



# VDOT SAFETY DATA AND ANALYTICS

## 2022 HIGHWAY SAFETY SUMMIT UPDATE

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May 2022

# Agenda

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

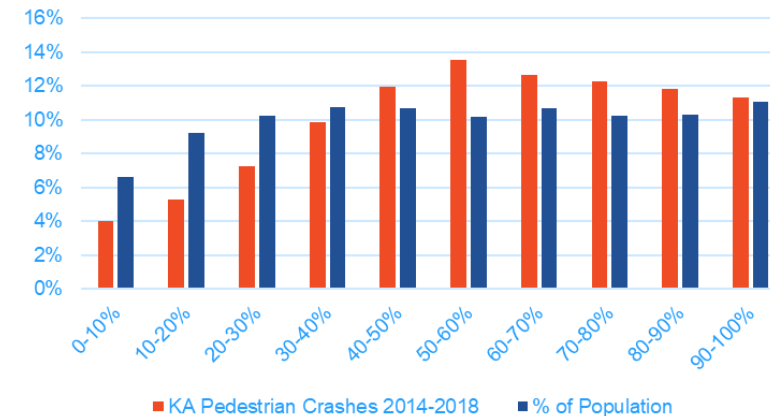
# PSAP VERSION 3

VDOT Pedestrian Safety Action Plan 2016-2020 Update

# PSAP Methodology Changes

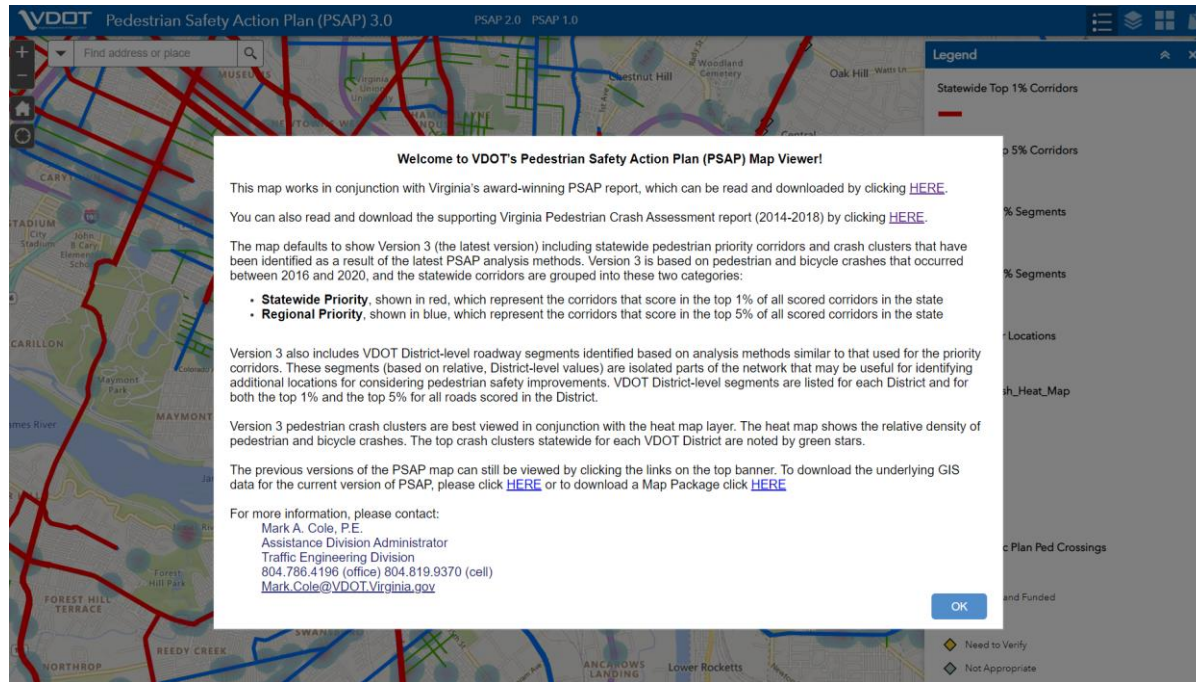
- Version 3 builds upon the upgrades in v2 and makes several key changes.
- Tested new weighting scenarios based on the inclusion of **pedestrian and bicycle crashes** between 2016-2020.
- Revised the scoring associated with population density based on the distribution of population and pedestrian/bicycle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

Distribution of Pedestrian Crashes and Population by Population Density



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

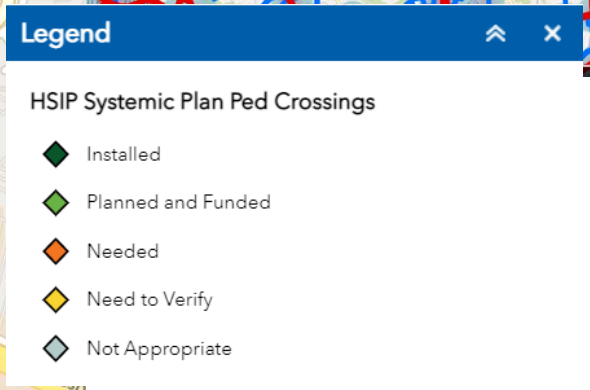
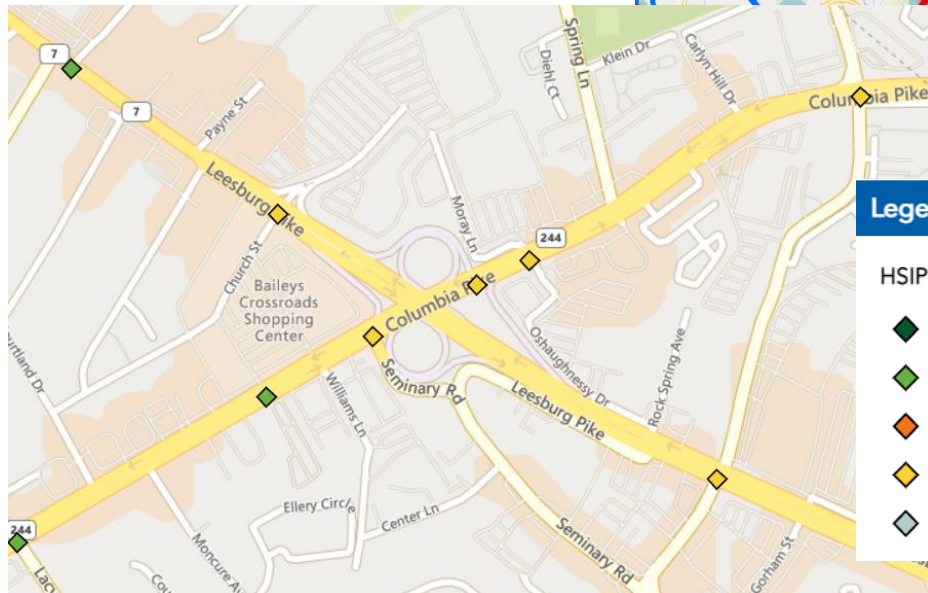
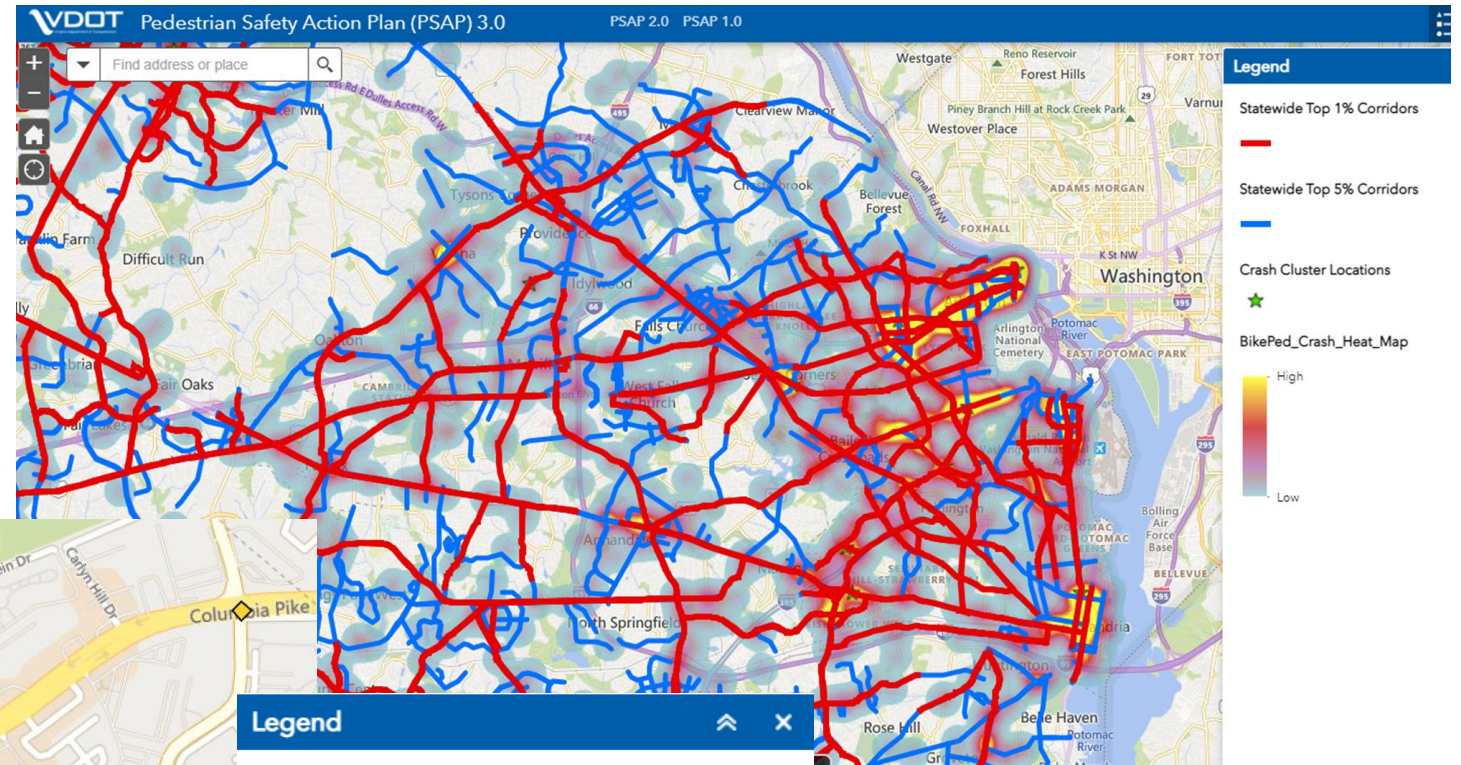


- ❑ Top 1% = Statewide Priority in **Red**
- ❑ Top 5% = Regional Priority in **Blue**
- ❑ **New** VDOT District ranking for top 1% and 5%
- ❑ Includes previous Version layers for comparison
- ❑ Note: VTrans needs is using previous version

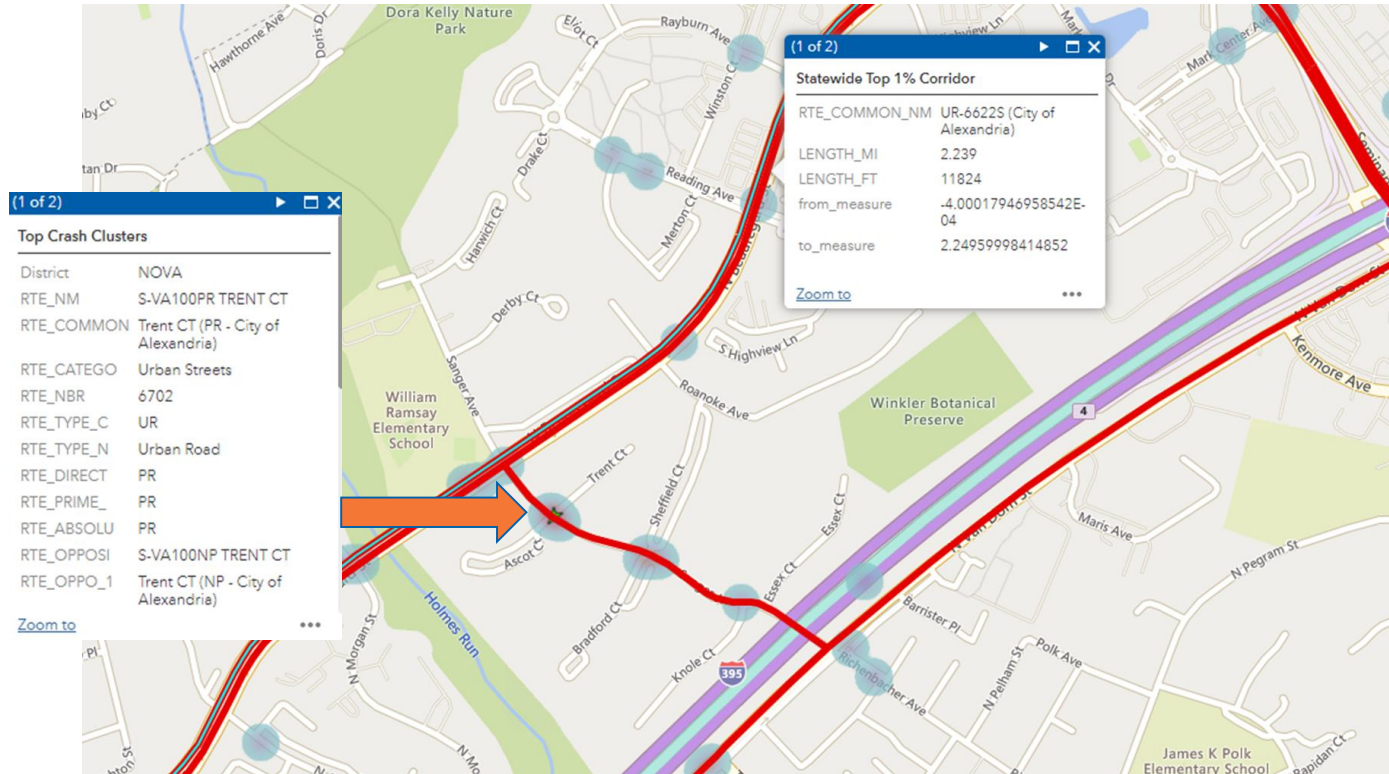
[www.bit.ly/VDOTPSAP](http://www.bit.ly/VDOTPSAP)



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



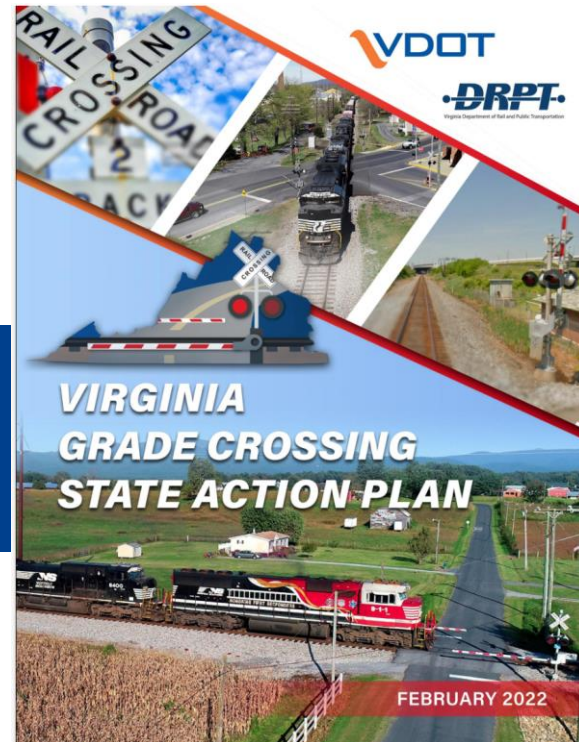
# Mapped Data



- ❑ 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:**

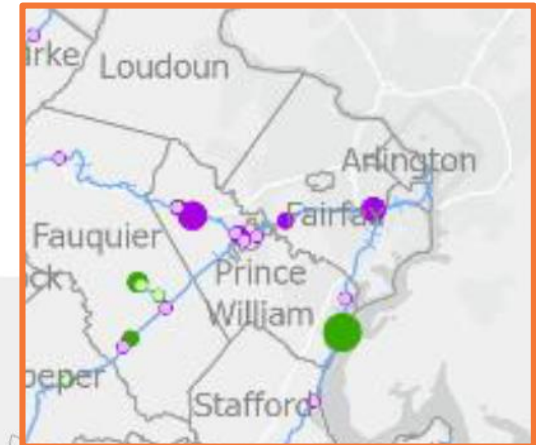
Virginia Highway-Rail  
Trespassing Incidents by Location  
All Incidents Reported 2011-2020, FRA 6180.55A  
Person Type E (Trespasser)

- Active Rail
- County
- Fatality or Fatal Injury
- Non-Fatal Incident



Virginia Highway-Rail  
Grade Crossing Incidents by Location  
All Incidents Reported 2011-2020, FRA 6180.57

- | Public Crossing Incidents | Private Crossing Incidents |
|---------------------------|----------------------------|
| ● 7                       | ● 9                        |
| ● 5                       | ● 4                        |
| ● 4                       | ● 3                        |
| ● 3                       | ● 2                        |
| ● 2                       | ● 1                        |
| ● 1                       |                            |



# Causal Factors & Collision Risk Assessment

Table 3 Rail Crossing Inventory Data Summary<sup>6</sup>

Total Crossings	9,409	Percent of Total
Closed Crossings	3,764	40%
Open Crossings	5,645 <sup>1</sup>	60%
Open Public	3,065	54% of Open Crossings
Open Private	2,574	46% of Open Crossings
<b>Open Public Crossings</b>	<b>3,065</b>	<b>Percent of Total</b>
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
<b>Open Private Crossings</b>	<b>2,574</b>	<b>Percent of Total</b>
Private Active Warning Devices At Grade	47	2%
Private Passive Warning Devices At Grade	2,379	92%
Private Active Grade-Separated	148	6%

<sup>1</sup> 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;

## Expected Cost of Crash

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

# 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<sup>1</sup>

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<sup>1</sup>

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

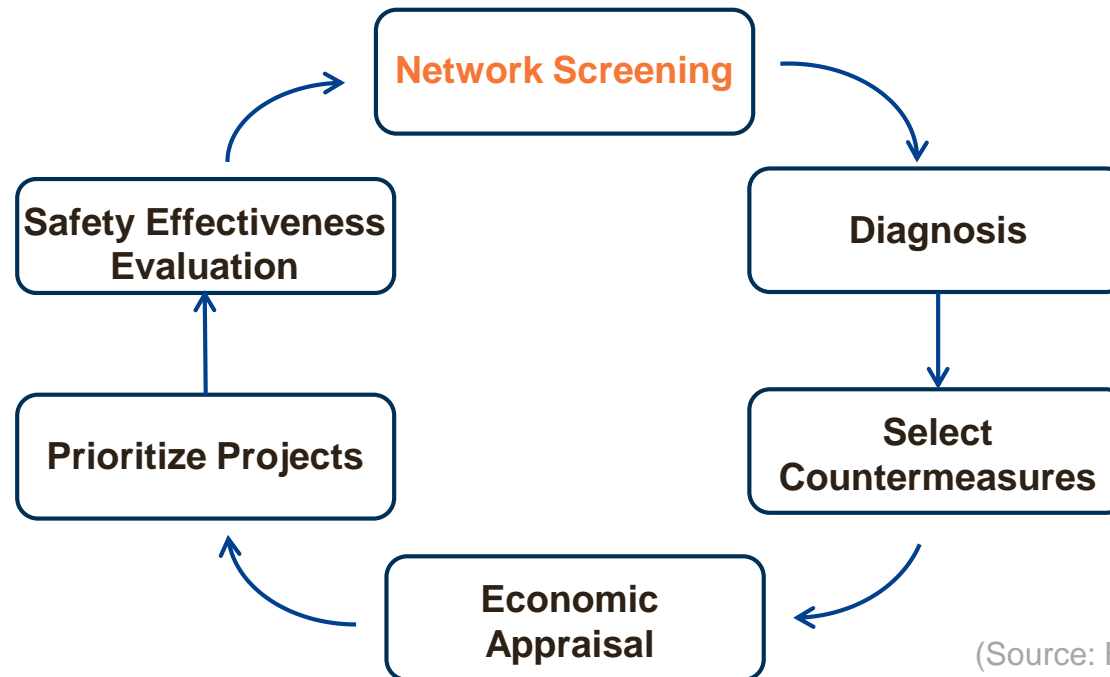
# NETWORK SCREENING, SPF & PSI

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

# Network Screening

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- ❑ 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)

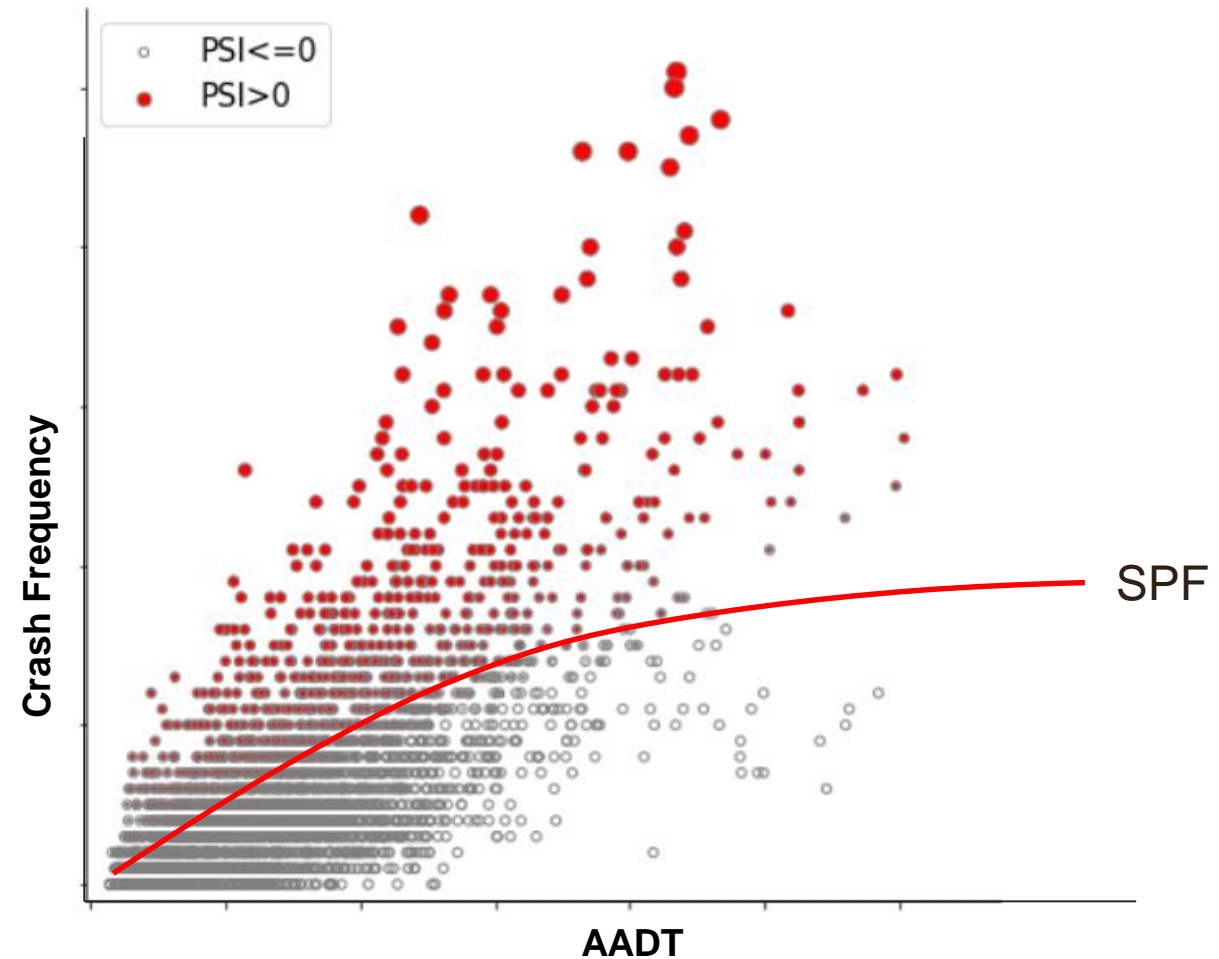
VA-specific SPFs for 24 site types

## ❑ Potential Safety Improvement

$PSI = (\text{Observed \#} - \text{Predicted \#})_{EB}$

## ❑ $PSI > 0$

Review for potential safety improvement



# 2016-2020 PSI List Update

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## ❑ 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

The screenshot displays the InteractVTrans Map Explorer interface. The top navigation bar includes a home icon, 'About', 'Vision + Actions', 'Needs + Priorities', 'Long-Term Risk Register', and the 'InteractVTRANS' logo. The main content area is divided into a left sidebar and a central map. The sidebar, titled 'Map Explorer', contains a search bar and a list of filters. The 'VTrans Mid-Term Needs' filter is expanded, showing '2021 VTrans Mid-term Needs' with a checked checkbox and a dropdown menu set to 'Need - Safety Improvement'. A callout box highlights this specific filter. The map shows a network of pink dashed lines representing VTrans Mid-Term Needs across Virginia, with major cities like Washington, Harrisonburg, Fredericksburg, and Richmond labeled. The map also shows the Chesapeake Bay and the state of Maryland.

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The screenshot displays the InteractVTrans Map Explorer interface. The top navigation bar includes a home icon, 'About', 'Vision + Actions', 'Needs + Priorities', 'Long-Term Risk Register', and the 'InteractVTRANS' logo. The main content area is divided into a left sidebar and a central map. The sidebar, titled 'Map Explorer', contains a search bar and a list of layers. The '2021 VTrans Mid-term Needs' layer is selected and expanded, showing a dropdown menu for 'Need - Pedestrian Safety Improvement' with 'Yes' selected. A callout box highlights this specific layer and its dropdown menu. The map shows a geographical view of Virginia with pink lines indicating the locations of the VTrans Mid-Term Needs. Major cities like Washington, Annapolis, Harrisonburg, Fredericksburg, California, Blacksburg, Richmond, Hampton, Norfolk, and Virginia Beach are labeled. The map also shows the Chesapeake Bay and the state boundary with Virginia.

# OIPI's VTrans Mid-Term Needs Update

## □ InteractVTrans Map Explorer

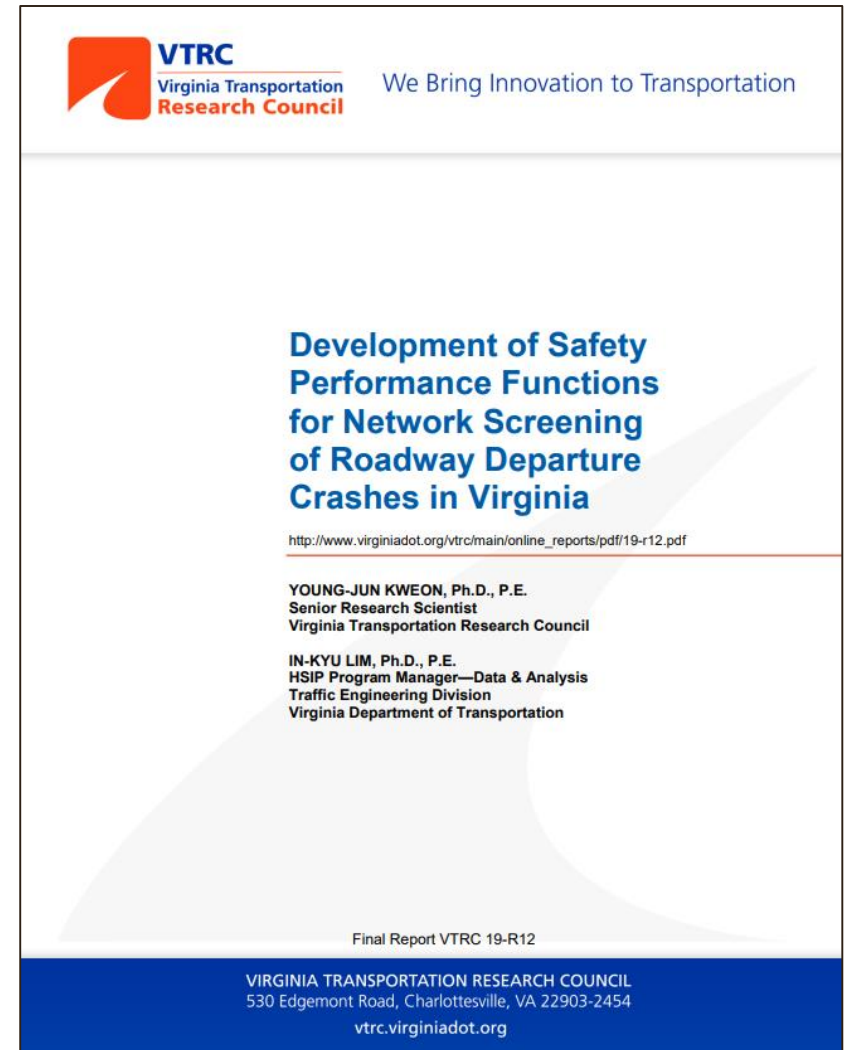
The screenshot shows the VTrans website interface. At the top, there is a search bar and a navigation menu. The 'InteractVTRANS' dropdown menu is open, highlighting 'Map Explorer', 'Data Explorer BETA', and 'About + Tutorials'. A red box highlights this menu. Below the navigation, there is a news article dated October 8, 2021, titled 'The Latest on About InteractVTrans'. A light blue callout box points to the 'About + Tutorials' link in the menu, stating: 'Access tutorials and a comprehensive list on this webpage'. At the bottom, a preview of the 'Map Explorer' interface is shown, including the title 'InteractVTRANS | Map Explorer' and a list of functions: SEARCH + DOWNLOAD, VIEW + DOWNLOAD LAYERS, and COMMENT.

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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



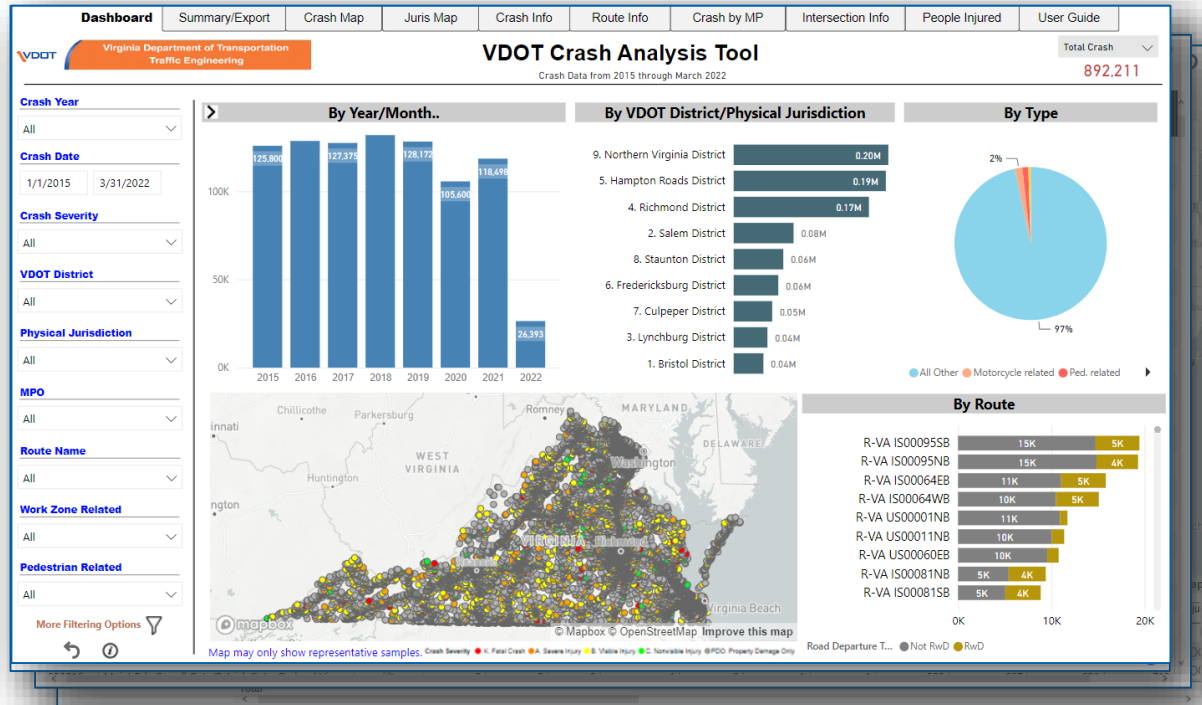
# VDOT SAFETY ANALYSIS RESOURCES

VDOT Safety Analysis Products and Tools

# VDOT Safety Analysis Products and Tools

<h3>VDOT Crash Analysis Tool</h3> <p>The screenshot shows the VDOT Crash Analysis Tool interface. It includes a navigation menu at the top with options like Dashboard, Summary/Export, Crash Map, Juris Map, Crash Info, Route Info, Crash by MP, Intersection Info, People Injured, and User Guide. The main area features several data visualization components: a 'By Year/Month' bar chart, a 'By VDOT District/Physical Jurisdiction' bar chart, a 'By Type' pie chart, and a 'By Route' table. A map of Virginia is also visible, showing physical jurisdiction boundaries.</p>	<h3>ArcGIS Online Crash Map</h3> <p>The screenshot displays the ArcGIS Online Crash Map for Virginia. It shows a detailed street-level view of an urban area, likely downtown Virginia Beach, with numerous colored markers representing crash locations. The interface includes standard ArcGIS navigation controls and a search bar at the top.</p>	<h3>Network Screening (Top 100 PSI Map)</h3> <p>The screenshot shows the Network Screening tool, specifically the 'Top 100 PSI Map'. It displays a map of Virginia with numerous orange circular markers of varying sizes, indicating high-traffic corridors or areas with high Potential Safety Index (PSI) values. The map includes major highways and regional labels.</p>	<h3>Work Zone Safety Dashboard</h3> <p>The screenshot shows the Work Zone Safety Dashboard. It features a 'Work Zone (WZ) Exposure Measure' section with line graphs showing exposure over time. There are also several bar charts, including one for 'Exposure by Dist' and another for 'Distances by Dist'. The dashboard includes a map of Virginia with work zone locations marked.</p>
<h3>Crash Summary Book</h3> <p>The screenshot shows the cover of the '2010-2020 Summary of Crash Data' report. The cover features the VDOT logo and the text 'Virginia Department of Transportation Traffic Engineering'. A disclaimer is visible at the bottom, stating that the data is for safety analysis and not an official Virginia record.</p>	<h3>Ped Safety Action Plan</h3> <p>The screenshot displays the Pedestrian Safety Action Plan (PSAP) 3.0 map. It shows a map of Virginia with various colored lines and markers representing pedestrian safety corridors and priority areas. The map includes labels for various locations and landmarks.</p>	<h3>Paving Project Safety Tool</h3> <p>The screenshot shows the Safety Analysis Reference Tool for Paving Projects. It features a map of Virginia with various colored lines representing different paving project segments. A legend on the right side of the map identifies the different project types and segments.</p>	<h3>RNS Crash Application</h3> <p>The screenshot shows the RNS (Roadway Network System) interface. It includes a search bar, a map of Virginia, and a 'Quick Search' button. The interface is designed for users to search for and analyze crash data within the roadway network.</p>

# VDOT Crash Analysis Tool

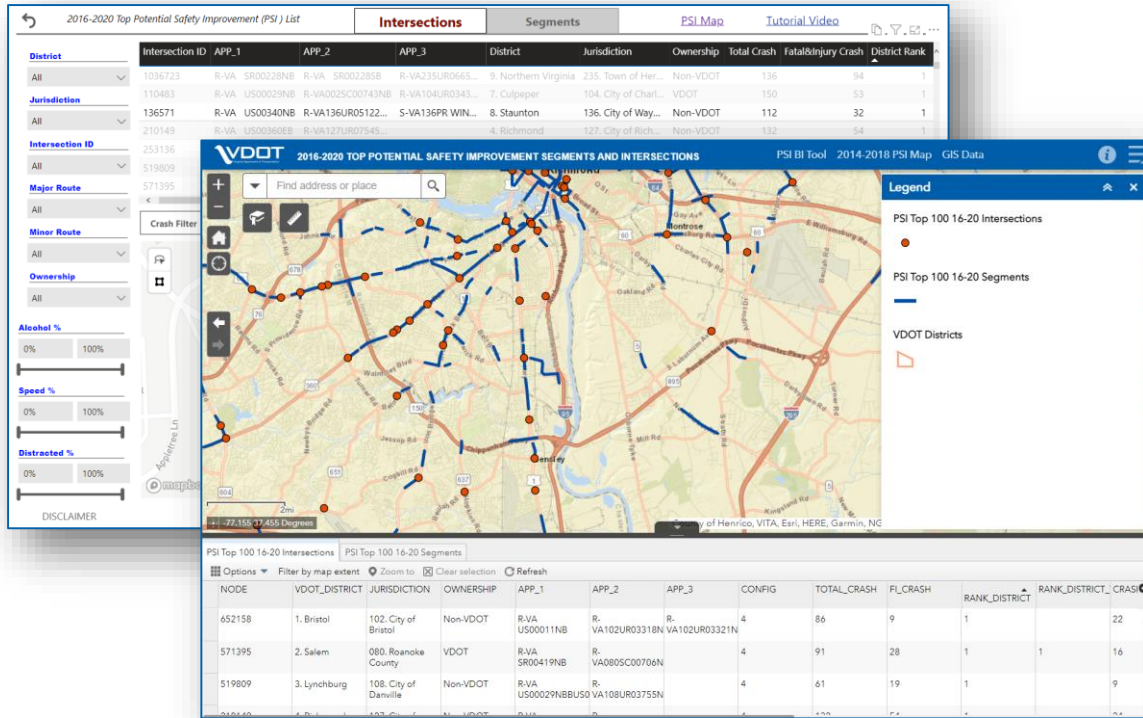


- ❑ Interactive crash data query
- ❑ Ready-to-use charts and statistics
- ❑ Integrated with roadway data elements
- ❑ People injury statistics
- ❑ Connection with ArcGIS Online Crash Map

[www.bit.ly/VDOTCrashTool\\_Public](http://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](http://bit.ly/VDOTHwySafetyData_ExternalSite)

[www.bit.ly/VDOTPSIMap](http://www.bit.ly/VDOTPSIMap)



# Work Zone Safety Dashboard

## VDOT Work Zone Safety Monitoring System

- Work Zone Exposures
- Work Zone Crash Counts
- Work Zone Crash Rates
- Interstate Work Zones
- US Primary Work Zones
- SR Primary Work Zones

[VTRC Report on Work Zone Safety Performance Measures for Virginia](#)



### Disclaimer

The VDOT Work Zone Safety Dashboard has been developed in-house by Traffic Engineering Division, Highway Safety section and Virginia Transportation Research Council for Work Zone safety analysis purpose. The main sources of the data are owned and maintained by DMV and VDOT. In providing this tool, VDOT assumes no responsibility for the accuracy and completeness of the data. In the process of recording and compiling the data, some deletions and/or omissions of data may occur and VDOT is not responsible for any such occurrences. The most recent data contained in this report is preliminary and subject to change. Please be advised that, under Title 23 United State Code – Section 409, this crash information cannot be used in discovery or as evidence in a Federal or State court proceeding or considered for other purposes in any action for damages against VDOT or State of Virginia arising from any occurrence at the location identified.

All users shall comply with and be subject to all applicable laws and regulations, whether federal or state, in connection with any of the receipt and use of DMV data including, but not limited to, (1) the Federal Drivers Privacy Protection Act (18 U.S.C. § 2721 et seq.), (2) the Government Data Collection and Dissemination Practices Act (Va. Code § 2.2-3800 et seq.), (3) the Virginia Computer Crimes Act (Va. Code § 18.2-152.1 et seq.), (4) the provisions of Va. Code §§ 46.2-208 and 58.1-3, and (5) any successor rules, regulations, or guidelines adopted by DMV with regard to disclosure or dissemination of any information obtained from DMV records or files.

The last updated date:

Friday, April 8, 2022

- ❑ 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](http://www.bit.ly/VDOT_WZDashboard)

# Thank you!

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# References

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- [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](#)