



Data Driven Safety Programming: Using Analytics to Save Lives

IMPACT Crash Data Portal Safety  
Applications

# Q&V Tool

<https://apps.impact.dot.state.ma.us/cdp/home>



## Interactive Data Dashboards

IMPACT's dashboards provide a wide range of crash-related analytics. The dashboards tell stories through maps, charts, and tables. They also allow users to interact with and explore the data. Users can use the data to target a specific theme or a range of categories.

INTERACT



## Data Query and Visualization

Users can filter the data through the Data Query and Visualization tool. Queries can be made at three levels: Person, Vehicle, or Crash. Once completed, users can view the data in charts, tables, or maps. Users can easily switch how to view the data.

EXPLORE



## Data Extraction

Users can use the Data Extraction service to access raw data. Publicly available data by municipality and date range can be found in several formats. Please use the standard data report requests for town-wide data by specific year. Users will also find a link to MassDOT's Open Data Portal, which allows them to download the crash data file by year.

EXTRACT



## Reports

Users can access IMPACT's data by using pre-built reports. The reports organize information across a variety of categories. Users can also sort some reports by date range. All reports are available for download in many formats.

REPORTS



## Crash Tabulation and Charting

This tool lets IMPACT users arrange data to display two or more variables. Based on user input, the crosstab summarizes the full crash database or data subsets.

EXPLORE



## Safety Analysis Tools

IMPACT provides tools for safety analysis. Network screening includes both Crash-Based and Risk-Based mapping. Diagnostic tools include a Crash Tree Maker and Test of Proportions tool.

EXPLORE

# Q&V Tool



All Core Crash Details



Extended Crash Details



Limited Crash Details

- |                                                                                |                                                                              |                                                                                   |                                                                                   |
|--------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Crash Number                               | <input type="checkbox"/> City Town Name                                      | <input type="checkbox"/> Crash Date                                               | <input checked="" type="checkbox"/> Crash Severity                                |
| <input checked="" type="checkbox"/> Crash Status                               | <input type="checkbox"/> Crash Time                                          | <input type="checkbox"/> Crash Year                                               | <input type="checkbox"/> Max Injury Severity Reported                             |
| <input checked="" type="checkbox"/> Number of Vehicles                         | <input type="checkbox"/> Police Agency Type                                  | <input type="checkbox"/> State Police Troops                                      | <input type="checkbox"/> Age of Driver - Youngest Known                           |
| <input type="checkbox"/> Age of Driver - Oldest Known                          | <input type="checkbox"/> Age of Vulnerable User - Youngest Known             | <input type="checkbox"/> Age of Vulnerable User - Oldest Known                    | <input type="checkbox"/> Crash Hour                                               |
| <input type="checkbox"/> Driver Contributing Circumstances (All Drivers)       | <input type="checkbox"/> Driver Distracted By (All Drivers)                  | <input type="checkbox"/> First Harmful Event                                      | <input type="checkbox"/> Is Geocoded                                              |
| <input checked="" type="checkbox"/> Light Conditions                           | <input type="checkbox"/> Manner of Collision                                 | <input type="checkbox"/> MassDOT District                                         | <input type="checkbox"/> Vulnerable User Action (All Persons)                     |
| <input type="checkbox"/> Vulnerable User Location (All Persons)                | <input type="checkbox"/> Vulnerable User Type (All Persons)                  | <input type="checkbox"/> RMV Document Numbers                                     | <input checked="" type="checkbox"/> Road Surface Condition                        |
| <input type="checkbox"/> Roadway Junction Type                                 | <input type="checkbox"/> RPA Abbreviation                                    | <input type="checkbox"/> Total Fatalities                                         | <input type="checkbox"/> Total of Non-Fatal Injuries.                             |
| <input checked="" type="checkbox"/> Traffic Control Device Type                | <input type="checkbox"/> Trafficway Description                              | <input checked="" type="checkbox"/> Vehicle Actions Prior to Crash (All Vehicles) | <input checked="" type="checkbox"/> Vehicle Configuration (All Vehicles)          |
| <input type="checkbox"/> Vehicle Emergency Use (All Vehicles)                  | <input type="checkbox"/> Vehicle Towed From Scene (All Vehicles)             | <input type="checkbox"/> Vehicle Travel Direction (All Vehicles)                  | <input type="checkbox"/> Weather Conditions                                       |
| <input type="checkbox"/> County Name                                           | <input type="checkbox"/> Crash Report IDs                                    | <input checked="" type="checkbox"/> FMCSA Reportable (All Vehicles)               | <input checked="" type="checkbox"/> FMCSA Reportable (Crash)                      |
| <input type="checkbox"/> First Harmful Event Location                          | <input type="checkbox"/> Geocoding Method                                    | <input type="checkbox"/> Hit and Run                                              | <input type="checkbox"/> Locality                                                 |
| <input type="checkbox"/> Most Harmful Event (All Vehicles)                     | <input type="checkbox"/> Road Contributing Circumstance                      | <input checked="" type="checkbox"/> School Bus Related                            | <input type="checkbox"/> Speed Limit                                              |
| <input type="checkbox"/> Traffic Control Device Function                       | <input type="checkbox"/> Vehicle Sequence of Events (All Vehicles)           | <input type="checkbox"/> Work Zone Related                                        | <input type="checkbox"/> Vulnerable Users Sequence of Events (All Persons)        |
| <input type="checkbox"/> Vulnerable Users Distracted By (All Persons)          | <input type="checkbox"/> Vulnerable Users Traffic Control Type (All Persons) | <input type="checkbox"/> Vulnerable Users Origin Destination (All Persons)        | <input type="checkbox"/> Vulnerable Users Contributing Circumstance (All Persons) |
| <input type="checkbox"/> Vulnerable Users Alcohol Suspected Type (All Persons) | <input type="checkbox"/> Vulnerable Users Drug Suspected Type (All Persons)  | <input type="checkbox"/> X                                                        | <input type="checkbox"/> Y                                                        |
| <input checked="" type="checkbox"/> Latitude                                   | <input checked="" type="checkbox"/> Longitude                                |                                                                                   |                                                                                   |



## Advanced Search

The Advanced Search lets users build complex queries by clicking on the button below. Users can query over 190 data fields and use various mathematical and logical operators. A query is further refined through the Spatial Search where users can visualize results.

[Advanced Search →](#)

# Q&V Tool

## Query Builder

AND OR

+ Add rule

+ Add group

Crash Date

between

1/1/2021

, 11/5/2024

AND OR

+ Add rule

+ Add group

⊗ Delete

Vehicle Configuration (All Vehicles)

contains

truck

⊗ Delete

Manner of Collision

equal

Sideswipe, same direction

⊗ Delete

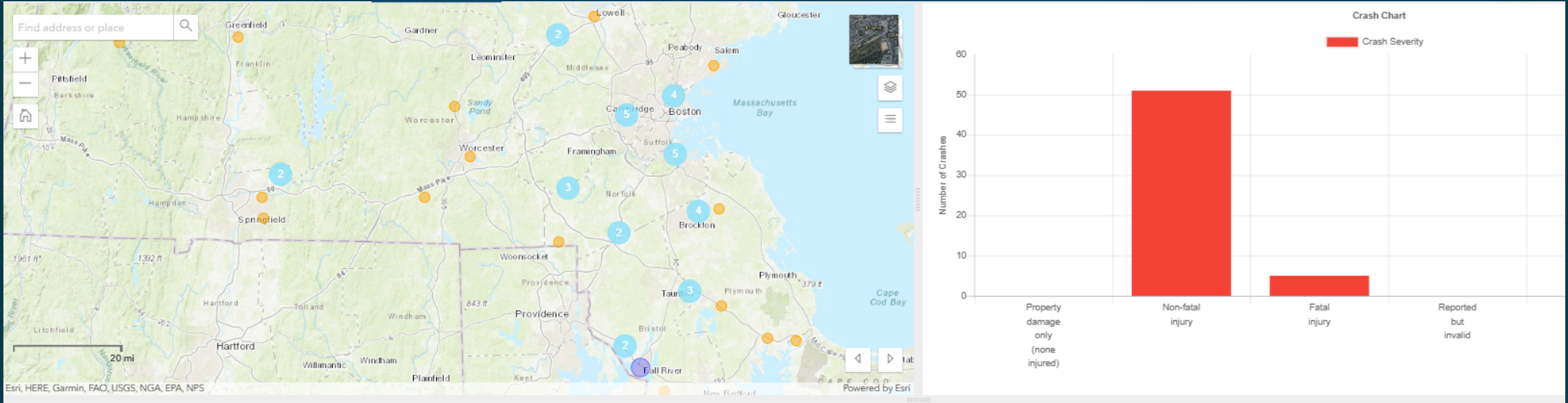
Crash Hour

equal

12:00PM to 12:59PM

⊗ Delete

# Q&V Tool



Drag here to set row groups

Crash Details

Crash Number	City Town Name	Crash Date	Crash Severity	Crash Status	Crash Time	Crash Year	Max Injury Severity ...	Number of Vehicles	Police Agency Type
5103299	WEST BOYLSTON	5/8/2022	Non-fatal injury	Open	1:50 AM	2022	Suspected Serious Injury		State police
5124308	BROCKTON	6/15/2022	Non-fatal injury	Open	5:24 AM	2022	Suspected Serious Injury		Local police
5124308	BROCKTON	6/15/2022	Non-fatal injury	Open	5:24 AM	2022	Suspected Serious Injury		Local police
5124308	BROCKTON	6/15/2022	Non-fatal injury	Open	5:24 AM	2022	Suspected Serious Injury		Local police
5129442	EVERETT	7/22/2022	Non-fatal injury	Open	7:00 AM	2022	Non-fatal injury - Incapac...		Local police
5129442	EVERETT	7/22/2022	Non-fatal injury	Open	7:00 AM	2022	Non-fatal injury - Incapac...		Local police
5132191	CHICOPEE	7/25/2022	Non-fatal injury	Open	12:52 PM	2022	Suspected Serious Injury		State police
5132191	CHICOPEE	7/25/2022	Non-fatal injury	Open	12:52 PM	2022	Suspected Serious Injury	5	State police
5132191	CHICOPEE	7/25/2022	Non-fatal injury	Open	12:52 PM	2022	Suspected Serious Injury	5	State police
5132191	CHICOPEE	7/25/2022	Non-fatal injury	Open	12:52 PM	2022	Suspected Serious Injury	5	State police
5133690	SPRINGFIELD	7/29/2022	Non-fatal injury	Open	6:51 PM	2022	Suspected Serious Injury	3	Local police
5133690	SPRINGFIELD	7/29/2022	Non-fatal injury	Open	6:51 PM	2022	Suspected Serious Injury	3	Local police
5133690	SPRINGFIELD	7/29/2022	Non-fatal injury	Open	6:51 PM	2022	Suspected Serious Injury	3	Local police
5132321	CHARLTON	7/18/2022	Non-fatal injury	Open	9:37 AM	2022	Suspected Serious Injury	3	Local police

# Q&V Tool

Crash Data

Vehicle Data

Person Data



## Vehicle Details

*Click this icon to include vehicle level data fields in the search results*

- |                                                             |                                                                   |                                                             |                                                    |
|-------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------|
| <input checked="" type="checkbox"/> Vehicle Sequence Number | <input checked="" type="checkbox"/> Alcohol Suspected             | <input type="checkbox"/> Driver Age                         | <input type="checkbox"/> Driver Contributing Circ. |
| <input type="checkbox"/> Driver Distracted                  | <input type="checkbox"/> Driver License State                     | <input checked="" type="checkbox"/> Drugs Suspected         | <input type="checkbox"/> Emergency Use             |
| <input checked="" type="checkbox"/> FMCSA Reportable        | <input type="checkbox"/> Hazmat Placard                           | <input type="checkbox"/> Maximum Injury Severity In Vehicle | <input type="checkbox"/> Most Harmful Event        |
| <input type="checkbox"/> Total Occupants in Vehicle         | <input checked="" type="checkbox"/> Vehicle Action Prior to Crash | <input checked="" type="checkbox"/> Vehicle Configuration   | <input type="checkbox"/> Vehicle Most Damaged Area |
| <input type="checkbox"/> Vehicle Owner City Town            | <input type="checkbox"/> Vehicle Owner State                      | <input type="checkbox"/> Vehicle Registration State         | <input type="checkbox"/> Vehicle Registration Type |
| <input type="checkbox"/> Vehicle Sequence of Events         | <input type="checkbox"/> Vehicle Towed From Scene                 | <input type="checkbox"/> Vehicle Direction                  | <input type="checkbox"/> Vehicle Make              |
| <input type="checkbox"/> Vehicle Model                      | <input type="checkbox"/> Vehicle Model Year                       | <input type="checkbox"/> VIN                                | <input type="checkbox"/> Driver Violation          |

# Crash Tabulation and Charting Tool

CITY TOWN NAME All								
1	2	3	4	5	6	7	8	9
1	YEAR							
2	WORK ZONE RELATED	LIGHT CONDITIONS	FMC SA REPORTABLE (CRASH)	2023	2022	2024	2021	Crash Count
3	▶ No			132,443	130,771	60,690	122,717	446,621
4	▶ Not reported			726	367	482	277	1,852
5	▶ Reported but invalid			68	80	18	93	259
6	▶ Unknown			73	9	33	1	116
7	▼ Yes	▼ Dark - lighted roadway	No, not federally reportable	263	38	111	37	449
8			Unknown		5		3	8
9			Yes, federally reportable →	15	10	9	8	42
10			Blank	14	237		275	526
11		▼ Dark - roadway not lighted	No, not federally reportable	108	13	50	21	192
12			Unknown		2		1	3
13			Yes, federally reportable	15	10	8	12	45
14			Blank	6	84		104	194
15		▼ Dark - unknown roadway lighting	No, not federally reportable	7	2	3		12
16			Yes, federally reportable	2		1		3
17			Blank		9		10	19
18		▼ Dawn	No, not federally reportable	25	3	4		32
19			Unknown				1	1
20			Yes, federally reportable		1	2	2	5
21			Blank	3	13		16	32

# IMPACT Home – Crash Data Portal

<https://apps.impact.dot.state.ma.us/cdp/home>

Welcome to IMPACT. IMPACT is a tool for researching crash-related data in Massachusetts. IMPACT helps with public safety initiatives and raises awareness about crashes in our state. Users have access to pre-built reports or tools for analysis. Please explore the options and find what works best for you.



### Interactive Data Dashboards

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EXPLORE

### Reported Crashes YTD

92,162

As of: Mon Oct 07 2024

### Reported Fatalities YTD (FARS)

266

As of: Mon Oct 07 2024

### Reported Pedestrian Crashes YTD

1,206

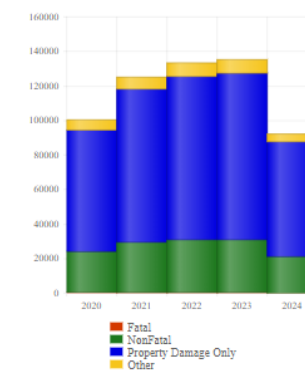
As of: Mon Oct 07 2024

### Reported Bicyclist Crashes YTD

1,056

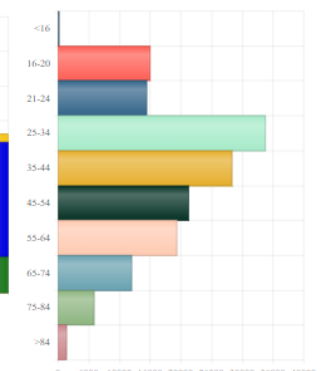
As of: Mon Oct 07 2024

### Reported Crash Severity By Year (CDS)



As of: Mon Oct 07 2024

### Reported Ages of Drivers in Crashes YTD



19,583 drivers with ages unknown  
As of: Mon Oct 07 2024



# Safety Analysis Tools in IMPACT

## Network Screening Crash Based

The crash-based network screening tool focuses on excess average crash frequency with an Empirical Bayes (EB) adjustment for crashes on five facility types on collectors and arterials. This analysis applies to either total crashes or fatal and injury crashes only. Segments rank from the most to least excess crash frequency. The rank is the difference between [more...](#)

[Explore](#) →

## Crash Tree

The crash tree maker tool allows users to create crash trees to summarize and analyze crash data. Users select key data elements to build a tree showing common crash characteristics. The crash tree maker groups crash data by road jurisdiction or emphasis area. Crash trees may be built at the crash level, vehicle level, or person level.

[Explore](#) →

## Network Screening Risk Based

The risk-based network screening tool uses risk factors identified for specific emphasis areas. Locations with the highest risk have greater numbers and types of risk factors. Visualize the sites with the greatest primary and secondary risks. View this statewide or by MPO/RPA. This analysis supplements the crash-based network screening results and also allows [more...](#)

[Explore](#) →

## Test of Proportions

Users can identify overrepresented crash types with the test of proportions tool. The tool provides a process for users to select a subject area and then compare attributes in the subject data to those in comparison groups.

[Explore](#) →

# Crash Tree Overview

Establish Focus Create Crash Tree

## Crash Tree Builder

### Data Level

Crash Data **Vehicle Data** Person Data ?

Trees built at the vehicle-level count the number of vehicles for which the selected attribute is reported. If using a crash-level field, the tree will count the number of vehicles in crashes for which [more...](#)

### Select a Date Range

Any date after 2002  
Crash Tree Date Range  
1/1/2019 – 12/31/2023

### Emphasis Area

More information on [Emphasis Areas](#).  
Select All Data (Not Limited To Emphasis Area)

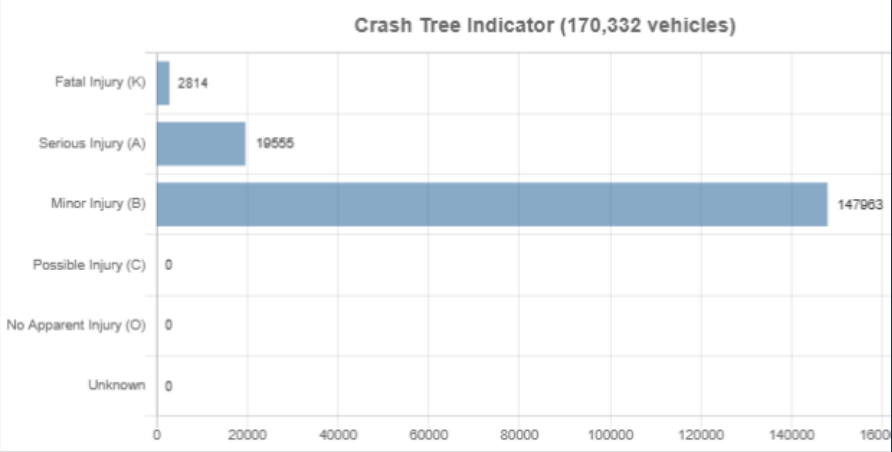
### Select Maximum Injury Severity Reported All crash severities are selected by default

- Fatal Injury (K)
- Serious Injury (A)
- Minor Injury (B)
- Possible Injury (C)
- No Apparent Injury (O)
- Unknown

### Select Location (Optional)

Select a Location Type **Reset Location Type**  
Location Type  
City/Town ?

Select a City/Town **Reset City/Town**  
City/Town  
SPRINGFIELD  
Select at least one City/Town



# Crash Tree Overview

## Add Crash Tree Node

1. Choose Field Type

2. Choose Value

### Data Field Attributes

Add Individually  Add Group

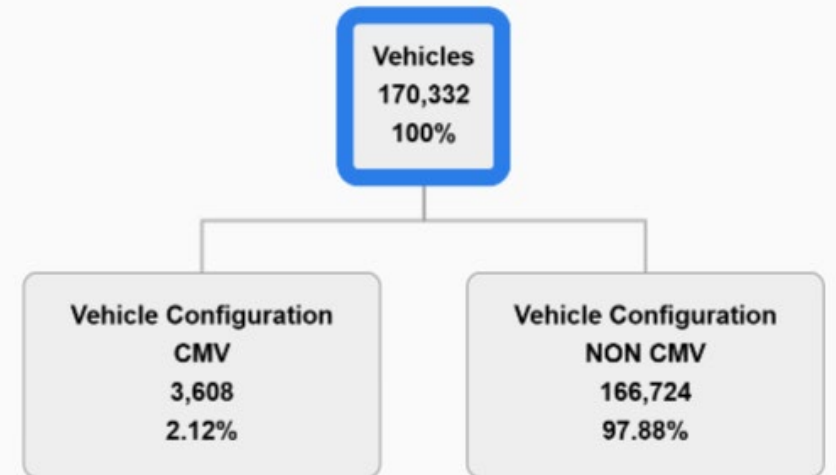
Group Name Alias: CMV

\* Required Field

### Vehicle Configuration Attributes

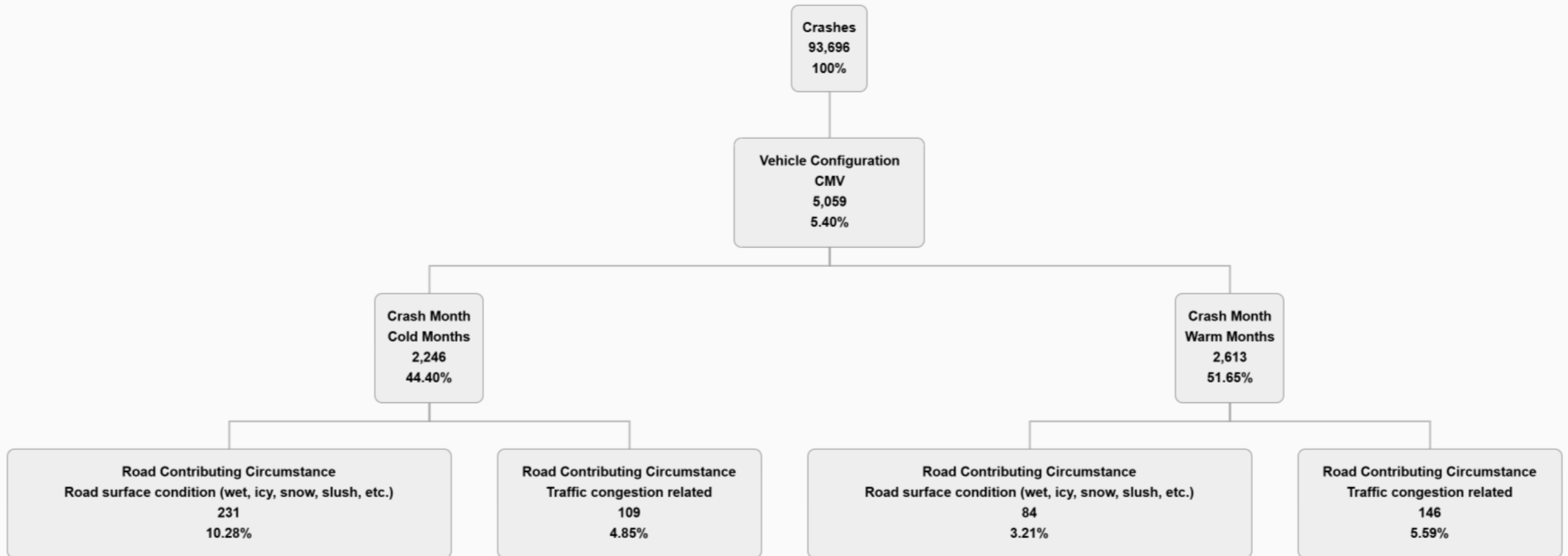
<input type="checkbox"/>	Value	Count
<input checked="" type="checkbox"/>	Bus (seats for 16 or more, including driver)	431
<input checked="" type="checkbox"/>	Bus (seats for 9-15 people, including driver)	269
<input type="checkbox"/>	Light truck(van, mini-van, pickup, sport utility)	34853
<input type="checkbox"/>	Low Speed Vehicle	25
<input type="checkbox"/>	MOPED	1057
<input type="checkbox"/>	Motor home/recreational vehicle	40
<input type="checkbox"/>	Motorcycle	5809
<input type="checkbox"/>	Not reported	1054
<input type="checkbox"/>	Other	778
<input type="checkbox"/>	Passenger car	120944
<input type="checkbox"/>	Registered farm equipment	1
<input type="checkbox"/>	Reported but invalid	4
<input type="checkbox"/>	Single-unit truck (2-axle, 6-tires)	1286
<input type="checkbox"/>	Single-unit truck (3-or-more axles)	396
<input type="checkbox"/>	Snowmobile	1
<input checked="" type="checkbox"/>	Tractor/doubles	36
<input checked="" type="checkbox"/>	Tractor/semi-trailer	898
<input checked="" type="checkbox"/>	Tractor/triples	4
<input checked="" type="checkbox"/>	Truck tractor (bobtail)	66

- Add nodes individually or grouping attributes
- The highlighted node will have nodes added to it
- You can view counts while exploring and selecting features

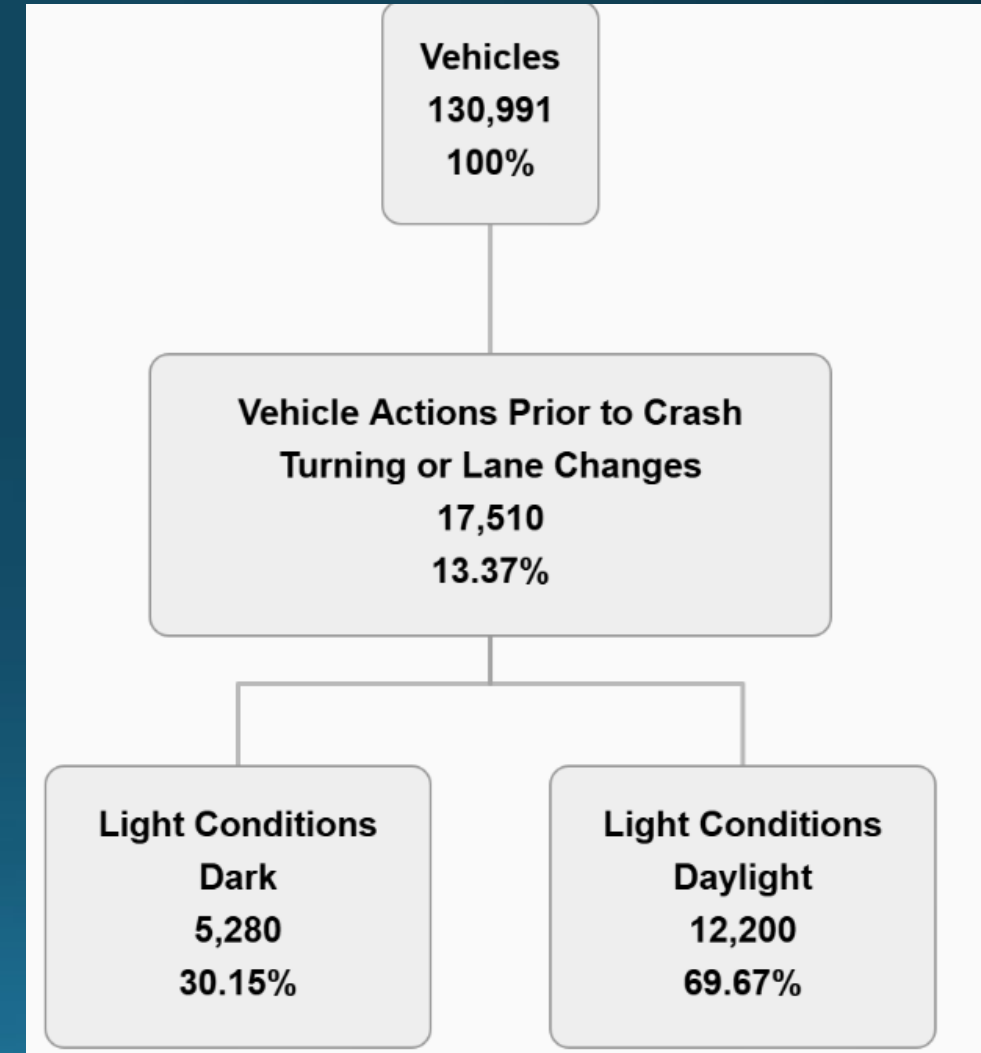
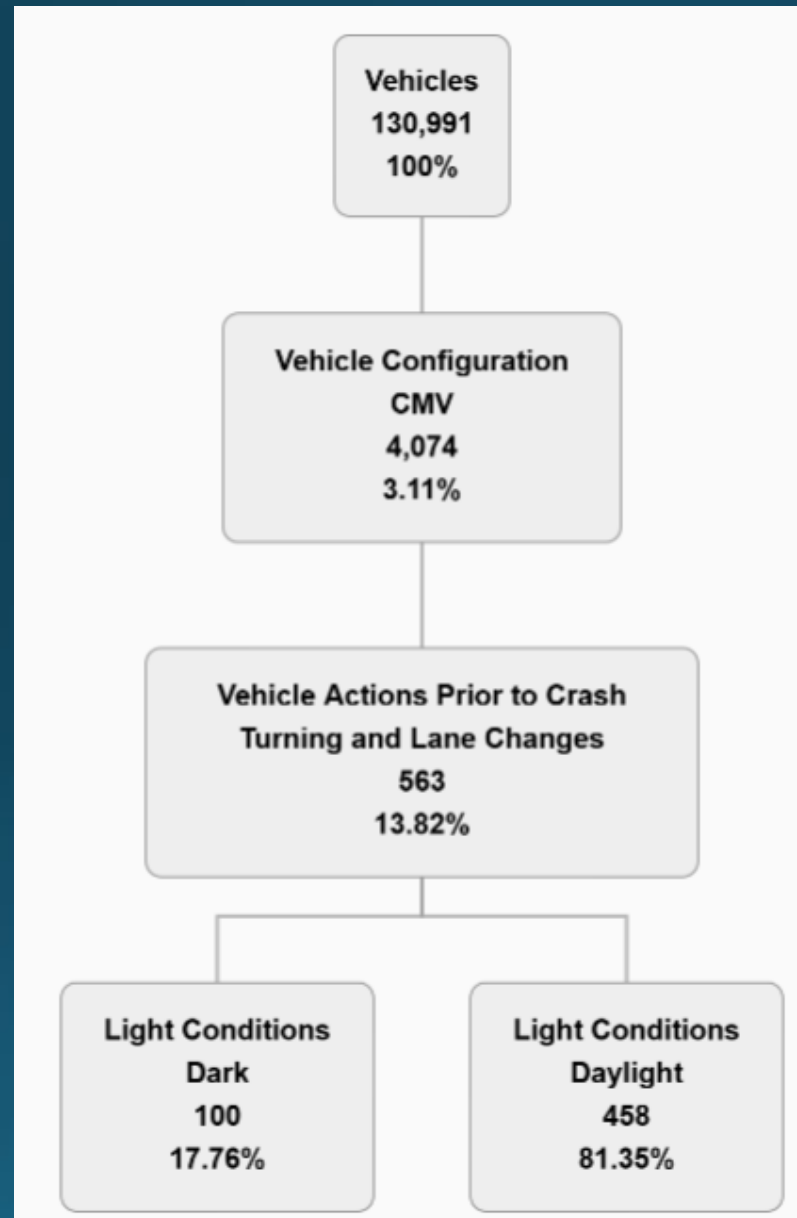


# Crash Tree Overview

A rather obvious analysis here shows that wet, icy, snowy, or slushy roads contribute to a higher percentage of truck involved collisions in the colder months than in the warmer months.

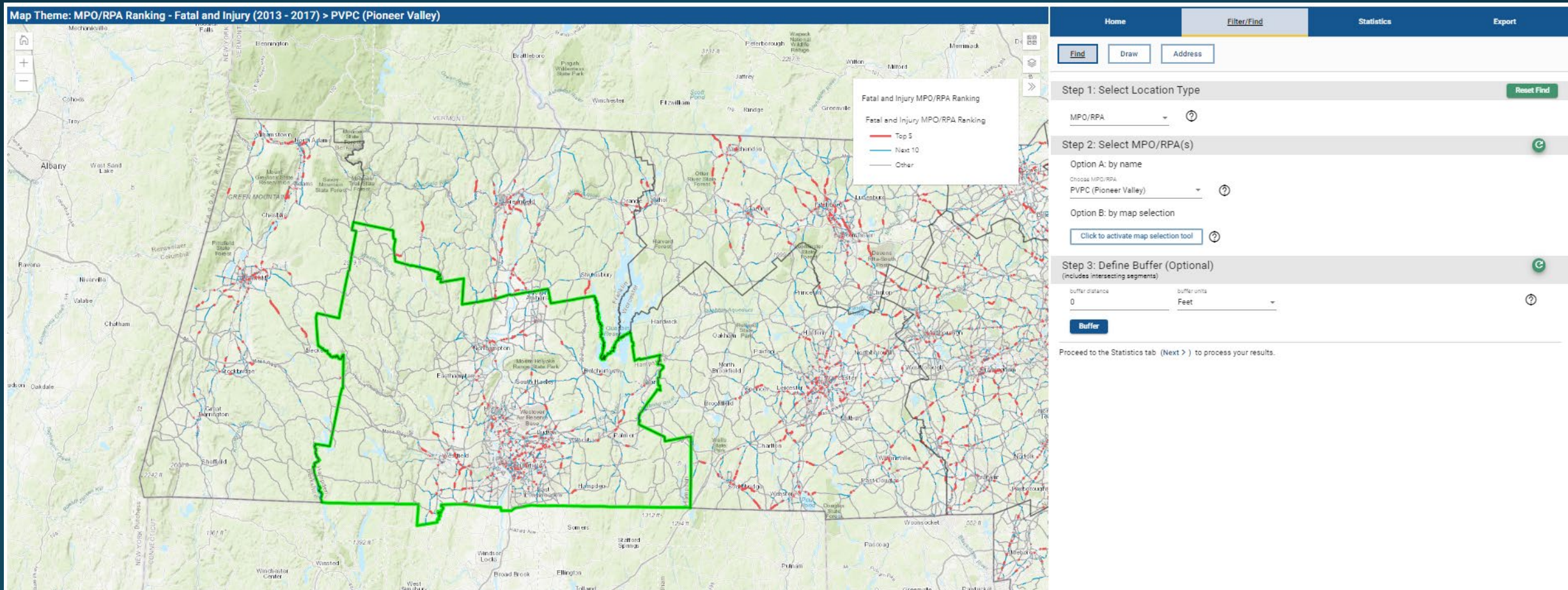


Maybe you see different results for CMV vehicles compared to all vehicle types.



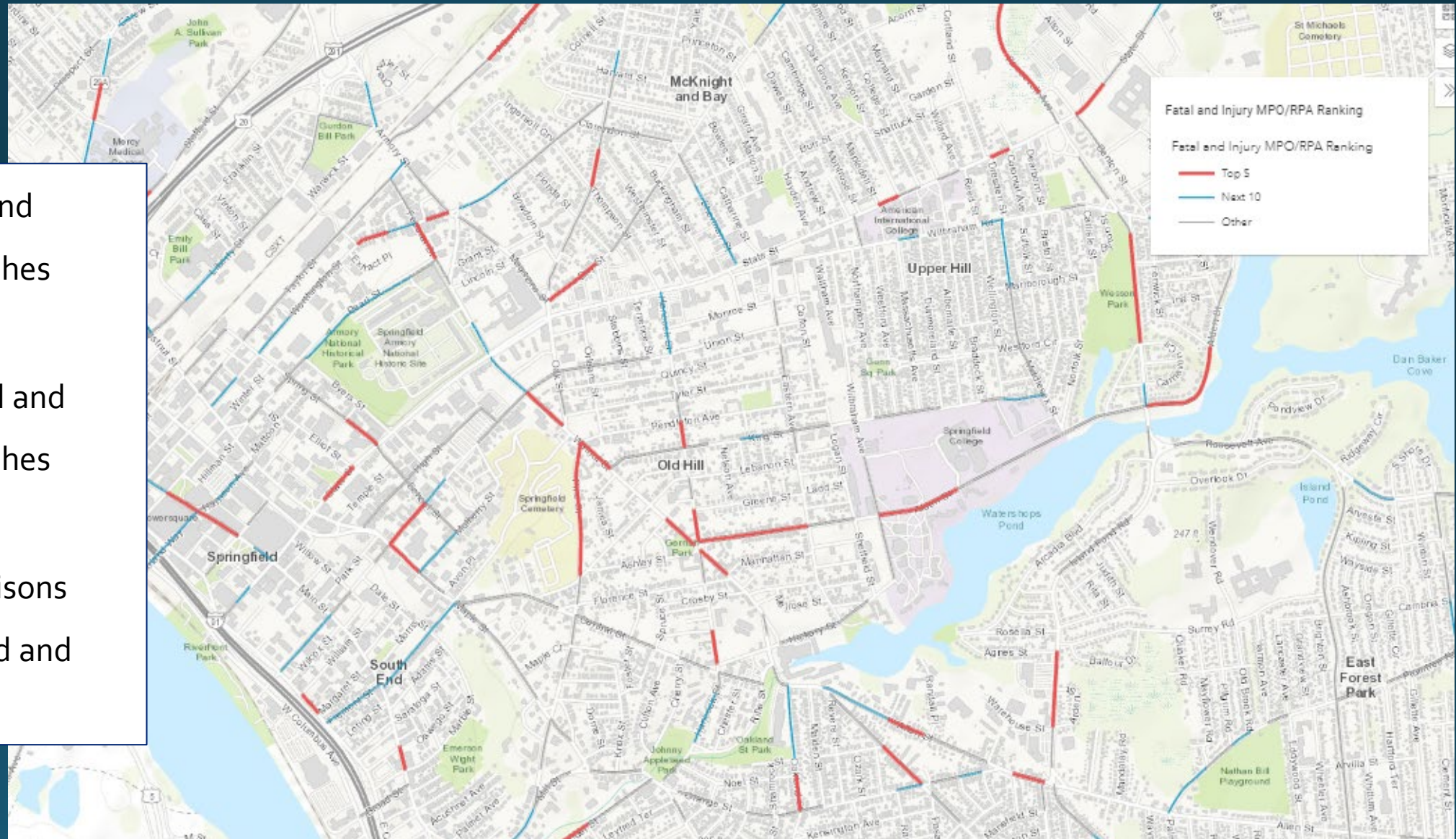
# Network Screening Crash Based Overview

- Filter your selection by MPO ranking AND by MPO (these are different)
- Use this to define your area of interest
- Select statistical interest such as “Facility Type” or “AADT” to see the breakdown of crashes



# Network Screening Crash Based Overview

- Top 5% for fatal and serious injury crashes
- Next 10% for fatal and serious injury crashes
- Based on comparisons between expected and observed crashes



# Network Screening Crash Based Overview

- Observed Crashes – the number of observed crashes for the given time period
- Predicted Crashes – based on a statistical model called a safety performance function, based on roadway characteristics
- Expected Crashes – based on the observed crashes and the predicted crashes
- Excess Expected – Expected minus Predicted, showing how observed crashes may be occurring more than the model predicts

# Observed Crashes	# Expected Crashes	# Predicted Crashes	Excess Expected Crashes
109	92.968428	20.624324	72.344104
105	83.379304	12.209700	71.169604
131	72.067159	4.276238	67.790921
111	77.895732	11.444335	66.451398
90	63.034002	7.519005	55.514997
80	64.099223	9.550571	54.548652
84	65.307274	10.813252	54.494022
94	60.207881	5.967037	54.240844
87	61.674074	8.820519	52.853555
80	64.081305	12.714129	51.367176



# Network Screening Risk Based Overview

- SHSP Emphasis Areas: support the risk based screening by categorization
- You'll notice that statewide ranking shows fewer severity segments for some MPO's than others
- MPO ranking allows you to focus on a smaller area and see more risk-results

**To start, select the top crash location based on:**

1. Emphasis Area
2. Ranking Type (Statewide vs. MPO/RPA)

Emphasis Area

Lane Departure



Ranking Type

MPO/RPA Ranking



# Network Screening Risk Based Overview

- What defines the SHSP emphasis areas when it comes to risk?

Details on the specific risk factors and how they were developed for each emphasis area can be found in the [MassDOT Network Screening Risk Based Methodology Reports](#). Details on the queries used to identify crashes for each emphasis area can be found on the [IMPACT Emphasis Area Definitions webpage](#).

## Work Zone

- Persons with "Non-fatal injury - Incapacitating" or "Suspected Serious Injury (A)" injuries involved in a crash in which the Work Zone Related flag is reported as "Yes".

## Intersection Related

- Persons with "Non-fatal injury - Incapacitating" or "Suspected Serious Injury (A)" injuries involved in a crash where the Roadway Junction Type is reported to be "Four-way intersection", "T-intersection", "Y-intersection", or "Five-point or more".

# Network Screening Risk Based Overview

Map Theme: MPO/RPA Ranking - Lane Departure (2013 - 2017)

