



**ROADWARE**  **GRP**

## *Infrastructure Data Collection Solutions*



***Linear Based  
Pavement Data in  
a Spatial World***

***Integration of the City  
of Oklahoma City's  
Pavement Evaluation  
Program and  
VideoLog to the  
Enterprise GIS***

***April 6, 2009***

***Allan Venema, P.Eng.***

# Fugro Roadware Inc

- Fugro Roadware Inc is a division of Fugro World Wide
- Established in 1969
- Largest automated collector of road data in North America
- Design, build, support & operate the ARAN<sup>®</sup>

Single pass collection of...    To calculate...

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Right of Way Images</li><li>• Pavement Images</li><li>• Transverse Profile</li><li>• Longitudinal Profile</li><li>• Vehicle Orientation</li><li>• Ground Penetrating Radar (GPR) Data</li><li>• Linear Position</li><li>• GPS Data</li></ul> | <ul style="list-style-type: none"><li>• Pavement Distresses</li><li>• Roadside asset locations</li><li>• Grade &amp; Cross Fall</li><li>• Vertical &amp; Horizontal Curvature</li><li>• Sub base construction</li><li>• Rut depth</li><li>• Edge drop off</li><li>• Roughness (IRI)</li><li>• Faulting</li><li>• Texture</li></ul> |
|--|--|



# City of Oklahoma City

- 2<sup>nd</sup> Largest US City by Land Area at over 600 square miles
- Over 13,000 lane miles of roadway



## City of Oklahoma City – Pavement Condition Assessment – 2005 & 2007

- Pilot project of 595 miles in 2005/06,
- Extended to 1,156 miles for 2007/08 cycle.
- Data delivered;
  - Right of Way Images (Front & Rear Facing)
  - Pavement Images
  - Pavement Distress
  - Roughness (IRI)
  - Rutting
  - GPS Data

# Right Of Way Images

106360 6 NW 5TH ST -6 1 1 02/08/2008 0.281 25.8



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.276 25.2



106360 6 NW 5TH ST

6 1 1

02/08/2008

0.271

24.7



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.266 24.2





106360 6 NW 5TH ST 6 1 1 02/08/2008 0.260 23.5



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.256 22.6



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.251 21.7



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.246 106360 6 NW 5TH ST 6 1 1 02/08/2008 0.246 20.6



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.241 106360 6 NW 5TH ST 6 1 1 02/08/2008 0.241 19.4



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.236 106360 6 NW 5TH ST 6 1 1 02/08/2008 0.236 18.1



106360 6 NW 5TH ST 6 1 1 02/08/2008 0.231 106360 6 NW 5TH ST 6 1 1 02/08/2008 0.231 16.0



# Distance Measuring Instrument (DMI)

- DMI utilizes a precision optical shaft encoder that is mounted on the left rear driving wheel.
- The DMI records 2,000 pulses per revolution.
- Accuracy is  $\pm 0.02\%$  of the linear distance traveled.
- Ensures accurate low speed roughness measurements down to 20 km/h (12.5 mph).





# Pavement Condition Data

- Rear downward facing cameras
- Continuous pavement images of full lane width
- Renders pavement distresses down to 2mm (0.08 inches) in width



# Pavement Distress

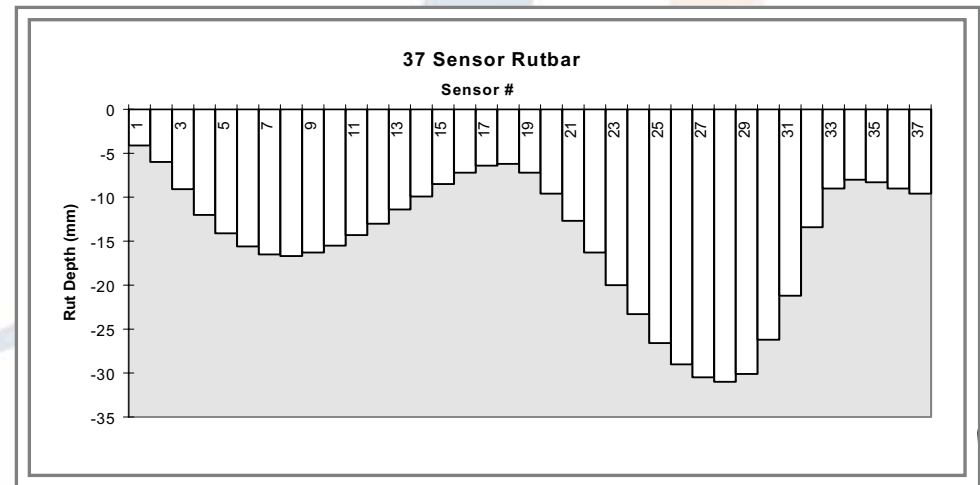
The software interface displays a video feed of a road with a longitudinal crack. A data table at the top right lists pavement segments with columns for ID, From, To, Length, Forward, Direction, Lane, Status, and Date. A data table at the bottom left lists distress segments with columns for Segment ID, Type, Severity, Length (ft), Width (ft), Depth (ft), and Area (sq ft). A legend window titled 'Select Distress' is overlaid on the close-up image, showing options for Alligator Cracking, Block Cracking, Cracking, Pothole, and Rutting, with corresponding color-coded boxes.

ID	From	To	Length	Forward	Direction	Lane	Status	Date
2004700	0.20000	0.20000	0.00000	11	0	1	STOP	09/01/10
2004701	0.20000	0.20000	0.00000	11	0	1	STOP	09/01/10
2004702	0.20000	0.20000	0.00000	11	0	1	STOP	09/01/10
2004703	0.20000	0.20000	0.00000	11	0	1	STOP	09/01/10

Segment ID	Type	Severity	Length (ft)	Width (ft)	Depth (ft)	Area (sq ft)
5-072	CRACK	01	1.866	7.011	1.293	0.000
52-890	CRACK	01	1.488	7.011	1.293	0.000
42-420	POTHOLE	05	3.754	1.314	0.976	4.914
60-266	CRACK	01	1.248	8.488	1.285	0.000
71-340	CRACK	03	1.452	7.421	1.453	0.000
82-214	POTHOLE	05	1.439	0.188	0.084	0.102

# Transverse Profile (Rutting)

- Ultrasonic Rutbar
- 37 sensors
- 4 inch spacing
- Generates an accurate repeatable profile
- Locates Maximum Rut in each Wheel path



# International Roughness Index (IRI)



- Laser SDP System
- 16 kHz laser in each wheelpath
- Measures continuous profile of the roadway

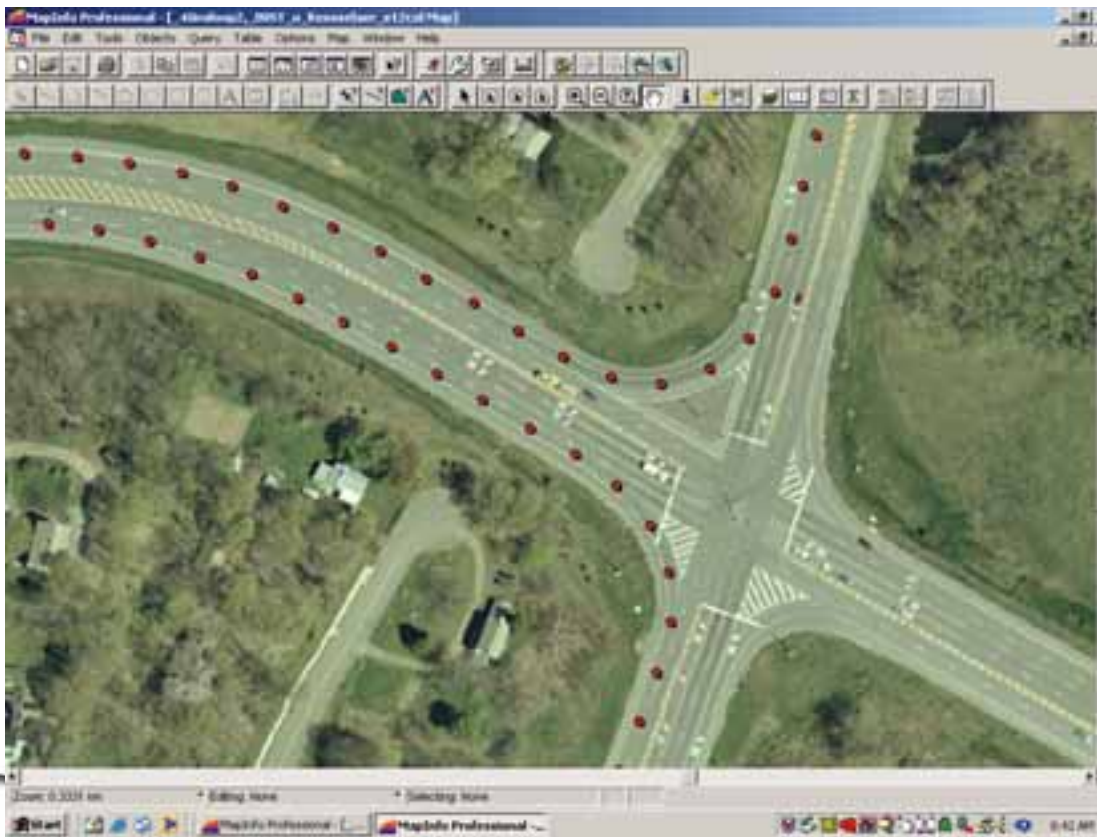
# GPS Data



- Trimble System
- Applanix® **POSLV** (Position and Orientation System)
- Collected every 10 millimiles (52.8 feet)
- Two antennas to give vehicle heading

# GPS Data

- Real Time GPS Data Collection to ensure proper collection and referencing.
- Inertial referencing system allows for fill in of missing GPS data.



Applanix POS LV™

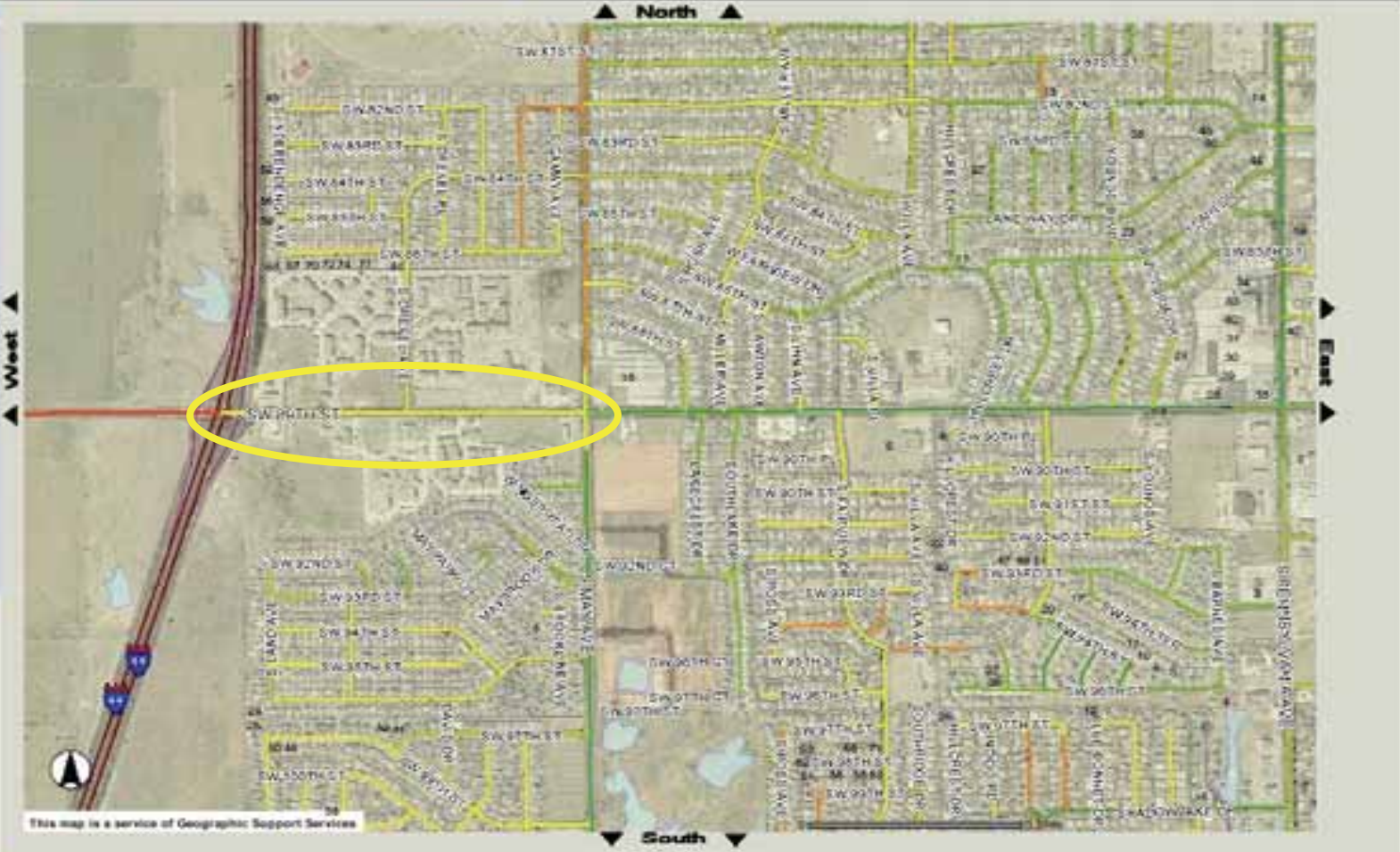
# In the end the City of OKC have...

- a full multi dimensional set of accurate condition data,
- data that is precisely linear referenced,
- but is also geo referenced,
- accurately segmented road sections using GPS collected by the ARAN and the existing centre-line data,
- a summarized condition score by segment,
- a dynamic map service populated with this condition, and...
- the ability to sort and analyze data spa



### Public Works Map Service

- Layers**
- All Layers
  - AVL Vehicles
  - GO Bond Layers
  - Public Works Layers
    - Bridges
      - Closed
      - 1 - 10
      - 11 - 20
      - > 20
    - Guardrails
    - ITS Street Corridors
      - 0
      - M
    - Traffic Counts
      - City Streets
      - Major Arterial
      - Minor Arterial
      - Major Collector
      - Rural Arterial
      - Expressway
      - Scenic Route
      - Freeway
      - Local Collector
      - call other values >
    - Pavement Condition
      - NR - Dirt or Gravel
      - 0-25
      - 26-40
      - 41-55
      - 56-70
      - 71-85
      - 86-100
    - Speed Limits
      - 25
    - SW Sample Sites
      - SH SR Open
      - SH SR Closed
    - Bridge Snow Routes
    - Street Snow Routes
    - Traffic Signs

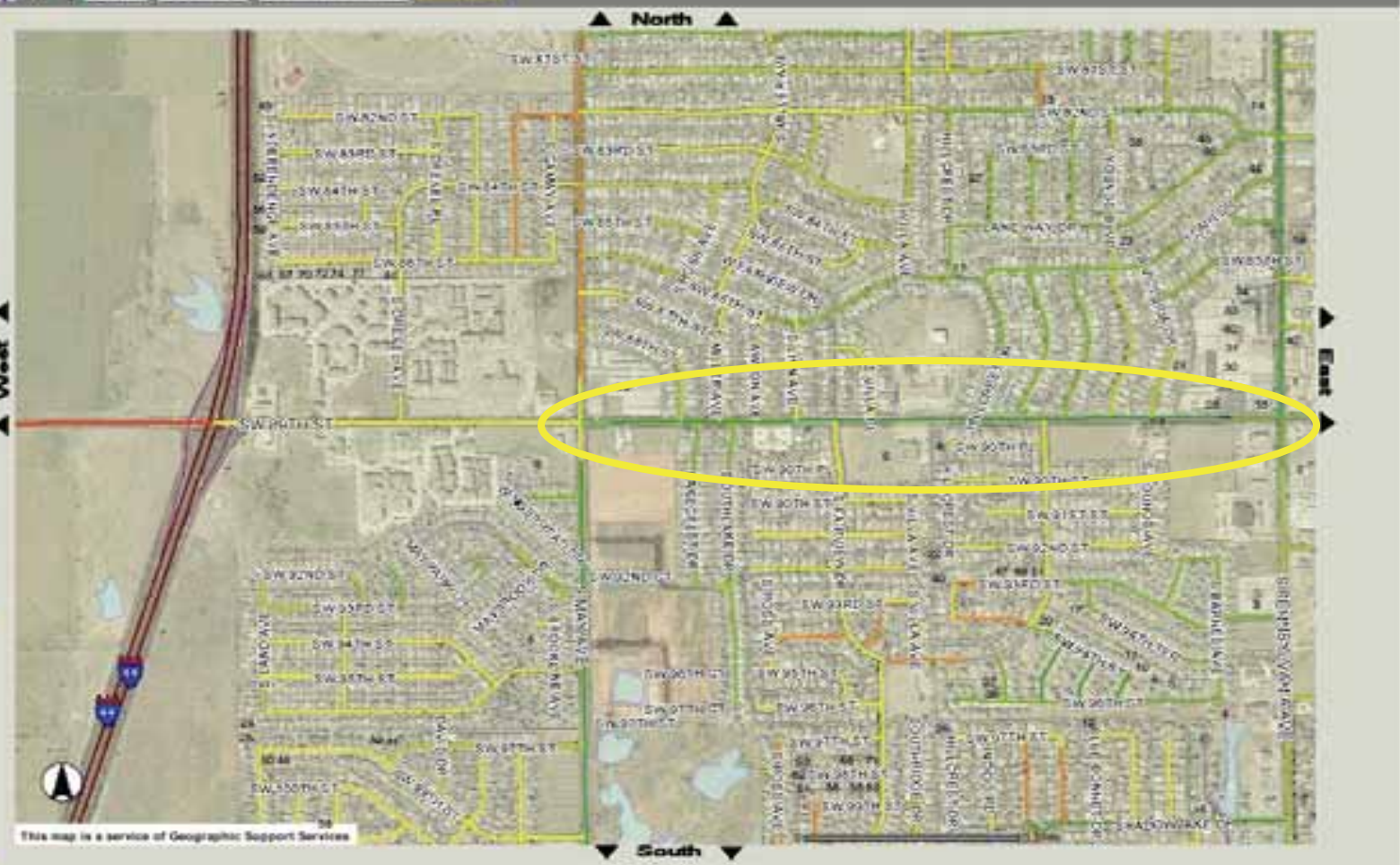


DD	PCI	PCI_Date	PCI_Source	STATUS	QA	LANES	STREET_TYPE	SURFACE	LENGTH	WIDTH	ASSETID	LEGACYID	WARRANTYDATE	CONDITION	CONDITIONDATE	FROM	TO	ZO
05	05	05/27/2000				4		ASPHALTIC CONCRETE	2103	44								002



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- Layers**
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ID	PCI	PCI_Date	PCI_Source	STATUS	QA	LANES	STREET_TYPE	SURFACE	LENGTH	WIDTH	ASSETID	LEGACYID	WARRANTYDATE	CONDITION	CONDITIONDATE	FROM	TO
90	1	1/28				4		ASPHALTIC CONCRETE	1250	44							902

Public Works Map Service - Windows Internet Explorer

http://gsokc.ci.ok.gov/webste/publworks/viewer.htm

Public Works Map Service

### Public Works Map Service

Advanced Mapservice Searches Mapservice Help Tutorial Exit

Search Print Map Print Attributes Power On TV

- Bridges
  - Closed
  - 1 - 10
  - 11 - 20
  - > 20
- Guardrails
- ITS Street Corridors
  - 0
  - M
- Traffic Counts
  - City Streets
  - Major Arterial
  - Minor Arterial
  - Major Collector
  - Rural Arterial
  - Expressway
  - Scenic Route
  - Freeway
  - Local Collector
  - <all other values>
- Pavement Condition
  - NR - Dirt or Gravel
  - 0-25
  - 26-40
  - 41-55
  - 56-70
  - 71-85
  - 86-100
- Speed Limits
  - 25
- GW Sample Sites
- GH SR Open
- SM SR Closed
- Bridge Snow Routes
- Street Snow Routes
- Traffic Signs
- Traffic Signals
- Storm Sewer Layers
- Base Layers
- Planning Layers
- FEMA Flood Zone Layers

North

West

East

South

This map is a service of Geographic Support Services

DO	PCI	PCI_Date	PCISource	STATUS	QA	LANES	STREET_TYPE	SURFACE	LENGTH	WIDTH	ASSETID	LEGACYID	WARRANTYDATE	CONDITION	CONDITIONDATE	FROM	TO	ZO	
90		Tue, 29 Aug 2006 00:00:00				4		ASPHALTIC CONCRETE	1200	44								902	

Information Technology  
Geographic Support Services

Map Coordinates: -97.56393, 35.37567 -- Image: 341, 353 -- ScaleFactor: 1.02362003249797, Scale 1:1200

Local intranet 100%

# VisiWeb

The screenshot displays the VisiWeb application within a Microsoft Internet Explorer browser window. The browser title is "Roadware GRP - VisiWeb - Microsoft Internet Explorer provided by Roadware Group Inc.". The address bar shows "http://www.roadware.com/visiweb/". The application header includes the Roadware logo and the text "Regional Website" and "ROADWARE VISIWEB". Below the header, there are two main panels: a Street View image on the left and a satellite map on the right. Below these panels is a control bar with navigation buttons. At the bottom, there is a data table with the following columns: Year, Segment, Segment Start, Segment End, Road ID, Road Name, Road Type, Road Length, and Segment Length. The table contains five rows of data.

Year	Segment	Segment Start	Segment End	Road ID	Road Name	Road Type	Road Length	Segment Length
2008	022	0	0.4	0007	WY TERPLOC	UNIMULTI AV B	00000	0
2008	023	0.4	0.8	0007	WY TERPLOC	UNIMULTI AV B	00000	0.4
2008	024	0.8	0.8	0007	WY TERPLOC	UNIMULTI AV B	00000	0.0
2008	025	0.8	0.8	0007	WY TERPLOC	UNIMULTI AV B	00000	0.0
2008	026	0.8	0.8	0007	WY TERPLOC	UNIMULTI AV B	00000	0.0

# More than just pretty maps...

- Identify network trends
- Tool for public awareness and education
- City council reports and budget analysis
- View and optimize multiple works programs
  - < 45 = reconstruction
  - ~ 60 = overlay
- Visualization of decisions
- Evaluate areas slated for new development

# Thank you!

