Kentucky Transportation Cabinet's Data-Driven Safety Analysis (DDSA) Implementation Plan

Outline

Kentucky Transportation Cabinet's (KYTC's) Inspiration

Developing and Organizing KYTC's DDSA Implementation Plan

Highlight 2 of KYTC's DDSA Tools

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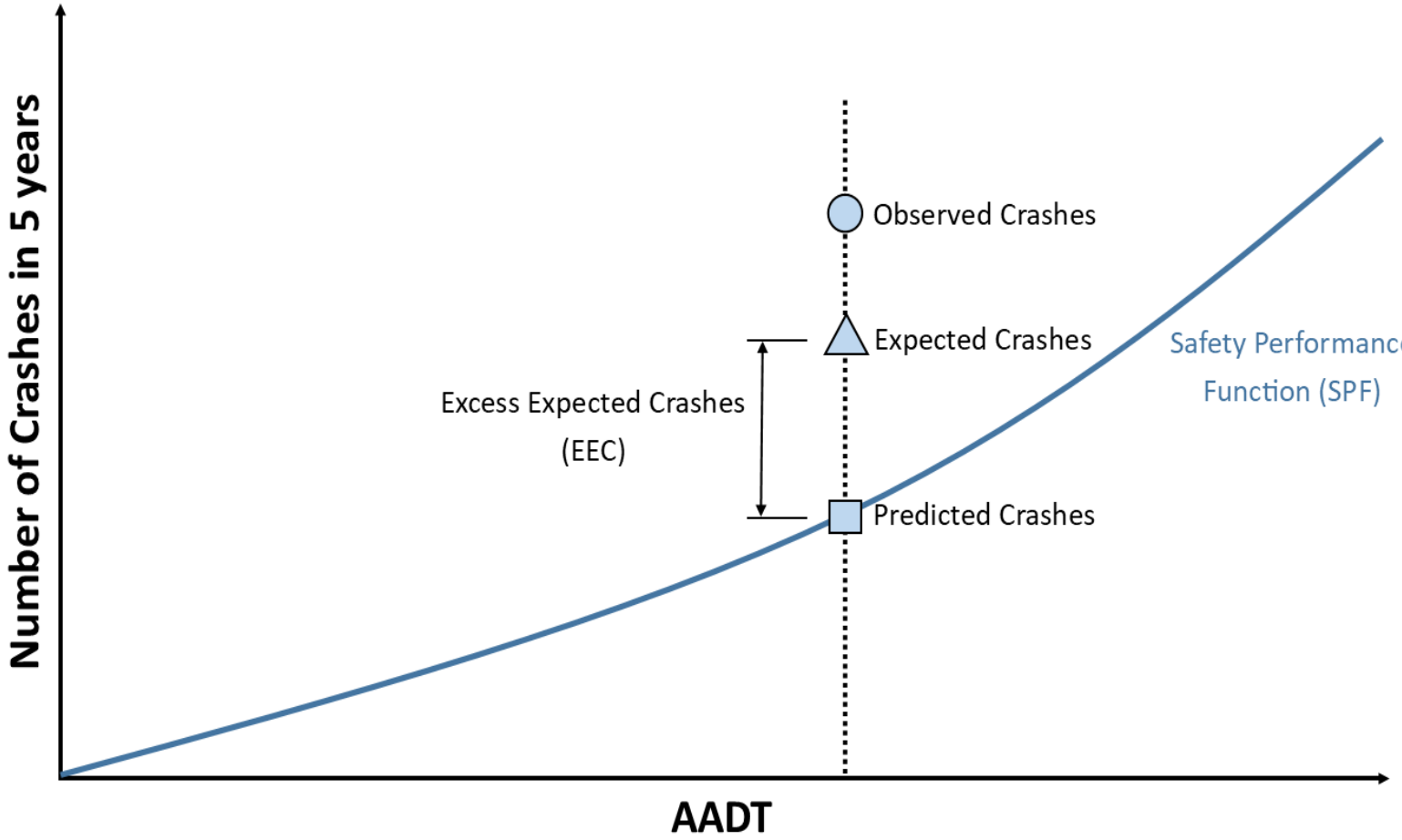
Inspiration to Develop KYTC's DDSA Implementation Plan

- Past and on-going DDSA efforts within KYTC
- In 2012, KY's HSIP began developing state-specific Safety Performance Functions (SPFs)
  - Applied Empirical Bayes to calculate Excess Expected Crashes (EECs)
  - Annual Network Screening to identify possible safety projects



Inspiration to Develop KYTC's DDSA Implementation Plan

- In 2016, the Division of Planning began developing the Strategic Highway Investment Formula for Tomorrow (SHIFT)
  - SHIFT uses data for 5 key attributes to prioritize projects for inclusion into KY's Highway Plan:

  - EEC values are part of the scoring for the Safety attribute and Crash Modification Factors (CMFs) are part of the scoring for the Benefit/Cost attribute

Inspiration to Develop KYTC's DDSA Implementation Plan

- October 2018, NCHRP publishes the Scan Team Report for:
  - NCHRP 20-68A, Scan 16-01 – Leading Practices in the Use of the Highway Safety Manual for Planning, Design, and Operations

- NCHRP 20-68A, Scan 16-01 was the keystone KYTC needed
  - How DOTs are implementing the HSM across their agencies
  - Processes, job aids/tools, and workforce training related to implementation of the HSM

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Highlight 2 of KYTC's DDSA Tools

Developing KYTC's DDSA Implementation Plan

- Identify safety champions to recruit from all Divisions
  - Planning
  - Highway Design
  - Project Delivery & Preservation (aka Construction & Maintenance)
  - Traffic Operations
  - Others:
    - Researchers at the University of Kentucky
    - Key staff within our District offices
    - A few safety analysis "experts" from the consulting community

Developing KYTC's DDSA Implementation Plan

- Created "sub-committees" to focus on increased DDSA implementation in key areas:
  - DDSA in Planning
  - DDSA in Highway Design
  - DDSA in Project Development & Delivery (aka Construction & Maintenance)
  - DDSA in Traffic Operations
  - DDSA Safety Analysis Tools & Training
  - KYTC DDSA webpage

Original Outline of KYTC's DDSA Implementation Plan

- Safety Data, Safety Predictions, and Safety Performance Measures
- Incorporating DDSA in Project Development
  - DDSA in Planning
  - DDSA in Highway Design
- Incorporating DDSA in Project Delivery & Preservation
  - DDSA in Traffic Operations
  - DDSA in Construction
  - DDSA in Maintenance
- DDSA Tools and Resources
- DDSA Training

Final Outline of KYTC's DDSA Implementation Plan

- Crash and Roadway Data
- Safety Performance
- DDSA Tools and Resources
- Implementing DDSA Methods at the Network-Level
  - How various KYTC areas could utilize network screening
- Implementing DDSA Methods at the Project-Level
  - How various KYTC areas could utilize project-specific safety prediction
- DDSA Training

Outline

Kentucky Transportation Cabinet's (KYTC's) Inspiration

Developing and Organizing KYTC's DDSA Implementation Plan

Highlight 2 of KYTC's DDSA Tools

Crash Data Analysis Tool (CDAT)

- CDAT provides users with a searchable record of KY's:
  - Crash Data
  - Traffic Volumes
  - Roadway Attributes
- CDAT can currently be used to:
  - Obtain current Excess Expected Crash (EEC) values for predetermined roadway segments and all intersections across the network
  - Calculate EEC values for user-specified roadway segments

CDAT
Crash Data Analysis Tool

Crash Data Analysis Tool (CDAT)

- CDAT can currently be used to:
  - Compare site specific crash type %s with crash type %s of all similar sites
    - Example 1: Segment A has 65% crashes occurring on Wet Pavement vs. the Statewide avg of 20% of crashes occurring on Wet Pavement
    - Example 2: Segment A has 50% of crashes occurring at Nighttime vs. the Statewide avg of 25% crashes occurring at Nighttime
- CDAT features being developed:
  - Predicting safety performance for relatively simple proposed projects
- Goal for CDAT is to be a one-stop shop for:
  - Safety-related data and network screening results (aka EEC values)
  - Project-specific safety diagnosis and safety performance predictions

CDAT
Crash Data Analysis Tool

KYTC's CMF Search Tool

- Web-based search tool
- Users can select from up to 18 different attributes to narrow down the list of applicable CMFs:
  - Crash Type
  - Crash Severity
  - Area Type (Rural, Urban, or Suburban)
  - Number of Lanes
  - Traffic Control Type
- CMF list updates on the fly as attributes are selected
- The CMF ID in the list is a link to the CMF Details page on the CMF Clearinghouse

Kentucky Crash Modification Factor Recommendation List

Start Over

Primary Deciders

Step 1 — Countermeasure: 6 Rumble Strips_CMF

Step 2 — Countermeasure Group: Edgeline rumbles

Step 3 — Countermeasure Sub-...: All

Step 4 — Crash Type: All

Step 5 — Severity: All

Step 6 — Roadway Type: All

Step 7 — Area Type: Rural

Step 8 — Star: Multiple selections

Step 9 — Std Err: All

Show All Deciders

Secondary Deciders

Step 10 — State: All

Step 11 — Int Related: All

Step 12 — Avg ADT (non-int): All

Step 13 — Major Road avg. ADT (I...: All

Step 14 — Minor Road avg. ADT (I...: All

Step 15 — No of Lanes: 2

Step 16 — Inter. Geometry: All

Step 17 — Traffic Control Type: All

Step 18 — Roadway Division Type: Undivided

Total Number of CMFs Meet Requirements

11

Results

CMF ID	CMF	Star	State	Comments
9835	0.79	4-Stars	OH	The CMF includes the effects of a stat horizontal curve warning sign upgrade
9836	0.79	4-Stars	OH	The CMF includes the effects of a stat horizontal curve warning sign upgrade
9837	0.78	4-Stars	OH	The CMF includes the effects of a stat horizontal curve warning sign upgrade
9838	0.75	4-Stars	OH	The CMF includes the effects of a stat horizontal curve warning sign upgrade
9839	0.71	4-Stars	OH	The CMF includes the effects of a stat horizontal curve warning sign upgrade
3394	0.67	5-Stars	MN,MO,PA	
3396	0.61	4-Stars	MN,MO,PA	
9830	0.75	4-Stars	KY	
9831	0.64	4-Stars	KY	
9832	0.74	4-Stars	KY	
9833	0.63	4-Stars	KY	

CMF / CRF DETAILS

CMF ID: 9833

INSTALL EDGELINE RUMBLE STRIPS AT HORIZONTAL CURVE

DESCRIPTION: INSTALL EDGELINE RUMBLE STRIPS AT HORIZONTAL CURVE

PRIOR CONDITION: *NO PRIOR CONDITION(S)*

CATEGORY: ROADWAY

STUDY: *SAFETY EVALUATION OF EDGE-LINE RUMBLE STRIPS ON RURAL TWO-LANE HORIZONTAL CURVES*, HIMES ET AL., 2017

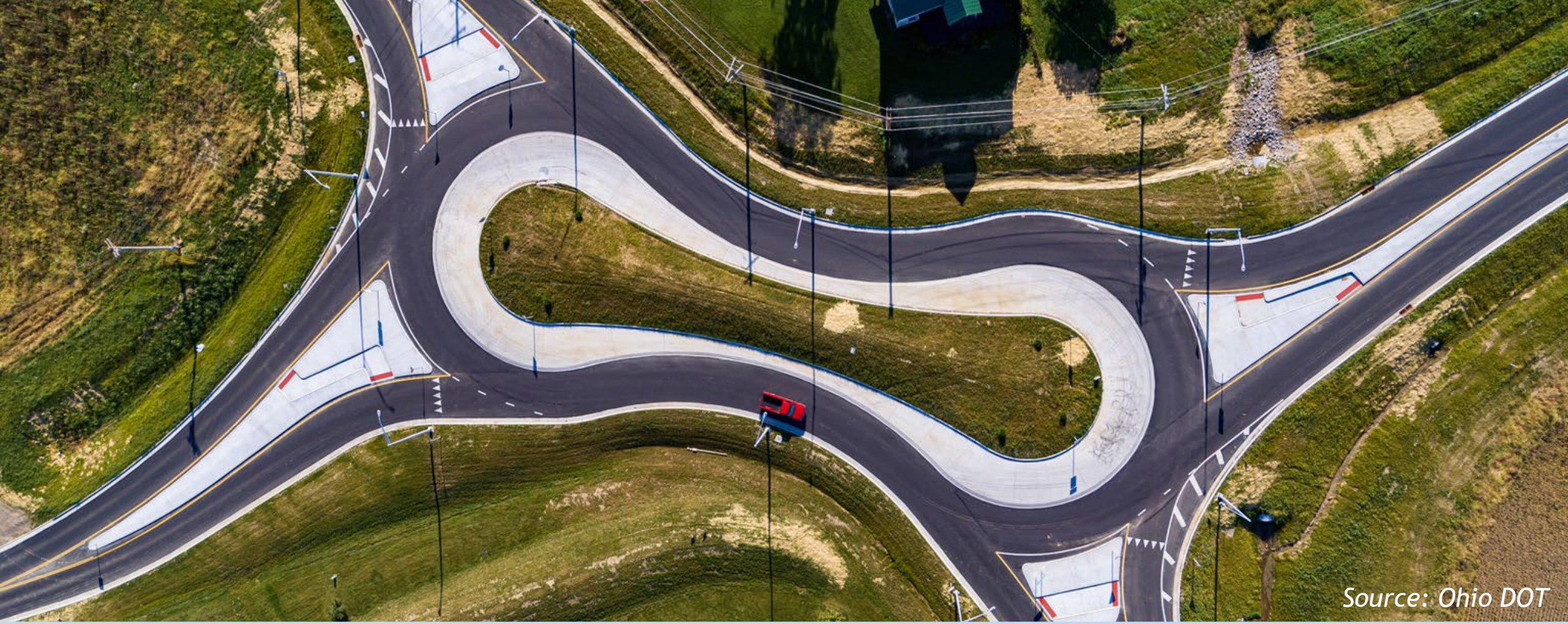
Star Quality Rating:	★★★★☆ [VIEW SCORE DETAILS]
Rating Points Total:	115

Crash Modification Factor (CMF)	
Value:	0.63
Adjusted Standard Error:	
Unadjusted Standard Error:	0.14

Contact Info

Michael Vaughn, PE
Highway Safety Improvement Program
Division of Traffic Operations
Kentucky Transportation Cabinet

Mike.Vaughn@ky.gov



Navigating DDSA

TRB – 6/28/2022

EVERY MOVE YOU MAKE

TOWARD ZERO DEATHS

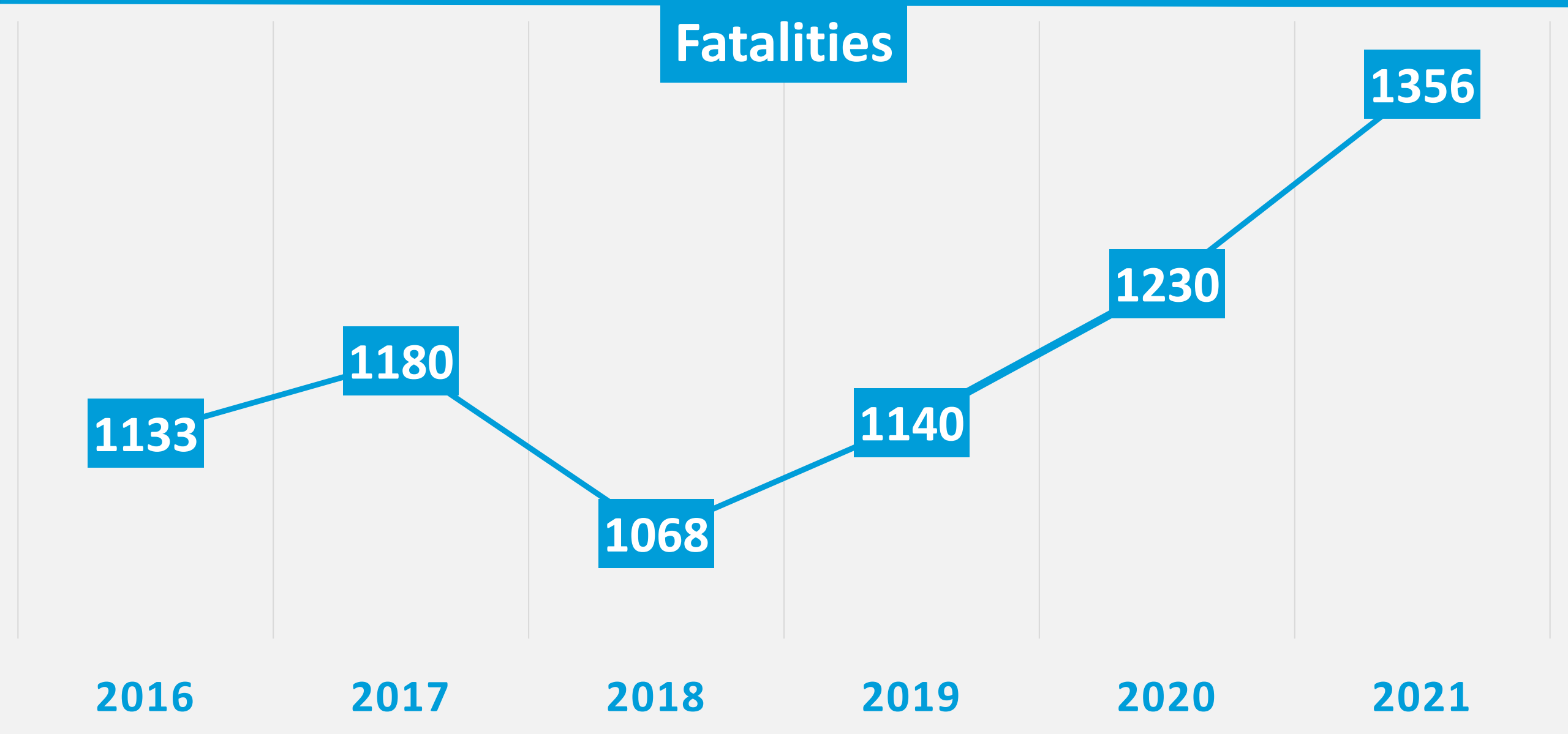
Purpose

More **Informed** Decision Making

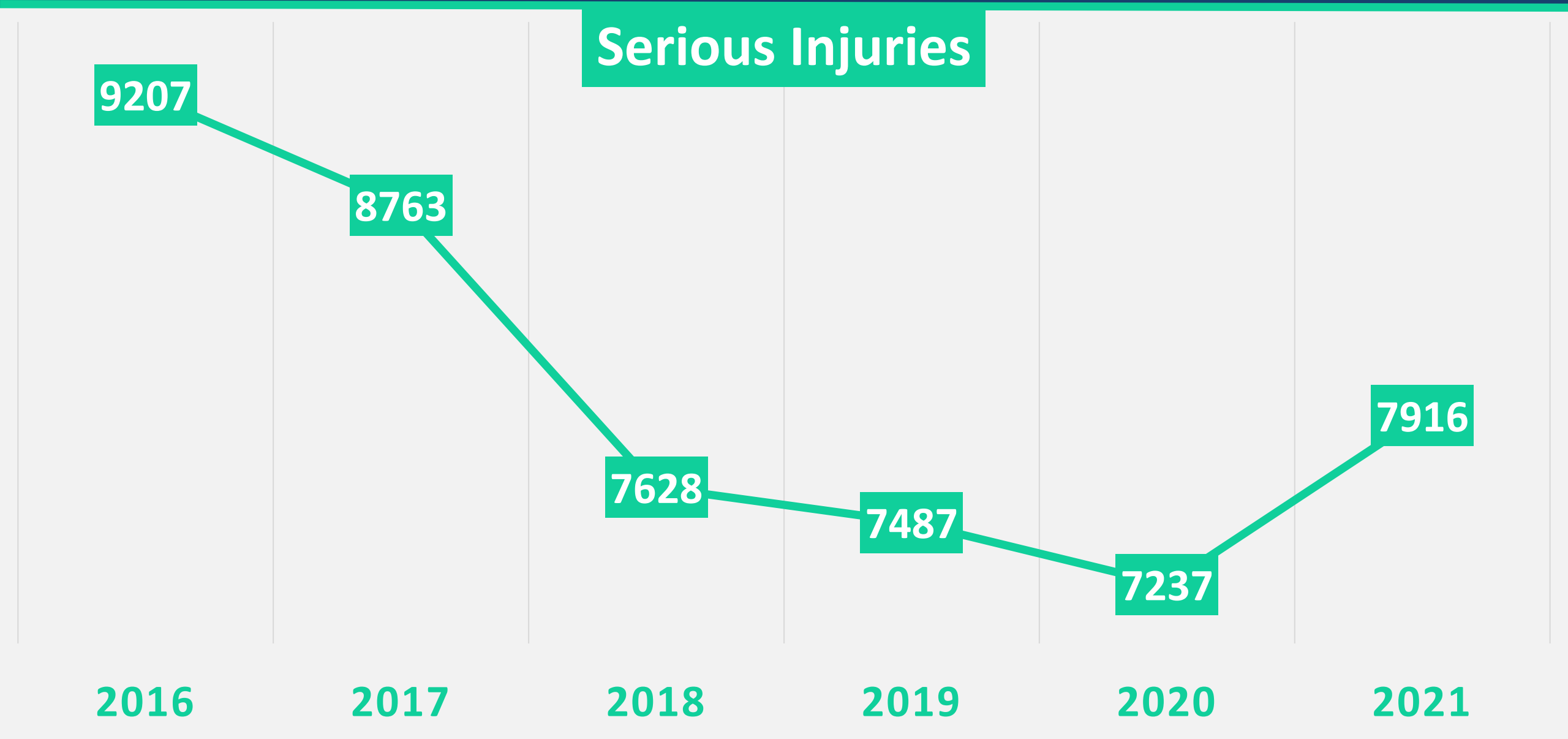
Better **Targeted** Investments

Fewer Fatalities & Serious Injuries

Why?


Fatalities
1133
1180
1068
1140
1230
1356
2016
2017
2018
2019
2020
2021

Why?

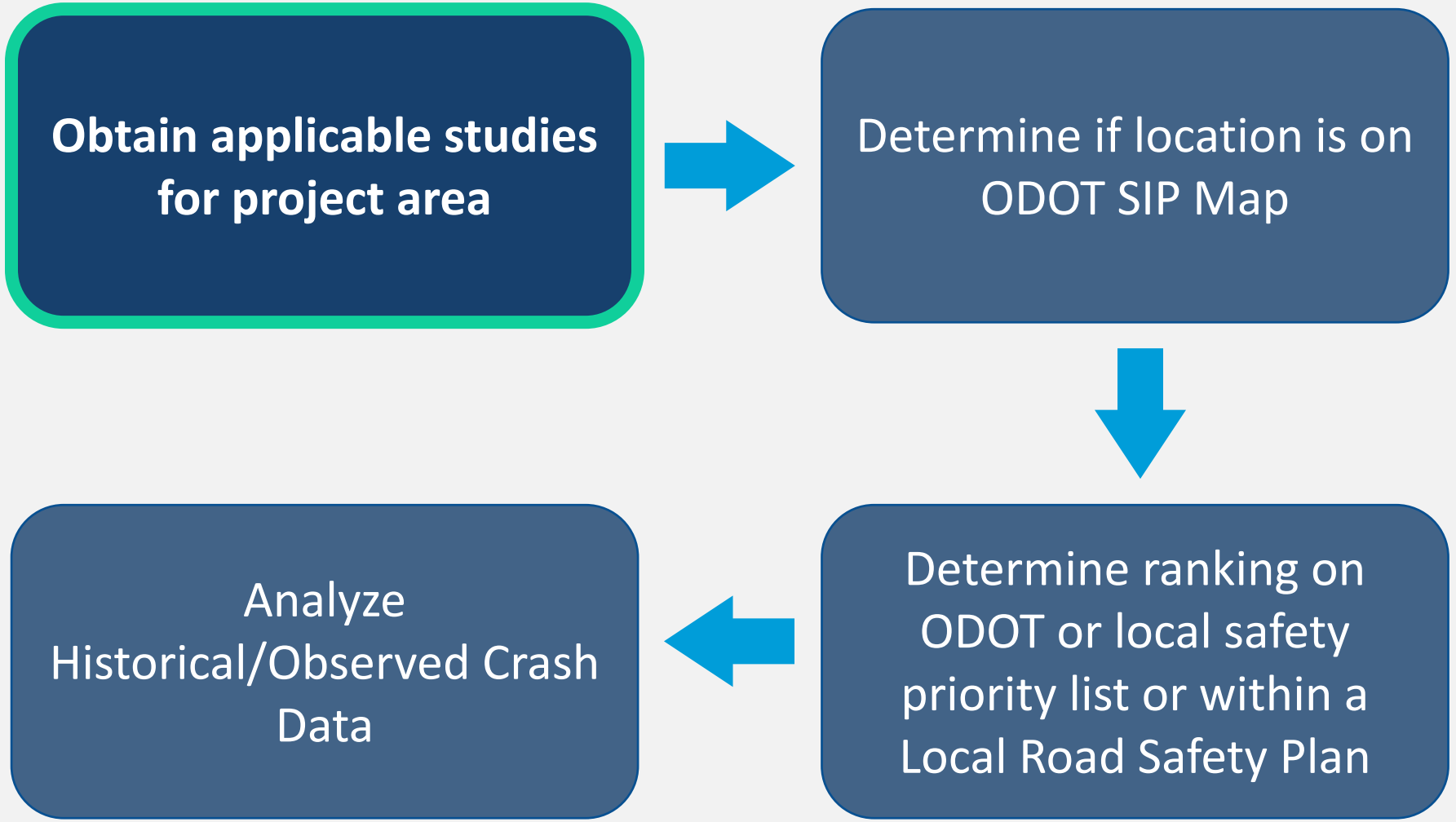

Serious Injuries
9207
8763
7628
7487
7237
7916
2016
2017
2018
2019
2020
2021

Application

DDSA applies to all ODOT let projects **except**:

- Maintenance projects – guardrail, mowing, striping, signing, RPM's, etc.
- Minor pavement surface treatments
- Spot repairs
- Slot Paving

Minimum Assessment



Obtain Applicable Studies

- Feasibility Studies
- Corridor Studies
- Traffic Impact Studies
- **Safety Studies**

Ohio Department of Transportation, District 3

2021 Safety Study

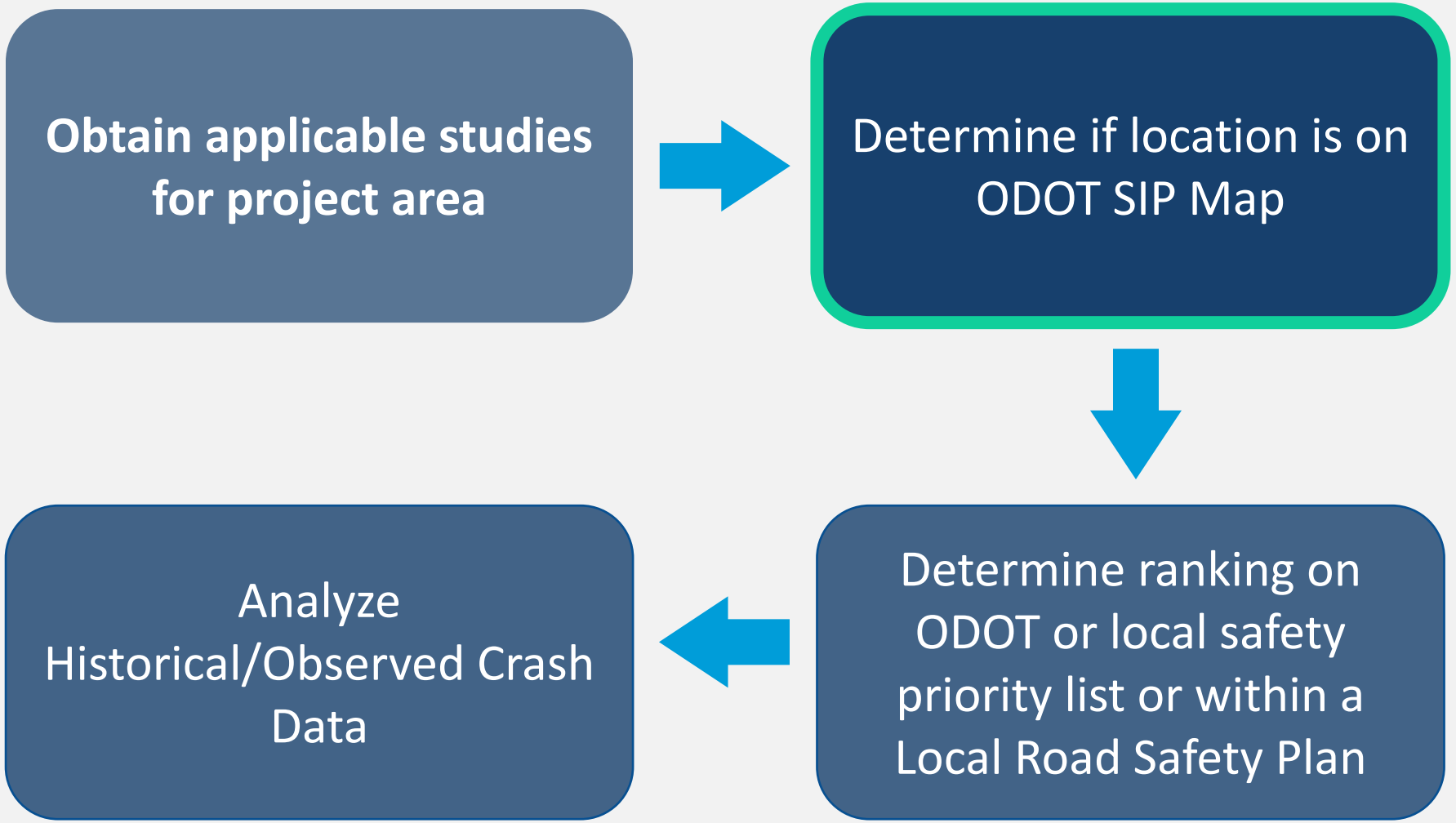
WAY SR 57 SLM 10.32 SR 604

2020 District 3 Unsignalized Intersection List #36

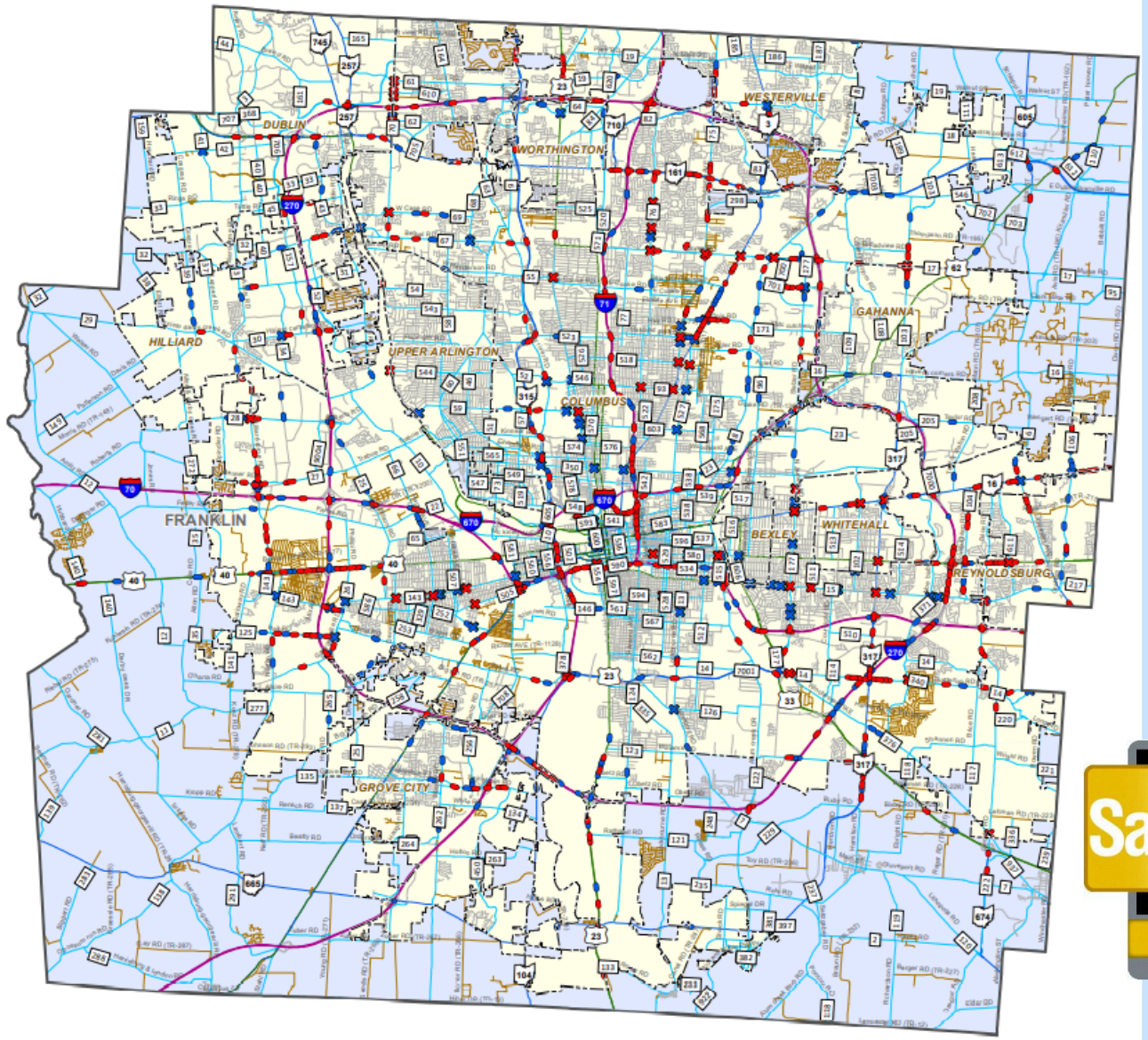
By: Jared Feller, P.E. **Date:** April 2021

Study Location Map

Minimum Assessment



Safety Integrated Project (SIP) Maps



City Boundary

High Priority

- Intersections/Interchanges
- Segments

Low Cost Improvements

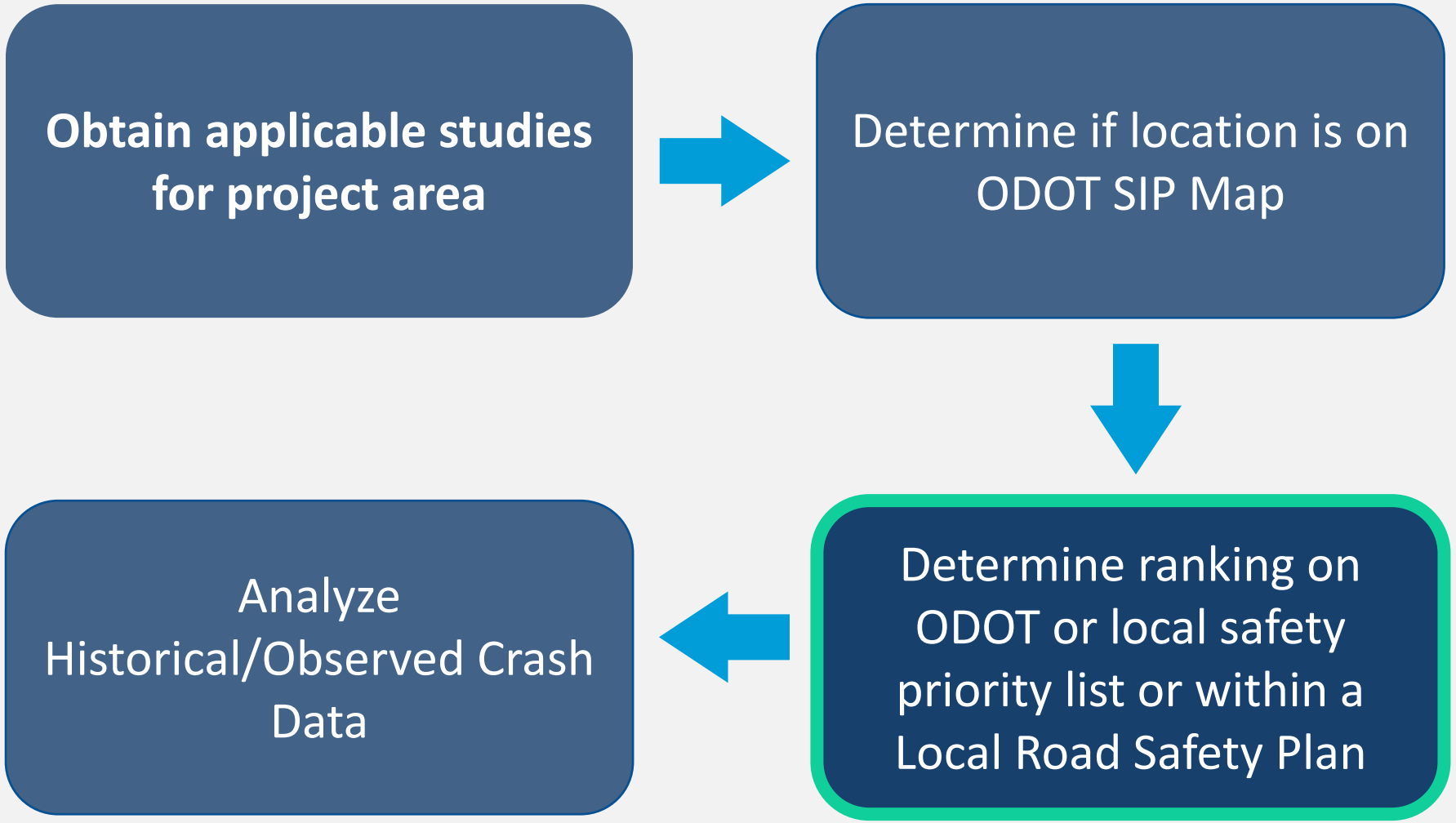
- Intersections/Interchanges
- Segments

Roads by Type

- Other Routes
- Interstate Route
- United States Route
- State Route
- County Road
- Township Road

AASHTOWare Safety Analyst
AASHTO

Determine Ranking



Determine Ranking

Rural

- Intersection
- Non-Freeway
- Freeway

Urban

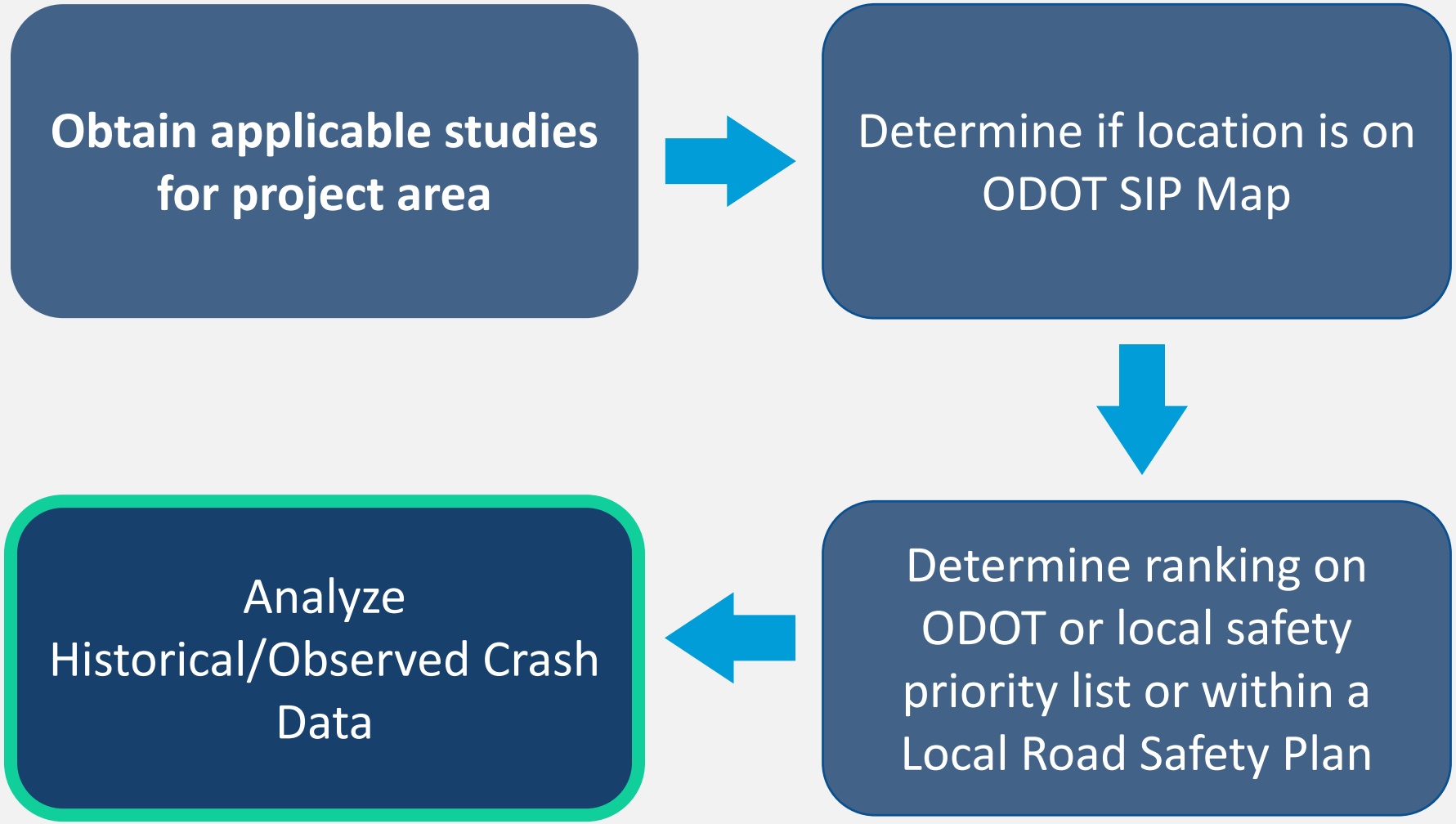
- Intersection
- Non-Freeway
- Freeway

Suburban

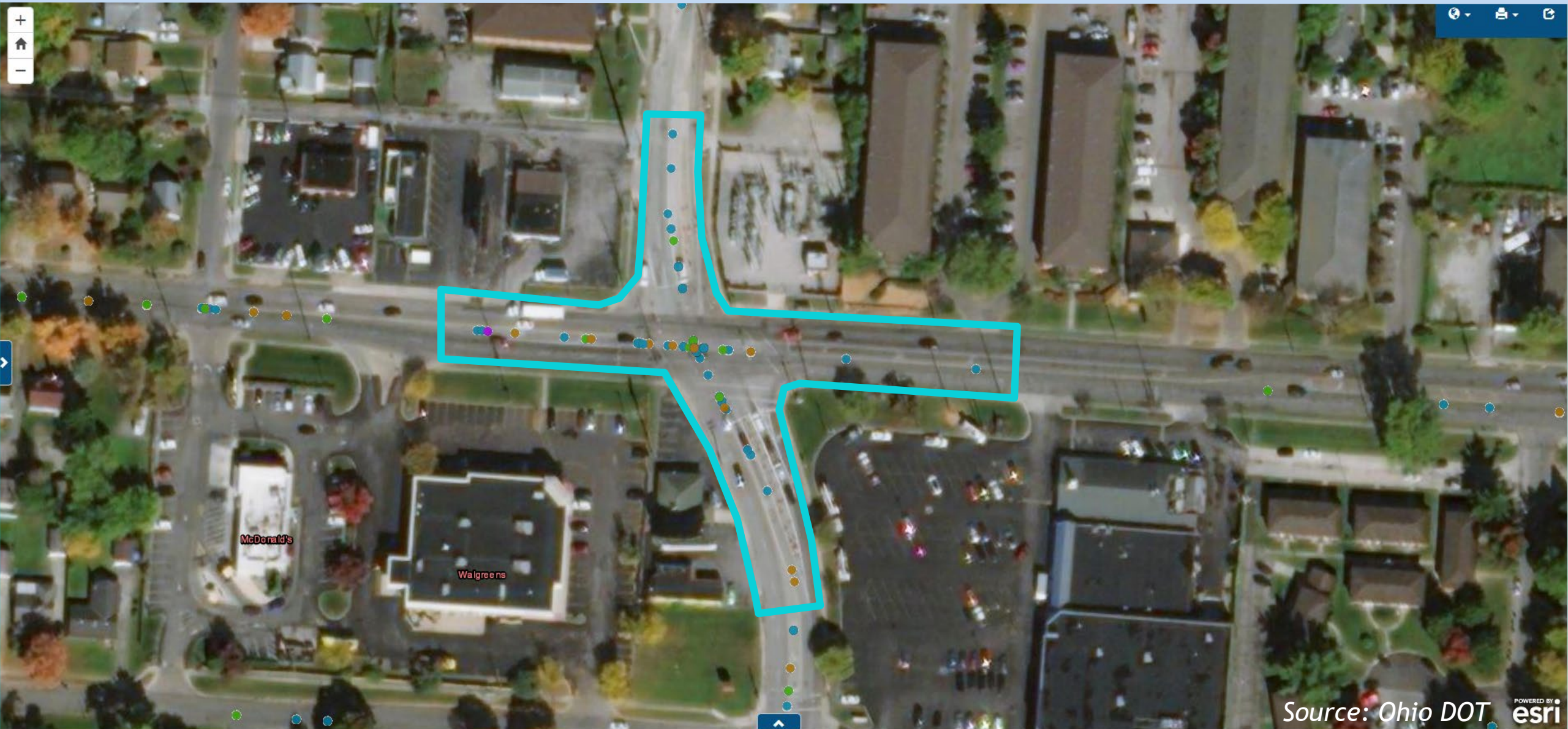
- Intersection
- Non-Freeway

2020 Urban Intersection Peak Searching Excess Locations (2016-2020)								Crashes Per Year			
Location Information								Fatal & All Injury Crashes			
Rank	District	County	Location	Site Type	Subtype	Freeway	Turnpike	Average Observed Crashes	Predicted Crashes	Expected Crashes	Expected Excess Crashes
1	6	FRA	MR-4207	Intersection	Int/Urb; 4-leg signalized	N	N	53.51	2.37	25.18	22.81
2	6	FRA	MR-4231	Intersection	Int/Urb; 4-leg signalized	N	N	32.79	4.83	22.44	17.61
3	6	FRA	SR-317	Intersection	Int/Urb; 4-leg signalized	N	N	27.12	3.3	21.21	17.91
4	6	FRA	CR-17	Intersection	Int/Urb; 4-leg signalized - Div Multilane	N	N	22.98	5.25	20.07	14.82
5	6	FRA	MR-4231	Intersection	Int/Urb; 4-leg signalized - Div Multilane	N	N	27.68	5.69	20.05	14.36
6	6	FRA	CR-75	Intersection	Int/Urb; 4-leg signalized	N	N	20.73	2.94	17.93	14.99
7	7	MOT	CR-230	Intersection	Int/Urb; 4-leg signalized - Div Multilane	N	N	22.74	3.29	16.83	13.54
8	6	FRA	MR-4231	Intersection	Int/Urb; 4-leg signalized	N	N	29.46	3.01	16.57	13.56
9	7	MOT	MR-4972	Intersection	Int/Urb; 4-leg signalized	N	N	36.07	2.1	16.36	14.26
10	6	FRA	MR-4231	Intersection	Int/Urb; 3-leg signalized - Div Multilane	N	N	20.84	5.55	14.81	9.26
11	6	FRA	SR-16	Intersection	Int/Urb; 4-leg signalized	N	N	19.35	2.97	14.75	11.78
12	6	FRA	MR-4207	Intersection	Int/Urb; 4-leg signalized	N	N	31.75	1.86	14.65	12.79
13	6	FRA	MR-4205	Intersection	Int/Urb; 4-leg signalized	N	N	24.86	2.74	14.01	11.27
14	6	FRA	MR-4205	Intersection	Int/Urb; 4-leg signalized	N	N	24.36	2.76	13.73	10.97
15	6	FRA	US-62	Intersection	Int/Urb; 4-leg signalized	N	N	20.15	2.06	13.69	11.63
16	2	LUC	SR-2	Intersection	Int/Urb; 4-leg signalized	N	N	15.68	1.93	12.89	10.96

Analyze Historical/Observed Crash Data



Analyze Historical/Observed Crash Data



Analyze Historical/Observed Crash Data

HYPERLIN	Document	Ye	Local Report Num	User Defin	Severity	Crash Type	ODOT Distr	County	ODOT Crash Location	NLFID	County True L	State True L	On Road	At Road	ODOT Latitu	ODOT Longitu
Crash Report	20186016106	2018	180054228		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.761	1.761	MR4254	E LIVINGSTON	39.946884	-82.915597
Crash Report	20186055284	2018	180269957		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.74	1.74	MR4254	S LIVINGSTON	39.946603	-82.915409
Crash Report	20186085013	2018	180425118		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.774	1.774	MR4254	S JAMES RD	39.947064	-82.915645
Crash Report	20186120746	2018	180640079		(4) Injury Possil	Angle	6	FRA	Not An Intersection	MFRAMR04254**C	1.75	1.75	MR4254	SR3	39.946734	-82.915503
Crash Report	20186121736	2018	180649628		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.75	1.75	MR4254	E LIVINGSTON	39.946734	-82.915503
Crash Report	20186037474	2018	180182545		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.75	1.75	MR4254	E LIVINGSTON	39.946734	-82.915503
Crash Report	20186081915	2018	180418355		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Not An Intersection	MFRAMR04254**C	1.774	1.774	MR4254	IR1	39.947064	-82.915645
Crash Report	20186112426	2018	180590281		(3) Minor Injury	Head On	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.75	1.75	MR4254	E LIVINGSTON	39.946734	-82.915503
Crash Report	20186147165	2018	180784040		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.242	1.242	MR4207	S JAMES RD	39.946872	-82.915681
Crash Report	20186147499	2018	180788907		(4) Injury Possil	Left Turn	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.247	1.247	MR4207	S JAMES RD	39.946866	-82.915593
Crash Report	20186140934	2018	180753951		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.74	1.74	MR4254	E LIVINGSTON	39.946603	-82.915409
Crash Report	20186140936	2018	180754684		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.245	1.245	MR4207	S JAMES RD	39.946869	-82.915628
Crash Report	20186195521	2018	180997230		(3) Minor Injury	Pedestrian	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.252	1.252	MR4207	S JAMES RD	39.946861	-82.915501
Crash Report	20186196876	2018	180995704		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.774	1.774	MR4254	E LIVINGSTON	39.947064	-82.915645
Crash Report	20186196900	2018	180993502		(5) PDO/No Inju	Right Turn	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.774	1.774	MR4254	E LIVINGSTON	39.947064	-82.915645
Crash Report	20186047942	2018	180212943		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.774	1.774	MR4254	E LIVINGSTON	39.947064	-82.915645
Crash Report	20186126524	2018	180678706		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.761	1.761	MR4254	E LIVINGSTON	39.94688	-82.915596
Crash Report	20186163800	2018	180842761		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.759	1.759	MR4254	E LIVINGSTON	39.946856	-82.915586
Crash Report	20186214241	2018	181073922		(5) PDO/No Inju	Left Turn	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.247	1.247	MR4207	S JAMES RD	39.946866	-82.915593
Crash Report	20186216452	2018	181058269		(4) Injury Possil	Pedestrian	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.248	1.248	MR4207	S JAMES RD	39.946865	-82.915574
Crash Report	20186105184	2018	180544107		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.774	1.774	MR4254	E LIVINGSTON	39.947064	-82.915645
Crash Report	20186173573	2018	180912181		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.76	1.76	MR4254	E LIVINGSTON	39.946866	-82.915593
Crash Report	20186174692	2018	180893221		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.759	1.759	MR4254	E LIVINGSTON	39.946856	-82.915586
Crash Report	20186197959	2018	180999163		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.247	1.247	MR4207	S JAMES RD	39.946866	-82.915593
Crash Report	20193000292	2019	190009116		(4) Injury Possil	Right Turn	6	FRA	Not An Intersection	MFRAMR04254**C	1.722	1.722	MR4254	S James RD	39.946293	-82.915267
Crash Report	20193000301	2019	190009502		(4) Injury Possil	Rear End	6	FRA	Not An Intersection	MFRAMR04207**C	1.239	1.239	MR4207	S James RD	39.946875	-82.915741
Crash Report	20193001992	2019	190012191		(5) PDO/No Inju	Left Turn	6	FRA	Not An Intersection	MFRAMR04254**C	1.796	1.796	MR4254	E LIVINGSTON	39.94739	-82.915663
Crash Report	20193002515	2019	190025960		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Not An Intersection	MFRAMR04254**C	1.783	1.783	MR4254	E LIVINGSTON	39.947195	-82.91568
Crash Report	20193029657	2019	190162892		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Not An Intersection	MFRAMR04207**C	1.211	1.211	MR4207	S James RD	39.946907	-82.916268
Crash Report	20193029824	2019	190161920		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.755	1.755	MR4254	S James RD	39.9468	-82.915548
Crash Report	20186058780	2018	180288372		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.75	1.75	MR4254	E LIVINGSTON	39.946734	-82.915503
Crash Report	20186058911	2018	180259703		(5) PDO/No Inju	Rear End	6	FRA	Four-Way Intersection	MFRAMR04207**C	1.253	1.253	MR4207	S JAMES RD	39.94686	-82.915482
Crash Report	20186097875	2018	180488678		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Not An Intersection	MFRAMR04207**C	1.224	1.224	MR4207	BRICE RD	39.946892	-82.916017
Crash Report	20186169095	2018	180893172		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Not An Intersection	MFRAMR04254**C	1.759	1.759	MR4254	E LIVINGSTON	39.946856	-82.915586
Crash Report	20193048250	2019	P190252199		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Four-Way Intersection	MFRAMR04254**C	1.759	1.759	MR4254	E LIVINGSTON	39.946856	-82.915586
Crash Report	20186203733	2018	181028193		(5) PDO/No Inju	Sideswipe - Passing	6	FRA	Not An Intersection	MFRAMR04207**C	1.247	1.247	MR4207	S JAMES RD	39.946866	-82.915591
Crash Report	20186205415	2018	181024325		(5) PDO/No Inju	Backing	6	FRA	Shared-Use Paths Or Trails	MFRAMR04207**C	1.21	1.21	MR4207	WALGREENS	39.946908	-82.916285
Crash Report	20193009452	2019	190055279		(5) PDO/No Inju	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.734	1.734	MR4254	E LLIVINGSTOI	39.946516	-82.915355
Crash Report	20193067419	2019	190253318		(2) Serious Injur	Pedestrian	6	FRA	Not An Intersection	MFRAMR04254**C	1.759	1.759	MR4254	E LIVINGSTON	39.946856	-82.915586
Crash Report	20193068569	2019	190334029		(5) PDO/No Inju	Angle	6	FRA	Not An Intersection	MFRAMR04254**C	1.76	1.76	MR4254	LIVINGSTON A	39.946863	-82.91559
Crash Report	20186069901	2018	180353157		(4) Injury Possil	Rear End	6	FRA	Not An Intersection	MFRAMR04254**C	1.704	1.704	MR4254	DOVER RD	39.946081	-82.91528

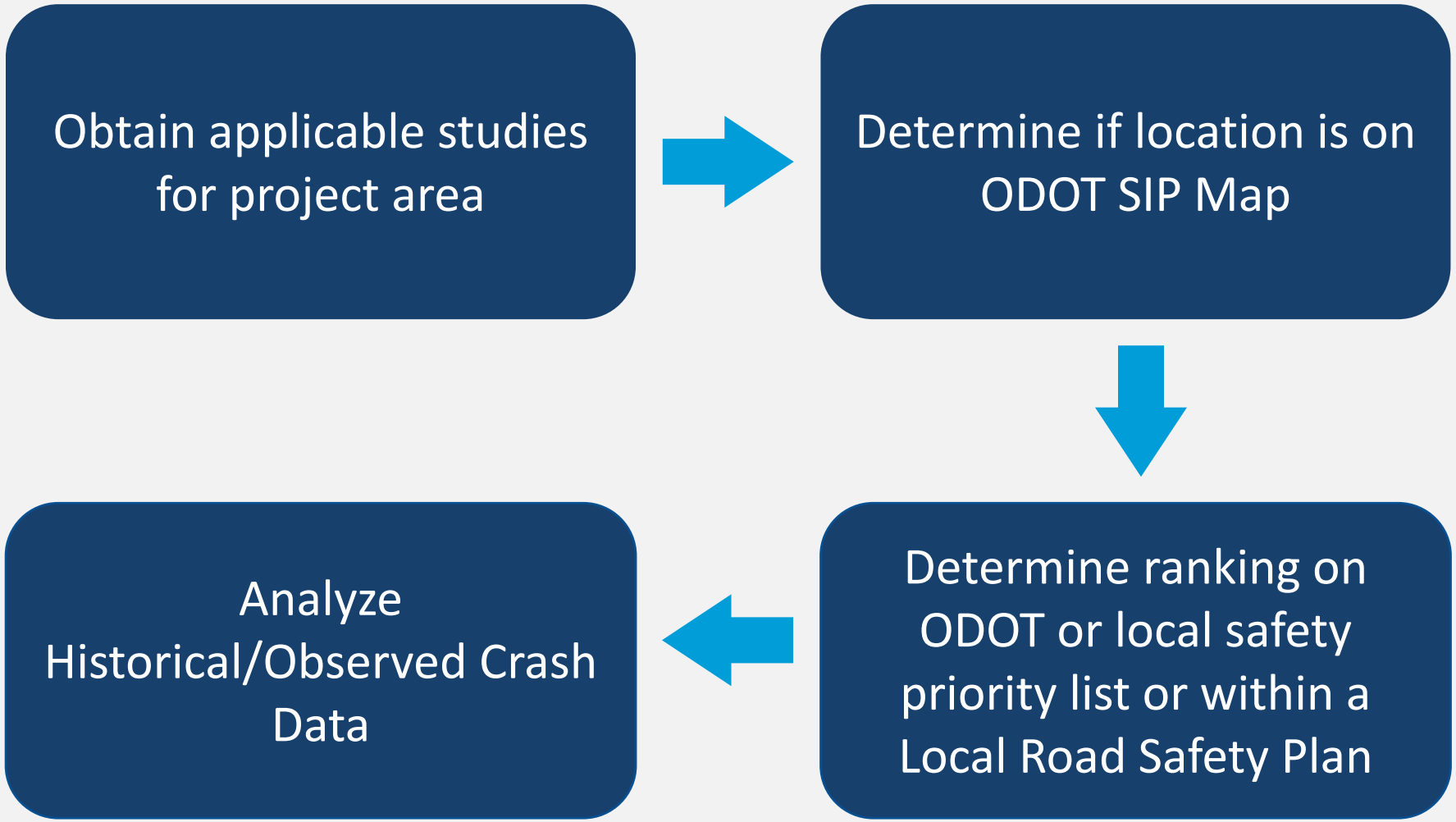
Analyze Historical/Observed Crash Data

Crashes by Crash Type				
	Total (%)		Fatal & All Injury (%)	
Crash Type	Site Average	Statewide Average	Site Average	Statewide Average
Unknown	0.70%	0.23%	0.70%	0.15%
Head On	4.26%	1.63%	4.26%	3.16%
Rear End	36.17%	39.17%	36.17%	40.14%
Backing	1.42%	2.59%	1.42%	0.74%
Sideswipe - Meeting	0.00%	0.87%	0.00%	0.82%
Sideswipe - Passing	23.40%	13.23%	23.40%	6.16%
Angle	13.48%	8.78%	13.48%	11.31%
Parked Vehicle	0.00%	2.49%	0.00%	1.33%
Pedestrian	4.96%	1.29%	4.96%	4.16%
Animal	0.00%	2.50%	0.00%	0.50%
Train	0.00%	0.01%	0.00%	0.02%
Pedalcycles	0.00%	0.90%	0.00%	2.64%
Other Non-Vehicle	0.00%	0.00%	0.00%	0.00%
Fixed Object	1.42%	6.36%	1.42%	7.63%
Other Object	0.00%	0.23%	0.00%	0.10%
Falling From Or In Vehicle	0.00%	0.00%	0.00%	0.00%
Overturning	0.00%	0.17%	0.00%	0.45%
Other Non-Collision	0.00%	0.36%	0.00%	0.35%
Left Turn	11.35%	15.12%	11.35%	17.74%
Right Turn	2.84%	4.07%	2.84%	2.60%

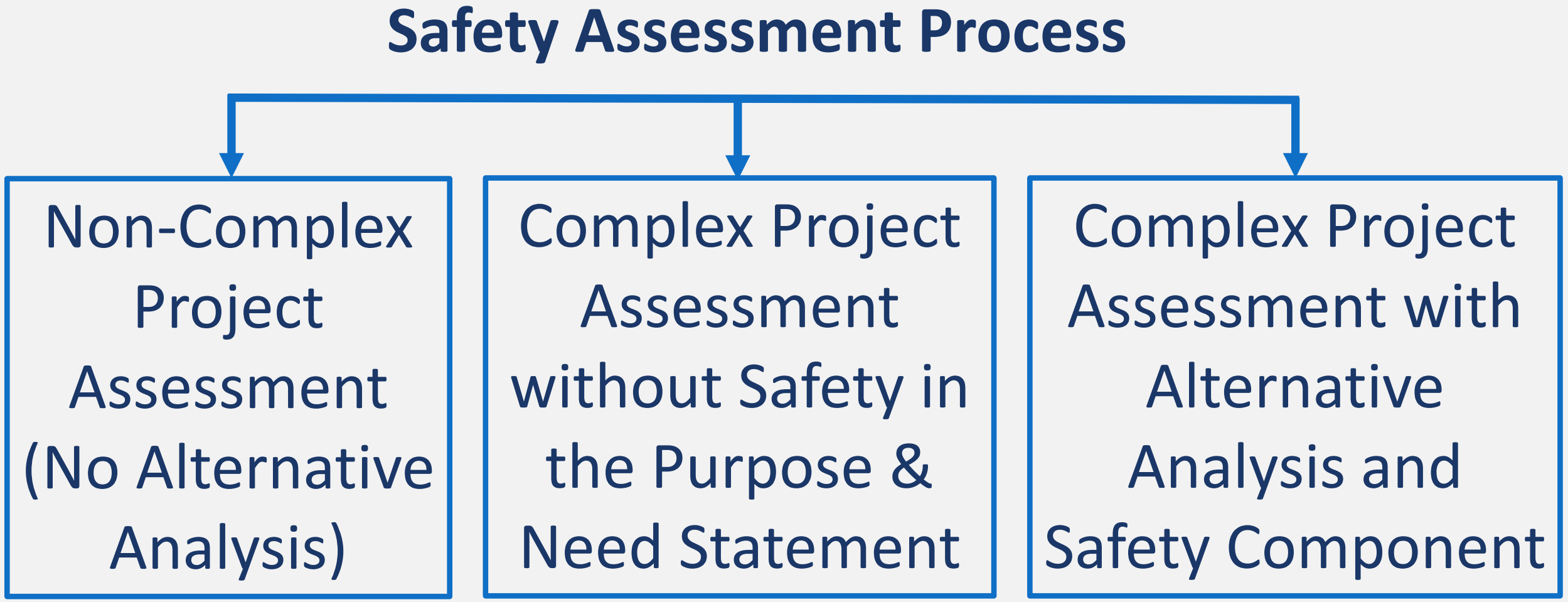
Analyze Historical/Observed Crash Data

OHIO SHSP EMPHASIS AREAS (Total Crashes)	2021	2021	2020	2020	2019	2019	2018	2018
Target Group	Crashes	% of Total Crashes	Crashes	% of Total Crashes	Crashes	% of Total Crashes	Crashes	% of Total Crashes
Total Crashes by Year	**19**		**36**		**49**		**37**	
Roadway Departure	1	5%	2	6%	0	0%	0	0%
Intersection	16	84%	31	86%	38	78%	27	73%
Railroad Crossing	0	0%	0	0%	0	0%	0	0%
Alcohol Related Involvement	1	5%	0	0%	1	2%	1	3%
Restraints Not Used Driver/Occupants	2	11%	1	3%	1	2%	3	8%
Speed Related Involvement	3	16%	5	14%	2	4%	2	5%
Young Driver Involvement (15-25)	6	32%	13	36%	16	33%	9	24%
Older Driver Involvement (65+)	3	16%	6	17%	8	16%	7	19%
Distracted Drivers	0	0%	1	3%	0	0%	3	8%
Motorcycle Driver/Passenger	0	0%	1	3%	0	0%	0	0%
Pedestrian Involvement	0	0%	2	6%	3	6%	2	5%
Bicycle Involvement	0	0%	0	0%	0	0%	0	0%
Work Zone Related	3	16%	5	14%	4	8%	0	0%
Drug Related Involvement	0	0%	1	3%	0	0%	1	3%
Marijuana Involvement	0	0%	0	0%	0	0%	0	0%
Rear End	7	37%	13	36%	14	29%	17	46%

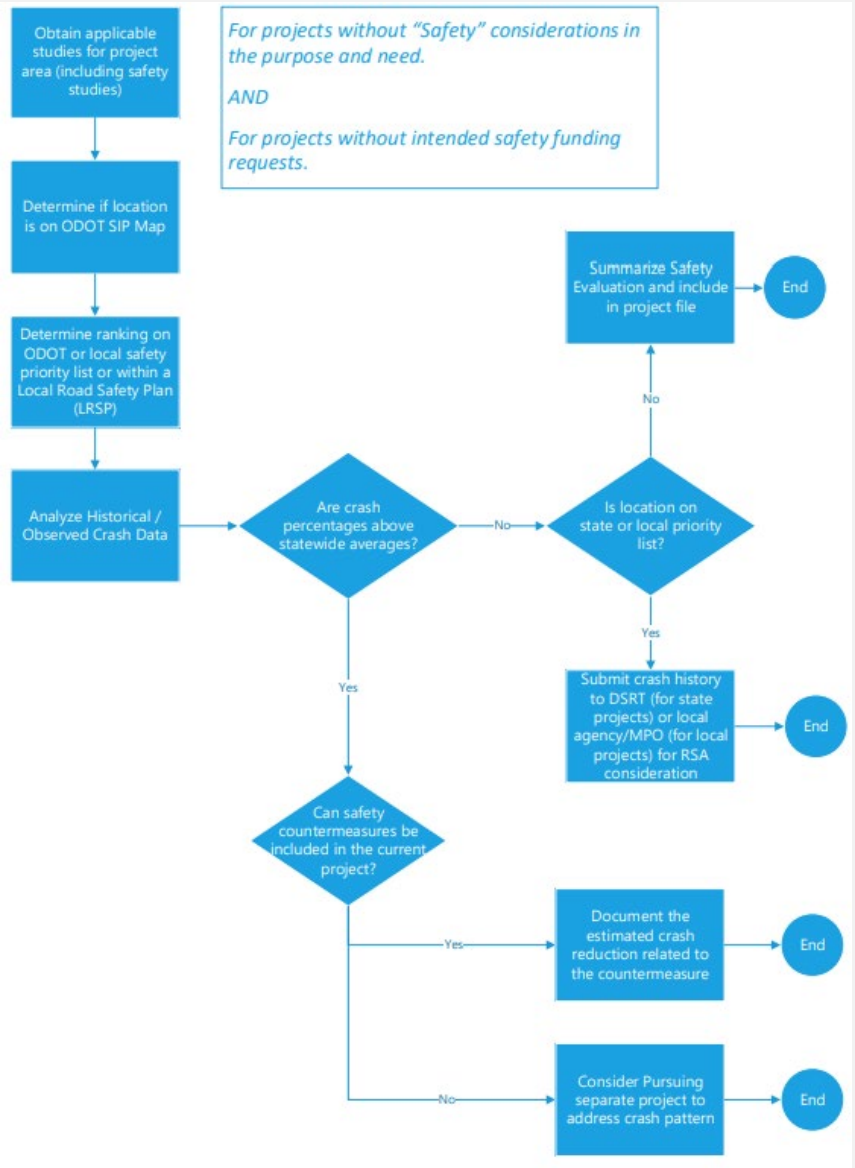
Minimum Assessment

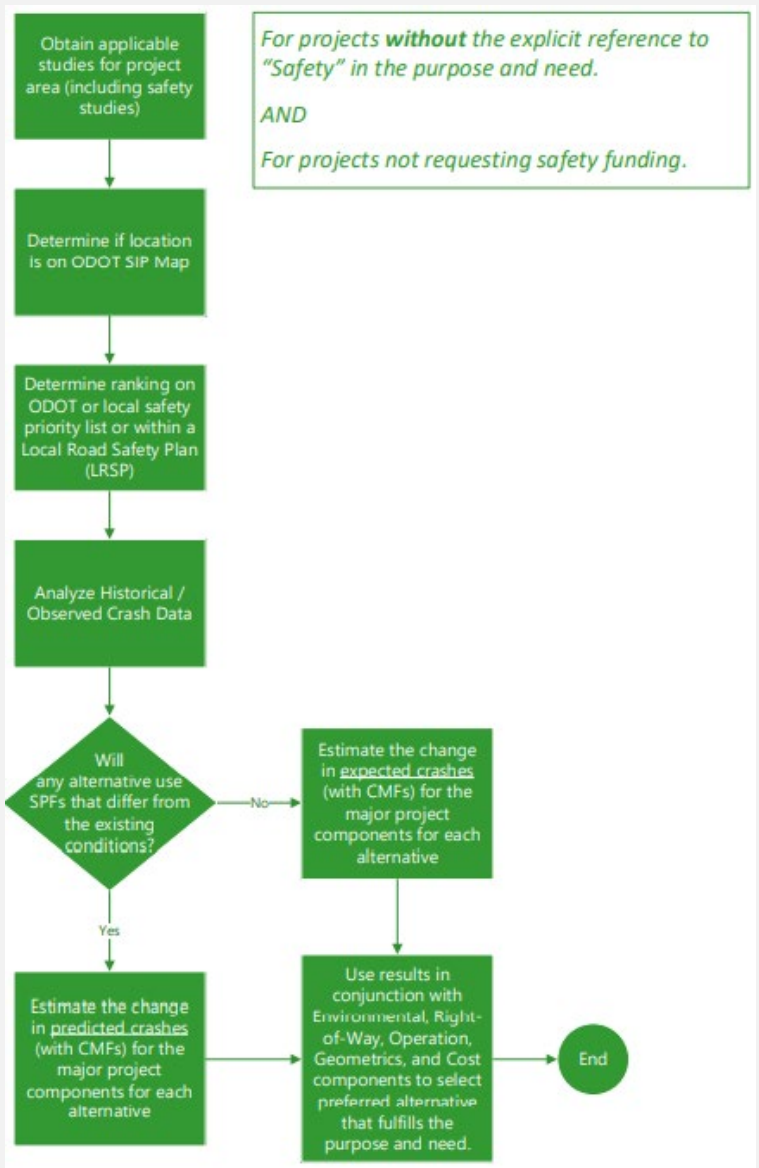


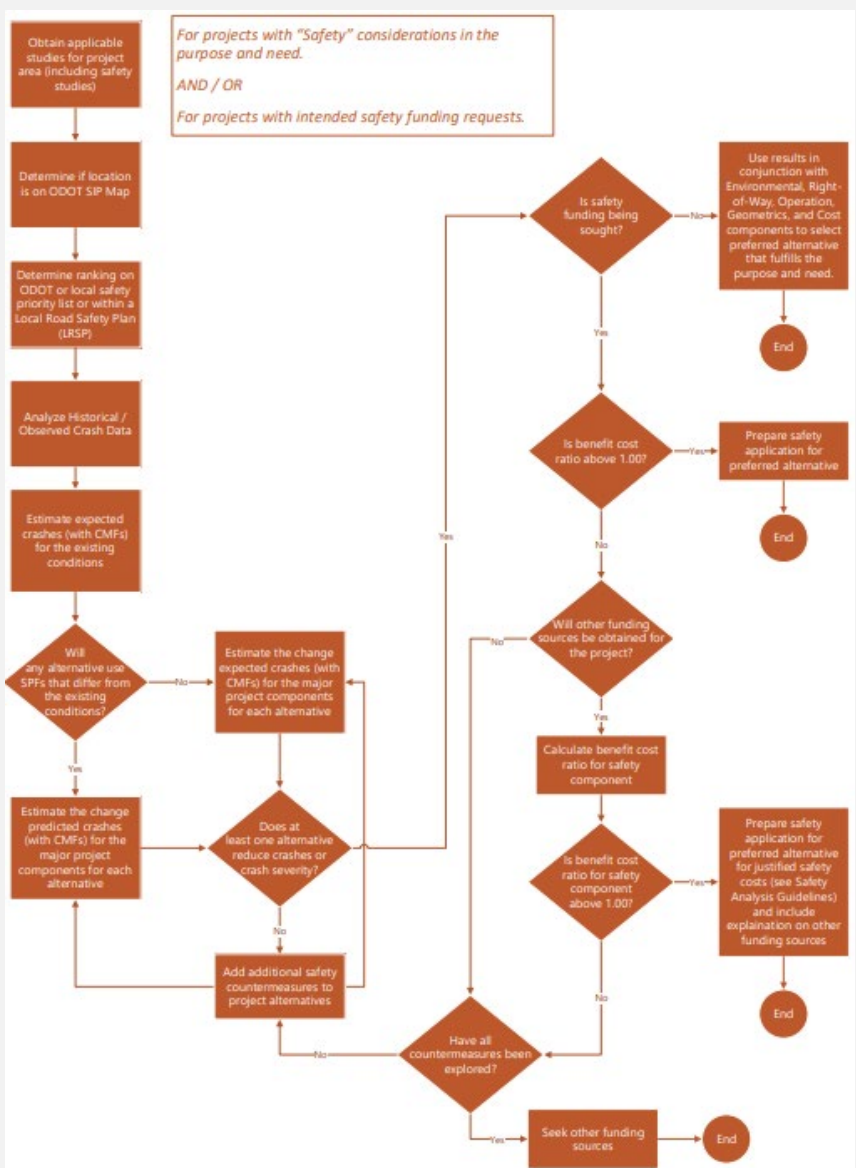
Safety Assessment Process



Safety Assessment Process





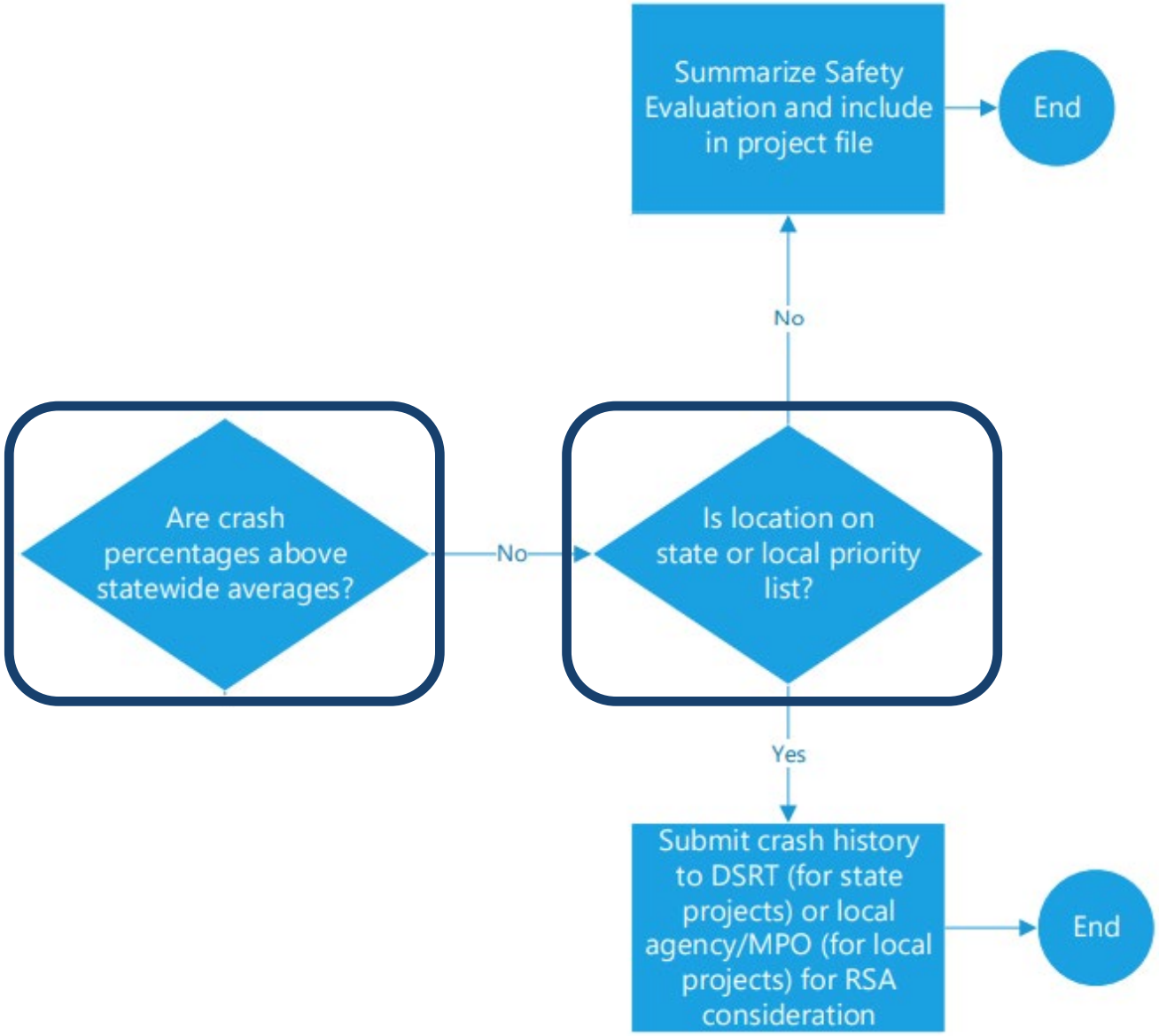


Non-Complex Projects

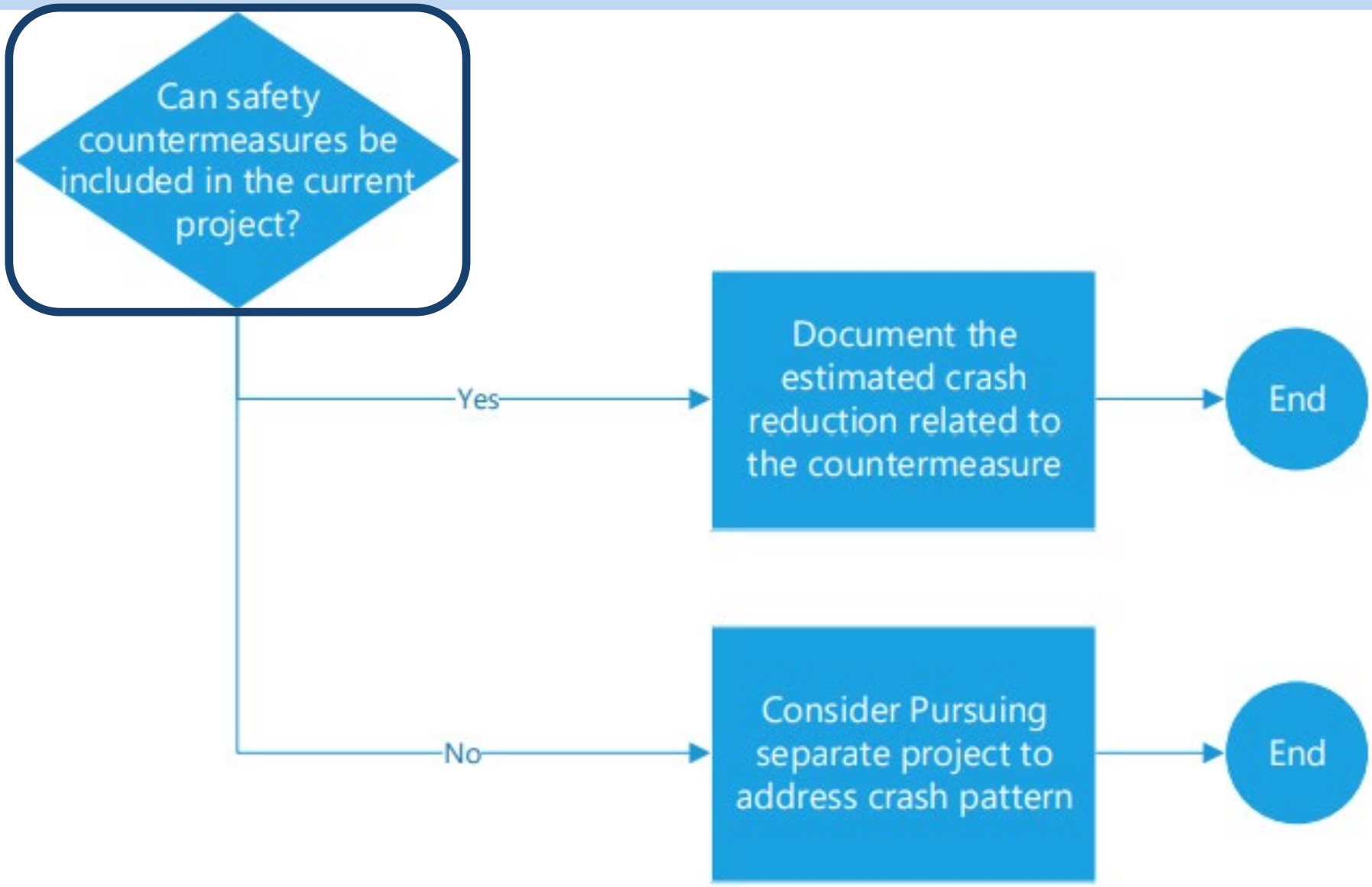
Source: Ohio DOT


Source: Ohio DOT

Non-Complex Projects



Non-Complex Projects



Non-Complex Projects

Project Safety Analysis Checklist
Non-Complex Projects

General Information

Project Name		PID	
Project Description		ODOT District	
		ODOT Project Manager	
Project Limits		Date Performed	

Priority Lists

ODOT SIP Map			
Priority List Rankings	List	Ranking	Location

Historical Crash Data

Crash Analysis Years		Total Crash Frequency	
Fatal Crash Frequency		Injury Crash Frequency	
Historical Crash Analysis			

DDSA Process

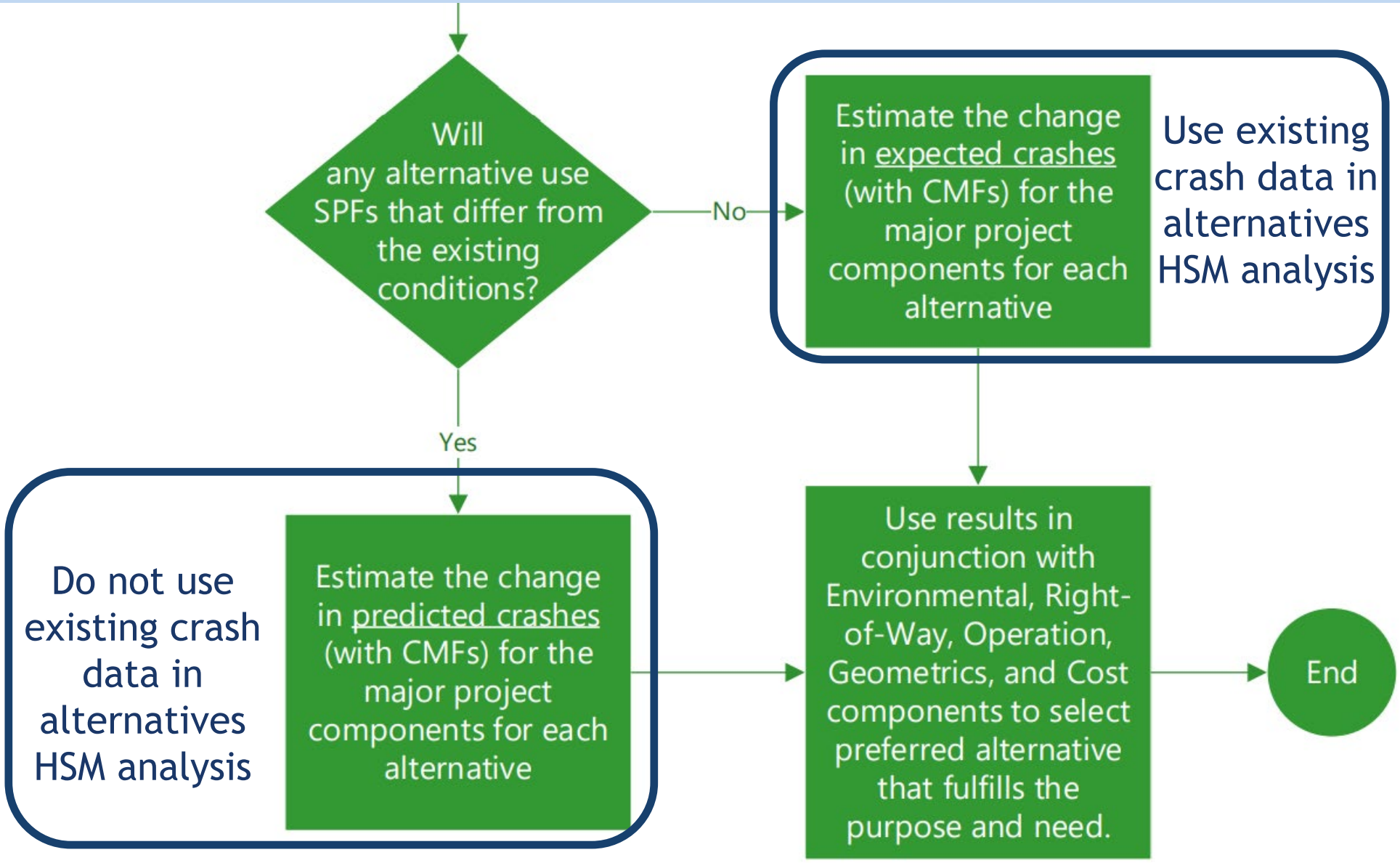
Are crash frequencies above statewide averages?		
Data forwarded for RSA consideration?		
Can safety countermeasures be included in the current project?		

Complex Projects (No Safety Component)

Source: Ohio DOT

Source: Ohio DOT

Complex Projects (No Safety Component)



Complex Projects (No Safety Component)

Project Safety Analysis Checklist
Complex Projects (Alternatives Analysis) with Safety Component

General Information

Project Name		PID	
Project Description		ODOT District	
		ODOT Project Manager	
Project Limits		Date Performed	

Priority Lists

ODOT SIP Map			
Priority List Rankings	List	Ranking	Location

Historical Crash Data

Crash Analysis Years		Total Crash Frequency	
Fatal Crash Frequency		Injury Crash Frequency	

Historical Crash Analysis

Complex Projects (No Safety Component)

DDSA Process		
Will any alternative use SPFs that differ from existing conditions?		
Estimate the change in	Expected Crashes	

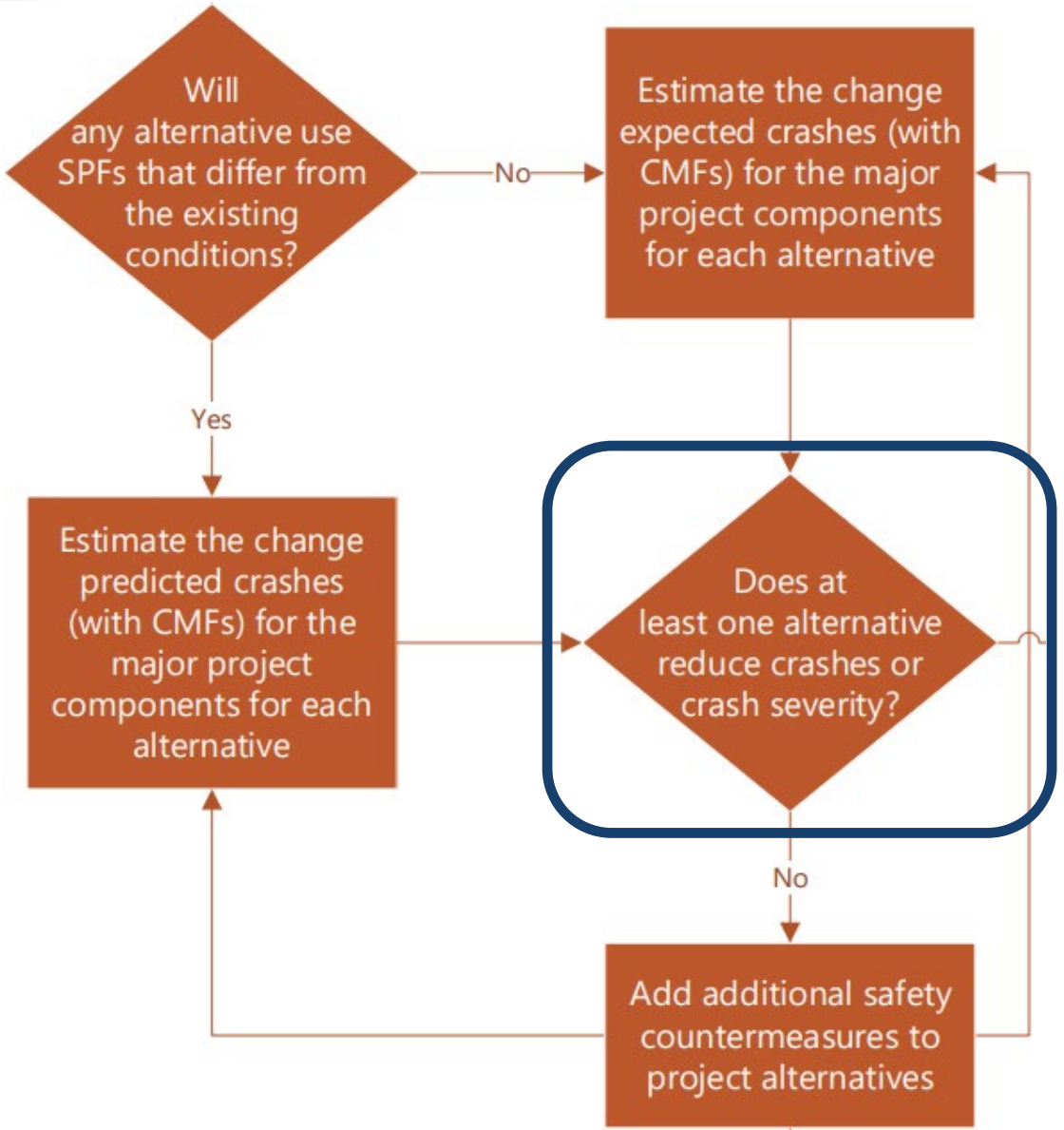
ECAT FOR EXISTING CONDITIONS		KA	B	C	O	Total
Predicted	Existing Conditions					
Expected	Existing Conditions					
PSI	Existing Conditions					
Expected	Alternative 1					

Applying for safety funding? (If YES, attach safety funding application)		Other funding sources:
Will funding sources other than safety be obtained?		

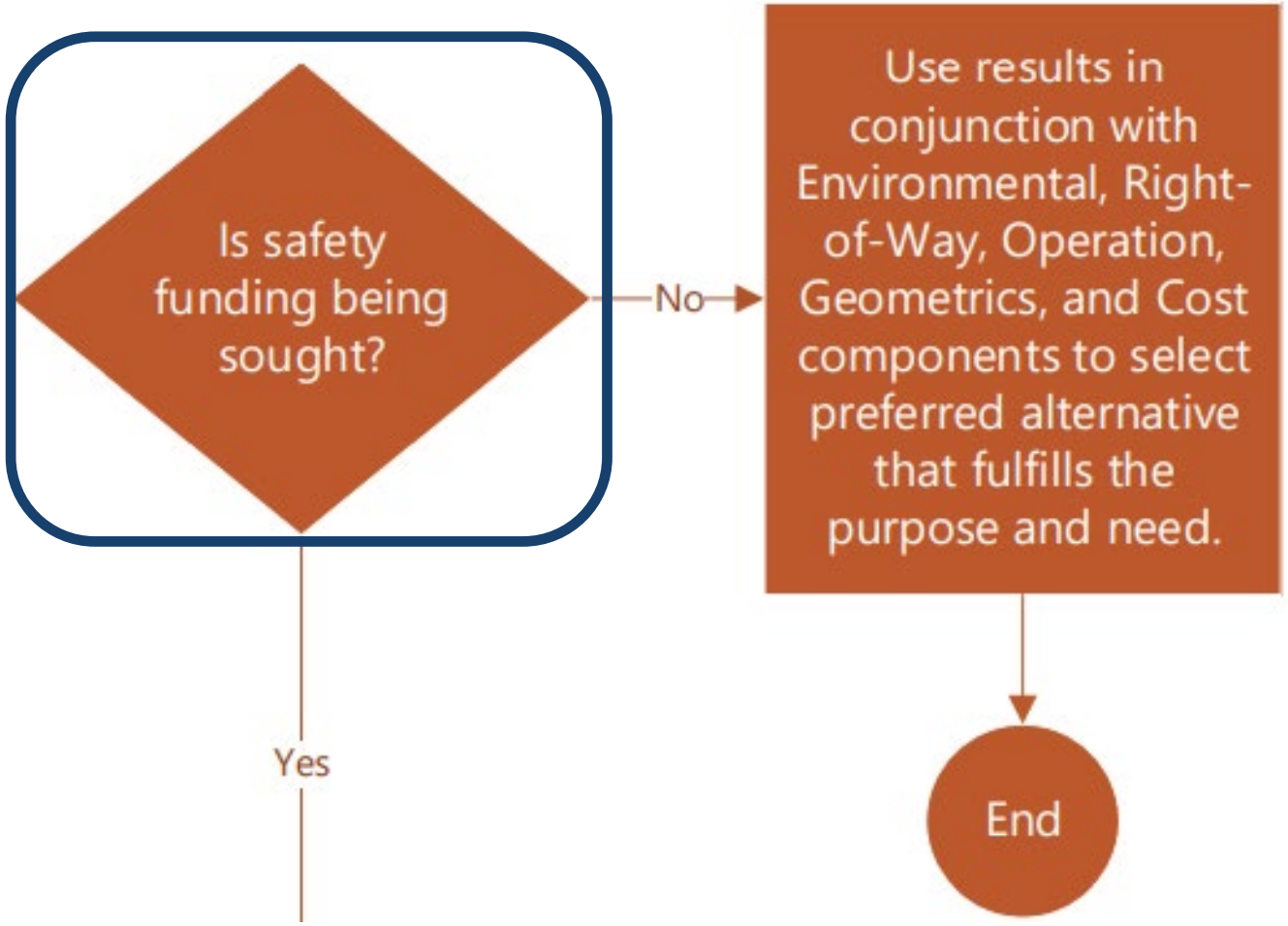
Complex Projects with Safety Component

Source: Ohio DOT

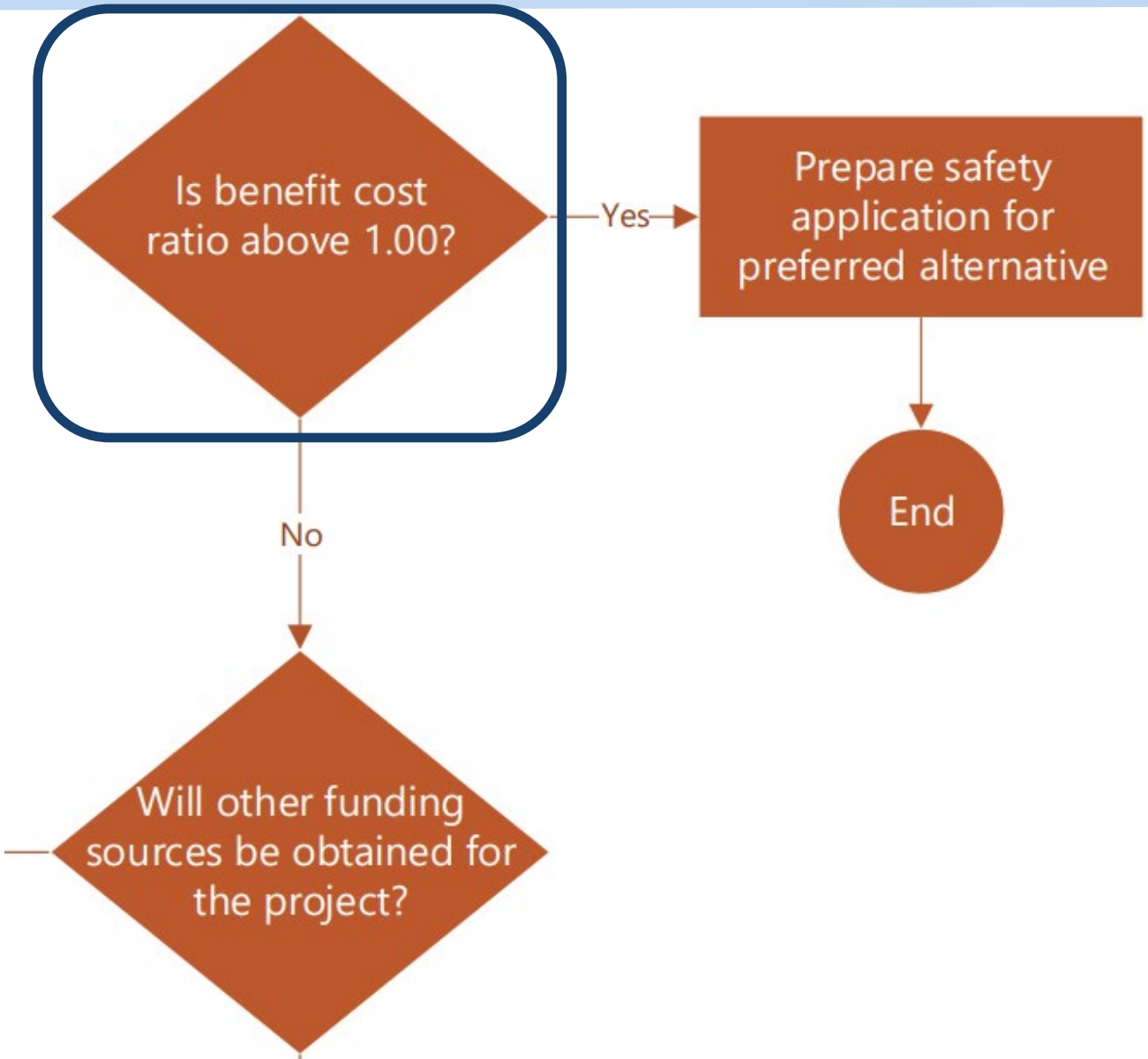
Complex Projects with Safety Component



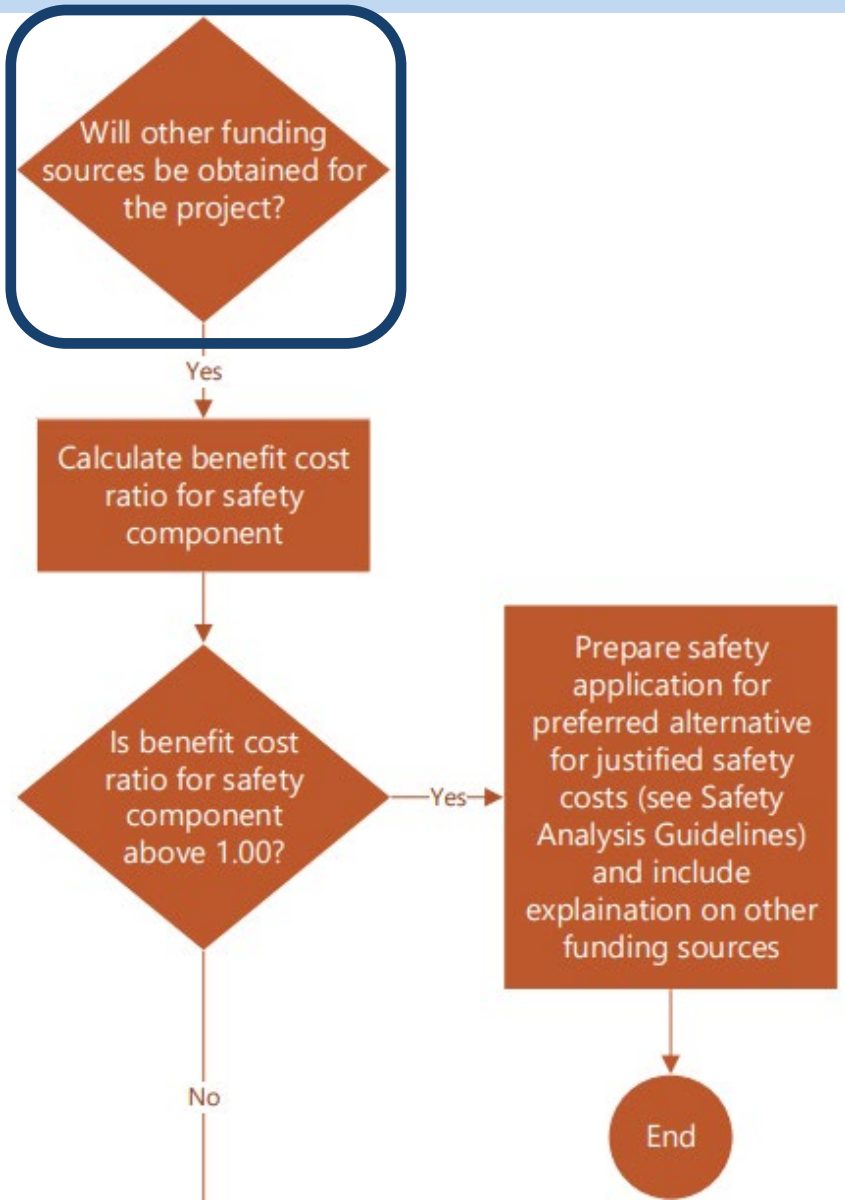
Complex Projects with Safety Component



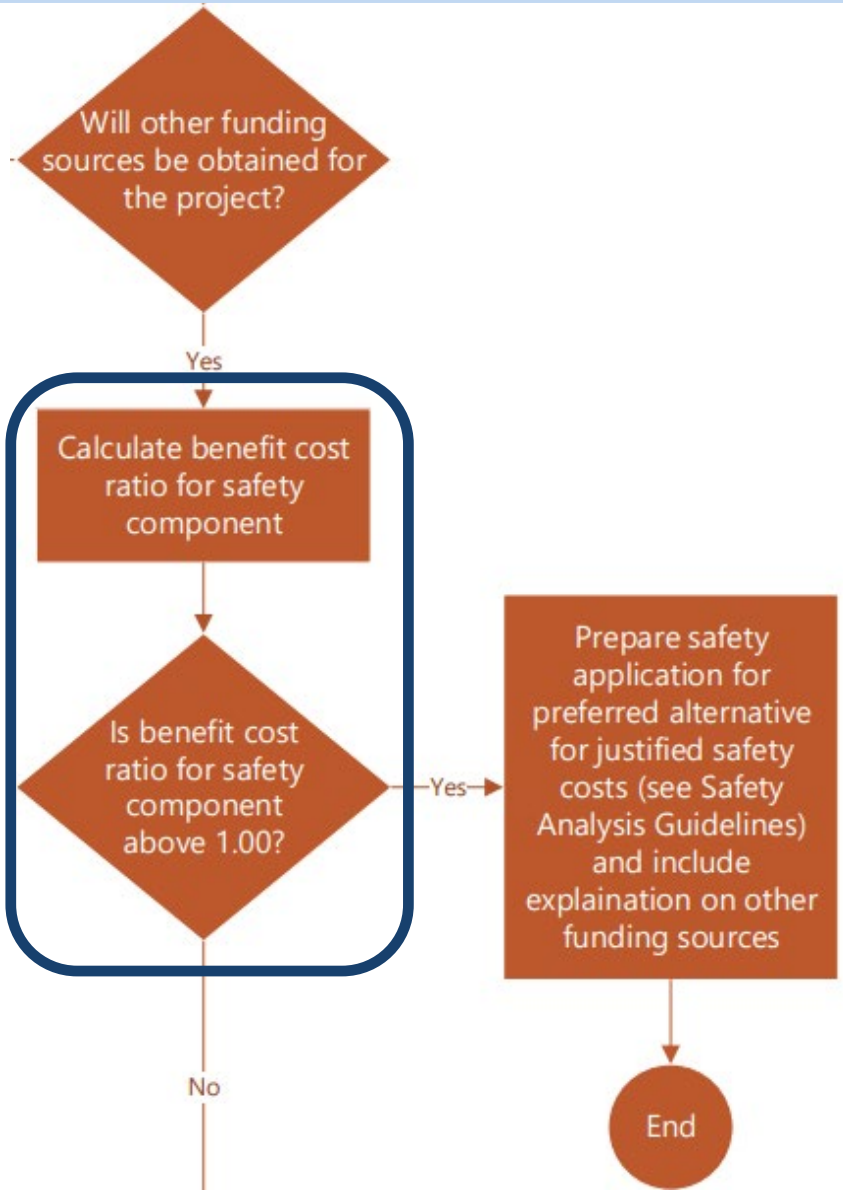
Complex Projects with Safety Component



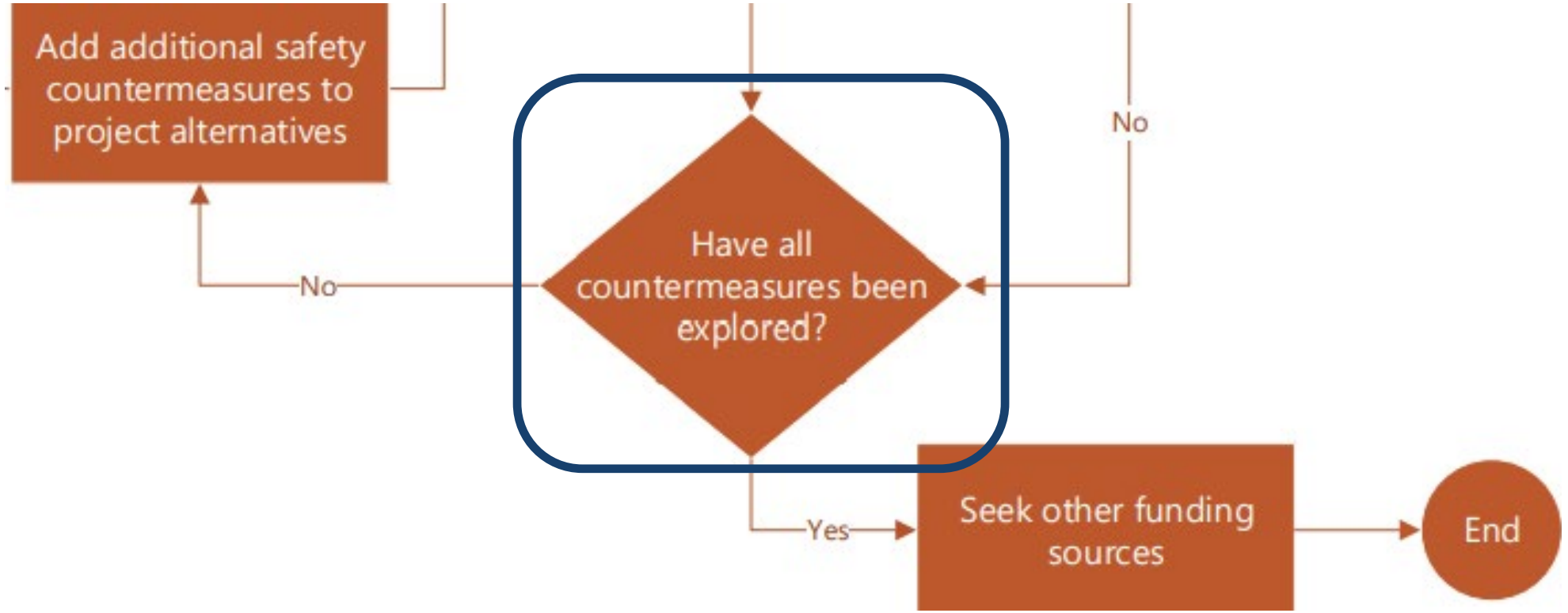
Complex Projects with Safety Component



Complex Projects with Safety Component



Complex Projects with Safety Component



Complex Projects with Safety Component

Project Safety Analysis Checklist
Complex Projects (Alternatives Analysis) with Safety Component

General Information

Project Name		PID	
Project Description		ODOT District	
		ODOT Project Manager	
Project Limits		Date Performed	

Priority Lists

ODOT SIP Map			
Priority List Rankings	List	Ranking	Location

Historical Crash Data

Crash Analysis Years		Total Crash Frequency	
Fatal Crash Frequency		Injury Crash Frequency	

Historical Crash Analysis

Complex Projects with Safety Component

DDSA Process	
Will any alternative use SPFs that differ from existing conditions?	
Estimate the change in	Expected Crashes

ECAT FOR EXISTING CONDITIONS		KA	B	C	O	Total
Predicted	Existing Conditions					
Expected	Existing Conditions					
PSI	Existing Conditions					
Expected	Alternative 1					

Applying for safety funding? (If YES, attach safety funding application)		Other funding sources:
Will funding sources other than safety be obtained?		

Overview

DDSA

Non-Complex

- Minimum Assessment
- Apply countermeasures if needed & able

Complex - No Safety

- Minimum Assessment
- Estimate change in Predicted/Expected Crashes

Complex - Safety

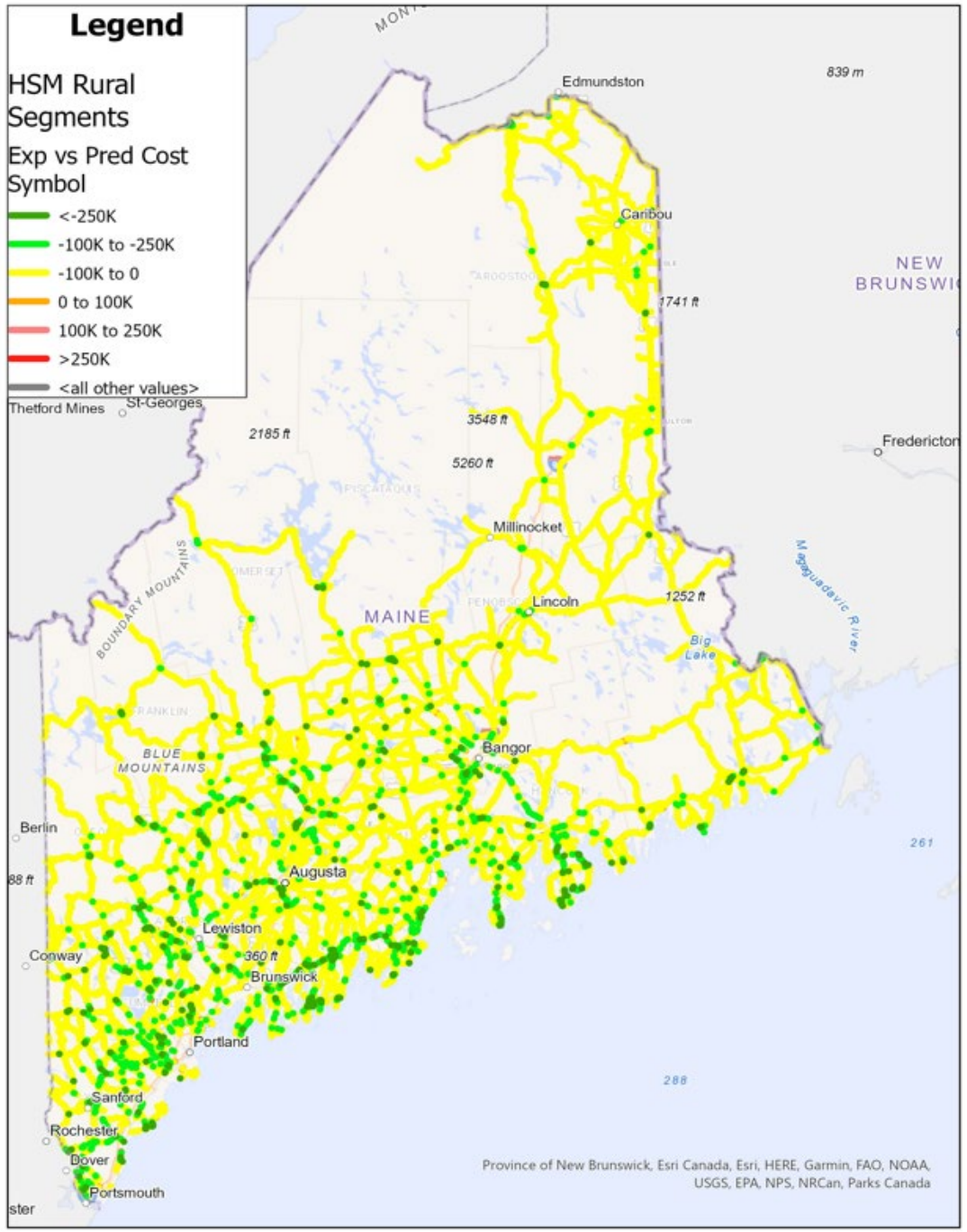
- Minimum Assessment
- Estimate change in Predicted/Expected Crashes (must reduce)
- Requires B/C over 1 for project or safety component of project for safety funding eligibility

Brenton Bogard
Ohio Department of Transportation
Brenton.Bogard@dot.ohio.gov

MaineDOT Rural Two Lane Network Screening using Part C of HSM

Initial Expectations

- Resultant dataset would be data driven.
- Generate Predictive Results and Expected Results using 3,5, and 10 Years of Observed Crash Data
- Publish GIS version of the results to ArcGIS Online (AGOL) and use applications like AGOL Dashboards to review the results.
- Identify any **new** data elements that might be needed.
- Create different visualizations



Example of Final GIS Product

HSM Seg Def	NUMYEARS	RTCODE	BMP	EMP	CURVE ID	HZ GENERAL TYPE	SEGMENT LENGTH	HZ CURVE RADIUS	HZ CURVE LENGTH	CURVE LEN MILES	GREATEST SLOPE	MEAS SUPER	SUPERELEV VAR	RURAL DESIGN SUPER	SUPERELEVATION VARIANCE RURAL	COMBINE CMF	EXPECTED COST PER YEAR	EXPECTED 20YR WORTH	EXPECTED 10YR WORTH	EXC CRA PER
HSM Two Way Segment	3	0001X	439.887	439.907	21910	Tangent	0.02	0	1633.998	0.309	5.858099					1.217542	$3,377.80	$38,743.10	$24,860.90	
HSM Two Way Segment	3	0001X	439.907	440.135	21908	Curve	0.228	6521.093	1193.948	0.226	6.180926	2.48507	0	2.2	0	1.322383	$69,042.86	$791,916.16	$508,161.46	
HSM Two Way Segment	3	0001X	440.135	440.14	21907	Curve	0.005	6557.335	1057.185	0.2	6.180926	1.795823	0.004042	2.2	0.404177	1.327902	$898.53	$10,306.07	$6,613.26	
HSM Two Way Segment	3	0001X	440.14	440.335	21907	Curve	0.195	6557.335	1057.185	0.2	6.180926	1.795823	0.004042	2.2	0.404177	1.324186	$65,452.21	$750,731.69	$481,733.96	
HSM Two Way Segment	3	0001X	440.335	440.396	21905	Tangent	0.061	0	710.024	0.134	6.115754					1.28036	$11,067.93	$126,948.29	$81,460.93	
HSM Two Way Segment	3	0001X	440.396	440.435	21905	Tangent	0.039	0	710.024	0.134	2.703655					1.103759	$19,189.16	$220,098.15	$141,233.89	
HSM Two Way Segment	3	0001X	440.435	440.472	21905	Tangent	0.037	0	710.024	0.134	2.727801					1.103759	$6,033.99	$69,209.39	$44,410.69	
HSM Two Way Segment	3	0001X	440.472	440.706	21904	Curve	0.234	5760.579	1239.514	0.235	2.727801	3.643722	0	2.4	0	1.14599	$52,406.78	$601,101.64	$385,718.46	
HSM Two Way Segment	3	0001X	440.706	440.81	21902	Tangent	0.104	0	958.611	0.182	0.892723					1.027291	$16,082.14	$184,460.88	$118,365.95	
HSM Two Way Segment	3	0001X	440.81	440.89	21902	Tangent	0.08	0	958.611	0.182	0.892723					1.027076	$36,796.66	$422,054.79	$270,826.62	
HSM Two Way Segment	3	0001X	440.89	440.921	21902	Tangent	0.031	0	958.611	0.182	0.892723					1.023683	$5,007.04	$57,430.35	$36,852.25	
HSM Two Way Segment	3	0001X	440.921	441.033	21902	Tangent	0.112	0	958.611	0.182	0.622954					1.140427	$19,564.40	$224,402.13	$143,995.69	
HSM Two Way Segment	3	0001X	441.033	441.178	21900	Curve	0.145	7792.233	768.585	0.146	0.622954	-2.48479	0.024848	0	2.484791	1.326893	$43,432.83	$498,171.14	$319,669.41	
HSM Two Way Segment	3	0001X	441.178	441.279	21899	Curve	0.101	7152.955	539.035	0.102	0.622954	-2.26835	0.022684	0	2.268352	1.35071	$19,851.77	$227,698.24	$146,110.76	
HSM Two Way Segment	3	0001X	441.279	441.357	21898	Curve	0.078	2351.125	408.693	0.077	0.622954	-3.9413	0.085413	4.6	8.541301	1.905391	$19,107.99	$219,167.14	$140,636.47	
HSM Two Way Segment	3	0001X	441.357	441.378	21897	Curve	0.021	2077.886	113.422	0.021	0.622954	1.153759	0.036462	4.8	3.646241	2.828879	$6,397.31	$73,376.64	$47,084.76	
HSM Two Way Segment	3	0001X	441.378	441.478	21896	Curve	0.1	7766.281	531.558	0.101	0.771609	2.367438	0	0	0	1.259126	$33,464.59	$383,836.21	$246,302.30	
HSM Two Way Segment	3	0001X	441.478	441.61	21895	Curve	0.132	2196.487	983.585	0.186	0.771609	4.289786	0.005102	4.8	0.510214	1.330311	$25,677.54	$294,519.36	$188,988.93	
HSM Two Way Segment	3	0001X	441.61	441.664	21895	Curve	0.054	2196.487	983.585	0.186	1.771609	4.289786	0.005102	4.8	0.510214	1.341331	$9,945.76	$114,077.08	$73,201.66	
HSM Two Way Segment	3	0001X	441.664	441.806	21893	Tangent	0.142	0	674.934	0.128	1.771609					1.273013	$53,137.55	$609,483.51	$391,096.99	
HSM Two Way Segment	3	0001X	441.806	441.874	21893	Tangent	0.068	0	674.934	0.128	1.072193					1.190754	$24,818.78	$284,669.45	$182,668.38	
HSM Two Way Segment	3	0001X	441.874	441.887	21893	Tangent	0.013	0	674.934	0.128	0.311567					1.190754	$2,199.85	$25,232.11	$16,191.09	
HSM Two Way Segment	3	0001X	441.887	441.97	21891	Curve	0.083	1809.307	921.302	0.174	0.311567	3.692534	0.015075	5.2	1.507466	1.428109	$31,097.09	$356,681.17	$228,877.29	
HSM Two Way Segment	3	0001X	441.97	442.061	21891	Curve	0.091	1809.307	921.302	0.174	1.914301	3.692534	0.015075	5.2	1.507466	1.591127	$35,455.97	$406,677.18	$260,959.03	
HSM Two Way Segment	3	0001X	442.061	442.161	21890	Curve	0.1	7209.178	526.926	0.1	1.914301	-1.87698	0.01877	0	1.876975	1.652192	$38,268.41	$438,935.65	$281,658.83	
HSM Two Way Segment	3	0001X	442.161	442.272	21888	Tangent	0.111	0	1859.997	0.352	1.914301					1.464292	$37,496.08	$430,077.08	$275,974.41	
HSM Two Way Segment	3	0001X	442.272	442.423	21888	Tangent	0.151	0	1859.997	0.352	0.093924					1.464292	$29,851.89	$342,398.83	$219,712.51	
HSM Two Way Segment	3	0001X	442.423	442.5	21888	Tangent	0.077	0	1859.997	0.352	2.734285					1.680932	$16,677.94	$191,294.66	$122,751.09	
HSM Two Way Segment	3	0001X	442.5	442.551	21888	Tangent	0.051	0	1859.997	0.352	2.734285					1.655285	$11,522.84	$132,166.07	$84,809.11	
HSM Two Way Segment	3	0001X	442.551	442.594	21888	Tangent	0.043	0	1859.997	0.352	2.313108					1.655285	$27,489.12	$315,298.04	$202,322.32	
HSM Two Way Segment	3	0001X	442.594	442.783	21888	Tangent	0.189	0	1859.997	0.352	1.685477					1.441951	$71,568.56	$820,885.74	$526,750.83	
HSM Two Way Segment	3	0001X	442.783	442.924	21888	Tangent	0.141	0	1859.997	0.352	3.894743					1.586146	$48,302.49	$554,025.75	$355,510.53	
HSM Two Way Segment	3	0001X	442.924	442.994	21888	Tangent	0.07	0	1859.997	0.352	3.301505					1.586146	$15,392.30	$176,548.47	$113,288.67	
HSM Two Way Segment	3	0001X	442.994	443.204	21888	Tangent	0.21	0	1859.997	0.352	1.954138					1.310937	$55,947.66	$641,715.25	$411,779.65	
HSM Two Way Segment	3	0001X	443.204	443.25	21888	Tangent	0.046	0	1859.997	0.352	1.324444					1.179924	$8,286.59	$95,046.53	$60,990.02	
HSM Two Way Segment	3	0001X	443.25	443.449	21888	Tangent	0.199	0	1859.997	0.352	1.324444					1.168477	$38,193.61	$438,077.70	$281,108.29	
HSM Two Way Segment	3	0001X	443.449	443.635	21888	Tangent	0.186	0	1859.997	0.352	1.2032					1.168477	$35,698.55	$409,459.56	$262,744.44	
HSM Two Way Segment	3	0001X	443.635	443.647	21888	Tangent	0.012	0	1859.997	0.352	4.741411					1.285325	$2,456.45	$28,175.29	$18,079.69	
HSM Two Way Segment	3	0001X	443.647	443.859	21879	Curve	0.212	5318.257	1121.129	0.212	5.005099	2.345585	0.002544	2.6	0.254415	1.344218	$61,288.04	$702,968.99	$451,085.31	

Two Way Rural Roadways

- Maine DOT State Urban Rural
- Two Way
- Doesn't include Interstate or Freeway and Expressway
- Number of Thru Lanes <=3
- Excluding Interstate and Freeway and Expressway road functions you are left with almost 7100 miles of roadway segments that will be evaluated.

FFC	Number of Thru Lanes	Rural Horizontal Curves Miles (mi)	Urban Horizontal Curves Miles	No Horizontal Curves Rural (mi)	No Horizontal Curves
Local	<=3	39.742	10.74	12625.262	1787.009
Interstate	<=3	676.49	163.126	9.943	3.099
Other Freeway or Expressway	<=3	17.07	30.121	0.02	1.39
Other Principal Arterial	<=3	784.128	116.044	7.644	15.728
Minor Arterial	<=3	946.234	214.996	6.988	16.823
Major Collector	<=3	3252.311	446.426	45.255	14.727
Minor Collector	<=3	2065.583	111.718	10.928	1.66
		7781.558	1093.171	12706.04	1840.436

FFC	Number of Thru Lanes	Rural Horizontal Curves Miles (mi)	Urban Horizontal Curves Miles (mi)	No Horizontal Curves Rural (mi)	No Horizontal Curves Urban (mi)
Local	<=3	39.742	10.74	12625.262	1787.009
Other Principal	<=3	784.128	116.044	7.644	15.728
Minor Arterial	<=3	946.234	214.996	6.988	16.823
Major Collector	<=3	3252.311	446.426	45.255	14.727
Minor Collector	<=3	2065.583	111.718	10.928	1.66
		7087.998	899.924	12696.077	1835.947

Crash Modification Factors (CMF's) used

- Lane Width
- Shoulder Width and Type
- Horizontal Curves
- Super Elevation
- Grades
- Driveway Density
- Centerline Rumblestrips
- Passing Lanes
- Two Way Left Turn Lane
- Roadside Design
- Lighting

Worksheet 1B -- Crash Modification Factors for Rural Two-Lane Two-Way Roadway Segments

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
CMF for Lane Width	CMF for Shoulder Width and Type	CMF for Horizontal Curves	CMF for Super-elevation	CMF for Grades	CMF for Driveway Density	CMF for Centerline Rumble Strips	CMF for Passing Lanes	CMF for Two-Way Left-Turn Lane	CMF for Roadside Design	CMF for Lighting	CMF for Automated Speed Enforcemen	Combined CMF
CMF 1r	*CMF 2r*	*CMF 3r*	*CMF 4r*	*CMR 5r*	*CMF 6r*	*CMF 7r*	*CMF 8r*	*CMF 9r*	*CMF 10r*	*CMF 11r*	*CMF 12r*	*CMF comb*
from Equation 10-11	from Equation 10-12	from Equation 10-13	from Equations 10-14, 10-15, or 10-16	from Table 10-11	from Equation 10-17	from Section 10.7.1	from Section 10.7.1	from Equation 10-18 & 10-19	from Equation 10-20	from Equation 10-21	from Section 10.7.1	(1)x(2)x ... x(11)x(12)
1.02	1.02	1.14	1.00	1.16	1.31	0.94	1.00	1.00	1.07	1.00	1.00	1.814

Data Inputs

- Horizontal and Vertical Curve Data
  - ARAN Database
  - Horizontal Curve Data includes Radius, Length, Superelevation
  - Vertical Curve Data includes Start and End Slopes
- Centerline Rumblestrips
  - Managed in the Linear Referencing System (LRS)
- Cross Sectional Data
  - Managed in the LRS
  - Lane and Shoulder Types and Widths
    - Passing Lanes and Truck Lanes
  - Guardrail data managed in Maintenance System
- Factored AADT's
  - AADT's managed in the LRS and factors are used to factor this value to the current year.
- Observed Crash Crashes
  - All crashes are reviewed and kept in sync with the LRS
  - Expected Results would be compiled based on 3,5, and 10 years of observed crashes

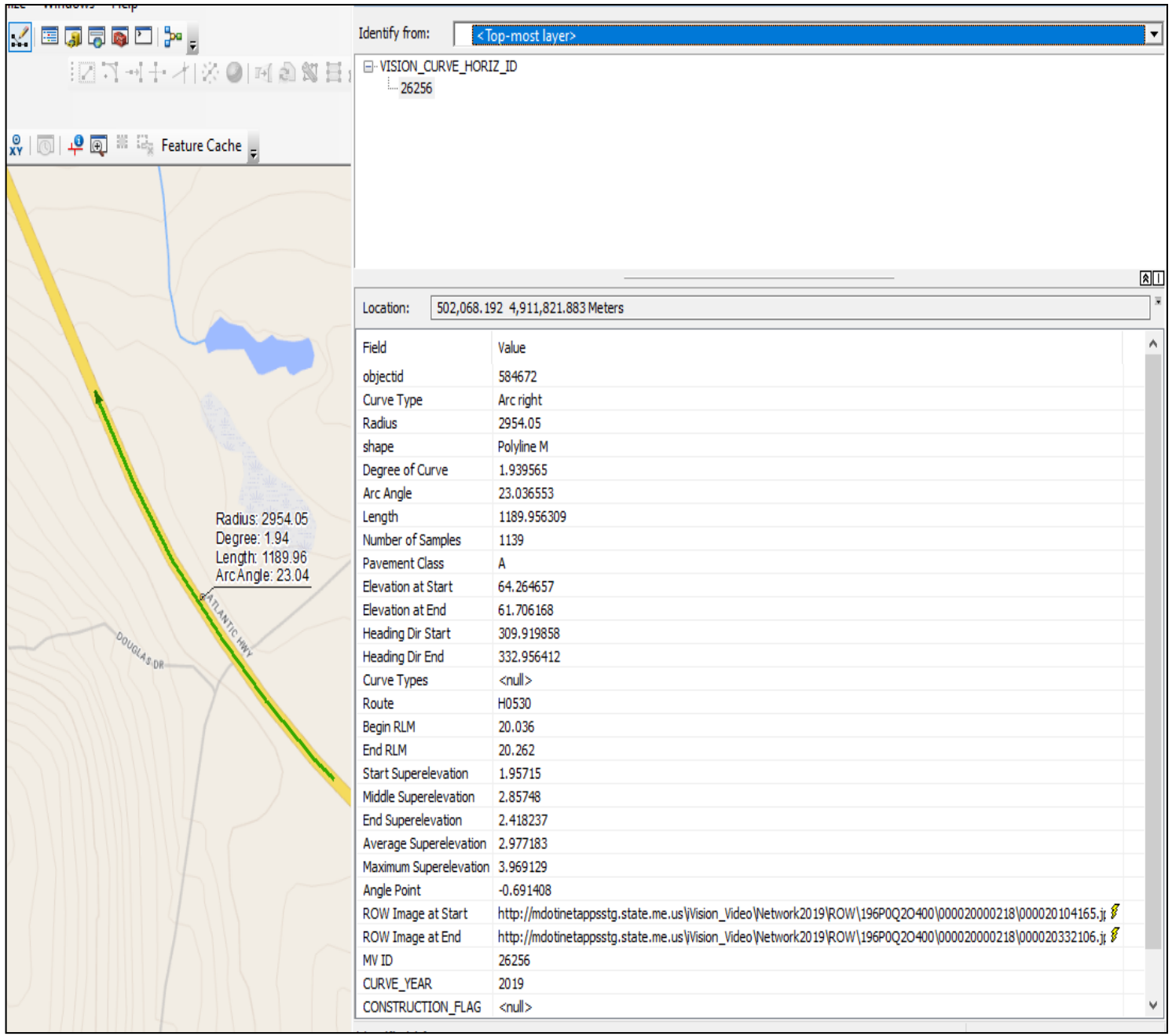
GIS Segmentation

- Nightly Extract, Transform, and Load (ETL) of Road Network Segmentation that includes items from the LRS in addition to other items.
  - 1/10 mile Pavement Data
  - Horizontal and vertical Curve Data Best-Of (2015-2021 Data Collections)
  - Standard LRS Assets used for Reporting (FFC, Street Name, AADT, etc.)
  - Calculated Project Items such as Most Recent Highway Treatment, Full Project History.
  - Current segmentation includes 450,431 segments

Horizontal Curve Data

- Based on report from software used with ARAN.
- Includes Radius, Length, Super Elevation
- Many Routes do include curve data collected for both directions, but HSM segment output set to one side.
- Three Types of Curves

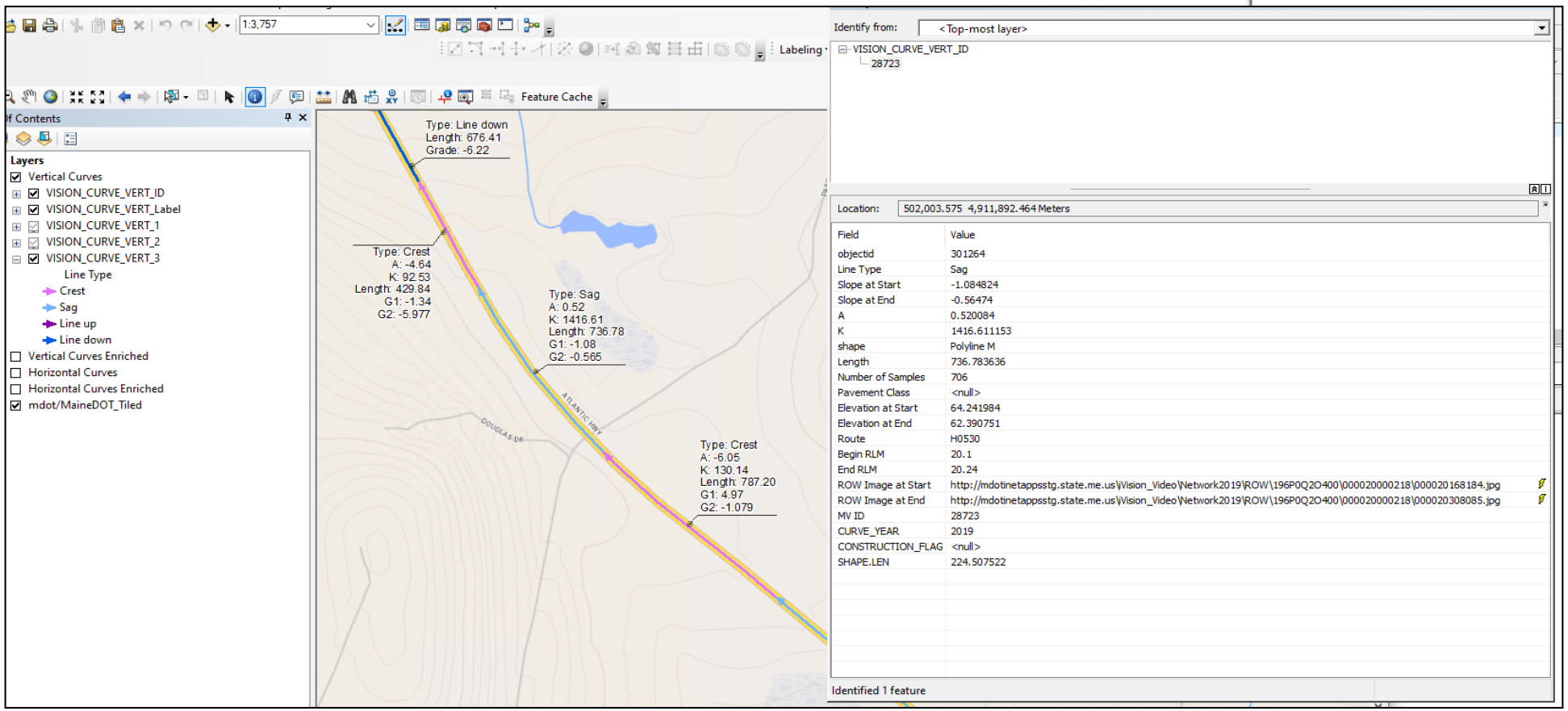
SEG_LEN	TYPE
6632.621	Line
2190.892	Arc right
2129.329	Arc left



Vertical Curve Data

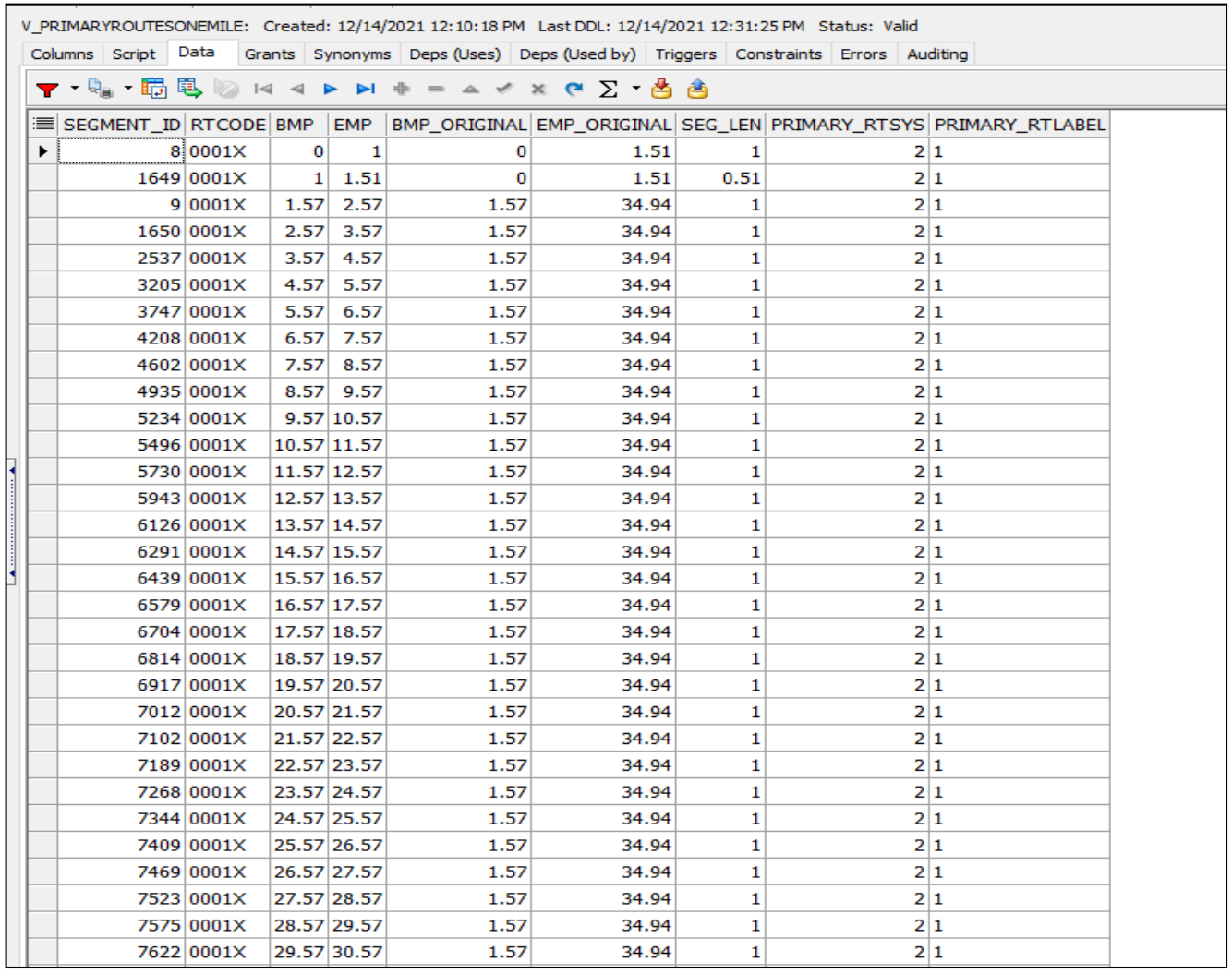
- Used the absolute max of the Start and End Slope
- Multiple Horizontal Tangents were combined and then segmented based on Vertical Curve Changes

SEG_LEN	TYPE
4129.249	Sag
4012.729	Crest
1433.968	Line up
1380.952	Line down



Driveway Density

- Associate e911 geocoded address points to DOT Road Centerlines
- DOT Road Centerlines broken up into ~1 mile segments based on the Primary Route.
  - This was completed using an Oracle View and functions and methods available in the Database to Dissolve segmentation and to create segments of any length.



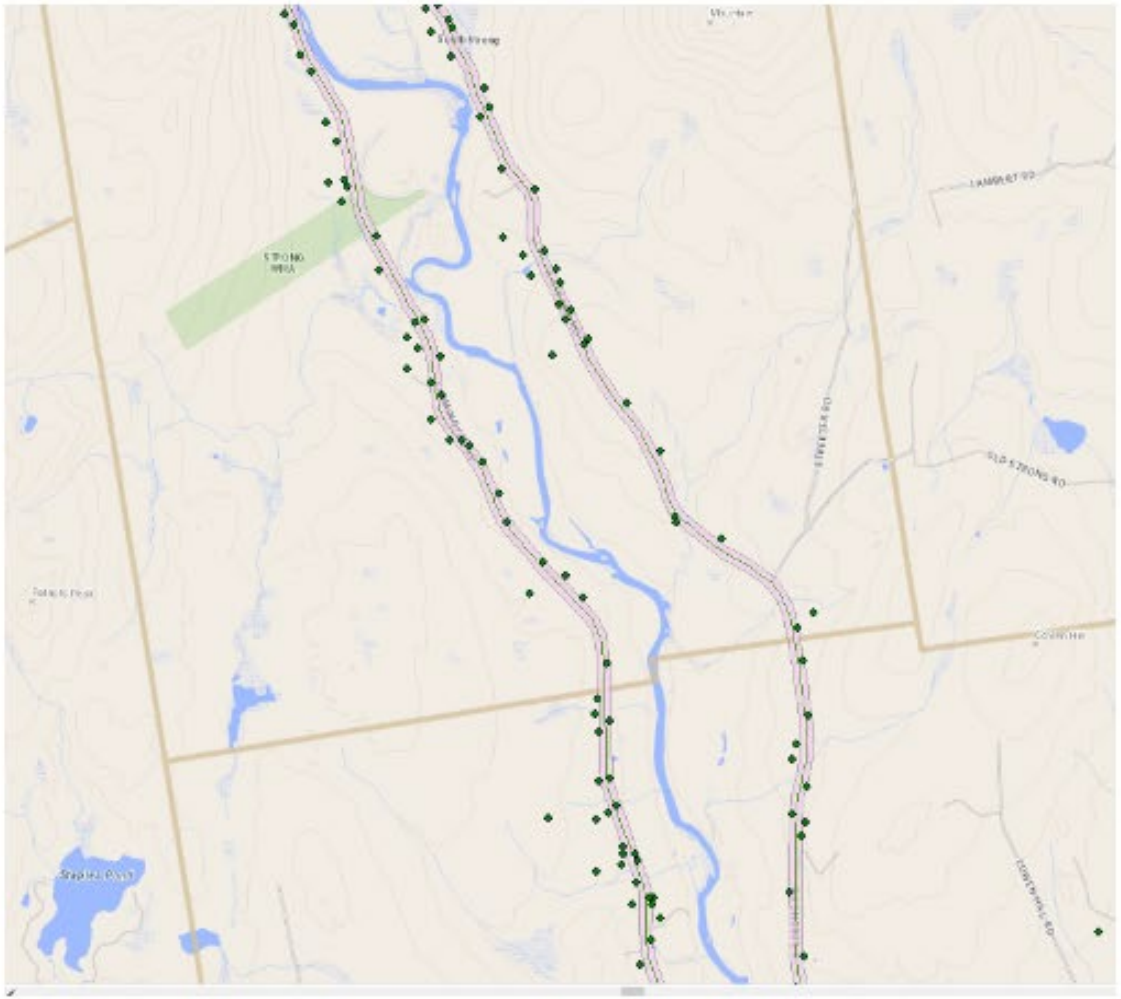
V_PRIMARYROUTESONEMILE: Created: 12/14/2021 12:10:18 PM Last DDL: 12/14/2021 12:31:25 PM Status: Valid

Columns | Script | Data | Grants | Synonyms | Deps (Uses) | Deps (Used by) | Triggers | Constraints | Errors | Auditing

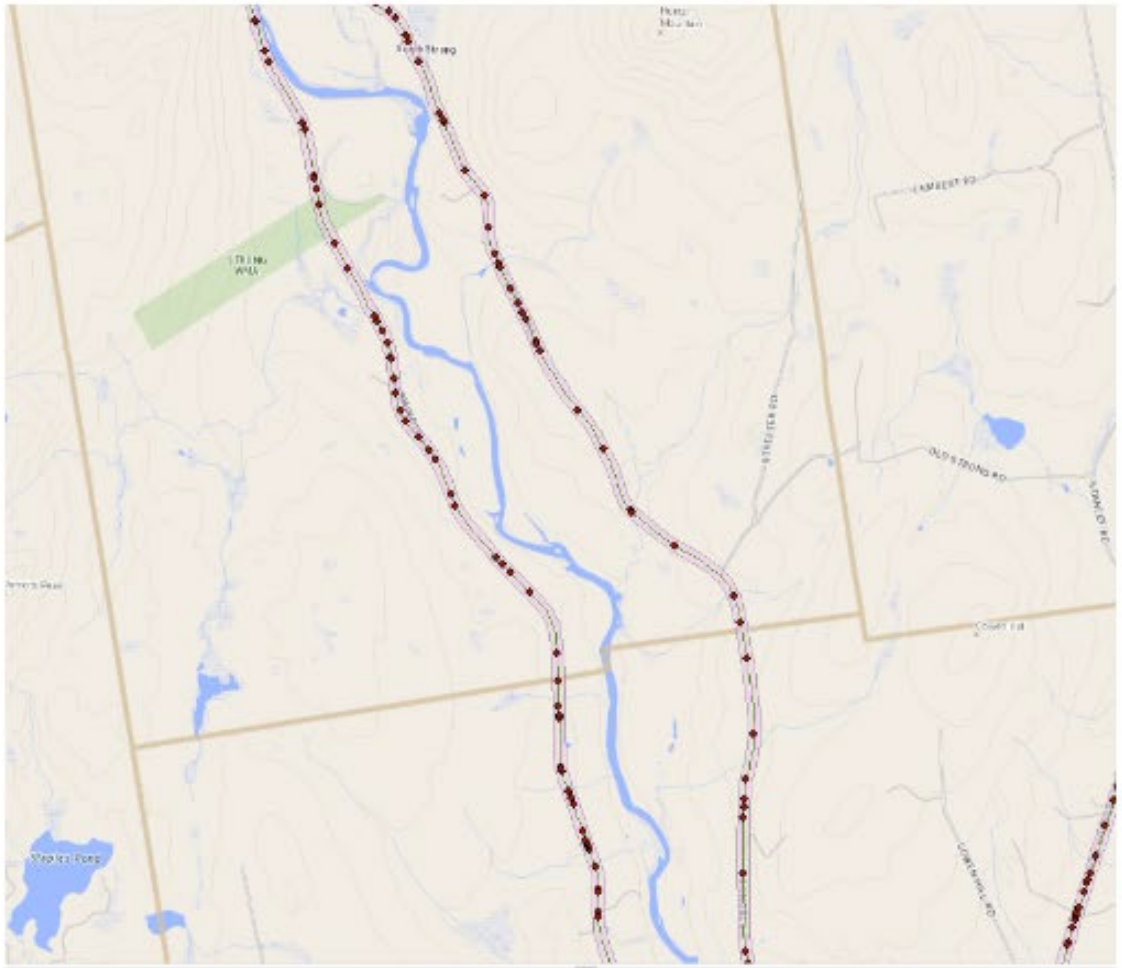
SEGMENT_ID	RTCODE	BMP	EMP	BMP_ORIGINAL	EMP_ORIGINAL	SEG_LEN	PRIMARY_RTSYS	PRIMARY_RTLABEL
8	0001X	0	1	0	1.51	1	2	1
1649	0001X	1	1.51	0	1.51	0.51	2	1
9	0001X	1.57	2.57	1.57	34.94	1	2	1
1650	0001X	2.57	3.57	1.57	34.94	1	2	1
2537	0001X	3.57	4.57	1.57	34.94	1	2	1
3205	0001X	4.57	5.57	1.57	34.94	1	2	1
3747	0001X	5.57	6.57	1.57	34.94	1	2	1
4208	0001X	6.57	7.57	1.57	34.94	1	2	1
4602	0001X	7.57	8.57	1.57	34.94	1	2	1
4935	0001X	8.57	9.57	1.57	34.94	1	2	1
5234	0001X	9.57	10.57	1.57	34.94	1	2	1
5496	0001X	10.57	11.57	1.57	34.94	1	2	1
5730	0001X	11.57	12.57	1.57	34.94	1	2	1
5943	0001X	12.57	13.57	1.57	34.94	1	2	1
6126	0001X	13.57	14.57	1.57	34.94	1	2	1
6291	0001X	14.57	15.57	1.57	34.94	1	2	1
6439	0001X	15.57	16.57	1.57	34.94	1	2	1
6579	0001X	16.57	17.57	1.57	34.94	1	2	1
6704	0001X	17.57	18.57	1.57	34.94	1	2	1
6814	0001X	18.57	19.57	1.57	34.94	1	2	1
6917	0001X	19.57	20.57	1.57	34.94	1	2	1
7012	0001X	20.57	21.57	1.57	34.94	1	2	1
7102	0001X	21.57	22.57	1.57	34.94	1	2	1
7189	0001X	22.57	23.57	1.57	34.94	1	2	1
7268	0001X	23.57	24.57	1.57	34.94	1	2	1
7344	0001X	24.57	25.57	1.57	34.94	1	2	1
7409	0001X	25.57	26.57	1.57	34.94	1	2	1
7469	0001X	26.57	27.57	1.57	34.94	1	2	1
7523	0001X	27.57	28.57	1.57	34.94	1	2	1
7575	0001X	28.57	29.57	1.57	34.94	1	2	1
7622	0001X	29.57	30.57	1.57	34.94	1	2	1

Driveway Density

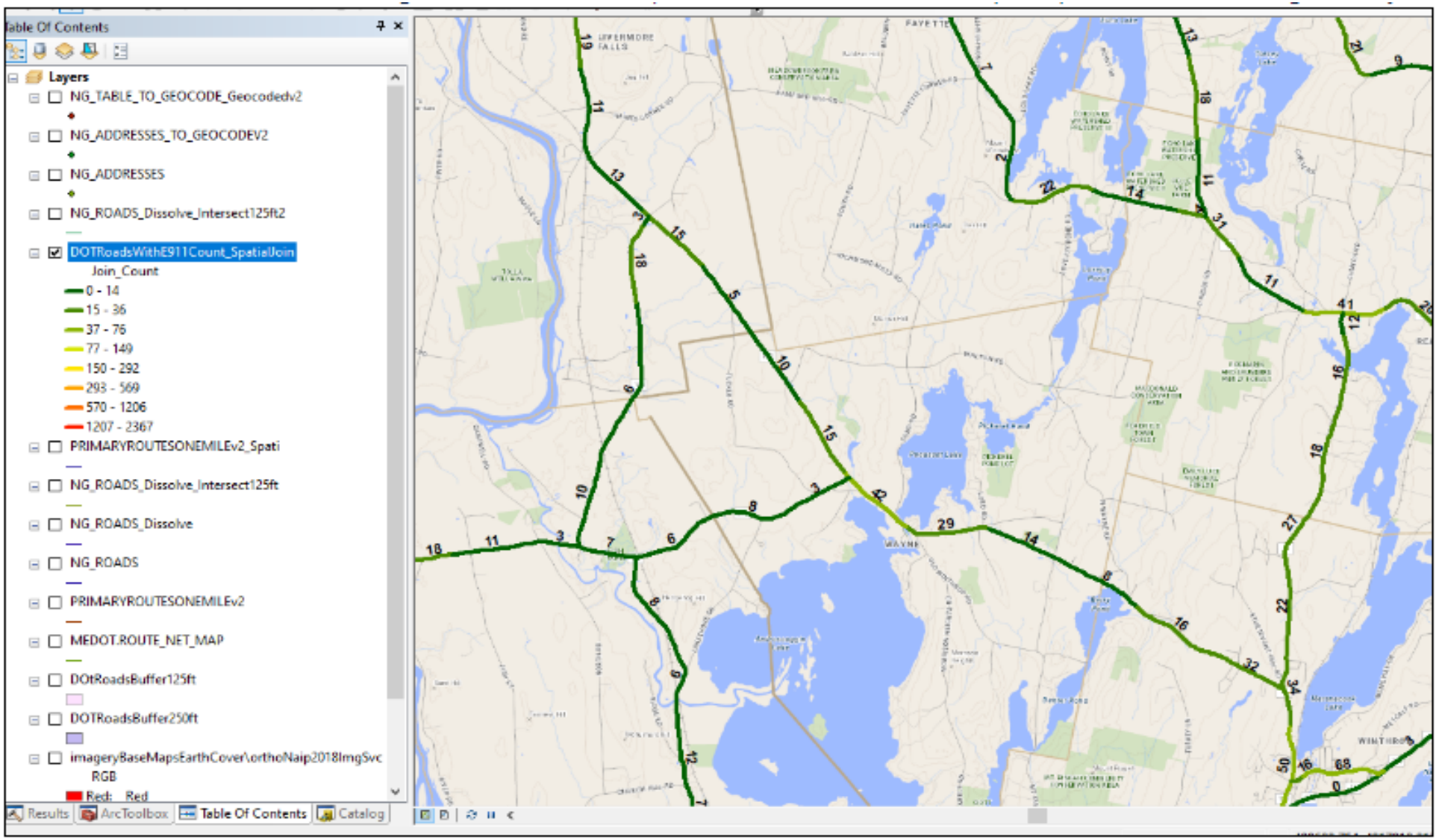
Original E911 Address Point Locations



Snapped Geocoded Points

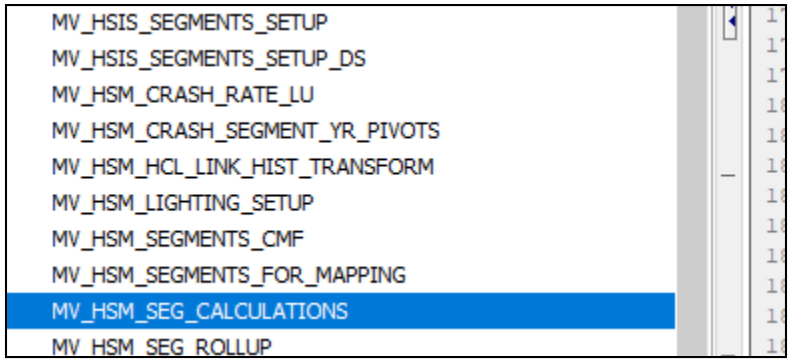


Driveway Density



How Dataset was Put Together

- Logic was adapted using HSM Part C and Excel File for Rural Two Lane Roadways in Oregon https://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/HSM-OR_Rural-Two-lane.xls
- Logic and formulas were adapted for use in Structured Query Language (SQL) in and Oracle Database
- Based on a series of views in the GIS Database that help pull together different objects.



MV_HSM_CRASH_SEGMENT_YR_PIVOTS: Created: 3/15/2022 11:08:36 AM Last DDL: 6/21/2022 9:28:38 AM

Mat. View

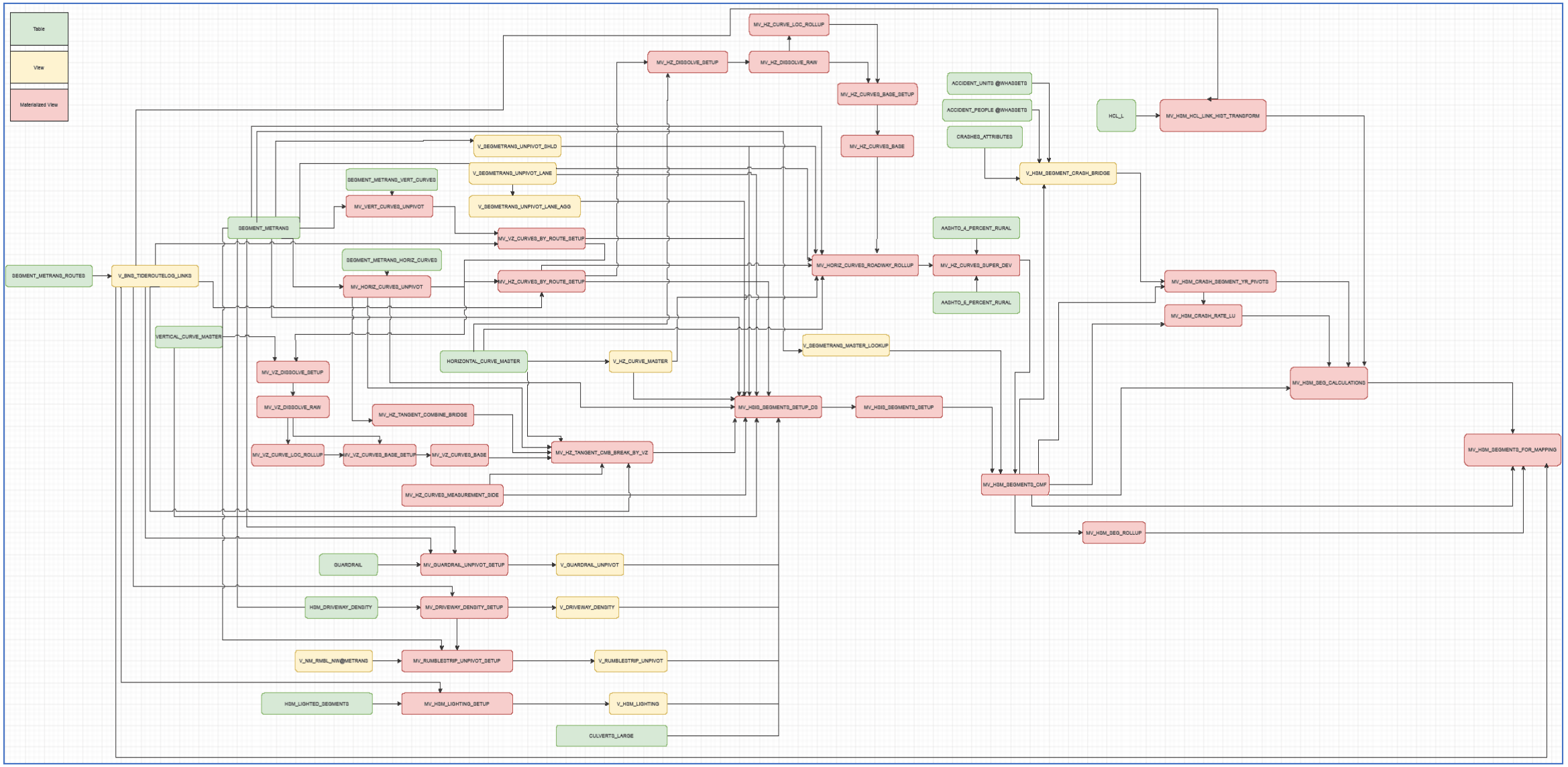
Primary Key: <None>

Columns | Indexes | Constraints | Triggers | Data | Script | Partitioning | Grants | Synonyms | Stats/Size | Referential | Used By | Auditing

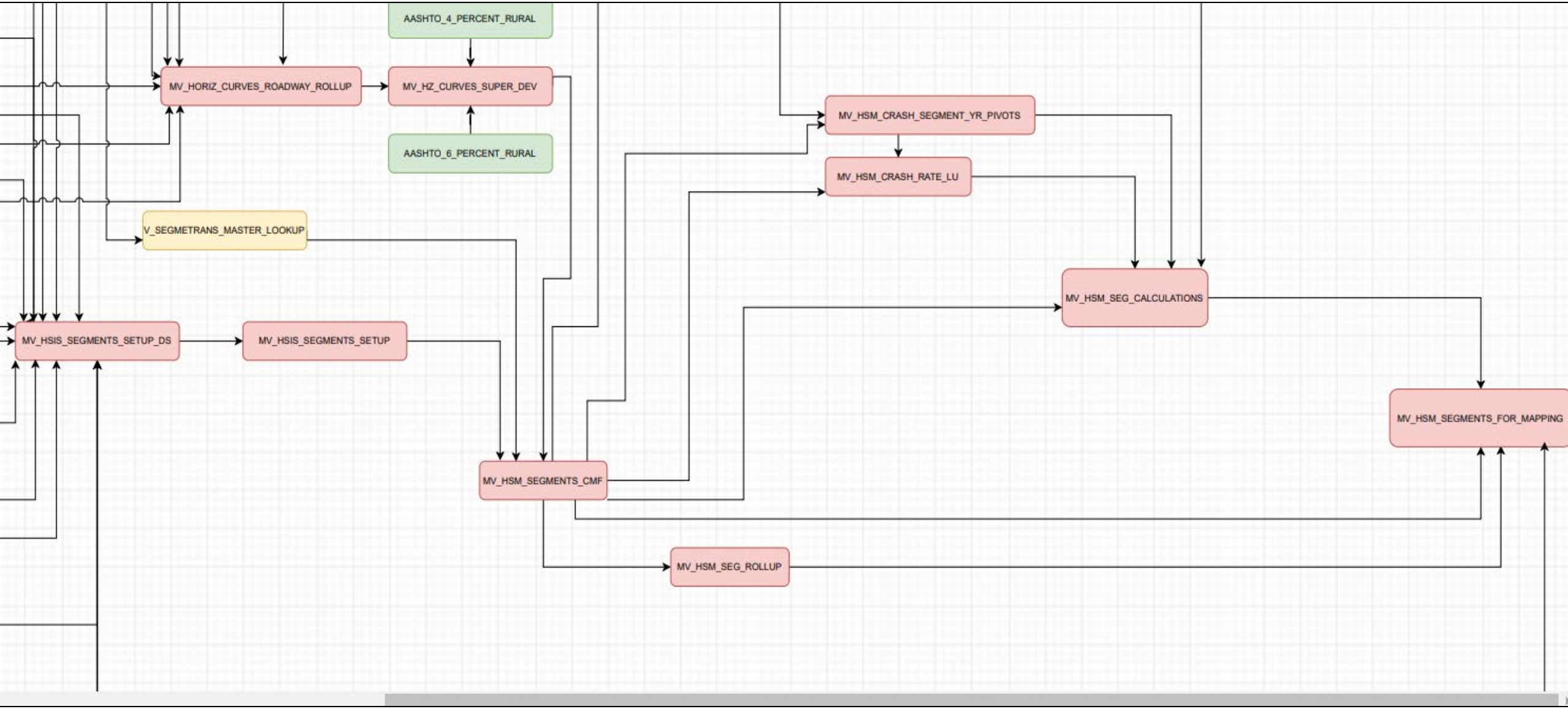
Sort by PK | Desc | Read Only | Auto Refresh

PD_TOTAL	INJ_TOTAL	KEYFIELD	CRASH_GROUP	NUMYEARS_CRASH_GROUP	CRASH_COUNT	AADT_FACT	AVMT	CRASH_RATE	SEGMENT_LENGTH	HZ_GENERAL_TYPE	K_INJ_CRASHES	A_INJ_CRASHES	B_INJ_CRASI
22	7	3966588-2	5 Year	5	29	3810	4151090.25	139.72233	2.985	Tangent	0	0	
17	4	3966588-2	3 Year	3	21	3810	4151090.25	168.630398	2.985	Tangent	0	0	
37	11	3966588-2	10 Year	10	48	3810	4151090.25	115.632273	2.985	Tangent	0	0	

Database Objects



HSM Specific Objects



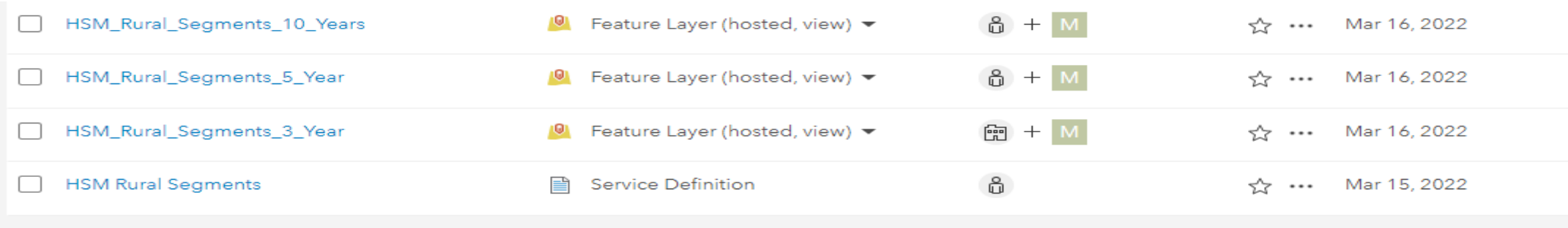
Crash Modification Factor Ranges

- The following are the range of the Crash Modification Factors (CMF) values for the 12 used on Two Way Rural Roadways.

CMF_DESC	MINVAL	MAXVAL	AVGVAL
Lane Width	1	1.225	1.055
Shoulder Width and Type	0.942	1.225	1.05
Horizontal Curves	1	28.32	1.787
Superelevation	1	1.629	1.016
Grades	1	1.16	1.079
Driveway Density	1	4.163	1.382
Centerline Rumblestrips	0.94	1	0.996
Passing Lanes	0.65	1	0.997
Two Way Left Turning Lane	0.663	1	0.999
Roadside Design	0.875	1.222	1.068
Lighting	0.931	1	0.986
Automated Speed Enforcement	1	1	1

Deliverables

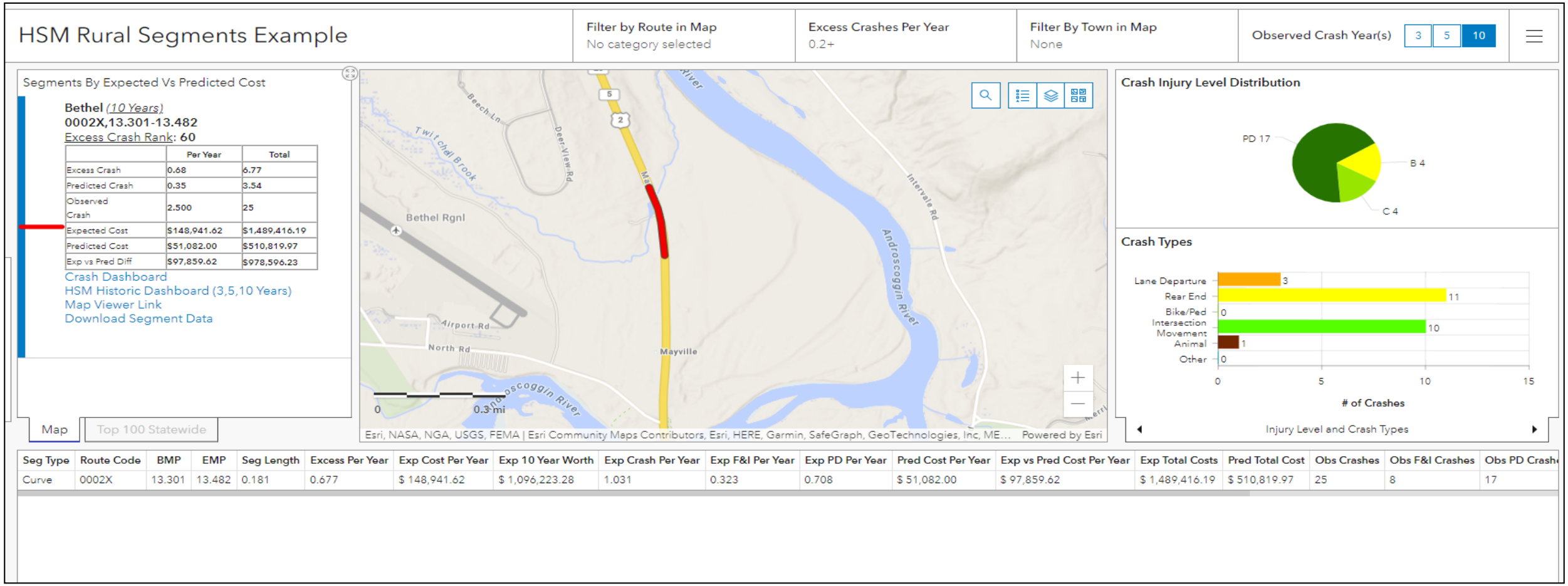
- Predicted/Expected/Observed Results are part of a materialized view in the Database that is refreshed daily based on any changes in the segmentation and/or calculations.
  - Segments can be mapped using Route/Measures
- Mapped dataset includes a Feature Layer with 252 columns https://maine.maps.arcgis.com/home/item.html?id=afc08ad8680e4cc4ad32a3414e0b5482&view=table&sortOrder=desc&sortField=defaultFSOrder#data



  - ~95,000+ segments for the 7100 miles for each of the observed year groupings
- A subset of the segments can easily be created and provided for use in Safety Benefit type calculations.

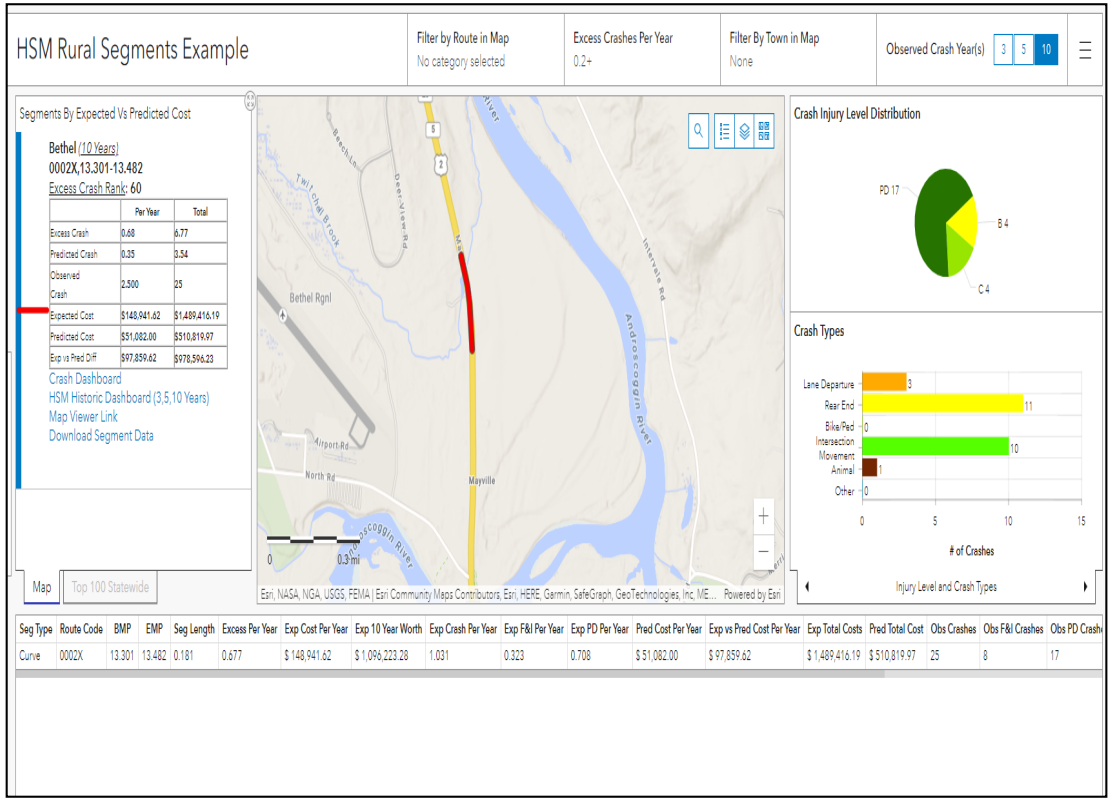
ArcGIS Online Dashboard

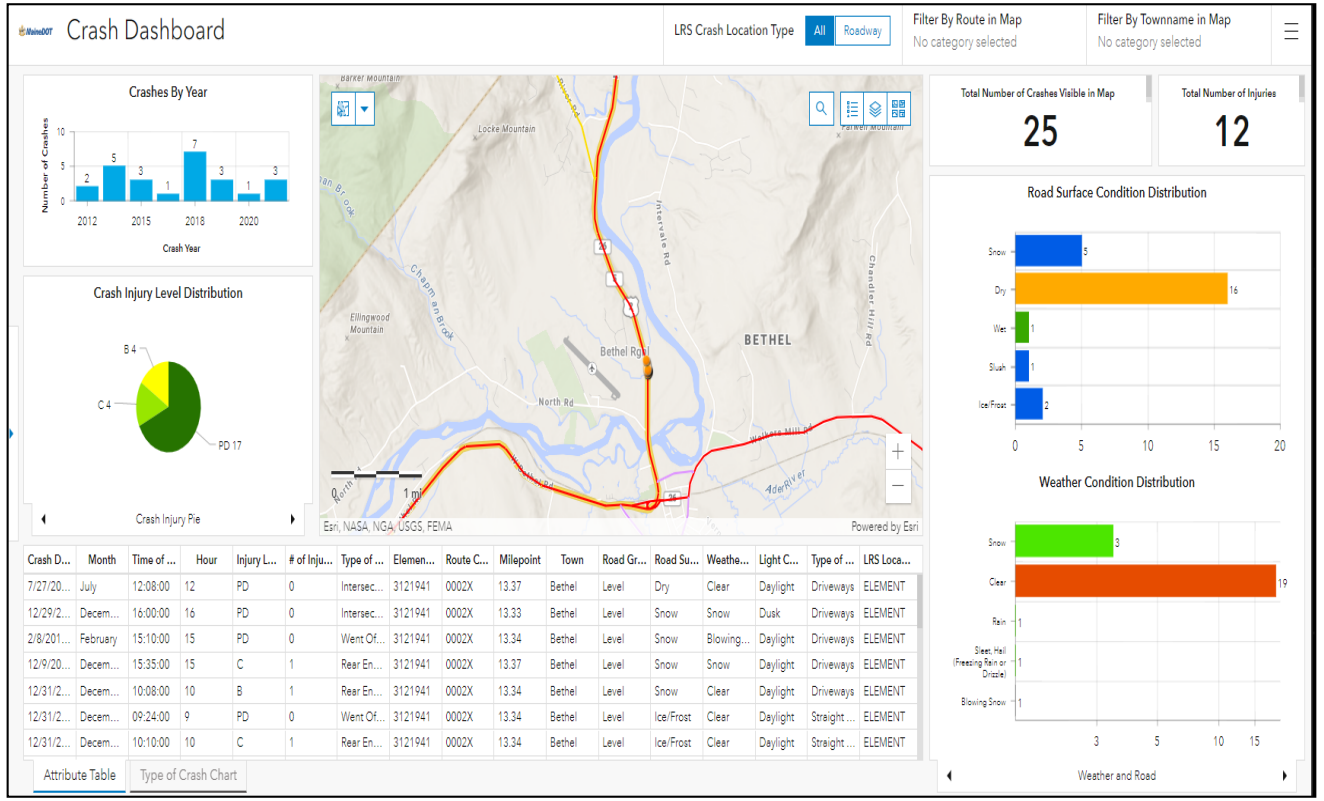
- Example that links to other ArcGIS Online (AGOL) Applications. https://maine.maps.arcgis.com/apps/dashboards/5b9f3641464f48909dd864e2c6ad0cea



ArcGIS Online Dashboard

- Explore Observed Crash Data Associated to segment.
- List Results include a link that will open to a universal crash dashboard filtered on just the crashes for that segment. https://maine.maps.arcgis.com/apps/dashboards/3b0042670e8c49a68383d62ee4f9d0cd#elementid=3121941&eleoffset=0.431,0.612&crashyear=2012,2021&casloctype=ELEMENT





Future Goals

- Continue to evaluate what items are helpful and those that are not.
  - Where is the data coming from for a calculation and if there is an issue how to fix it?
- Relate additional crash items that are available at the Unit and Person level
  - Sequence of Events, Pre-Crash, Most Damaged Area of Unit, etc.
- Continue to explore functionality available in ArcGIS Online
  - What objects are reusable for analysis that could be integrated easily with the HSM Data
  - Improve Performance of AGOL applications and Feature Layers?
- Expand Datasets available in ArcGIS Online
  - Maine DOT specific datasets are pretty limited, but should really include at the very least the layers available in the Maine DOT Public Map Viewer. https://www.maine.gov/mdot/mapviewer/

Future Goals

- Use statewide Digital Elevation Model that includes different lidar collections over the past 10 years to Derive and estimated Side Slope (1:2, 1:3, 1:4).

Contact Info

Jon Prendergast
Maine DOT Office of Safety
Jon.J.Prendergast@maine.gov