



COMMONWEALTH of VIRGINIA
Office of the
SECRETARY of TRANSPORTATION

Interstate 95 Corridor Improvement Plan

Ben Mannell, AICP
January 2020



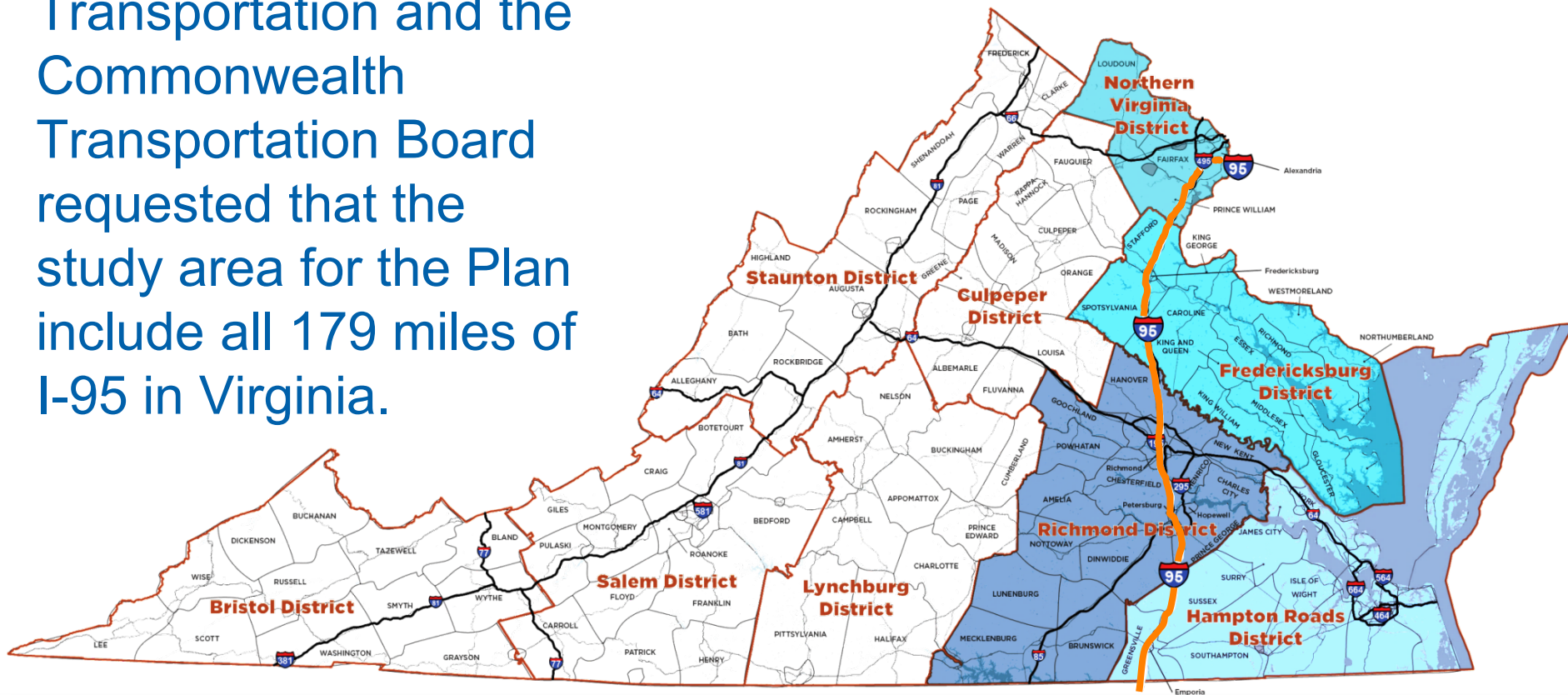
I-95 Corridor Improvement Plan- Progress to Date

- Problem identification
- Identification of potential solutions for each problem area and operations plan
- Prioritization and adoption of operations strategies
- Transforming Rail in Virginia

Study Area

I-95, Route 1, and Route 301 Corridors

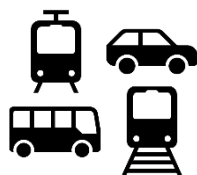
The Secretary of Transportation and the Commonwealth Transportation Board requested that the study area for the Plan include all 179 miles of I-95 in Virginia.



I-95 Corridor Significance



Critical North-South Corridor



Multimodal Corridor

- Highway
- Vanpool
- Commuter/Express Bus
- Metrorail
- Carpooling
- Park and Ride Lots
- VRE
- Slugging
- Amtrak



9.0 Million

Trucks Per Year



> 3,700 Incidents Per Year

(With Average Clearance Times Almost 2 Hours)



~ 21,000

Crashes Over 4 Years



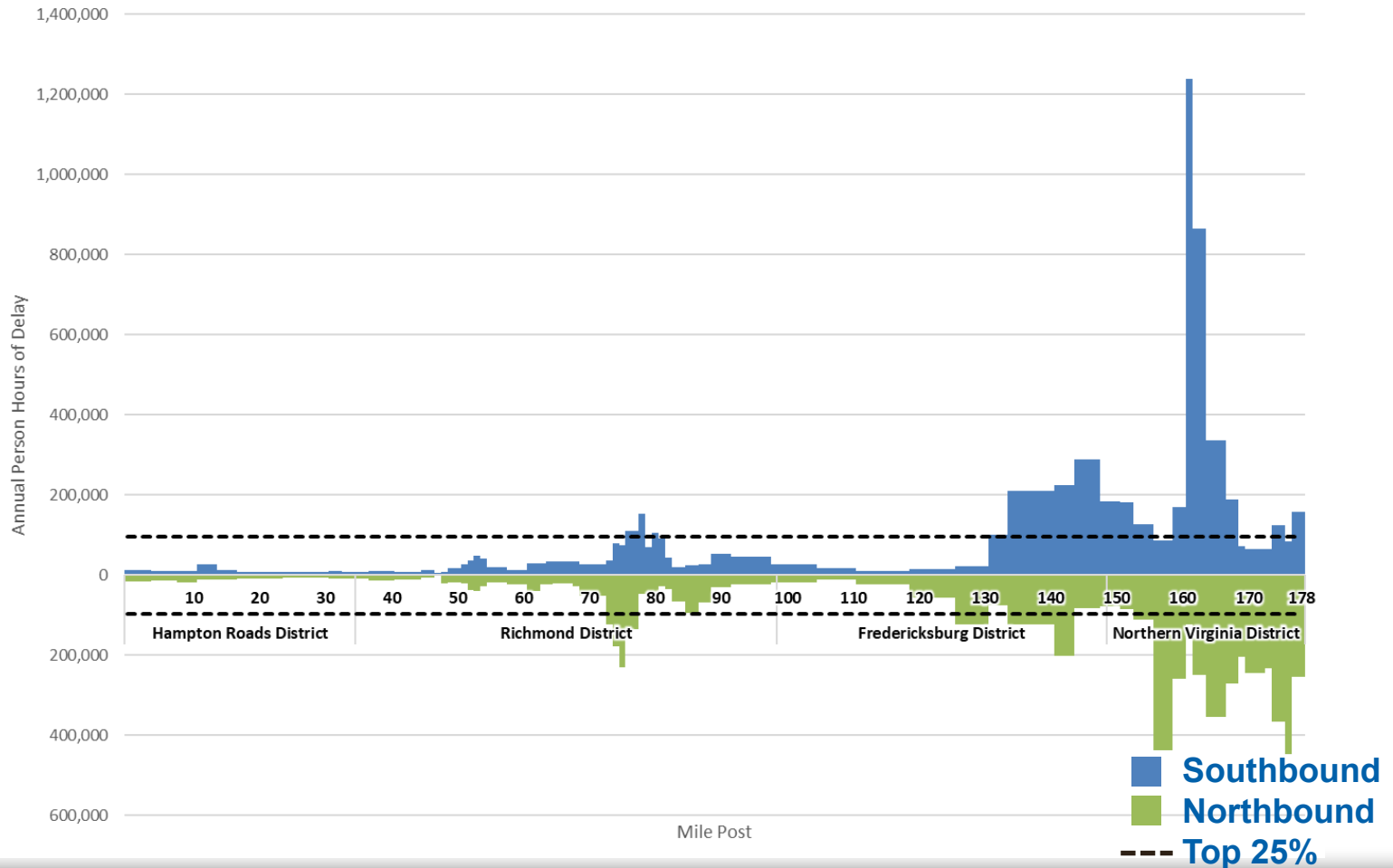
\$195 Billion

in Goods Per Year

Focus Area: Occoquan

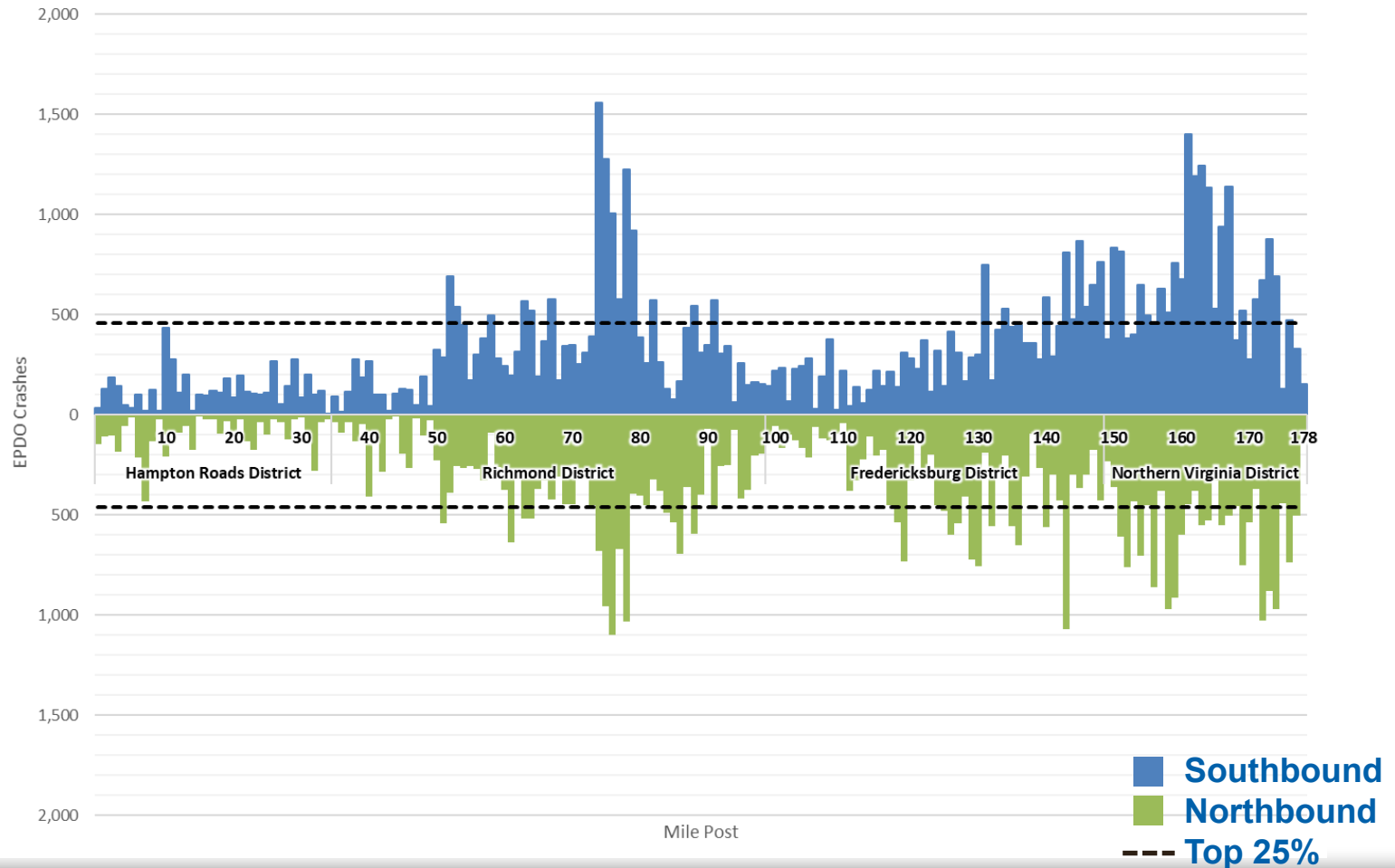
2018 Annual Delay Summary

One-Mile Segments

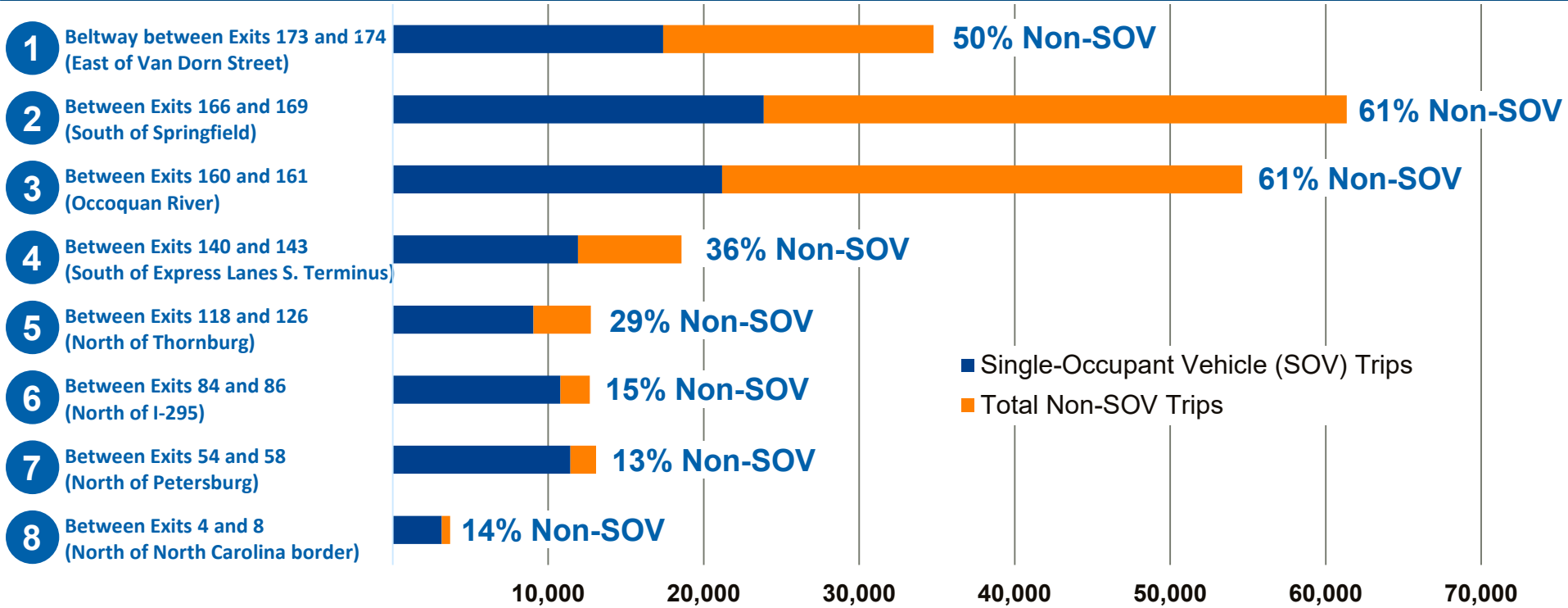


Crash Frequency and Severity Summary

One-Mile Segments



Persons Moved on Northbound I-95 in AM Existing



Total
Persons
Moved

=



SOV

+



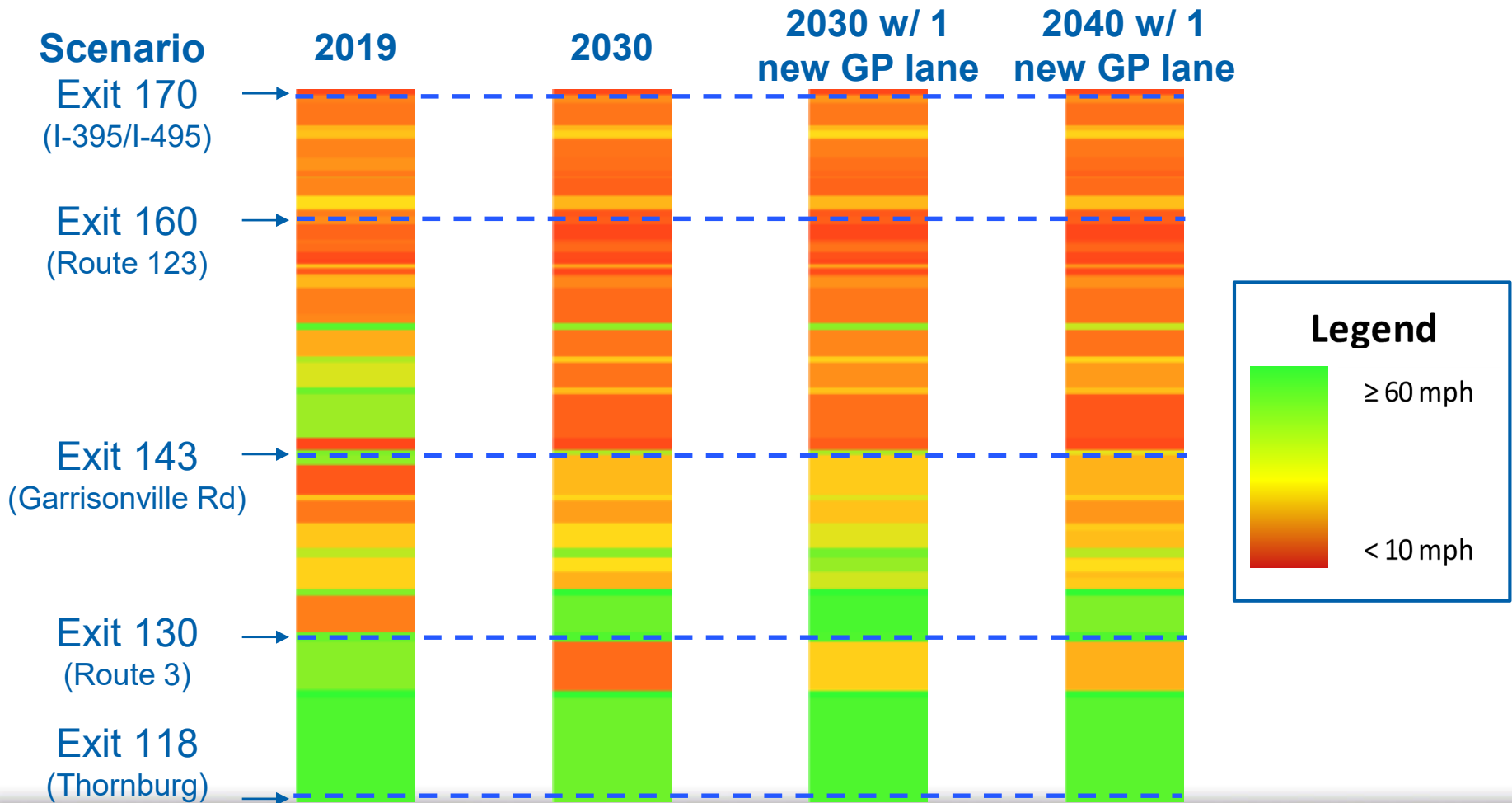
Intercity Rail (Amtrak), Commuter Rail (VRE), Metrorail, Commuter Bus, Vanpool, Slugging and Carpool

Highway Capacity Improvement Scenario Analyses (Exit 118 to Exit 170)

Analysis Summary

- Adding one or more general purpose lanes in each direction
- Used regional travel demand model for analysis
- Assumed open to traffic in 2030
- Analyzed performance through 2040
- Analyzed speed change along the 52-mile corridor

Peak Period Speed Results after Widening



Persons Moved Summary



One new general purpose lane

= 2,200-2,400 people per hour



New bus service + 2 new VRE trains

= ~2,000 people per hour



New bus service + 4 new VRE trains

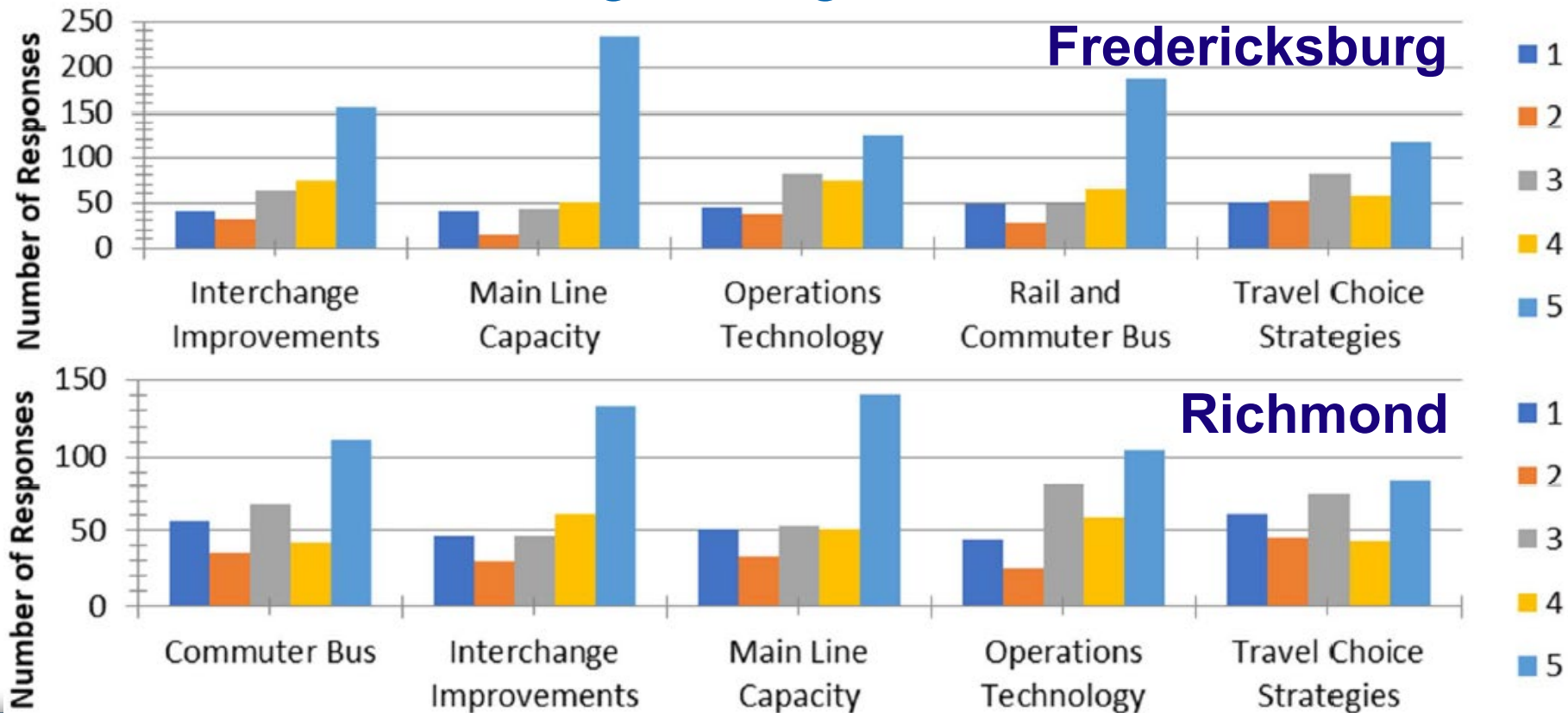
= ~3,500 people per hour



Multimodal solutions offer opportunities to address peak period conditions at lower cost than large-scale widening of the I-95

October Meetings Public Feedback and Survey Results: Strategy Rating

Participants were asked to rate strategies on a scale of 1 to 5, with 5 being the highest



Suite of Improvements

Focus Areas

OPERATIONS ON I-95

PARALLEL FACILITIES (Routes 1 and 301)

MULTIMODAL (rail, bus, carpool, park and ride)

CAPITAL PROJECTS ON I-95



Data-driven approach incorporating performance measures

GOALS

To provide faster, safer, and more reliable travel along the I-95 corridor

Initial Recommendation

- **Operational improvements offer highest ROI and fastest implementation**
- **\$60-\$68M cost will require first 3 years of available I-95 dedicated funding**
- **Proceed with allocation of funding for operational and parallel facilities upgrades**

Recommended Operational and Parallel Facilities Improvements

Recommended operational improvements

- Tied to top 25% locations for incident-related delay on I-95 mainline
- Incorporate both freeway and parallel arterial improvements

Over \$200M of operations and parallel facilities improvements initially identified

- Prioritized to reflect countermeasures with greatest return on investment
- Will be prioritized on a segment level by district

Total recommended freeway and arterial operations investments: \$60 - \$68 M

Partial List of Operational Improvements

CCTV Cameras

Detect incidents and provide situational awareness of incidents

Changeable Message Signs

Informs drivers of conditions ahead

Safety Service Patrols

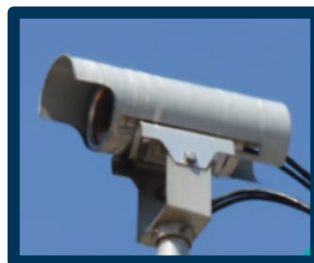
Provide incident scene support and help stranded motorists

Towing Programs

Contract towing services that are activated as incidents are detected

Variable Speed Limits

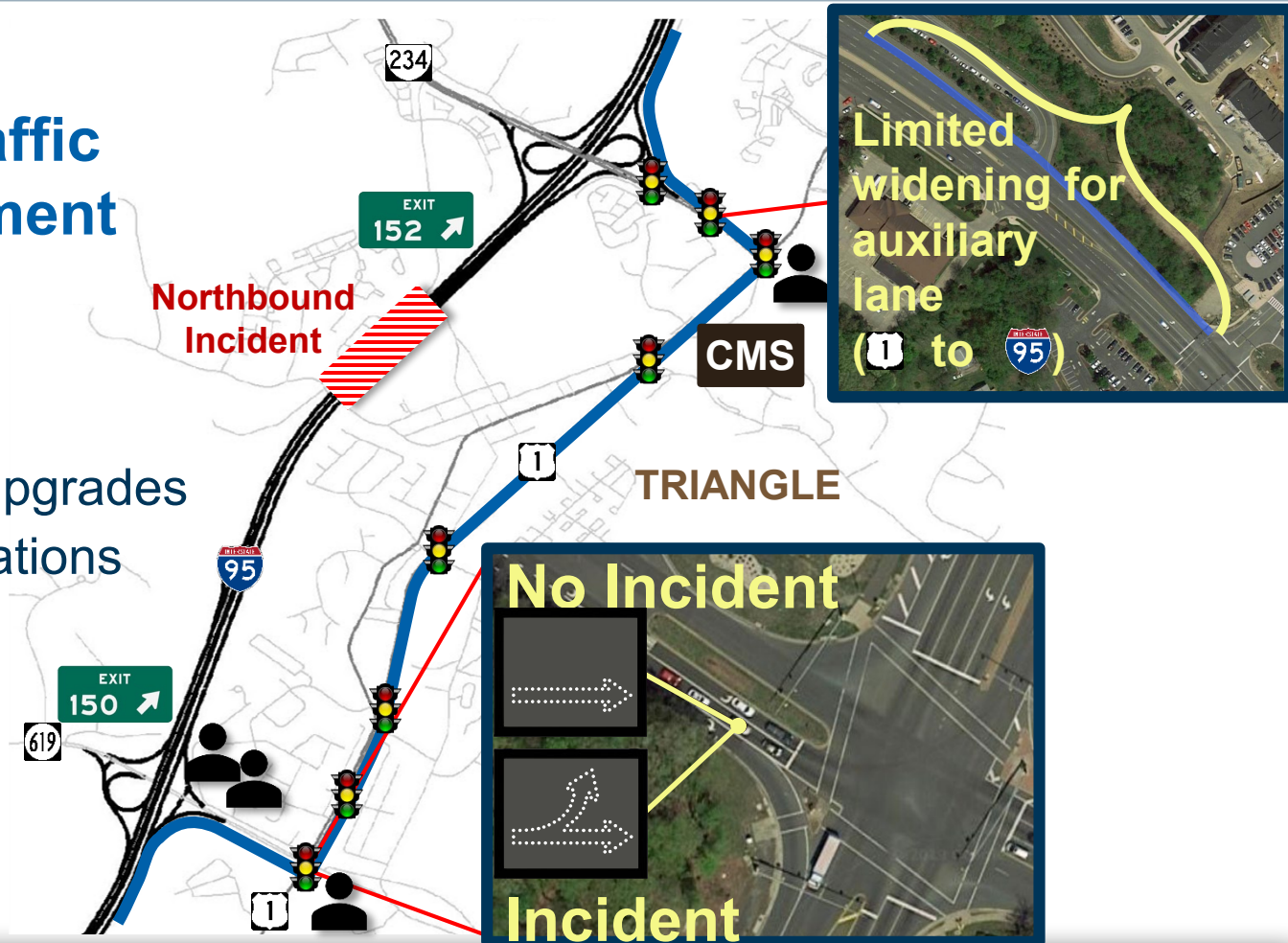
Adjustable speed limits that change to reduce traffic congestion



Parallel Facilities Improvements

Improvements considered for traffic incident management

- Message signs
- Traffic control personnel
- Communications upgrades
- Traffic signal operations
- Intersection improvements
- Sign improvements



Operational Improvements

Potential Benefits

Towing Program

Incident clearance times reduced by up to 27 minutes per incident

Safety Service Patrols

Incident duration reduced by 17% when SSP is on-site

Variable Speed Limits

Reduce crashes by 8% and increase vehicle throughput by 5%

Ramp Metering

22% reduction in travel times on I-95

Recommended Operational and Parallel Facilities Improvements

Example ROI Analysis

Safety Service Patrols (SSP)

- **Safety**
 - Average percent reduction of secondary crashes is 40%
 - 20% of crashes are secondary crashes
- **Mobility**
 - SSP reduces incident duration by 17%



Recommended Operational and Parallel Facilities Improvements

Safety Service Patrol ROI Metrics

• Mobility

- Incident delay
- % reduction in incident delay
- Travel time savings

• Safety

- PDO crashes
- Injury crashes
- Fatality crashes

• Energy & Environment

- Travel time savings
- Fuel consumption
- Fuel costs
- Emissions benefits

Safety Service Patrol Expansion		
Mobility	number of 2018 incidents on SSP expansion corridors =	6,501 incidents
	average AADT on SSP expansion corridors =	70,000 veh / day
	average incident reduction due to SSP (21) =	17%
	percent incident duration reduction =	32%
	average 2018 incident duration* =	5.4 minutes
	projected average incident duration reduction due to SSP =	264 veh per incident
	average vehicles benefited during incident duration reduction =	1,719,153 veh / year
	average number of vehicles benefited per year =	427 veh hours / day
	travel time savings due to reduced incident duration =	90%
	percent distribution of personal/business vehicles =	30%
	percent distribution of freight vehicles =	1.62 persons / vehicle
	average vehicle occupancy (23) =	\$ 17.81 / person / hour
passenger hourly value of delay time (23) =	\$ 53.69 / person / hour	
commercial hourly value of delay time (23) =	\$ 4,172,393	
average annual benefit of personal/business travel =	\$ 205,066	
average annual benefit of freight travel =	\$ 5,009,250	
Annual Mobility Benefit (passenger + commercial) =		
Safety	Total 2018 crashes on SSP expansion corridors =	1,393 crashes
	average percent VA crashes resulting in fatality =	0.3%
	average percent VA crashes resulting in injury =	33.9%
	average percent VA crashes resulting in PDO/non-injury =	76.7%
	average percent VA crashes resulting in PDO/non-injury =	20%
	average expected percentage of incidents that are secondary crashes (8) =	40%
	average reduction of secondary crashes due to reduced incident duration (8) =	1.0 fatality crashes
	estimated annual number of secondary crashes resulting in fatality along SSP expansion routes =	93 injury crashes
	estimated annual number of secondary crashes resulting in injury along SSP expansion routes =	214 non-injury/PDO crashes
	estimated annual number of secondary crashes resulting in non-injury / PDO along SSP expansion routes =	0.58 fatality crashes
	estimated reduced annual number of secondary fatality crashes due to SSP expansion =	56.0 injury crashes
	estimated reduced annual average number of secondary injury crashes due to SSP expansion =	228.2 non-injury crashes
estimated reduced annual average number of secondary PDO/non-injury crashes due to SSP expansion =		
Average cost of a fatal collision per person (9) =	\$ 4,008,400	
Average cost of an injury collision per person (9) =	\$ 124,525	
Average property damage only crash (9) =	\$ 7,400	
Annual Safety Benefit =	\$ 10,254,122	
Energy and Environment	Emissions during idle time (14) =	
	NOx =	0.055 gms/min
	VOC =	0.045 gms/min
	CO =	2.187 gms/min
	Average travel time savings per year =	25,622 min
	Annual emissions reduction - NOx =	2 lb
	Annual emissions reduction - VOC =	1 lb
	Annual emissions reduction - CO =	30 lb
	Total emissions reduction (NOx + VOC + CO) =	33 lb
	veh-hours of travel time savings per year =	6,494.50 veh-hours / year
	average fuel consumption per minute of idle time (15)** =	0.145 gal / hr
	average fuel consumption reduction per year =	1,039 gal
average cost of fuel in Virginia (16) =	\$ 3.61 / gallon	
Annual Energy Benefit =	\$ 3,700	
average CO2 emitted per gallon of gasoline burned (17) =	0.03 metric tons / gallon	
average CO2 emission reduction due to Event Timing =	9 metric tons	
average cost per metric ton of CO2 (18) =	\$ 20.80 / metric ton	
Annual Energy Benefit =	\$ 200	

Recommended Operational and Parallel Facilities Improvements

Safety Service Patrol ROI

Capital Cost = **\$3.3-3.6 M**

O&M cost over 10 yrs. = **\$25 M**

Benefit over 10 yrs. = **\$80.1 M**

ROI = **3.1**

Safety Service Patrol Expansion			
Mobility	number of 2018 incidents on SSP expansion corridors =	6,501	incidents
	average AADT on SSP expansion corridors =	70,000	vehicles / day
	average incident reduction due to SSP =	3.7%	percent incident reduction
	average 2018 incident duration =	32	minutes
	projected average incident duration reduction due to SSP =	5.4	minutes
	average vehicles benefited during incident duration reduction =	264	vehicles per incident
	average number of vehicles benefited per year =	1,719,353	vehicles / year
	travel time savings due to reduced incident duration =	427	hours / day
	percent distribution of personal/business vehicles =	90%	percent
	percent distribution of freight vehicles =	10%	percent
	average vehicle occupancy =	1.62	persons / vehicle
	passenger hourly value of delay (13) =	\$ 17.81	dollars / person / hour
	commercial hourly value of delay (13) =	\$ 53.69	dollars / person / hour
	average annual benefit of personal/business travel =	\$ 4,172,393	dollars / year
	average annual benefit of freight travel =	\$ 206,666	dollars / year
Total Mobility Benefit (passenger + commercial) =	\$ 5,009,259	dollars / year	
Safety	Total 2018 crashes on SSP expansion corridors =	1,393	crashes
	average percent VA crashes resulting in fatality =	0.3%	percent
	average percent VA crashes resulting in injury =	33.9%	percent
	average percent VA crashes resulting in PDO/fatalities =	76.7%	percent
	average expected percentage of incidents that are secondary crashes =	20%	percent
	average reduction of secondary crashes due to reduced incident duration =	40%	percent
	estimated annual number of secondary crashes resulting in fatality along SSP expansion routes =	1.0	fatality crashes
	estimated annual number of secondary crashes resulting in injury along SSP expansion routes =	93	injury crashes
	estimated annual number of secondary crashes resulting in non-injury / PDO along SSP expansion routes =	214	injury/PDO crashes
	estimated reduced annual number of secondary fatality crashes due to SSP expansion =	0.58	fatality crashes
estimated reduced annual average number of secondary injury crashes due to SSP expansion =	56.0	injury crashes	
estimated reduced annual average number of secondary PDO / non-injury crashes due to SSP expansion =	228.2	injury crashes	
Average cost of a fatal collision per person (9) =	\$ 4,008,400	dollars / person	
Average cost of an injury collision per person (9) =	\$ 124,525	dollars / person	
Average property damage only collision (9) =	\$ 7,400	dollars / person	
Annual Safety Benefit =	\$ 10,254,122	dollars / year	
Energy and Environment	Emissions during idle time (14) =	0.055	grams / min
	NOx =	0.045	grams / min
	CO =	1.38	grams / min
	Average travel time savings per year =	25,622	minutes / year
	Annual emissions reduction NOx =	2	tons / year
	Annual emissions reduction VOC =	1	tons / year
	Annual emissions reduction CO =	30	tons / year
	Total emissions reduction NOx + VOC + CO =	33	tons / year
	veh-hours of travel time savings per year =	6,494,550	veh-hours / year
	average fuel consumption per minute of idle time (15)** =	0.148	gallons / min
average fuel consumption reduction per year =	1,039	gallons / year	
average cost of fuel in VA (16) =	\$ 2.61	dollars / gallon	
Annual Energy Benefit =	\$ 2,700	dollars / year	
average CO2 emitted per gallon of gasoline burned (17) =	0.01	metric tons / gallon	
average CO2 emission reduction due to Event mitigation =	9	metric tons / year	
average cost per metric ton of CO2 (18) =	\$ 20.80	dollars / metric ton	
Annual Energy Benefit =	\$ 200	dollars / year	

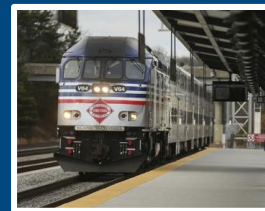
Recommended Operational Improvements – ROI Summary

Proposed Operational Improvement	Implementation Cost	O&M Cost (10 Years)	Benefit (10 Years)	ROI (10 Years)
CCTV Cameras	\$14.7M - \$16.2M	\$ 4,608,000	\$ 134,582,891	7.0
Changeable Message Signs	\$3.0M - \$3.3M	\$ 1,890,000	\$ 18,645,613	3.9
Safety Service Patrols	\$3.9M - \$4.3M	\$ 27,000,000	\$ 88,226,236	2.9
TRIP Towing Program	\$2.1M - \$2.3M	\$ 15,300,000	\$ 84,452,327	4.9
Towing Program	\$1.1M - \$1.3M	\$ 9,820,000	\$ 141,152,049	12.9
Variable Speed Limits	\$2.1M - \$2.3M	\$ 15,570,000	\$ 117,483,669	3.9
Ramp Metering	\$5.4M - \$5.9M	\$ 2,070,000	\$ 71,734,627	9.7
Geofenced Emergency Notifications	\$0.1M - \$0.2M	\$ 1,000,000	\$ 1,381,000	1.3
Advanced Work Zone Technology	\$0.9M - \$1.0M	\$ 4,050,000	\$ 19,205,243	3.9
Regional Multimodal Mobility Project (RM3P)	N/A	\$ 9,630,000	\$ 28,211,249	2.9
Misc. Low Cost Operations Improvements	\$4.1M - \$4.5M	\$ 14,220,000	\$ 98,309,970	5.4

Recommended Parallel Facilities Improvements – ROI Summary

Proposed Operational Improvement	Implementation Cost	O&M Cost (10 Years)	Benefit (10 Years)	ROI (10 Years)
CCTV Cameras - Arterials	\$3.2M - \$3.5M	\$ 890,000	\$ 28,640,085	6.9
ATSPM	\$11.0M - \$11.5M	\$ 2,700,000	\$ 65,064,066	4.8
Blank-Out Signs	\$0.3 - \$0.5M	\$ 71,000	\$ 2,709,108	7.0

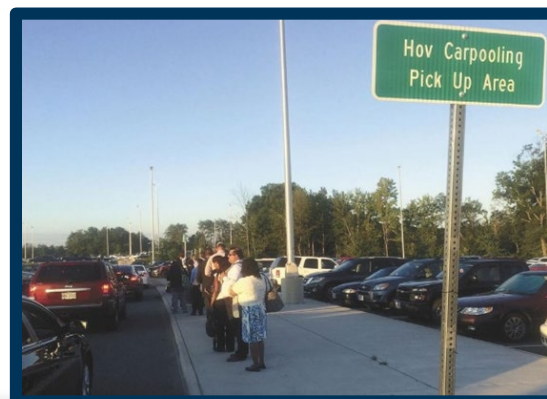
Multimodal Improvements



Improvements considered

- Long Bridge
- Intercity passenger rail
- Commuter rail
- Commuter bus
- Park & Ride lots
- TDM strategies
 - Carpooling
 - Vanpooling
 - Slugging

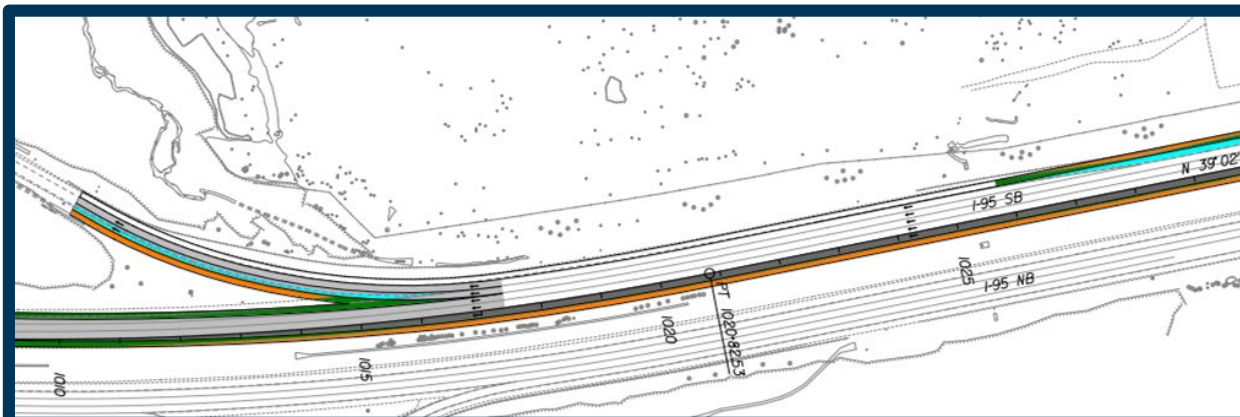
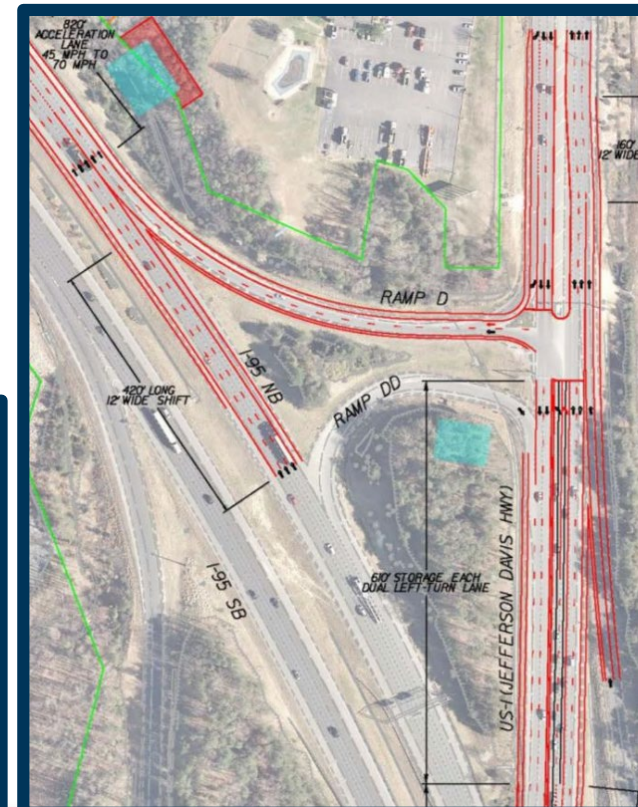
Commute!VA



Recommendations Major Improvements - Highlights

• Fredericksburg District

- Exit 126 to 130 – Widen to four lanes
- Exit 126 – Widen U.S. 1 and northbound I-95 on-ramp; extend acceleration lanes
- Exit 133 to 160 – Add managed lanes in shoulders



Recommendations

Major Improvements - Enhanced Commuter Bus

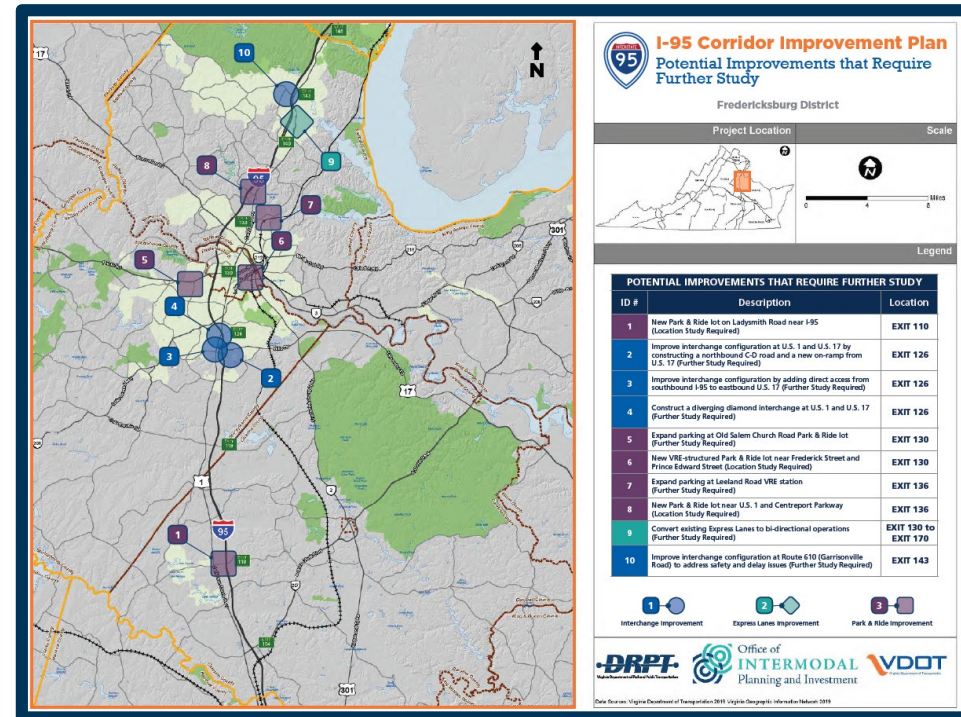
Origin		Tysons (via I-495)	Mark Center	Old Town Alexandria (via I-95/I-495)	Pentagon/ Crystal City	Rosslyn/Ballston	Washington DC
Fairfax County	Springfield	○	○		○		○
Occoquan River							
Prince William County	Lake Ridge	○	○	●	○		○
	Dale City		○		○	○	○
	Montclair/Dumfries				○		○
Stafford County	Aquia Harbor		●		●		●
	Stafford		●		●		○ ●
Fredericksburg	Fredericksburg				●		●
Spotsylvania	Massaponax				●	●	●

Commuter Bus Key	
Existing (Baseline) Service	○
Proposed New Service	●
Proposed Additional Service	○ ●

Recommendations Areas for Further Study - Highlights

• Fredericksburg District

- Exit 126 – Improve interchange configuration by adding direct access from southbound I-95 to eastbound U.S. 17
- Exit 130 to 170 – Convert existing Express Lanes to bi-directional operations



Corridor-wide Improvements Planning Level Cost Estimates

Estimated FY20 Capital Cost Ranges

- Freeway operations upgrades: \$48 - \$53 M
- Arterial operations upgrades: \$12 - \$15 M
- Multimodal improvements: \$335 - \$376 M
- Highway capital improvements: \$1.3 - \$1.8 B

TOTAL: \$1.7 - \$2.2 B

Potential Capital Improvements

- **54 projects (highway, rail, bus, park & ride) with estimated cost between \$1.7 - \$2.2B**
- **35 locations requiring additional study**
- **Challenge: Needs far exceed available annual revenues**



Potential Sources of Revenue

Dedicated Interstate Funding Estimates

By FY2022 -

- **~\$40M per year:** for the I-95 corridor at the discretion of the CTB
- **~\$44M per year:** At the discretion of the CTB for any interstate

**Based on % of Truck (FHWA Class 6 and higher)
Vehicle Miles Traveled on each interstate**

Potential Sources of Revenue

Other Sources

- **SMART SCALE**
- **Regional funding – NVTA**
- **Regional Surface Transportation Block Grant Program (Northern Virginia, Fredericksburg, Richmond and Tri-Cities MPO regions)**
- **Innovative Transportation Technology Fund**
- **I-395 Commuter Choice**
- **Rail and transit funding programs**

Recommendations

- **Complete evaluation of I-64 corridor**
- **Identify operational improvements for other Interstate corridors**
- **Establish CTB policy on allocation of dedicated interstate revenues**
- **Evaluate all potential projects to determine best allocation of dedicated and discretionary Interstate funds**
- **Conduct further study on items identified**
 - Bi-directional HOT Lanes, Beltway HOT Lanes expansion, multiple interchange improvements

Status Update and Next Steps

- **Corridor-wide operations and arterial upgrades approved in January 2020**
- **Interim I-95 Corridor Improvement Plan adopted by CTB in January 2020**
- **Prioritize remaining projects after completion of the I-64 corridor plan**
- **Finalize I-95 Corridor Improvement Plan in summer 2020**

Transforming Rail in Virginia and I-95

- **In December 2019, a landmark deal with CSX was announced that will have major implications to the I-95 corridor in the near future**
 - Rail recommendations identified in the I-95 plan move closer to becoming a reality
 - Rail improvements will impact performance of the I-95 highway corridor

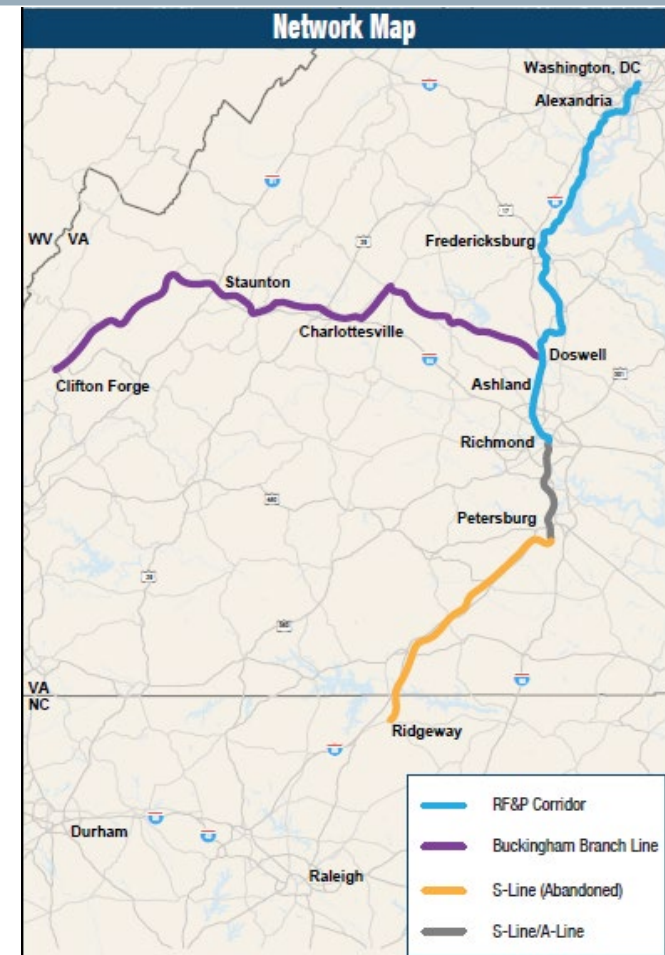
Transforming Rail in Virginia

- **\$3.7B landmark deal with CSX including acquisition of:**
 - 350 miles of right-of-way
 - 250 miles of track
 - Passenger rights
- **Build-out of infrastructure in two phases**
- **Completion of phases will result in additional VRE / Amtrak service**
- **Path forward to full separation of freight and passenger service in future**
- **Preservation of future rail corridors**
- **Funding for program has been identified and is in the process of being secured through agreements with funding partners**



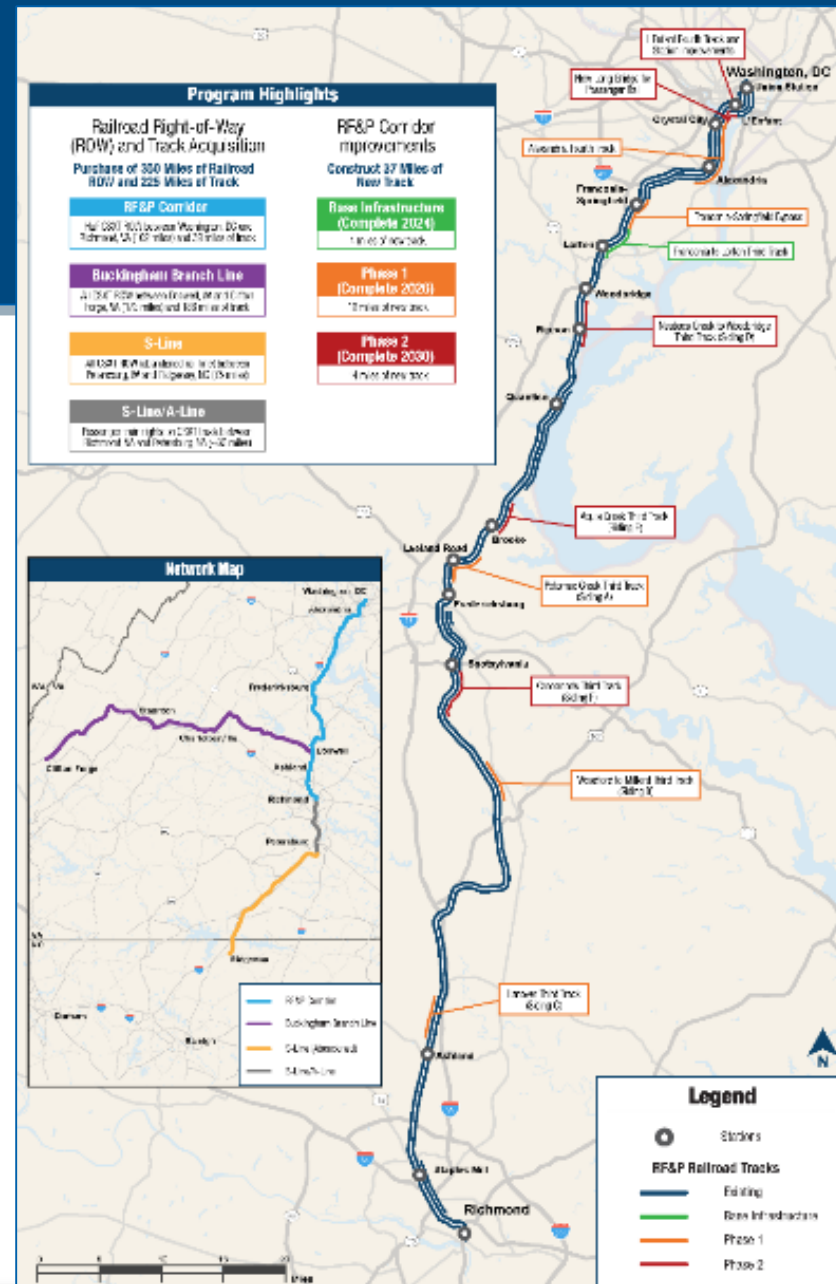
Acquisition

- 100+ miles of right of way and 39 miles of track from DC to Richmond along the “RF&P”
- 30 miles of passenger rights from Richmond to Petersburg
- 170+ miles of track on the Buckingham Branch from Doswell to Clifton Forge
- 75 miles of abandoned track from Petersburg to Ridgeway, NC



Infrastructure

- Construction of Long Bridge and 4th track in DC
- 4th track in Arlington and Alexandria
- All passenger trains in VA travel through this corridor
- 3rd track from Franconia to Lorton
- Franconia-Springfield Bypass
- Sidings at the following locations
 - Potomac Creek
 - Woodford - Milford
 - Hanover
 - Neabsco Creek - Woodbridge
 - Aquia Creek
 - Crossroads



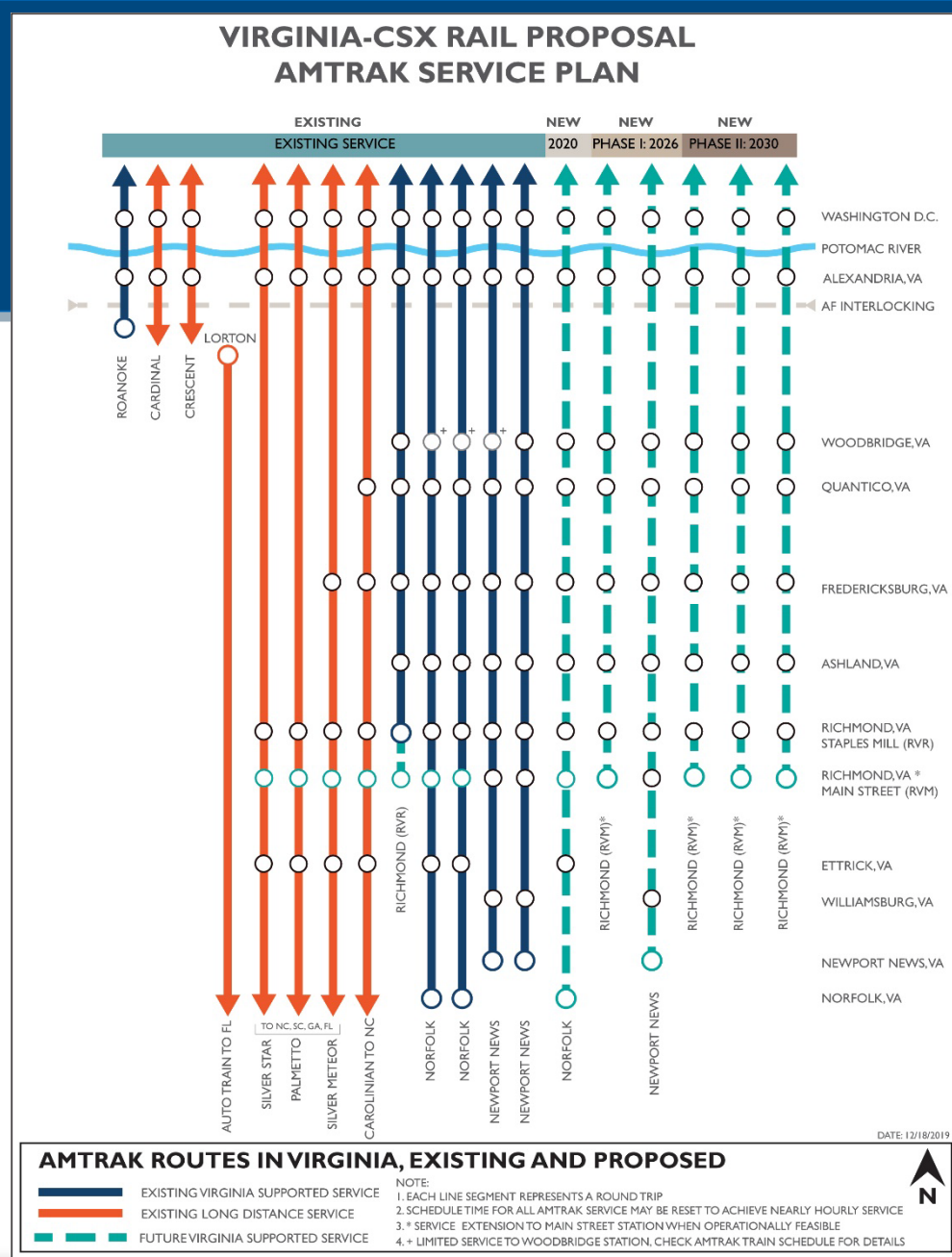
Service

- Provides Virginia with control and guaranteed VRE / Amtrak service
- Double state-supported Amtrak, with nearly hourly service from DC to Richmond
- Additional train to Norfolk with mid-day arrival and departure
- New round-trip train to Newport News
- Increase VRE service by 75% along the Fredericksburg line + new late night & weekend service offering
- Allows future ability to increase trains on the VRE Manassas Line



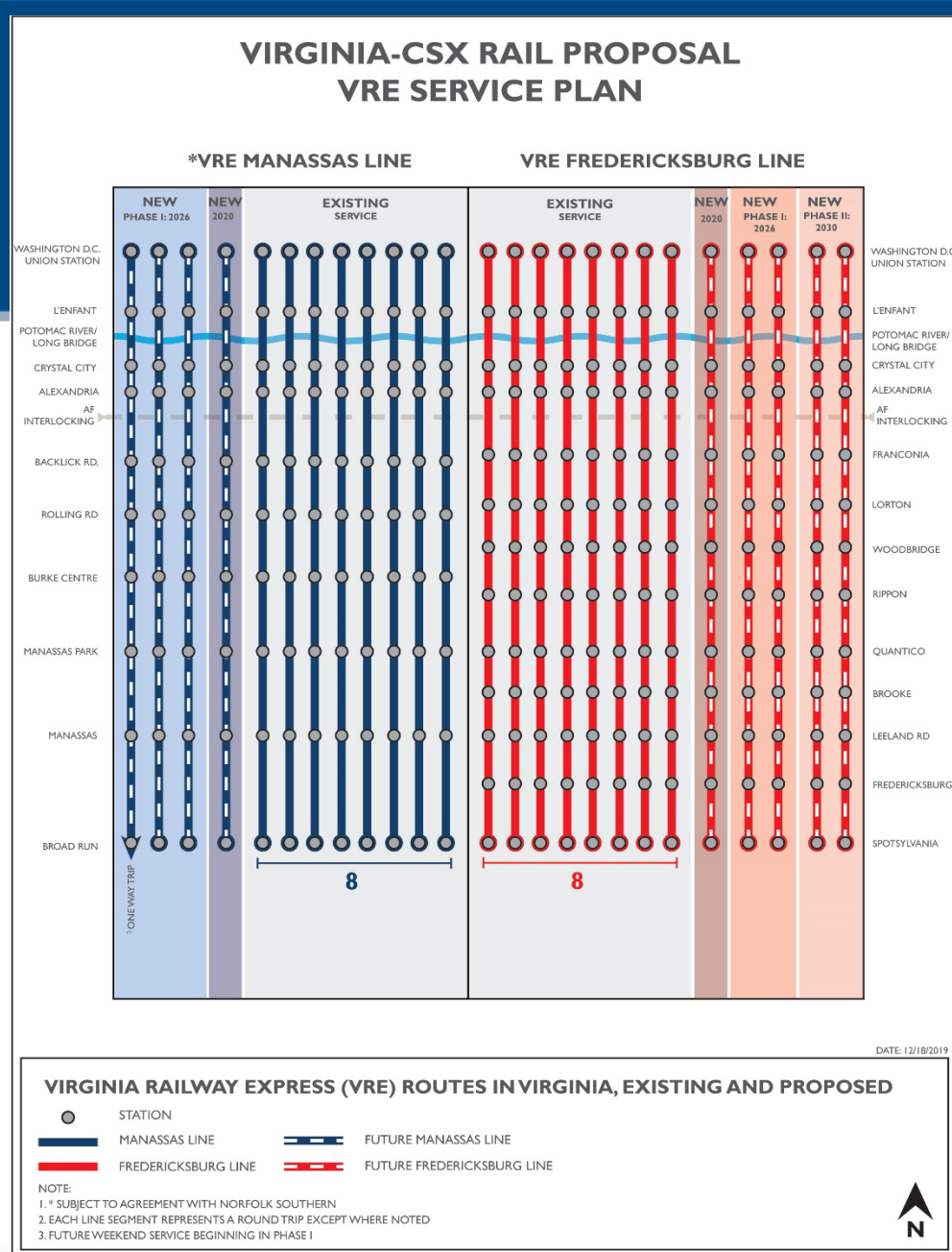
Amtrak Service Plan

- 6 additional round-trip trains connecting Virginia to the northeast by 2030



VRE Service Plan

- 5 additional round-trip VRE trains on the Fredericksburg Line by 2030
- Includes late-night & weekend service



Next Steps

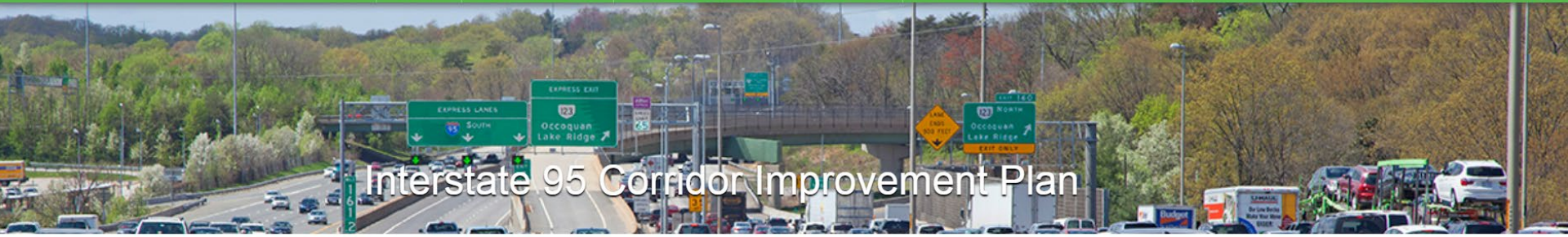
- **Finalize definitive agreements with CSX**
 - Conduct land survey and title work necessary for agreements
 - Maintenance and operation agreement
 - Transition agreement
- **Develop service agreements with Amtrak and VRE**
- **Refine financial plan and secure commitments from other state, Federal and local funding partners**
- **Continue working with CSX and other stakeholders to advance rail projects in the corridor**
 - Alexandria / Arlington 4th Track Design
 - Long Bridge Preliminary Engineering



Virginia Commonwealth Transportation Board

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Interstate 95 Corridor Improvement Plan

What's Being Done

The Commonwealth Transportation Board (CTB), supported by the Office of Intermodal Planning and Investment (OIP), the Virginia Department of Transportation (VDOT), and the Department of Rail and Public Transportation (DRPT), will study Interstate 95 (I-95) to initiate a data-driven study to develop the I-95 Corridor Plan which will (i) identify key problem areas along the corridor, and (ii) identify potential solutions and areas for additional review and study.

As directed in **Senate Joint Resolution 276** and **House Joint Resolution 581** during the 2019 General Assembly, the study team will identify targeted improvements and incident management strategies for the corridor.

Interim I-95 Corridor Improvement Plan

Study Duration: April-December 2019

Localities: Counties of Caroline, Chesterfield, Fairfax, Greensville, Hanover, Henrico, Prince George, Prince William, Spotsylvania, Stafford, Sussex and cities of Alexandria, Emporia, Fredericksburg, Colonial Heights, Petersburg and Richmond

Districts: Northern Virginia, Fredericksburg, Richmond and Hampton Roads