



# INTERSTATE 66 TECHNICAL MEMORANDUM

SEPTEMBER 2021

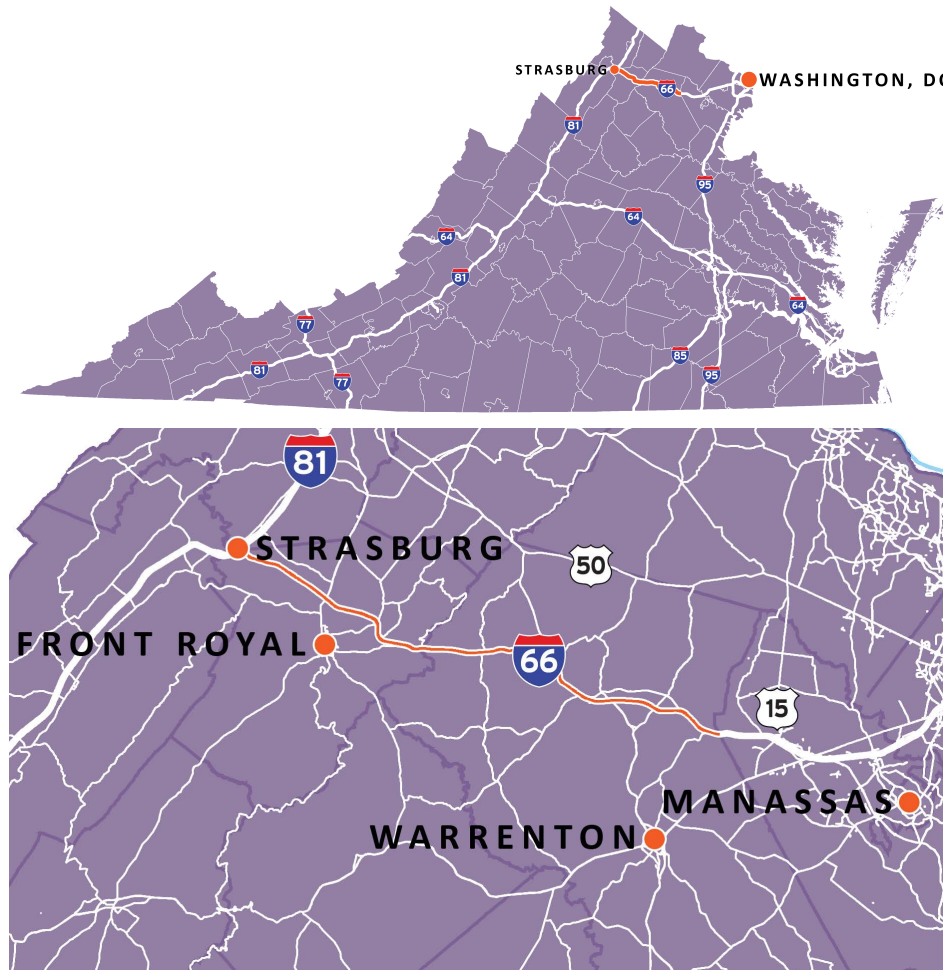


**Michael Baker**  
INTERNATIONAL

## PURPOSE

The purpose of this study is to identify a package of targeted capital improvements that are expected to deliver faster, safer, and more reliable travel on I-66 in Virginia. In 2019, the Virginia General Assembly passed House Bill 2718 and Senate Bill 1716 which provides revenues for improvements based on truck miles traveled on Virginia’s interstate highways. While Interstates 81, 95, and 64 have higher volumes and allocations, 19.4% of the funding is to be assigned for improvements to other Interstate highway corridors. This interstate corridor study identified capital improvements that may utilize this fund and other available funding sources.

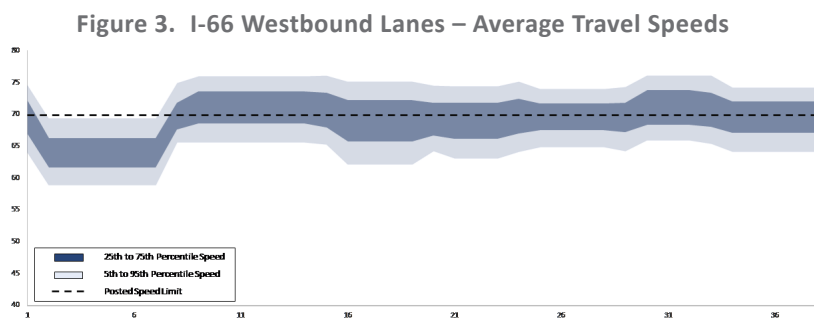
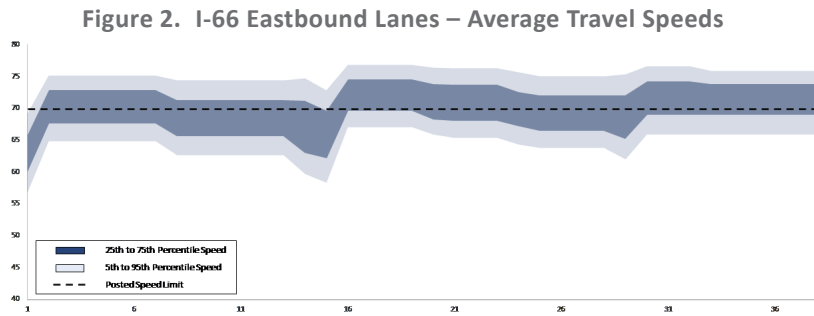
Figure 1. Study Area



## I-66 CORRIDOR CHARACTERISTICS

The I-66 study area is a 38-mile-long corridor that traverses from the east Fauquier County Line to the I-81 junction. The portion of I-66 east of Fauquier County was not included in the study area due to the large infrastructure improvements already being completed there. The corridor serves as an important connection between I-81 and Northern Virginia. However, it also provides access to many recreational activities within the region. Most of the corridor travels through rural areas within Warren and Fauquier Counties. The corridor does have multiple horizontal curves that are located near Front Royal, the Exit 23 interchange and east of Route 245 – Old Tavern Road.

The speed limit along the study corridor is 70 MPH. Available speed data, as shown in Figures 2 and 3 for eastbound and westbound I-66, respectively, show that speeds are relatively maintained close to the speed limit.



**ROADWAY VOLUMES AND TRAVEL PATTERNS**

Traffic volumes along I-66 are consistent with higher volumes on the US 17 overlap between Exit 23 and Exit 28. Table 1 summarizes the Average Annual Daily Traffic (AADT) Volume along I-66.

Table 1. I-66 AADT Volume Summary

Start	End	AADT
<b>Warren County</b>		
I-81	US 522/ 340	35,000
US 522/ 340	SR 79	33,000
SR 79	Fauquier County Line	40,000
<b>Fauquier County</b>		
Warren County Line	Route 688	40,000
Route 688	SR 55 / US 17 - EXIT 23	41,000
SR 55 / US 17 - EXIT 23	BUS 17 - EXIT 27	50,000
BUS 17 - EXIT 27	BUS 17 / US 17 - EXIT 28	52,000
BUS 17 / US 17 - EXIT 28	Route 245	41,000
Route 245	Prince William County Line	44,000

**MULTI-MODAL CHARACTERISTICS**

Warren and Fauquier Counties have multimodal transportation services and infrastructure that reflect their nature as the rural outer ring of the Washington Metropolitan Area. Multimodal services along I-66 are oriented to commuter trips into the denser core of Northern Virginia and Washington, D.C.

The intercity bus line – the Virginia Breeze – operates a route from Blacksburg to Washington, D.C. called the Valley Flyer. The Valley Flyer has a stop in Front Royal at the Crooked Run park and ride near the intersection of US 522 and I-66. The route continues east on I-66 to Dulles International Airport, then the West Falls Church Metrorail station, and then terminates at Union Station in Washington, D.C.

There are three park and ride lots in Warren County along I-66: Crooked Run (I-66 exit 6), Linden (I-66



exit 13), and Linden Chevron (I-66 exit 13). There are four park and ride lots in Fauquier County along I-66: Markham (I-66 exit 18), Delaplane (I-66 exit 23), Marshall (I-66 exit 27), and the Plains (I-66 exit 31).

## EXISTING CONDITIONS

In order to understand the operations and safety of the corridor, the study team gathered data from a variety of sources. This data included travel speed, crash data, vehicle delay, and lane-impacting data. This data was used to determine areas of focus and formulate solutions or plans.

### PERFORMANCE MEASURES

The study team utilized previously developed methodology from the I-81 and I-95 corridors to consistently evaluate interstate corridors in Virginia. The team collected and summarized crash and delay data for 5 years, 2015 through 2019, in 1-mile segments. The study team then ranked the 1-mile segments and highlighted the top 25 percent of segments, regardless of direction, to be reviewed for potential improvements. The four performance measures included:

- Crash frequency and severity: the total number of crashes, weighted by severity, using the equivalent property damage only (EPDO) scale. Source: Virginia Department of Transportation (VDOT) Roadway Network System
- Crash severity rate: the total rate of crashes, weighted severity, per 100 million vehicle-miles traveled. Source: VDOT Roadway Network System and VDOT Traffic Monitoring System
- Total delay: the total person-hours of delay caused by the impacts of congestion, incidents, and weather events. Source: INRIX
- Incident delay: the total person-hours of delay caused by incidents (crashes and disabled vehicles) that lead to at least one lane of the interstate to be closed for an hour or more. Source: INRIX and VA Traffic

Figure 4 shows the total annual person hours of delay that occur along a segment on I-66. Annual person hours of delay represent where users may experience the most amount of congestion along I-66. Figure 5 shows the delay type on I-66 compared to other Virginia interstates.

Figure 4. I-66 Annual Persons Hours of Delay

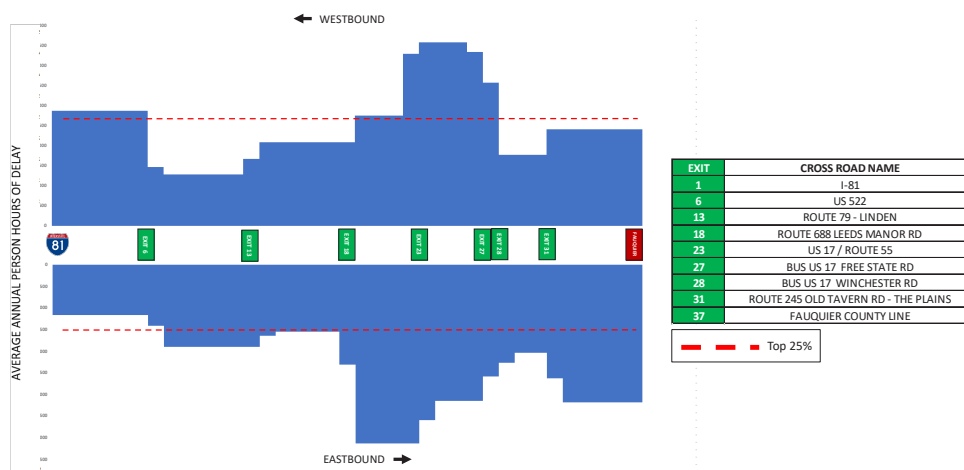
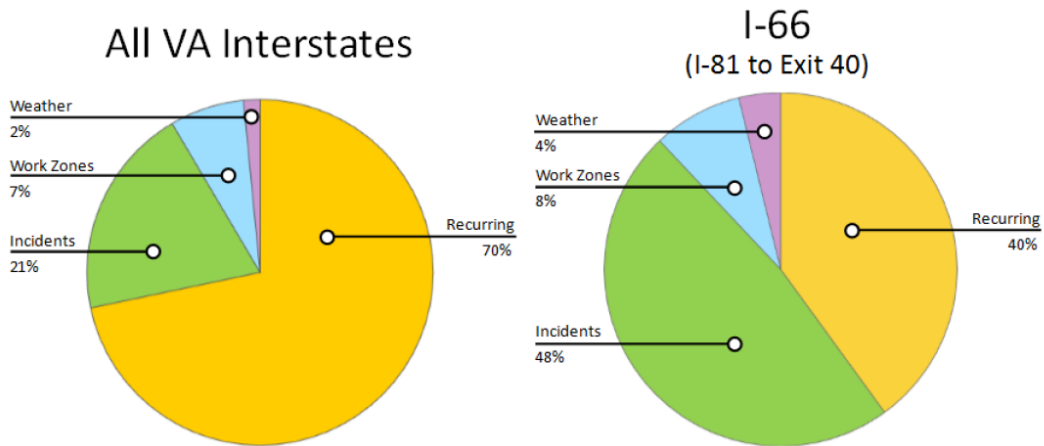


Figure 5. Delay Type on Virginia Interstates



Eastbound and westbound drivers both experience the most delay where US 17 overlaps with I-66, between exits 28 and 23. This is due to the increased interchange density, frequent volume changes and the horizontal curves near exit 23, resulting in slower traffic. Eastbound drivers also experience delay as they approach the Prince William County line, beginning near exit 31. This is a result of increased traffic volumes and cross-section change. Westbound drivers typically experience additional delay as they approach the I-81 junction west of US 522. This is a result of lane changes, incidents on I-81, and speed changes from ramp curvatures. Finally, most delay on the I-66 study corridor is between Exit 28 and Exit 23, where US 17 overlaps with I-66. The interchange density increases, more frequent volume changes, and horizontal curves near Exit 23 result in slower traffic.

**TRAFFIC SAFETY**

The I-66 crash type history is summarized in Figure 6. Most crashes that occur on I-66 are off-road, however rear-ends and sideswipes are very common near closely spaced interchanges or weave areas.

Figure 6. I-66 Crash Type Breakdown

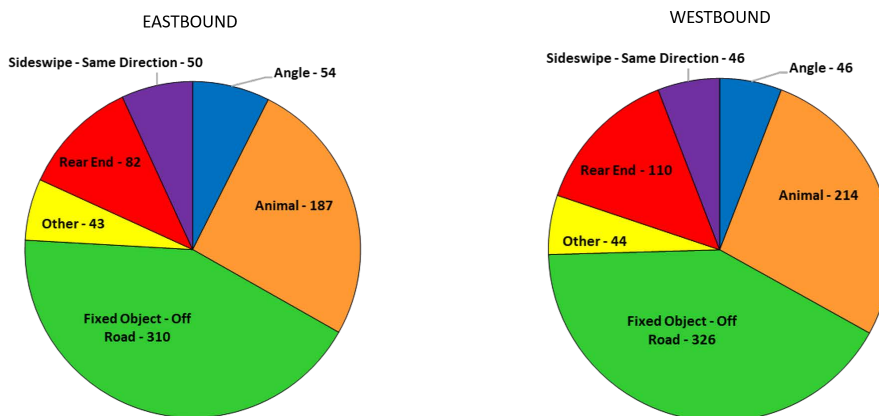
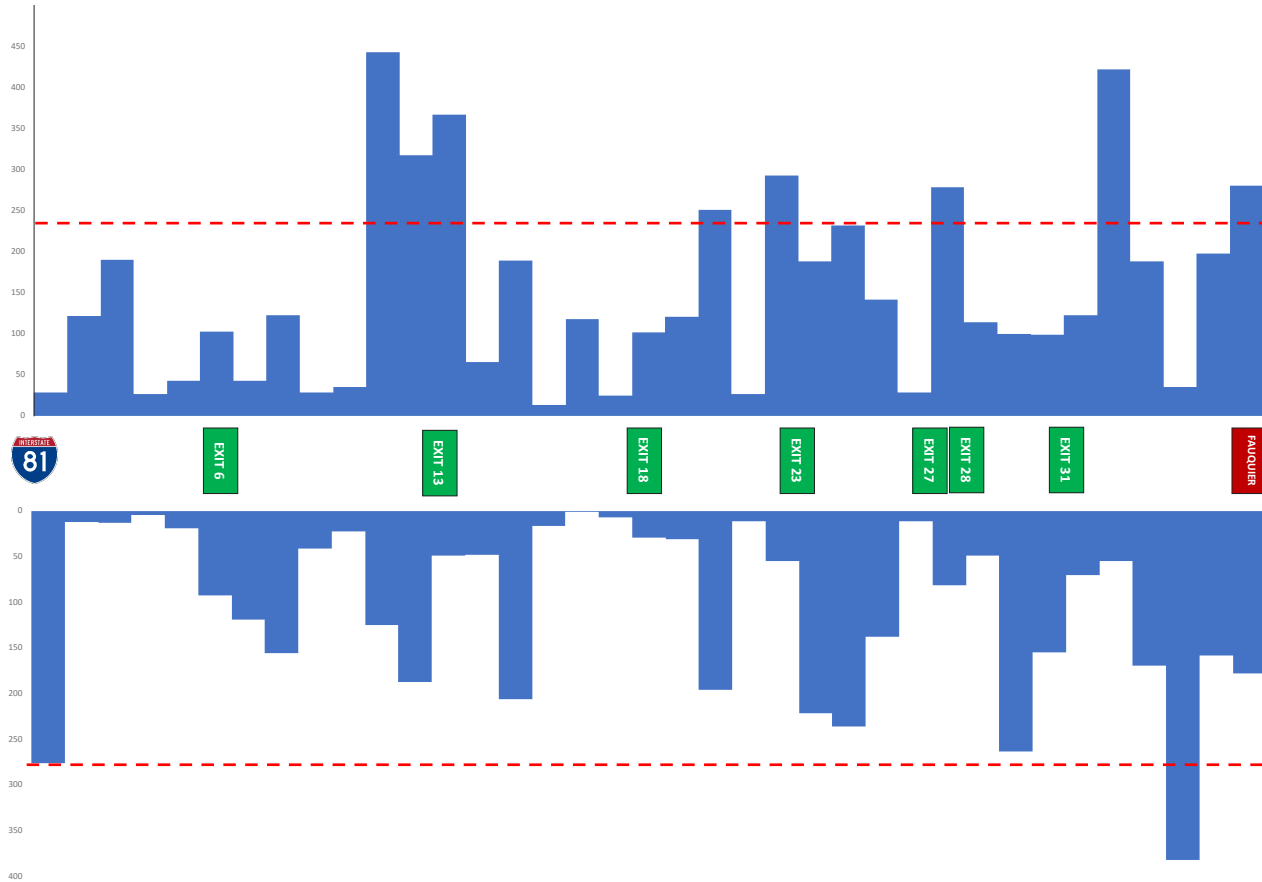


Figure 7 represents the annual Equivalent Property Damage Only (EPDO) for crashes along 1-mile segments on I-66. This data helps represent the severity of the crashes by quantifying fatalities and injuries in terms of property damage.

Figure 7. Equivalent Property Damage Only (EPDO) Crashes



Most of the corridor crashes are off-road or animal related. Off-road related crashes are primarily focused along the sections with horizontal and reverse curves. Most animal related crashes are concentrated near interchanges, particularly at exits 13 and 27. The two sections along I-66 with the most severe crashes were along the westbound reverse curve east of Town of Front Royal and at the Exit 31 interchange onto Route 245 – Old Tavern Road from westbound I-66. Both locations had a high number of off-road crashes as a result of either geometric deficiencies or surface conditions caused by weather.

### MAINLINE ROADWAY IMPROVEMENT PLAN

Upon reviewing the performance measures, supplementary data, roadway conditions, and VDOT input, the team developed a capital improvements plan for I-66. This plan includes both a combination of physical improvements and locations for further study. A summary of the most frequently proposed improvements can be found below:

- Acceleration or Deceleration Lane Extension: Extending existing acceleration or deceleration lanes at interchanges to VDOT Design Standards to improve merging / diverging operations and safety
- Shoulder Widening: Widen the inside or right shoulder via paving and/or grading to VDOT Design Standards in order to reduce off-road crashes and crash severity
- Signage and Striping Operations: Targeted improvement at locations with horizontal curves to improve driver awareness and reduce off-road crashes

Table 2 shows a summary of mainline improvements which include the location, direction, targeted operational and/or safety metric, brief description and an estimate cost. Cost estimates are represented in 2020 Dollars and used a combination of VDOT Statewide and District averages, the Statewide Planning Tool, and previously completed projects.

Table 2. I-66 Capital Improvement Summary

Improvement Location	Mile Post From:	Mile Post To:	Improvement Type	Target Metric	General Description	Est. Low Cost Limit	Est. High Cost Limit
<b>Staunton District</b>							
I-66 Eastbound	7.50	8.00	Safety	Off Road Crashes	Widen left and right shoulders (where feasible) to improve recovery zones for vehicles	\$600K	\$700K
I-66 Eastbound	11.00	12.00	Safety	Off Road Crashes	Widen left and right shoulders (where feasible) to improve recovery zones for vehicles	\$2.4 M	\$2.9 M
I-66 Eastbound	11.00	12.00	Safety	Off Road Crashes	Install Sequential Dynamic LED Chevrons to improve visibility during weather events and no-light conditions	\$610K	\$910K
I-66 Westbound	13.00	10.00	Safety	Off Road Crashes	Widen left and right shoulders (where feasible) to improve recovery zones for vehicles	\$2.5 M	\$3.0 M
I-66 Westbound	13.00	10.00	Safety	Off Road Crashes	Install Sequential Dynamic LED Chevrons to improve visibility during weather events and no-light conditions	\$550K	\$815K
<b>Culpeper District</b>							
I-66 Westbound	22.50	22.00	Safety and Operations	Off Road Crashes / Incident Delay	Improve sight distance and visibility by removing vegetation on right side of roadway and installing Advance Warning Signage with Sequential Dynamic LED Chevrons	\$400K	\$600K
I-66 Westbound	22.50	22.00	Safety and Operations	Off Road Crashes / Incident Delay	Perform Bridge Widening and Curve Widening to improve recovery areas and ability to move incidents to shoulder	\$18.0M	\$21.6 M
I-66 Eastbound: Exit 23	23.85	24.10	Safety and Operations	Off Road, Sideswipes, and Rear End Crashes / Operations	Extend Acceleration Lane onto I66 from John Marshall Hwy (Route 55)	\$2.0M	\$2.3M
I-66 Westbound: Exit 23	24.00	23.80	Safety and Operations	Off Road, Sideswipes, and Rear End Crashes / Operations	"Construct Deceleration Lane onto John Marshall Hwy (Route 55) from I66 Replace and add overhead signage in advance of Exit 23"	\$1.6 M	\$1.9 M
I-66 Westbound: Exit 31	32.20	31.90	Safety and Operations	Off Road and Rear End Crashes / Operations	"Install Advance Curve and Bridge Warning Signage Extend Deceleration lane onto Old Tavern Road (Route 245) from I66 Add advance signage to notify drivers of Exit 31"	\$1.0M	\$1.1M

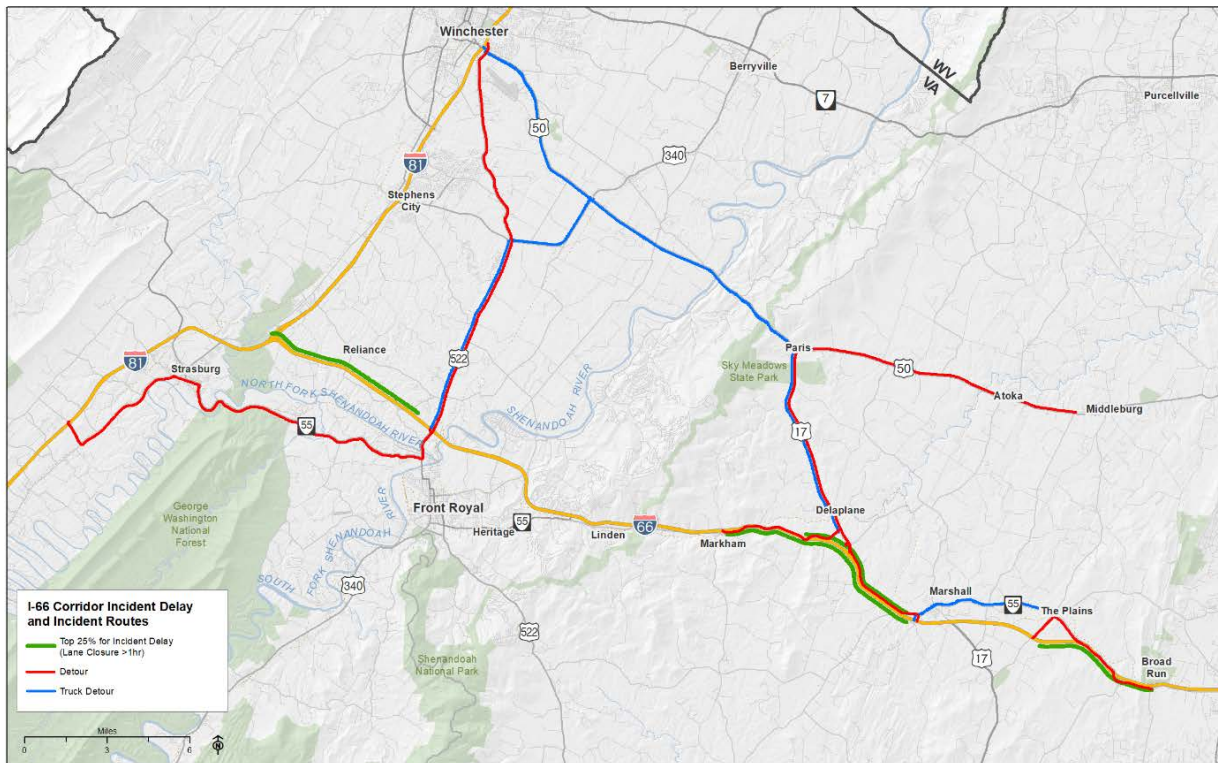
**INCIDENT ROUTES**

As part of the IOEP policy for Corridor Improvement Plans, parallel routes are included in the analysis near segments of the corridor that experience the worst incident delay. These are the routes where traffic is most likely to be diverted in the case of an incident on the interstate. In those instances, operational upgrades and other low-cost improvements could provide a substantial benefit.

Multiple incident routes exist for I-66. Most of these incident routes are not necessarily parallel but provide access from I-66 to I-81. These roads include US Route 50, US Route 522, VA Route 55, and US Route 17. Some of the incident routes are specific for truck traffic, such as Route 55 and US Route 50. The study team evaluated the incident routes where an incident was located in the top 25% of incident delay along I-66. Figure 8 shows the incident routes evaluated and the top 25% of where incidents occurred along I-66.

A high-level analysis was performed for the study sections using a similar process that was done for I-66. The study team reviewed vehicular volume, crash data, VTRANS 2045, and geometrics. Recommendations were developed in the context of benefiting a potential incident route between I-66 interchanges. However, the study team did identify areas that were problematic and should be investigated further by VDOT. It should be noted that there are current and previous efforts that will provide or have recommended improvements along the incident routes. These improvements and on-going efforts are listed on the following page.

Figure 8. I-66 Incident Routes





Staunton District:

- Route 522 Corridor Study (UNDERWAY).
- Route 522 Right-turn lane extension onto I-66 Westbound (FUNDED)
- Route 50 between I-81 and Independence Drive: I-81 Exit 313 Interchange improvement and intersection improvements at Route 50 and Independence Drive and Route 50 and Route 655.
- Route 55 and Route 678/610: Construction of left-turn lanes on Route 55 and a westbound right-turn lane of Route 610.
- I-81 Exit 291 Northbound Ramp Termini: Construction of dedicated turn lanes on I-81 ramp onto Route 651 (FUNDED)

Culpeper District:

- I-66 Exit 28 Interchange Improvements: Westbound I-66 termini roundabout) and eastbound I-66 termini Restricted Crossing U-turn. (FUNDED)
- Route 55 Corridor Study – Town of Marshall (UNDERWAY)
- Route 55 and Route 709 Roundabout (FUNDED)

Table 3 shows a summary of incident route recommendations.

**Table 3. Incident Route Recommendations**

Interchange Location	Improvement Type	Target Metric	General Description
<b>Staunton District</b>			
Route 11 between Route 601 and Route 639	Safety	Off Road Crashes	Evaluate Segment for further study to reduce off road crashes. Consider implementing advance signage, rumble stripes, and/or using available pavement area to modify pavement markings.
Route 50 and Route 638	Safety	Angle Crashes	Evaluate intersection for further study to improve driver awareness of intersection and reduce angle crashes by employing multiple low-cost countermeasures or use of innovative intersections.
Route 55 between Shenandoah County Line and Route 616	Safety	Off Road Crashes	Widen shoulders and provide safety edge where feasible.
<b>Culpeper District</b>			
I-66 EB/WB Ramps with Route 688	Operations	Operations	Improve pavement areas at ramp termini with Route 688 to accommodate turning radii of larger vehicles
I-66 EB Ramp with Route 245	Operations	Operations	Improve pavement areas at ramp termini to accommodate turning radii of larger vehicles. Adjust signage and medians to improve driver understanding.
Route 17 and Route 50	Safety	Rear-End Crashes	Evaluate intersection for further study to improve driver awareness of intersection and reduce rear-end crashes by employing multiple low-cost countermeasures or use of innovative intersections.
Route 17 between SR 712 and Route 50	Safety	Animal Crashes	Increase Deer Warning Signage and evaluate fencing opportunities.
Route 17 and Route 713	Operations	Operations	Improve pavement area on Maidstone road to accommodate turning vehicles using soft shoulder. Evaluate if a right-turn lane is warranted.
Route 55 and Route 688	Safety	Angle Crashes	Evaluate intersection for further study to improve driver awareness of intersection and reduce angle crashes by employing multiple low-cost countermeasures or use of innovative intersections.
Route 55 between Route 17 and Route 688	Safety	Off Road Crashes	Widen shoulders and provide safety edge where feasible.
Route 55 and Route 17	Operations	Operations	Evaluate if a right-turn lane is warranted on Northbound Route 55.
Route 55 and Route 600	Safety	Off Road and Angle Crashes	Evaluate intersection for further study to improve driver awareness of intersection and reduce off road and angle crashes by employing multiple low-cost countermeasures or use of innovative intersections.

## Next Steps

The I-66 targeted improvements will be evaluated at a statewide level against targeted improvements along other interstate corridors, using an evaluation method similar to Virginia's SMART SCALE program. Improvements that score well enough in the evaluation process are prioritized for funding and the prioritized project list is sent to the Commonwealth Transportation Board for final funding selections.

This study will be updated every four years to allow for the development of a new prioritized project list for consideration by the Commonwealth Transportation Board.