INTERSTATE 295
TECHNICAL MEMORANDUM

OCTOBER 2021

VDOT Virginia Department of Transportation

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PURPOSE

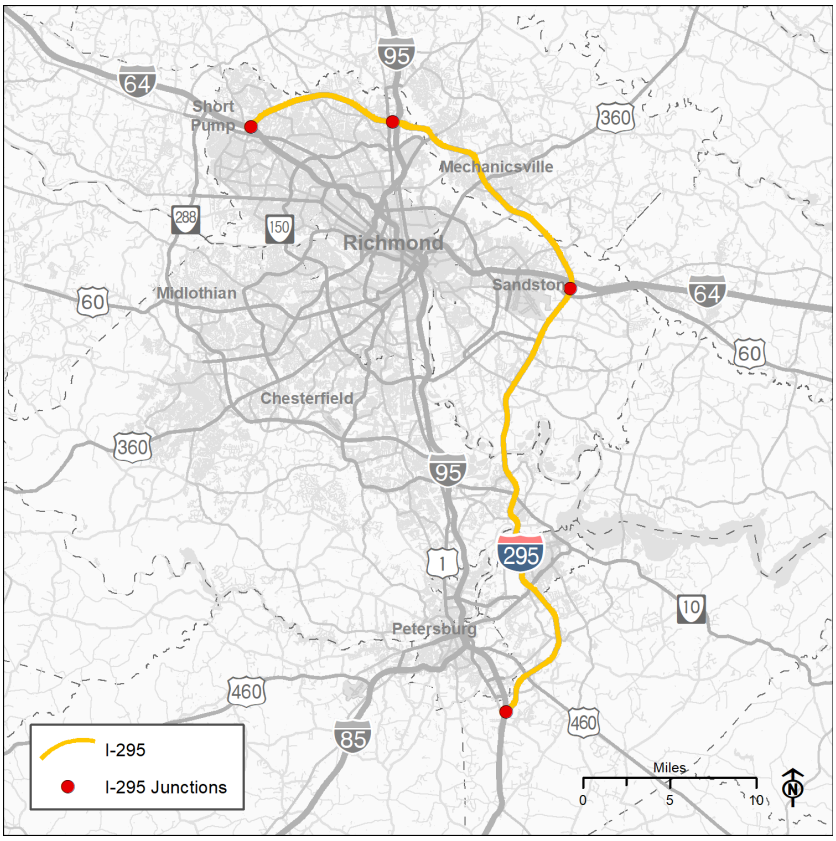
The purpose of this study is to identify a package of targeted capital improvements that are expected to deliver faster, safer, and more reliable travel on I-295 in Virginia. In 2019, the Virginia General Assembly passed House Bill 2718 and Senate Bill 1716 which provides revenues for improvements based 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-295 CORRIDOR CHARACTERISTICS

I-295 is a 53-mile long corridor that traverses around the Richmond-Petersburg Area. The corridor connects to two major interstates, I-64 and I-95. Most of the corridor travels through urban and suburban areas within Henrico, Hanover, Chesterfield, and Prince George Counties. The corridor has a cross-section with adequate shoulders and a wide grassy or wooded median. Four major junctions are located on I-295; I-64 in Henrico County, I-95/US 1 in Henrico County, I-64/US 60 in Henrico County, and I-95 in Prince George County, as shown in Figure 2.

Figure 2. Junction Map



The speed limit along I-295 is between 65 MPH and 70 MPH. Available speed data, as shown in Figures 3 and 4 for northbound and southbound I-295, respectively, show that speeds are relatively maintained close to the speed limit.

Figure 3. I-295 Northbound Lanes – Average Travel Speeds

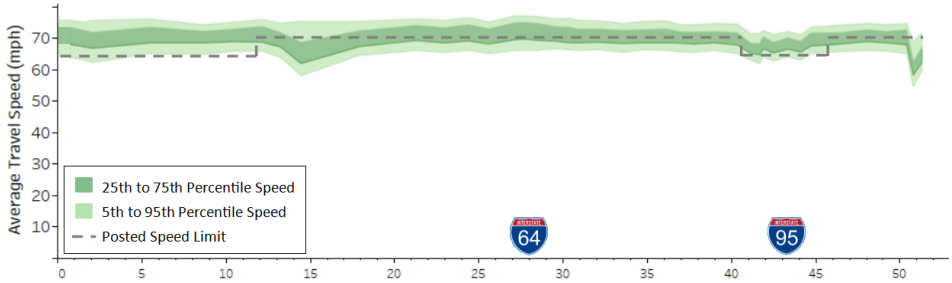
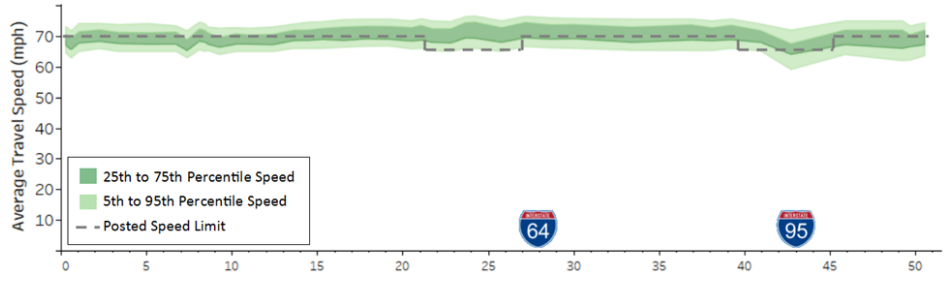


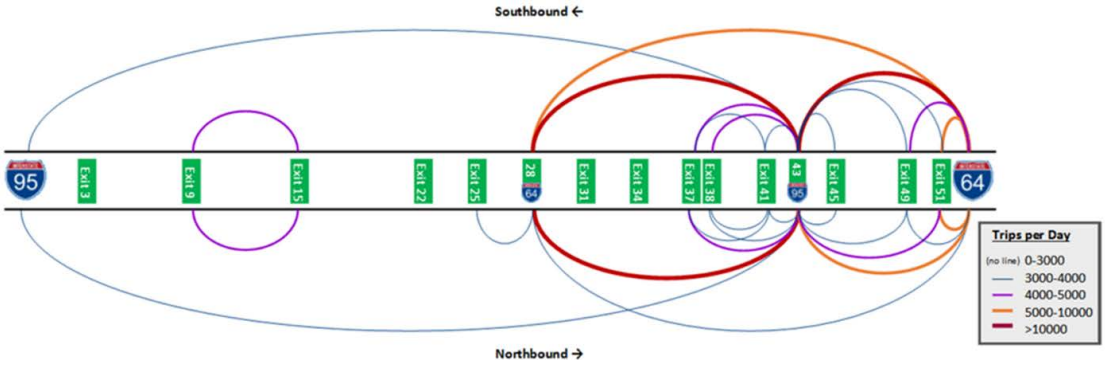
Figure 4. I-295 Southbound Lanes – Average Travel Speeds



ROADWAY VOLUMES AND TRAVEL PATTERNS

As shown in Figure 5, frequently traveled ingress / egress points along the corridor are between the two I-64 interchanges and the I-95 (Exit 43) interchange.

Figure 5. I-295 Travel Patterns – Origin-Destination Data



EXIT	CROSS ROAD NAME
54	I-64
51	Nuckols Rd
49	US 33
45	Woodman Rd
43 C-D	ROUTE 1
43 A-B	I-95
41	Chamberlayne Rd
38	Pole Green Rd
37	US 360
34	Creighton Rd

EXIT	CROSS ROAD NAME
31	Airport Dr
28	I-64
28	US 60
25	Pocahontas Pkwy
22	Route 5 New Market Rd
16	Meadowville Technology Pkwy
15	Route 10
9	Route 36 Oaklawn Blvd
3	Country Drive
0	I-95

The travel patterns show that most drivers are using I-295 to access I-64 or the I-95/US 1 (Exit 43) interchange. This is expected as the interstate is commonly used as an incident route and to avoid I-95 or I-64 traffic within the Petersburg-Richmond Metropolitan Area. The interstate is also used as a commuter route with short trips between interchanges is common, such as Nuckols Road and I-64 in Henrico County or Route 10 and Route 36 in Prince George County.

Traffic volumes along I-295 are much higher between the I-64 branch in Henrico County and the I-64/ US 460 interchange. Table 1 summarizes the Average Annual Daily Traffic (AADT) Volume along I-295.

Table 1. I-295 AADT Volume Summary

Start	End	AADT
Henrico County		
I-64	Nuckols Road	67,000
Nuckols Road	US 33	70,000
US 33	Woodman Road	71,000
Woodman Road	US 1	78,000
US 1	I-95	85,000
I-95	Hanover County Line	109,000
Hanover County		
Hanover County Line	Chamberlayne Road	109,000
Chamberlayne Road	Pole Green Road	113,000
Pole Green Road	US 360	108,000
US 360	Creighton Road	92,000
Creighton Road	Henrico County Line	87,000
Henrico County		
Henrico County Line	Airport Drive	87,000
Airport Drive	I-64/US 60	74,000
I-64/US 60	Pocahontas Pkwy	44,000
Pocahontas Pkwy	New Market Road	38,000
New Market Road	Chesterfield County Line	40,000
Chesterfield County		
Chesterfield County Line	Meadowville Road	40,000
Meadowville Road	Route 10	35,000
Chesterfield County		
Route 10	Route 36	35,000
Route 36	US 460	22,000
US 460	I-95	19,000

As shown with the travel patterns along I-295, most vehicular volume is between both I-64 interchanges and the I-95/US 1 Interchange. The AADT is above 100,000 between Pole Green Road and the I-95/US 1 Interchange and significantly drops south of the I-64/US 60 interchange as vehicles travel through Chesterfield and Prince George Counties.

I-295 MULTI-MODAL CHARACTERISTICS

No alternative transportation routes use or parallel I-295. There are no bus services on I-295. All Virginia Breeze Routes originate west of I-295 and prefer an I-64/I-95 alignment when traveling through Richmond. All Greyhound routes prefer an I-64/I-95 alignment as well. All Greater Richmond Transit Company (GRTC) routes are within the circumference of I-295. There are no paralleling rail lines for I-295. The interstate crosses railroads where Amtrak operates two times – once between the Woodman Road exit (Exit 45) and the US 33 Montpelier exit (Exit 49) and once between the US 60 exit (Exit 28) and the VA 895 exit (Exit 25). However, I-295 does not provide access to any Amtrak station. One park and ride lot with about 90 spaces has direct access to I-295 at the Mechanicsville Turnpike/ US 360 exit. The lot is on the east side of I-295.

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.

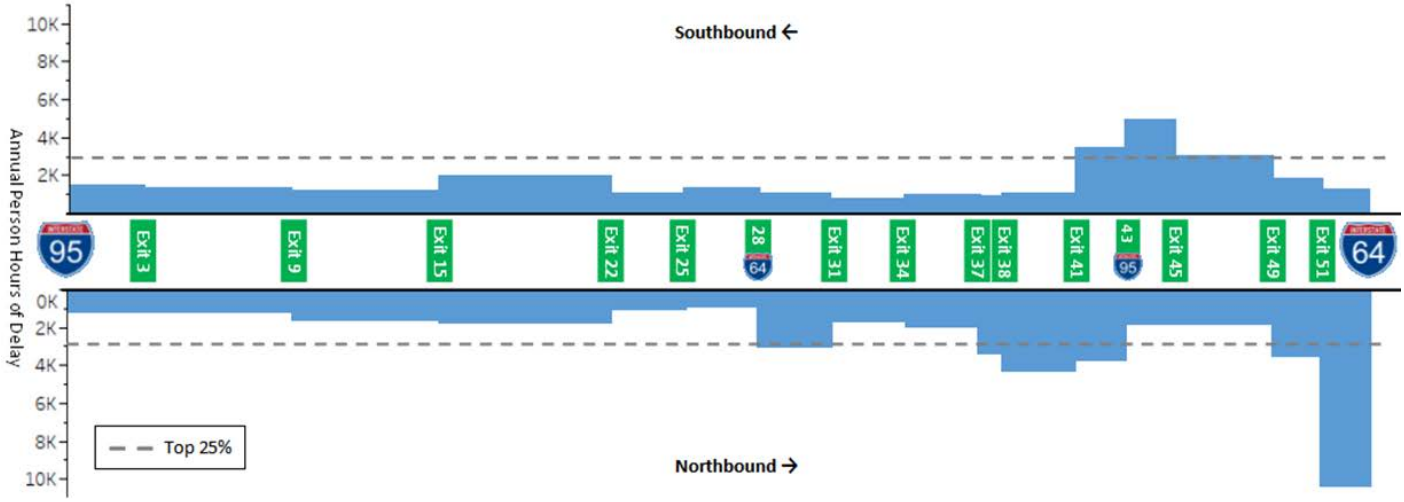
PERFORMANCE MEASURES

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 4 years, 2015 through 2018, 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 6 shows the total annual person hours of delay that occur along a segment on I-295. Annual person hours of delay represent where users may experience the most amount of congestion along I-295.

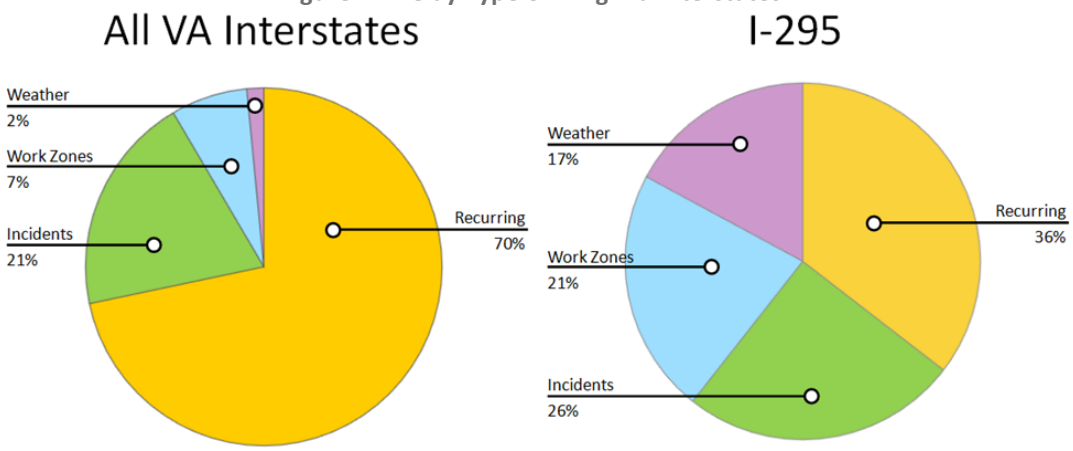
Figure 6. I-295 Annual Persons Hours of Delay



Most delay on I-295 occurs as drivers approach the I-64 branch in Henrico County. Some of the reasons for an increase in delay are poor lane utilization as drivers approach I-64 and incidents on I-64. The remainder of the corridor operates well, although some delay occurs near the I-95/US 1 interchange (Exit 43). As previously shown in Figure 4, Exit 43 is a heavily used interchange by drivers. The delay can be attribute to a combination of volume entering and exiting the interchange and the close interchange spacing with Chamberlayne Road (Exit 41) and Woodman Road (Exit 45).

The type of delay that is experienced on roadways help further identify ways to address congestion. Figure 7 shows the contributors of delay on all Virginia interstates and I-295.

Figure 7. Delay Type on Virginia Interstates



Compared to other interstates in Virginia, I-295 experiences less recurring delay. However, incidents, work zones, and weather-caused delay are more prevalent. Weather and incident type delay are fairly common in areas along I-295 northbound between the I-64/US 60 interchange (Exit 28) and US 360 (Exit 37) or at the Varina-Enon Bridge due to high-wind weather situations. As stated previously, most recurring delay, occurs at the I-95/US 1 interchange and I-64 interchange in Henrico County. Traffic Safety

The I-295 crash type history can be summarized in Figure 8. Most crashes that occur on I-295 are off-road, however rear-ends and sideswipes are very common near closely spaced interchanges or weave areas.

Figure 8. I-295 Crash Type Breakdown

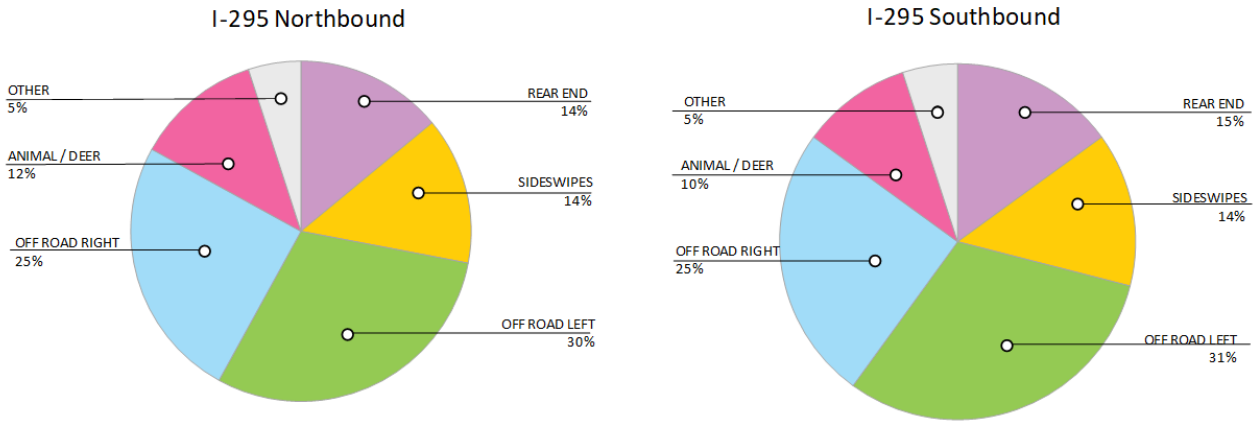
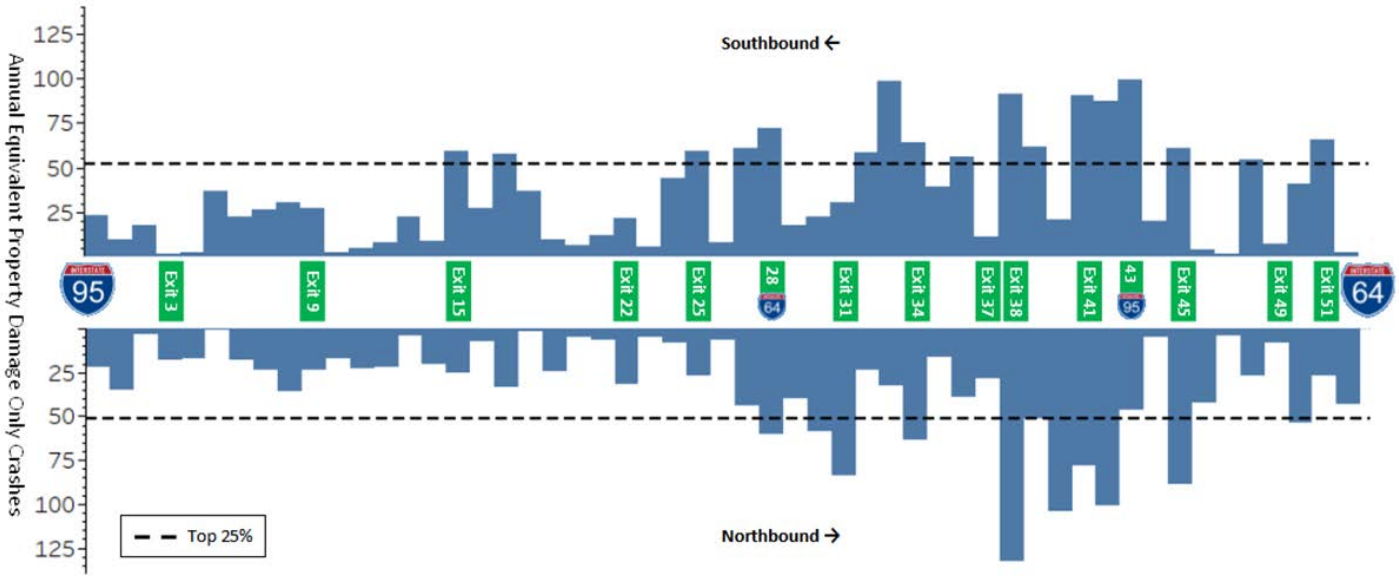


Figure 9 represents the annual Equivalent Property Damage Only (EPDO) for crashes along a 1-mile segment on I-295. EPDO helps represent the severity of the crashes by quantifying fatalities and injuries in terms of property damage.

Figure 9. I-295 Crash Type Breakdown



The segment between Creighton Road (Exit 34) and Woodman Road (Exit 45) has the highest amount of severe type crashes along I-295. This area has an increased interchange density which will result both in poor operations and safety. As well, traveling Northbound on I-295 between Pole Green Road (Exit 38) and the I-95/US 1 Interchange (Exit 41), severe type crashes are more concentrated because of traffic weaving and merging with I-295 or I-95.

MAINLINE ROADWAY IMPROVEMENT RECOMMENDATIONS

Upon reviewing the performance measures, supplementary data, roadway conditions, and VDOT input, the team developed recommendations for I-295. This study 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 interchanges to improve lane utilization, safety, capacity, and driver understanding by restriping mainline lanes and installing new overhead signage.
- Auxiliary Lane: Additional outside mainline lane that connects two interchanges to facilitate traffic that is not destined elsewhere beside the two interchanges. Auxiliary lanes improve safety and operations by reducing merging and unnecessary lane changes.

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-295 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
Henrico County							
I-295 Northbound and I-64 Branch in Henrico County (West End)	52.60	53.00	Congestion	Travel Time	Improve lane volume balancing by restriping the existing branch onto I-64 and replace overhead signs between western gore termini and beginning of deceleration lane onto I-64 Westbound.	$0.2 M	$0.3 M
Segment between I-295 Northbound and I-64 Branch in Henrico County (West End) and Nuckols Road (Exit 51)	52.00	52.60	Congestion and Safety	"Travel time Off-road, sideswipe crashes"	Reduce merge related crashes from Nuckols Road southbound onto I-295 Northbound and improve operations by constructing single northbound auxiliary lane between the onramp from Nuckols Road Southbound (Exit 51) on-ramp and I-295 Northbound and I-64 Branch.	$18.6 M	$20.4 M
I-295 Southbound: Nuckols Road (Exit 51)	51.80	52.00	Safety	Rear-end and off-road crashes	"Extend Deceleration Lane onto Nuckols Road Southbound (250 foot taper and increase parallel decel length by 100' - 150')"	$0.4 M	$0.5 M
I-295 Northbound: Nuckols Road (Exit 51)	50.88	51.06	Safety	Rear-end and off-road crashes	"Extend Deceleration Lane onto Nuckols Road Northbound (250 foot taper and increase parallel decel length by 100' - 150')"	$0.4 M	$0.5 M
I-295 Southbound: US 33 Staples Mill Road (Exit 49)	48.41	48.59	Safety	Rear-end and off-road crashes	"Extend Deceleration Lane onto US 33 Staples Mill Road Southbound (250 foot taper and increase parallel decel length by 100' - 150')"	$0.4 M	$0.5 M
I-295 Southbound: US 33 Staples Mill Road (Exit 49)	48.30	48.75	Safety	Rear-end, off-road, sideswipes crashes	"Extend Acceleration Lane off of US 33 Staples Mill Road Northbound (300 foot taper and increase parallel length by 200')"	$0.6 M	$0.7 M
I-295 Southbound: Route 1 (Exit 43)	44.70	44.56	Safety	Rear-end and off-road crashes	"Extend Deceleration Lane onto Exit 43 C-D Lanes (250 foot taper and increase parallel decel length to 400')"	$0.8 M	$0.9 M
I-295 Southbound between Milepost 43.5 and Milepost 44.56	43.50	44.56	Safety	Off-road crashes	Widen Left-Shoulder on Segment	$1.7 M	$2.0 M
I-295 Southbound C-D Lanes (Exit 43)	44.00	44.56	Congestion and Safety	"Travel time Off-road crashes"	Widen Cross-section between I-295 Southbound deceleration and Exit 43 C to two-lane section.	$3.7 M	$4.5 M
I-295 Northbound C-D Lanes (Exit 43)	44.00	44.50	Congestion and Safety	"Travel time Off-road crashes"	Continue two-lane section from I-95 Southbound on ramp onto I-295 Northbound to end of C-D lane.	$6.3 M	$7.6 M
I-295 Southbound: I-64 Eastbound (Exit 43A) Flyover Ramp	29.44	29.44	Safety	Off-road crashes	Improve safety by installing reflective barrier panels and a dynamic warning system that warns trucks of their approaching speed. Speed feedback signs targeting larger vehicles may require additional fabrication.	-	<$1.0M

Improvement Location	Mile Post From:	Mile Post To:	Improvement Type	Target Metric	General Description	Est. Low Cost Limit	Est. High Cost Limit
Hanover County							
I-295 Southbound and I-95 Southbound Branch	42.70	42.70	Congestion and Safety	"Travel time Off-road, sideswipe crashes"	Improve merging operations at the I-295 Southbound and I-95 Southbound branch by striping out the existing southbound I-295 inside lane and restriping the gore area. Advance signage will need to be added and/or replaced.	$1.3 M	$1.6 M
Segment between I-295 Southbound and I-95 Southbound Branch to Chamberlayne Road (Exit 41)	42.20	41.86	Operations	Travel time	Construct southbound auxiliary lane between the existing lane drop on I-295 Southbound and Chamberlayne Road (Exit 41) off ramp.	$0.4 M	$0.5 M
I-295 Northbound and I-95 Northbound Branch	41.90	42.78	Congestion and Safety	"Travel time Off-road, sideswipe crashes"	Reduce lane-changing related crashes by restriping the gore area and replacing overhead with lane use identifiers and diagrammatic signs.	$2.4 M	$2.7 M
I-295 Northbound: Pole Green Road (Exit 38)	38.36	38.50	Safety	Rear-end and off-road crashes	"Extend Northbound Deceleration Lane onto Pole Green Road (250 foot taper and increase parallel decel length by 100' - 150')"	$0.4 M	$0.5 M
I-295 Southbound: Creighton Road (Exit 34)	35.00	34.87	Safety	Rear-end and off-road crashes	"Extend Southbound Deceleration Lane onto Creighton Road (250 foot taper and increase parallel decel length by 150' - 200')"	$0.5 M	$0.6 M
Chesterfield County							
I-295: Varina-Enon Bridge	17.63	18.58	Safety	Off-road crashes	Install Wind Advisory System	>$100K	$1.5 M

Locations that require a study are summarized in Table 3. Further information is required that be accomplished within a more-focused study to appropriately address the interchanges.

Table 3. I-295 Interchanges Requiring Further Study

Interchange Location	Exit Number	Improvement Type	Target Metric	General Description
Henrico County				
Exit 51: Nuckols Road Interchange	51	Congestion and Safety	"Travel time sideswipe crashes"	Evaluate interchange to improve operations and safety on I-295. Particular attention should be made on the Northbound I-295 Lanes at the loop ramps and onto I-295 from Nuckols Road.
Exit 49: US 33 / Staples Mill Road	49	Congestion and Safety	"Travel time sideswipe, rear end, crashes"	Evaluate interchange to improve operations and safety on I-295 and focusing on the Southbound I-295 with Southbound Staples Mill Road node.
Hanover County				
Exit 41: Chamberlayne Road Interchange	41	Congestion and Safety	"Travel time Off-road, sideswipe crashes"	Evaluate Interchange to address weave between Northbound I-295 loop ramps and the weave between the Chamberlayne Road on-ramp to Northbound I-295 and the I-95/29 Branch.

CONCLUSION

The I-295 targeted improvements will be evaluated at a statewide level against targeted improvements along other 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. The prioritized project list is then sent to the Commonwealth Transportation Board for final funding selections.