Automated Data Collection Methods for Municipal Governments in Chicagoland

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ARA

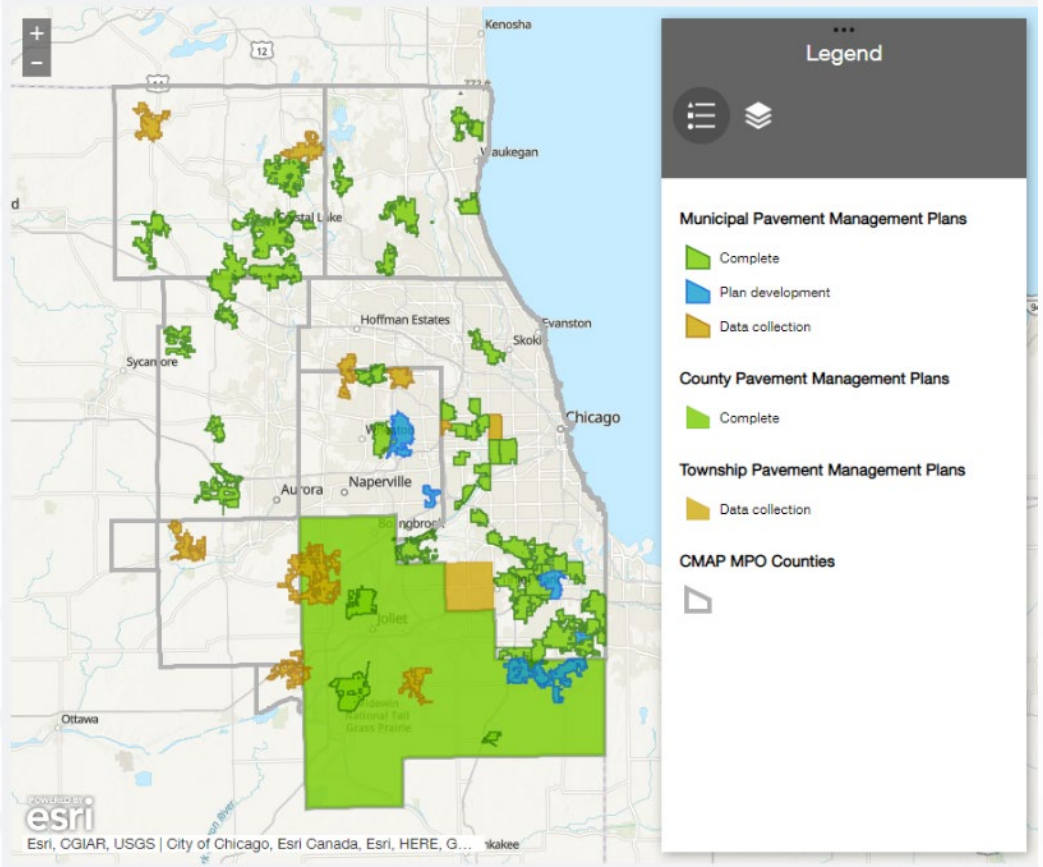
RPUG Road Profile Users' Group

Introduction

Chicago Metropolitan Agency for Planning (CMAP)

Chicago Metropolitan Agency for Planning

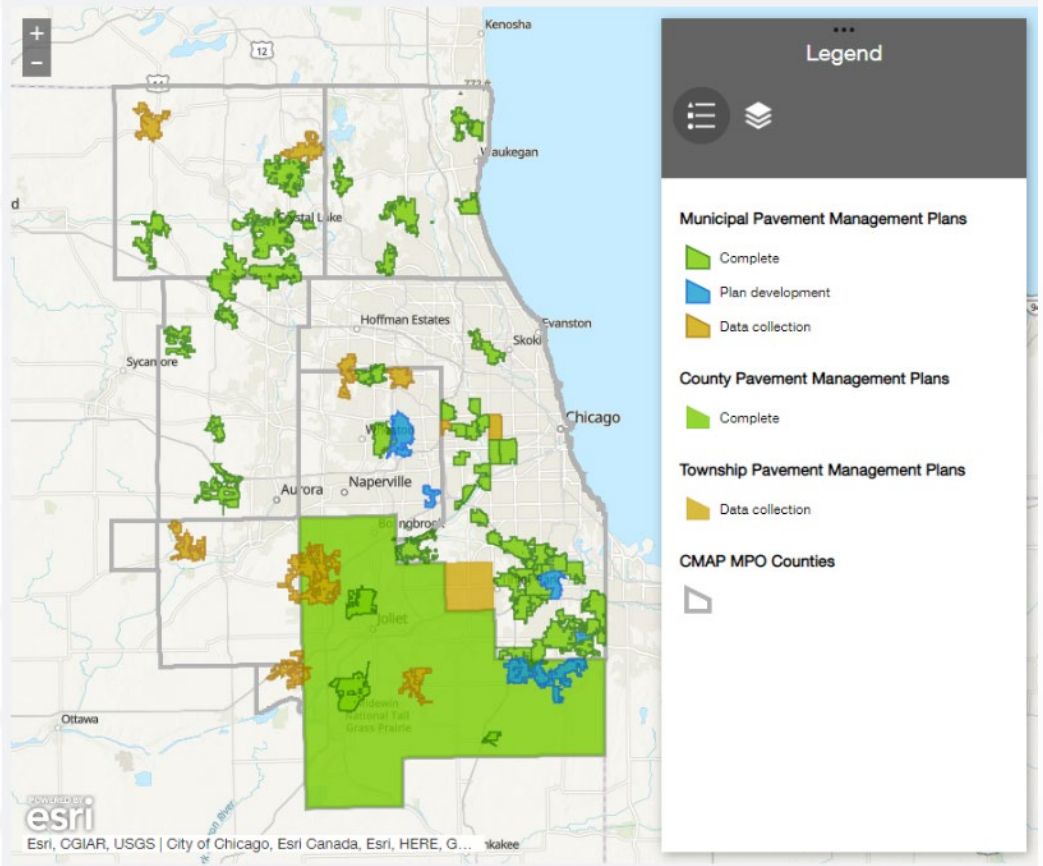
- ON TO 2050-CMAP's comprehensive, long-range plan
- Infrastructure investment – Core focus of ON TO 2050
- Implementing PMS and prioritizing investment guides CMAP towards the long-range plan.



Chicago Metropolitan Agency for Planning (CMAP)

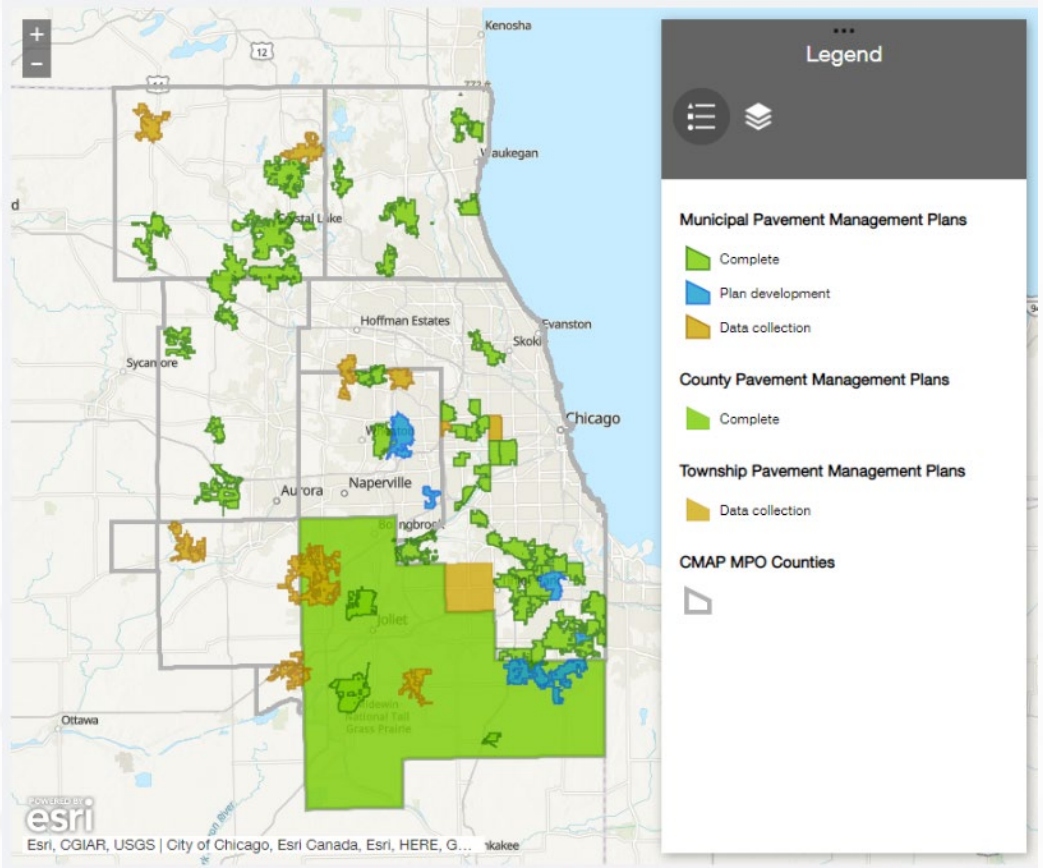
Chicago Metropolitan Agency for Planning

- CMAP initiated a program in 2018 to select agencies for implementing Pavement Management Systems (PMS)
- Total of 75 agencies to date
- ARA has implemented PMS for 26 CMAP agencies and currently working with 4 more.

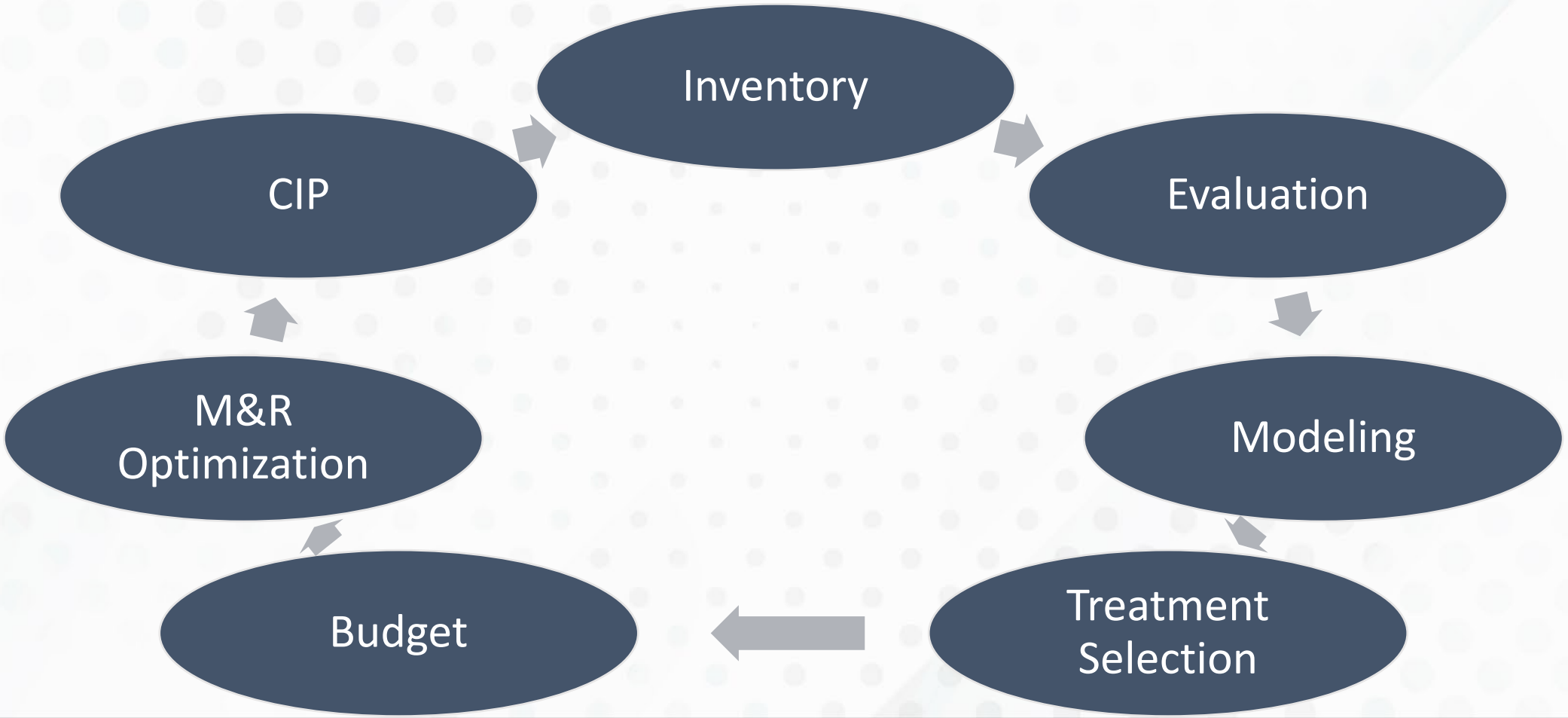


Chicago Metropolitan Agency for Planning (CMAP)

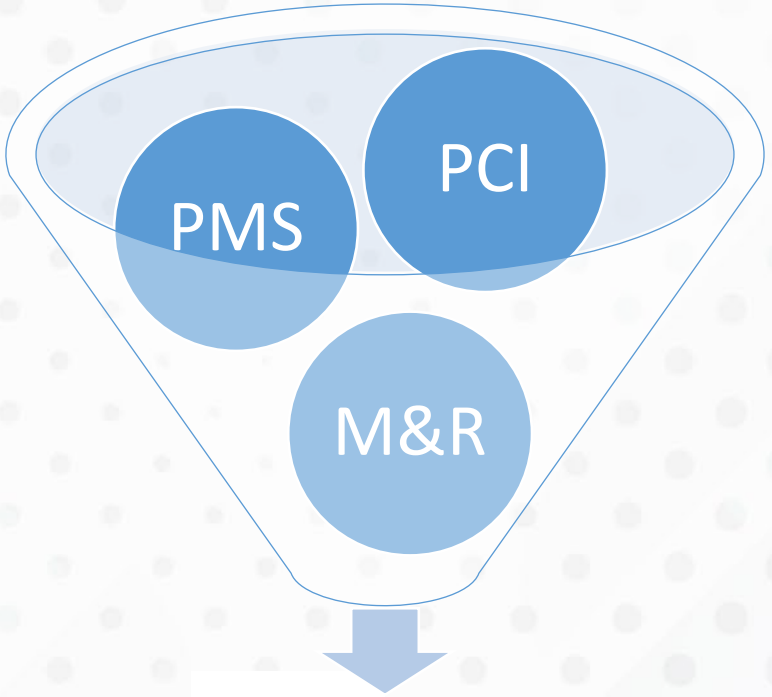
- None of these agencies had a pavement management system previously
- Roads were evaluated (if at all) through windshield surveys
- Majority asphalt surfaces, but significant amounts of concrete pavements



Pavement Management Methodology



…With the Ultimate Goal of Obtaining…



The Best Bang for the Buck!

Agency Questionnaire

PMS Setup

- Network Segmentation
- Pavement Type
- Performance Model
- Treatment Matrix
- Pavement Age
- Traffic
- Construction History

Budget

- 5 or 10-Year Budget
- Budget bucket assignment

Treatment

- Treatment Activity Type
- Unit Cost
- Consequence of Activity (PCI change, year to next activity, etc.)

Data Collection & Condition Rating

Data Collection Methods

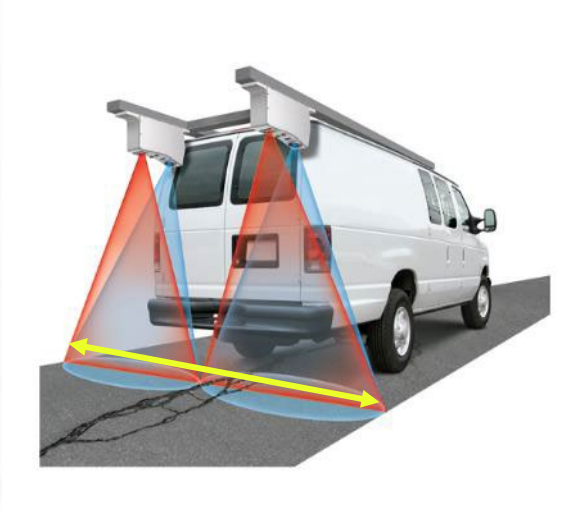
Manual Method

- Foot-on-ground or windshield surveys in the field
- Typically, sample unit based

Semi-Automated

- Combination of automated and manual methods
- Survey performed manually using images collected using automated methods

Fully-Automated



- Using automated data collection and analysis
- Minimal manual intervention

Data Collection

- **LCMS 3D Pavement Imaging** - 1mm cracks are clearly visible; full lane-width coverage
- **Right of Way Imaging** - High resolution, geotagged images
- **IRI, Faulting and Rutting** - High-speed laser profiler is certified at TTI
- **Pavement Geometry** - Cross slope and grade
- **Sub-meter accuracy GPS Coordinates**

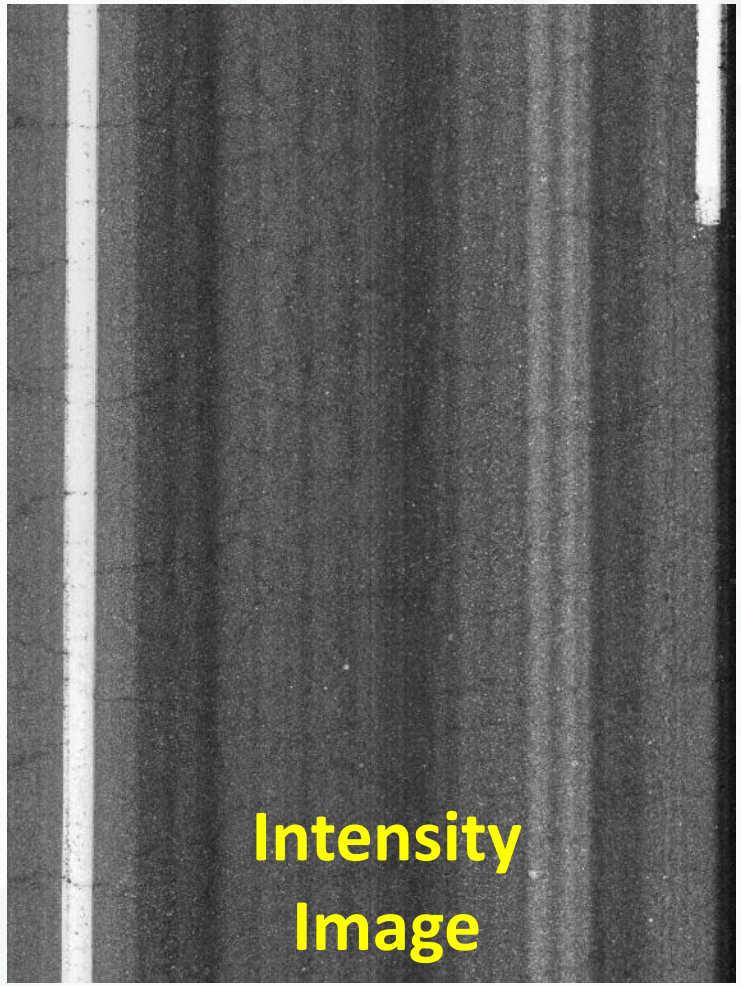
Another Unique Aspect of the Project

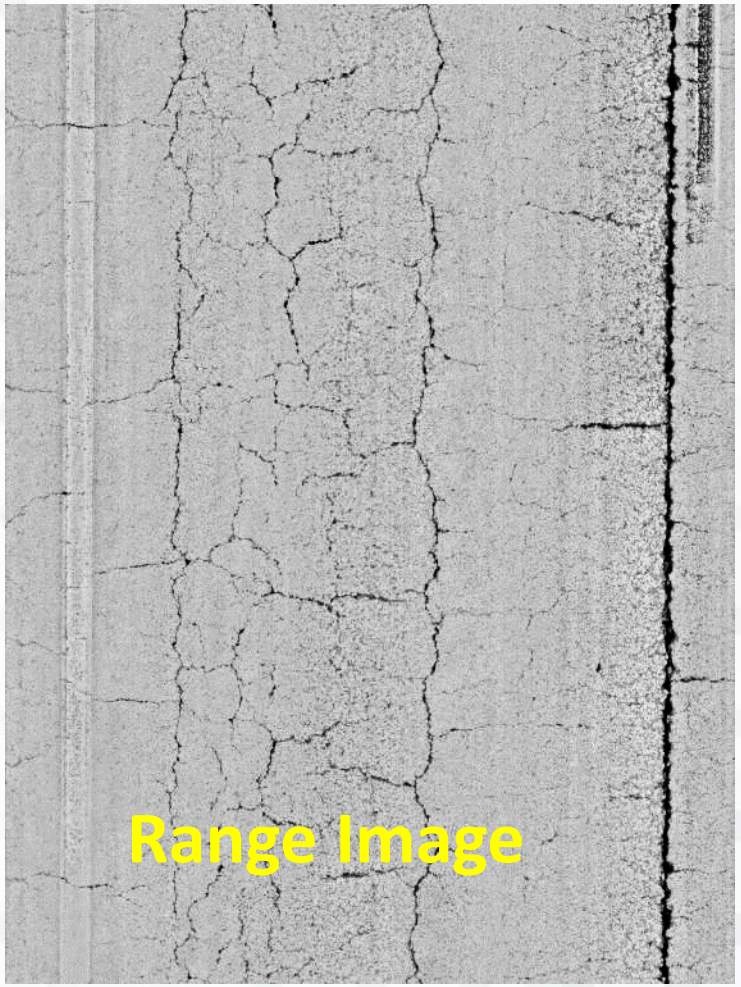

DSV

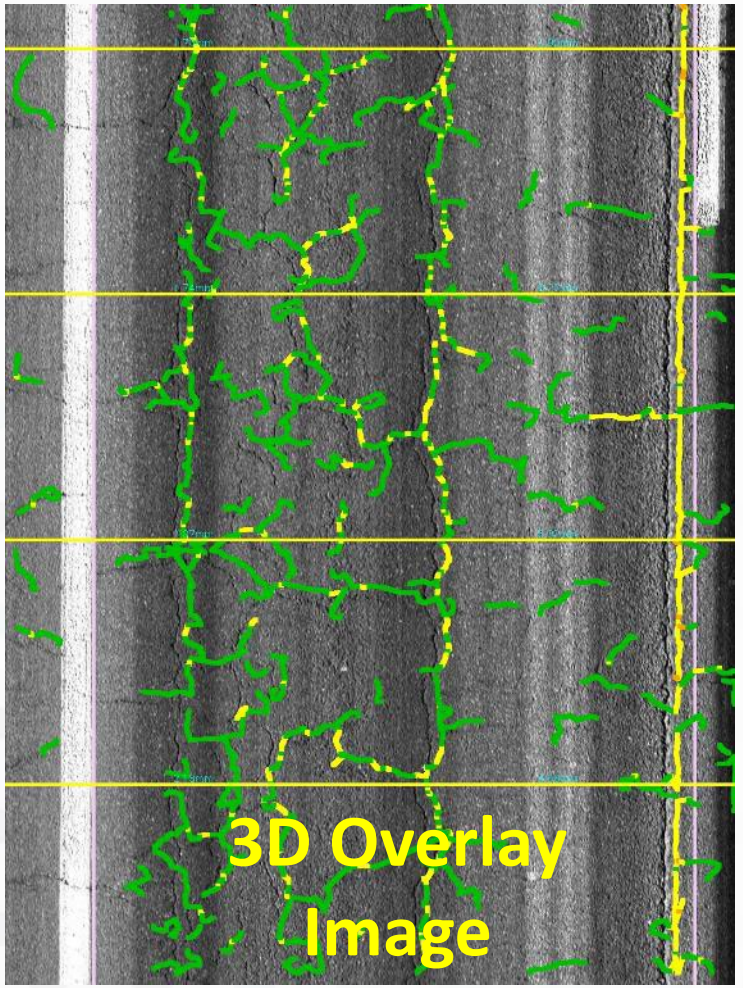

MFV

- ARA acquired Dynatest Consulting in 2020
- We operate two different systems:
  - International Cybernetics Digital Survey Vehicles
  - Dynatest Multi Function Vehicle
- We used both types for various agencies in this project
- Possible issues:
  - Data consistency
  - Processing pipeline

Example Pavement Images







Example Right of Way Images

Angled Left

Center

Angled Right

Georeferenced Right of Way Images

(Rear View also Captured)

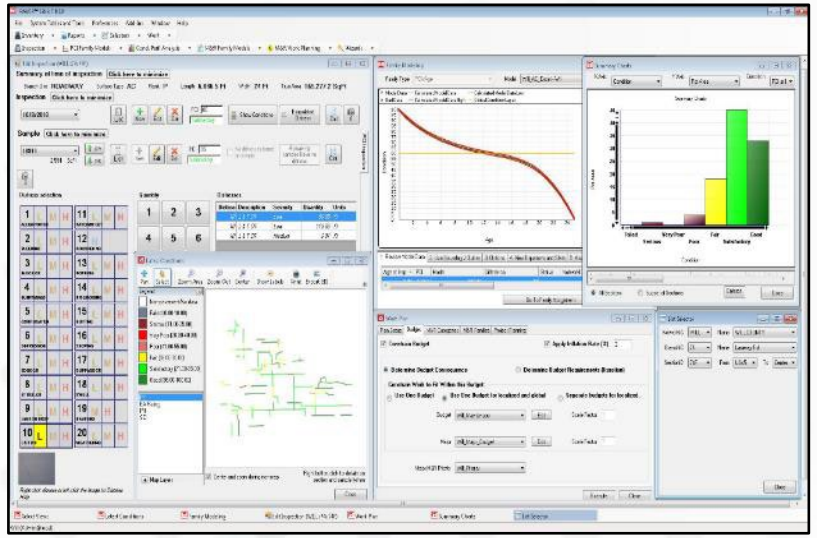
Processing Pipeline

Automated condition surveys are a good option to increase productivity for large networks

INTERNATIONAL CYBERNETICS

Distress
Severity
Extent

Custom program to generate xml



PCI

Distress Rating

100% Distress Rating on Surveyed Area

STEP 1

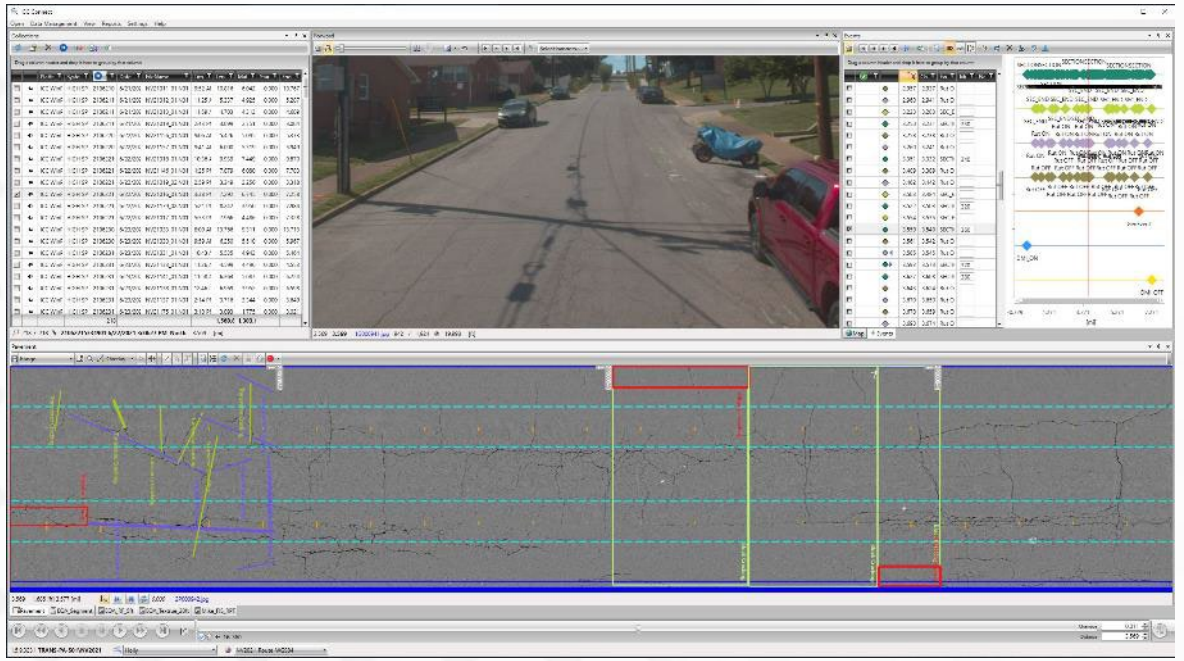
AUTOMATED

- Alligator cracking
- Block cracking
- Longitudinal cracks
- Transverse cracks
- Sealed cracks
- Edge cracks
- Potholes
- Curbs or edge drop-off
- Rutting
- Raveling
- Concrete joints

STEP2

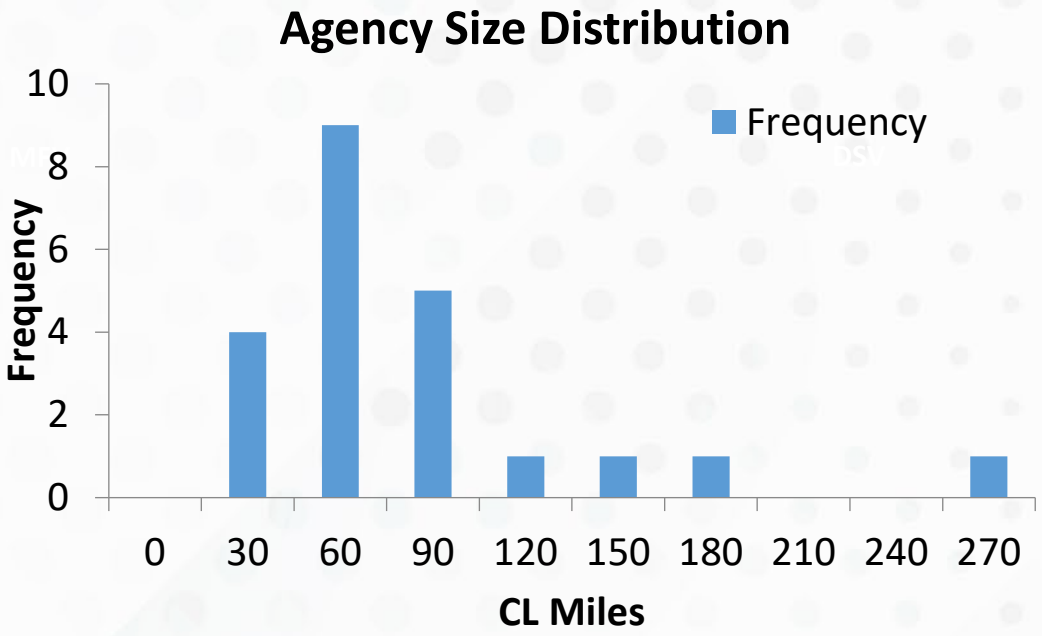
MANUAL REVIEW

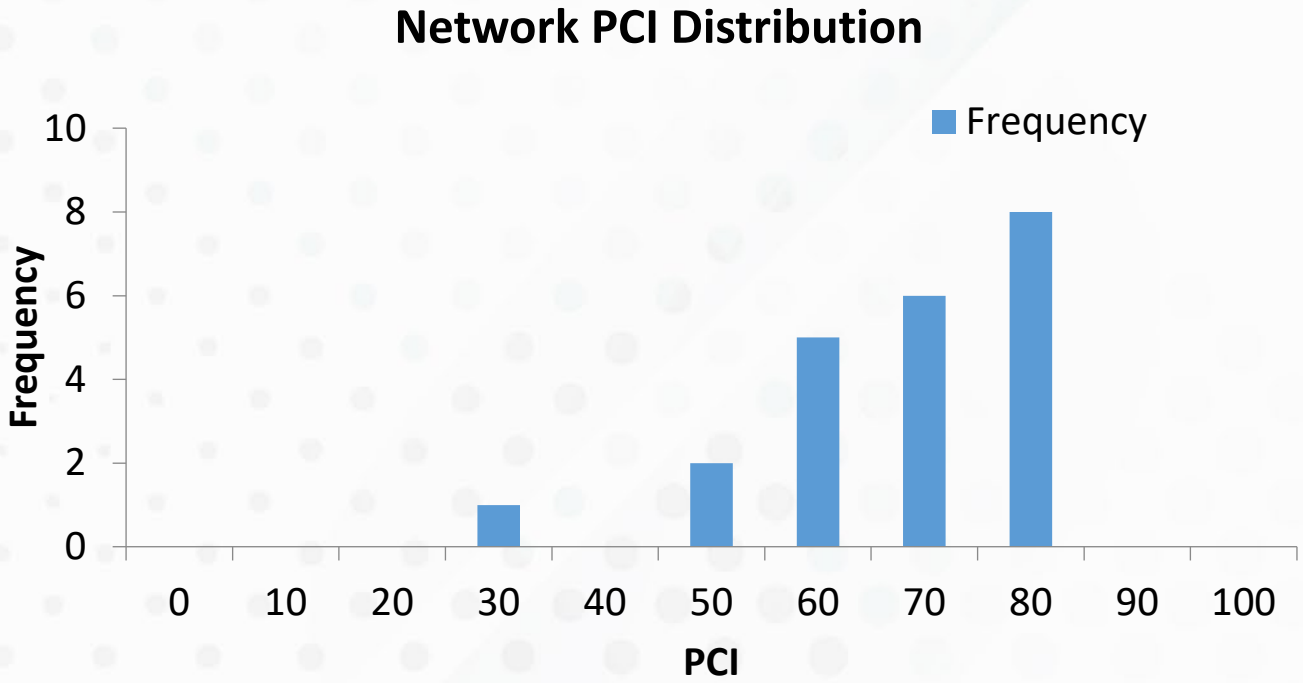
- Editing quantities and severities
- False positives
- False negatives
- Other distresses
- PCC pavement distresses



Results

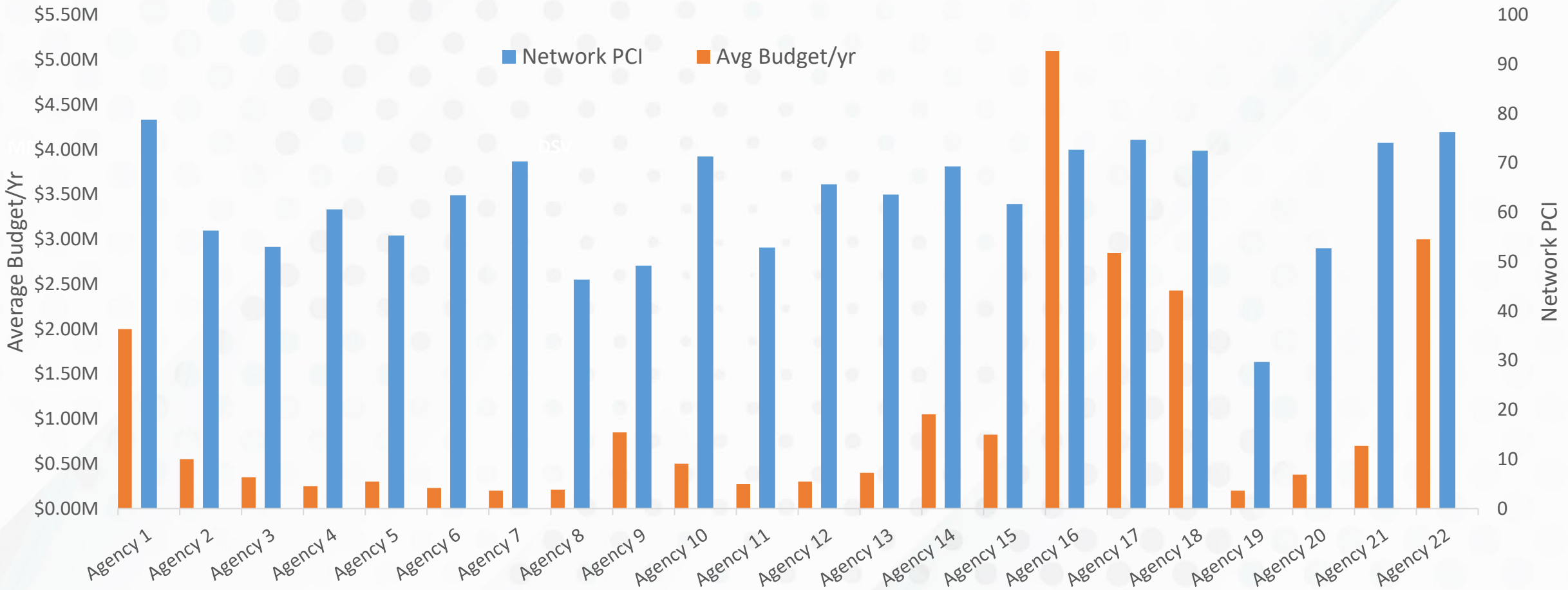
Condition Results – CMAP Overall





Results based on 22 agencies

Condition Results – Agency Comparison



Conclusions

- The issue with using multiple vendor's equipment is *processing*, not consistency (we are using the same pavement sensor)
- Following a standard data collection and implementation process allows a group of agencies to achieve benefits normally available only to larger agencies (costs, timing, etc.)

Conclusions (continued)

- Using the same standards (images, processing, evaluation method) assists with comparisons between agencies
- Automated data collection is better than windshield surveys but not as good as a semi-automated – but it is much more cost effective
- Automated on concrete is not good enough – we had to do manual

Acknowledgements

- CMAP
- AECOM
- ARA Field Technicians

Questions