



2006 GIS-T Symposium Columbus Ohio

Analyzing Transportation Data Using Linear Referencing

**Miami Valley Regional
Planning Commission
(MVRPC)**

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Miami Valley Regional Planning Commission

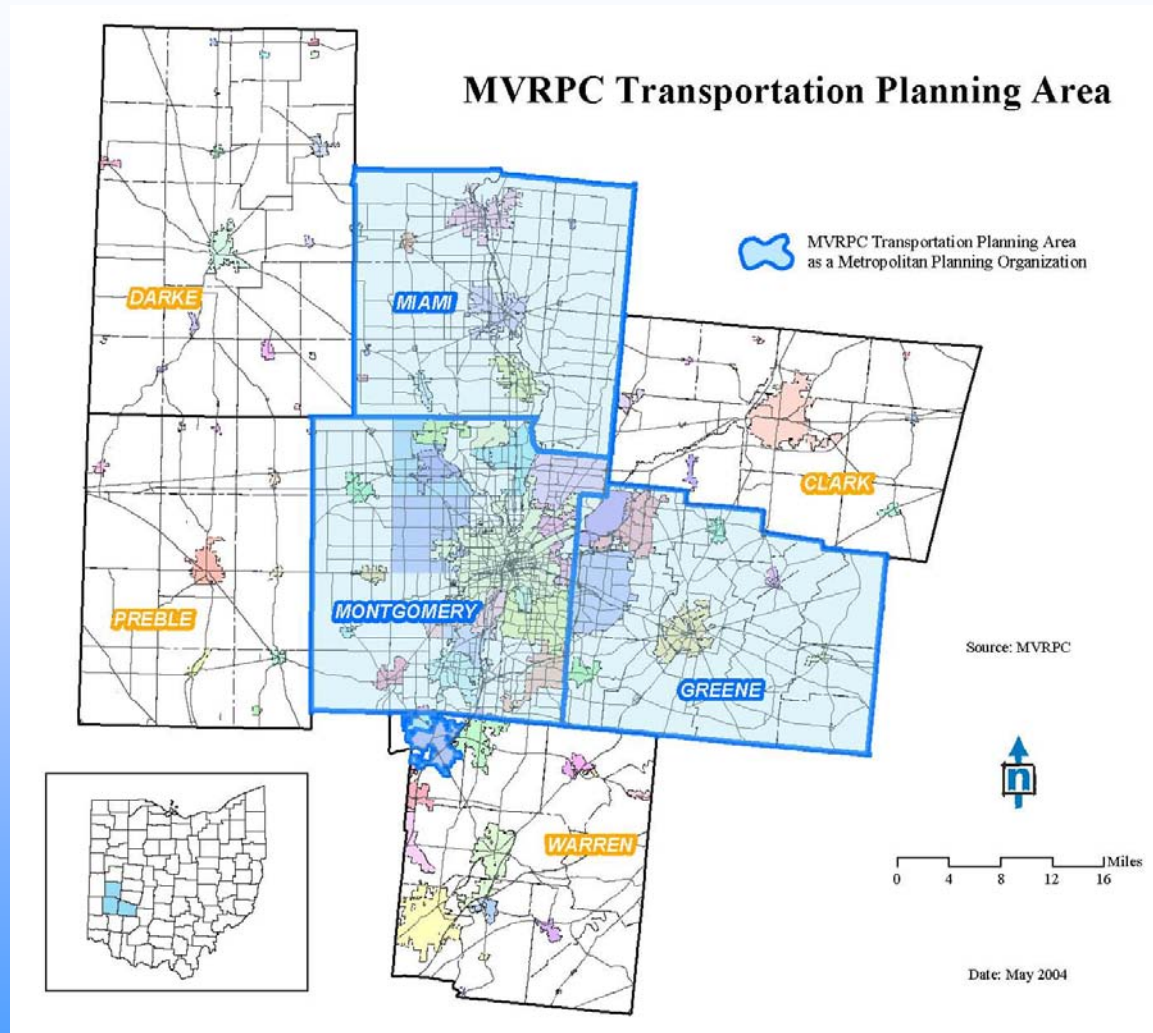
- Voluntary association of local governments and non-governmental organizations surrounding Dayton, Ohio

- MVRPC used as a forum and resource for our partners to:
 - Identify Priorities
 - Develop Public Policy
 - Implement Collaborative Strategies





- Regional Planning Commission for 5 Counties in West-Central Ohio
- MPO for:
 - Miami, Greene, Montgomery Counties
 - Cities of Carlisle and Franklin in Warren County
- Responsible for several transportation planning activities





MVRPC GIS Department

- MVRPC's GIS program coordinates and implements various GIS activities to address long-term and short-term internal and external GIS needs
- MVRPC have been using GIS since the late 1980s to provide an enhanced technical support in conducting regional planning activities





Maintained Databases

- Traffic Counts Collection Sites
 - 22 jurisdictions, ODOT, MVRPC
- Accident Locations
 - ODPS, ODOT
- Transportation Improvement Program (MVRPC)
- Long Range Transportation Plan (MVRPC)
- Roadway Characteristics (MVRPC)
- Bikeways (MVRPC)
- Water and Sewer Utilities



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Why Use Linear Referencing?

- Promotes Standardization for Collecting and Reporting Data
 - Sets standards for multiple jurisdictions and/or MVRPC
 - Standards encourage rules and longevity
- Simplifies Data Transfer and Storage
 - Preserves original roadway segmentation
 - Reduces editing time
 - Efficient attribute transfer to new road layer
- Reduces Human Error / Quality Control
 - No need for snapping or geographic editing
 - Alternative to locating using addresses, intersections and landmarks
- Less Costly Method for Data Collection
 - Odometer / Highway Mile Markers -VS- GPS



Why Use Linear Referencing? Unique Issues to MPO

Maintain Multiple Databases

- 7 Databases
- Roadway network too segmented
- Spatial editing is too time consuming
 - Splitting Segments
 - Dissolving Segments
 - Updating Attributes

Data Collected from Multiple Jurisdictions

- Received in paper, digital and spatial formats
- Location information reported in variety of ways

Employee Turnover

- Interns and staff perform data assembly and entry
- LR System promotes standards (within and outside MVRPC)
- Standards and training = quality control and longevity



Drawbacks

- **Collecting and Reporting Data**
 - Difficult to change status-quo
 - Multiple jurisdictions must buy into system
 - Distance measure must be taken from correct starting location
 - Local roads do not have mile markers
 - Tendency to use distance from landmarks, addresses and intersections to report location
- **Data Transfer to New Route Layer**
 - Non-alignment of new and original roadway layer
 - Matching segments must have same route IDs
 - May involve additional manual updates
 - Change in route sinuosity = change in location of attributes
- **Initial Costs**
 - Software
 - Training
 - Data Conversion



MVRPC Role

- Implement Collaborative Strategies
 - Champion an effective GIS database management system
 - Educate partners about the need for data standards
 - Reduce resistance to change by providing training
- Data Clearing House
 - Create regional route layer
 - ODOT has route layer for state routes
 - MVRPC provide route layer for local roads
 - Make LR Data Available Upon Request
 - Maintain In-House Standards and Quality Control



Terminology

Question: What is the difference between Dynamic Segmentation and Linear Referencing?

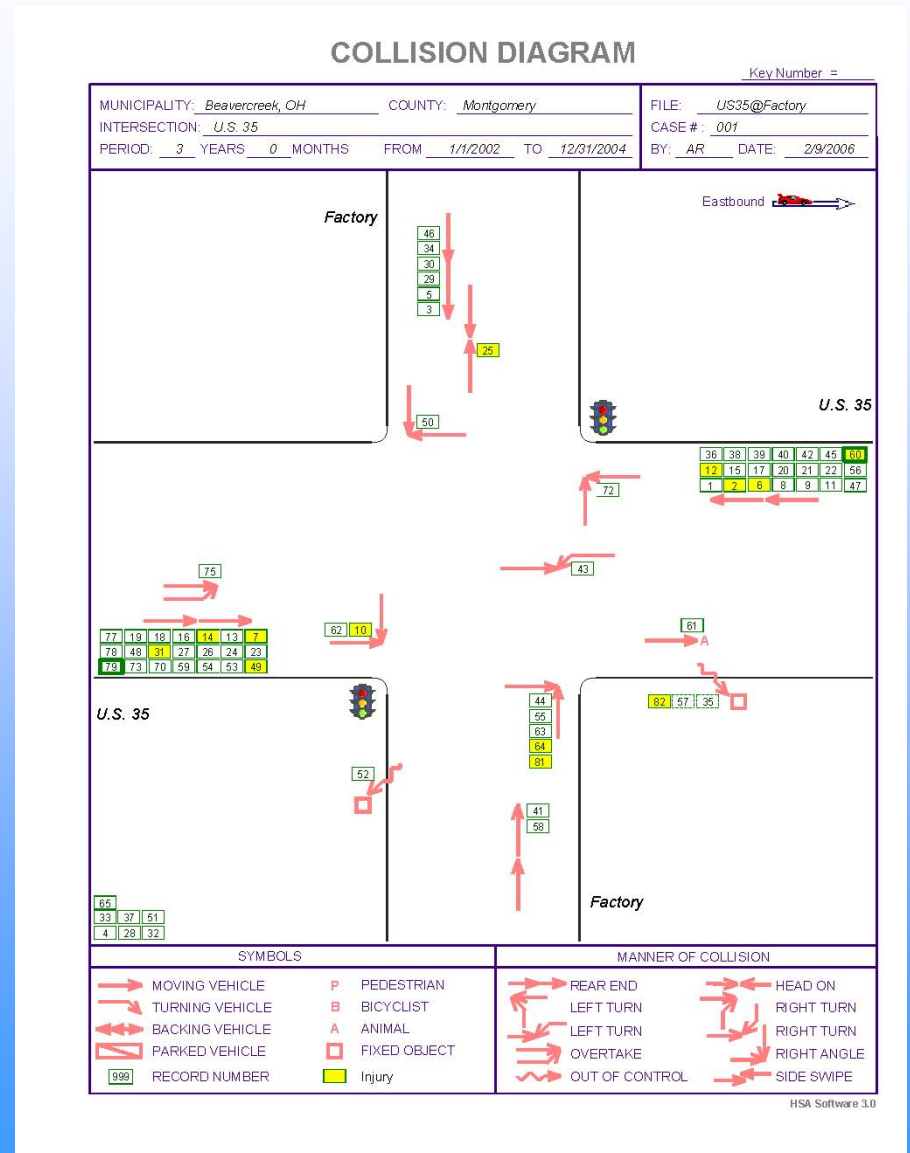
Linear Referencing is the term used to describe the methodology for storing, transferring and displaying data using a route layer and measures.

Dynamic Segmentation is the process of computing and displaying the location of events in an event table.



Accident Database

- Origin of concept through Transaction 2030
- Increased significance due to SAFETEA-LU
- Currently utilized for Intersection and Segment Level Crash Analysis





Accident Database

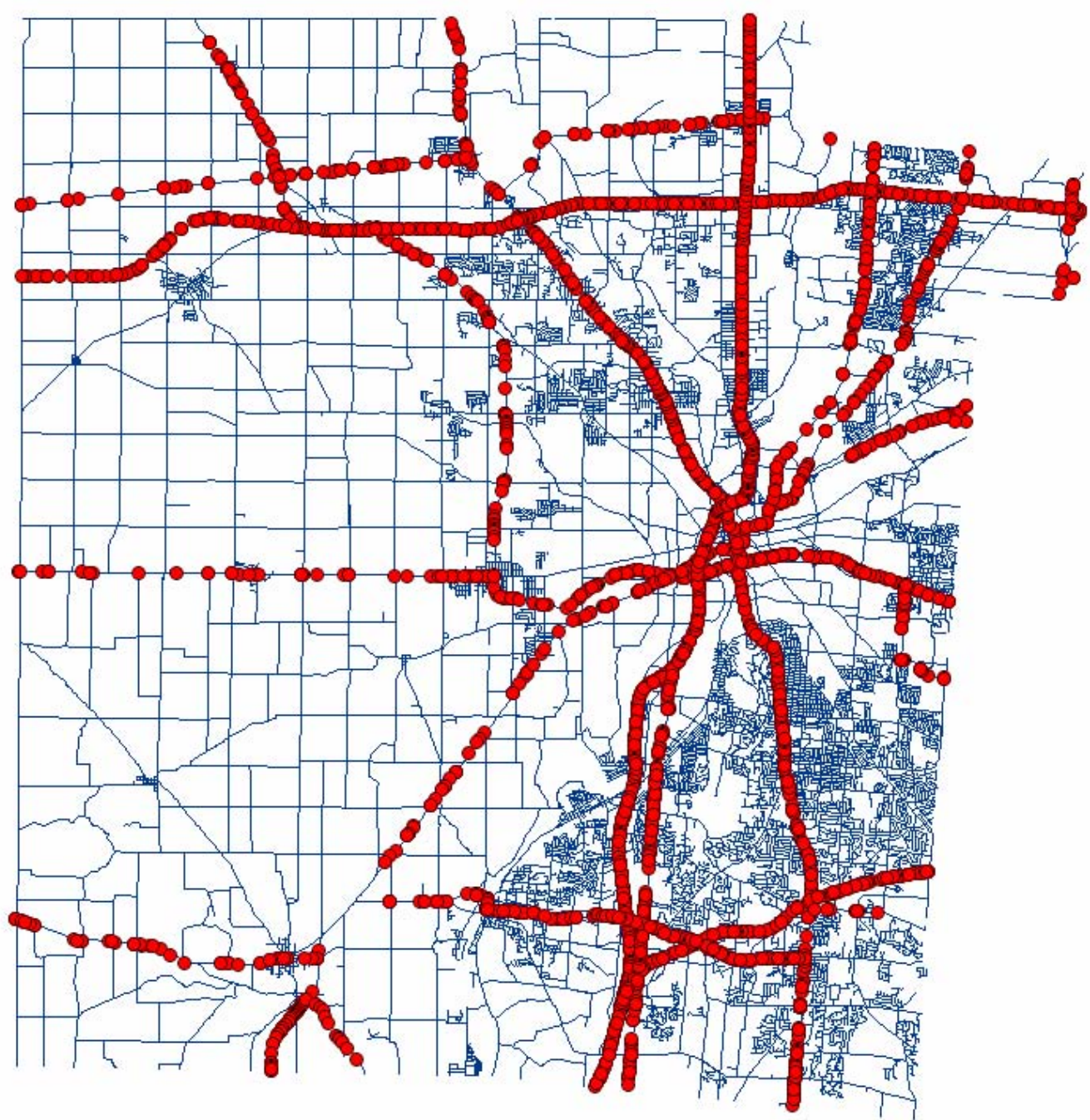
- Data Source: ODPS
 - Compile paper reports into excel spreadsheet
 - Accident locations recorded as Addresses, Intersections, Distances from Intersections and “Logged” Measures
- “Logged Measures”
 - Assembled by ODOT for LR System
 - Available for Interstate, State and US Routes
 - Mapped to ODOT Route Layer using LR
- MVRPC Geocoded Remaining County and Local Road Accident Locations
 - Geocoding took significantly more time than LR



Purpose:

Map accident locations that are geospatially referenced using 'logged' distances

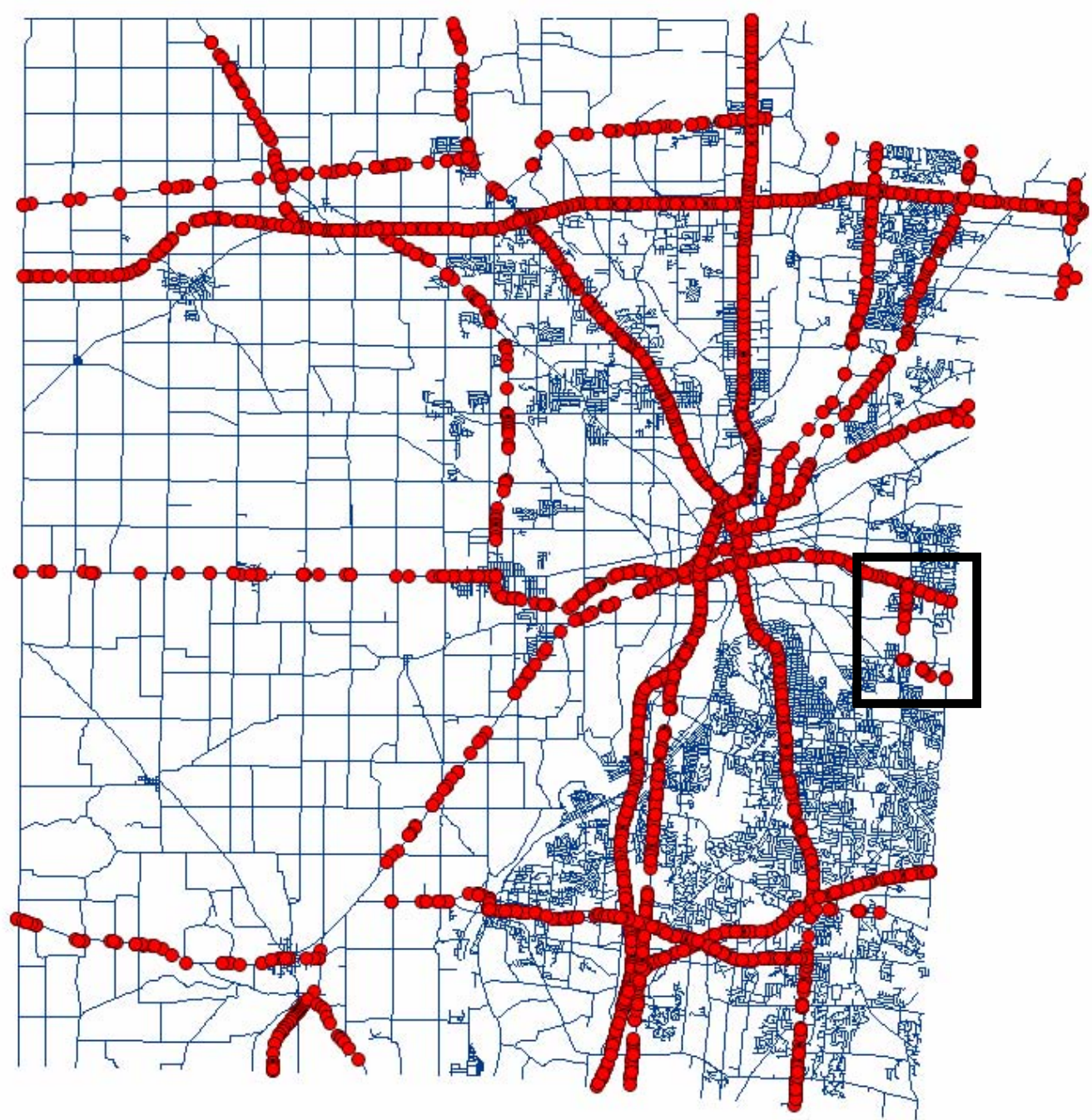
Logged Distances are determined using mile markers





Data Sources:

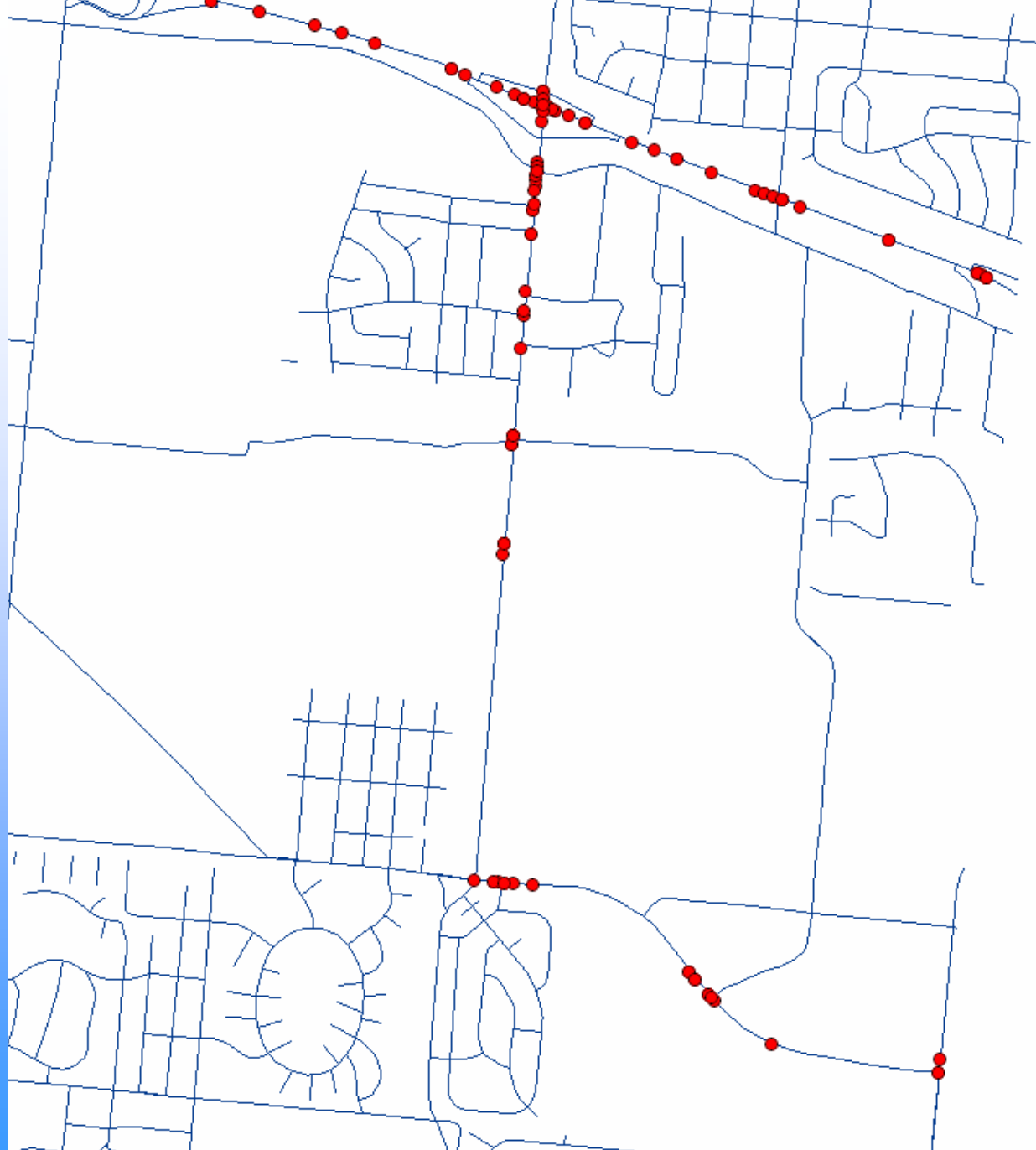
- ODOT
Logged
Accidents
- ODOT Route
Layer
- Accidents
Located Along
State Routes
- Contains
Informative
Attribute Data





Attributes:

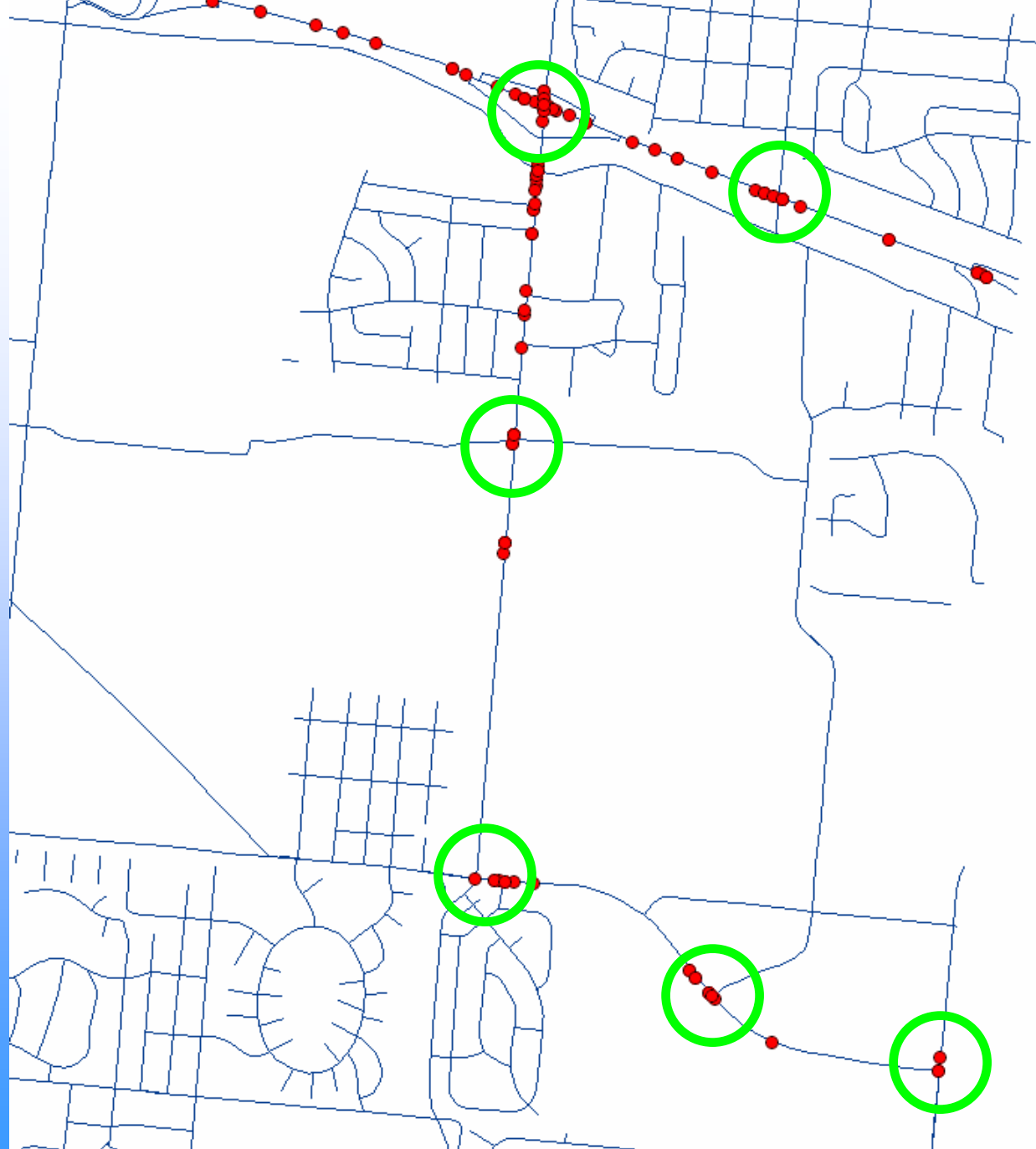
- Posted Speed
- Estimated Speed
- Object Struck
- Vehicle Type
- Driver's Age/Gender
- Traffic Conditions
- Crash Severity
- Injuries
- Animal Involved





Data Analysis:

- Highway Ramps
- Roadway Intersections
- High Accident Segments





Traffic Counting Program

- ④ Used as Input to the MPO's Travel Demand Model for Forecasting Traffic and Analyzing Scenarios for Projects and Special Studies
- ④ Every 3 Years 'Traffic Volume Map' Generated
- ④ Respond to Traffic Count Data Requests from General Public and Special Groups



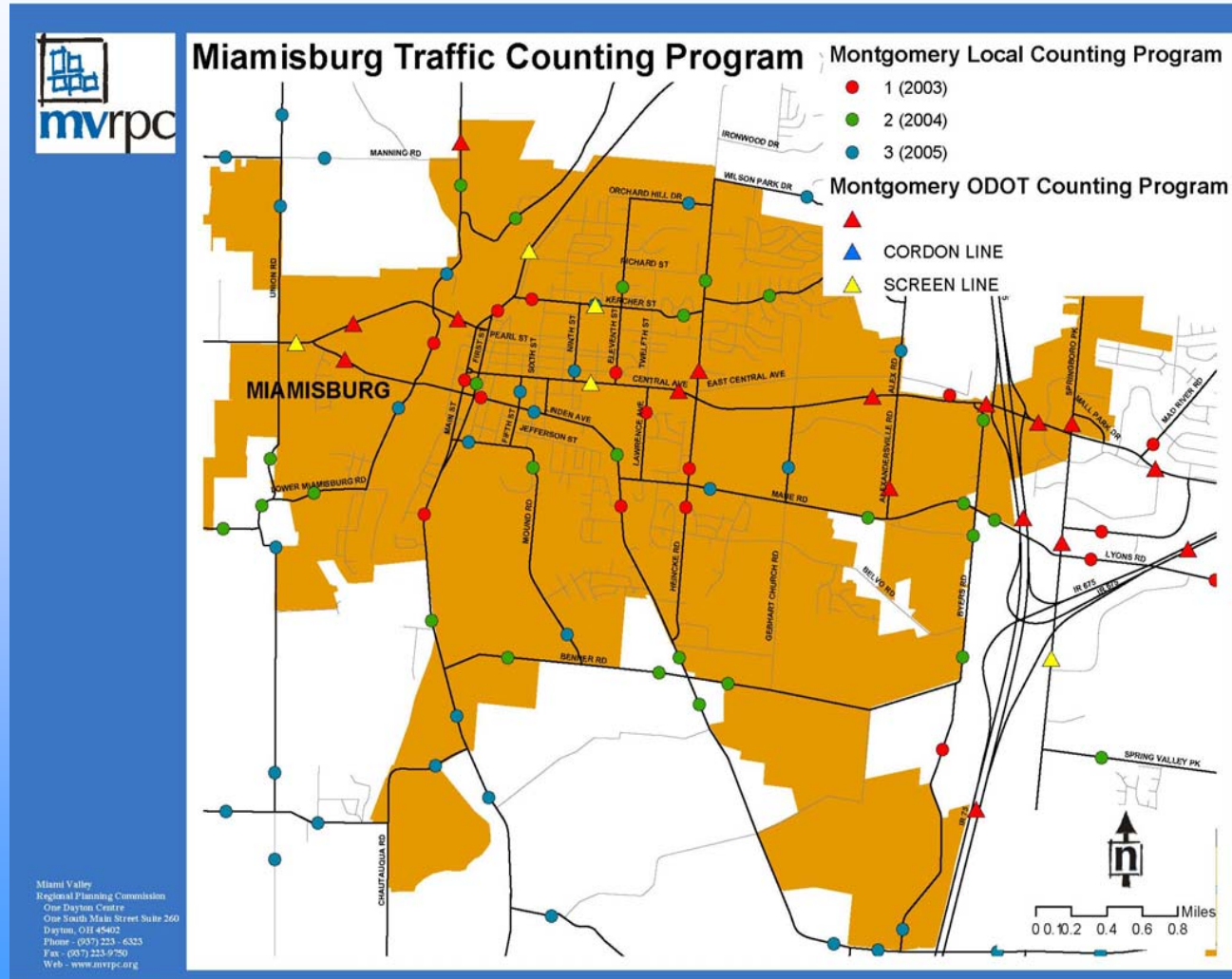
Traffic Counting Program

- Includes over 3 counties in MPO Area
- 3 year traffic counting cycle
- Counts collected by:
 - Local Jurisdictions (1107 locations)
 - ODOT (686)
 - Permanent Stations
 - Portable Stations
 - MVRPC
 - Special Studies and Projects



Traffic Count Program

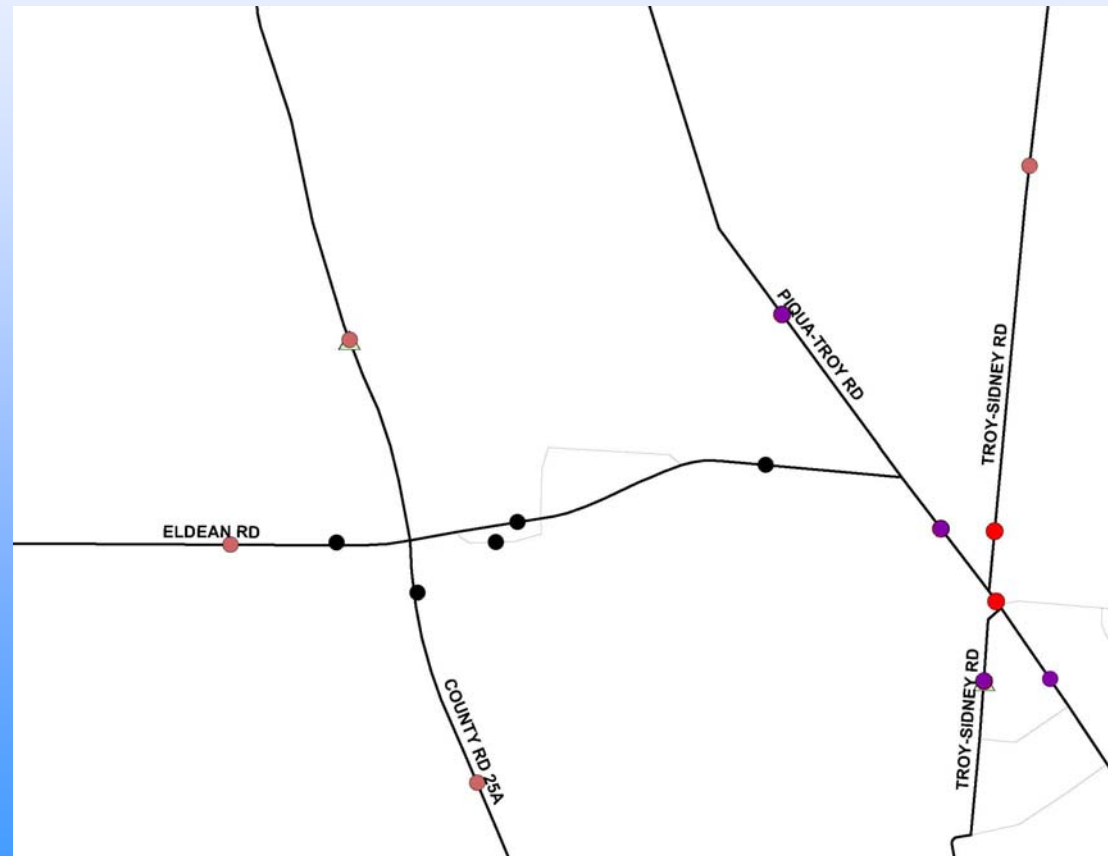
- Point Format
- 8 Point Files for Each County
 - Local, ODOT and ATR
- Many Collection Sites are Constant





Issues with Current TCP Data Structure

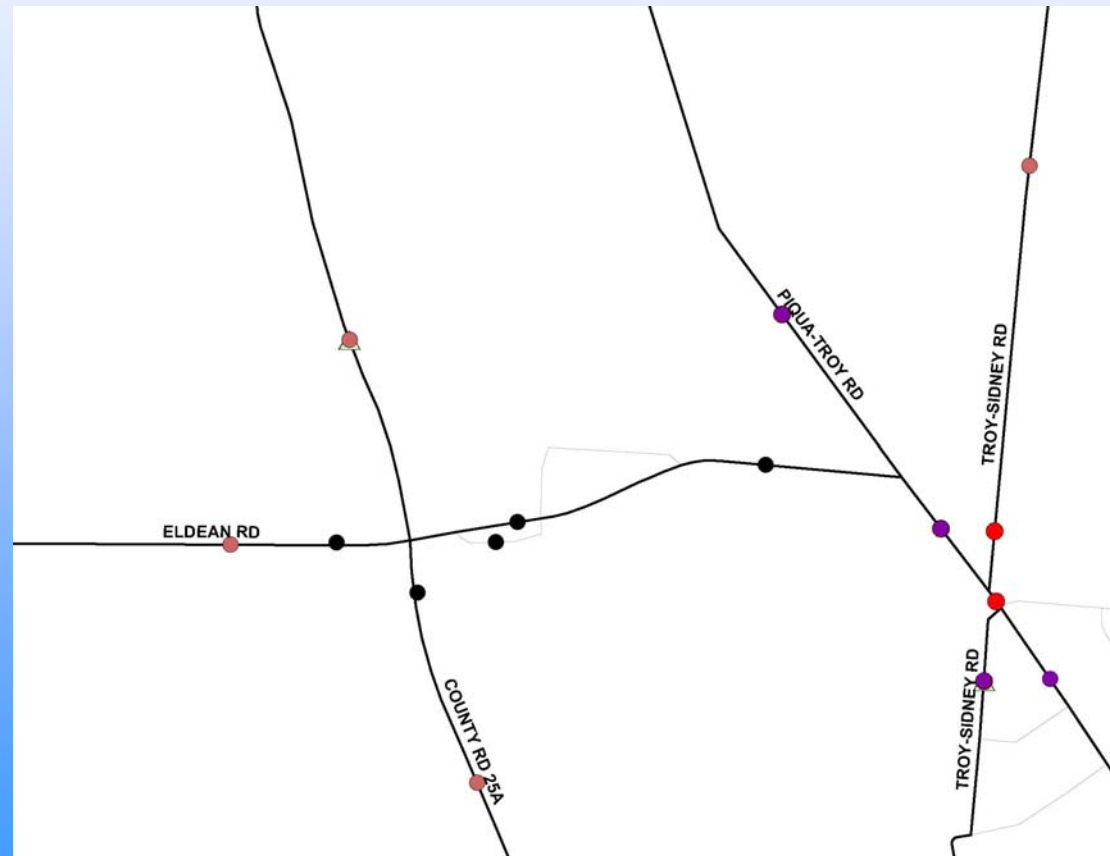
- Quality Control
- Unable to Achieve 'True' Standardization for Data Input
- Trend Analysis or Response to Traffic Count Requests for Several Locations at Once Becomes Tedious





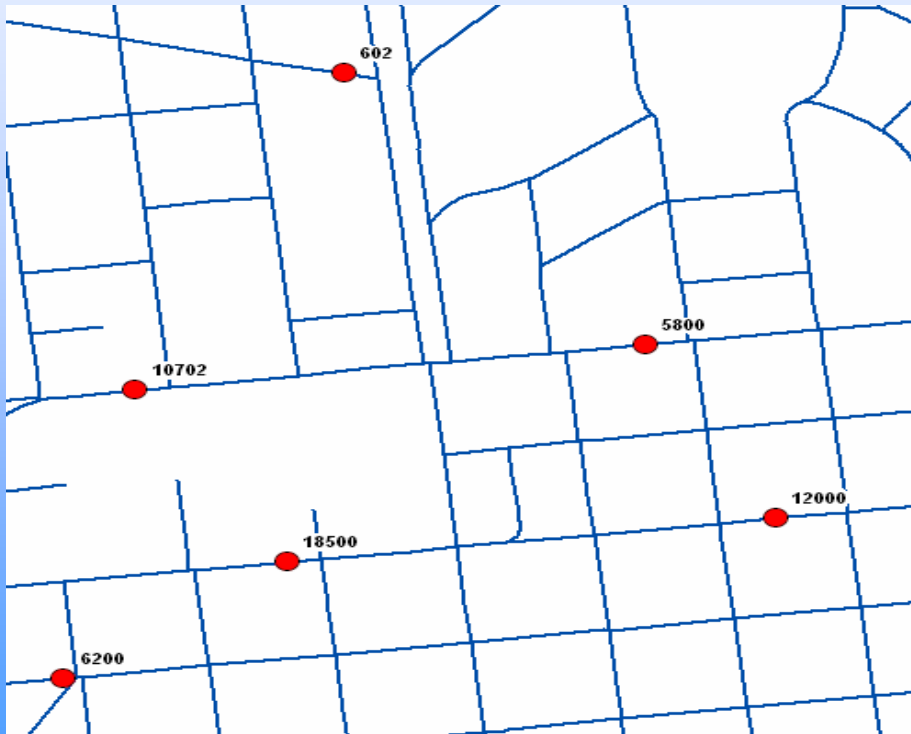
Traffic Count Applications

Purpose: Standardize the assembly and input of data into database system. Also, create a Map Document with a dynamically linked point layer representing traffic count collection sites.





Traffic Count Applications



Procedures:

- ④ Create route layer
- ④ Manually edit collection sites to correct for human error
- ④ Convert point layer into an event table
- ④ Locate collection sites to route layer using Linear Segmentation
- ④ Label collection sites with count numbers



Traffic Count Applications

Benefits:

- Only table needs editing
 - No need for snapping or spatial editing
- Map Document automatically updates with new traffic count or with new collection site
- Route tools helpful in determining distance measure

Drawbacks:

- Comfort seeing the route layer and physically placing point
- Location determined by cross streets not distance measure – LR spatial tools assist in finding distance measure



Future Projects

- Link and transfer attributes from current roadway database and spatial file to our Traffic Congestion Model
 - Topology does not align
 - Segmentation does not align
 - Maintain specific segmentation rules for Traffic Congestion Model



Questions?

2006 GIST Symposium