# Safety Analysis Management System

Jim C. Willis, P.E.
Safety Engineer
Mississippi Department of Transportation

# SAMS Project Overview

- Goals
- Data
- Query Methods
- Analysis
- Reports
- Admin Functions

# What are the Goals?

<u>NUMBER 1 Goal!!!</u>

Help Reduce Fatal and Injury Producing Crashes!

# What are the Goals for SAMS?

- Help Reduce Fatal and Injury Producing Crashes
- Quickly Identify Locations with Opportunity
- Identify Countermeasures for Individual Locations and for the entire Road Systems
- Evaluate Highway Safety Improvement Program and Projects

What do you need to do all of this?

# Data Layers and Sources

- Planning Division - MDOT
  - Road Network
  - Roadway Characteristics
  - Traffic Volumes
- Traffic Eng Division – MDOT
  - Sign Data
  - Signal Data
- Research Division – MDOT
  - Pavement Data
- Bridge Division – MDOT
  - Bridge Attributes
- MS Dept of Public Safety
  - Crash Data
  - Narratives
  - Crash Diagrams
- NCHRP Report 500 Series
  - Crash Reduction Factors
- TeleAtlas
  - Local Roads (Line work and RWC)
- NHTSA
  - FARS

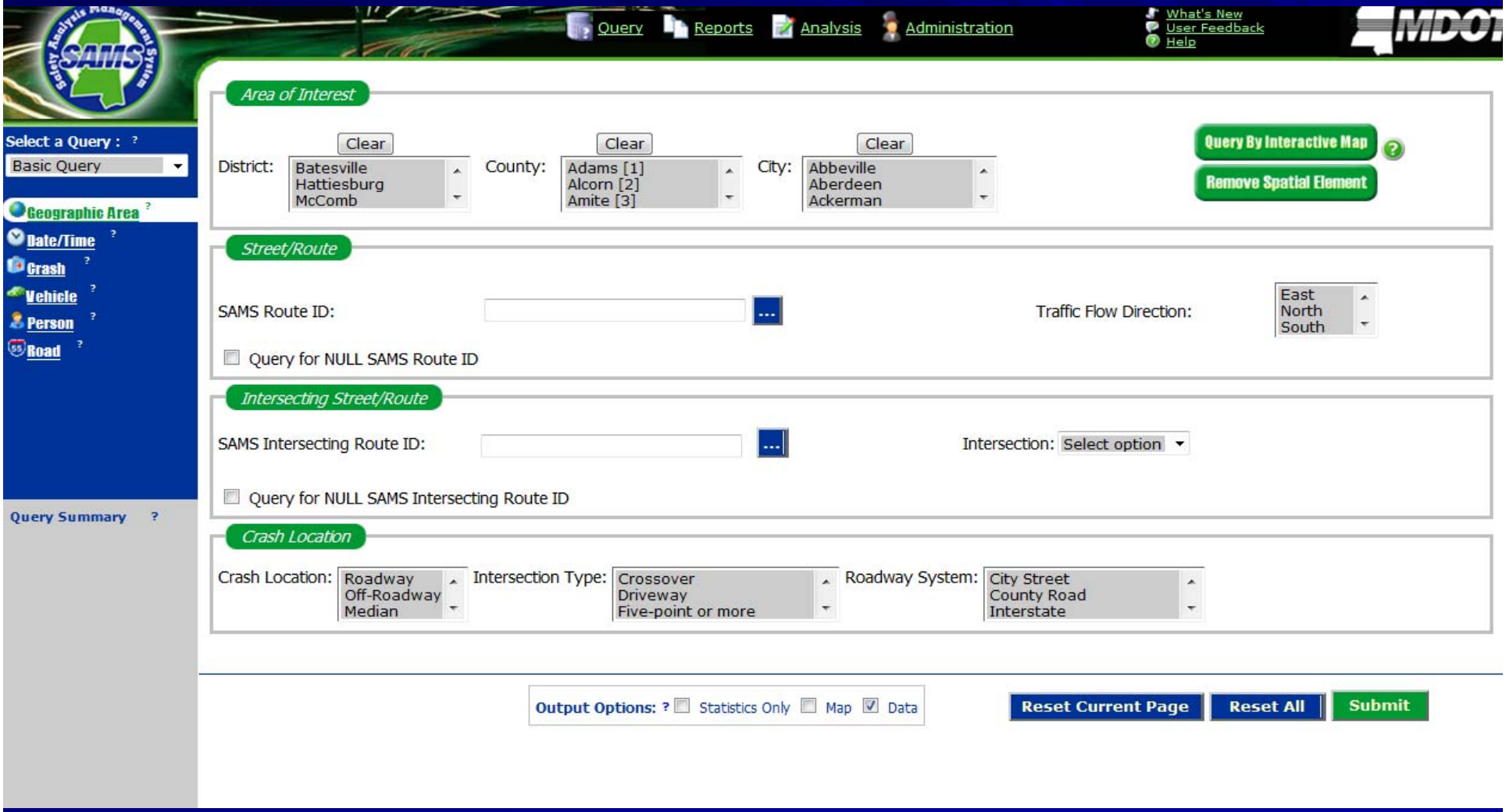
# Data Staging Processes

- Staging Processes
  - Validation Checks
  - Aliasing
    - Cities
    - Route Id’s
  - Route Concurrencies
  - Crash Snapping
  - Assigning Attributes to Crash Data

Data is loaded and ready to Query

# Attribute Queries

# Geographic Area



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Select a Query : ?
Basic Query

Geographic Area ?
Date/Time ?
Crash ?
Vehicle ?
Person ?
Road ?

Query Summary ?

## Crash Identification

Agency Number: Agency Case Number: SAMS Crash ID:

## Crash Related

Vehicle Count: > Injured: > Killed: >

Injury Severity: Killed, Life Threatening, Moderate

Ejected Severity: Not, Totally, Partially

DUI Involved: Select

Crash Type: Run off Road - Right, Run off Road - Left, Run off Road - Straight

## First Harmful Event

Crash with OMV in road: Angle, Head on, Hit and run

Non-Crash in Road: Fell from vehicle, Jackknife, Other

Non-fixed Object: Maint. Equip. Moving, Maint. Equip. Not Moving, Other non-fixed object

Crash of MV in road with: Animal (other than deer), Bicyclist, Deer

Fixed Object: Bridge/Culvert, Building/Other Structure, Embankment/Ditch/Curb

## Conditions

Light: Dark-Lit, Dark-Unlit, Dawn

Weather: Blown Debris, Clear, Cloudy

Road: Dry, Ice, Sand/Mud/Dirt/Oil/Gravel

Workzone Relationship: Advance Warning Area, Not Workzone Related, Within Construction Zone

Workzone Type: Intermittent or Moving Work, Lane Closure, Lane Shift/Crossover

Output Options: ? ☐ Statistics Only ☐ Map ☑ Data

Reset Submit

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elect a Query : ?
Basic Query

Geographic Area ?
Date/Time ?
Crash ?
Vehicle ?
Person ?
Road ?

uery Summary ?

## Vehicle Related

Vehicle Action:
- Avoidance
- Backing
- Going Straight

Vehicle Configuration:
- ATV
- Commercial Bus
- Emergency Vehicle

Pre-Crash Direction of Travel:
- E (East)
- N (North)
- NE (Northeast)

Initial Contact:
- Under
- Overturn
- None
- Other

Speed Zone: min: max:

## Roadway/Control Related

Divided: Select option

Center Turn Lane: Select option

Device Functioning? Select option

Road Character:
- Begin/End Divided Road
- Bridge
- Crossover

Road Design:
- 1 Lane
- 2 Lane
- 3 Lane

Road Surface Type:
- Asphalt
- Concrete
- Dirt

Traffic Control Device:
- Channel-Painted
- Channel-Physical
- Flag Person

Bikeway Type:
- None
- Signed
- Right Only

## Commercial Vehicle Related

HAZMAT Released: Select option

Cargo Body Type:
- Grain/Chips/Gravel
- Flatbed
- Pole/Log

Output Options: ? Statistics Only Map Data

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Select a Query : ?

Basic Query

- Geographic Area ?
- Date/Time ?
- Crash ?
- Vehicle ?
- Person ?
- Road ?

Query Summary ?

## Person

| | | | |
|---|---|---|---|
| Condition: | Affected by Exhaust Fumes<br>Drinking-Impaired<br>Drinking-Not Impaired | Safety Equipment: | Automated Restraint<br>Child Safety Seat<br>Helmet |
| Contributing Factors: | Animal on Roadway<br>Avoidance<br>Driving Under the Influence | Person Type: | Driver<br>Pedestrian<br>Bicyclist |
| DL Status: | Valid<br>No License<br>Expired | DL State/Province: | AB<br>AK<br>AL |

Driver Age: min: max:

Output Options: ? ☐ Statistics Only ☐ Map ☑ Data

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# Spatial Query

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Select a Query : ?
Basic Query

- Geographic Area ?
- Date/Time ?
- Crash ?
- Vehicle ?
- Person ?
- Road ?

**Area of Interest**

District: Batesville, Hattiesburg, McComb
County: Attala [4], Benton [5], Calhoun [7]
City: Ashland, Bethel, Brody

Query By Interactive Map
Build SQL
Show XML

**Street/Route**

SAMS Route ID: ...
Traffic Flow Direction: East, North, South
☐ Query for NULL SAMS Route ID

**Intersecting Street/Route**

SAMS Intersecting Route ID: ...
Intersection: Select option
☐ Query for NULL SAMS Intersecting Route ID

**Crash Location**

Crash Location: Roadway, Off-Roadway, Median
Intersection Type: Crossover, Driveway, Five-point or more
Roadway System: City Street, County Road, Interstate

**Query Summary** ?

**District:**
Batesville

**County:**
Benton [5]

**City:**
Brody

**Crash Location:**
Roadway

**Roadway System:**
Interstate

Output Options: ? ☐ Statistics Only ☐ Map ☑ Data

Reset Submit

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Select a Query :
Basic Query

Geographic Area
Date/Time
Crash
Vehicle
Person
Road

Query Summary

Query by Geographic Area
*Interactive Map Options*

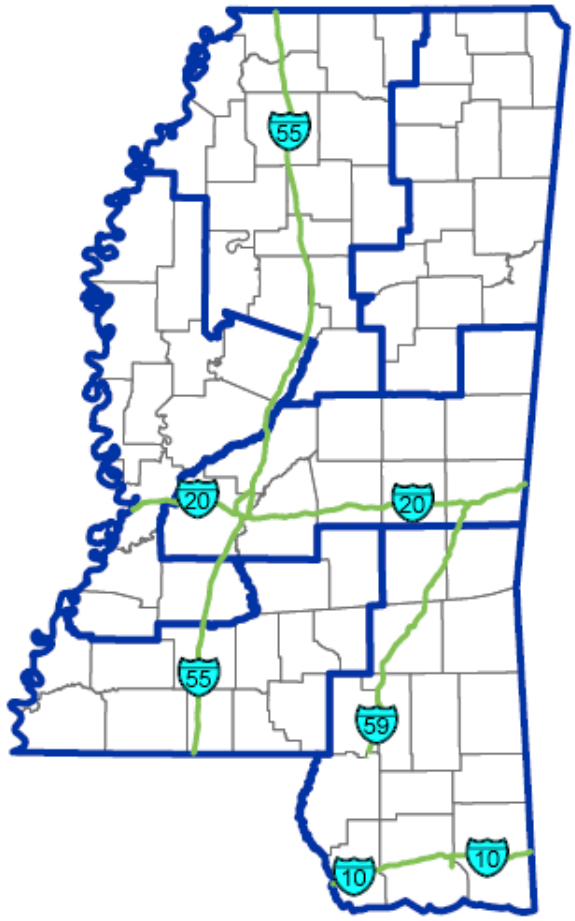
Query by User-Defined:

--Select Option --

Submit

Save & Return

Cancel

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Select a Query :
Basic Query

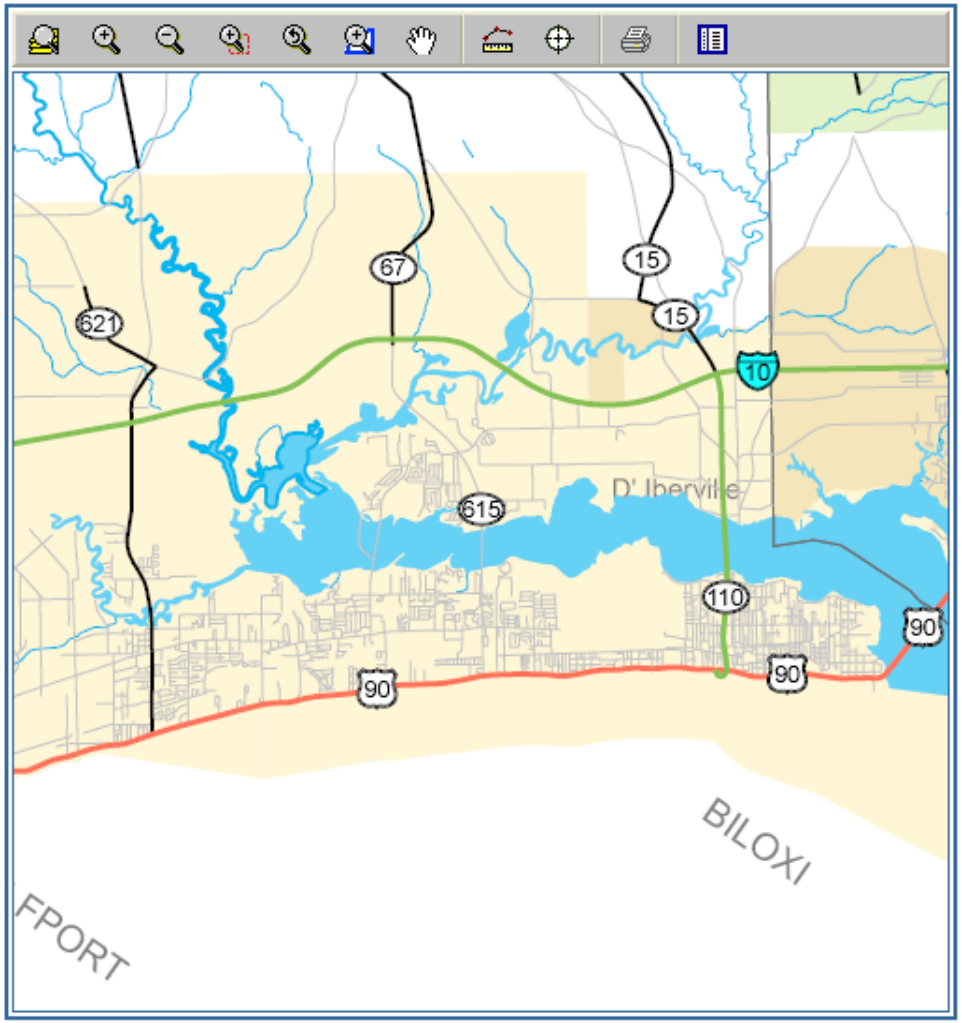
Geographic Area
Date/Time
Crash
Vehicle
Person
Road

Query Summary

**Start Date:**
01/01/2007

**End Date:**
01/01/2008

**City:**
Gaines




## Query by Geographic Area
*Interactive Map Options*

**Query by User-Defined:**

--Select Option --

- --Select Option --
- Rectangle
- Polygon
- Polygon with Route from List
- Polygon with Route from Map
- Point and Radius
- Point and Keyed-in Radius
- Begin and End Points from Map

Submit

Cancel

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Select a Query : ?

Basic Query

Geographic Area ?
Date/Time ?
Crash ?
Vehicle ?
Person ?
Road ?

Query Summary ?

## Query by Geographic Area

### *Query by Polygon and Selected Route from List*

Use the following steps to create a polygon on the map:

1. Click **Capture Map Input** to begin.
2. Click on the map to indicate the beginning point of the polygonal area of interest.
3. Continue clicking points on the map to draw the polygonal area of interest.
4. Double-click the last point of the polygonal area of interest (the minimum number of points is 3). The polygon will automatically be closed and completed.
5. Is the shaded polygon the correct area of interest? If so, click "Populate List." If not, click "Redigitize."
6. Select the Route of interest from the list:

   **Populate List**

   I-110

7. Is the selected Route correct? If so, click "Save & Return." If not, reselect the Route from the list.
8. Click "Cancel" to return to the Interactive Map Options menu.

**Save & Return** **Redigitize**

**Cancel**

Done

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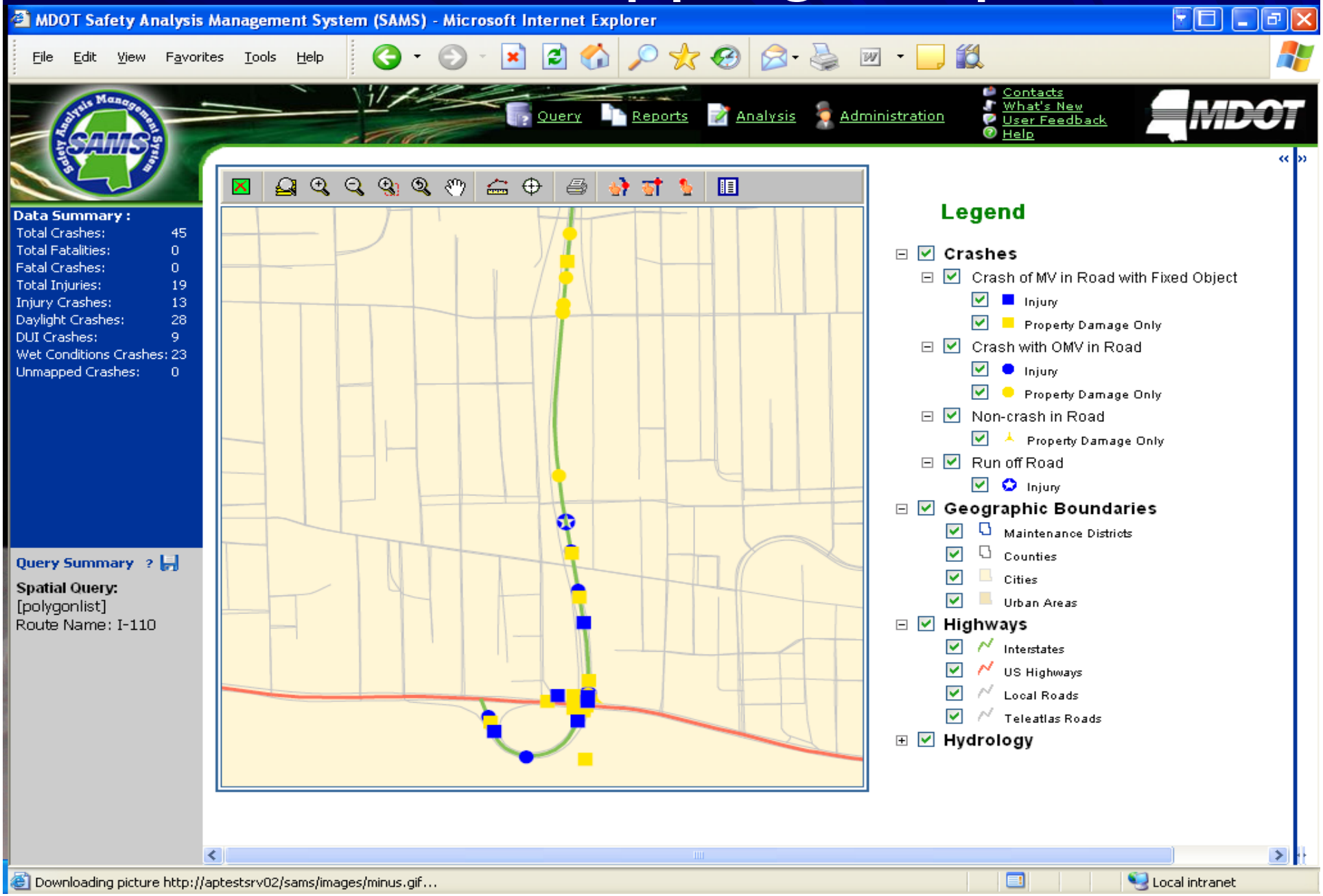
# SAMS Mapping Output



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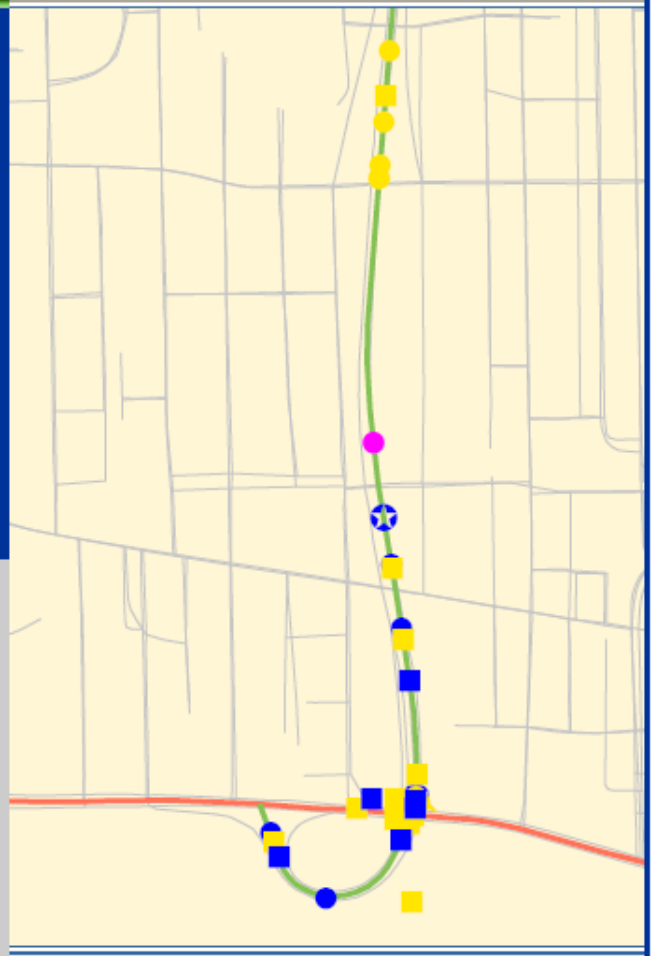
**Data Summary :**

| | |
|---|---|
| Total Crashes: | 45 |
| Total Fatalities: | 0 |
| Fatal Crashes: | 0 |
| Total Injuries: | 19 |
| Injury Crashes: | 13 |
| Daylight Crashes: | 28 |
| DUI Crashes: | 9 |
| Wet Conditions Crashes: | 23 |
| Unmapped Crashes: | 0 |

**Query Summary** ?

**Spatial Query:**
[polygonlist]
Route Name: I-110



| e | SAMS Route ID | SAMS Intersectir | Intersection Dist | Intersection Dist | Intersection Dire |
|---|---|---|---|---|---|
| | I-110 | US 90 | 0 | | |
| | I-110 | DIVISION ST | 250 | F | N |
| | I-110 | DIVISION ST | 0.25 | M | N |
| | I-110 | DIVISION ST | 250 | F | N |
| | I-110 | DIVISION ST | 500 | F | N |
| | I-110 | DIVISION ST | 800 | F | N |
| | I-110 | BAY VIEW AVE | 0.1 | M | N |
| | I-110 | US 90 | 0.5 | M | N |
| | I-110 | US 90 | 0.12 | M | N |
| | I-110 | US 90 | | | |
| | I-110 | US 90 | | | |
| | I-110 | US 90 | 150 | F | W |
| | I-110 | US 90 | 20 | F | N |
| | I-110 | | 0 | | |
| | I-110 | | 0 | | |
| | I-110 | US 90 | | | |
| | I-110 | US 90 | 150 | F | S |
| | I-110 | US 90 | 150 | F | S |
| | I-110 | US 90 | 300 | F | S |
| | I-110 | US 90 | | | |

Column Selector Selected Rows: 1 Enable Paging Page 2 of 2

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# SAMS Data Grid

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**Data Summary :**

| | |
|---|---|
| Total Crashes: | 99 |
| Total Fatalities: | 0 |
| Fatal Crashes: | 0 |
| Total Injuries: | 61 |
| Injury Crashes: | 40 |
| Daylight Crashes: | 68 |
| DUI Crashes: | 8 |
| Wet Conditions Crashes: | 23 |
| Unmapped Crashes: | 0 |

**Query Summary** ?

**Start Date:**
01/01/2007

**End Date:**
01/01/2008

**Spatial Query:**
[rectangle]

| Reported Date | Reported Time | SAMS Crash Type | Vehicle Count | Road Condition | DUI Involved | Light Condition | Crash Location | Invest |
|---|---|---|---|---|---|---|---|---|
| 06/22/2007 | 11:56 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 11/27/2007 | 12:38 | Sideswipe | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 07/10/2007 | 14:59 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 07/03/2007 | 17:28 | Angle | 2 | Wet | 0 | Daylight | Roadway | 2401 |
| 09/21/2007 | 21:20 | Angle | 2 | Wet | 0 | Dark-Lit | Roadway | 2401 |
| 07/15/2007 | 16:08 | Angle | 2 | Wet | 0 | Daylight | Roadway | 2401 |
| 11/08/2007 | 16:20 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 12/28/2007 | 10:46 | Left turn cross traff | 2 | Wet | 0 | Daylight | Roadway | 2401 |
| 04/04/2007 | 14:54 | Left turn cross traff | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 01/16/2007 | 07:42 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 02/24/2007 | 13:40 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 01/12/2007 | 11:06 | Rear end slow or st | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 08/05/2007 | 06:53 | Rear end slow or st | 2 | Dry | 1 | Daylight | Roadway | 2401 |
| 07/25/2007 | 12:53 | Rear end slow or st | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 08/28/2007 | 10:14 | Angle | 2 | Wet | 0 | Daylight | Roadway | 2401 |
| 07/11/2007 | 11:39 | Parked vehicle | 2 | Dry | 0 | Daylight | Parking Lot | 2401 |
| 06/02/2007 | 18:04 | Hit and Run | 3 | Dry | 0 | Daylight | Roadway | 2401 |
| 10/08/2007 | 12:21 | Hit and Run | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 09/12/2007 | 15:42 | Hit and Run | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 09/13/2007 | 14:34 | Fixed Object | 1 | Dry | 0 | Daylight | Roadway | 2401 |
| 09/04/2007 | 13:41 | Rear end slow or st | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 11/28/2007 | 07:31 | Rear end turn | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 11/18/2007 | 14:14 | Other Object | 1 | Dry | 0 | Daylight | Parking Lot | 2401 |

Column Selector Selected Rows: 0 Enable Paging Page 1 of 4 Go First Previous Next

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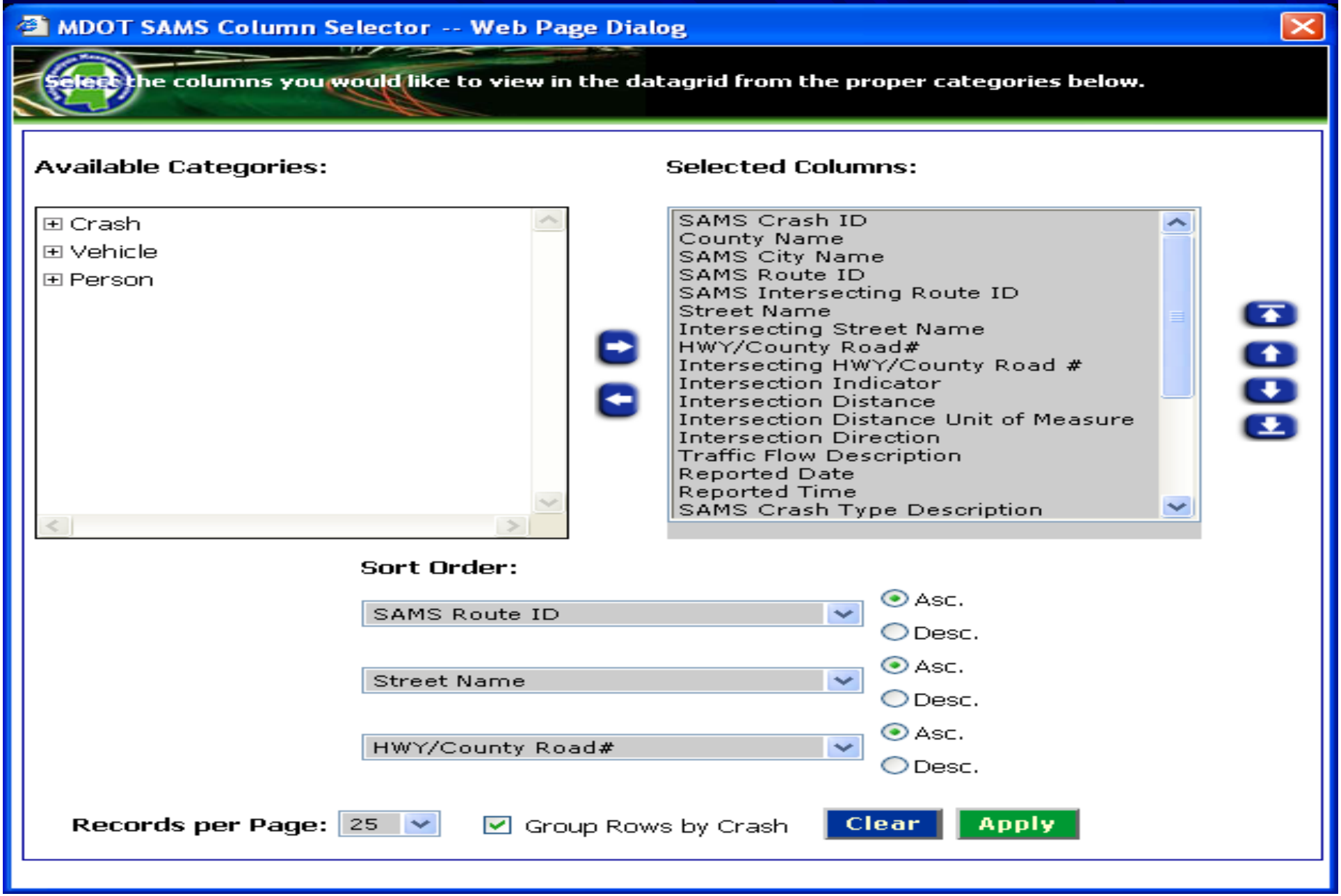
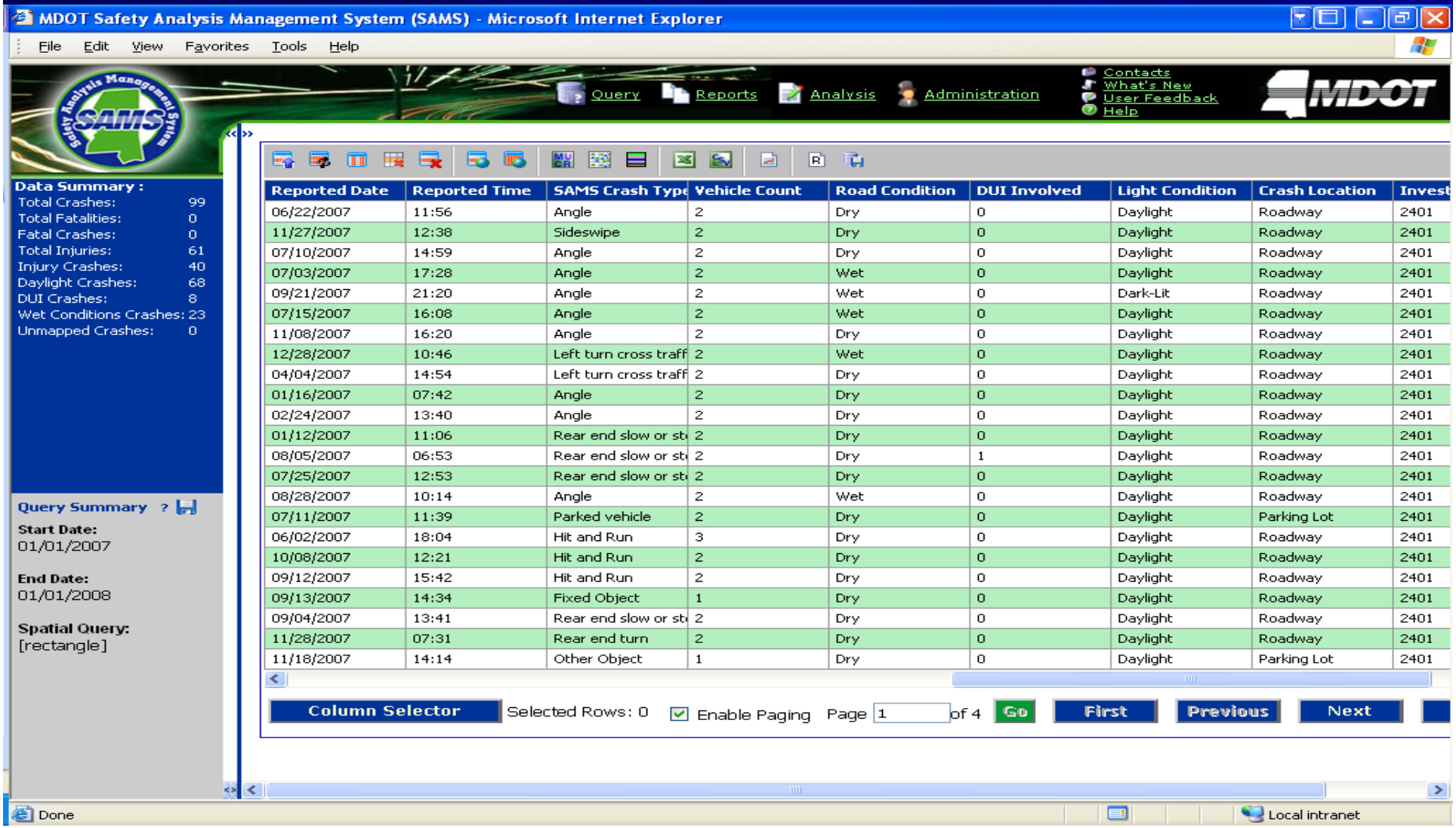
# Column Selector for Data Grid



# Data Grid Functions




| Reported Date | Reported Time | SAMS Crash Type | Vehicle Count | Road Condition | DUI Involved | Light Condition | Crash Location | Invest |
|---|---|---|---|---|---|---|---|---|
| 06/22/2007 | 11:56 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 11/27/2007 | 12:38 | Sideswipe | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 07/10/2007 | 14:59 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 07/03/2007 | 17:28 | Angle | 2 | Wet | 0 | Daylight | Roadway | 2401 |
| 09/21/2007 | 21:20 | Angle | 2 | Wet | 0 | Dark-Lit | Roadway | 2401 |
| 07/15/2007 | 16:08 | Angle | 2 | Wet | 0 | Daylight | Roadway | 2401 |
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| 01/16/2007 | 07:42 | Angle | 2 | Dry | 0 | Daylight | Roadway | 2401 |
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| 01/12/2007 | 11:06 | Rear end slow or st | 2 | Dry | 0 | Daylight | Roadway | 2401 |
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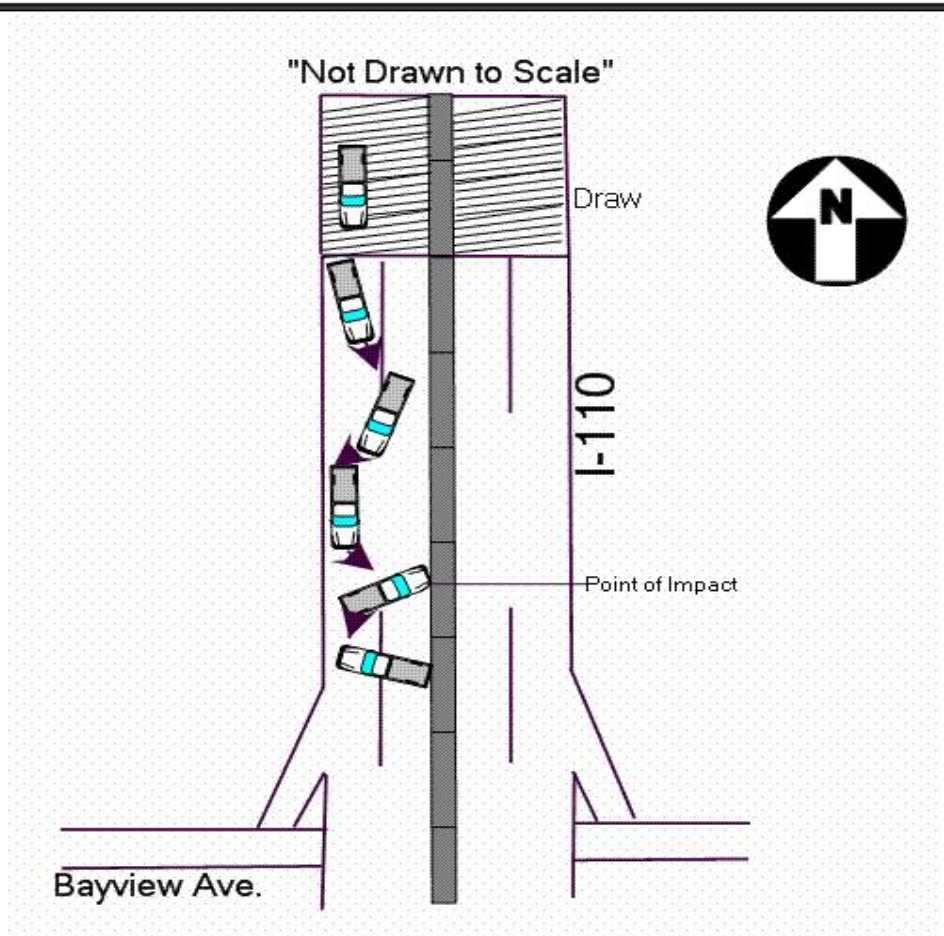
| 07/25/2007 | 12:53 | Rear end slow or st | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 08/28/2007 | 10:14 | Angle | 2 | Wet | 0 | Daylight | Roadway | 2401 |
| 07/11/2007 | 11:39 | Parked vehicle | 2 | Dry | 0 | Daylight | Parking Lot | 2401 |
| 06/02/2007 | 18:04 | Hit and Run | 3 | Dry | 0 | Daylight | Roadway | 2401 |
| 10/08/2007 | 12:21 | Hit and Run | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 09/12/2007 | 15:42 | Hit and Run | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 09/13/2007 | 14:34 | Fixed Object | 1 | Dry | 0 | Daylight | Roadway | 2401 |
| 09/04/2007 | 13:41 | Rear end slow or st | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 11/28/2007 | 07:31 | Rear end turn | 2 | Dry | 0 | Daylight | Roadway | 2401 |
| 11/18/2007 | 14:14 | Other Object | 1 | Dry | 0 | Daylight | Parking Lot | 2401 |

# MUCR Diagram and Narrative

MUCRDiagramDisplayForm - Microsoft Internet Explorer

**Available Diagrams:**

04029257 | Output to PDF




Narrative:

V1 WAS SOUTHBOUND ON THE I 110. V1 LOST CONTROL WHEN CROSSING THE DRAW. DRIVER OF V1 STEERED LEFT AND RIGHT TRYING TO REGAIN CONTROL OF THE VEHICLE. V1 STRUCK THE CENTER CONCRETE DIVIDER CAUSING DAMAGE TO THE FRONT OF V1.

# SAMS Analysis Functions

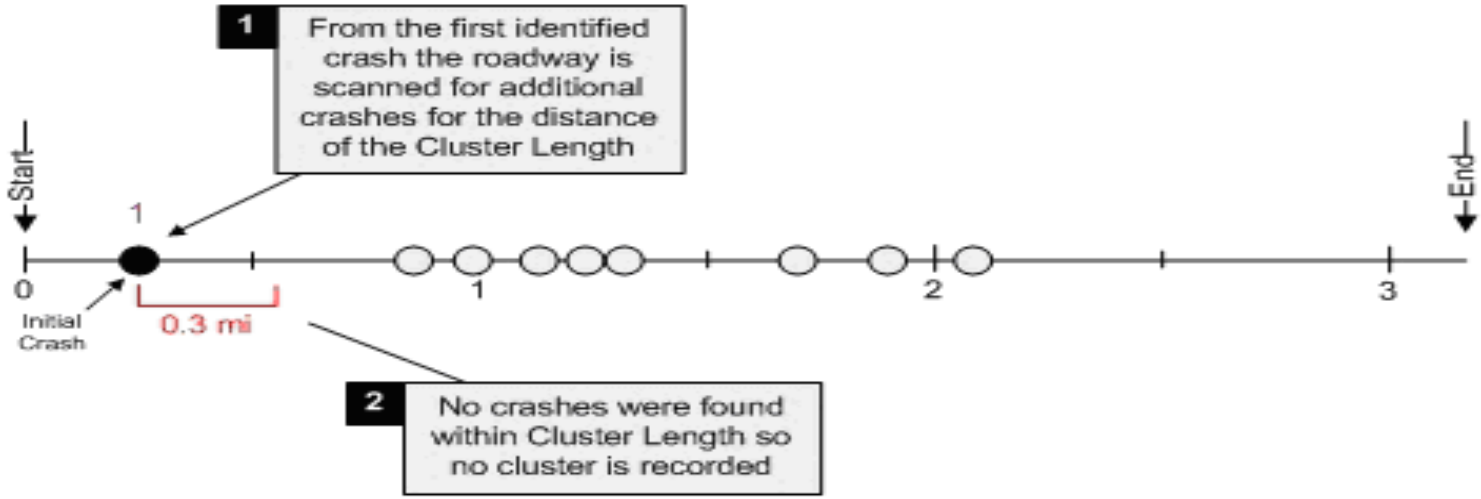
- Cost-Benefit Analyses
- Rank High Crash Locations
- Severity Index
- Crash Rates and Critical Crash Rates
- Semi Automated Countermeasures
- Sliding Scale Analysis
- Identify Over-Representation of Crash Types at Intersections & Highway Sections
- Pre and Post Improvement Crash Rate Analyses
- Homogenous Intersections and Highway Sections

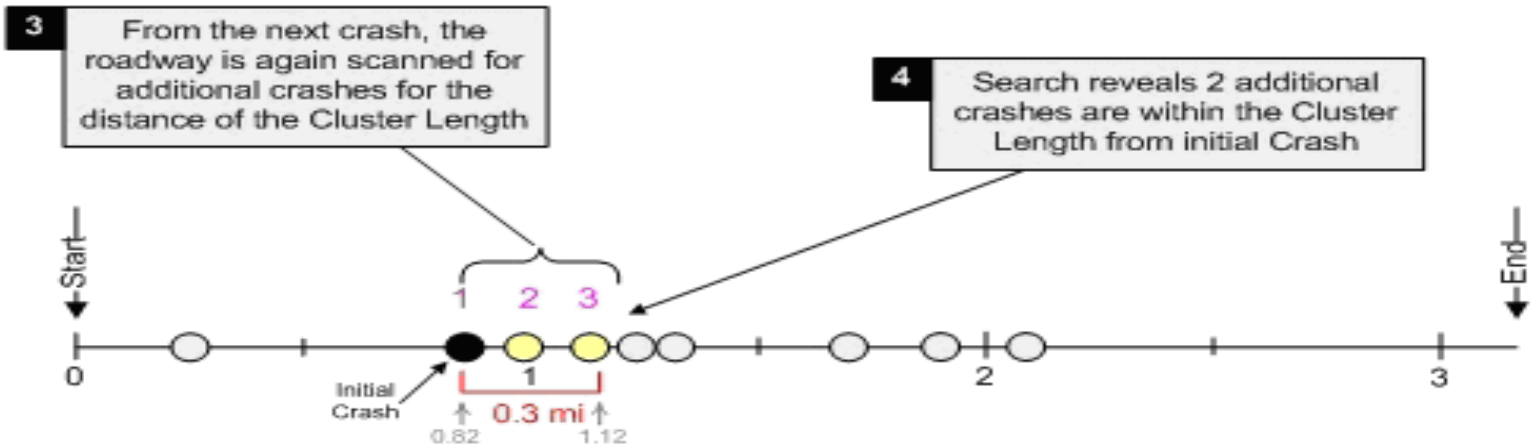
# Sliding Scale Analysis

- Identifies crash clusters
- Capable on all or specified FC roads
- Flexible and robust analysis
  - Cluster definition
    - Cluster lengths
    - Cluster tolerance or “look ahead”
    - Number of crashes
  - Crash types
  - Injury types

# Sliding Scale Example

CL=0.3
#C=3
CT=0.1




**CLUSTERS**

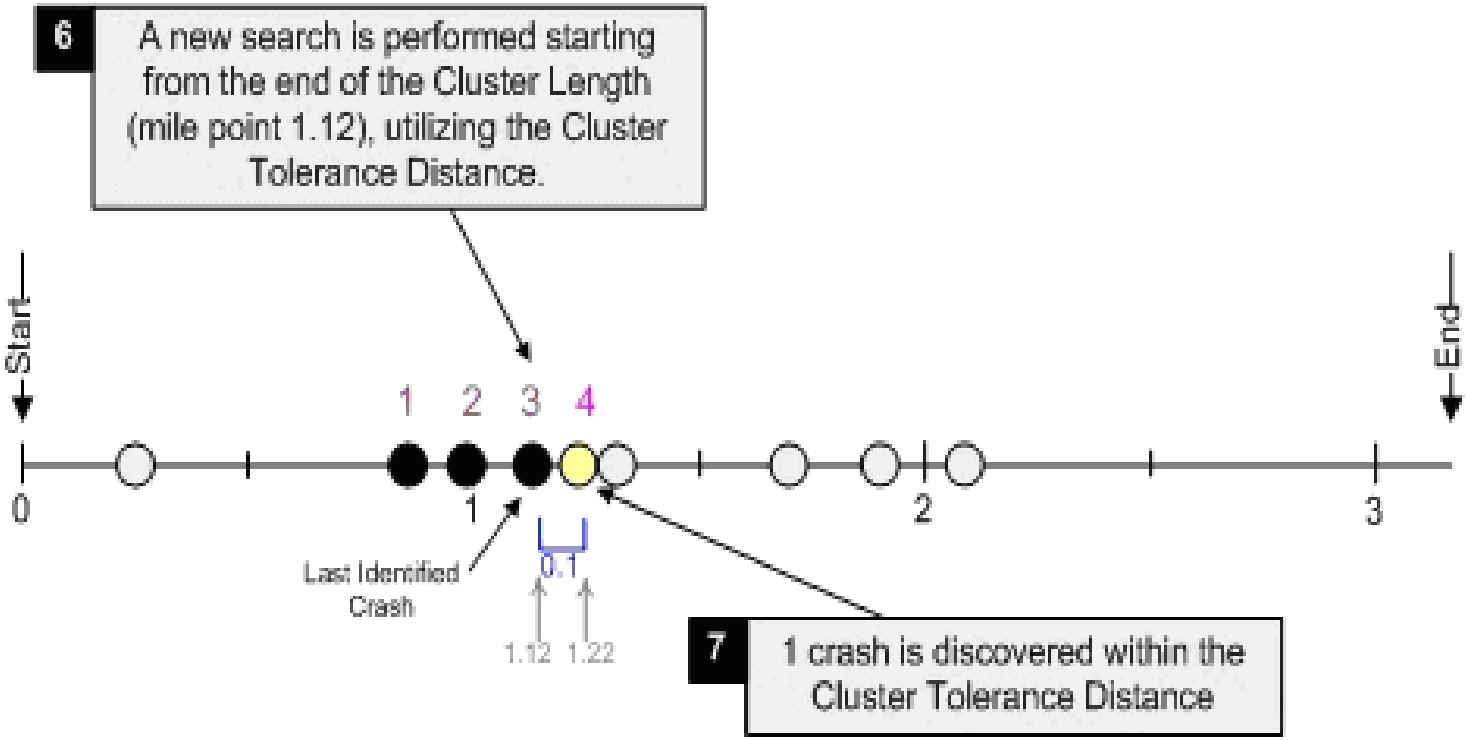
| ID | BEG_MILE | END_MILE |
|---|---|---|
| 1 | 0.82 | 1.11 |

**CRASH_CLUSTER**

| ID | CLUSTER_ID | SAMS_CRASH_ID | MILE_POINT |
|---|---|---|---|
| 1 | 1 | 1761870 | 0.82 |
| 2 | 1 | 4232490 | 0.97 |
| 3 | 1 | 3345823 | 1.11 |

**5** If the number of discovered crashes meets or exceeds the minimum number then the cluster is created and the crashes are recorded

CL=0.3
#C=3
CT=0.1




8 Crash is registered within existing cluster

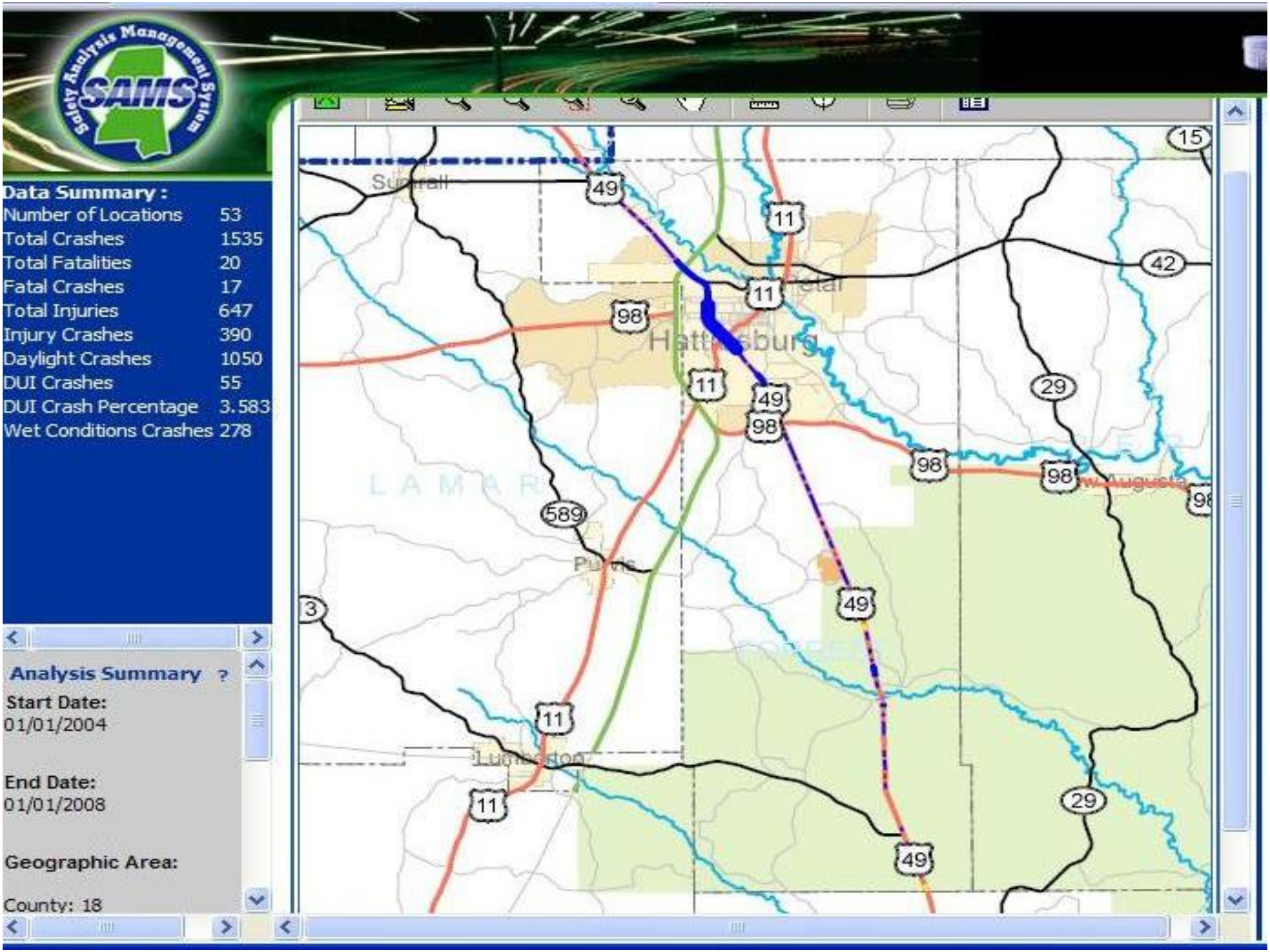
**CRASH_CLUSTER**

| ID | CLUSTER_ID | SAMS_CRASH_ID | MILE_POINT |
|---|---|---|---|
| 1 | 1 | 1761870 | 0.82 |
| 2 | 1 | 4232490 | 0.97 |
| 3 | 1 | 3345823 | 1.11 |
| 4 | 1 | 2445613 | 1.20 |

**CLUSTERS**

| ID | BEG_MILE | END_MILE |
|---|---|---|
| 1 | 0.82 | 1.20 |

Crash mile point updates the cluster's END_MILE


Safety Analysis Management System
SAMS
Data Summary :
Number of Locations 53
Total Crashes 1535
Total Fatalities 20
Fatal Crashes 17
Total Injuries 647
Injury Crashes 390
Daylight Crashes 1050
DUI Crashes 55
DUI Crash Percentage 3.583
Wet Conditions Crashes 278
Analysis Summary ?
Start Date:
01/01/2004
End Date:
01/01/2008
Geographic Area:
County: 18
Sumrall
Hattiesburg
Petal
Purvis
Lumberton
LAMAR
49
11
98
589
42
29
15
3

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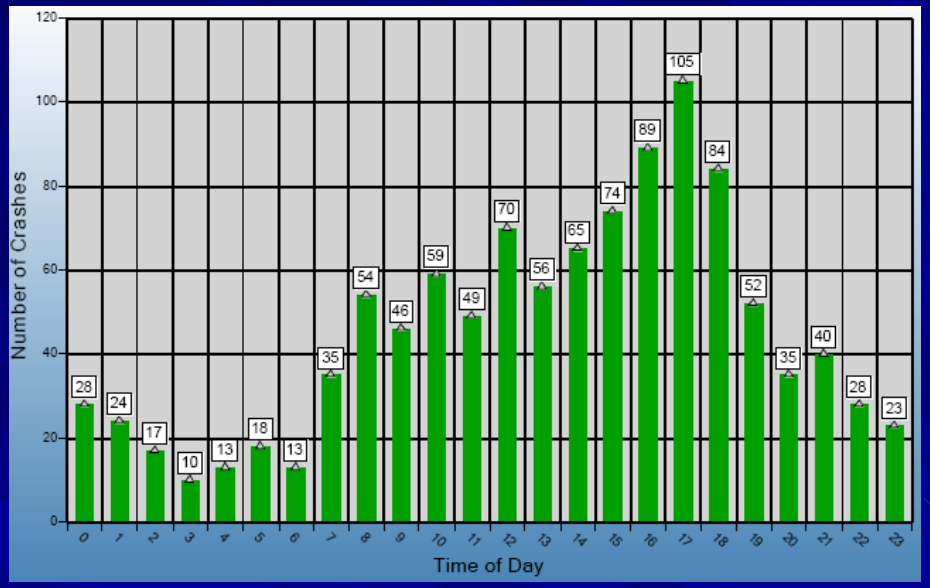
| ID | Cluster ID | County Number | Sliding Scale Analysis I | Route ID | Begin Cumulative Mile | End Cumulative Mile | Cluster Length (Mi.) | Crash Count | AADT | Crash Rate | HCL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 181 | 181 | 18 | 5 | 49 | 55.7260 | 56.0360 | 0.31 | 4 | 17990 | 0.49 | 4 |
| 182 | 182 | 18 | 5 | 49 | 56.2240 | 56.5520 | 0.3280 | 12 | 18000 | 1.39 | 1 |
| 183 | 183 | 18 | 5 | 49 | 56.68 | 57.1210 | 0.4410 | 12 | 18000 | 1.03 | 2 |
| 184 | 184 | 18 | 5 | 49 | 57.3770 | 57.6090 | 0.2320 | 5 | 18000 | 0.82 | 7 |
| 185 | 185 | 18 | 5 | 49 | 57.8270 | 59.0170 | 1.19 | 38 | 17998 | 1.21 | 1 |
| 186 | 186 | 18 | 5 | 49 | 59.1630 | 59.5450 | 0.3820 | 9 | 17997 | 0.90 | 1 |
| 187 | 187 | 18 | 5 | 49 | 59.7920 | 60.0660 | 0.2740 | 5 | 17997 | 0.69 | 1 |
| 188 | 188 | 18 | 5 | 49 | 60.2340 | 60.6020 | 0.3680 | 17 | 17997 | 1.76 | 1 |
| 189 | 189 | 18 | 5 | 49 | 60.7630 | 61.7030 | 0.94 | 28 | 17997 | 1.13 | 1 |
| 190 | 190 | 18 | 5 | 49 | 61.8150 | 62.22 | 0.4050 | 15 | 17997 | 1.41 | 1 |
| 191 | 191 | 18 | 5 | 49 | 62.3560 | 62.9830 | 0.6270 | 31 | 16980 | 1.99 | 1 |
| 192 | 192 | 18 | 5 | 49 | 63.1040 | 63.54 | 0.4360 | 18 | 17997 | 1.57 | 1 |
| 193 | 193 | 18 | 5 | 49 | 63.7120 | 64.0530 | 0.3410 | 9 | 17997 | 1 | 1 |
| 194 | 194 | 18 | 5 | 49 | 64.1740 | 64.5750 | 0.4010 | 23 | 17997 | 2.18 | 1 |
| 195 | 195 | 18 | 5 | 49 | 64.6940 | 65.3790 | 0.6850 | 77 | 19317 | 3.98 | 2 |
| 196 | 196 | 18 | 5 | 49 | 65.48 | 65.9550 | 0.4750 | 20 | 21001 | 1.37 | 1 |
| 197 | 197 | 18 | 5 | 49 | 66.1290 | 66.7290 | 0.60 | 37 | 21001 | 2.01 | 1 |
| 198 | 198 | 18 | 5 | 49 | 66.8720 | 69.6860 | 2.8140 | 475 | 26454 | 4.37 | 2 |
| 199 | 199 | 18 | 5 | 49 | 69.7890 | 72.3720 | 2.5830 | 369 | 28329 | 3.45 | 2 |
| 200 | 200 | 18 | 5 | 49 | 72.5070 | 73.9830 | 1.4760 | 108 | 23977 | 2.09 | 2 |

# Homogenous Location Analysis

- Classify locations or group by:
  - Traffic Volume
  - Route Class
  - Functional Class
  - Rural/Urban Designation
  - Number of Lane
  - Divided Highway or Undivided
  - Signalization
  - Lane Widths
  - Speed Limits
  - Median Width
  - Shoulder Width

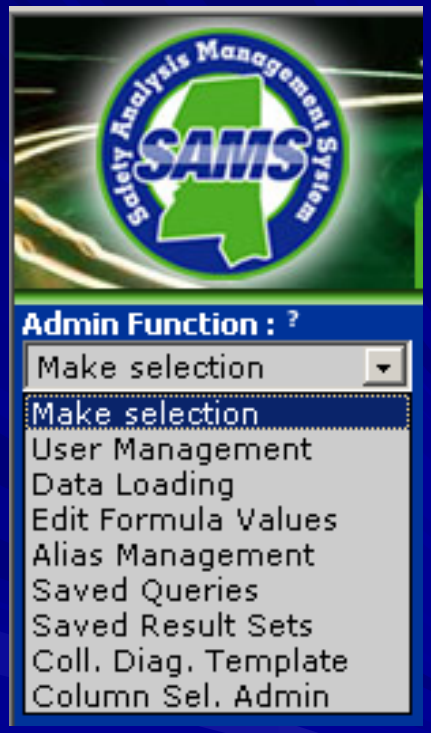
# SAMS Reporting Functions




- Standard Reports
- Customized Reports
- Maps and Printing
- Export from Data Grid
- Interactive Data Grid Reports
- User Reporting Classes (admin)

# SAMS Administrator Functions

- Crash Data Loading
- Alias Management
- Column Selector Defaults for Data Grid
- Help
- Formula Edits
- Security
  - User Analysis Classes
  - User Reporting Classes
  - Geographic Restrictions
  - MDOT User Classes
  - Site & User usage
  - Logins for internal & external



CAPTAIN
Questions?