



# Navigating Highway Assets: Just the Right Fit



Presented by:  
Scott Stocking, GISP  
October 25, 2011



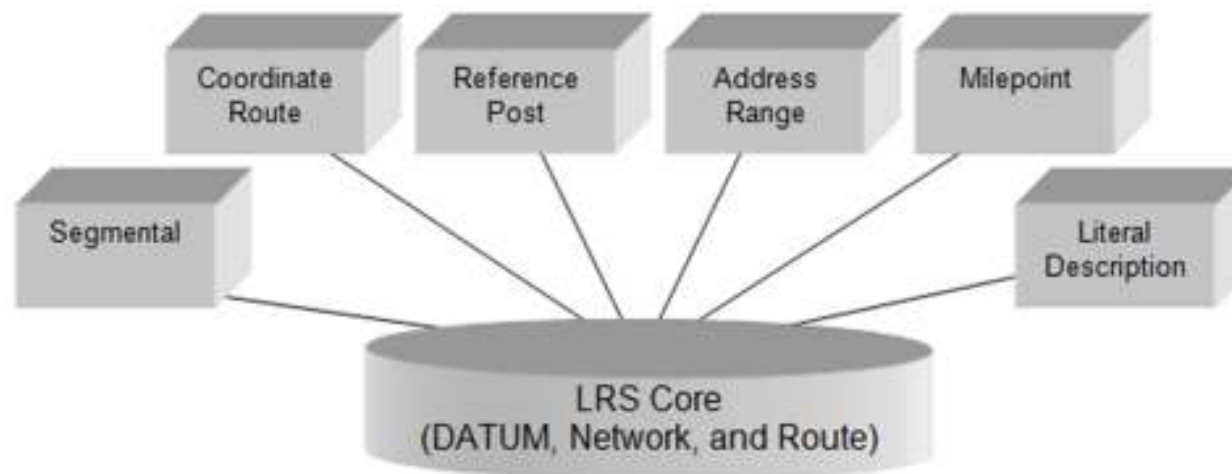
# Presentation Outline

- + Mapping Grade Data Deliverables
- + Benefits of the Data Cloud: Program ROI & Technical
- + Feature Extraction Process: Parking Meters/Signs
- + Change Detection: Key for Data & Asset Maintenance
- + Trends in EAM Practice
- + Final Thoughts



# Mapping Grade Deliverables

- + GIS level data
  - + Positional accuracy – vertical and horizontal
  - + Usually tied to LRS (mile marker) – but often requires many Linear Reference Methods - supported as well for different DOT operations
  - + Of course you can utilize survey level data if you have it!



# Mapping Grade Deliverables

- + Spatial Data models – key considerations:
  - + One to Many Relationships are common
  - + Temporal – new assets coming on line, assets retired – need to keep it all!
  - + Management Challenges - New Assets coming in via many different methods/formats: design drawings, scanning, field crews
  - + Data needs to be maintained as part of the daily work flow

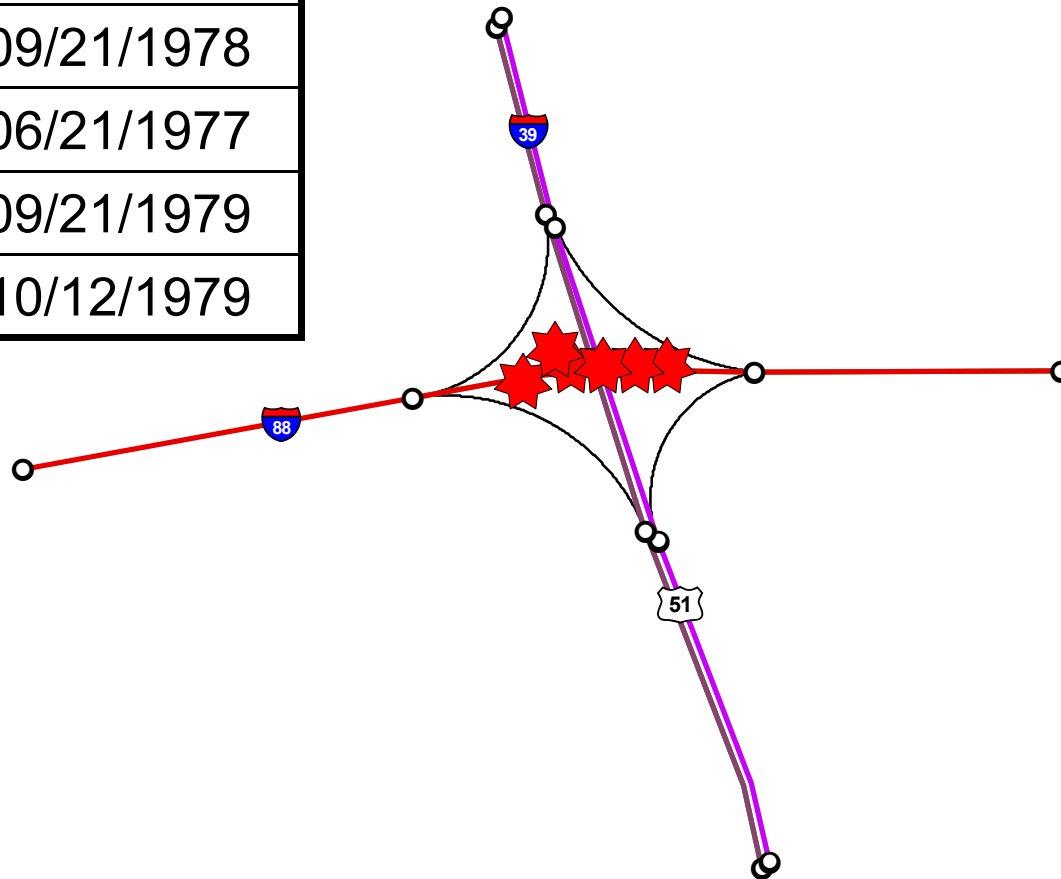




# Linear Referencing Over Time

Event	Date
Accident	08/12/1954
Accident	06/21/1962
Accident	09/21/1978
Accident	06/21/1977
Accident	09/21/1979
Accident	10/12/1979

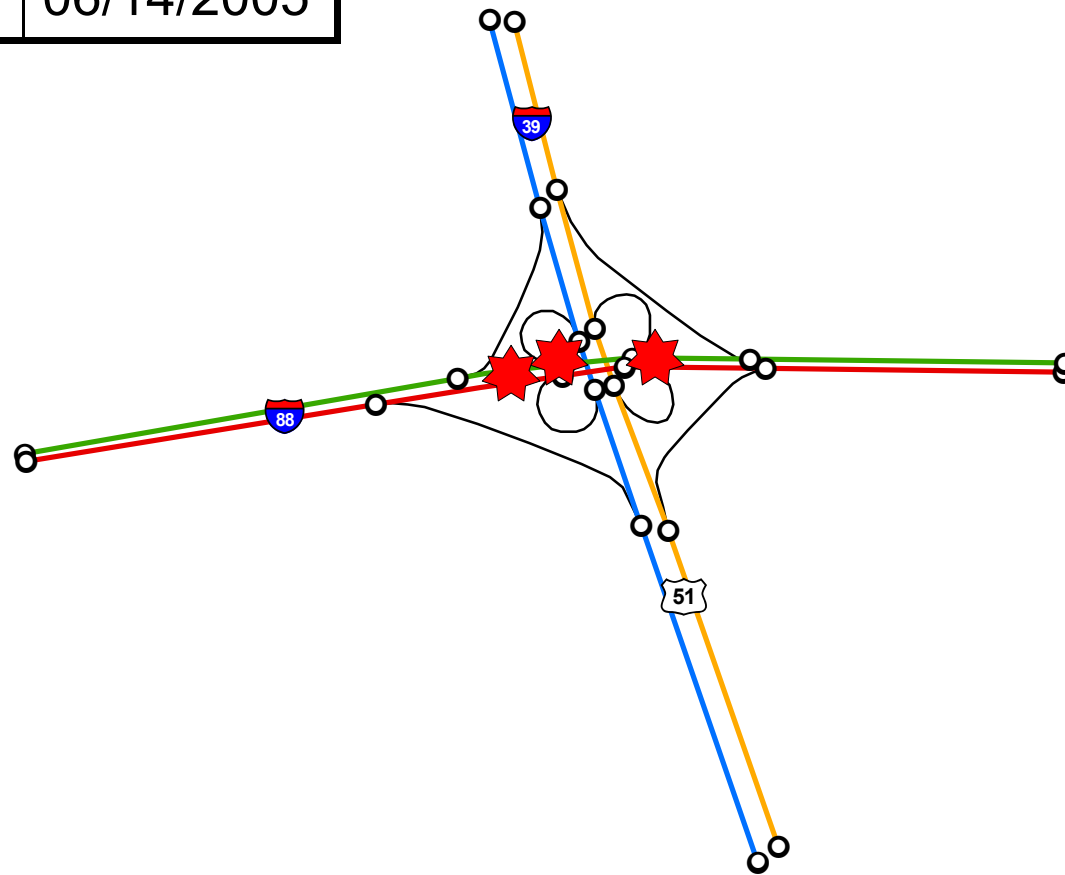
An excessive amount of crashes are occurring with this road configuration



# Linear Referencing Over Time

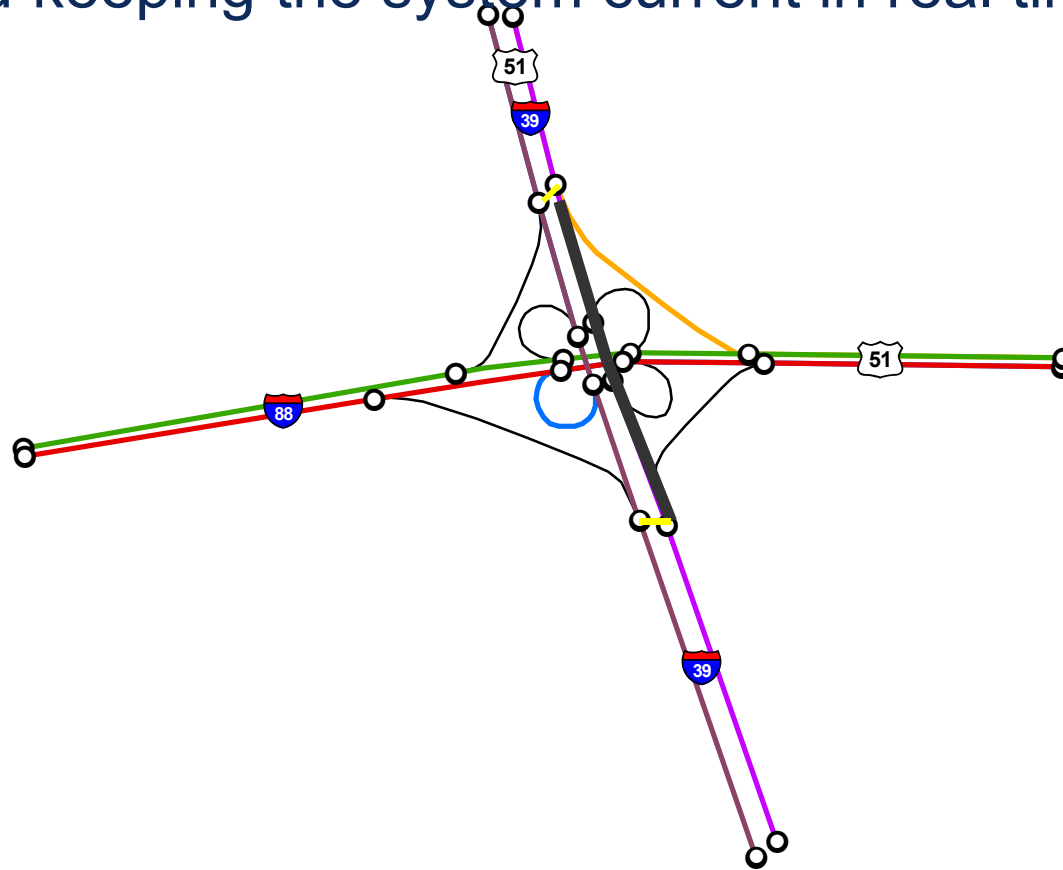
Event	Date
Accident	03/12/1980
Accident	06/14/1990
Accident	06/14/2005

From this trend analysis planners changed I88 into an MLDH, and crashes were cut in half.



# Linear Referencing Over Time

In the case in point, northbound 51 is being diverted to share the southbound lane. This will occur for a month, with openings to be in the system already on the day they are scheduled keeping the system current in real time.



# Benefits of the Data Cloud: Program ROI & Technical

- + Scan once/use often: extract what & when you need it!
- + No need to set up front all possible uses of the data
- + Cost sharing between government departments – the ‘cloud’ has value to many end users



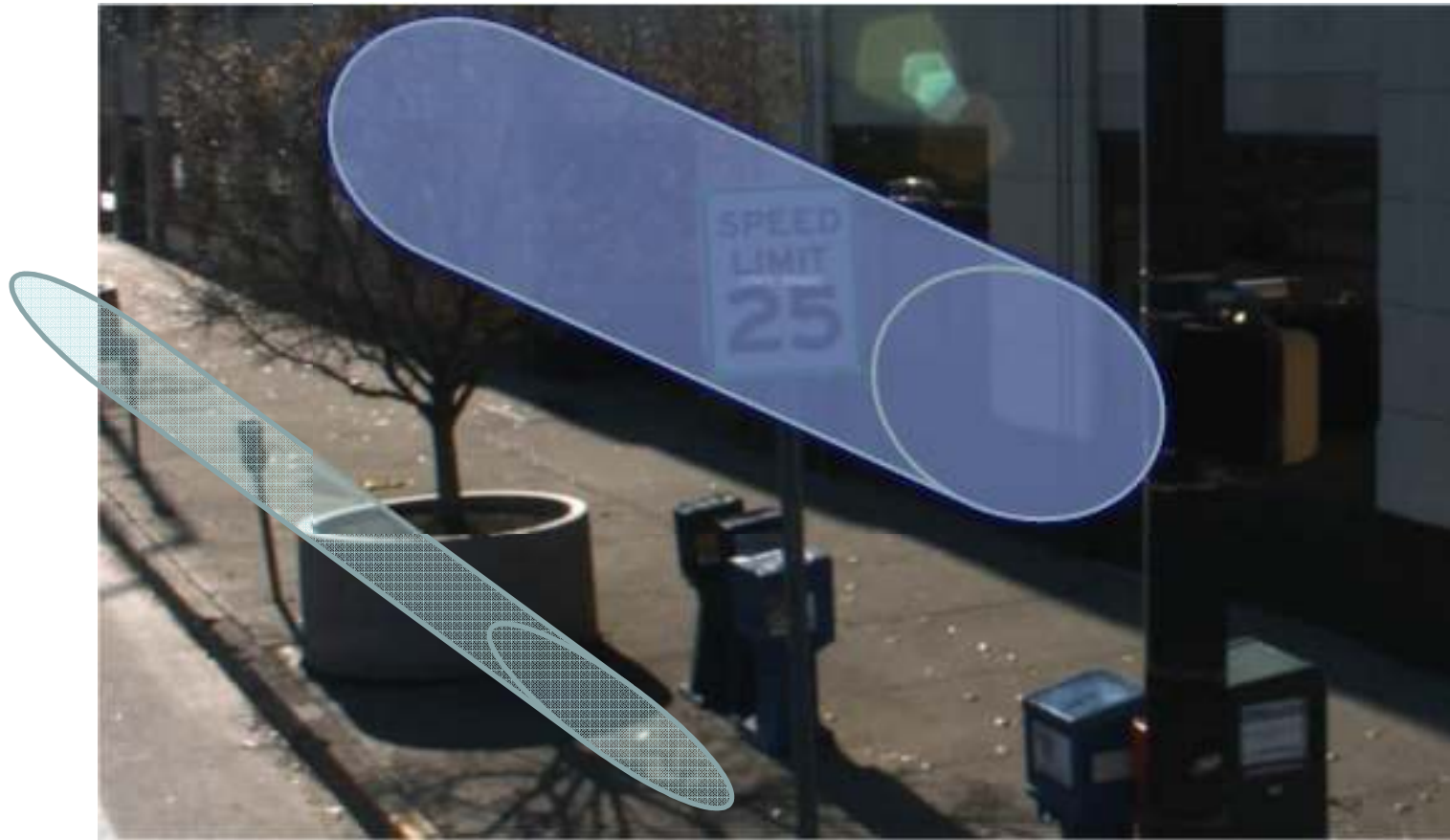
# Feature Extraction Process: Parking Meters & Signs

- + Problem: find existing parking meters and signs
- + Solution:
  - + Image processing along visual corridor
  - + Pixel comparison to master library of images to find assets
  - + Automated delineation of meter or sign face
  - + Once the asset is found – tool takes a section of the point cloud within the delineated area. Finds the best fit of points
  - + Reflectivity Measurement
  - + Creates GIS point(s) and assigns attributes



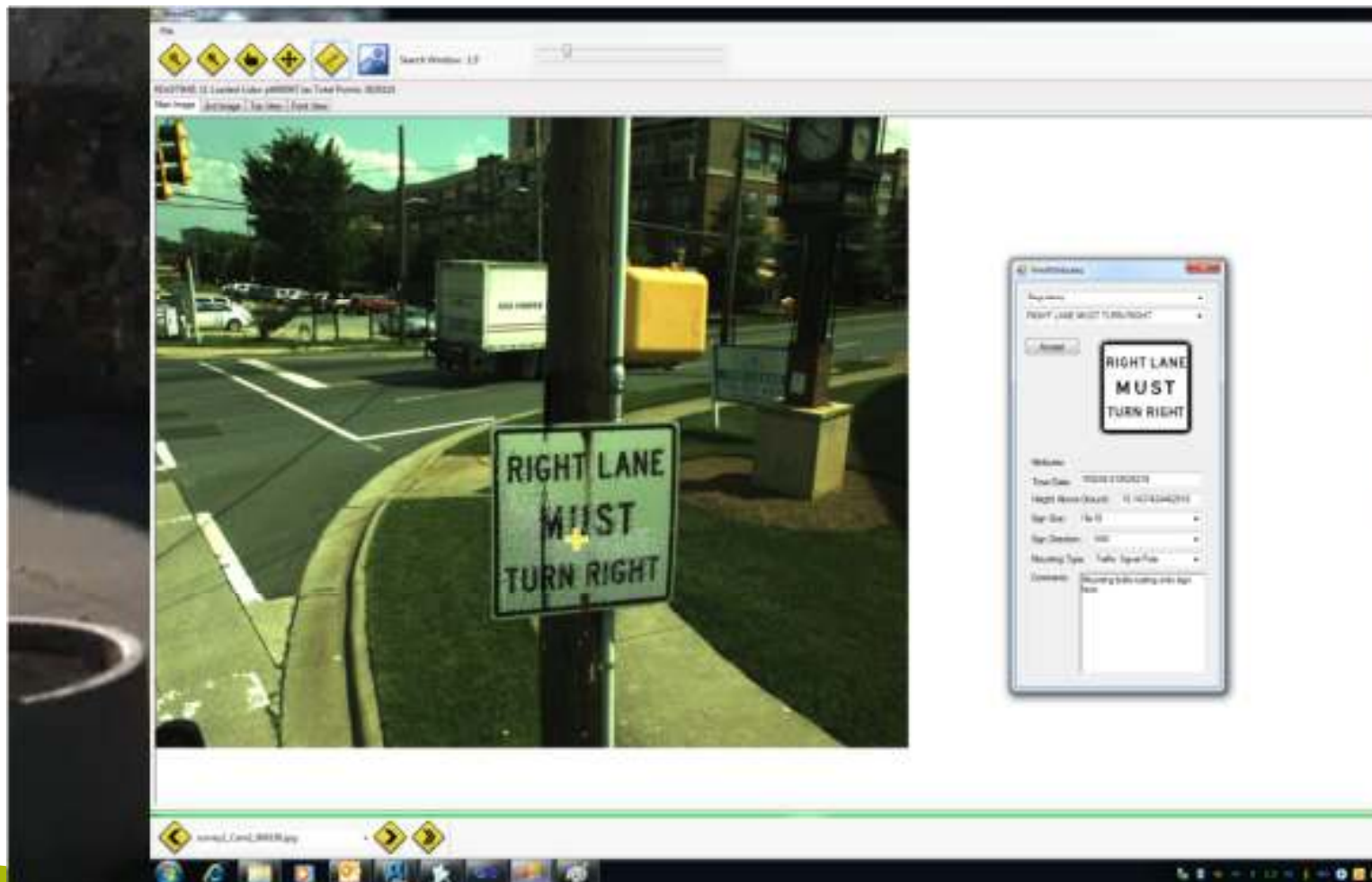
# Feature Extraction Process: Parking Meters & Signs

- + Image processing along a corridor



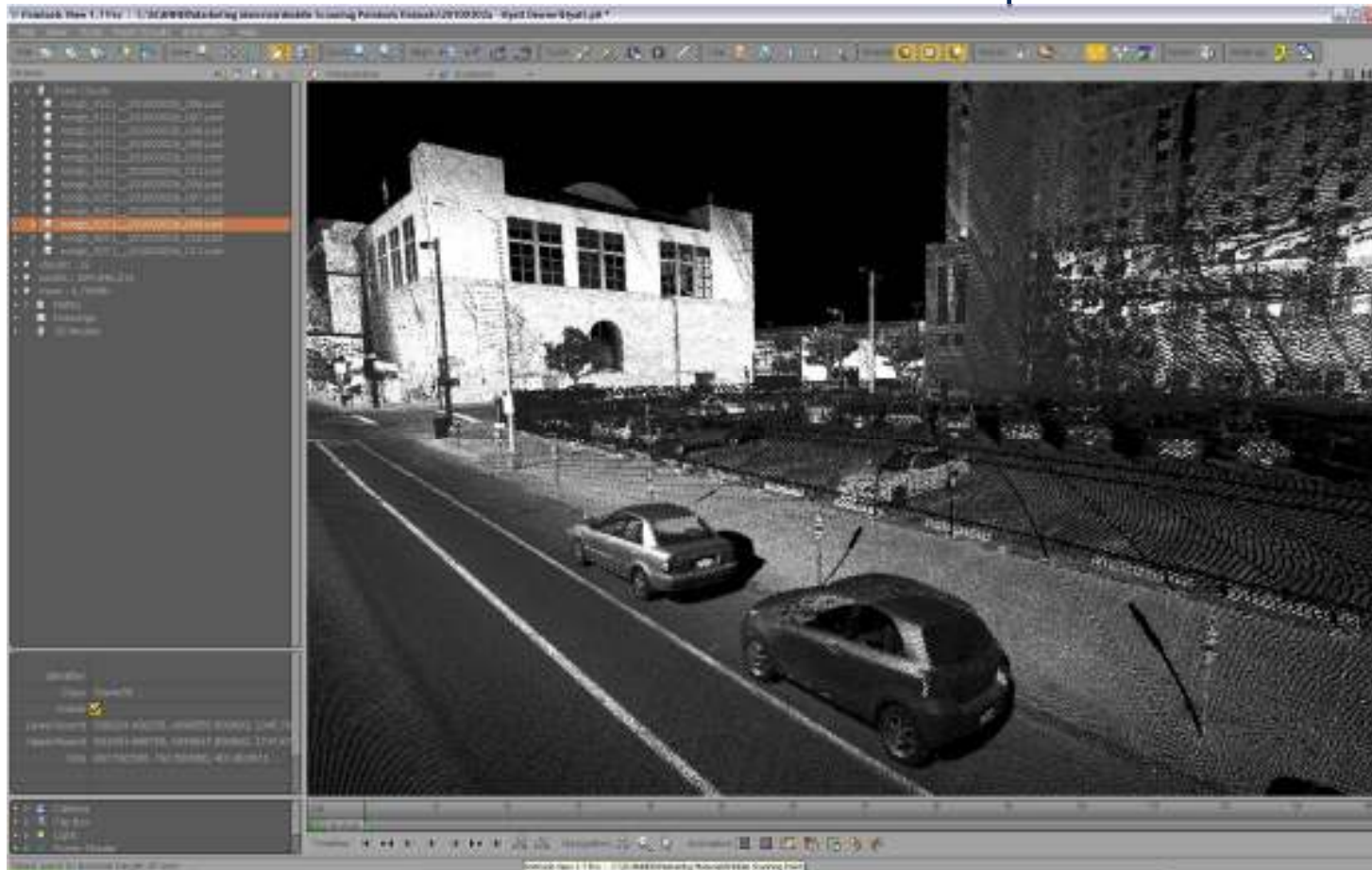
# Feature Extraction Process: Parking Meters & Signs

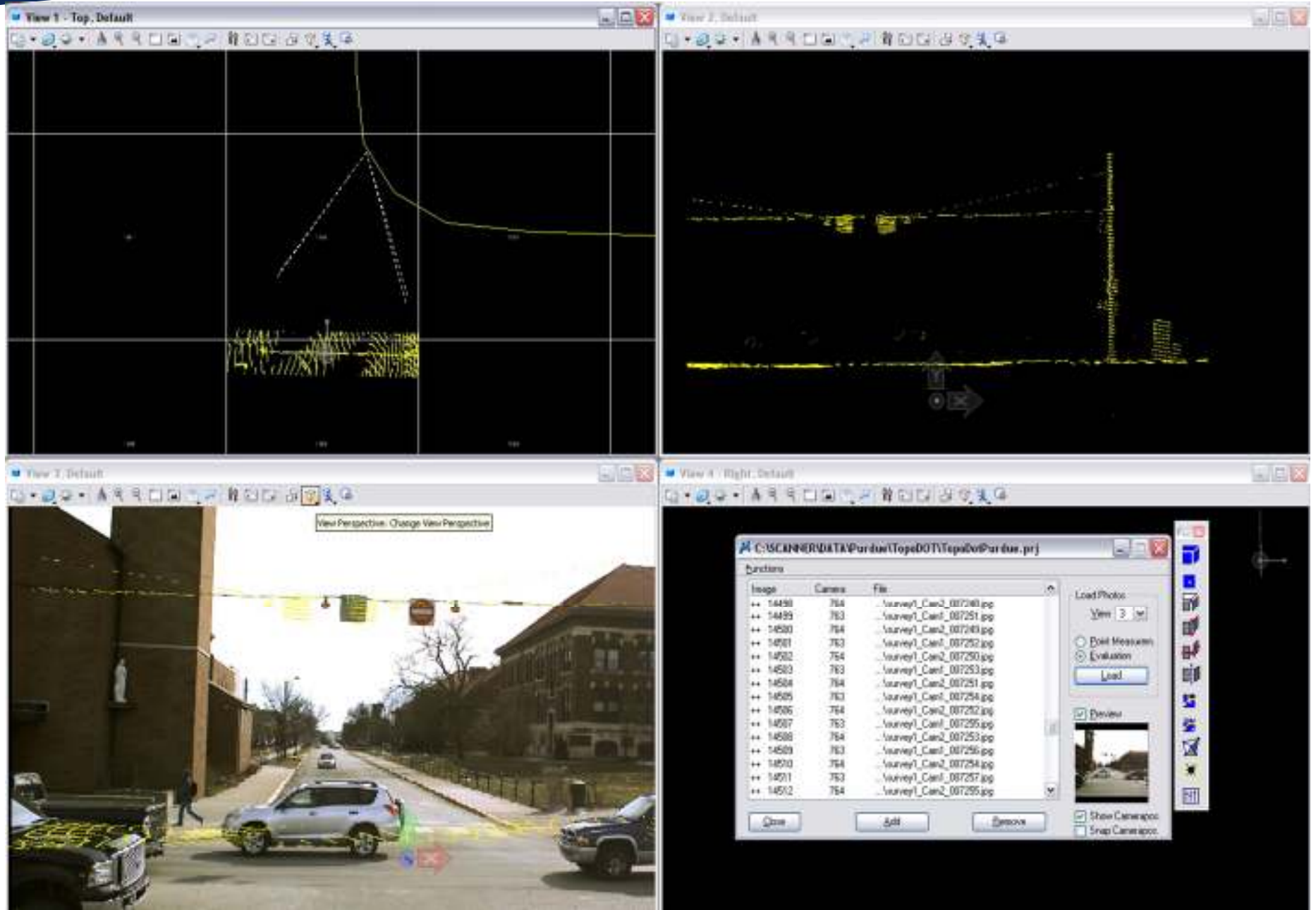
- + Automated delineation of meter or sign face and content



# Feature Extraction Process: Parking Meters & Signs

- + Once the asset is found – tool takes a section of the point cloud within the delineated area. Finds the best fit of points





# MMS used for Reflectiveness

- + Utilizes multi-wave lengths/active sensing system traveling at posted speeds, along with digital imagery.
- + Special Calibration's are performed on the LiDAR sensors to map out relative tables to reflectiveness.
- + Angle, Distance, Air Pressure, Humidity, etc. all effect LiDAR and need to be modeled in order to determine a features "reflectiveness"
- + PLUS - same dataset used for pavement markings, street signs and more!



# Feature Extraction Process: Parking Meters & Signs

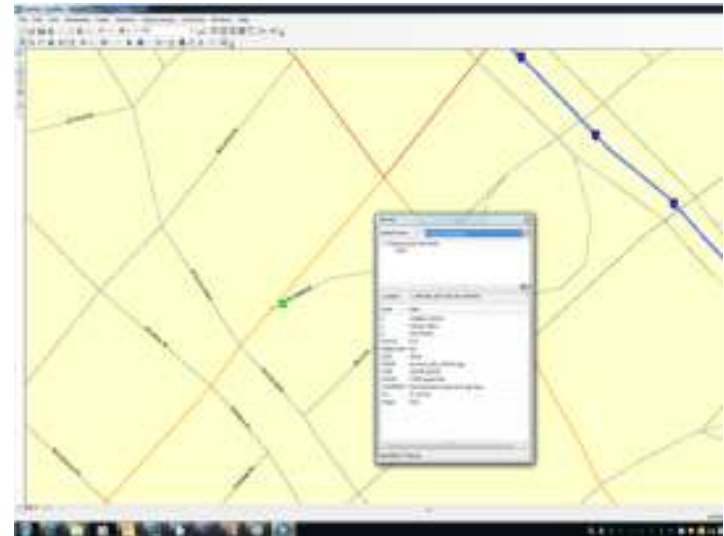
- + Creates GIS point(s) links images and assigns attributes

The screenshot displays a GIS application window with an 'Identify' tool active. Below the tool, a table titled 'Attributes of 9dCoordinateCats Events' is shown. The table lists 13 rows of data, each representing a feature with various attributes including file names, speed limits, and coordinates. A yellow circle highlights the 'FileLink' column in the table. Below the table, a map view shows a street scene with a yellow circle on the map labeled 'Parking Meter 2', corresponding to the highlighted row in the table.

OID	FileFromImage	FileImage	SRUT CD	FileLink	RdCalcY	RdCalcZ	RdDistance	RdAngle
0	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001950.jpg		25MPH	190020 480220	1643242 984244	725 148949		0
1	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001951.jpg		25MPH	190020 439976	1643242 98427	725 160798		0
2	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001954.jpg		Parking Meter 2	190023 90028	1643225 818	725 796943		0
3	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001956.jpg		Parking Meter 2	190020 236697	1643182 14093	718 839389		0
4	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001957.jpg		Parking Meter 2	190019 388898	1643178 481193	718 806217		0
5	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001958.jpg		Parking Meter 2	190018 758527	1643152 362487	718 748234		0
6	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001961.jpg		Parking Meter 2	190017 793983	1643125 748963	718 82388		0
7	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001963.jpg		Parking Meter 5	190017 535307	1643183 717796	718 968658		0
8	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001965.jpg		Parking Meter 2	190015 84518	1643085 101288	718 710302		0
9	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001966.jpg		25 MPH Parking	190014 859632	1643048 778354	728 532332		0
10	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001967.jpg		Parking Meter 2	190013 381248	1643018 533481	718 821572		0
11	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001972.jpg		20 MPH Parking	190013 506363	1643062 367129	724 193883		0
12	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001975.jpg		Parking Meter 5	190017 887384	1643084 823	721 452838		0
13	F:\ITSVSCANS\009001\03_MERDAA_ST_NDY\20110105\9dIMAGE\image\survey2_Cam2_001976.jpg		Parking Meter 5	190012 185303	1643076 77288	725 207238		0

# Feature Extraction QC Tool

- + Online QC Tool for Feature Extraction Data
- + A Semi-Streaming Ortho-rectified Video from MMS is played back to user
- + GDB/features are imbedded in video to QC features
  - + Signs, ADA ramps, hydrants, poles, etc.
- + If feature missing, etc., stop video and able to provide heads-up digitizing for editing/redlining.
  - + This kicks off an automatic LiDAR Search Pattern that will locate the feature in 3D space using Underlying LiDAR data
  - + User then enters in comments (direction, size, type, etc.) – auto-populates from LiDAR calculations so user only has to enter comments.





# Change Detection

- + Second Mobile Scan
  - + Location is important – but so is content
  - + Machine image comparison – pixels/pattern recognition
  - + Machine flags the items as changed – position and/or content
  - + Human spot check on decision system – then turn and burn!



# Trends in EAM Practice

- + Spatial information is critical to EAM Systems
- + Assets/Pavement into a Integrated System
- + Field updates on Spatial & Attribute data
- + Business Process improvements as part of the EAM implementation:
  - + LOS
  - + Asset Criticality

*How: It comes from condition and other key information included and managed in the EAM – can be used for Capital Planning and key M&R decisions*



# Spatial Information Critical EAM Systems

Assets

Find: [ ] Select Action [ ] [ ] [ ] [ ] [ ]

List Asset Spare Parts Safety Meters Specifications Features Work

Asset: I-95N Interstate 95 Northbound Site: BEDFORD

Classification: ROAD Class Description: [ ]

Specifications Filter 1 - 10 of 24

Use the slider control below the graph to change the start and end measures and to zoom in. Drag the graph to scroll. [More information](#)

Specifications	Alt Name	Area	County	DISTOC	ELEV	FURCLAS	LINES	LOS	ROADMAT	SPEED	TERRAN
ALT NAME	Capital Beltway										
AREA	Suburban	Rural	Suburban								
COUNTY	Prince George	Howard	Baltimore	Baltimore City							Baltimore
DISTOC											
ELEV											
FURCLAS						Principal Arterial - Interstate					
LINES											
LOS											
ROADMAT											
SPEED										65	
TERRAN											

Work

- Work Orders
- 1140
- Tickets
- Relationships
- Features

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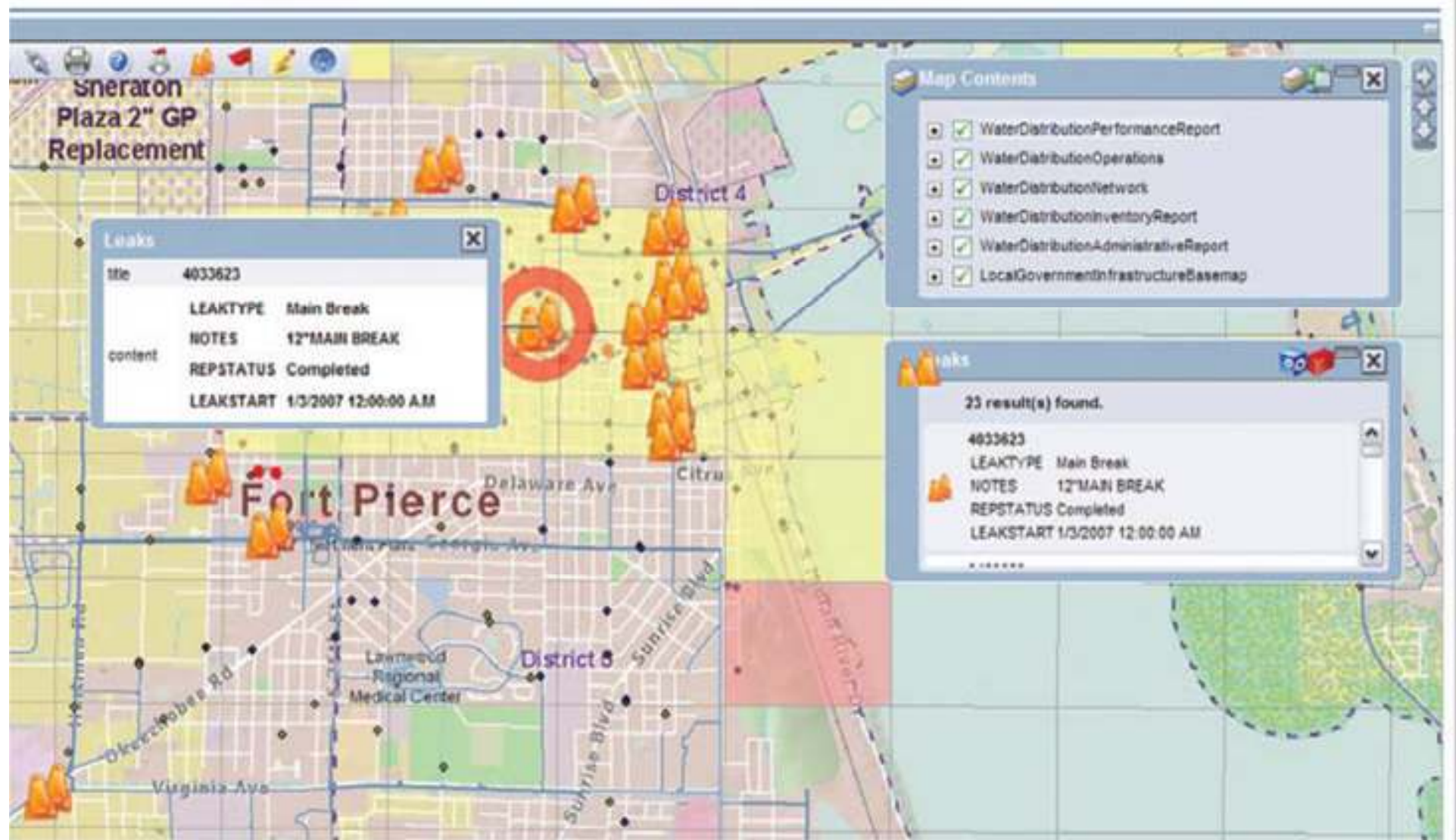


ire Reporting Specifications **Map** Service Address

Status **WAPPR**

Feature Class

Attachments



Sheraton Plaza 2" GP Replacement

**Leaks**

title	4033623
LEAKTYPE	Main Break
NOTES	12"MAIN BREAK
content	REPSTATUS Completed
LEAKSTART	1/3/2007 12:00:00 A.M

**Map Contents**

- WaterDistributionPerformanceReport
- WaterDistributionOperations
- WaterDistributionNetwork
- WaterDistributionInventoryReport
- WaterDistributionAdministrativeReport
- LocalGovernmentInfrastructureBasemap

**Leaks**

23 result(s) found.

4033623
LEAKTYPE Main Break
NOTES 12"MAIN BREAK
REPSTATUS Completed
LEAKSTART 1/3/2007 12:00:00 A.M
.....

WO #9515 Inspection - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://localhost/Cityworks.WebApp/default.aspx

WO #9515 Inspection

Cityworks Server™

Logged in as: PW, PW

Inbox Requests Inspection Work Order Reports Managers Permits Report Admin Permit Admin Admin

Work Order View Save Close Delete

**Work Order**

Description: Inspection

Number: 9515

Entity Type: BUILDING

Category: PARKS

Initiated By: BILLS TERRY Date: 10/27/2009 2:18 PM

Status: OPEN Priority: Medium

Requested By: Supervisor:

Submit To: Date:

Projected Start: 10/27/2009 2:18 PM Projected Finish: 11/10/2009 2:18 PM

Opened By: Date:

Closed By: Date:

Completed By:

Actual Start: Actual Finish:

Stage: ACTUAL Expense Type: MAINT

Add Comments:

Map showing streets: Ashley Dr, Bennett Pl, Dock Ave, Dennis St, N Park Ave, Sequoyia Bl, Oyah Bl.

Layers:

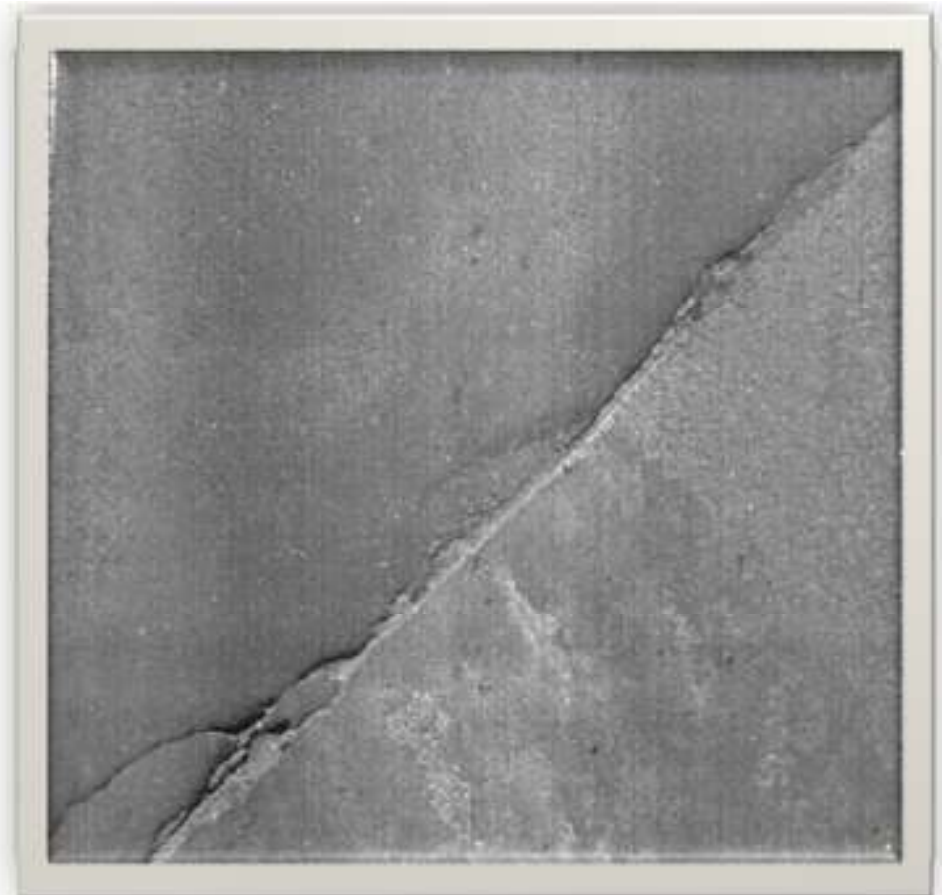
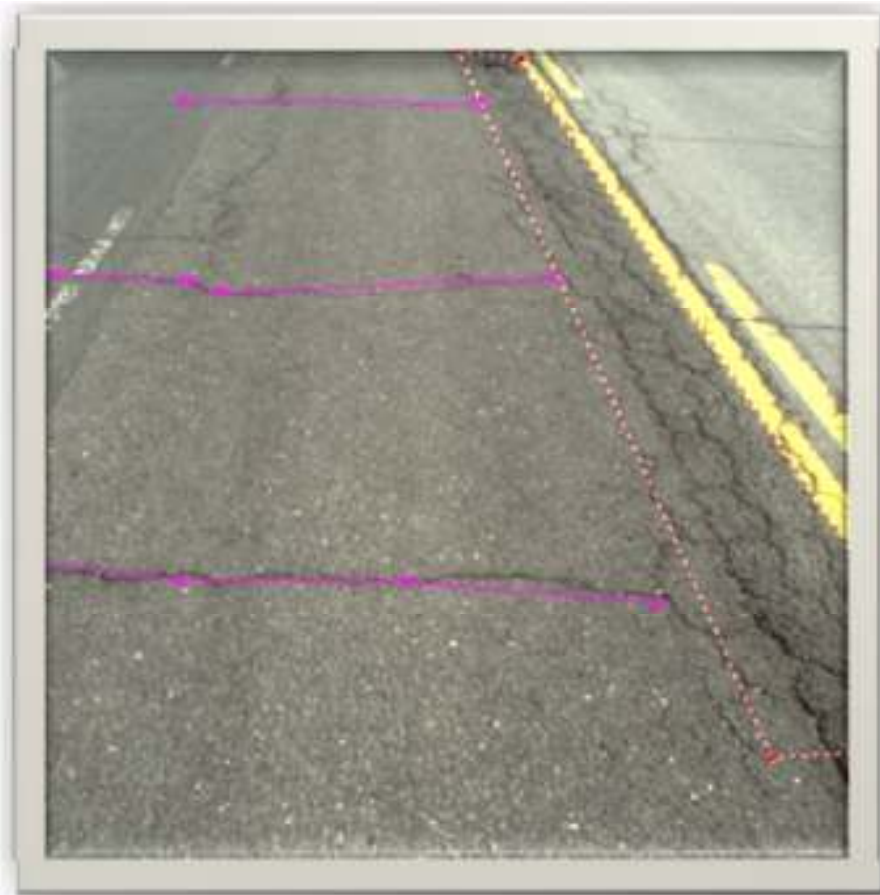
- Selected Features
- Graphic Layers
- Events
- Water
- Base Map
- ArcGIS Online

1:58 PM 9/27/2009



# Assets/Pavement into an Integrated Solution

- + Dual data capture: Scan Pavement & Highway Assets



# Assets/Pavement into an Integrated Solution

PAVER 5.3.7 - [Prediction Modeling]

File Tables Preferences Add-Ins Window Help

Inventory Work PCI Reports Pred. Modeling Cond. Analysis M&R Plan GIS/Tree Sel. List Sel. Visual Menu Help 5.3 About

View

Family Type: PCI vs. Age Model: Other-ACS - ROADPARK

Age	PCI (Red)	PCI (Green)	PCI (Cyan)	PCI (Blue)
0	85	85	85	100
5	65	75	85	100
10	55	70	85	95
15	50	65	85	90
20	40	55	85	85

Calculate

Close

Boundaries: Active

Outliers: Active

4 Options

1. Collect Model Data

5 View Equation and Stats

2 Review Model Data

6. Assign Family

3 Use Boundary/Outlier

Select Inventory Items

All Items

Build Selection

Edit Selection

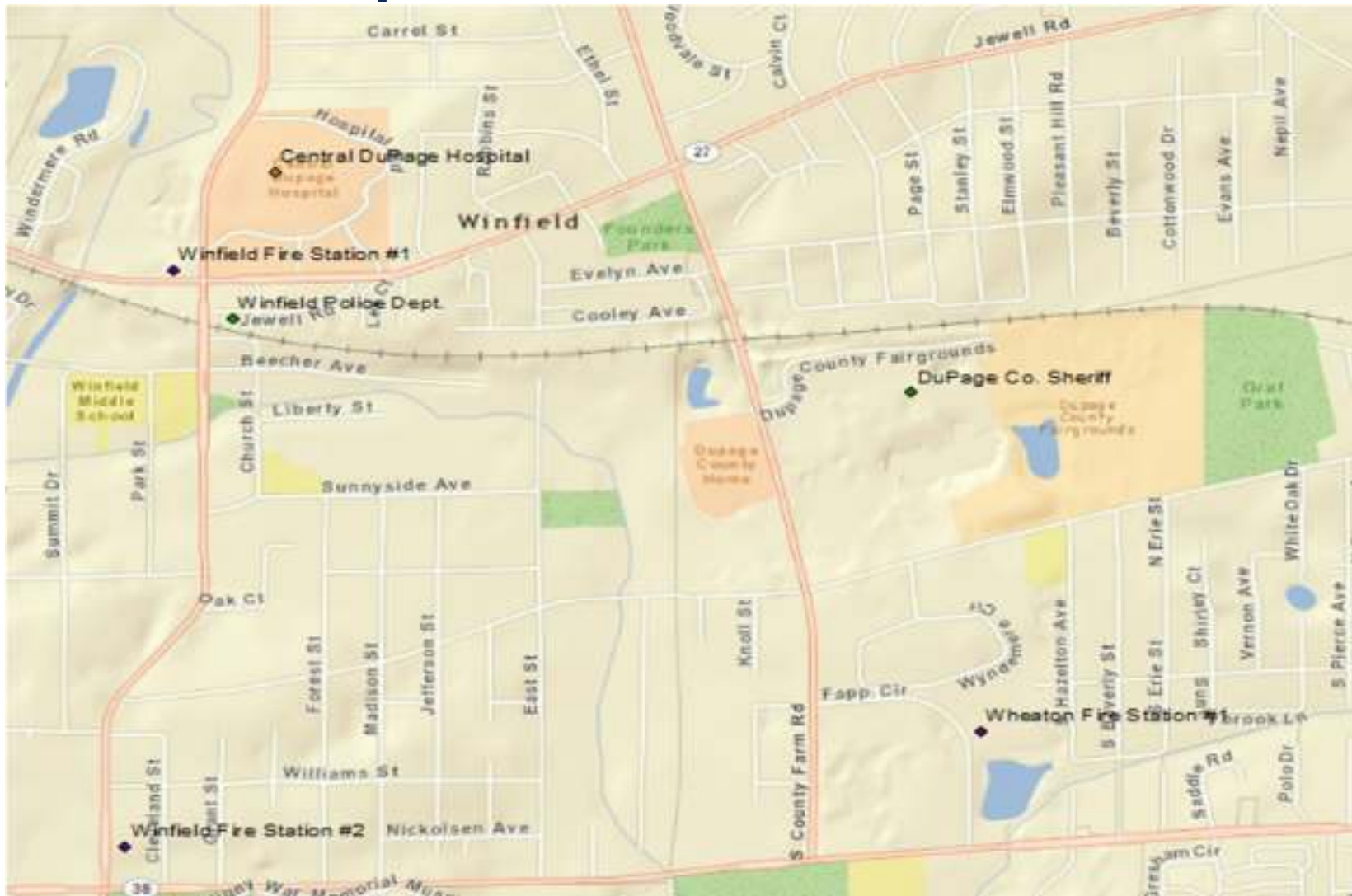
[PCI Data Source] Use = "OTHER" And [PCI Data Source] Surface = "AC" And [PCI Data Source] Rank = "S"

New Rename Get Data Delete Copy

Prediction

C:\EMS Program Files\User Data\2008.12.09.PGC\_CD2\_Subset\

# Business Process improvements as part of the EAM implementation



# Woolpert - IO Decision Tool



# Final Thoughts

- + Mobile Scanning is a paradigm shift in data acquisition
- + Spatial data improves EAM ability to meet operational requirements
- + EAM systems provide critical information beyond supporting maintenance programs. Key to Level of Service, Asset Criticality and CIP Planning.



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