Project Objective

The Monroe County Department of Transportation (MCDOT) continuously tracks the traffic safety history of all locations under its jurisdiction, including within the City of Rochester. Historically, data has been obtained from New York State's Central Local Accident Surveillance System (CLASS). However, in late 2007, the State ceased inputting accident data into CLASS and changed over to New York State's Accident Location Information System (ALIS). As ALIS is a GIS based product, it requires a compatible GIS network to be able to process the data.

The purpose of the Monroe County Accident Rate Database GIS conversion project is to migrate the existing accident location and accident rate database to a GIS based network that is compliant with ALIS, allowing the County to continue to receive current collision information. Without this effort, no collision information beyond 2007 could be received. This would cripple programs such as the High Accident Location Program (HALP) which rely on current collision data, and hamper the County's engineering effort to review, study, and address collision patterns at locations. The consulting work for the project was performed by Bergmann Associates.

Source Data

ALIS maintains GIS layers of segment and node feature classes for local roadways. However, the ALIS system's source attributes do not include all of the information necessary for MCDOT purposes to track intersection and non-intersection accident rates. Therefore, the first phase of the project was to import and combine multiple GIS data sources into a single GIS layer based on the ALIS segments and nodes. A variety of spatial join methods and manual overlay analyses were used. See Figure 1 for the illustration of the work flow.

The sources that were used for the importation process included:

1. The County's legacy system (based on CLASS), both segments and nodes. Many of the attributes contained in these databases needed to be transferred to the new ALIS based schema.

2. The County's traffic machine count database. This is the document that is freely distributed internally and externally by MCDOT on an annual basis.

3. MCDOT highway jurisdiction information from Monroe County Department of Environmental Services (MCDES).

4. Functional classifications and urban area boundary from Genesee Transportation Council.

5. Accident records from NYSDMV. Accident data initially migrated into the system is for the years 2009-2011, representing the most recent three year block of data available.

6. Traffic machine counts taken on local roads by NYSDOT. NYSDOT updates their local road traffic counts on a six-year basis.

The project successfully combined the above elements into a common GIS layer such that each relevant attribute was captured and can be mathematically and/or logically combined as needed.

Output Products

From the source data, the following feature classes with attribute tables were created:

1. Crash Locations from NYSDOT – GIS point layer (see Figure 2).

2. ALIS Segments – GIS line layer (see Figure 3).

3. ALIS Nodes – GIS point layer (see Figure 3).

4. MCDOT Intersections – GIS polygon layer (see Figure 3). The purpose of the polygons is to geographically group clusters of nodes together, so that they can be treated as a single intersection for accident rate calculation purposes.

A series of custom tools were developed by the consultant to calculate accident rates and create report-ready Microsoft Access tables. The tools enabled the following outputs:

- Calculate Intersection Average Daily Traffic (ADT) for the intersection polygons. Primary inputs are the segment ADT's for segments that cross the intersection polygon boundaries.

- Calculate Intersection Polygon Accident Rates. Primary inputs are the intersection ADT's and the total number of accidents at the ALIS nodes contained within the polygons.

- Segment Accident Rate Calculations

- Intersection Accident Rate Statistics Summary. The tool outputs a report ready table.

- "Supersegment" Accident Rate Statistics Summary. The tool outputs a report ready table that summarizes ALIS segment statistics generally from intersection to intersection or "supersegments". Figure 4 illustrates how supersegments are mapped.

- "Supersection" Accident Rate Statistics Summary. The tool outputs a report ready table that summarizes ALIS segment statistics into more significant and meaningful roadway sections that would be the subject of P.I.L. studies or "supersections". Figure 5 illustrates how supersections are mapped.

Training and documentation in the use of the database and the above tools were also provided to MCDOT by the consultant.

Program Applications

The project has enabled MCDOT to resume getting current collision information from the State. Furthermore, the use of a GIS platform has enabled the following capabilities in a visual mapping format:

- Where collisions are occurring by link and by node.

- Safety trends over time.

- Traffic volumes by location.

- Filtering, sorting, and categorizing capabilities to produce special purpose maps.

- Ability to combine data with other information sources relevant to traffic safety features.

An example of a program output is shown in Figure 6. The ratio of the three year accident rate to the critical rate illustrates the overall performance of each intersection relative to others. While we do not use this measure to select our Priority Investigation Locations (these are chosen primarily by individual year performance, as well as the overall trend), this is an example of a new way to view the data that can help in doing comparisons and visualizing the big picture.

Conclusions

The Monroe County Accident Rate Database GIS conversion project has successfully migrated the existing accident location and accident rate database into a GIS based network that is compliant with the State's ALIS system. This has allowed the County to resume receiving current collision information as well as providing the other attributes necessary to continue the monitoring and tracking of safety trends through programs such as the High Accident Location Program (HALP). The new GIS platform and the tools provided by this project allow MCDOT to not only stay current but to also better view and display the data. In addition, as more traffic feature location data is converted into GIS format, the outputs from this project will allow the use of the data for safety performance comparison purposes.

Figure 1

Overall Task Flow Process

**Monroe County DOT Accident Data Conversion
Task 1 Data Flow Diagram
April, 24, 2012**

CLASS Node and Link shapefiles from 2006 project

Join by LINK_ID

Dave's mdb
CITY MIDBLOCKS (6823)
COUNTY MIDBLOCKS (4450)
INTERSECTIONS

Merge midblocks to single layer, retain
Adt
LinkClass
IsAdtEstimate
Town Name, Street Name (Seq/Order only unique by Town + Street Name)
Seq/Order
Segment
Segment Description
CommentPIL
CommentSTDY
CIPDesign
CIPConstruction

Intersections, retain:
Control
Signal
Tmcdate
Calctype
Inadt

2_map_Daves_mdb
Daves_CLASS.gdb
Final_Intersections
Final_Merge

Various manual and automated processes to conflate Dave's CLASS attributes to ALIS segment geometry.

Final Products: ALIS centerlines and nodes for Monroe County with attributes from MCDOT CLASS, RIS Functional Classification, and accident count summary

Functional classifications from NYS RIS via GTC

Make route event theme, dissolve by FUNCTIONAL_CLASS, planarize, and spatial join to ALIS. Some manual clean-up needed.

3_RIS_join_to_ALIS
Join_target.gdb
RIS_Selection.gdb
Spatial_Join.gdb
Join_Output
RIS_Functional.lyr

4_Accident_table_data_join
Accident_count_summary_table.gdb
ALIS_with_RIS_FUNC_and_Accident_count
GEO_SEGMENT_ID_Sum

Join Accident table summary by DYNAMAP_ID and SEGMENT_ID

ALIS segments via MCDES

Various manual and automated processes to conflate Dave's CLASS attributes to ALIS node geometry.

Source_Data
ALIS_lines_from_MCDES
Brighton_Tables_from_NYSDOT
Brighton.mdb
Acident
ContributingFactor
Vehicle

SIMS Accident Count Tables from NYSDOT

Split into two tables: GEO_NODE and GEO_SEGMENT

Summarize by GEO_SEGMENT

Adds COUNT, SUM_FATALITIES, SUM_INJURIES

Summarize by GEO_NODE

Adds COUNT, SUM_FATALITIES, SUM_INJURIES

Join Accident table summary by DYNAMAP_ID and NODE_ID

Intersections_from_NYSDOT
Intersections_From_Prod.mdb
Intersections

Create point file of all accidents?

4_Accident_table_data_join
Accident_count_summary_table.gdb
Map_XY_accident_events.gdb
Accident_events
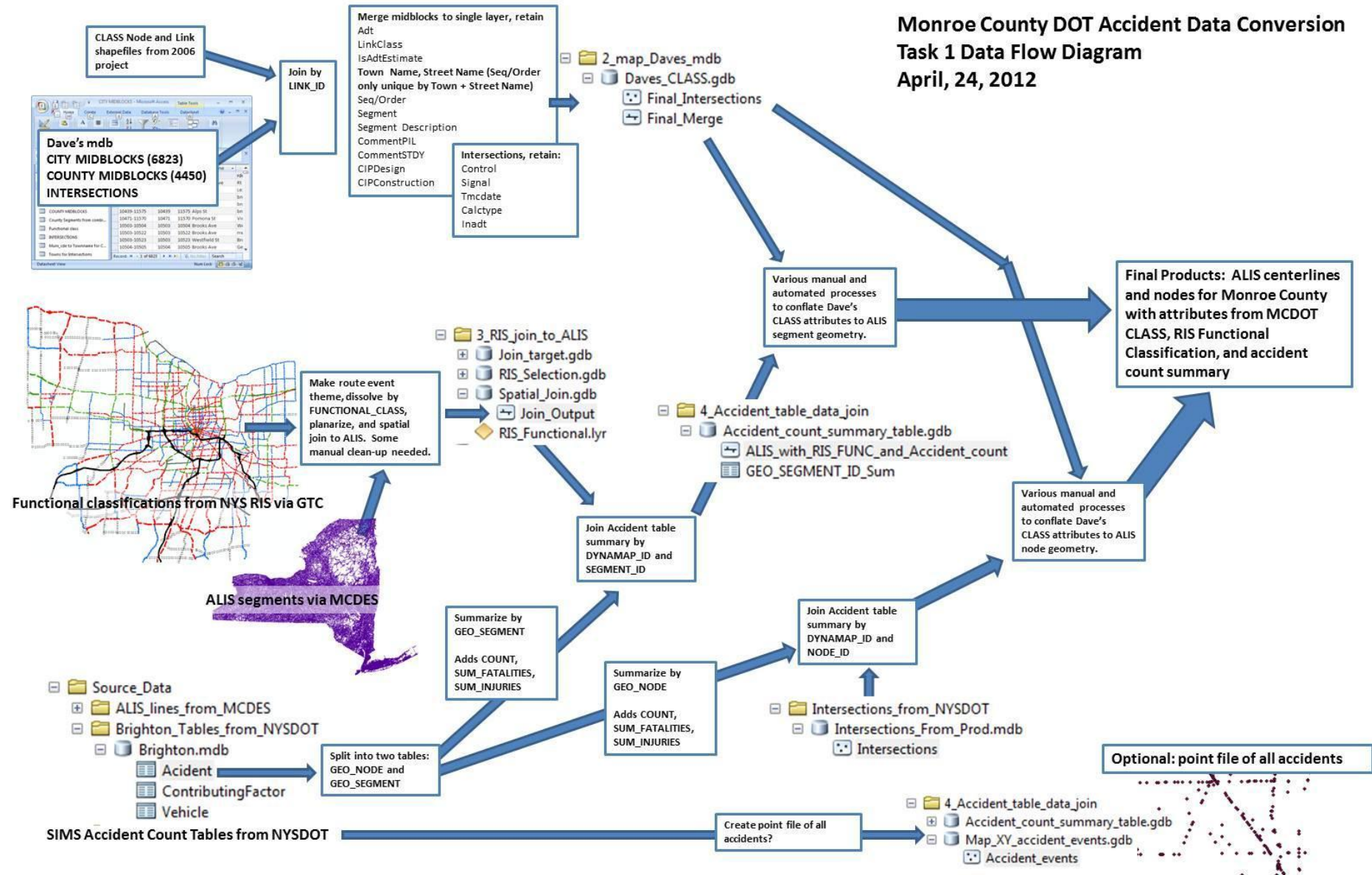
Optional: point file of all accidents

Figure 2 — Crash Locations 2009-2011 (from NYSDOT)

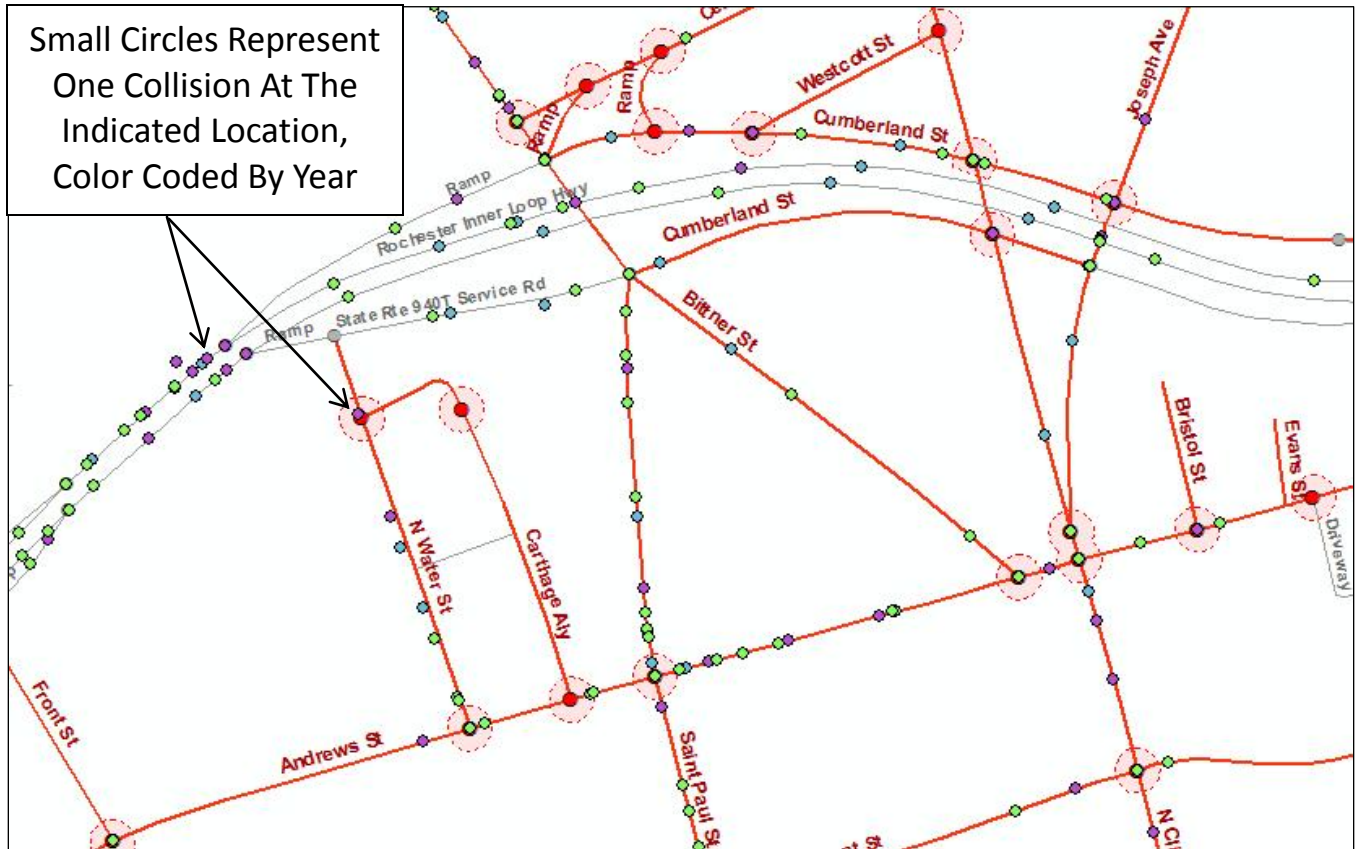Small Circles Represent One Collision At The Indicated Location, Color Coded By Year
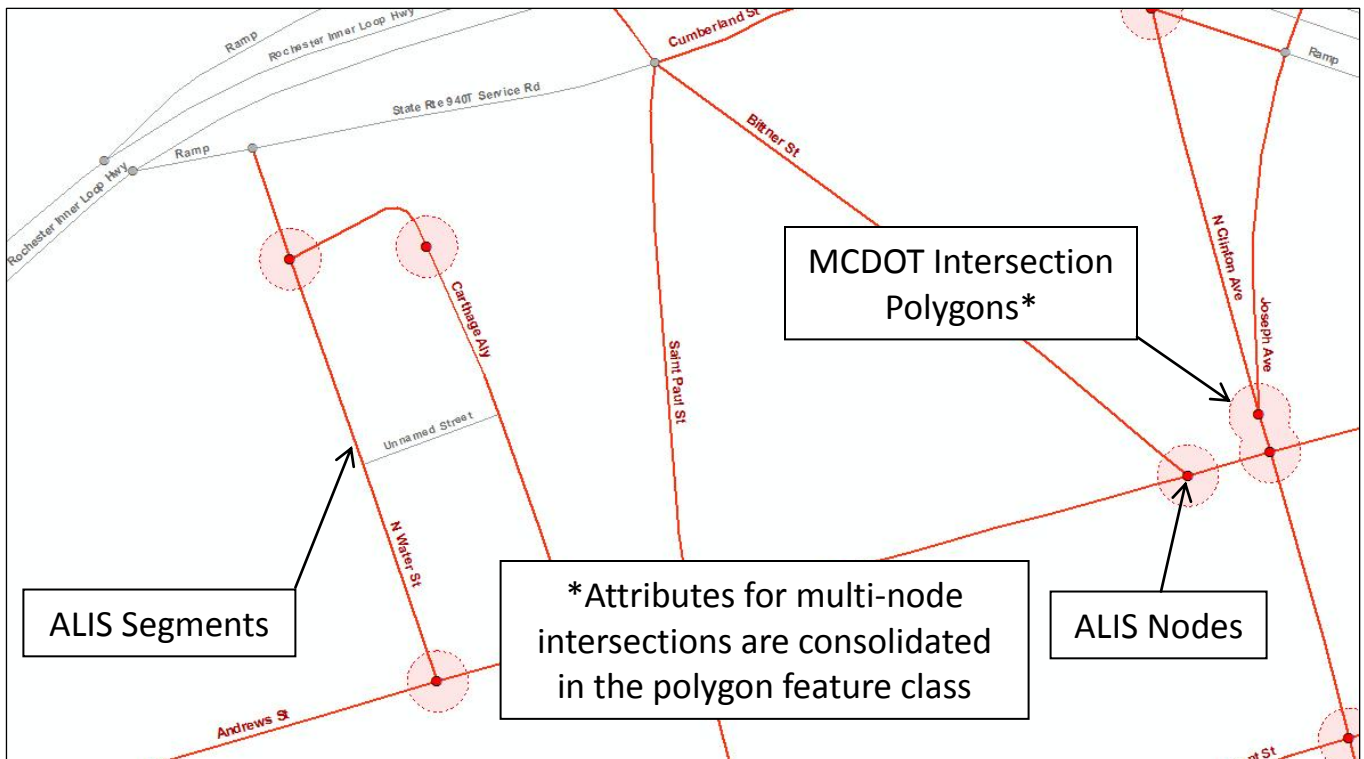
Figure 3 — ALIS and MCDOT Feature Classes

MCDOT Intersection Polygons*

ALIS Segments

ALIS Nodes

*Attributes for multi-node intersections are consolidated in the polygon feature class

Figure 4

ALIS segments are combined into "Super Segments" to make for a more understandable breakdown of the roadway accident rate analysis
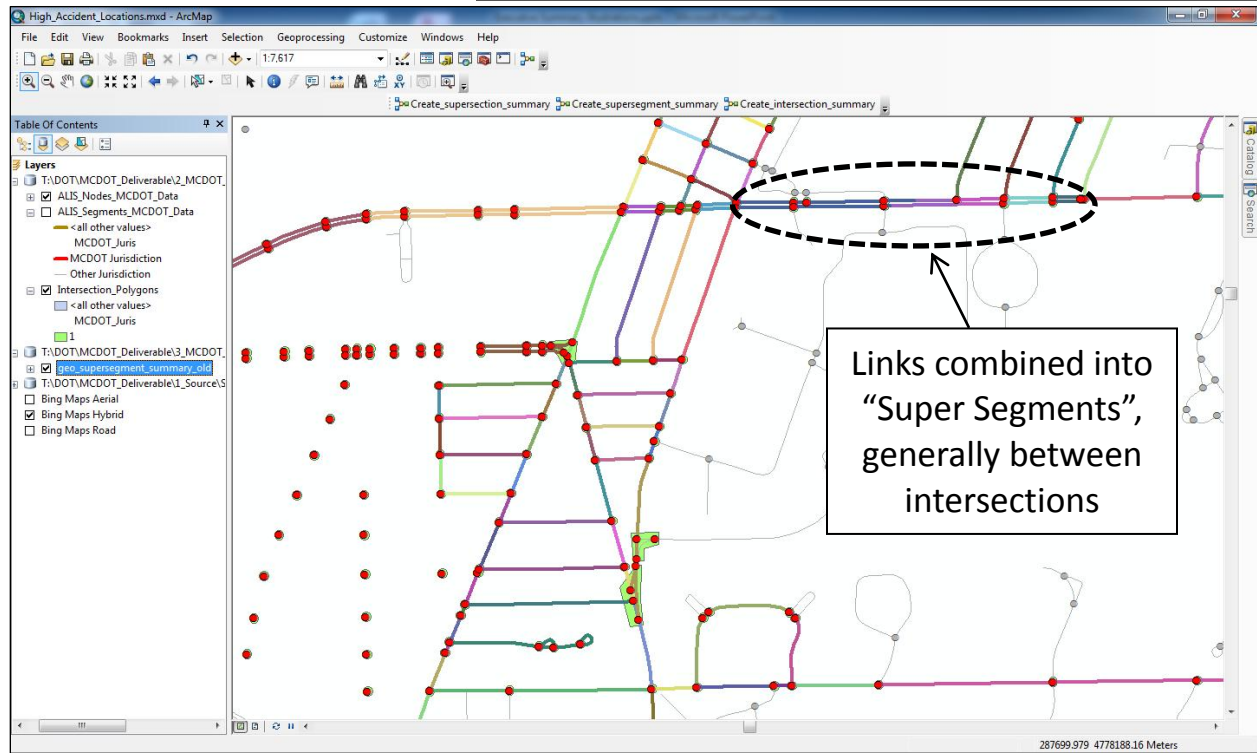
Links combined into "Super Segments", generally between intersections

Figure 5

Segments are further combined into "Super Sections" to make their accident rate analysis more significant for study

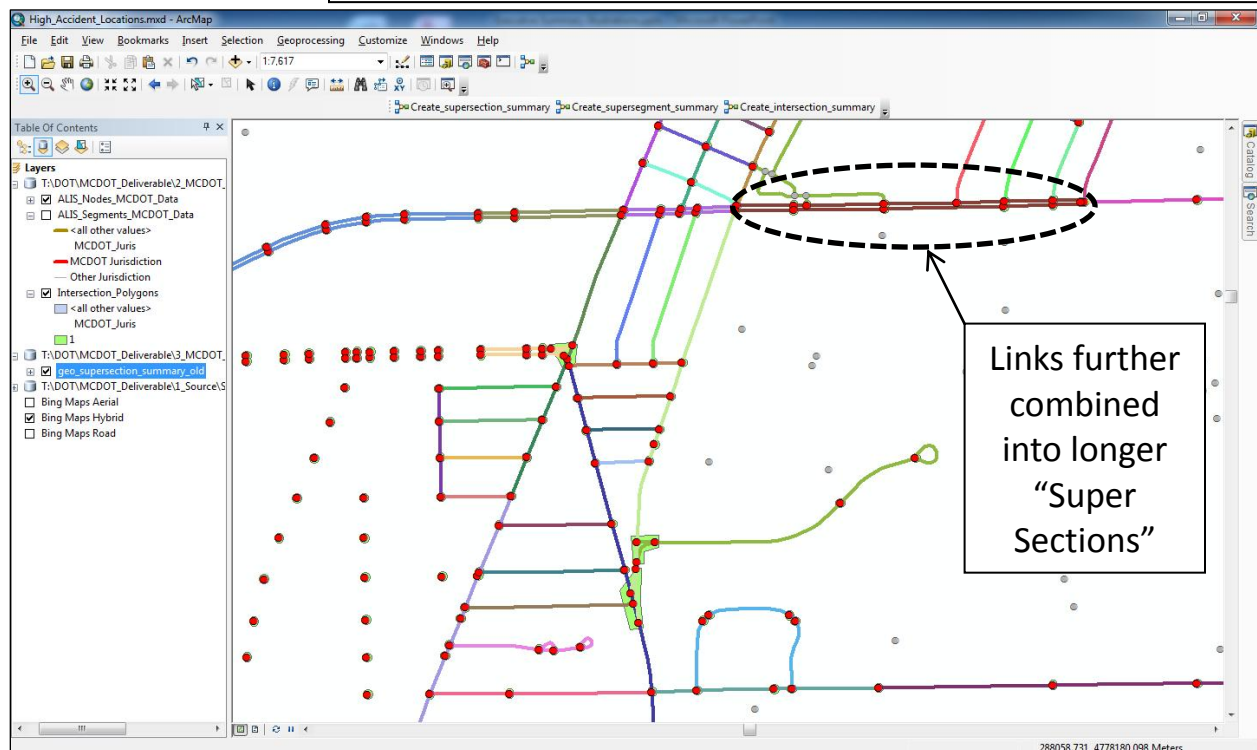Links further combined into longer "Super Sections"

Figure 6 | Example Product: 3 Year Accident Rates vs. Critical Rate