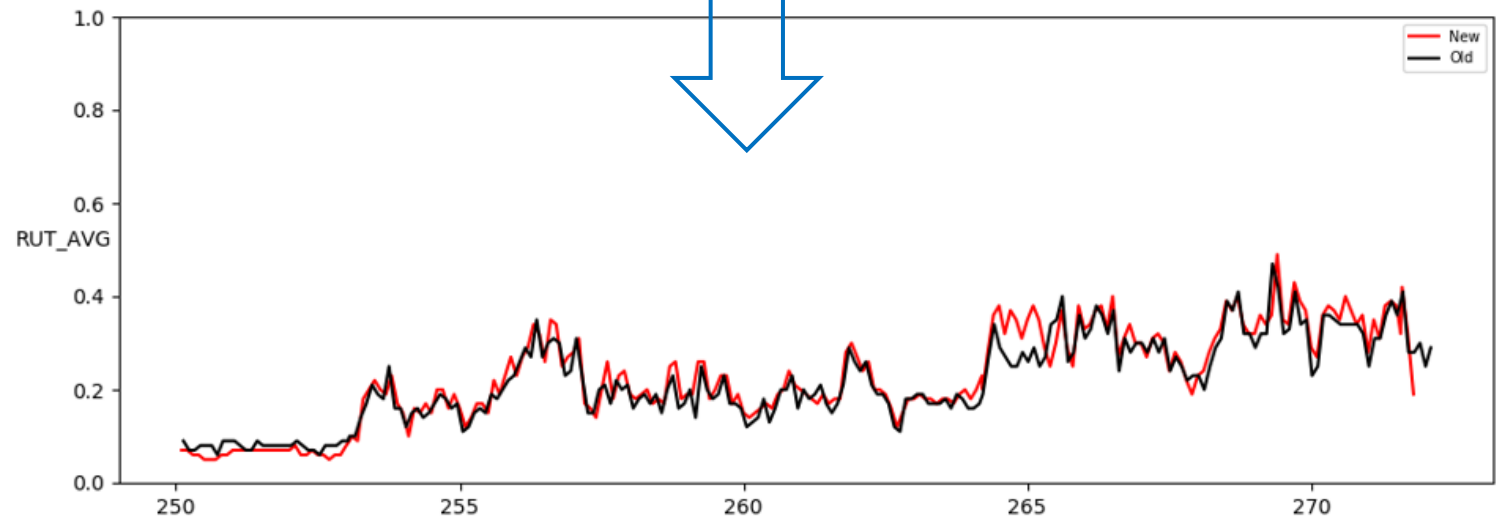
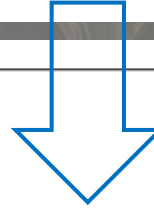
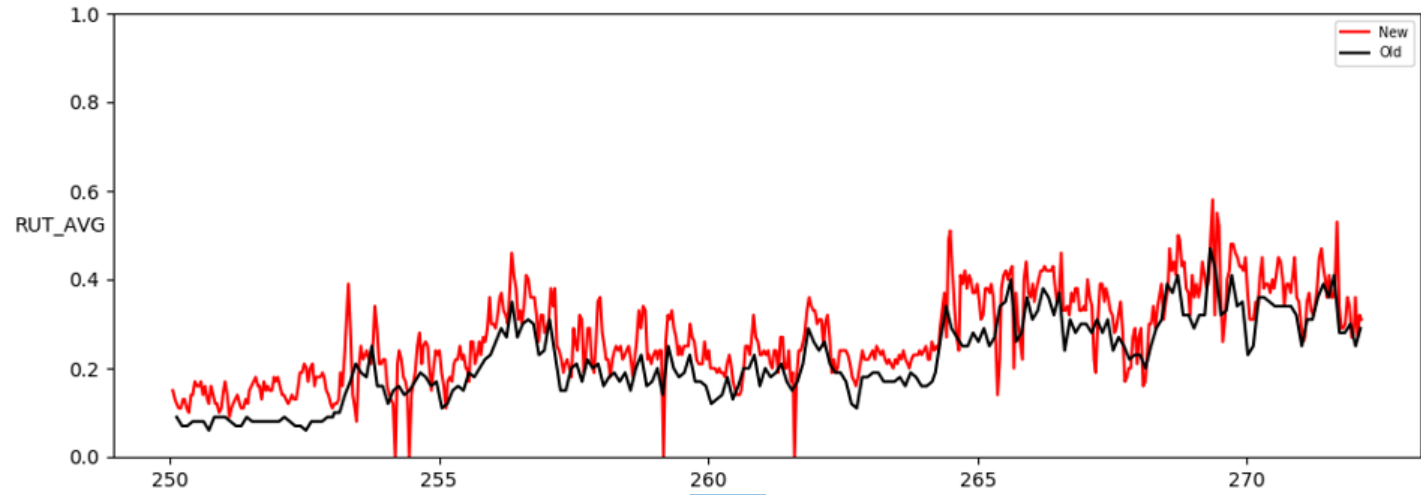
# STATE DOT-1

-GIS LAYER

-COMPARISON OF NON  
HPMS DISTRESSES

-RUTTING METHOD

Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	A	C





# STATE DOT-2

-CRACK DETECTION WITH SAND

-RAVELING

-SEALED CRACKING

Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	B	C



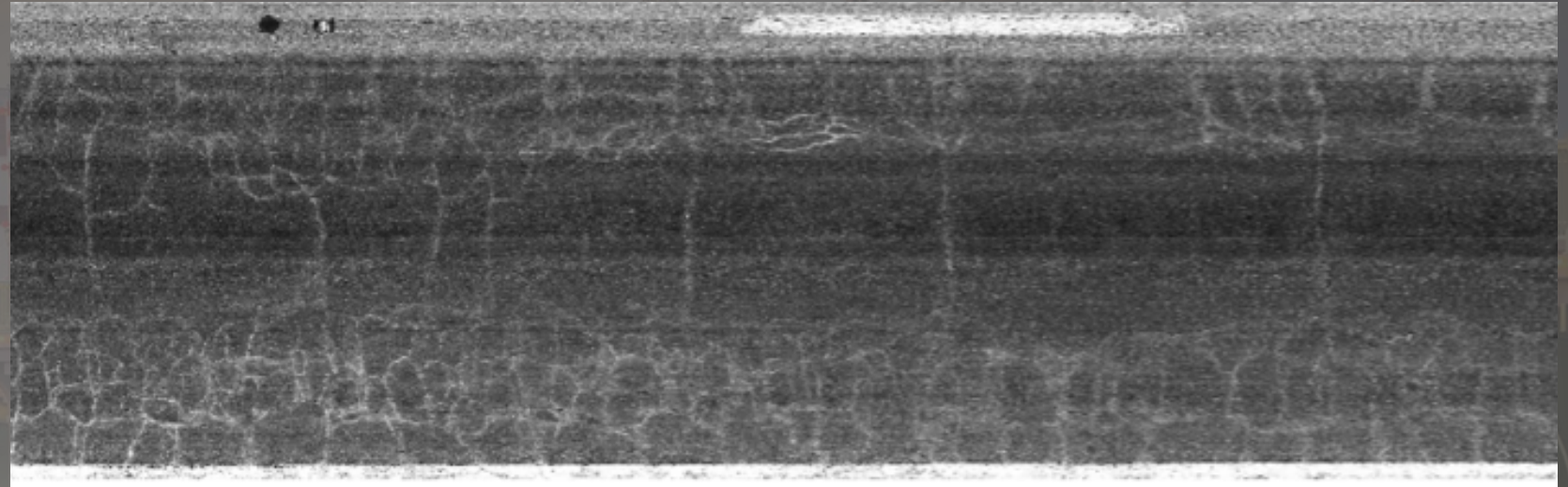
# STATE DOT-2

-CRACK DETECTION WITH SAND

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Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	B	C



# STATE DOT-2

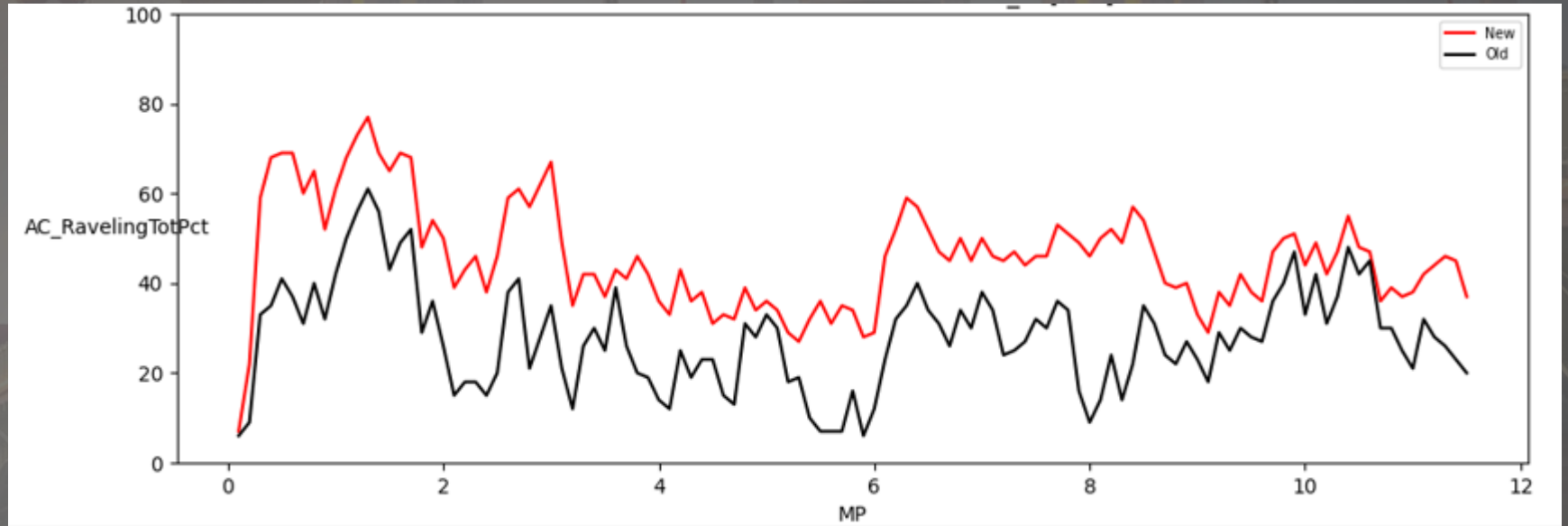
Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	<b>B</b>	<b>C</b>



-CRACK DETECTION WITH SAND

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# STATE DOT-2

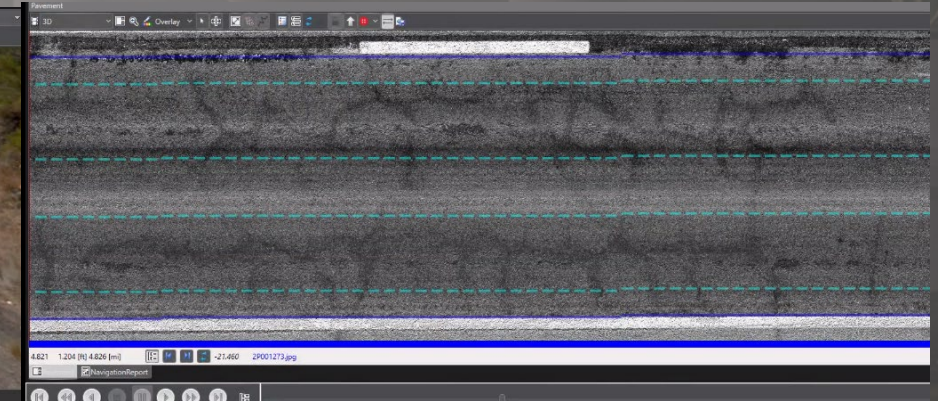
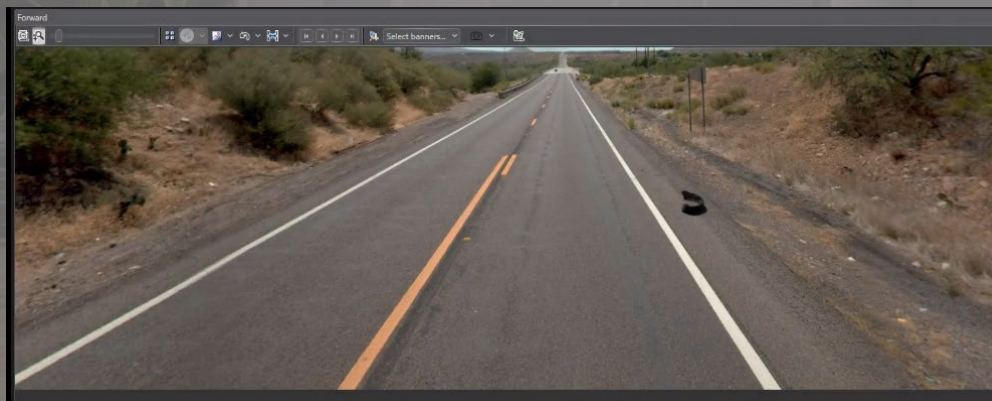
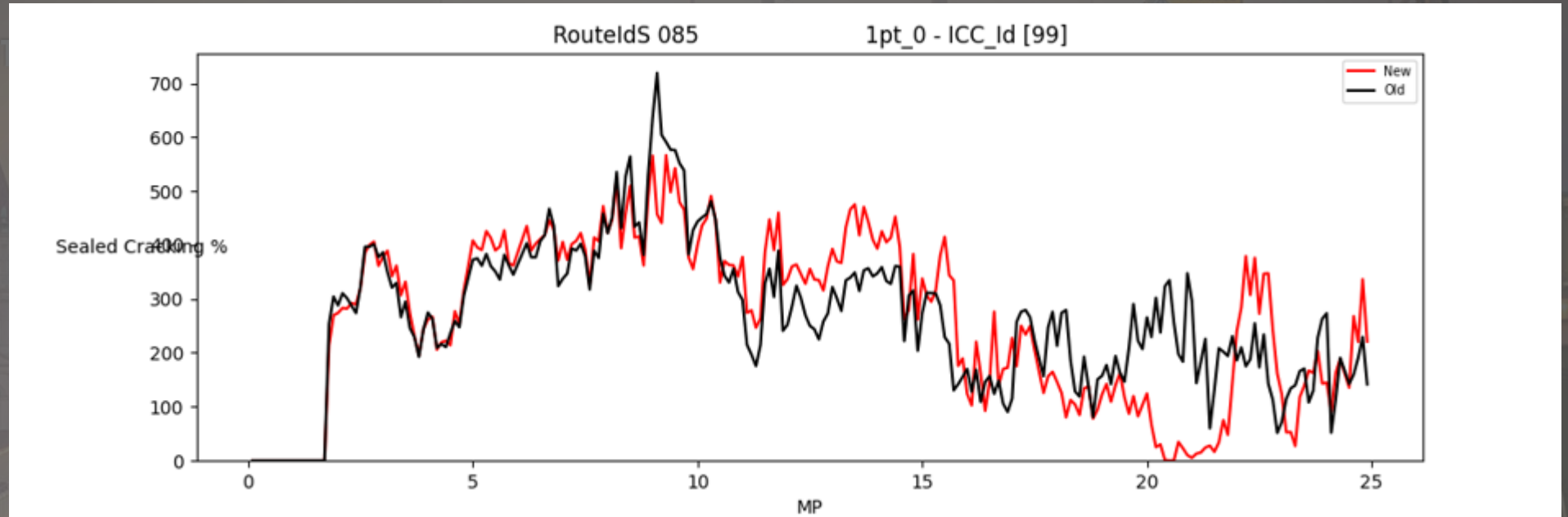
Agency	Data Collection Company Year1	Data Collection Company Year2
State - 1	<b>B</b>	<b>C</b>



-CRACK DETECTION WITH SAND

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-SEALED CRACKING

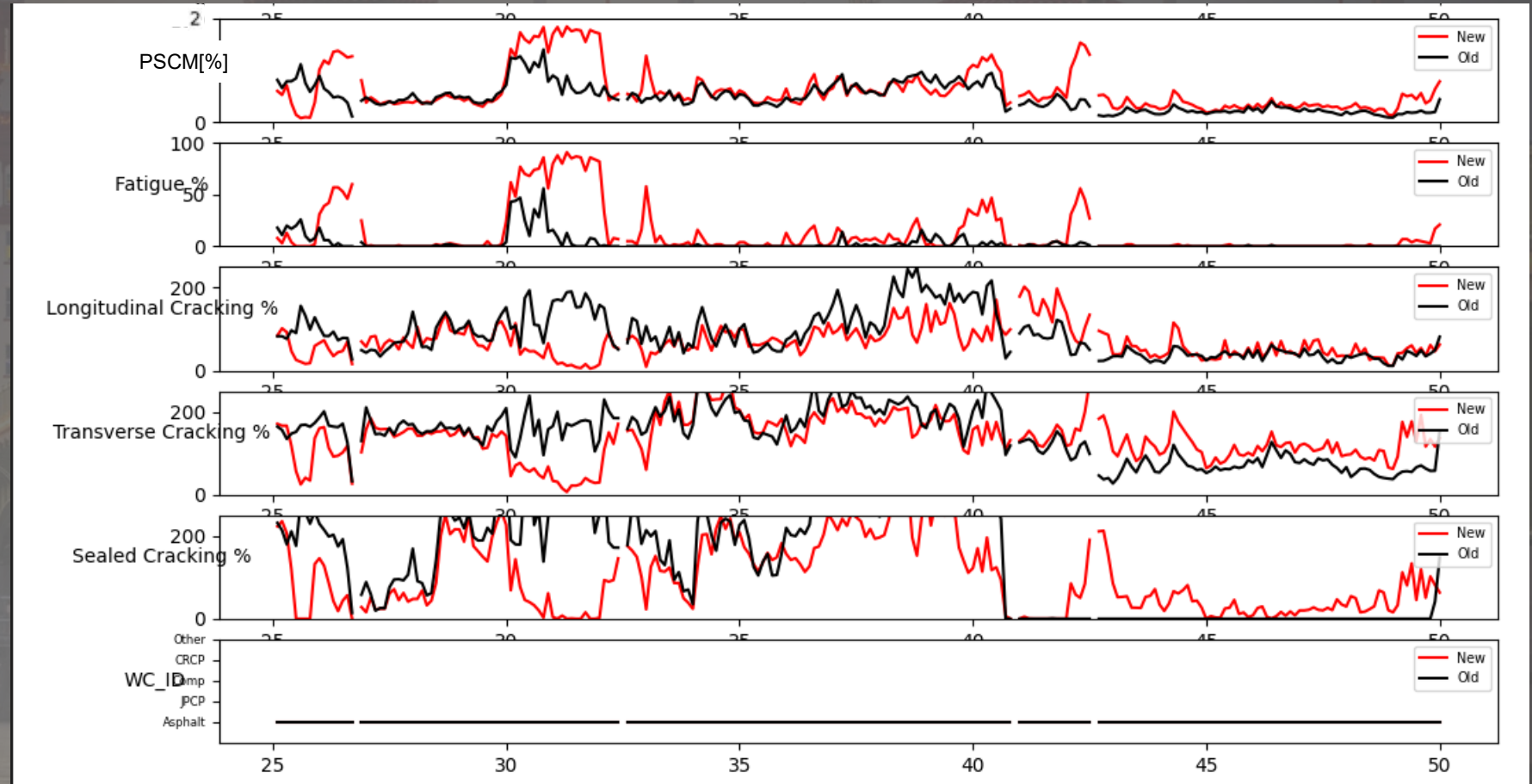


# STATE DOT-3

Agency	Data Collection Company Year1	Data Collection Company Year2
State - 3	C	C



## -USE OF PSCM



# MUNICIPALITY

Agency	Data Collection Company Year1	Data Collection Company Year2
Municipality	B	C



## URBAN ENVIRONMENT:

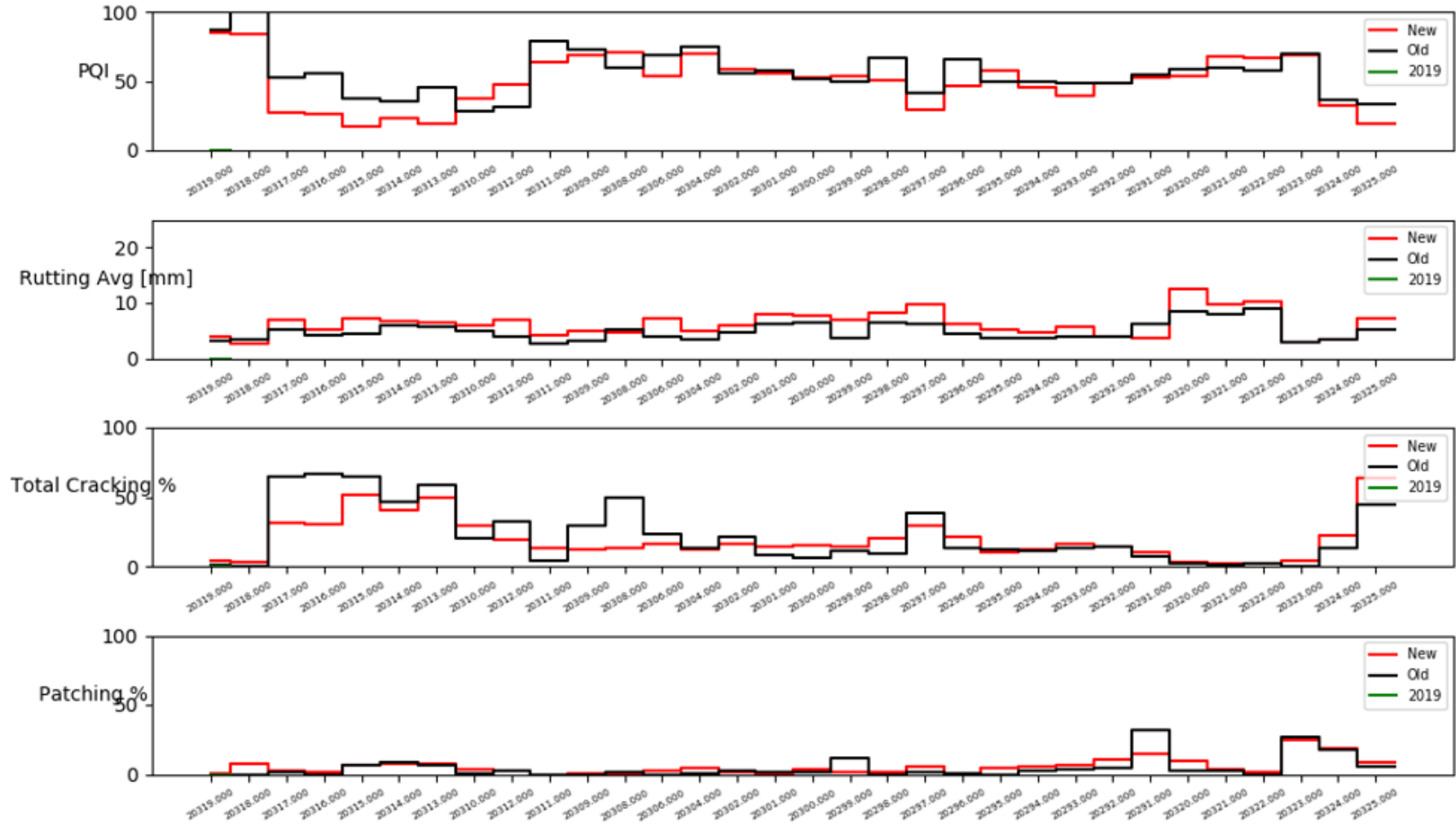
- STOP AND GO SITUATION. IRI MEASUREMENTS AFFECTED
- RUTTING MEASUREMENTS NOT ALWAYS ACCURATE. DRIVING TRAJECTORY, MORE PAVEMENT DEFORMATIONS
- LANES AND DIRECTION TO COLLECT NOT PRECISELY DEFINED

## DISTRESS PROTOCOL:

- PCI CALCULATION IS VERY HEAVILY AFFECTED BY ALLIGATOR AND RUTTING MEASUREMENT. SMALL ERRORS CAUSE LARGE ERRORS IN PCI CALCULATION
- AGENCY HAS DECIDED TO APPLY SEVERAL CORRECTION FACTORS
- HARDER TO COMPARE YEAR OVER YEAR DATA

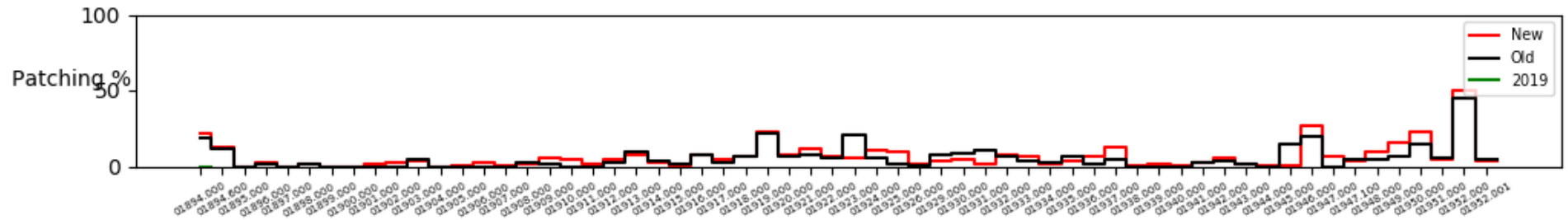
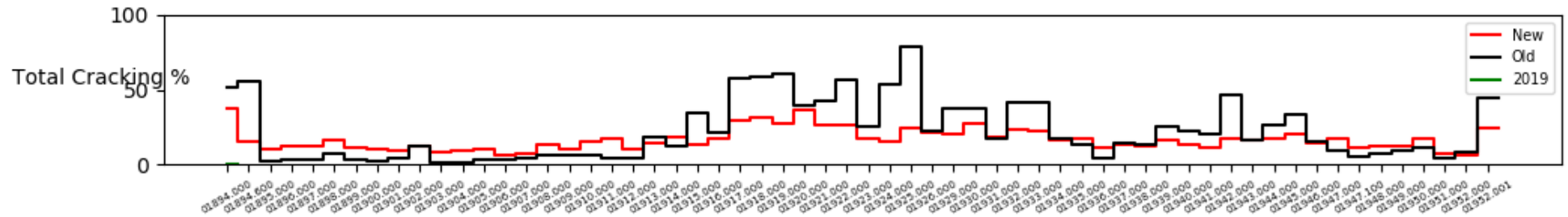
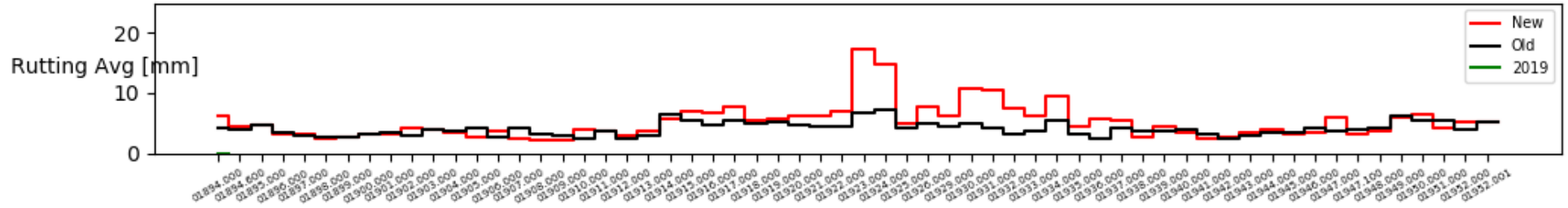
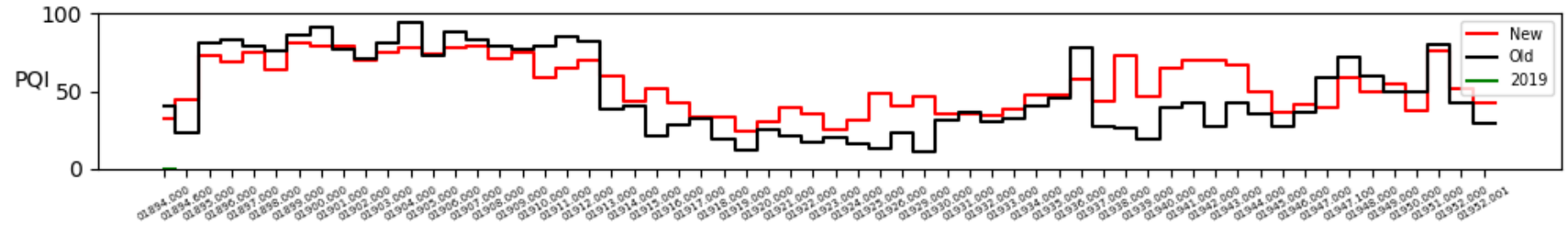
# MUNICIPALITY

Agency	Data Collection Company Year1	Data Collection Company Year2
Municipality	<b>B</b>	<b>C</b>



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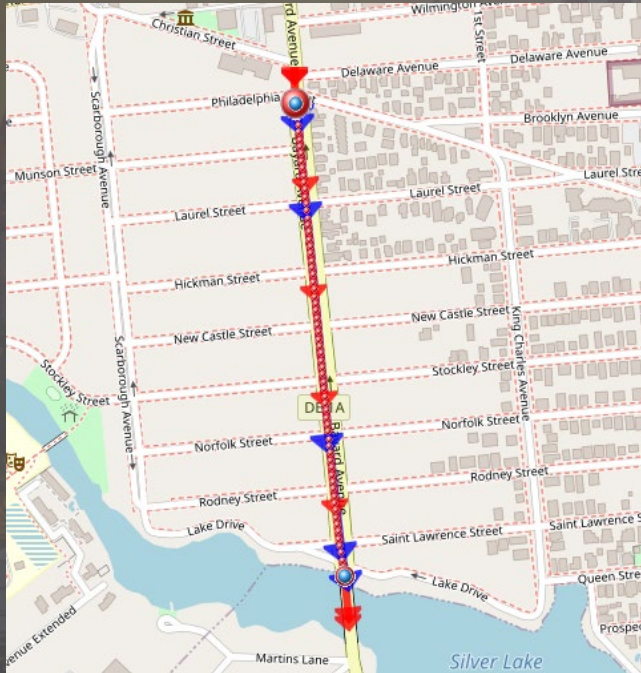




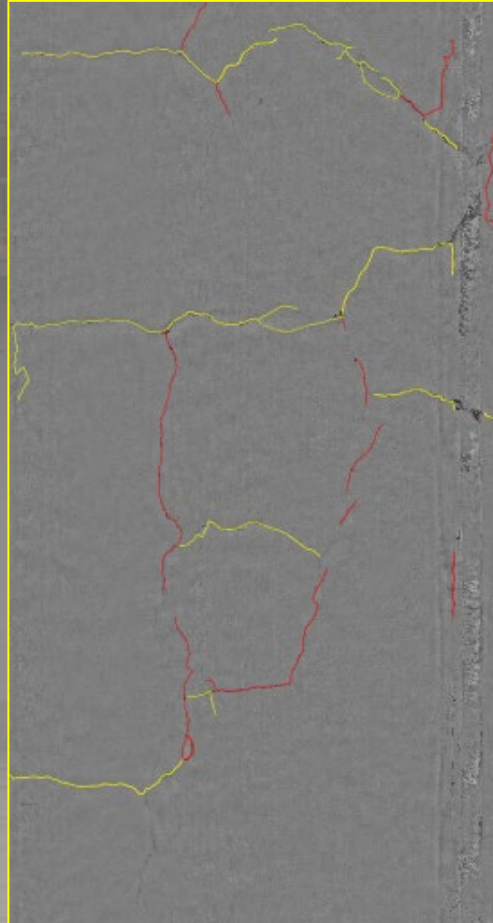
# SOURCES OF ERROR



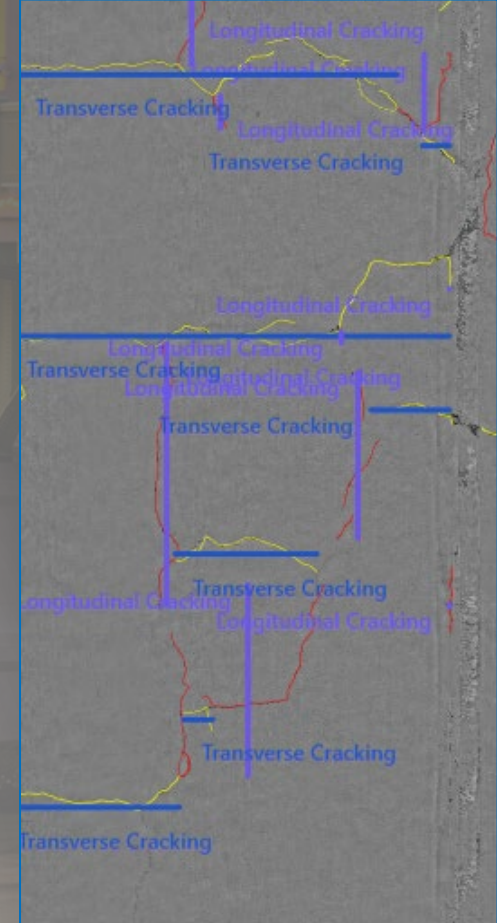
## GIS LAYER AND NETWORK MATCHING



## DISTRESS DETECTION



## DISTRESS CLASSIFICATION



# SUMMARY



Agency	Data Collection Company Year1	Data Collection Company Year2	HPMS Cracking comparison	Rutting comparison	IRI comparison	Faulting comparison	Distress protocol comparison
State - 1	A	C	✓	✓**	✓	✓	X
State - 2	B	C	✓	✓*	✓	✓	✓'
State - 3	C	C	✓	✓*	✓	✓	✓'
Municipality	B	C		X	X	✓	X

# CONCLUSIONS

- THE HPMS DATA COMPARISON FROM 3 DOT AGENCIES SHOWS CONSISTENCY BETWEEN CONSECUTIVE YEARS. THE CLARITY OF THE DEFINITION OF HPMS DISTRESSES ALLOW THEM TO BE REPEATABLE, INDEPENDENTLY OF THE VENDOR PERFORMING THE DATA COLLECTION.
- THE MUNICIPALITY AND STATE DOTs DISTRESS PROTOCOL DATA SHOW THAT ADDING MORE BINNING (SEVERITIES) AND DETAILED DISTRESS CLASSIFICATION INCREASES THE DEPENDENCY OF THE RESULTS ON THE DATA COLLECTION VENDOR AND THE RATING PROCEDURES.



# QUESTIONS?

