VDOT SAFETY DATA AND ANALYTICS

2022 HIGHWAY SAFETY SUMMIT UPDATE

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May 2022

Agenda

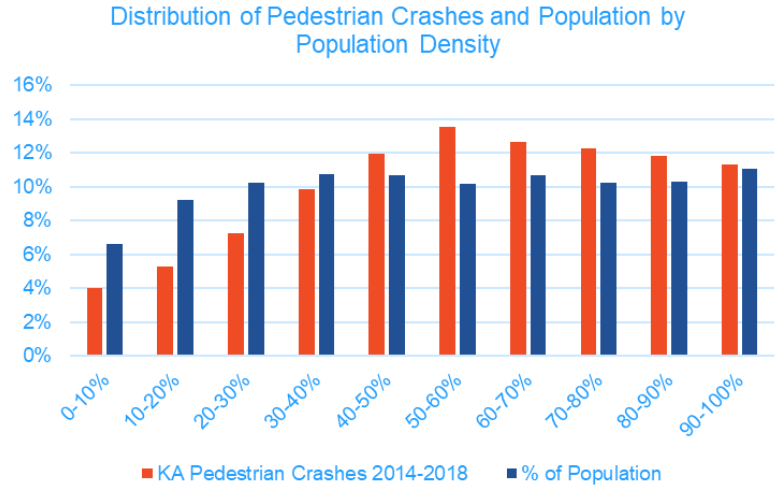
- Pedestrian Safety Action Plan
- Rail Grade Crossing Action plan
- Network Screening
- VDOT Safety Analysis Resources

PSAP VERSION 3

VDOT Pedestrian Safety Action Plan 2016-2020 Update

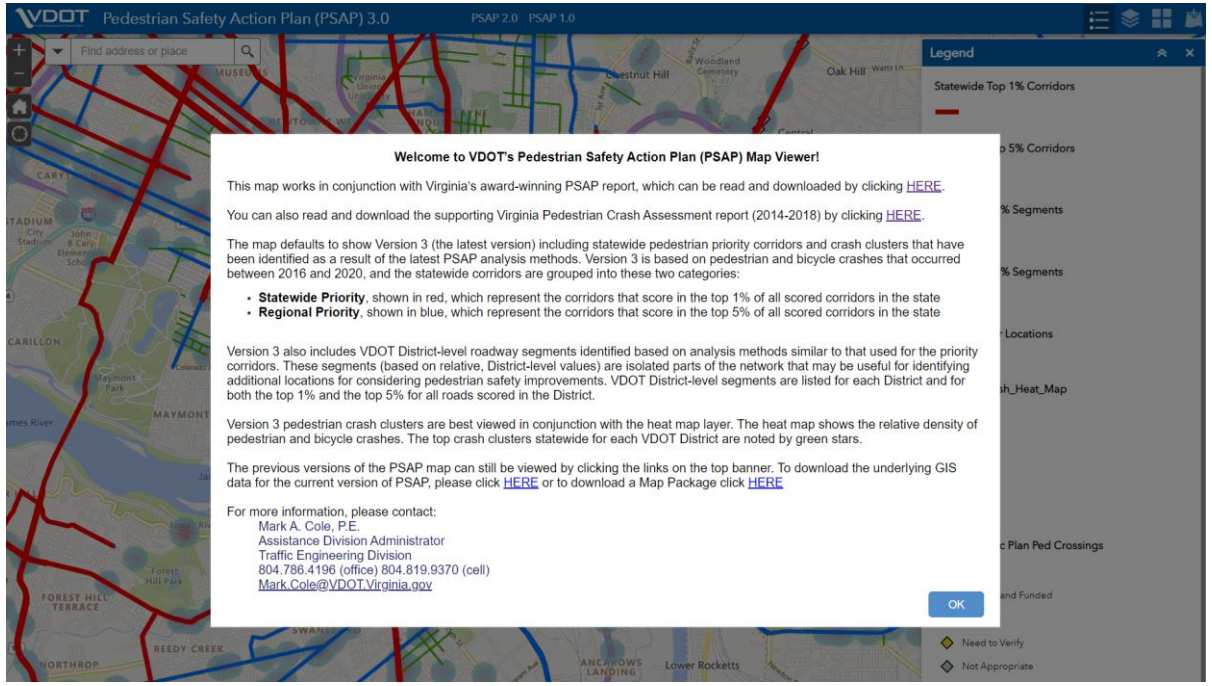
PSAP Methodology Changes

- Version 3 builds upon the upgrades in v2 and makes several key changes.
- Tested new weighting scenarios based on the inclusion of **pedestrian and bicycle crashes** between 2016-2020.
- Revised the scoring associated with population density based on the distribution of population and pedestrian/bicycle crashes.



Scenario	Crash Type	Crash Severity	Coverage 1% (50 FT Buffer)	%	Coverage 5% (50 FT Buffer)	%
1. Original	Bike and Ped	KA	587	17.4%	1,561	46.4%
	Bike and Ped	KABCO	2,103	19.3%	5,430	49.9%
	Centerline Mileage		766.11	1.0%	2,914.55	4.0%
2. Speed and Road Configuration	Bike and Ped	KA	562	16.7%	1,458	43.3%
	Bike and Ped	KABCO	1,981	18.2%	4,912	45.1%
	Centerline Mileage		744.49	1.0%	2,928.91	4.0%
3: Population Density Adjustment	Bike and Ped	KA	603	17.9%	1,571	46.7%
	Bike and Ped	KABCO	2,111	19.4%	5,457	50.1%
	Centerline Mileage		785.16	1.1%	2,925.81	4.0%
4: Combination of Scenarios 2 and 3	Bike and Ped	KA	549	16.3%	1,459	43.3%
	Bike and Ped	KABCO	1,924	17.7%	4,880	44.8%
	Centerline Mileage		756.17	1.0%	2,912.99	4.0%
5: Poluation Density Plus Transit/Employment Density Swap	Bike and Ped	KA	603	17.9%	1,565	46.5%
	Bike and Ped	KABCO	2,127	19.5%	5,466	50.2%
	Centerline Mileage		744.99	1.0%	2,953.71	4.0%

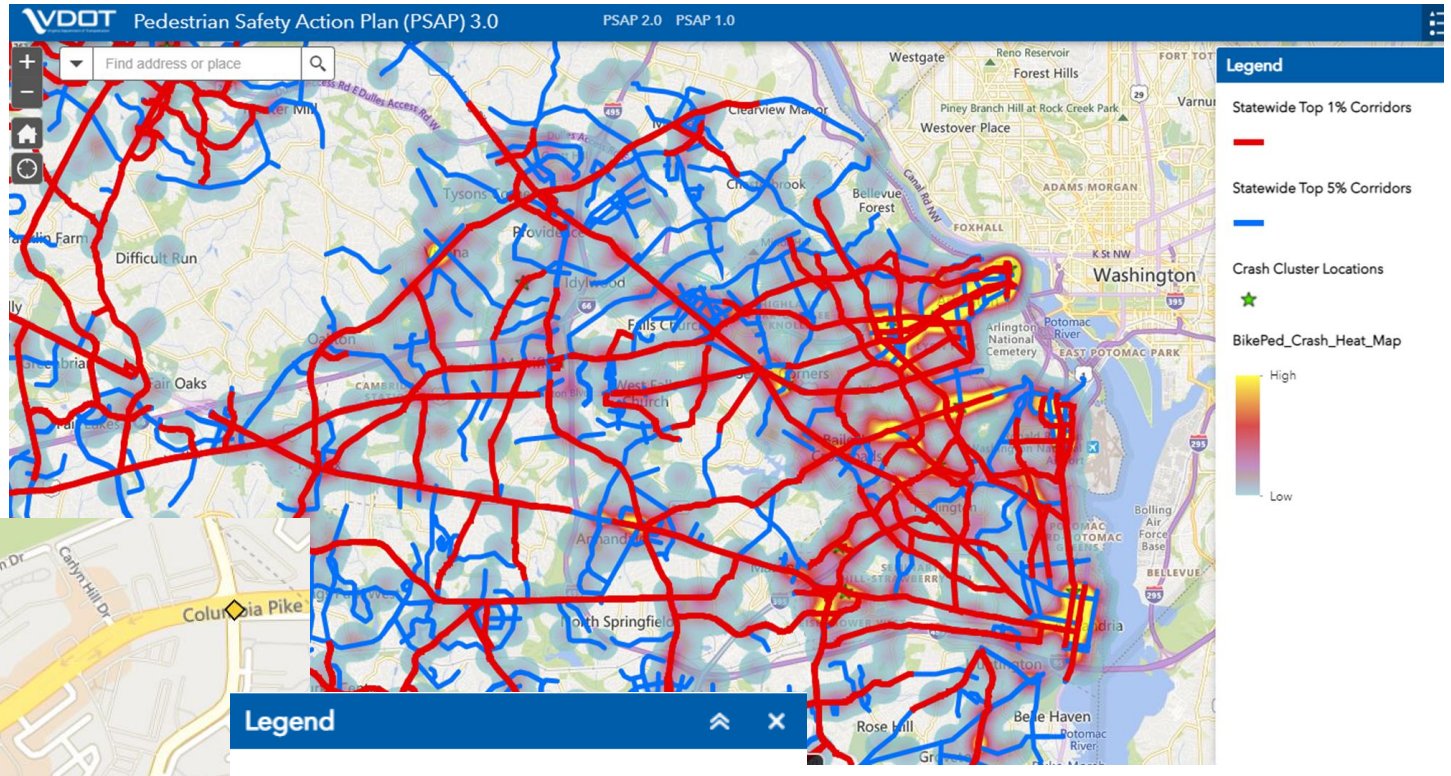
PSAP Factor Data & Ranking Updated

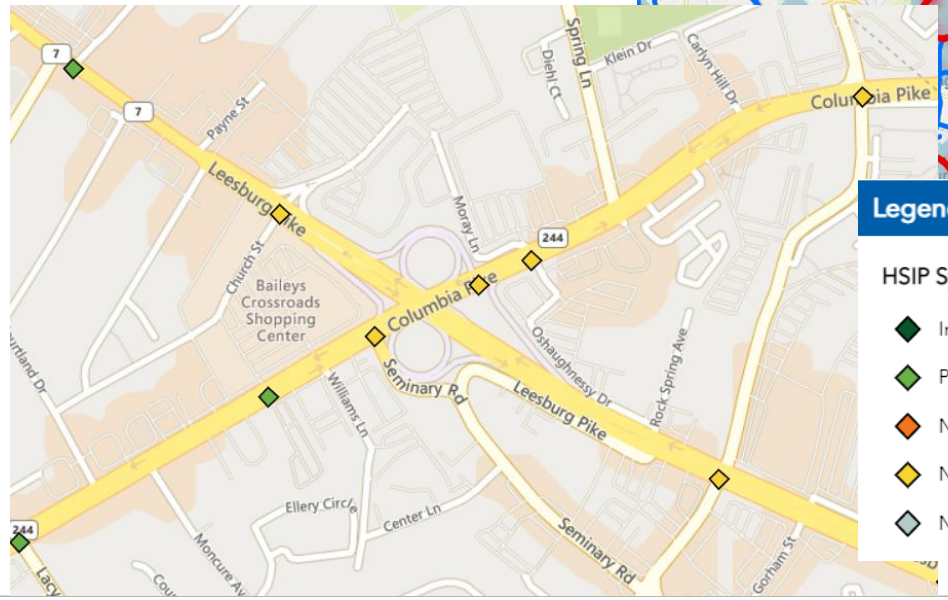


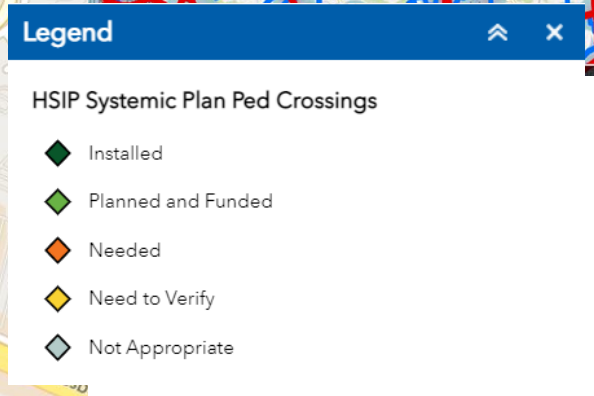
www.bit.ly/VDOTPSAP

- Top 1% = Statewide Priority in **Red**
- Top 5% = Regional Priority in **Blue**
- **New** VDOT District ranking for top 1% and 5%
- Includes previous Version layers for comparison
- Note: VTrans needs is using previous verion

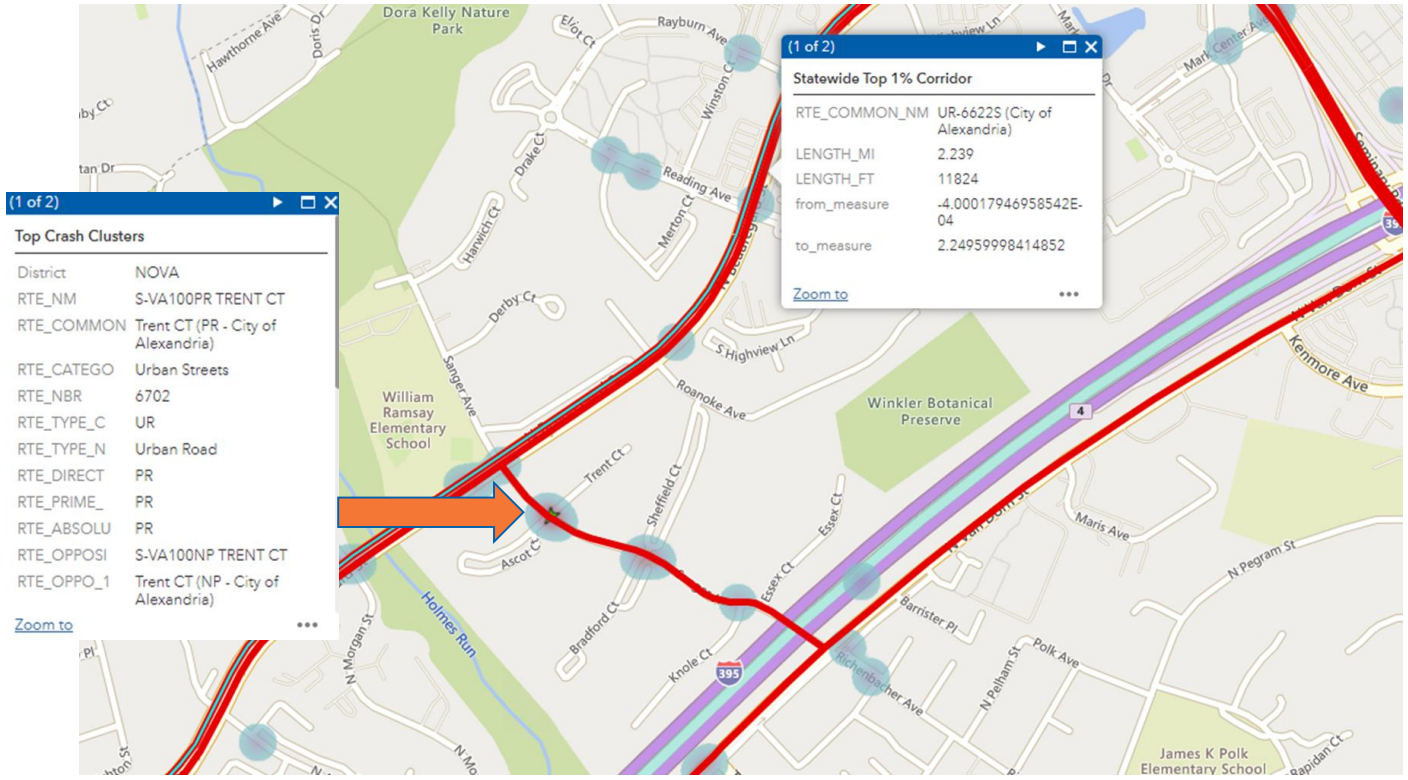
- Updated crash heat maps include pedestrian and bicyclist collisions
- Links to HSIP Systemic Ped Project Implementation







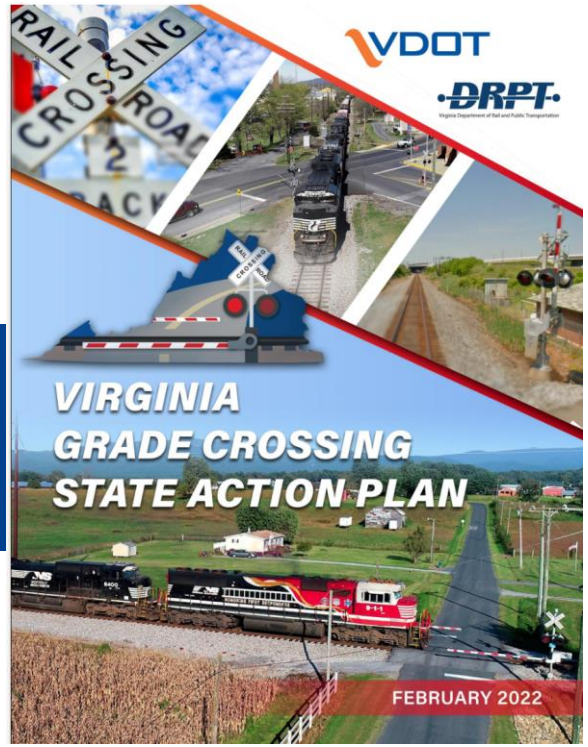
Mapped Data



- Crash heat map cluster centers labeled with a STAR
- Corridor information posted

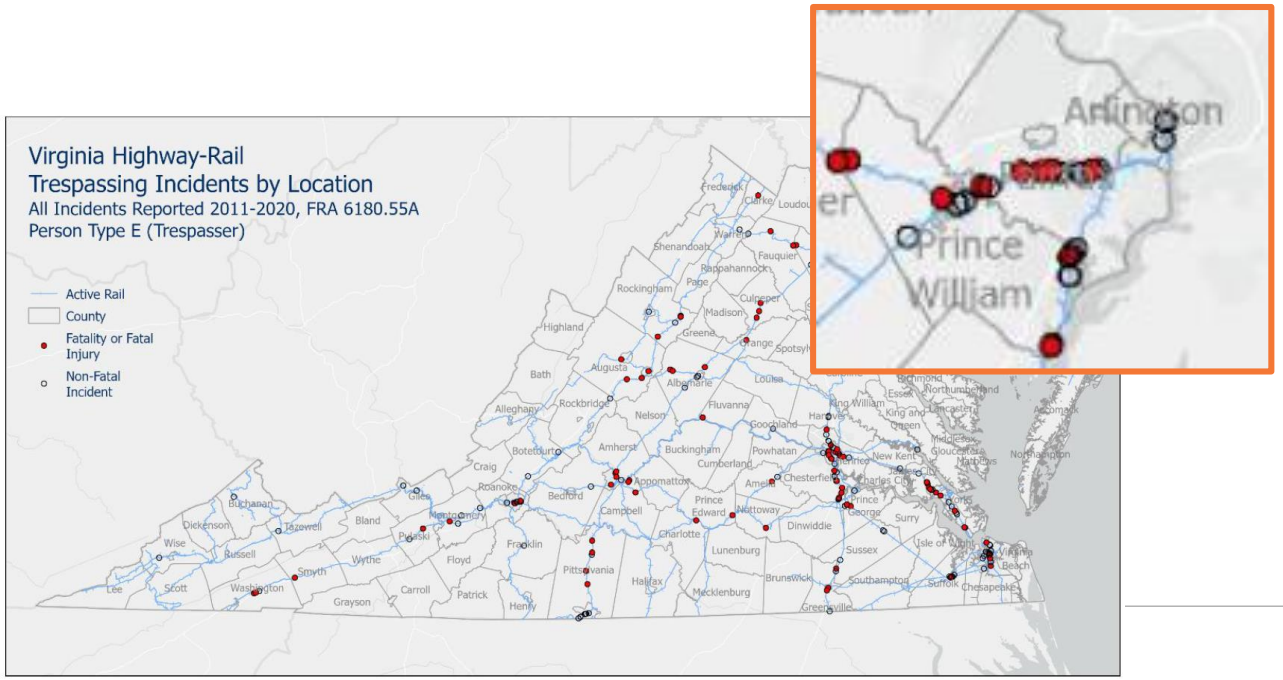
RAILWAY GRADE CROSSINGS

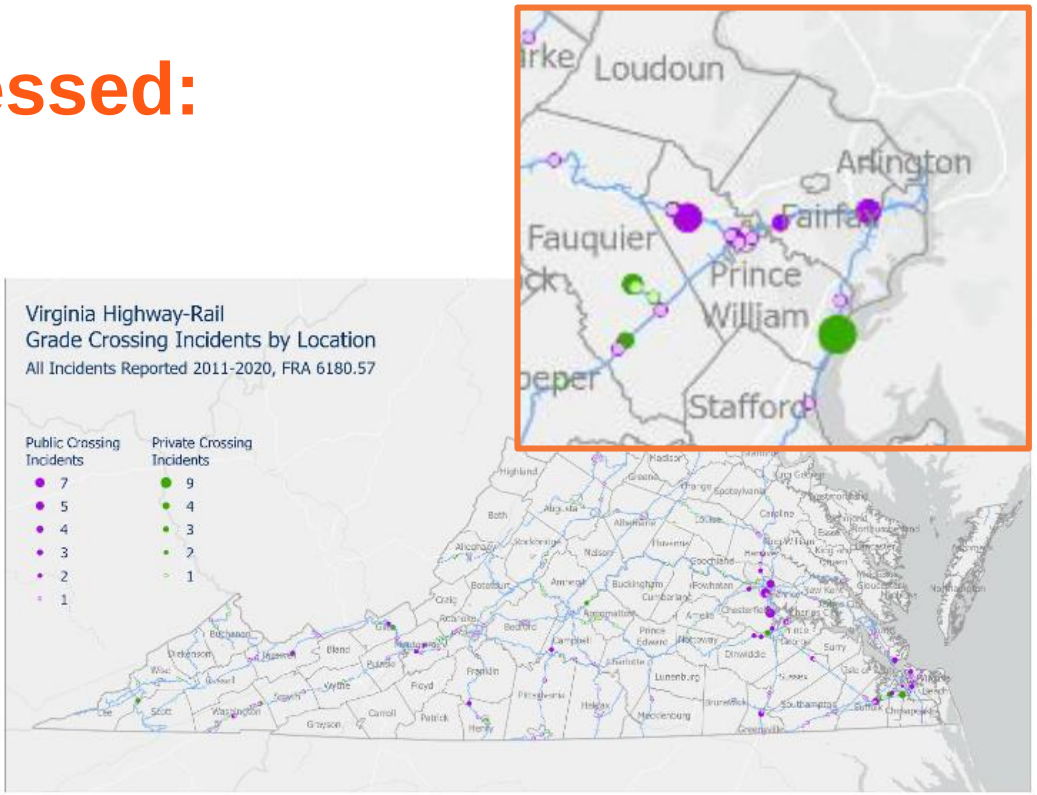
Virginia 2022 Grade Crossing Action Plan



GC SAP Background

- **Federal Rail Admin 2020 Rule required state action plans:**
  - **Review crossing with train-vehicle/persons incidents**
  - **Review crossing based on FRA risk factors in their Accident Prediction and Severity Model (APSM = SPF)**
- **Incidents and trespassing data assessed:**





Causal Factors & Collision Risk Assessment

Table 3 Rail Crossing Inventory Data Summary[6]

Total Crossings	9,409	Percent of Total
Closed Crossings	3,764	40%
Open Crossings	5,645[1]	60%
Open Public	3,065	54% of Open Crossings
Open Private	2,574	46% of Open Crossings
Open Public Crossings	**3,065**	**Percent of Total**
Public Grade Separated	1,213	40%
Public At Grade	1,852	60%
Public Active Warning Devices At Grade	1,376	74% of Public At Grade
Public Passive Warning Devices At Grade	476	26% of Public At Grade
Open Private Crossings	**2,574**	**Percent of Total**
Private Active Warning Devices At Grade	47	2%
Private Passive Warning Devices At Grade	2,379	92%
Private Active Grade-Separated	148	6%

[1] *Crossing type not defined for six open crossings in GCIS data.*

- **Assessed multiple factors, including:**
  - Time of day, month, weather, temperature
  - Driver age, motor vehicle type, driver actions
  - Train equipment, speed and track type info
- **Risk Assessment = probability of train collision SPF by TC Device Type:**
  - Exposure = highway x train "daylight" traffic
  - Train speed; number of tracks
  - Highway lanes; pavement;

$$
\begin{aligned}
&\textit{Expected Cost of Crash} \\
&\quad = [\textit{Probability of a Crash}] * [\textit{Probability of Property Damage}] * [\textit{Cost of Property Damage}] \\
&\quad + [\textit{Probability of a Crash}] * [\textit{Probability of Injury}] * [\textit{Cost of Injury}] \\
&\quad + [\textit{Probability of a Crash}] * [\textit{Probability of Fatality}] * [\textit{Cost of Fatality}] \\
&\quad + [\textit{Probability of a Crash}] * [\textit{Cost of Secondary Effects}]
\end{aligned}
$$

Ranked Crossings & Actions for Improvements

- **Based on expected costs**
- **Uses VA Priority Index Value with additional Sight Distance factors**
- **Like SHSP included 4E actions and timeframes**

Table 32 Rankings of Crossings based on Expected Costs and Improvement Costs[1]

Rank	Crossing ID	Annual Expected Cost ($)	Current Warning Device
1	623668M	583,538	Gates
2	623683P	477,988	Gates
3	467400K	305,461	Gates
4	714341S	224,423	Gates
5	224233S	209,797	Gates
6	623680U	197,337	Gates
7	467399T	193,927	Gates
8	467405U	187,757	Gates
9	714355A	177,735	Gates
10	860437F	175,612	Gates

Table 35 Ranking of Crossings Based on Priority Index Value[1]

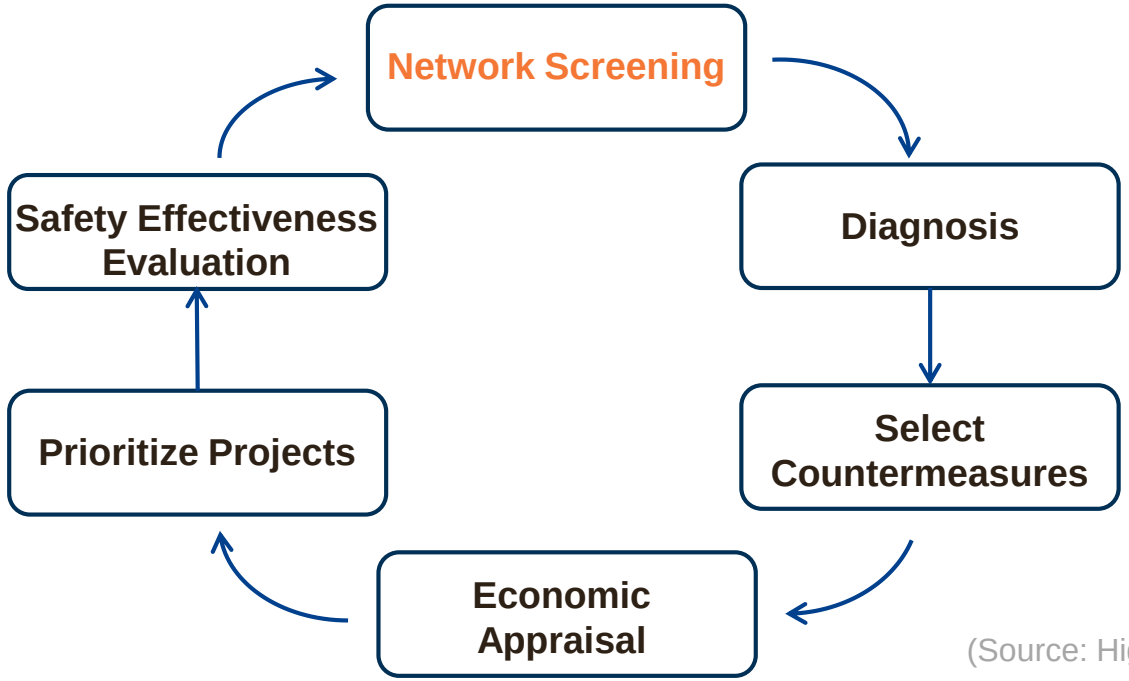
Crossing ID	Priority Index Value	FRA/NCHRP 755 Rank
224233S	0.6994	5
623683P	0.6193	2
859983H	0.5095	154
935045R	0.3920	28
842244J	0.3679	285
623668M	0.3675	1
469432X	0.3338	56
714356G	0.3091	23
468775B	0.3017	375
467402Y	0.2685	27

NETWORK SCREENING, SPF & PSI

VDOT Potential for Safety Improvement (PSI) 2016-2020 Update

Network Screening

- A method that uses crash history, roadway factors, and traffic characteristics to identify and prioritize locations for potential safety investment
- Network screening provides solid documentation and justification for prioritizing safety needs



(Source: Highway Safety Manual)

Network Screening Performance Measure

- **Safety Performance Function (SPF)**

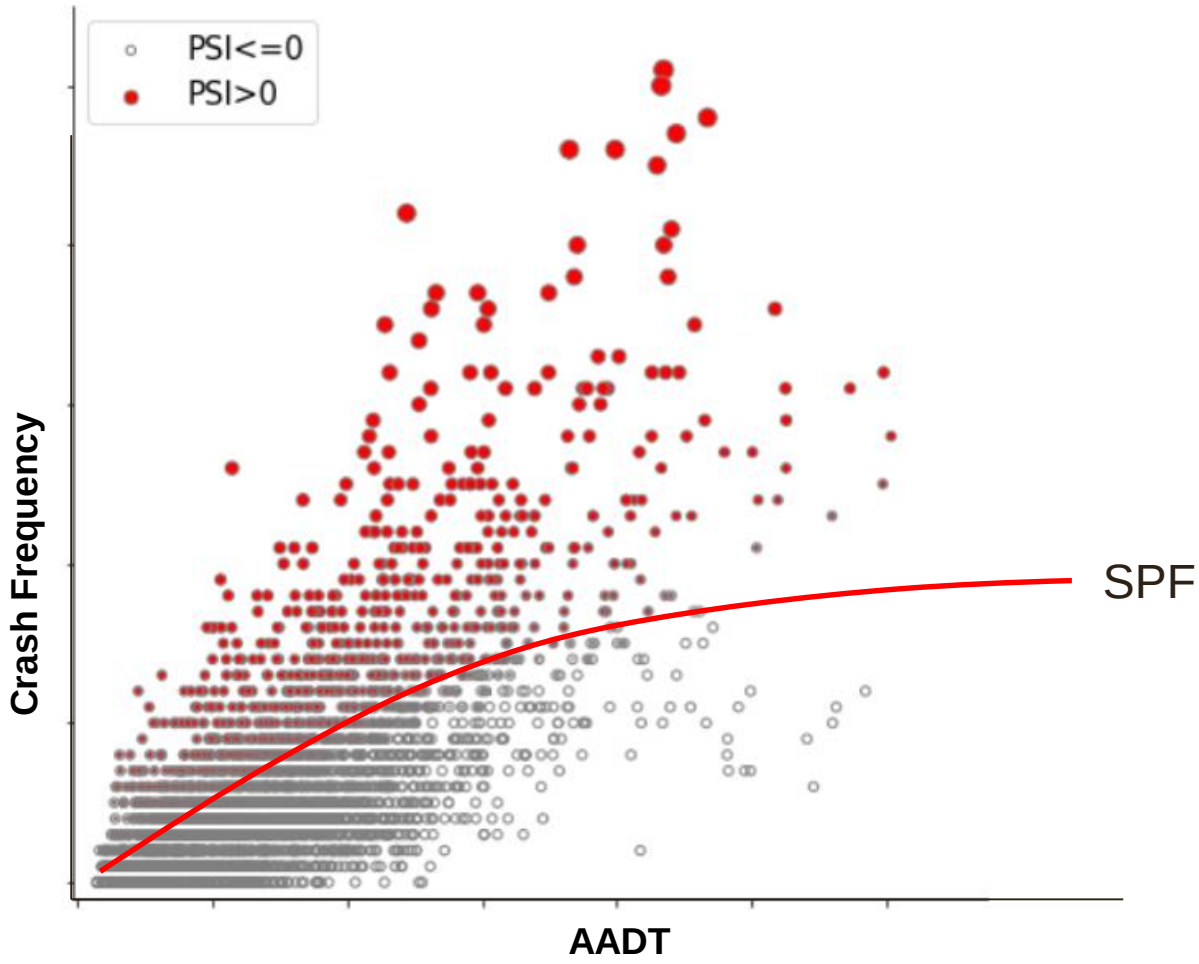
  VA-specific SPFs for 24 site types

- **Potential Safety Improvement**

  PSI = (Observed # - Predicted #) *EB*

- **PSI > 0**

  Review for potential safety improvement



2016-2020 PSI List Update

❑ SPF re-development using latest crash & traffic data

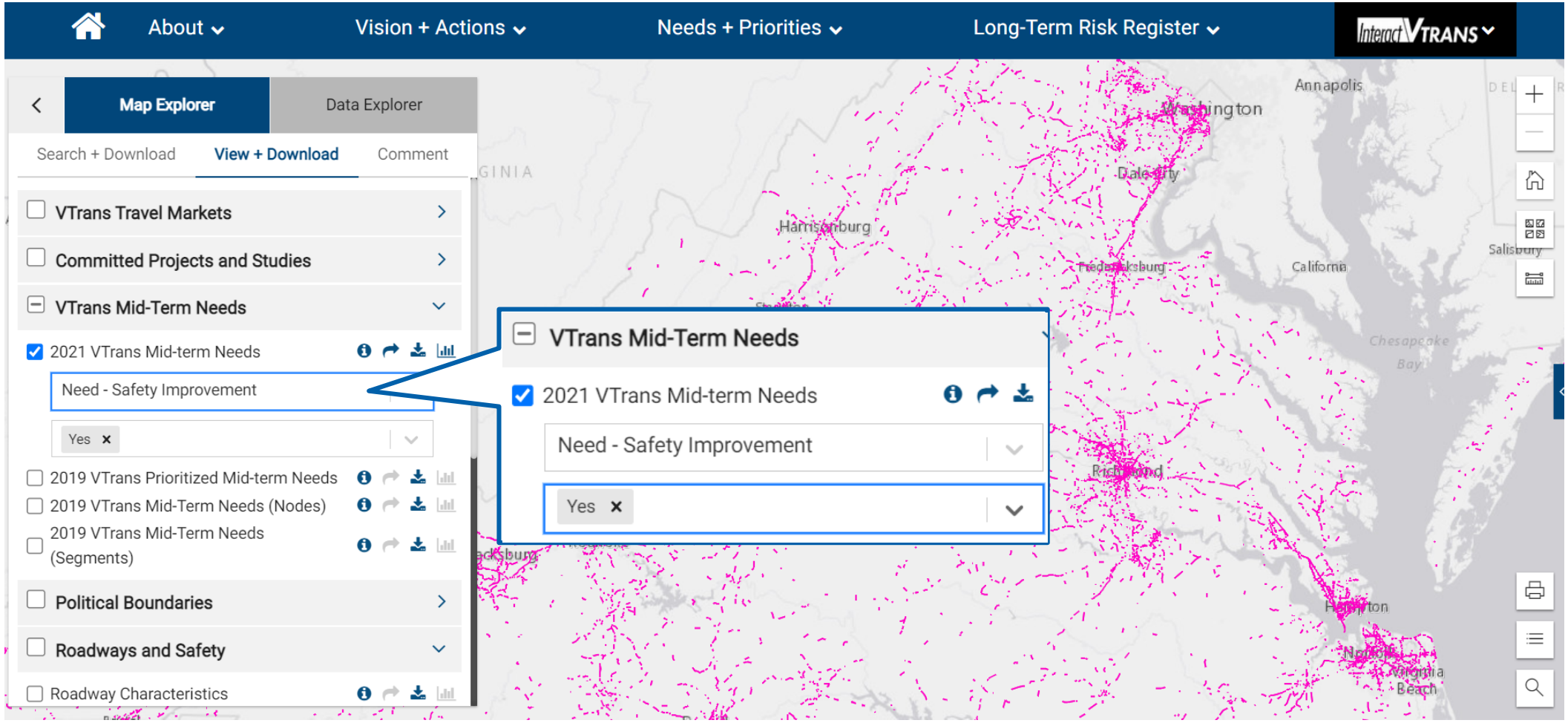
- **Total** Crashes
- **Fatal & Injury** Crashes

❑ PSI location selection

- Sites are selected based on VTrans Mid-Term Needs criteria
  - Total PSI List **2+** years out of 5 years, and
  - Fatal & Injury PSI List **2+** years out of 5 years, and
  - **3+** Fatal/Injury Crashes

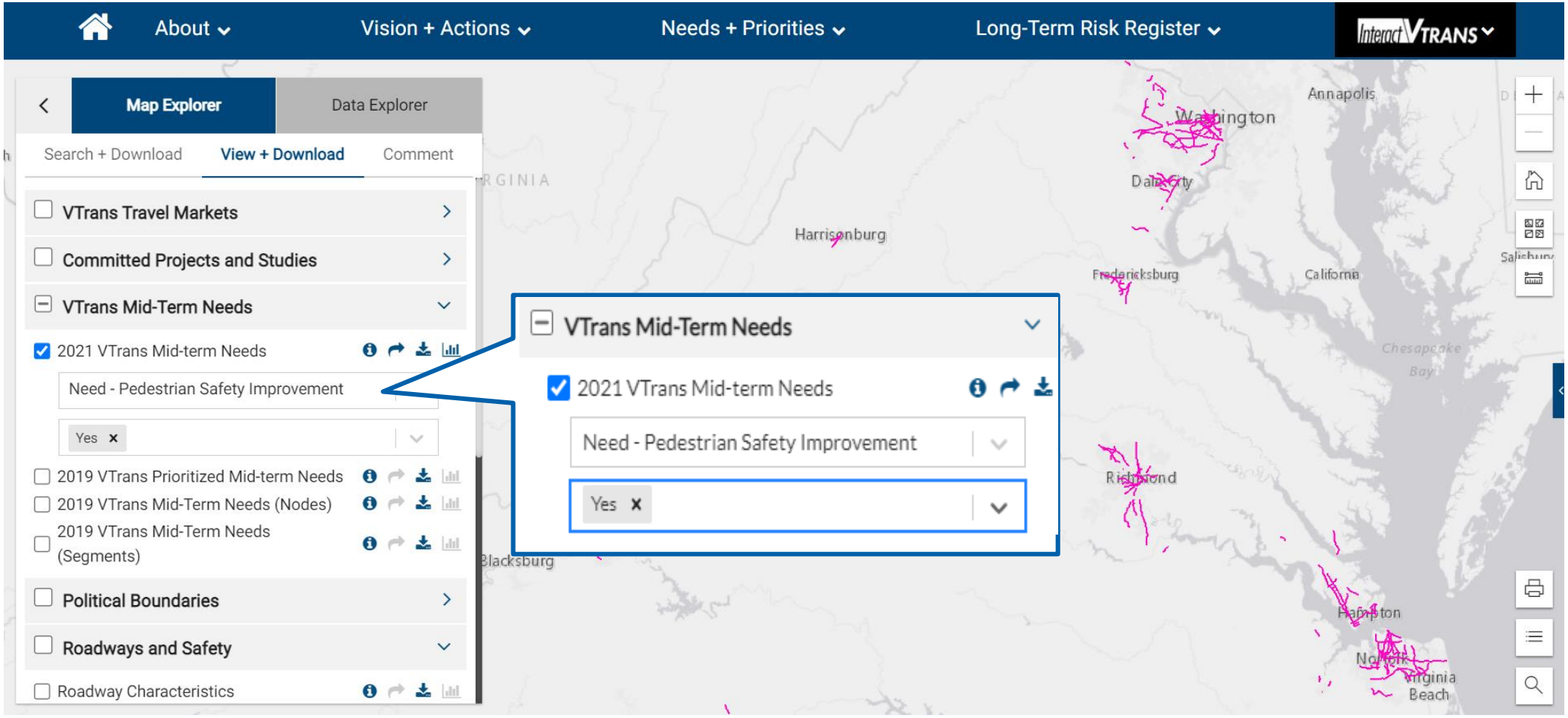
OIPI's VTrans Mid-Term Needs Update

InteractVTrans Map Explorer



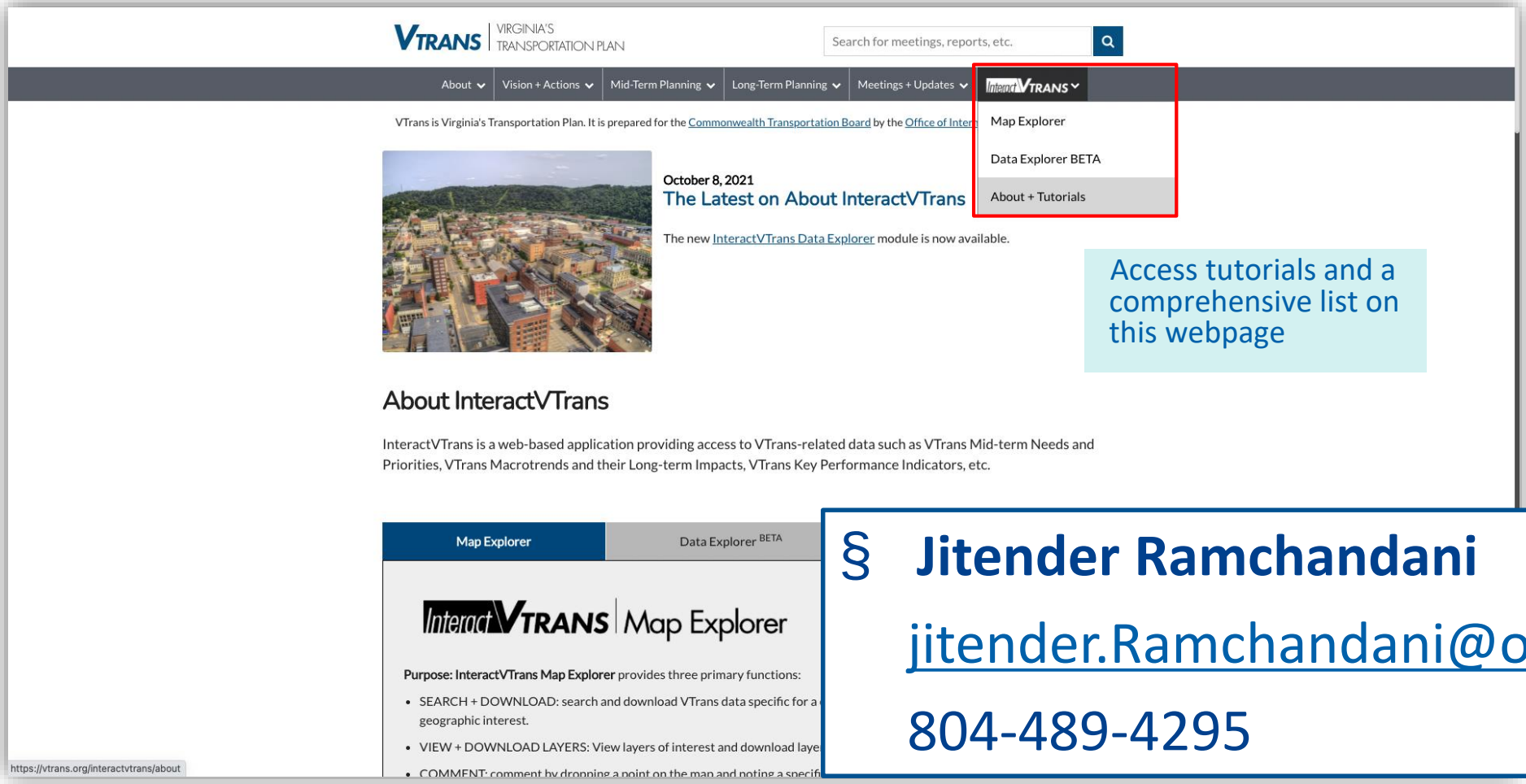
OIPI's VTrans Mid-Term Needs Update

InteractVTrans Map Explorer



OIPI's VTrans Mid-Term Needs Update

❑ InteractVTrans Map Explorer



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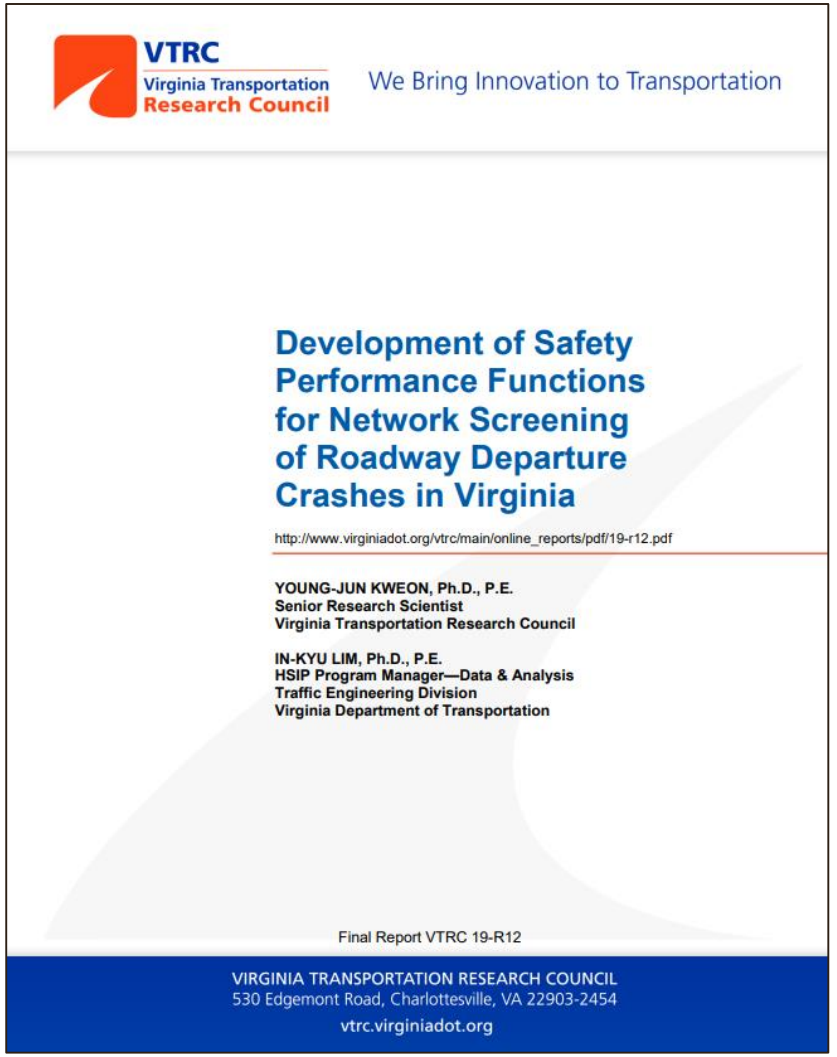
Roadway Departure Crash Network Screening

- Updating 2015 Roadway Departure Crashes Safety Performance Functions
- Implementation plan and screening work being scoped and updates by end of 2022

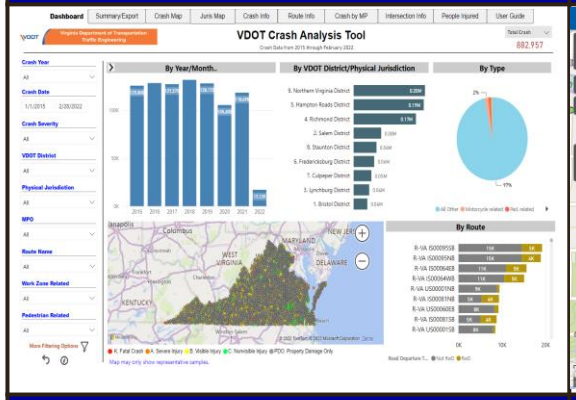


VDOT SAFETY ANALYSIS RESOURCES

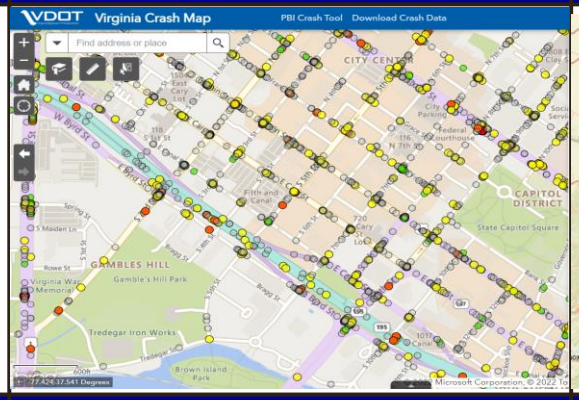
VDOT Safety Analysis Products and Tools

VDOT Safety Analysis Products and Tools

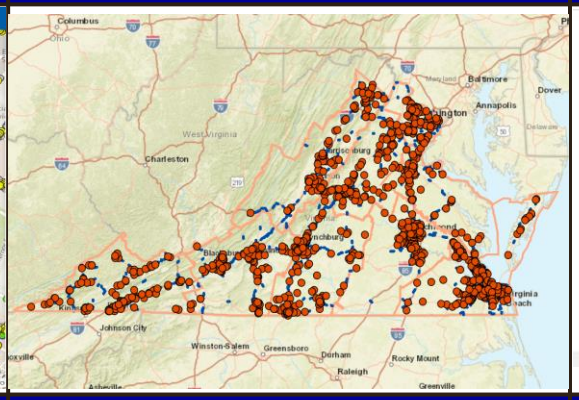
VDOT Crash Analysis Tool



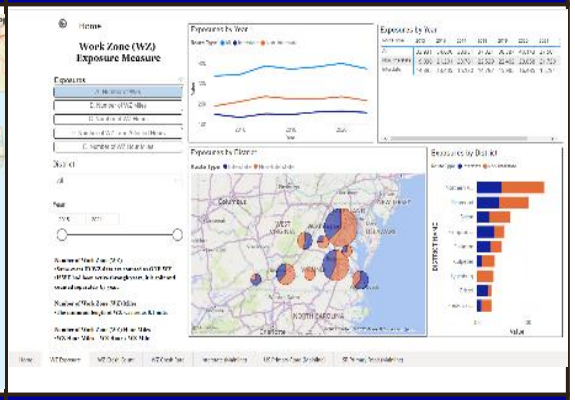
ArcGIS Online Crash Map



Network Screening (Top 100 PSI Map)

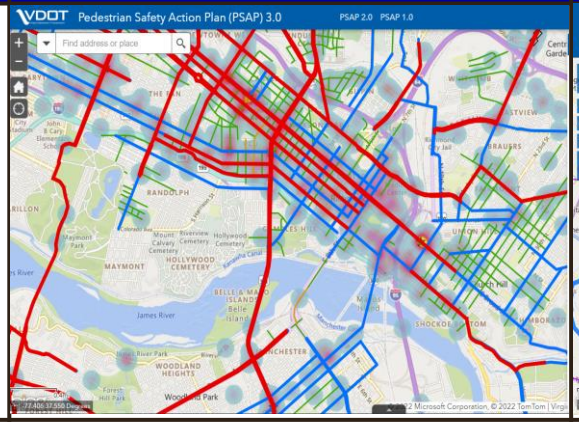


Work Zone Safety Dashboard

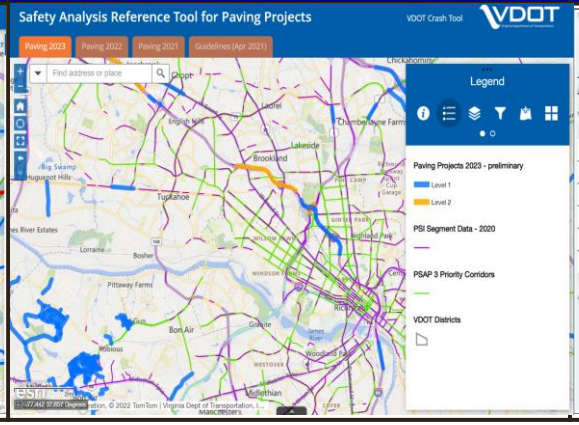


Crash Summary Book

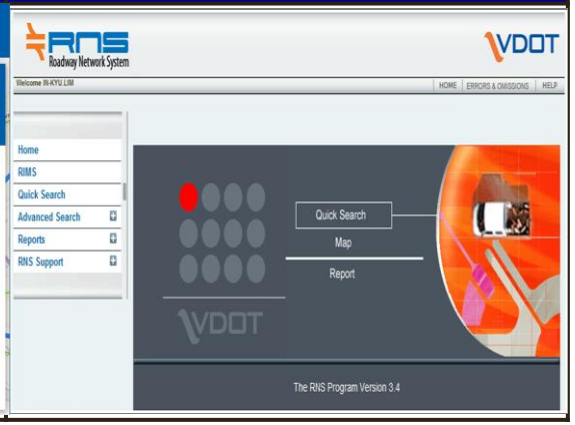
Ped Safety Action Plan



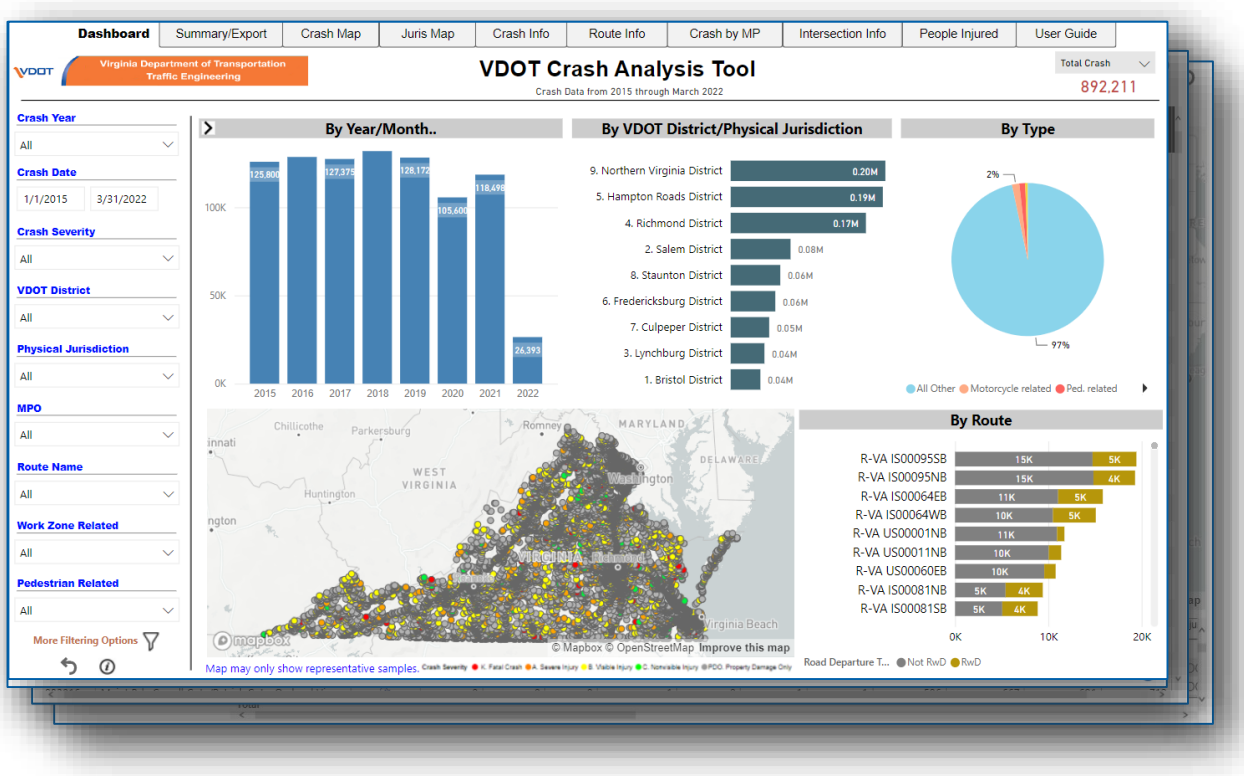
Paving Project Safety Tool



RNS Crash Application



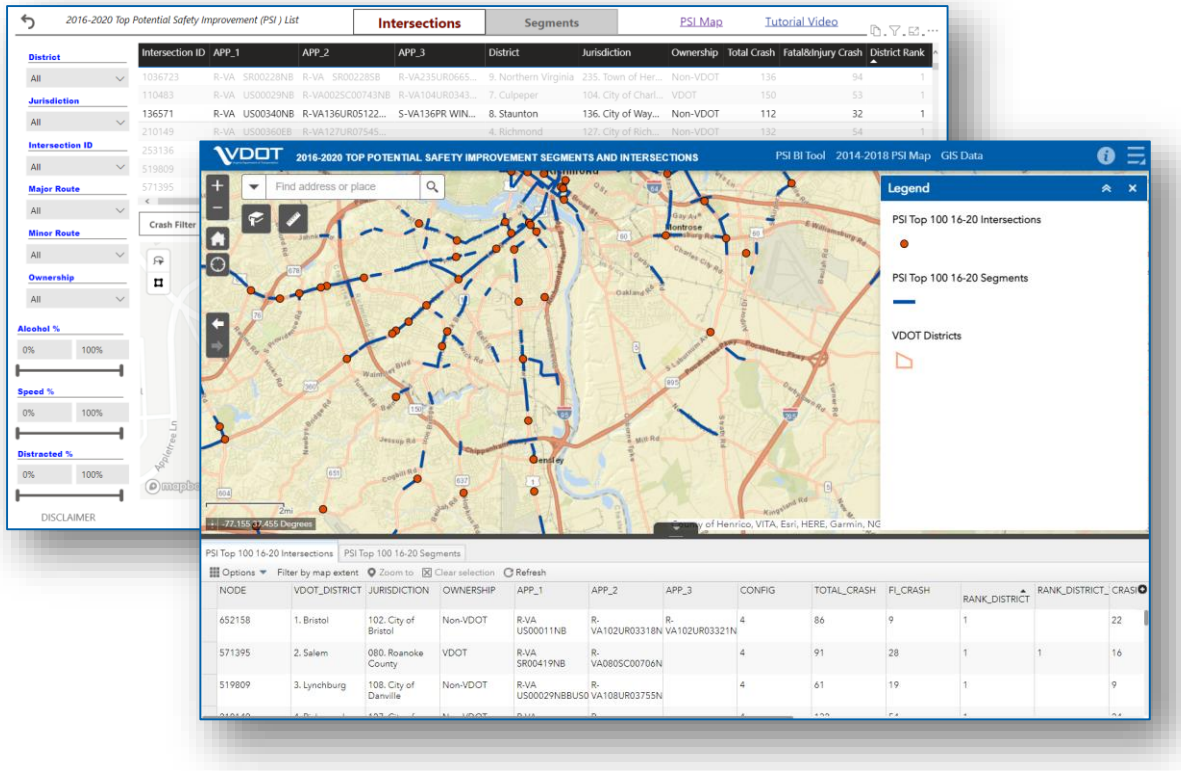
VDOT Crash Analysis Tool



- Interactive crash data query
- Ready-to-use charts and statistics
- Integrated with roadway data elements
- People injury statistics
- Connection with ArcGIS Online Crash Map

www.bit.ly/VDOTCrashTool_Public

VDOT PSI Map and BI Tool

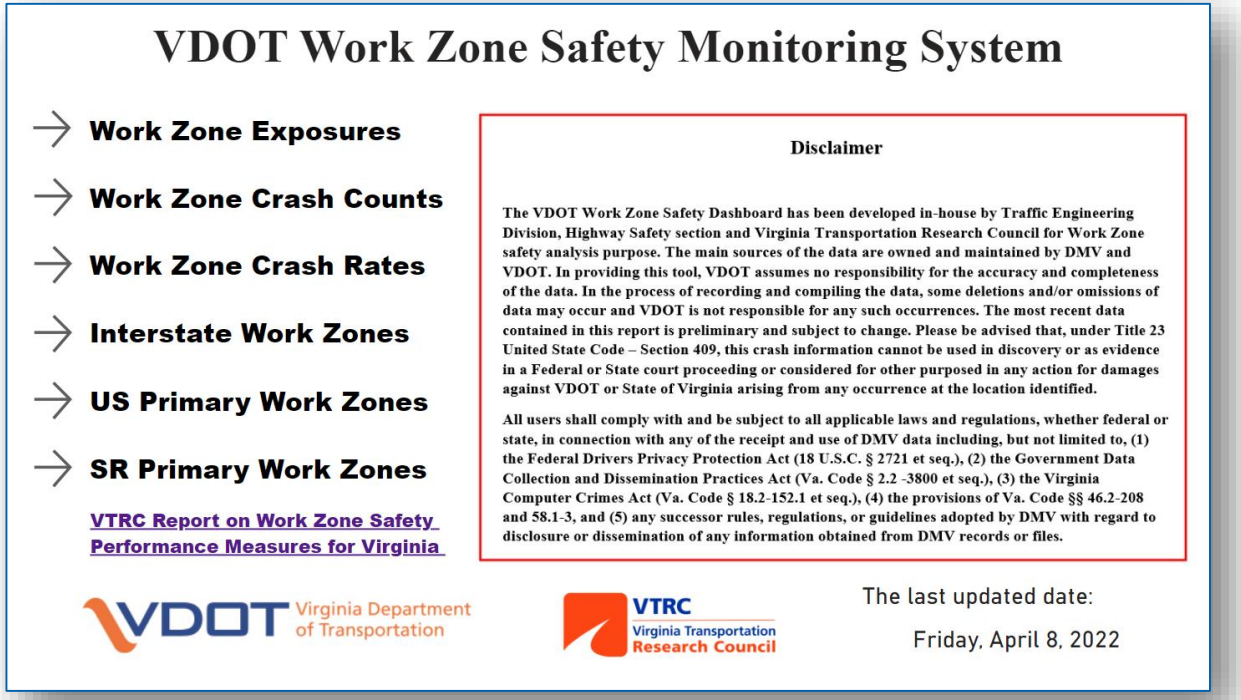


- Top highest PSI locations for each VDOT District
  - Top 100 intersections
  - Top 100 miles of segments
- Download current and historical Top 100 PSI data from VDOT SPOL site

  bit.ly/VDOTHwySafetyData_ExternalSite

www.bit.ly/VDOTPSIMap

Work Zone Safety Dashboard



- Focuses on work zone crashes
- Provides work zone exposure data including numbers, miles and hours
- By route and by system statistics
- Secondary work zone crashes

www.bit.ly/VDOT_WZDashboard

Thank you!

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References

- VTRC: Safety Performance Functions for Intersections on Highways Maintained by the Virginia Department of Transportation
- VTRC: Development of Safety Performance Functions for Two-Lane Roads Maintained by the Virginia Department of Transportation
- VTRC: Development of Safety Performance Functions for Multilane Highway and Freeway Segments Maintained by the Virginia Department of Transportation
- VTRC: Development of Safety Performance Functions for Network Screening of Roadway Departure Crashes in Virginia
- FHWA: Screening Your Network to Improve Roadway Safety Performance – Getting Started
- FHWA: Highway Safety Network Screening Process
- FHWA: Safety Performance Function Calibration Guide