



VTrans2040 Multimodal Transportation Plan

Corridors of Statewide Significance Needs Assessment

Heartland Corridor (E)

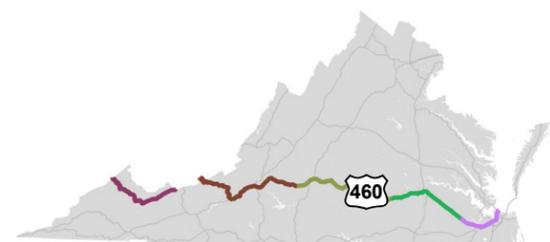


Table of Contents

<table border="0"> <tr> <td>I. Corridor Overview</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Demographics and Economic Trends</td> <td style="text-align: right;">5</td> </tr> <tr> <td>Corridor Travel Patterns</td> <td style="text-align: right;">7</td> </tr> <tr> <td>II. Segment E1</td> <td style="text-align: right;">8</td> </tr> <tr> <td>E1 Segment Profile</td> <td style="text-align: right;">9</td> </tr> <tr> <td>Travel Demand</td> <td style="text-align: right;">10</td> </tr> <tr> <td>Traffic Conditions</td> <td style="text-align: right;">12</td> </tr> <tr> <td>E1 Segment Needs</td> <td></td> </tr> <tr> <td>Redundancy and Mode Choice</td> <td style="text-align: right;">15</td> </tr> <tr> <td>Safety Metric</td> <td style="text-align: right;">16</td> </tr> <tr> <td>Congestion Metric</td> <td style="text-align: right;">17</td> </tr> <tr> <td>Reliability Metric</td> <td style="text-align: right;">18</td> </tr> <tr> <td>Summary of Needs</td> <td style="text-align: right;">19</td> </tr> </table>	I. Corridor Overview	3	Demographics and Economic Trends	5	Corridor Travel Patterns	7	II. Segment E1	8	E1 Segment Profile	9	Travel Demand	10	Traffic Conditions	12	E1 Segment Needs		Redundancy and Mode Choice	15	Safety Metric	16	Congestion Metric	17	Reliability Metric	18	Summary of Needs	19	<table border="0"> <tr> <td>III. Segment E2</td> <td style="text-align: right;">21</td> </tr> <tr> <td>E2 Segment Profile</td> <td style="text-align: right;">22</td> </tr> <tr> <td>Travel Demand</td> <td style="text-align: right;">23</td> </tr> <tr> <td>Traffic Conditions</td> <td style="text-align: right;">25</td> </tr> <tr> <td>E2 Segment Needs</td> <td></td> </tr> <tr> <td>Redundancy and Mode Choice</td> <td style="text-align: right;">28</td> </tr> <tr> <td>Safety Metric</td> <td style="text-align: right;">29</td> </tr> <tr> <td>Congestion Metric</td> <td style="text-align: right;">30</td> </tr> <tr> <td>Reliability Metric</td> <td style="text-align: right;">31</td> </tr> <tr> <td>Summary of Needs</td> <td style="text-align: right;">32</td> </tr> <tr> <td>IV. Segment E3</td> <td style="text-align: right;">34</td> </tr> <tr> <td>E3 Segment Profile</td> <td style="text-align: right;">35</td> </tr> <tr> <td>Travel Demand</td> <td style="text-align: right;">36</td> </tr> <tr> <td>Traffic Conditions</td> <td style="text-align: right;">38</td> </tr> <tr> <td>E3 Segment Needs</td> <td></td> </tr> <tr> <td>Redundancy and Mode Choice</td> <td style="text-align: right;">41</td> </tr> <tr> <td>Safety Metric</td> <td style="text-align: right;">42</td> </tr> <tr> <td>Congestion Metric</td> <td style="text-align: right;">43</td> </tr> <tr> <td>Reliability Metric</td> <td style="text-align: right;">44</td> </tr> <tr> <td>Summary of Needs</td> <td style="text-align: right;">45</td> </tr> </table>	III. Segment E2	21	E2 Segment Profile	22	Travel Demand	23	Traffic Conditions	25	E2 Segment Needs		Redundancy and Mode Choice	28	Safety Metric	29	Congestion Metric	30	Reliability Metric	31	Summary of Needs	32	IV. Segment E3	34	E3 Segment Profile	35	Travel Demand	36	Traffic Conditions	38	E3 Segment Needs		Redundancy and Mode Choice	41	Safety Metric	42	Congestion Metric	43	Reliability Metric	44	Summary of Needs	45	<table border="0"> <tr> <td>V. Segment E4</td> <td style="text-align: right;">47</td> </tr> <tr> <td>E4 Segment Profile</td> <td style="text-align: right;">48</td> </tr> <tr> <td>Travel Demand</td> <td style="text-align: right;">49</td> </tr> <tr> <td>Traffic Conditions</td> <td style="text-align: right;">51</td> </tr> <tr> <td>E4 Segment Needs</td> <td></td> </tr> <tr> <td>Redundancy and Mode Choice</td> <td style="text-align: right;">54</td> </tr> <tr> <td>Safety Metric</td> <td style="text-align: right;">55</td> </tr> <tr> <td>Congestion Metric</td> <td style="text-align: right;">56</td> </tr> <tr> <td>Reliability Metric</td> <td style="text-align: right;">57</td> </tr> <tr> <td>Summary of Needs</td> <td style="text-align: right;">58</td> </tr> <tr> <td>VI. 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Segment E5	60	E5 Segment Profile	61	Travel Demand	62	Traffic Conditions	64	E5 Segment Needs		Redundancy and Mode Choice	67	Safety Metric	68	Congestion Metric	69	Reliability Metric	70	Summary of Needs	71
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See *Corridors of Statewide Significance, Needs Assessment: Executive Summary and Methodology Report* for details on the overall assessment approach, data sources, and performance measures used throughout this report.

I. Corridor Overview

Corridors of Statewide Significance

A	Coastal Corridor (US 17)
B	Crescent Corridor (I-81)
C	East-West Corridor (I-64)
D	Eastern Shore Corridor (US 13)
E	Heartland Corridor (US 460)
F	North Carolina to West Virginia Corridor (US 220)
G	North-South Corridor (Route 234)
H	Northern Virginia Corridor (I-66)
I	Seminole Corridor (US 29)
J	Southside Corridor (US 58)
K	Washington to North Carolina Corridor (I-95)
L	Western Mountain Corridor (I-77)

- Corridor of Statewide Significance
(color varies by segment)
- Railroad
- Airport Facility
(grey denotes not a commercial service airport)
- Metropolitan Planning Organization Area



The Heartland Corridor (Corridor E) is defined primarily by US 460, which runs east to west from Norfolk, Virginia, to Frankfort, Kentucky, and is considered a spur of US 60. US 460 travels more than 400 miles through Virginia, providing local access to several communities and connecting the larger areas of Roanoke, Lynchburg, Petersburg, and Hampton Roads. It also connects to I-81, I-85, I-95 and US 29. The Heartland Corridor is an important freight corridor. Freight rail lines run along most of the corridor as part of the Norfolk Southern's Heartland Corridor, one of the important freight corridors in the eastern United States, providing access between the Port of Virginia and the Midwest.

US 460 is primarily a four-lane facility along its length in Virginia, although there are a few sections where it is a limited-access facility, such as through Blacksburg and Christiansburg, around Lynchburg, and where it bypasses smaller cities and towns such as Bedford, Farmville, and Appomattox. US 460 provides local access to the many small communities it connects and offers an alternative east-west thoroughway for passengers and freight.

There are no parallel roadway facilities to US 460, although the roadway does run concurrently with other routes for short stretches, most notably I-85 through part of Dinwiddie County and through the City of Petersburg. US 460

also runs concurrently with US 29 in Lynchburg as both of these routes bypass the city and run along the same roadway. It also runs concurrently with portions of US 13 and US 58 in the Hampton Roads Area, where it is known as the Military Highway.

In addition, there are some transit options in the corridor including:

- Line-haul service available along US 460 between Blacksburg and Christiansburg;
- Metro Area Express bus routes that access Park-and-Ride lots in the Hampton Roads Area and provide connections to the larger Hampton Roads Transit (HRT) system with local routes serving the entire Hampton Roads Area;
- Park-and-Ride facilities found in and around Lynchburg, Roanoke, Blacksburg, and Christiansburg, and in Tazewell and Buchanan Counties; and
- Greyhound bus service along the corridor, with stops in Norfolk, Petersburg, Farmville, Lynchburg, and Roanoke.

A substantial amount of freight rail movement occurs, especially along Norfolk Southern rail lines. Although there is no passenger rail directly

along the Heartland Corridor and along US 460, several Amtrak routes along connecting corridors are available in Norfolk, Petersburg, and Lynchburg. Several airport facilities along the Heartland Corridor, including facilities in the Hampton Roads Area, Lynchburg, and Roanoke provide commercial service, and many general-aviation and reliever facilities are available.

US 460 provides access to three major port facilities in the Hampton Roads Area. US 460 is a major freight corridor for moving freight in and out of the Port of Virginia, and it provides direct access to the major East Coast freight corridors, including I-81 and I-95. In addition, US 460 provides access to the James River navigational channels. Norfolk Southern operates its Heartland Corridor, which connects the Port of Virginia to West Virginia and Midwest markets, as well as other major rail corridors in Virginia, such as the Norfolk Southern's Coal Corridor and Crescent Corridor and CSX's Coal Corridor and National Gateway Corridor.

Corridor Components

Highway Facilities

- Primary Facility** • US 460
- Other Highway Facilities** • US 460 Business • US 460 Bypass

Transit Services

- Amtrak
- Intercity bus service

Rail Facilities

- Norfolk Southern Heartland Corridor

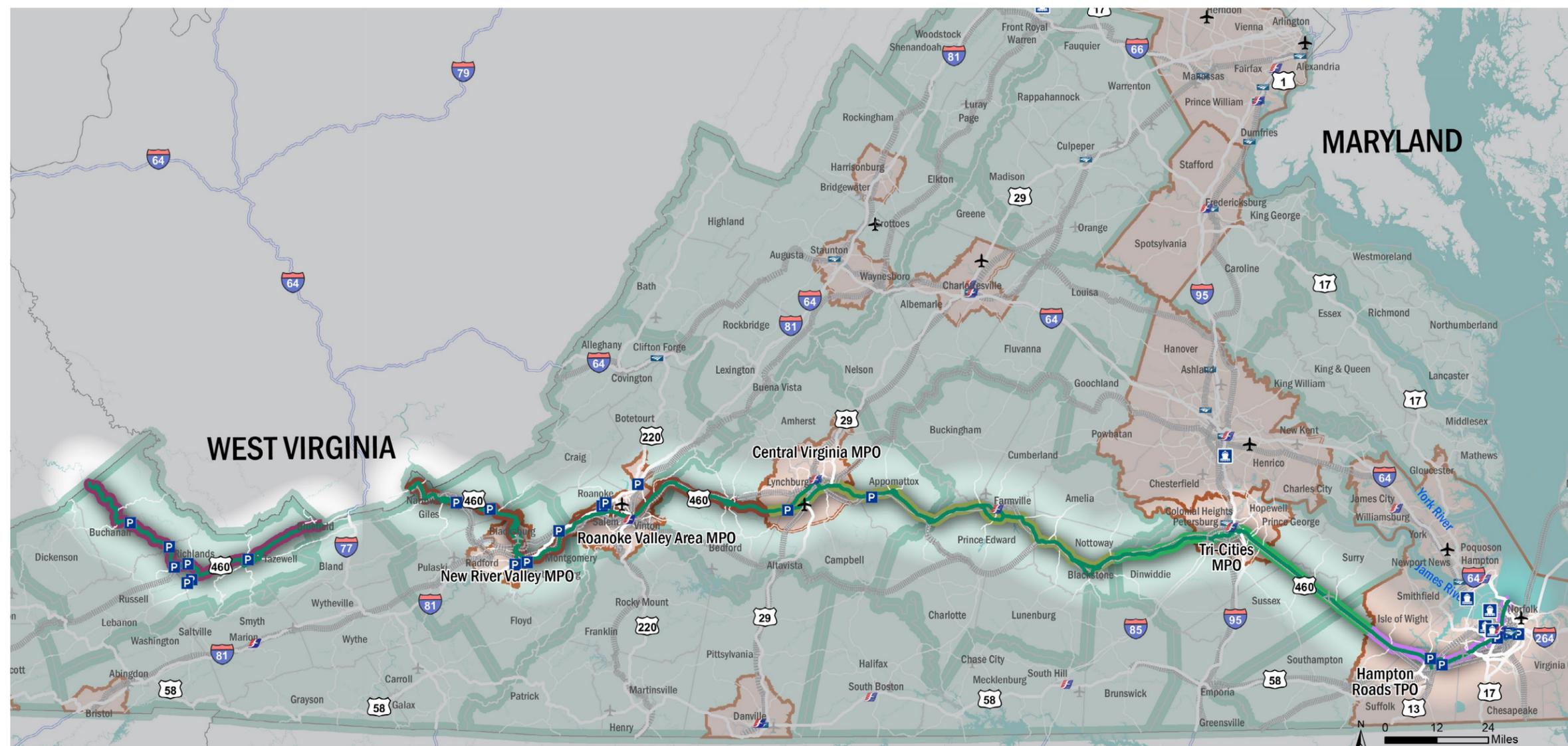
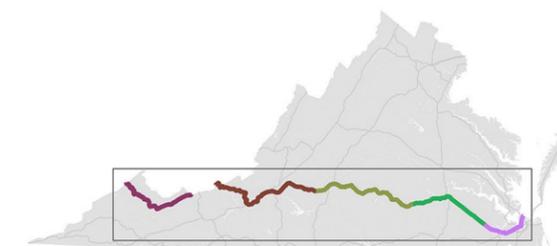
Port Facilities

- Newport News Marine Terminal
- Norfolk International Terminal
- Portsmouth Marine Terminal
- Virginia International Gateway

Airport Facilities

- Roanoke Regional Airport
- Lynchburg Regional Airport
- Richmond International Airport
- Newport News/Williamsburg International Airport
- Norfolk International Airport

- | | | | |
|--|-------------------------|--|----------------------|
| | E1 | | Amtrak Facility |
| | E2 | | Greyhound Facility |
| | E3 | | VRE Facility |
| | E4 | | Metrorail Facility |
| | E5 | | Port Facility |
| | Corridor Component Road | | Park & Ride Facility |
| | Railroad | | Airport Facility |
| | MPO Area | | |
| | Planning District Area | | |



CORRIDOR E OVERVIEW

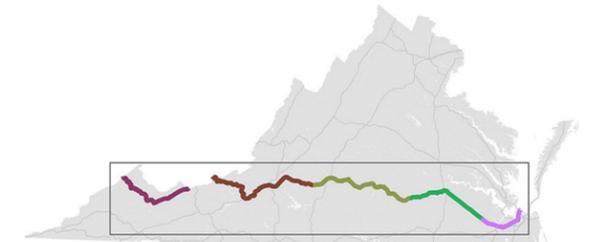
Demographics and Economic Trends

The primary population centers with greater than 500 persons per square mile along Corridor E are currently found in Salem, Roanoke, Lynchburg, Petersburg, Portsmouth, and Norfolk. The most densely populated segments along the corridor are near Blacksburg and Roanoke (E2) and in the Hampton Roads Area (E5). Giles, Appomattox, Sussex, and Southampton Counties have the lowest density along the corridor with less than 50 persons per square mile.

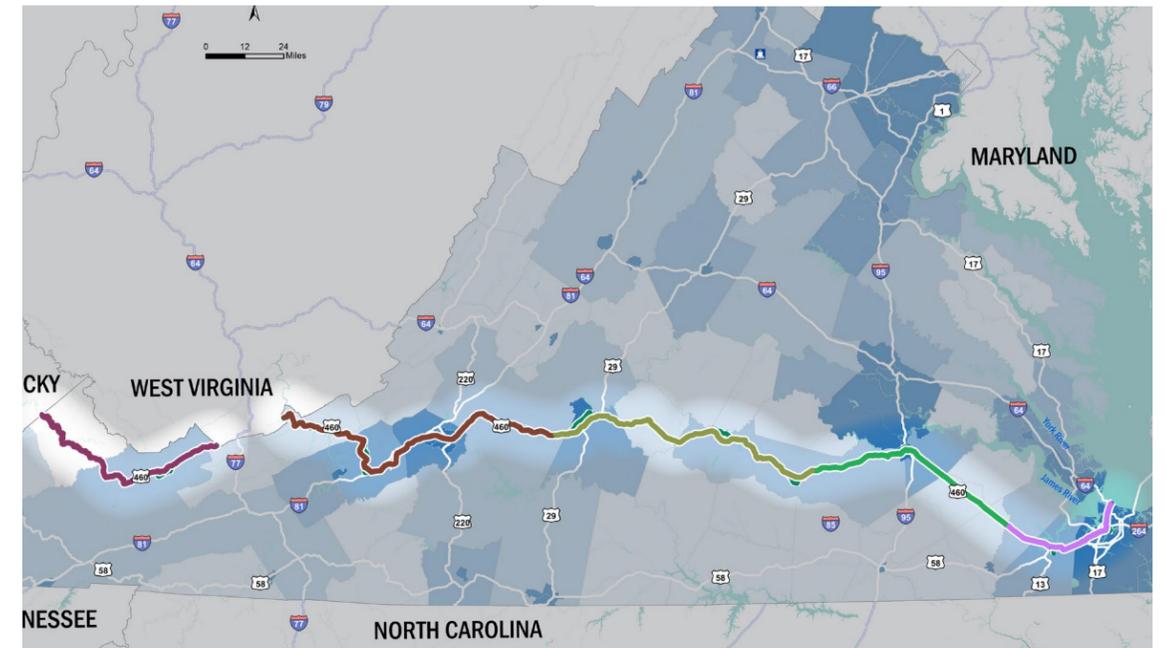
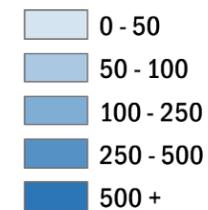
Between 2012 and 2025, Suffolk is anticipated to see the largest population growth (greater than 25 percent) among the jurisdictions along the corridor. Montgomery, Bedford, and Isle of Wight Counties, and the City of Chesapeake are anticipated to have the next highest population growth, between 11 and 25 percent. The already densely-populated City of Norfolk in the Hampton Roads Area is expected to see the lowest growth, and the population of Hampton is expected to decrease. Overall, population along the corridor is expected to grow significantly.

Current employment centers follow a pattern similar to the population centers, with the highest employment densities in the urban areas of Salem, Roanoke, Lynchburg, Petersburg, and Norfolk. Employment growth tracks a similar pattern along the corridor with the highest growth in Appomattox and Isle of Wight Counties; employment is anticipated to decrease in Buchanan and Southampton Counties and in the City of Lynchburg.

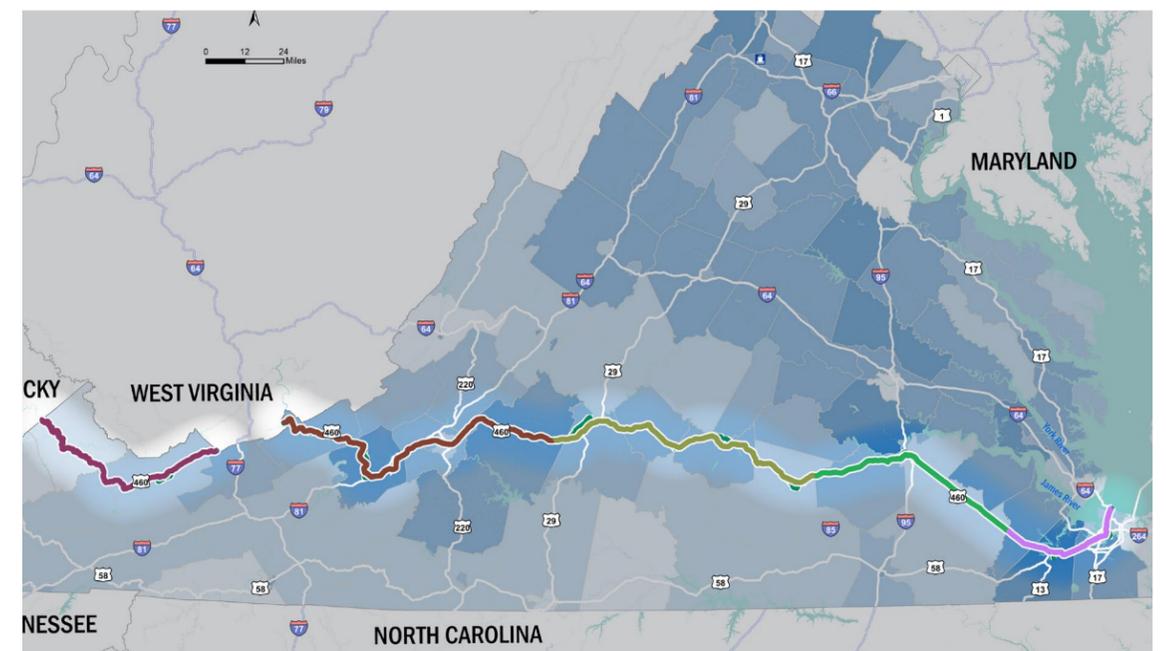
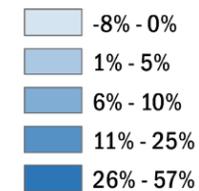
Corridor E passes through five Metropolitan Planning Organization (MPO) areas along its route, each with a different size and focus for its local economy. The Hampton Roads Transportation (TPO) Area has the highest GDP of any of the MPO areas in the corridor. The largest industry sectors in the corridor include wholesale trade, retail trade, and health care.



2012 Population Density Persons / Square Mile

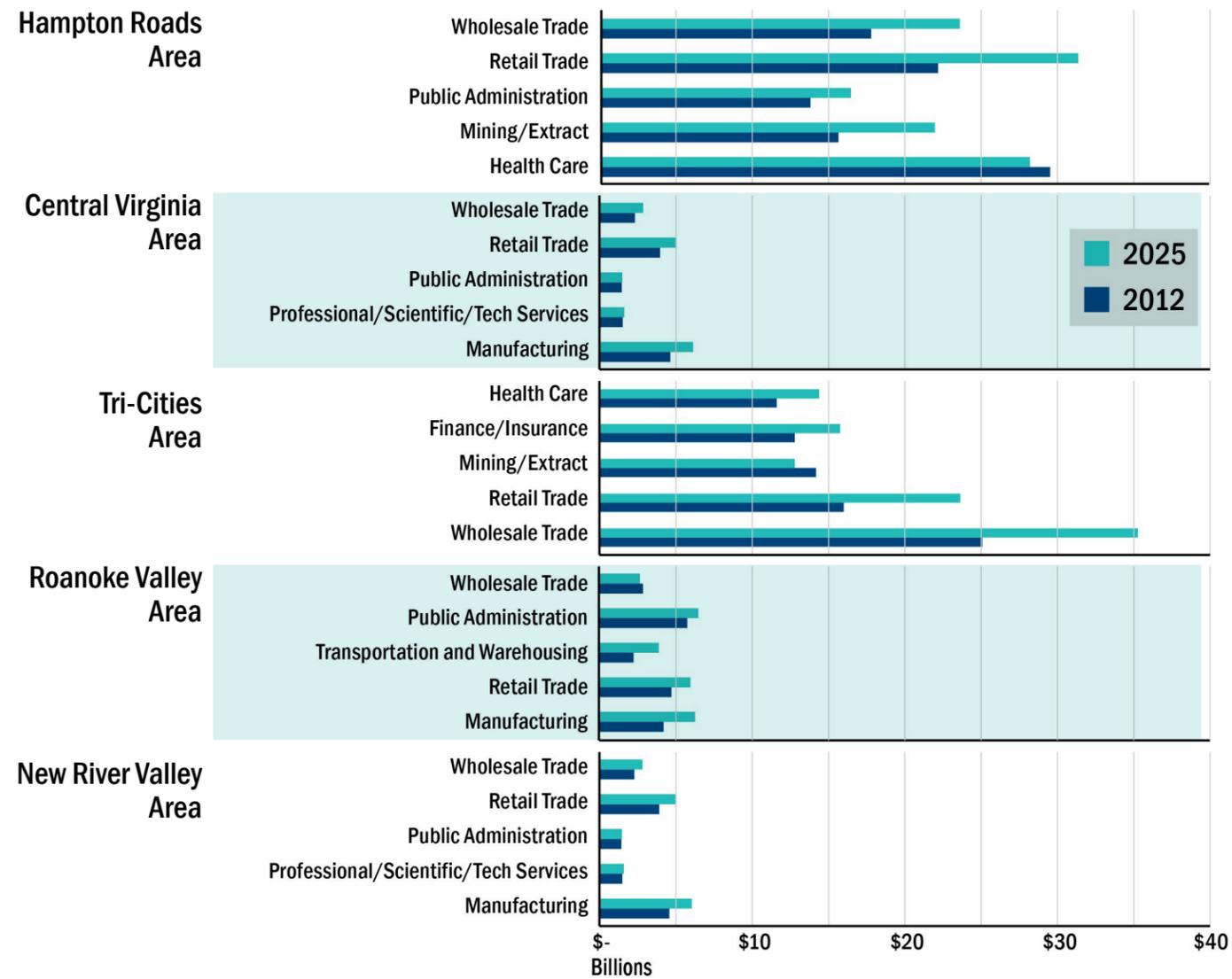


Population Growth (2012-2025 Percent Change)

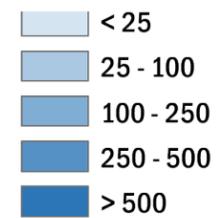


CORRIDOR E OVERVIEW

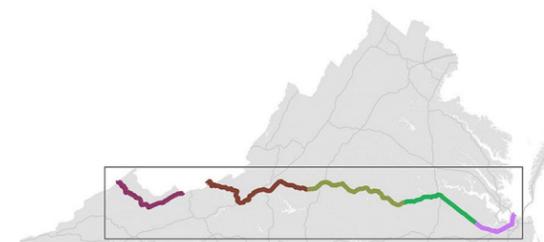
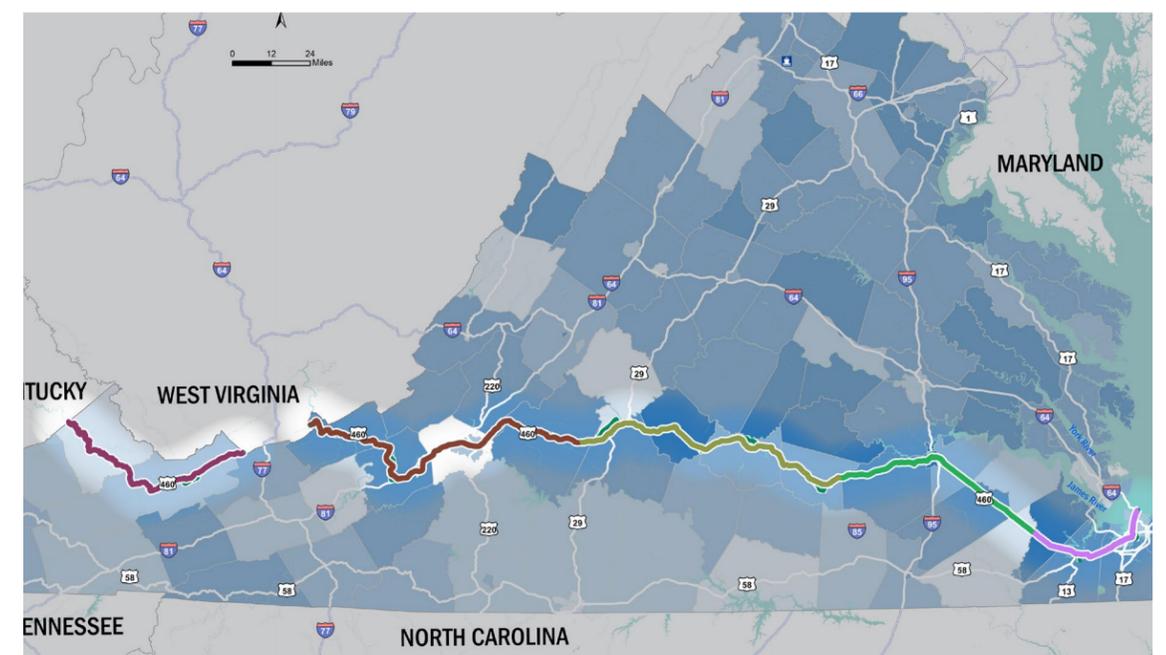
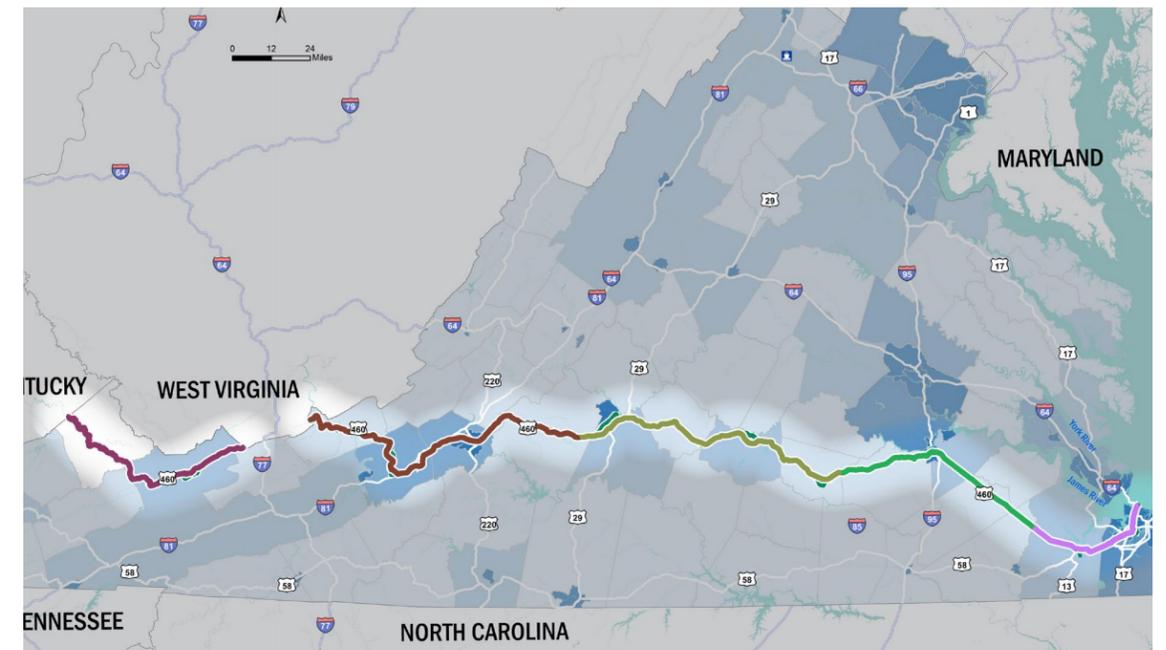
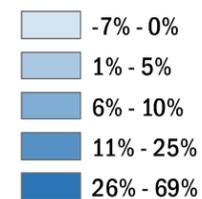
Top Industries (GDP)



2012 Employment Density Jobs / Square Mile



Employment Growth (2012-2025) Percent Change

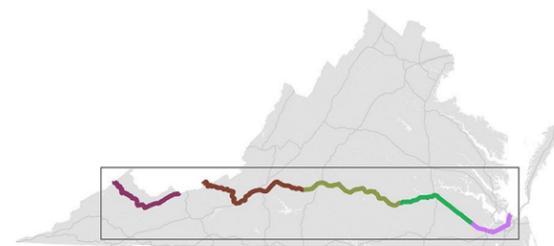


CORRIDOR E OVERVIEW

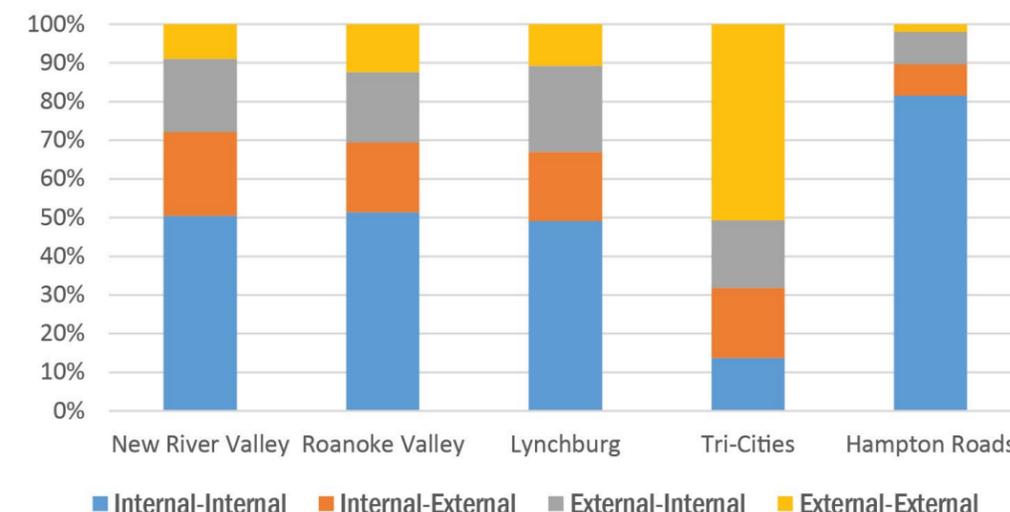
Corridor Travel Patterns

Passenger

Corridor E connects to Kentucky and West Virginia and passes through five MPO areas – New River Valley, Roanoke Valley, Lynchburg, Tri-Cities, and Hampton Roads – on its way to the Atlantic Coast. Throughout the western half of the state, Corridor E is dominated by local internal traffic, which represents approximately 50 percent of the traffic through the New River Valley, Roanoke Valley and Lynchburg MPO Areas. Less than 15 percent of the traffic in these three areas is pass-through traffic. The Hampton Roads Area is even more strongly dominated by local internal trips, which represent more than 80 percent of the traffic on Corridor E in this area. Conversely, travel along Corridor E in the Tri-Cities Area is dominated by pass-through trips, which represent approximately 50 percent of all traffic within the corridor. An additional 35 percent of trips have only their origin or destination in the Tri-Cities Area, indicative of the large portion of trips between the Hampton Roads Area and the Tri-Cities Area.



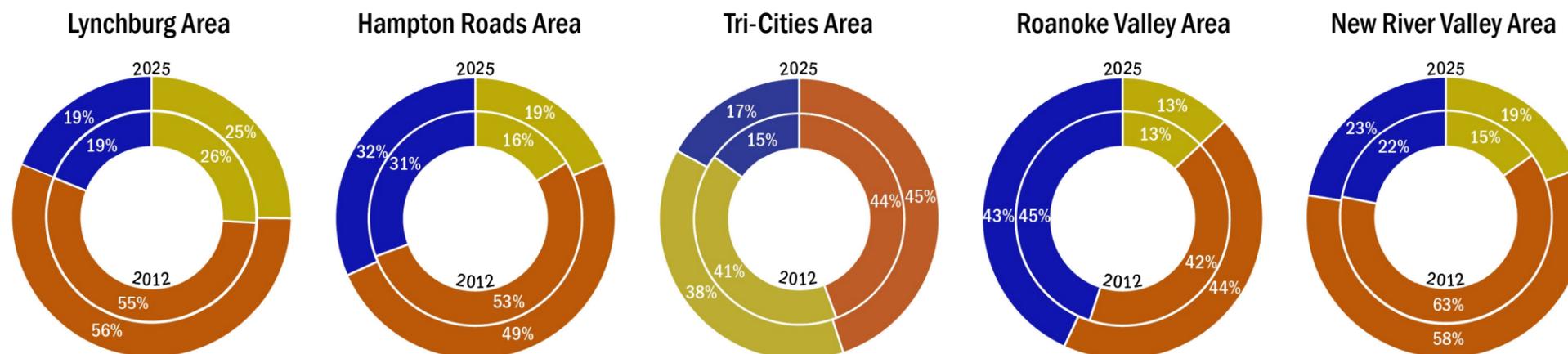
Distribution of Internal and External Travel



Freight

By truck, Corridor E carried 81 million tons of freight worth \$89 billion in 2012, and is estimated to carry 108 million tons of freight worth \$130 billion in 2025. A large proportion of truck freight traffic on Corridor E, representing 32 percent of the total truck freight value on the corridor, passes through Virginia. North Carolina is a major generator and attractor of truck freight on Corridor E, with traffic throughout the Mid-Atlantic, the Port of Virginia facilities in the Hampton Roads Area, and the Tri-Cities Area.

By rail, Corridor E carried 62 million tons of freight worth \$47 billion in 2012, and is estimated to carry 70 million tons of freight worth \$62 billion in 2025. The largest rail freight flows on Corridor E consist of low-value rail freight travelling from West Virginia to North Carolina, accounting for more than 17 percent of the total rail freight tonnage on the corridor. Rail freight between West Virginia and nearby counties in Virginia to the Port of Virginia in Norfolk accounts for more than 20 percent of the total rail freight tonnage on the corridor. In terms of rail freight value, the largest rail freight traffic patterns on Corridor E are between Illinois and the Port of Virginia, accounting for more than 20 percent of the total rail freight value on the corridor. Ohio and Louisiana are major generators of freight value on Corridor E, while North Carolina and Pennsylvania are major freight attractors.



GDP by Sector, 2012 and 2025

- Freight Dependent
- Local Serving
- Knowledge-based

Truck Freight

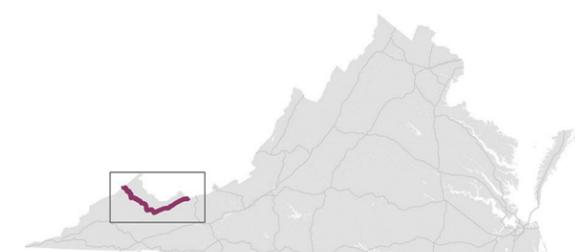
2012	2025
Rail Freight Value	Rail Freight Value
\$47 Billion	\$62 Billion
Rail Freight Tonnage	Rail Freight Tonnage
62 Million Tons	70 Million Tons
Freight Value per Ton	Freight Value per Ton
\$755	\$882
Corridor Tonnage Passing Through	Corridor Tonnage Passing Through
38%	39%

Rail Freight

2012	2025
Truck Freight Value	Truck Freight Value
\$89 Billion	\$130 Billion
Truck Freight Tonnage	Truck Freight Tonnage
81 Million Tons	108 Million Tons
Freight Value per Ton	Freight Value per Ton
\$1095	\$1198
Corridor Tonnage Passing Through	Corridor Tonnage Passing Through
26%	25%

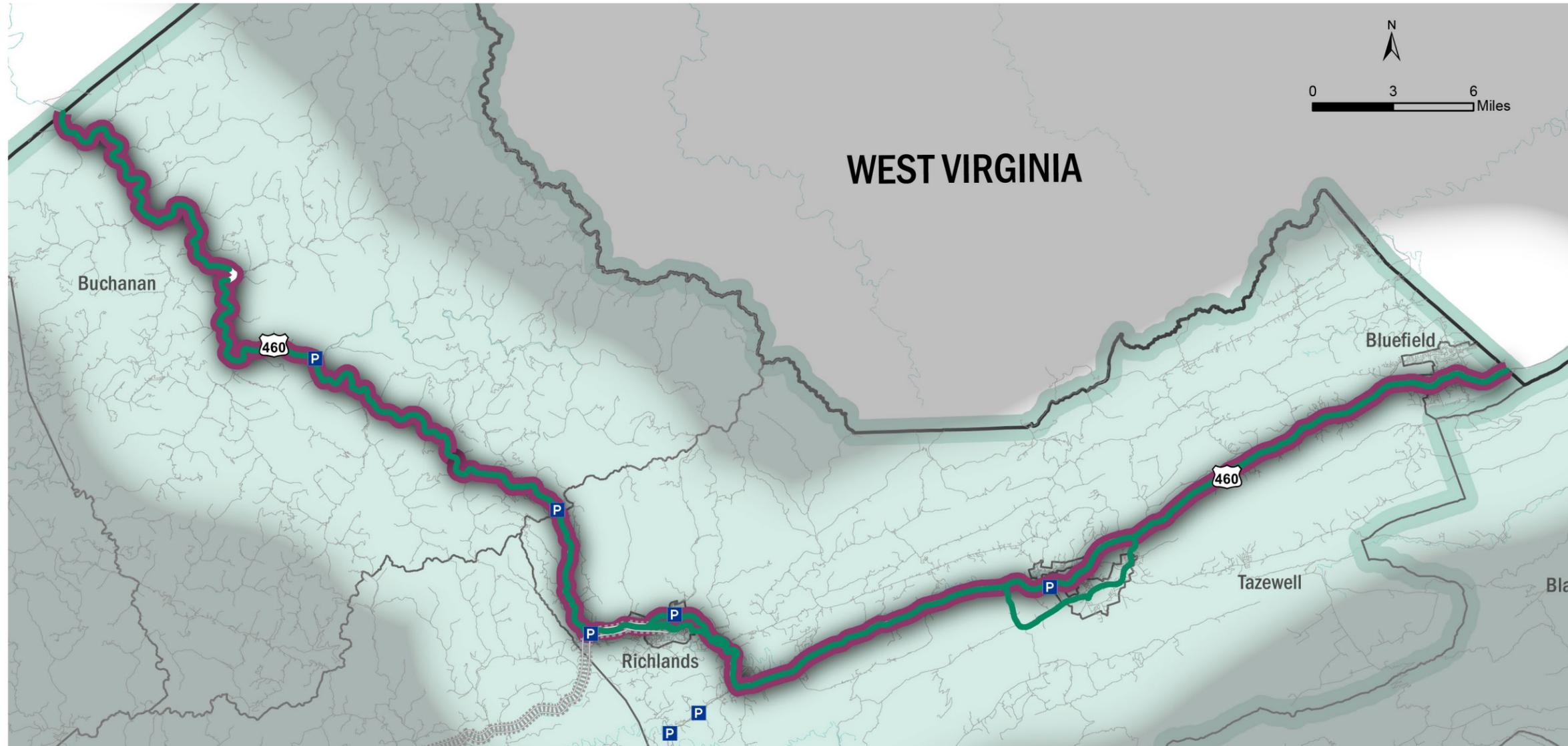
II. Segment E1

- E1
- Corridor Component Road
- Railroad
- MPO Area
- Planning District Area
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- Park & Ride Facility
- Airport Facility



Corridor Segment E1 Components

- US 460
- US 460 Business
- Norfolk Southern Heartland Corridor



E1 SEGMENT PROFILE

Segment E1 begins at the Kentucky border and continues east, serving Buchanan and Tazewell Counties and the Towns of Richlands, Tazewell, and Bluefield before terminating at the West Virginia border. For a portion of its length, the segment runs concurrently with US 19. Segment E1 serves as an alternative east-west throughway for passengers and freight, in addition to providing local access to the rural communities of southwest Virginia.

Highway Facilities: US 460 is a two-lane highway from the Kentucky state line to the Town of Grundy, where the highway becomes four lanes before continuing to the West Virginia state line. At Claypool Hill, US 19 and US 460 run concurrently to the West Virginia border. A business spur of US 460 serves the Towns of Richlands and Tazewell.

Transit Services: In this area, the corridor is served by the Four County Transit system, as well as several Park-and-Ride facilities.

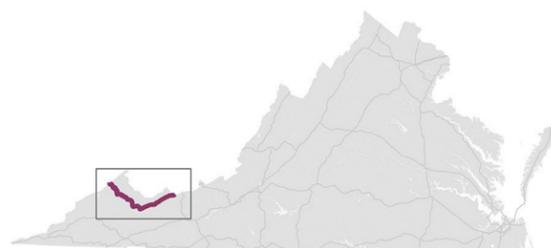
Rail Facilities: Norfolk Southern operates its Heartland Corridor line, the most important rail route for transport between the Port of Virginia and markets located west of Virginia. Richlands serves as a junction between rail traffic by connecting the Heartland Corridor with connections to the south.

Port Facilities: No port facilities are located directly adjacent to Segment E1, but the Heartland Corridor does provide direct access to the Port of Virginia facilities in the Hampton Roads Area.

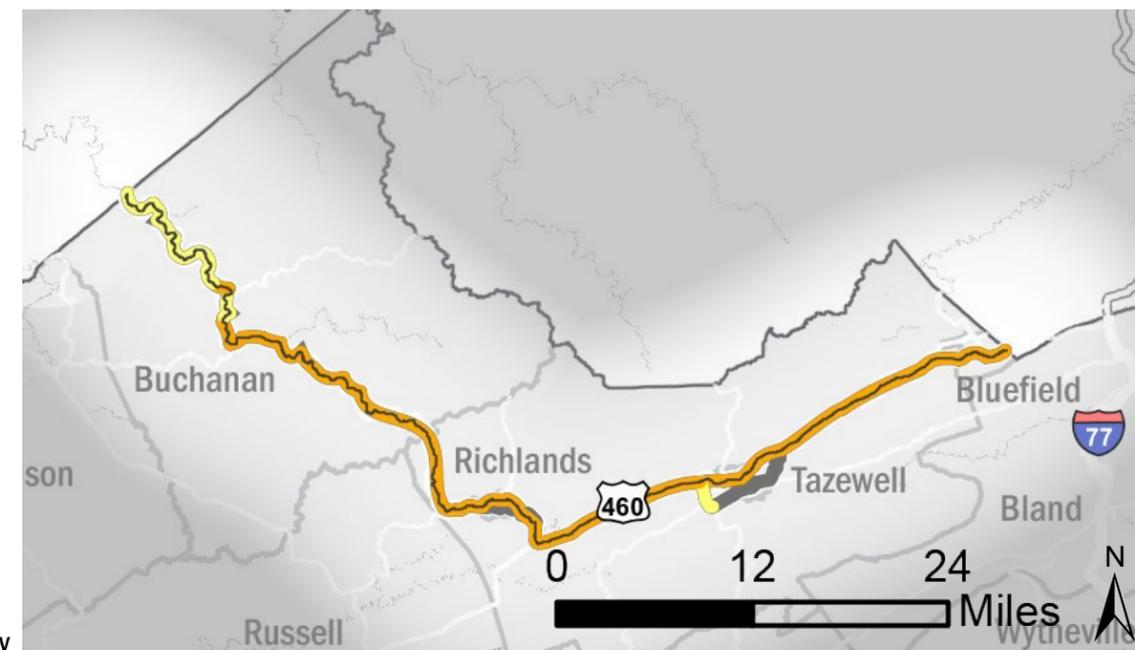
Airport Facilities: No commercial air service is available in Segment E1, although two general-aviation facilities do exist.

Major planned and future projects include:

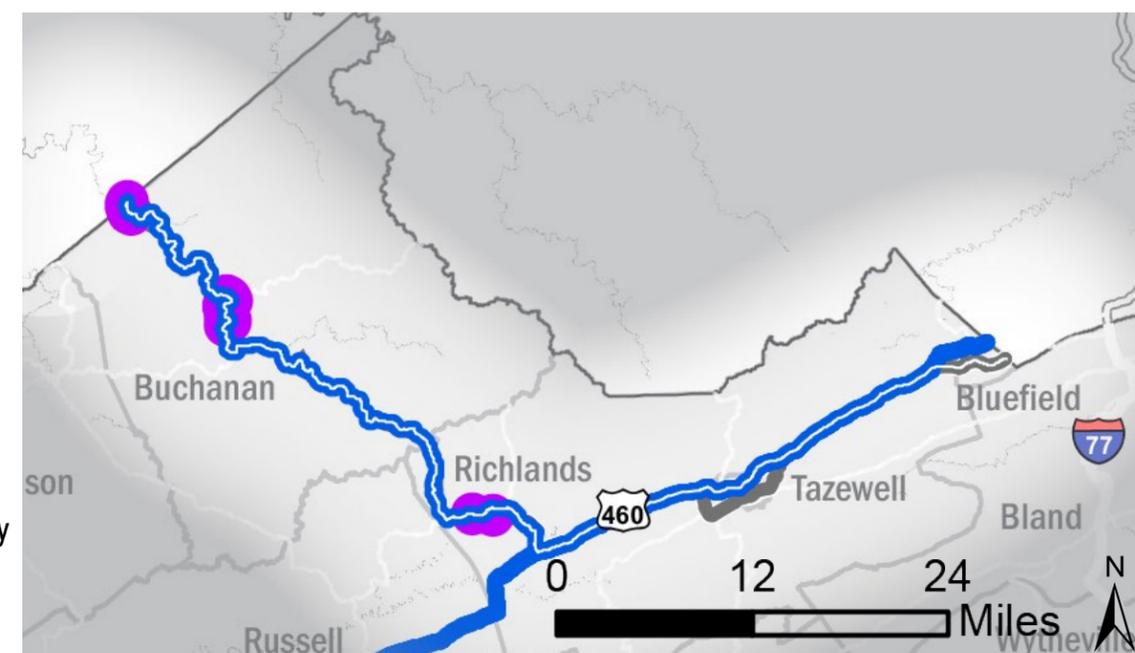
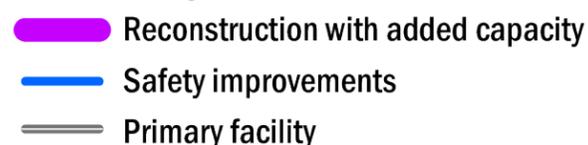
- Installing two- to four-foot paved shoulders, edge line rumble strips, and guardrail from the Kentucky border to the junction of US 460 with US 19 in Claypool Hill; and
- Replacing the Front Street bridge over Big Town Hill Creek (just before the US 460 ramps) in Tazewell County.



Number of Lanes (both directions)



Future Projects



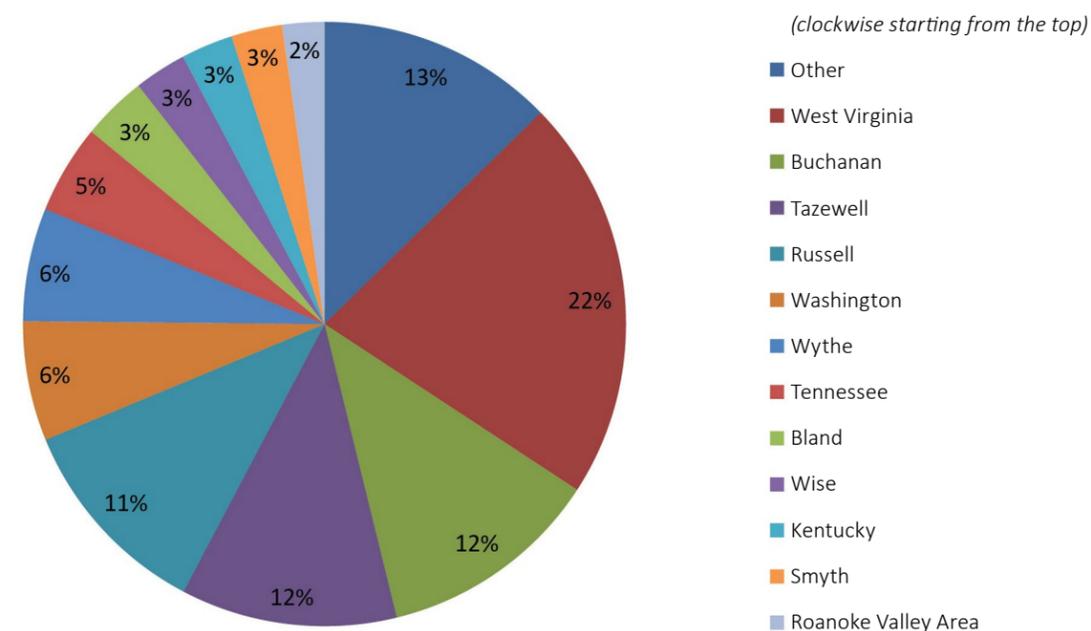
E1 SEGMENT PROFILE

Travel Demand

Passenger Demand

The westernmost segment of Corridor E connects Kentucky and West Virginia via Buchanan and Tazewell Counties, although it does not provide direct access to any of the Commonwealth's MPO Areas. Intercity passenger travel from these counties accounts for a very small percentage of intercity travel in the Commonwealth (less than 0.4 percent), but major markets for this travel include West Virginia (22 percent), travel between the two counties (24 percent), and Russell County (11 percent), all of which may use portions of Segment E1.

Travel from Jurisdictions along Segment E1 to...



E1 SEGMENT PROFILE

Freight Demand

By truck, Segment E1 carried five million tons of freight worth \$2 billion in 2012, and is estimated to carry four million tons of freight worth \$3 billion in 2025. A large proportion of truck freight traffic on Corridor E, representing 32 percent of the total truck freight value on the corridor, passes through Virginia. There are significant truck freight flows on this corridor between North Carolina and the Middle Atlantic region. North Carolina is a major generator and attractor of truck freight on Corridor E, with traffic throughout the Mid-Atlantic, the Port of Virginia facilities in the Hampton Roads Area, and the Tri-Cities Area. Despite being the destination for less than one percent of the corridor’s truck freight, the jurisdictions adjacent to Segment E1 are minor generators of truck freight on the corridor. In particular, truck freight originating in Tazewell County accounts for between two and three percent of all truck freight tonnage on Corridor E, with major flows to West Virginia and North Carolina.

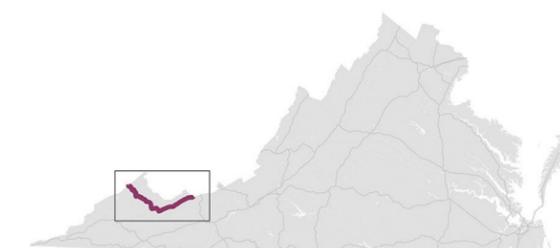
By rail, Segment E1 carried 13 million tons of freight worth \$770 million in 2012, and is estimated to carry 13 million tons of freight worth \$850 million in 2025. The largest rail freight flows on Corridor E consist of low-value rail freight travelling from West Virginia to North Carolina, accounting for more than 15 percent of the total rail freight tonnage on the corridor. Rail freight between West Virginia and nearby counties in Virginia to the Port of Virginia in Norfolk accounts for more than 20 percent of the total rail freight tonnage on the corridor. In terms of rail freight value, the largest rail freight traffic patterns on Corridor E are between Illinois and the Port of Virginia, accounting for more than 20 percent of the total rail freight value on the corridor. Ohio and Louisiana are major generators of freight value on Corridor E, while North Carolina and Pennsylvania are major freight attractors. In terms of tonnage, the jurisdictions adjacent to Segment E1 are major generators of rail freight in the corridor, accounting for between six and seven percent of the total rail freight value. Major origin locations of freight along Segment E1 include Buchanan and Tazewell Counties, with the majority of this freight destined for the Port of Virginia facilities in the Hampton Roads Area.

Truck Freight



Rail Freight

Rail Freight

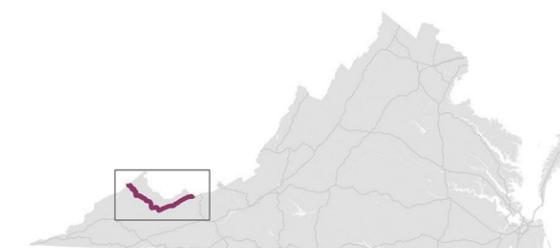


E1 SEGMENT PROFILE

Traffic Conditions

Traffic Volume and AADT

Traffic volume on Segment E1 is low relative to traffic volumes on all other segments of Corridor E. Along US 460 in Buchanan County, average daily traffic volumes range from 3,000 to 10,000 vehicles per day, with the highest volumes south of Grundy. In Tazewell County, daily volumes on US 460 range from 11,000 to 19,000 vehicles per day, with the highest volumes between Richlands and the junction with US 19. Volumes on US 460 Business in Richlands and Tazewell are generally lower, and range between 3,000 and 13,000 vehicles per day. Daily traffic volumes on almost all sections of US 460 are projected to increase by fewer than 1,000 additional vehicles by 2025, with no traffic growth forecast for US 460 Business. Thus, daily traffic volumes in 2025 throughout Segment E1 are projected to be only slightly higher than current daily traffic volumes.



Traffic Volume 2014 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility



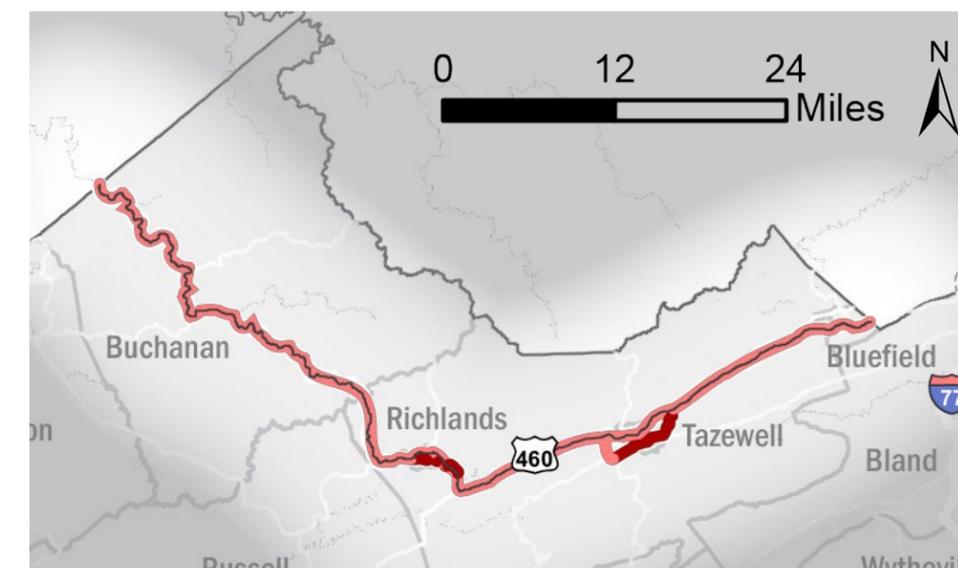
Traffic Volume 2025 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility



Change in Traffic Volume 2014- 2025 (AADT)

- Decreased
- 0 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- > 20,000
- Primary facility



E1 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment E1 is distributed throughout the day as shown in the graphs below. Weekday traffic shows morning and evening peak periods over the course of the day, and steady increase in the flow during the midday period. The highest hourly traffic occurs between 4 and 5 p.m. which accounts for 8.2 percent of daily traffic, and a less busy morning peak hour 8 to 9 a.m. accounting for 6.1 percent of daily traffic. The combined weekday traffic from 7 a.m. to 7 p.m. period accounts for 80 percent of total daily traffic. Peaking patterns for truck traffic are different from commuter traffic with a single midday peak occurring between noon and 2 p.m. Weekend traffic patterns are different from the typical commute patterns, with the highest percentage of hourly traffic occurring between noon and 1 p.m. (8.2 percent of daily traffic) for all traffic, and 10 to 11 a.m. (6.7 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment E1 vary by as much as 21 percent throughout the year, with the highpoint in October (around 14,000 vehicles per day) and the low point in January (around 12,000 vehicles per day). Truck volumes vary more than passenger volumes throughout the year, with the February high (around 500 trucks per day) 37 percent higher than the December low (less than 400 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (May, around 10,000 vehicles per day) are 29 percent higher than January levels (around 8,000 vehicles per day). Since truck volumes account for a relatively small portion of traffic (less than 3 percent of overall daily traffic for weekday and weekend) on Segment E1, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

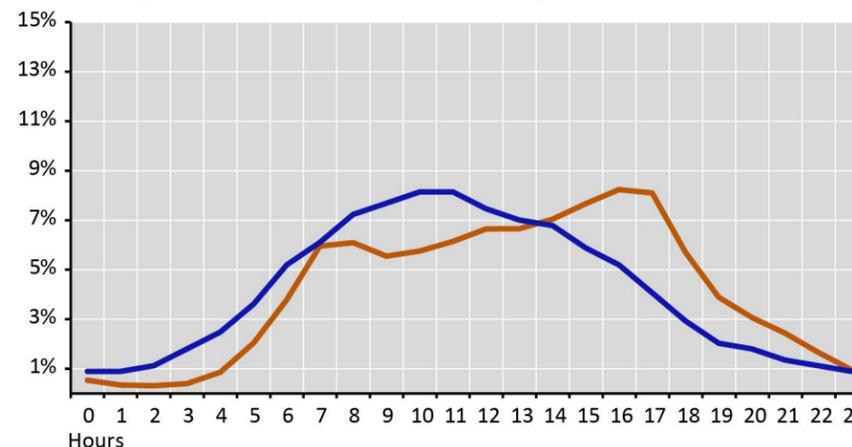
Truck Volumes

The percent of daily traffic comprised of heavy trucks on Segment E1 is low compared to the other segments in Corridor E. Along US 460 throughout Segment E1, heavy trucks comprise two to four percent of total traffic.

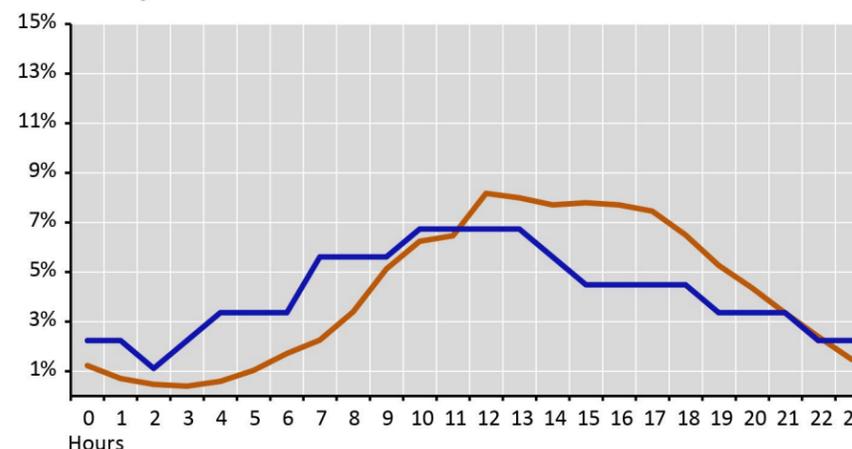
Percent Heavy Trucks



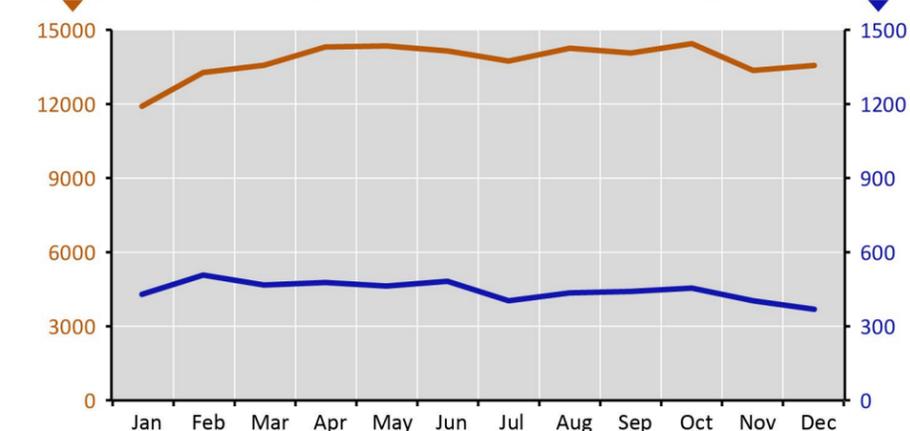
Hourly Traffic Distribution – Weekdays



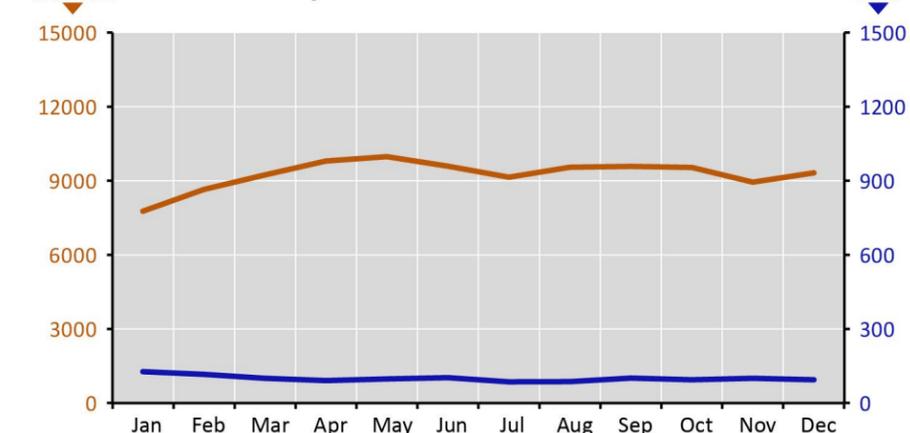
Hourly Traffic Distribution – Weekends



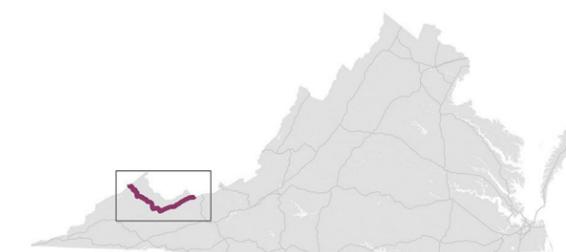
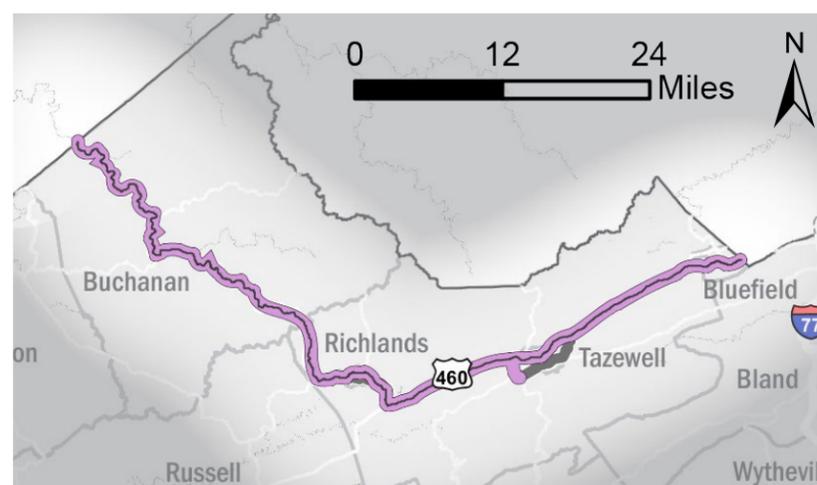
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks



E1 SEGMENT PROFILE

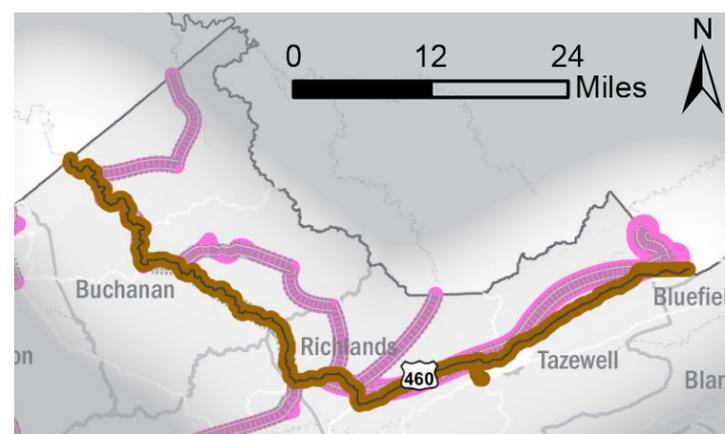
Freight Flows

In the Buchanan County section of Segment E1, freight is moved primarily by rail, in terms of tonnage, but by truck, in terms of value. In total, 1.4 million tons (26 percent) of freight is moved through this section of Segment E1 by truck, compared to four million tons by rail. By value, however, \$705 million (82 percent) of freight value travels by truck, compared to \$158 million by rail. On average, a ton of freight traveling through this section of Segment A1 by truck is worth \$507 while a ton of freight traveling by rail is worth only \$41. In 2025, both rail and truck freight tonnages and total values in this location are expected to decrease slightly, but the percentages of tonnage and value moved by truck, and the values per ton on truck and rail, are expected to remain nearly the same.

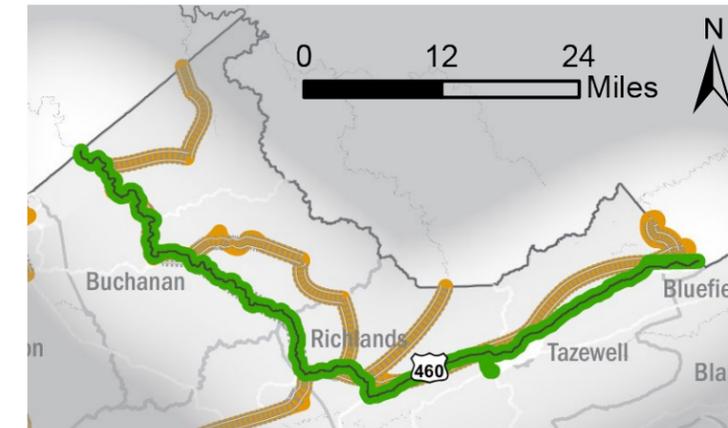
In Richlands, freight movements rely more heavily on rail, in terms of both tonnage and value. Only 1.3 million tons (nine percent) of freight travels through the Richlands section of Segment E1 by truck, compared to 13 million tons moved by rail. Freight value traveling by truck accounts for \$692 million (47 percent); freight value by rail accounts for \$774 million (53 percent). On average, a ton of freight traveling through this section of Segment E1 by truck is worth \$553 while a ton of freight traveling by rail is worth only \$59. In 2025, truck freight tonnages and total values in the Richlands area are expected to increase, and the percentage of the freight traveling by truck will likely increase slightly to 11 percent by tonnage and 59 percent by value. Values per ton on both truck and rail in 2025 are expected to increase to \$794 and \$66, respectively.

Near Springville, freight movements rely more heavily on rail, in terms of tonnage, and on truck, in terms of value. Approximately five million tons (28 percent) of freight travels through the Springville section of Segment E1 by truck, compared to 12 million tons by rail. Freight traveling by truck accounts for \$2 billion (74 percent); freight by rail accounts for \$716 million (26 percent). On average, a ton of freight traveling through this section of Segment E1 by truck is worth \$423 while a ton of freight moving by rail is worth only \$59. In 2025, truck and rail freight tonnages in the Springville area are expected to decrease; however, the freight value per ton for truck and rail is likely to increase to \$608 and \$67, respectively.

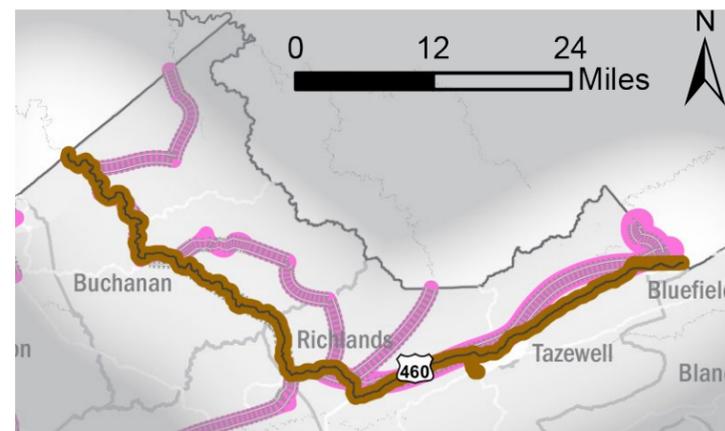
Annual Freight by Tonnage, 2012



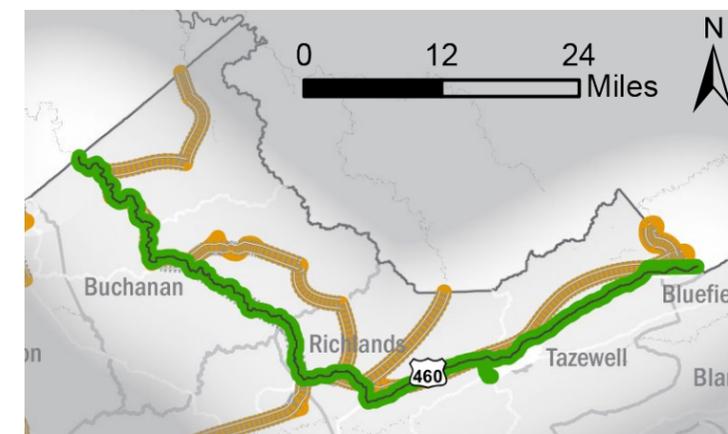
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



Truck Freight (in tons)



Rail Freight (in tons)



Truck Freight



Rail Freight



E1 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment E1 of the Heartland Corridor have few travel options, both in terms of travel path and mode choice. There are no parallel highway facilities to US 460 in Segment E1 that accommodate inter-city travel. Four County Transit serves this segment and provides connections to Bluefield, West Virginia. No bus or rail connections are available to the rest of the corridor or the Commonwealth.

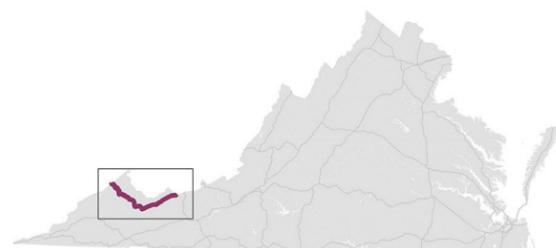
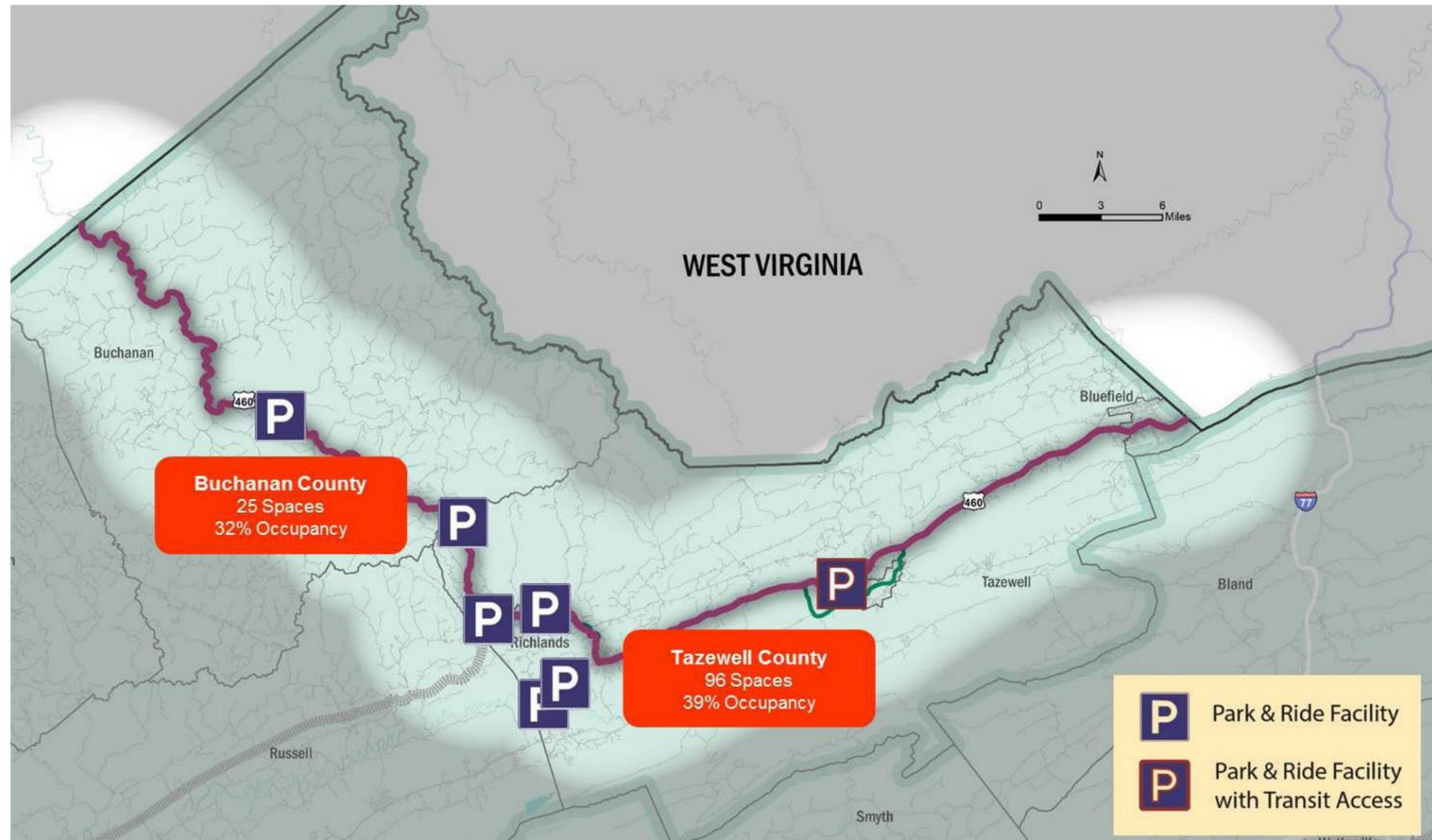
Park-and-Ride

Within Segment E1, commuters can utilize several Park-and-Ride facilities. Tazewell County provides the most Park-and-Ride locations, the highest number of Park-and-Ride spaces, and has the highest utilization rate of spaces available in the region. No county within the Segment E1 area has a rate higher than the statewide average for Park-and-Ride utilization, which is 76 percent.

Comparable Travel Options

Blacksburg / Christiansburg to Bluefield, WV

<p>Inter-City Bus</p> <p>0 Trips per Day 0:00 Travel Time \$0 Est. Cost</p>	<p>Train</p> <p>0 Trips per Day 0:00 Travel Time \$0 Est. Cost</p>
<p>Auto</p> <p>Via Rt. 460: 1:10 Travel Time \$34 Est. Cost</p>	



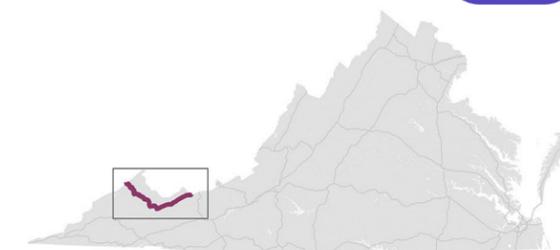
E1 SEGMENT NEEDS

Safety



Between 2010 and 2012, 131 severe crashes occurred on Segment E1, resulting in the highest crash rate on the Heartland Corridor. There are a few locations along Segment E1 where high concentrations of severe crashes occurred. Along US 460 in Tazewell County, north of Raven, there were 18 collisions over a stretch of 2.7 miles between Mulberry Road and Jacks Creek Road. Along US 460 (Front

Street) in Richlands, there were 45 crashes over a 1.2-mile stretch between Acme Road, near the Tazewell County Airport, and Front Street. Of the 45 crashes, 14 were at the intersection of US 460 and Front Street. On US 460 Business (2nd Street/Front Street) there were 14 incidents within a distance of 1.6 miles between Rockbridge Avenue and Robinhood Lane.



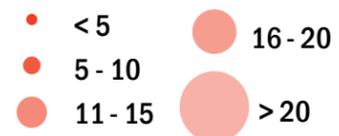
Performance Metrics:

Number of Severe Crashes **131**

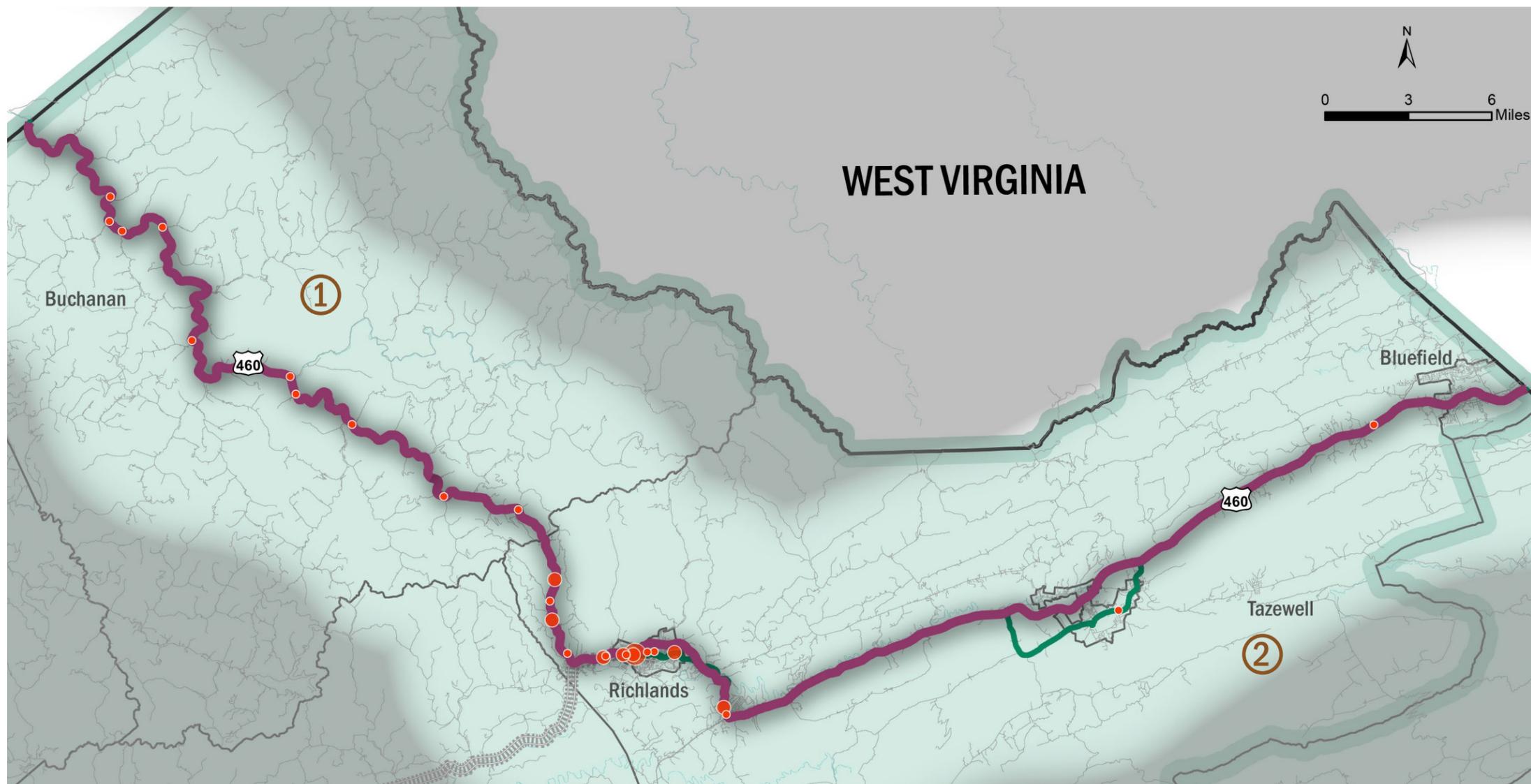
Severe Crashes/Million VMT **2.0**

Number of Railroad Crashes **3**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



E1 SEGMENT NEEDS

Congestion



Performance Metrics:

Person Hours of Delay per Mile

8

Freight Ton Hours of Delay per Mile

670

Passenger Delays

Passenger congestion along segment E1 is generally minimal, with the corridor segment experiencing around 1,300 person-hours of delay daily. The only location in which delays exceed 100 person-hours per mile is at the intersection of US 460 and US 19 in Tazewell. Peak-period passenger delays account for 48 percent of daily congestion, marginally higher than average for the peak-period share of congestion on CoSS segments.

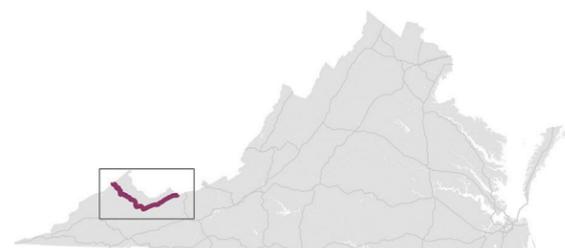
Freight Delays

Freight delays along Segment E1 rank among the lowest among CoSS segments with daily freight delays of just 110,000 ton-hours. As such, there are no locations of significant freight delay exceeding 250,000 ton-hours per mile along the corridor segment. Peak-period freight delays on Segment E1 account for 42 percent of daily congestion on the corridor segment.

Daily Person Hours of Delay per Mile



Daily Freight Ton Hours of Delay per Mile



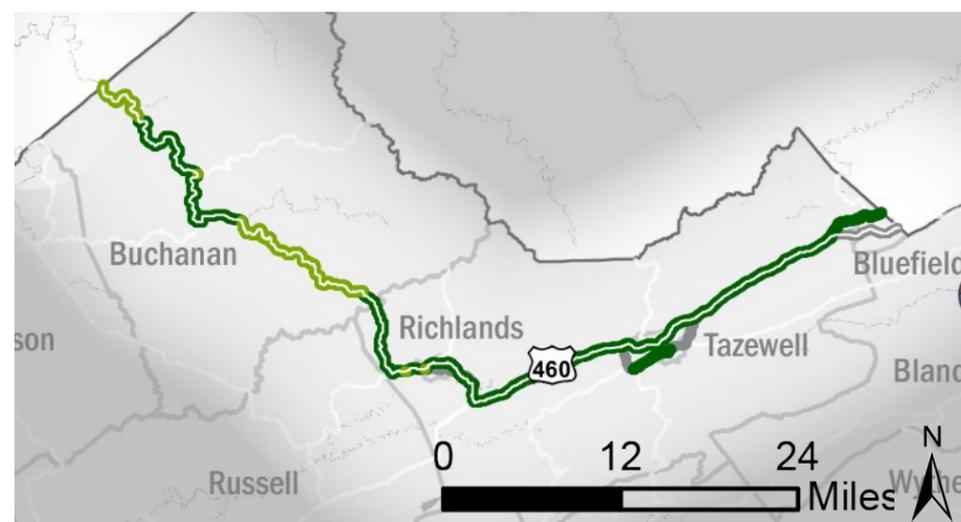
E1 SEGMENT NEEDS

Reliability



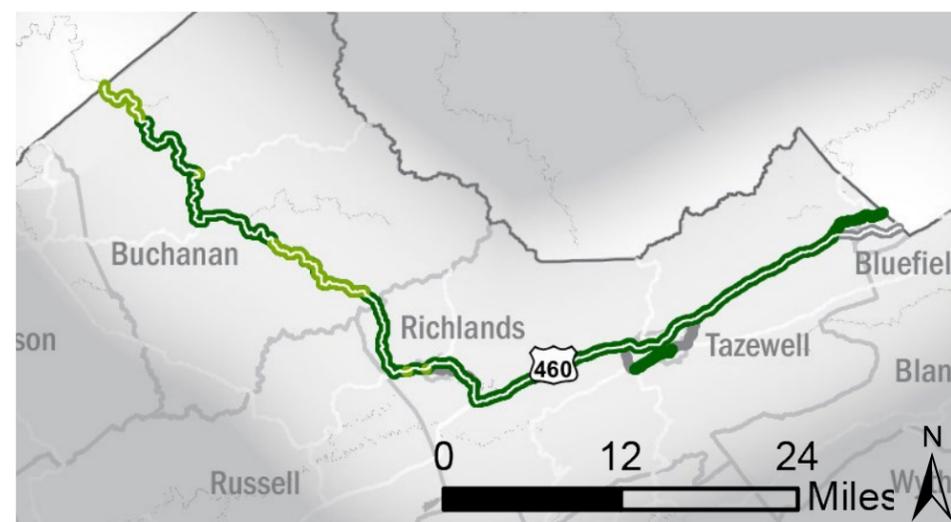
Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment E1 ranges from 0.02 to 0.35 in terms of reliability index, with an average value of 0.09. None of the locations along Segment E1 have reliability index values exceeding the statewide threshold.



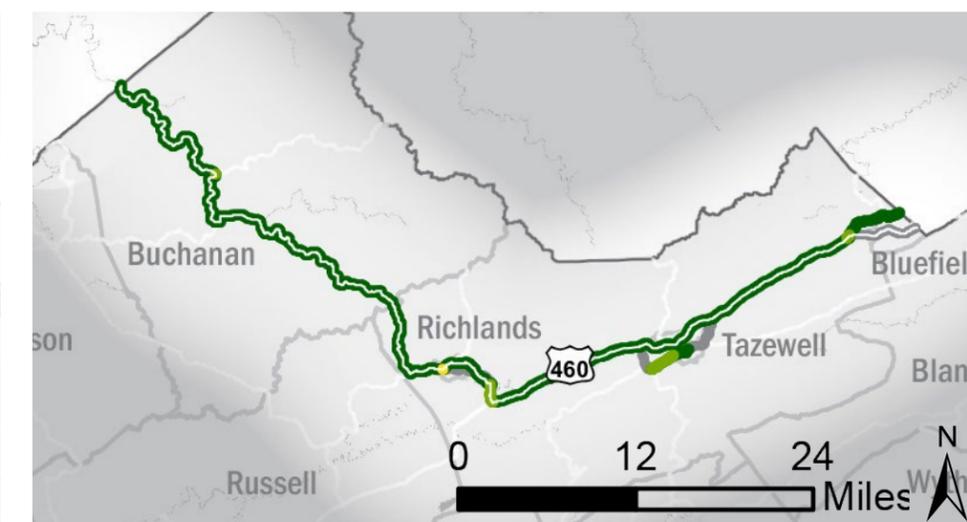
Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 0.30 in terms of reliability index, with an average value of 0.08. None of the locations along Segment E1 have reliability index values exceeding the statewide threshold.

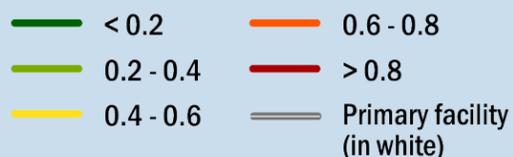


Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.45 in terms of reliability index, with an average value of 0.07. None of the locations along Segment E1 have reliability index values exceeding the statewide threshold.

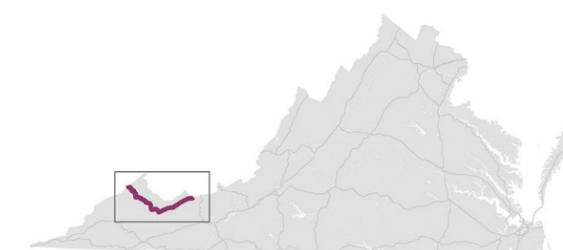


Reliability Index



Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



E1 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate.
See "Summary of Needs" table on
the following page for details.

Redundancy



Mode Choice



Safety



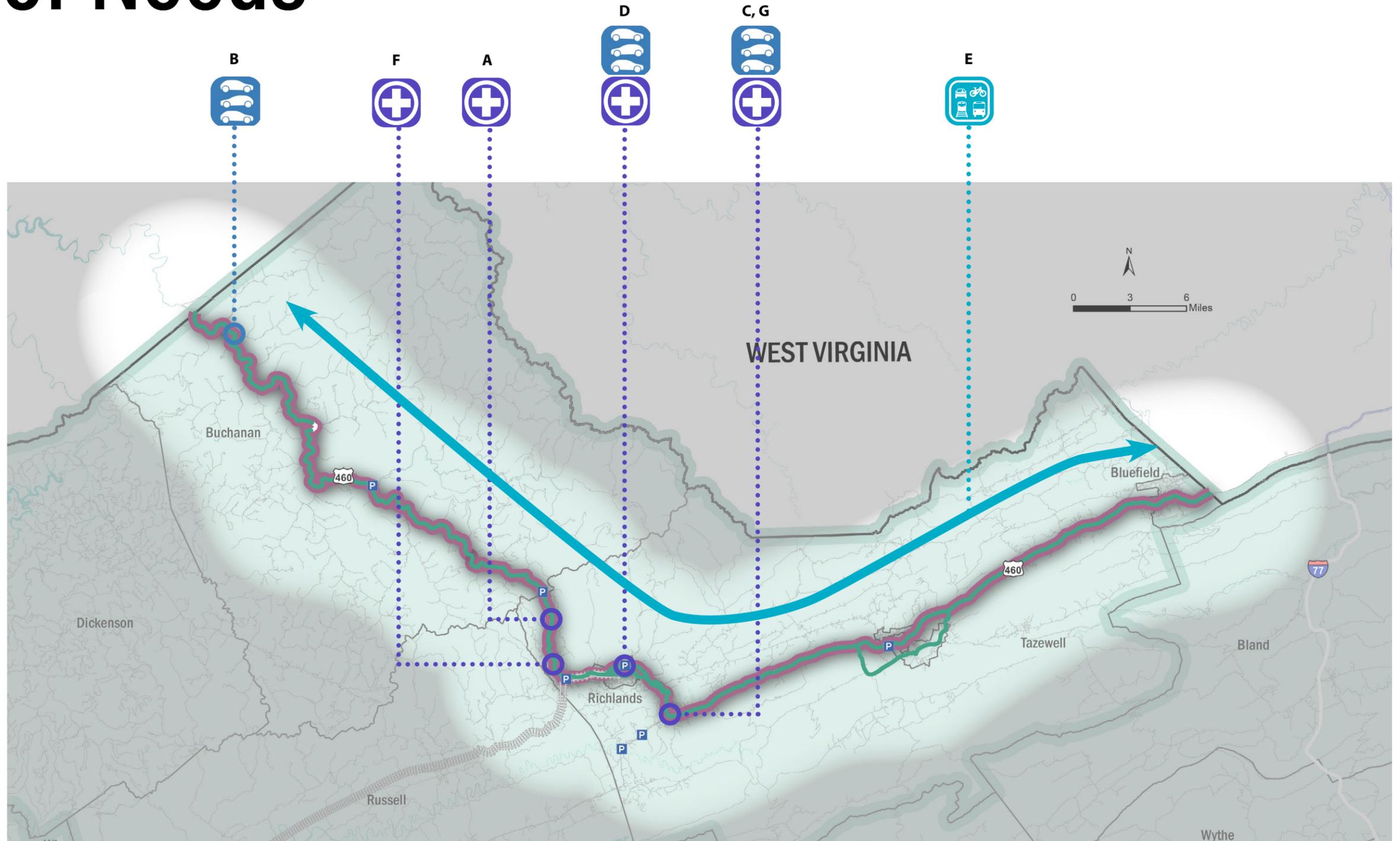
Congestion



Bottlenecks



Reliability



E1 SEGMENT NEEDS

Summary of Needs - E1 Segment

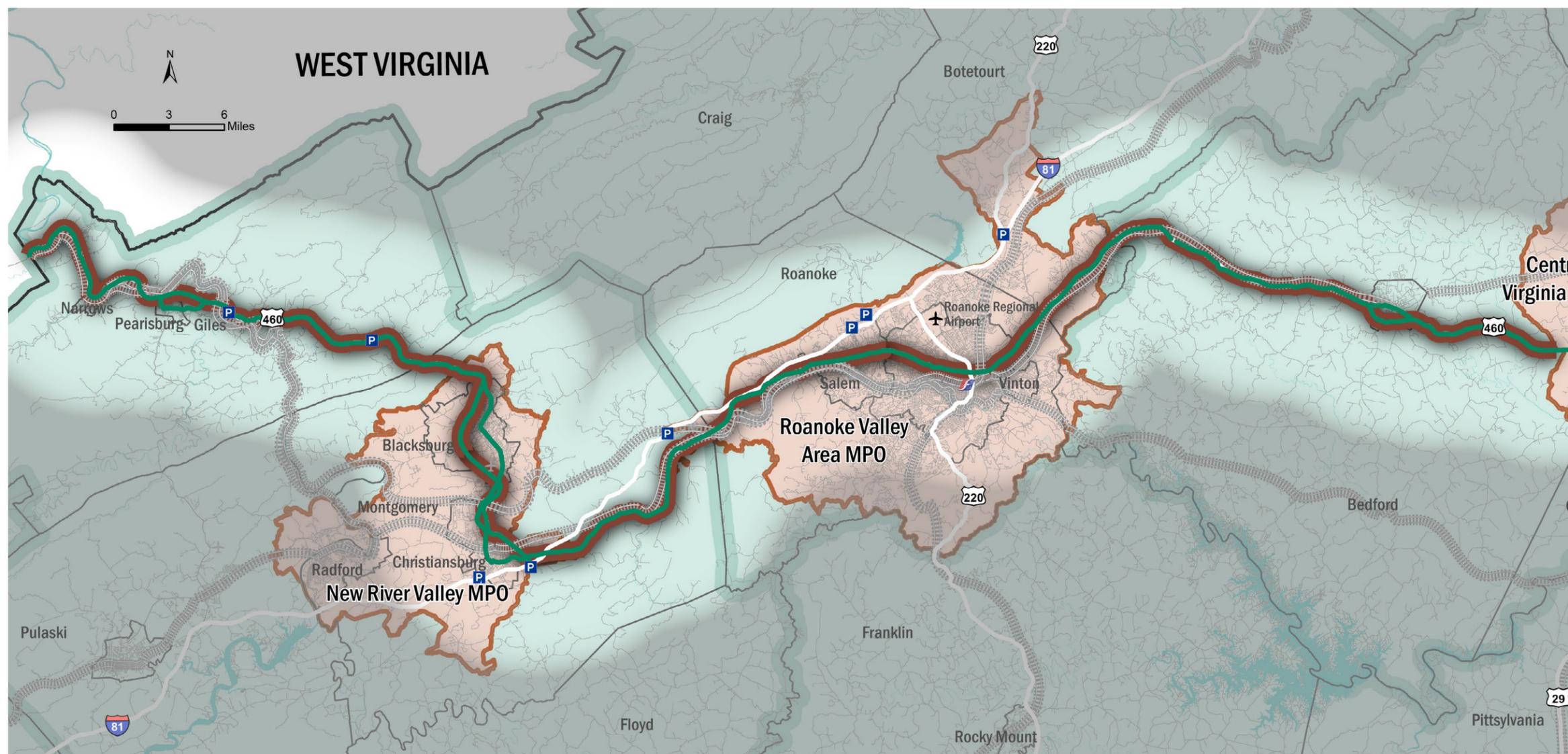
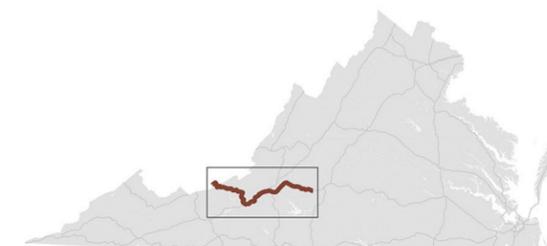
A.		US 460 north of Richlands: Geometric design, high levels of truck traffic, and mountainous terrain
B.		Limited accessibility along US 460 in Buchanan County (2-lane facility) including connection into Kentucky
C.		US 460 at US 19: Merging issues related to insufficient turning lanes
D.	 	US 460 in Richlands: Signalized intersections near at-grade rail crossings create safety and congestion issues; insufficient storage for vehicles. 45 severe crashes.
E.		No intercity bus or rail service connects communities in the segment to the rest of the corridor
F.		US 460 north of Raven in Tazewell County: 18 severe crashes
G.		Congestion issue at US 460 and US 19 in Tazewell County

III. Segment E2

Corridor Segment E2 Components

- US 460
- US 460 Business
- US 460 Bypass
- Norfolk Southern Heartland Corridor
- Roanoke Regional Airport

- E2
- Corridor Component Road
- Railroad
- MPO Area
- Planning District Area
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- Park & Ride Facility
- Airport Facility



E2 SEGMENT PROFILE

Segment E2 begins at the West Virginia border and continues east, serving Giles, Montgomery, Roanoke, Botetourt, and Bedford Counties and the Cities of Salem and Roanoke. The segment travels through the New River Valley and Roanoke Valley MPO Areas. Segment E2 terminates at the western boundary of the Central Virginia Area in Bedford County. The segment includes portions of US 460, US 460 Business, and US 460 Bypass, and runs concurrently with sections of US 11, US 11 Alternate, and US 221. Segment E2 serves as an alternative east-west throughway for passengers and freight, in addition to providing local access to the rural communities of southwest Virginia, through Blacksburg and Christiansburg,

Highway Facilities: US 460 is primarily a four-lane highway from the West Virginia state line. A portion of US 460 in Segment E2 is limited access through Blacksburg and Christiansburg and on the bypass around Bedford. US 460 also runs concurrently with US 221 around Roanoke and through Botetourt County, and with US 11 through Roanoke, Salem, and Christiansburg. A business spur of US 460 serves the Towns of Pearisburg, Blacksburg, Christiansburg, and Bedford. Between Christiansburg and Salem, the corridor parallels I-81.

Transit Services: In this segment, the corridor is served by several transit providers. The Two Town Trolley provides service between Blacksburg and Christiansburg, the Blacksburg Transit System services the town of Blacksburg and the Virginia Tech campus, and Valley Metro serves the Roanoke Valley. RADAR provides paratransit service for the greater Roanoke Valley. Greyhound has a bus station in Roanoke. Amtrak operates thruway bus service via Valley Metro’s “The Smart Way Connector,” connecting Blacksburg, Roanoke, and Bedford to the Lynchburg Amtrak Station. There are numerous Park-and-Ride facilities, mostly clustered around I-81.

Rail Facilities: Norfolk Southern operates its Heartland Corridor line, the most important rail route for transport between the Port of Virginia and markets located west of Virginia. Numerous rail lines traveling in all directions run throughout the corridor, with Roanoke serving as a major junction area between rail corridors and classified as a Thoroughbred Bulk Transfer Terminal.

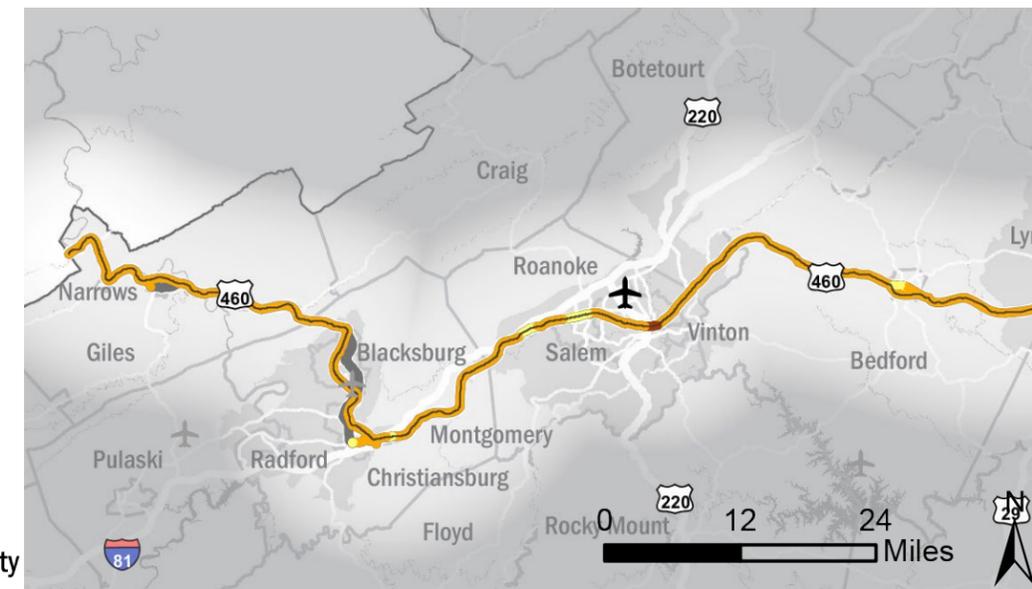
Port Facilities: No port facilities are located directly adjacent to Segment E2, but the Heartland Corridor does provide direct access to the Port of Virginia facilities in the Hampton Roads Area.

Airport Facilities: The Roanoke-Blacksburg Regional Airport is the only commercial airport in this segment.

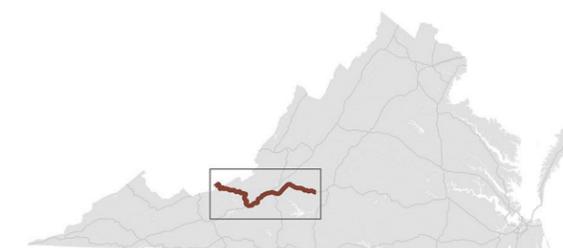
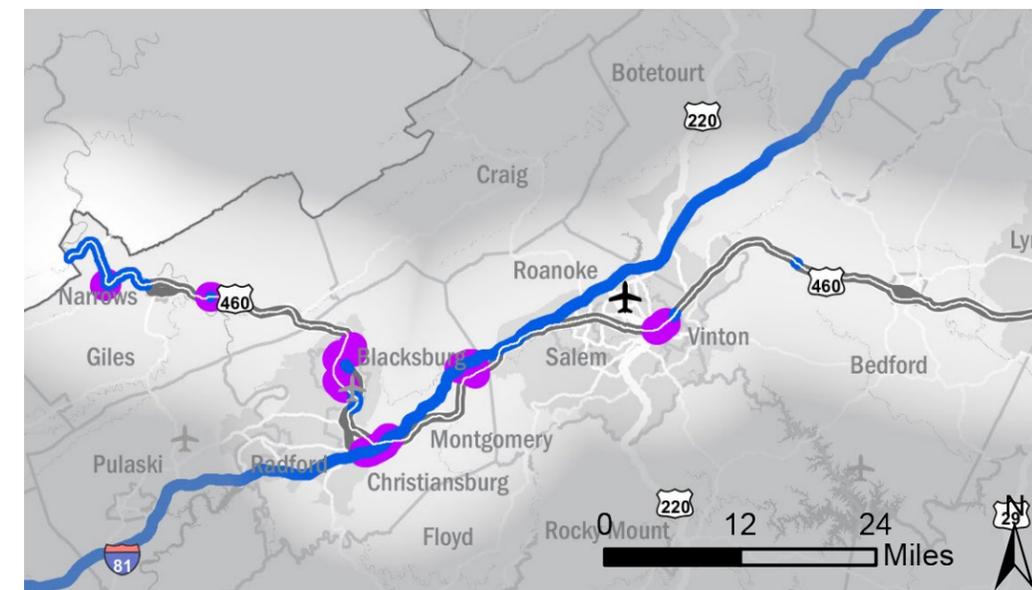
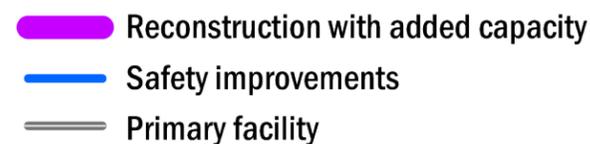
Major planned and future projects include:

- Improving the intersection of US 460 and US 623 to include the addition of left-turn lanes on westbound US 460 and southbound US 623, shifting the alignment of US 623 north of the intersection to better align with US 623 south of the intersection, and adding sidewalks and crosswalks in Giles County;
- Removing the at-grade signalized intersection at US 460 and Southgate Drive in Montgomery County;
- Widening State Route 603 (North Fork Road) between I-81 and US 11/460 in Montgomery County; and
- Widening Orange Avenue (US 460) to six lanes between 11th Street, NE and Gus Nicks Boulevard, NE in the City of Roanoke.

Number of Lanes (both directions)



Future Projects



E2 SEGMENT PROFILE

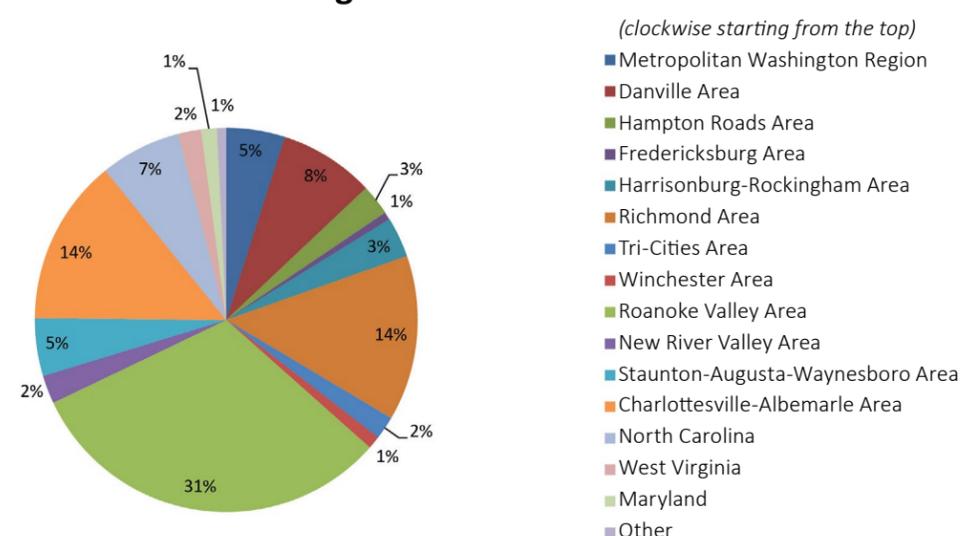
Travel Demand

Passenger Demand

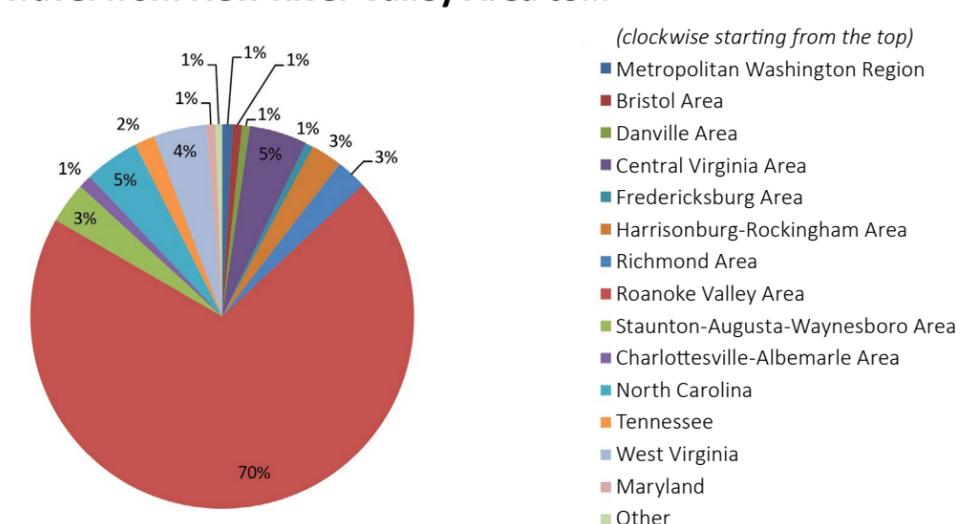
Segment E2 provides connections between the New River Valley, Roanoke Valley, and Lynchburg Areas. Travel between the New River Valley and Roanoke Valley Areas accounts for approximately two percent of the intercity passenger travel in the Commonwealth, and travel between Roanoke and Lynchburg accounts for an additional 1.5 percent. Some of these trips may use Segment E2 or segments along Corridor B.

The vast majority (70 percent) of intercity passenger travel starting in the New River Valley Area is destined for the Roanoke Valley Area, located directly adjacent and to the north along this segment. Other major destinations for intercity passenger travel along Segment E2 include the Lynchburg Area (five percent), West Virginia (four percent), and Richmond (three percent). Intercity travel originating in the Roanoke Valley Area is more distributed across the state, although 58 percent is still destined for the adjacent MPO Areas: New River Valley Area (34 percent) and Lynchburg Area (24 percent). Other major destinations for traffic from Roanoke along Segment E2 include Hampton Roads (seven percent), Richmond (five percent), and West Virginia (four percent). Westbound travel that may make use of Segment E2 accounts for a large portion of the intercity travel originating in Lynchburg, including travel to the Roanoke Valley (31 percent), the New River Valley (two percent), and West Virginia (two percent).

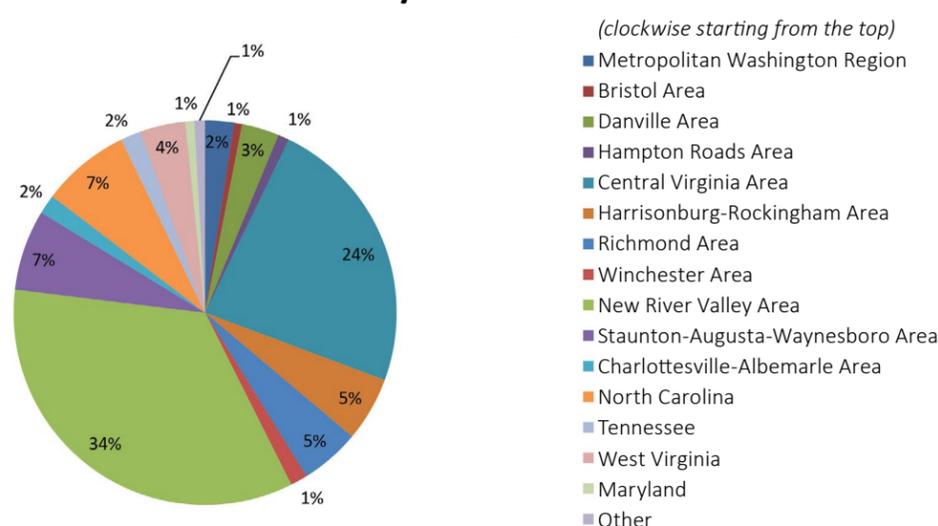
Travel from Central Virginia Area to...



Travel from New River Valley Area to...



Travel from Roanoke Valley Area to...



E2 SEGMENT PROFILE

Freight Demand

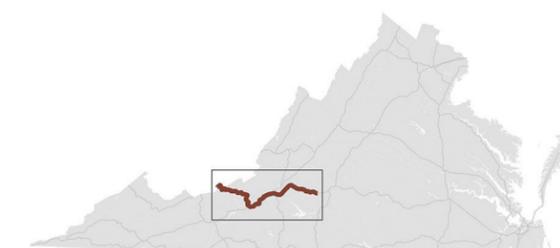
By truck, Segment E2 carried six million tons of freight worth \$5 billion dollars in 2012, and is estimated to carry seven million tons of freight worth \$7 billion dollars in 2025. A large proportion of truck freight traffic on Corridor E, representing 32 percent of the total truck freight value on the corridor, passes through Virginia. North Carolina is a major generator and attractor of truck freight on Corridor E, with traffic throughout the Mid-Atlantic, the Port of Virginia facilities in the Hampton Roads Area, and the Tri-Cities Area. Between seven and eight percent of the total truck freight tonnage on Corridor E originates or is destined for Segment E2. Significant generators along Segment E2 are Montgomery and Bedford Counties, with major freight movements to North Carolina and the Tri-Cities Area.

By rail, Segment E2 carried 26 million tons of freight worth \$5 billion dollars in 2012, and is estimated to carry 27 million tons of freight worth \$31 billion in 2025. The largest rail freight flows on Corridor E consist of low-value rail freight travelling from West Virginia to North Carolina, accounting for more than 17 percent of the total rail freight tonnage on the corridor. Rail freight between West Virginia and nearby counties in Virginia to the Port of Virginia in Norfolk accounts for more than 20 percent of the total rail freight tonnage on the corridor. In terms of rail freight value, the largest rail freight traffic patterns on Corridor E are between Illinois and the Port of Virginia, accounting for more than 20 percent of the total rail freight value on the corridor. Ohio and Louisiana are major generators of freight value on Corridor E, while North Carolina and Pennsylvania are major freight attractors. Segment E2 is a minor generator and attractor of rail freight on Corridor E, accounting for between two and three percent of rail freight origins and destinations by tonnage. Botetourt County and the City of Roanoke are the largest generators of rail freight tonnage along the segment, with most of this rail freight destined for North Carolina. Giles County and the City of Roanoke are the largest attractors along Segment E2, with a majority of these rail freight flows originating in Illinois.

Truck Freight



Rail Freight

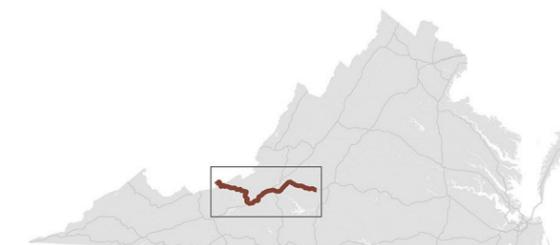


E2 SEGMENT PROFILE

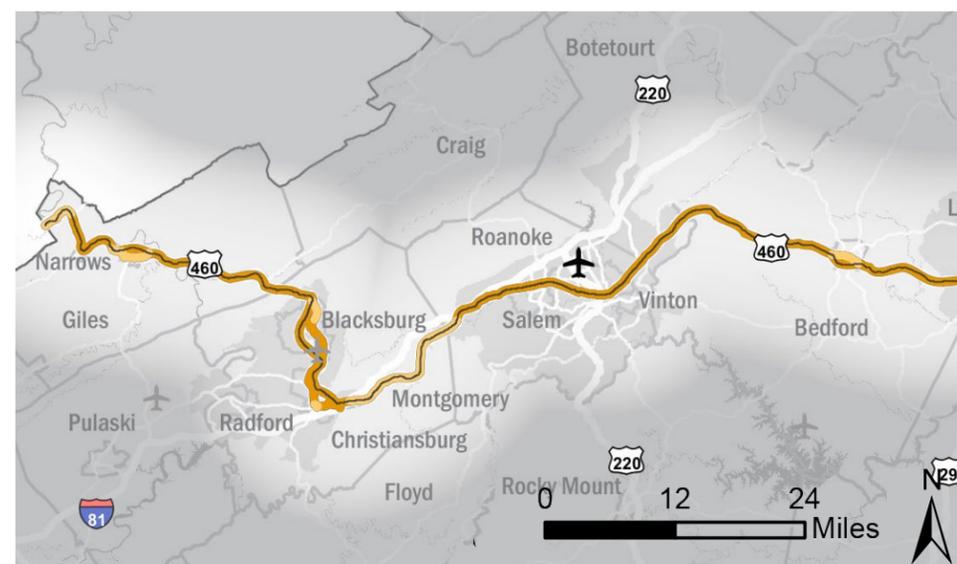
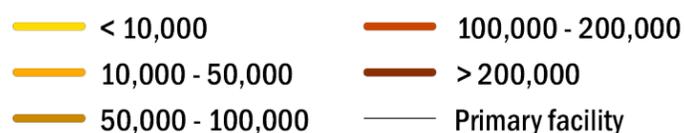
Traffic Conditions

Traffic Volume and AADT

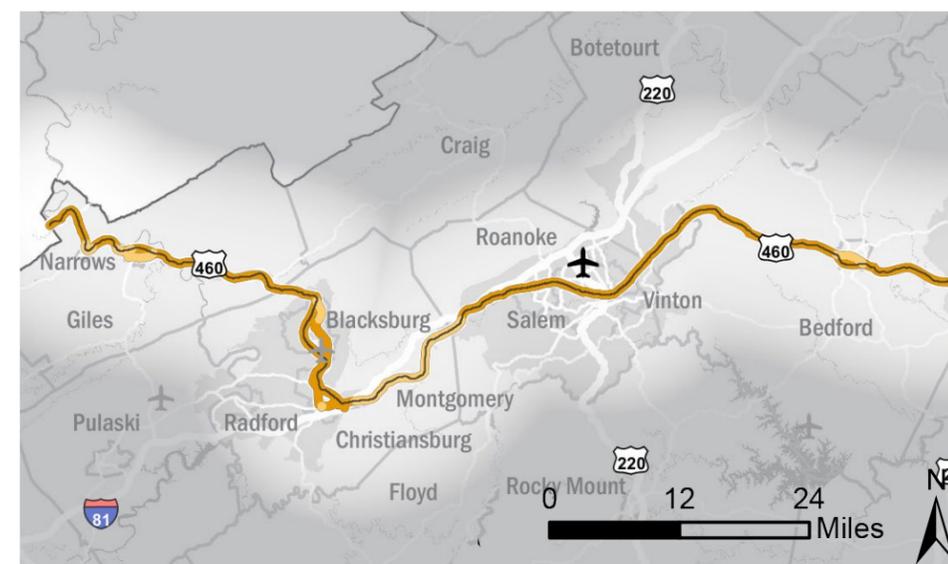
Traffic volume in Segment E2 varies by location and is moderate compared to traffic volumes in other segments of Corridor E. Outside of the major urbanized areas, average daily traffic volumes range from 5,000 to 25,000 vehicles. The highest traffic volumes in Segment E2 occur between Blacksburg and Christiansburg and in Roanoke where volumes can exceed 35,000 and 40,000 vehicles per day, respectively. Traffic on US 460 Business is approximately 8,000 vehicles per day in Pearisburg and up to 33,000 vehicles per day in Christiansburg. Traffic volumes are projected to increase along US 460 by 2025, with the largest increases occurring near Blacksburg and Roanoke, with increases between 6,000 and 8,000 additional vehicles per day. Outside of the urban areas, traffic growth is expected to be much lower, and no traffic growth is projected for US 460 Business.



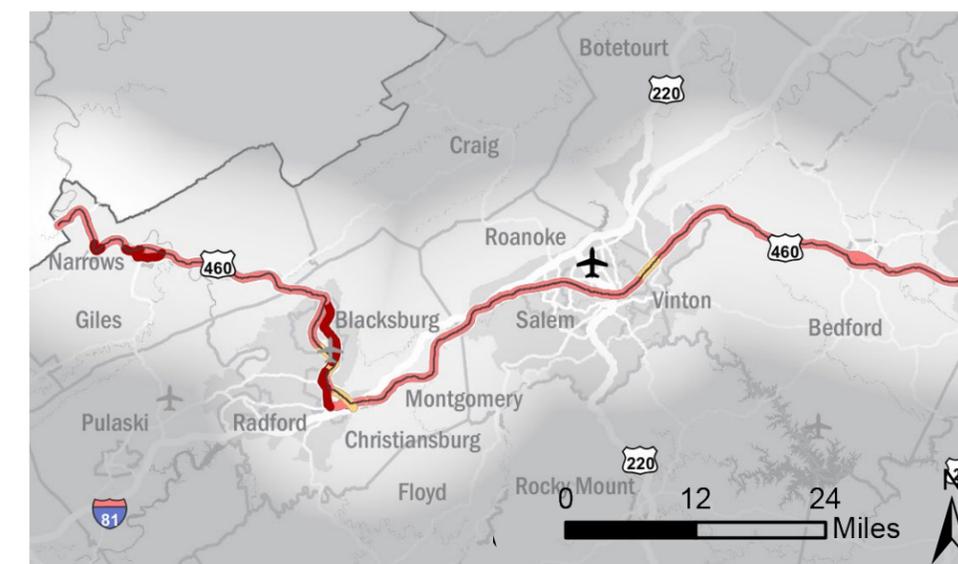
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



E2 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment E2 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 5 and 6 p.m. which accounts for 8.2 percent of daily traffic. The morning peak hour is less busy, with the 7 to 8 a.m. hour accounting for 6.8 percent of daily traffic. The combined weekday traffic in the two peak periods (from 6 to 10 a.m. and from 3 to 7 p.m.) accounts for 52 percent of total daily traffic. Peaking patterns for truck traffic are different from other traffic with the peak hourly flow of trucks occurring between 11 a.m. and noon (7.0 percent of daily traffic). Weekend traffic patterns are also different from the typical commute patterns, showing an even distribution of traffic during the middle of the day with the peak hour flow between noon and 1 p.m. (7.7 percent of daily traffic) for all traffic, and 11 a.m. to noon (5.5 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment E2 vary by as much as 19 percent throughout the year, with the highpoint in May (around 22,000 vehicles per day) and the low point in January (around 19,000 vehicles per day). Truck volumes vary similarly throughout the year, although with the high in October (around 1,500 vehicles per day) is 17 percent higher than the January low (around 1,200 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (October, around 17,000 vehicles per day) are 22 percent higher than January levels (around 14,000 vehicles per day). Weekend truck volumes remain relatively steady throughout the year. Since truck volumes account for a relatively small portion of traffic on Segment E2, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

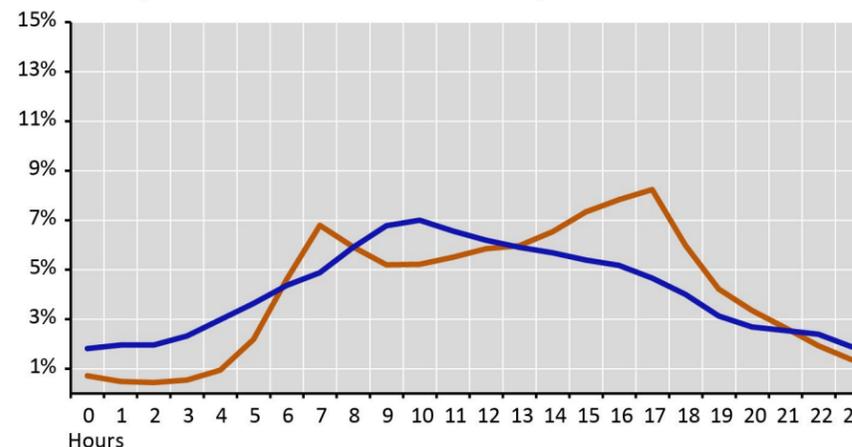
Truck Volumes

The percent of daily traffic comprised of heavy trucks on Segment E2 is moderate relative to other segments in Corridor E. The highest percentages of heavy truck traffic occur between the urban areas in the segment. From the West Virginia border to I-81, heavy trucks along US 460 comprise four to six percent of total traffic. Along US 460 from eastern Montgomery County to Salem, heavy trucks make up seven percent of total traffic. Through Roanoke, heavy trucks along US 460 comprise less than four percent of total traffic, and in eastern Bedford County heavy trucks account for six percent of total traffic.

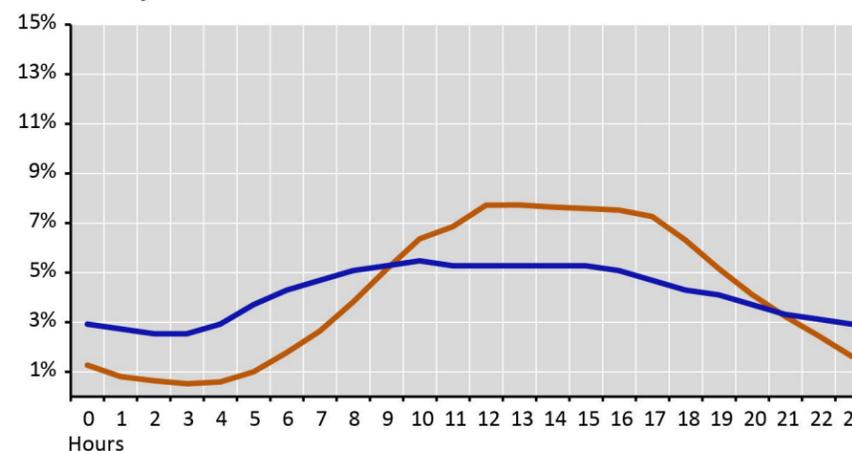
Percent Heavy Trucks

- < 5%
- 5% - 10%
- 10% - 15%
- 15% - 20%
- > 20%
- Primary facility

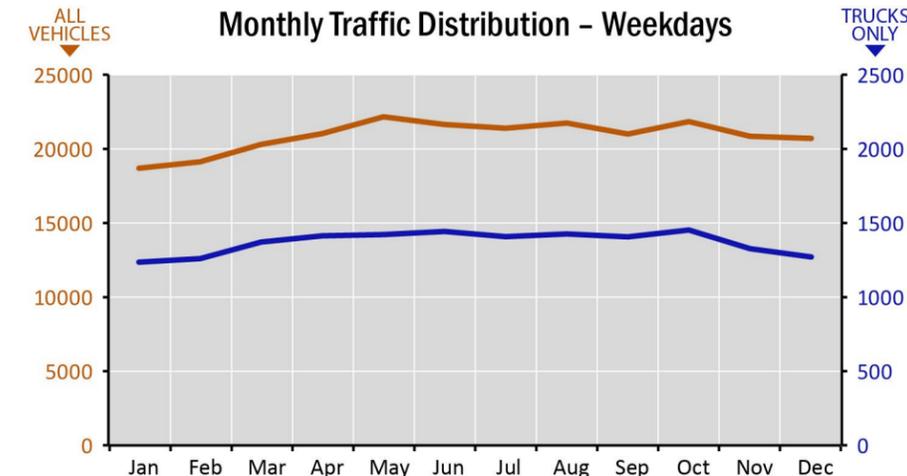
Hourly Traffic Distribution - Weekdays



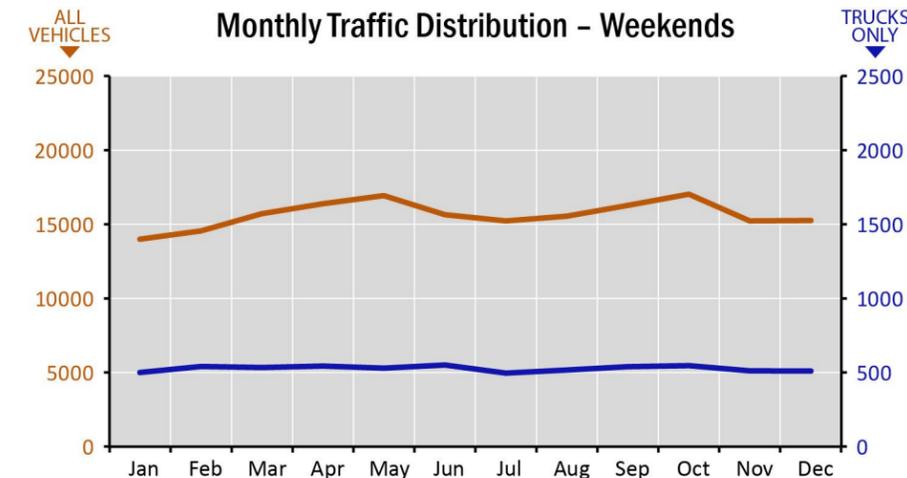
Hourly Traffic Distribution - Weekends



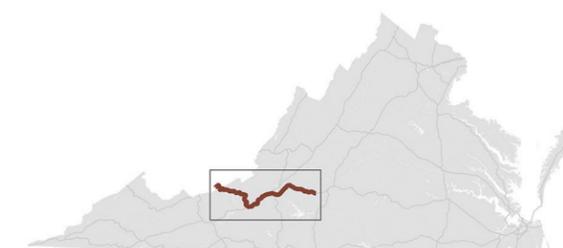
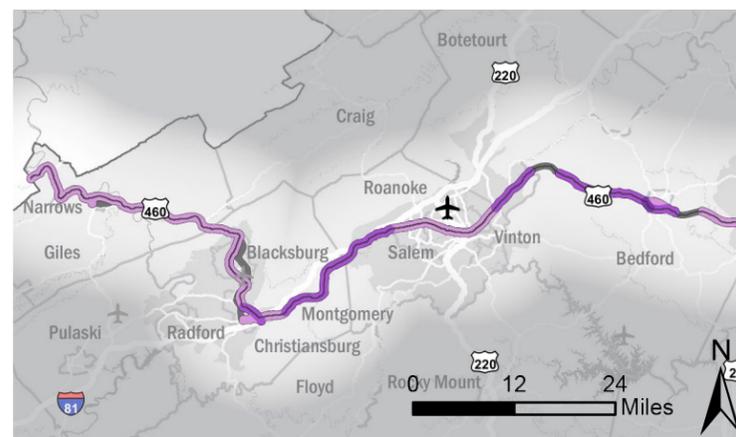
Monthly Traffic Distribution - Weekdays



Monthly Traffic Distribution - Weekends



- All Vehicles
- Trucks



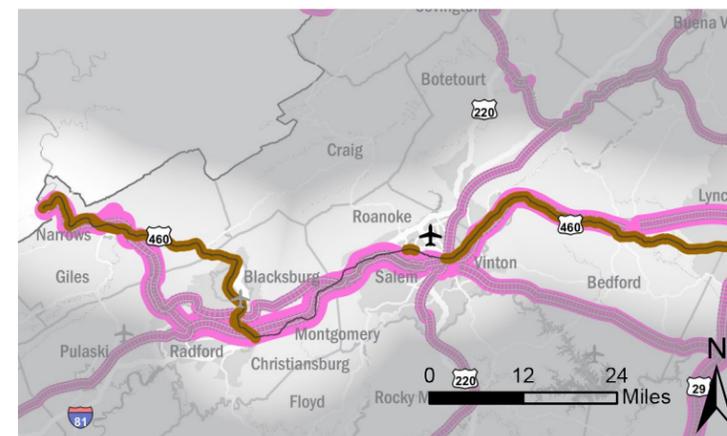
E2 SEGMENT PROFILE

Freight Flows

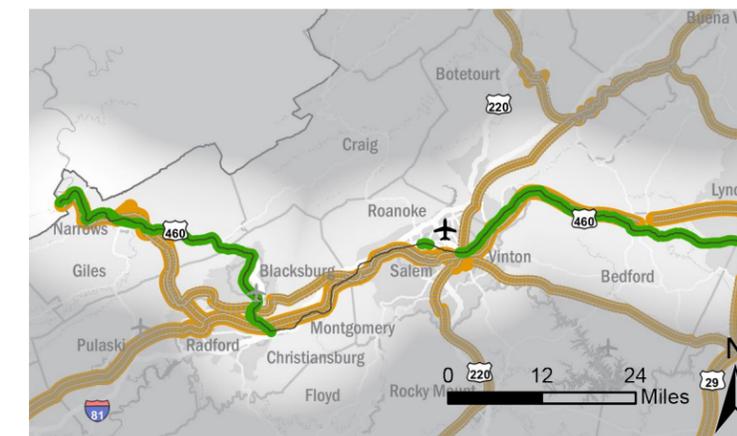
Near the Town of Pearisburg the large majority of freight moves by truck, in terms of both tonnage and value. In total, six million tons (99 percent) of freight travels through this section of Segment E2 by truck, compared to only 68,000 tons by rail. With regard to value, the contrast is even greater, with \$5 billion (almost 100 percent) of freight value traveling by truck, compared to only \$6 million by rail. On average, a ton of freight traveling through this section of Segment E2 by truck is worth \$856 while a ton of freight traveling by rail is worth \$84. In 2025, both rail and truck freight tonnages and total values in Segment E2 are expected to increase, and the percentage of the freight traveling by truck and rail is likely to remain the same both in terms of tonnage and value. Freight value per ton on trucks and rail is expected to increase to \$1,012 and \$94, respectively.

Near the Town of Bedford a large majority of freight moves by rail, in terms of both tonnage and value. In total, four million tons (14 percent) of freight travels through this section of Segment E2 by truck, compared to 26 million tons by rail (86 percent). With respect to value, approximately \$4 billion (14 percent) of freight value travels by truck, compared to \$24 billion by rail (86 percent). On average, a ton of freight traveling through this section of Segment E2 by truck is worth \$976 while a ton of freight traveling by rail is worth \$955. In 2025, both rail and truck freight tonnages and total values in Segment E2 are expected to increase. The percentage of the freight traveling by truck is also expected to increase by tonnage and value to 16 percent and 15 percent, respectively. It is anticipated that the freight value per ton on trucks and rail will increase to \$1,067 and \$1,133, respectively.

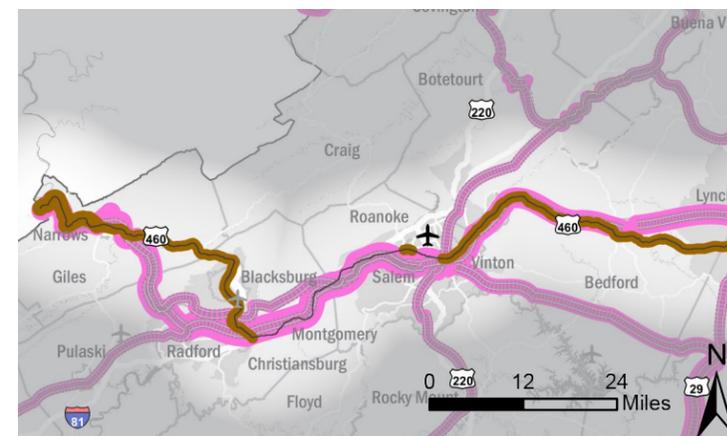
Annual Freight by Tonnage, 2012



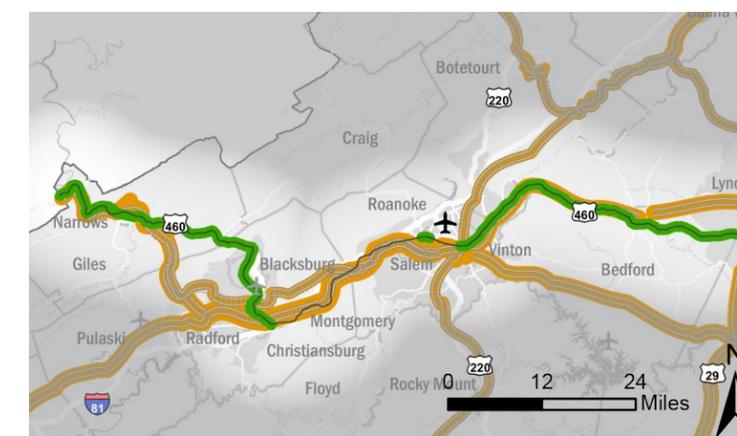
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



E2 SEGMENT NEEDS

Redundancy and Mode Choice



Comparable Travel Options

Lynchburg to Roanoke

Inter-City Bus 5 Trips per Day 1:40 Travel Time \$4 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
---	--

Auto
Via Rt. 460: 1:05 Travel Time \$32 Est. Cost

Roanoke to Blacksburg / Christiansburg

Inter-City Bus 13 Trips per Day 1:29 Travel Time \$4 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
--	--

Auto
Via Rt. 460: 0:45 Travel Time \$24 Est. Cost

Roanoke to Richmond

Inter-City Bus 3 Trips per Day 3:55 Travel Time \$46 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
--	--

Auto
Via Rt. 460: 3:04 Travel Time \$92 Est. Cost

Roanoke to Danville

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
---	--

Auto
Via Rt. 460: 2:15 Travel Time \$65 Est. Cost

Blacksburg / Christiansburg to Lynchburg

Inter-City Bus 3 Trips per Day 5:10 Travel Time \$10 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
--	--

Auto
Via Rt. 460: 1:46 Travel Time \$53 Est. Cost

Blacksburg / Christiansburg to Richmond

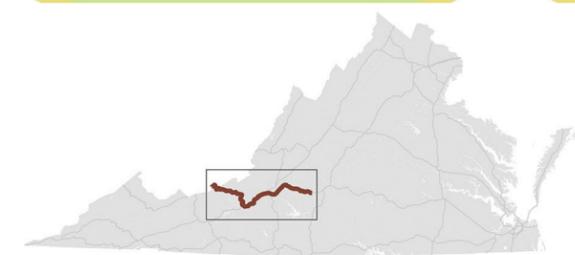
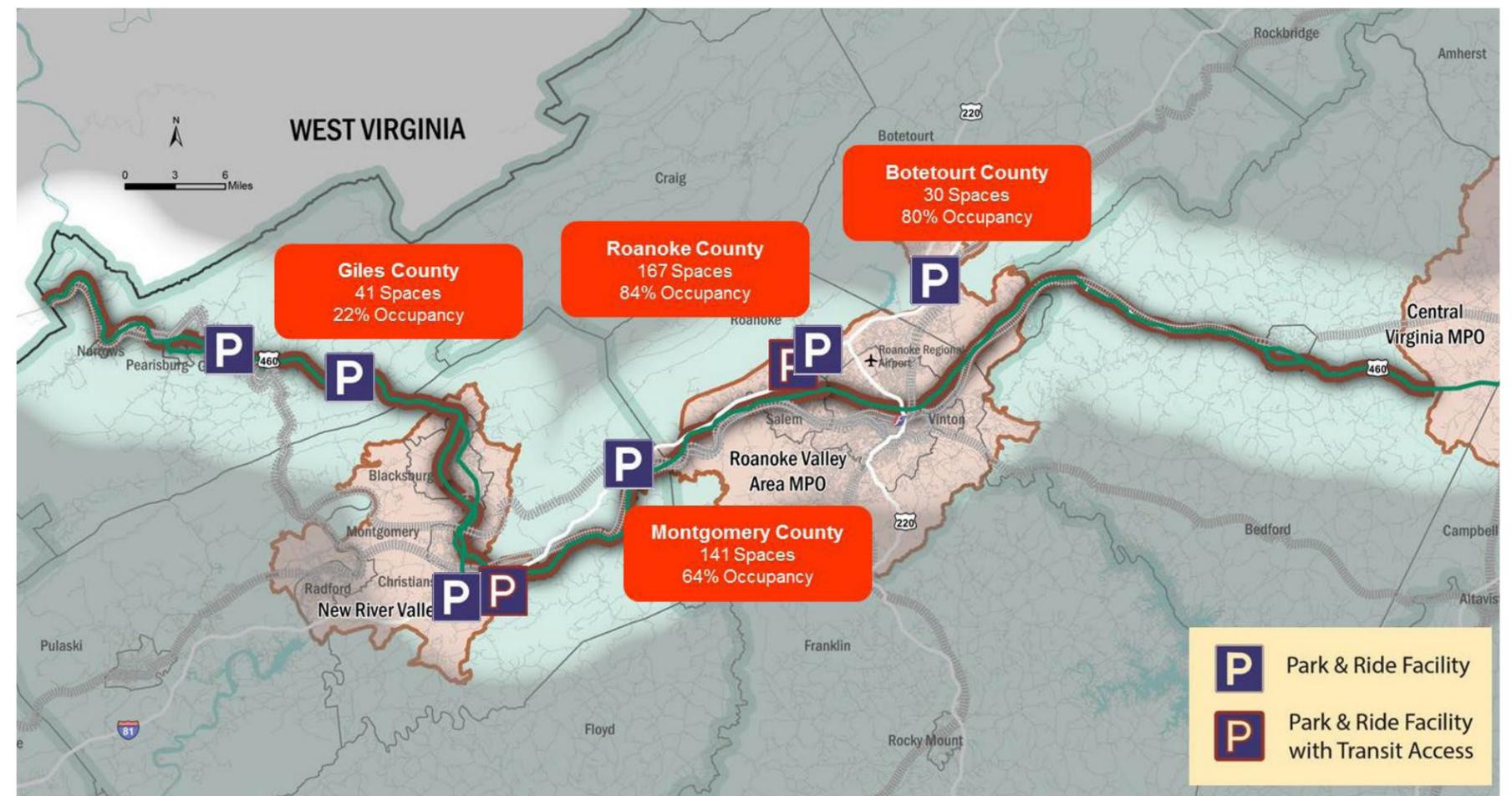
Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
---	--

Auto
Via Rt. 460: 3:37 Travel Time \$114 Est. Cost

Passenger trips on Segment E2 of the Heartland Corridor have few travel options, both in terms of travel path and mode choice. No parallel highway facility exists in Segment E2, except for in the area between Roanoke and Christiansburg, where US 460 runs concurrently to US 11 and parallel to I-81. Based on the 2014 federal standard mileage rate of 56 cents per mile, long-distance trips would be more expensive by automobile than by bus. In addition to its advantage over bus travel in terms of frequency, automobile travel in the region is typically quicker than bus. Greyhound offers service from Roanoke and Megabus offers service from Christiansburg. The Smart Way Bus provides transit service between Blacksburg and Roanoke.

Park-and-Ride

Within Segment E2, commuters can utilize several Park-and-Ride facilities. Roanoke County provides the highest number of Park-and-Ride spaces and experiences the highest utilization rate in the region, while Montgomery County has the most Park-and-Ride locations. Roanoke County (84 percent) and Botetourt County (80 percent) both have a rate higher than the statewide average for Park-and-Ride utilization, which is 76 percent.

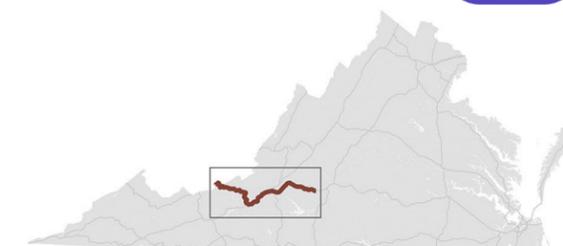


E2 SEGMENT NEEDS

Safety

Between 2010 and 2012, Segment E2 experienced 334 severe crashes, the highest on the Heartland Corridor. Several areas along Segment E2 experienced high concentrations of severe crashes. Along US 460 Business (South Main Street) in Blacksburg, near the Virginia Tech Airport, there were 21 incidents over 2.1 miles between Country Club Drive SW and Hightop Road. On US 460 Business (North Franklin Street) in Christiansburg, 21 collisions took place over a 1.3-mile stretch between

Merrimac Road and Conston Avenue NW. Along US 11/460 in Salem, 72 crashes occurred along 1.6 miles between Texas Hollow Road and Green Street (as noted for Segment B2). Of the 72 crashes, 12 occurred at the intersection with Route 12 and 12 took place at the intersection with Mill Lane. In Roanoke, along US 460, there were 21 severe collisions in less than a quarter mile between Evan Lane and Patrick Road NE.



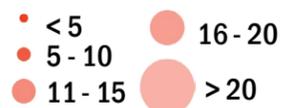
Performance Metrics:

Number of Severe Crashes **334**

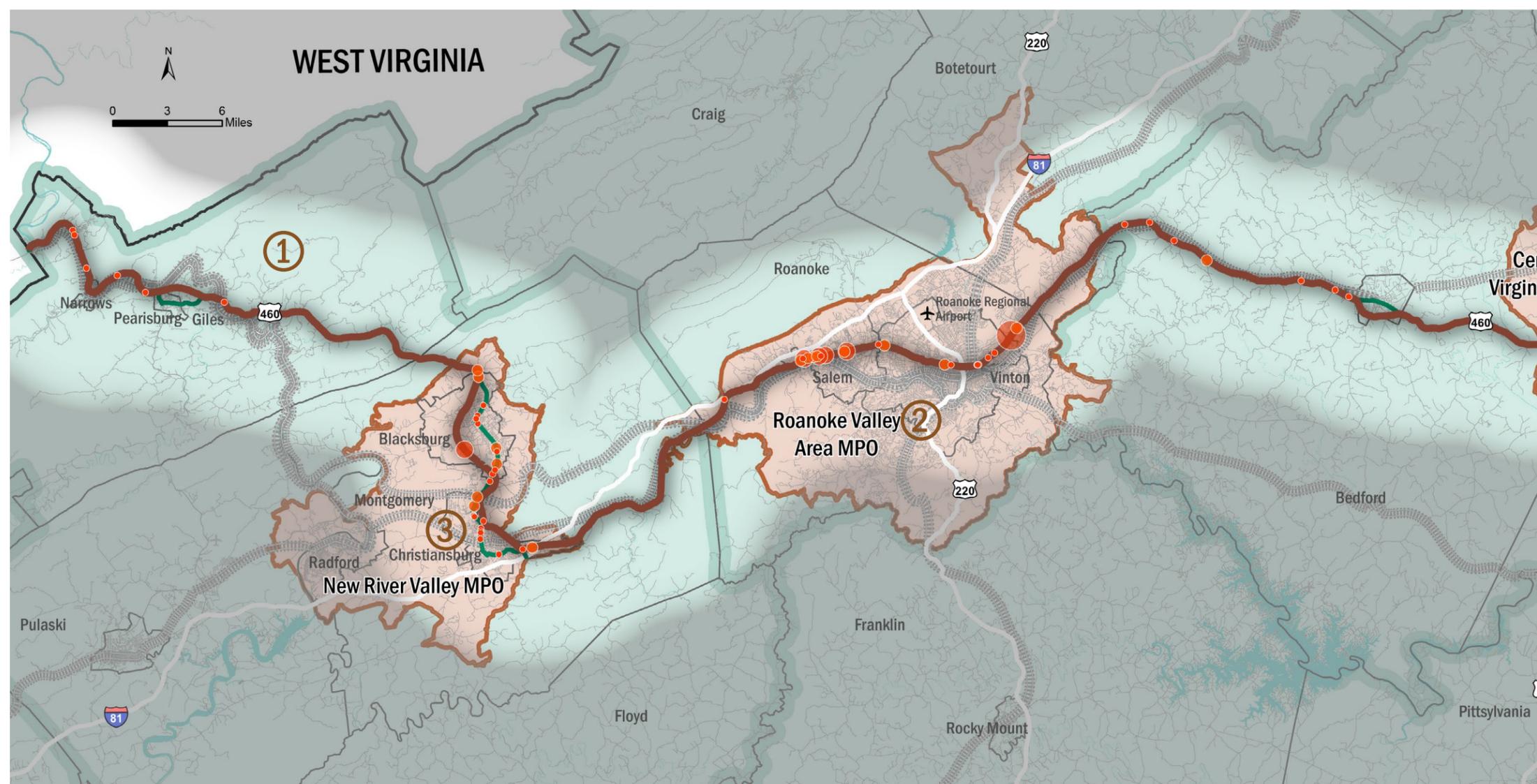
Severe Crashes/Million VMT **1.1**

Number of Railroad Crashes **6**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



E2 SEGMENT NEEDS

Congestion



Performance Metrics:

Person Hours of Delay per Mile

15

Freight Ton Hours of Delay per Mile

44.5K

Passenger Delays

Passenger traffic along Segment E2 experiences the second highest daily delay on the Heartland Corridor with over 3,800 person-hours delay. There are significant passenger delays in several locations:

- US 460 Business in Blacksburg near the Virginia Tech campus;
- US 11/460 between Route 112 and Route 635 in the City of Salem;
- US 460 between US 220 and Gus Nicks Blvd NE in the City of Roanoke; and
- US 460 near the intersection with US 221 in Roanoke County.

Peak-period passenger delays account for 27 percent of daily total delays, considerably lower than average for the peak-period share of congestion along CoSS segments.

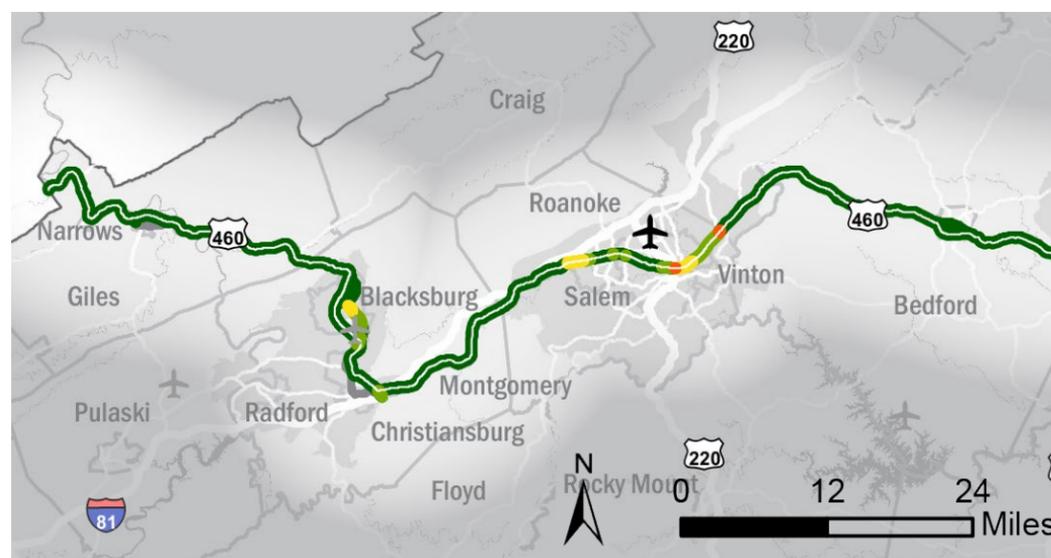
Freight Delays

Segment E2 experiences the highest levels of freight congestion on Corridor E with nearly 11 million ton-hours of delay daily. This results in nearly 45,000 ton-hours per mile of delay along the segment, ranking E2 as one of the most congested CoSS segments. Significant freight congestion occurs only between Christiansburg and Roanoke at the following locations:

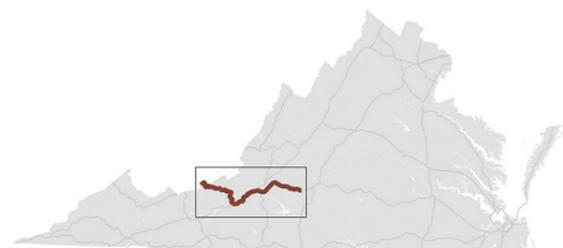
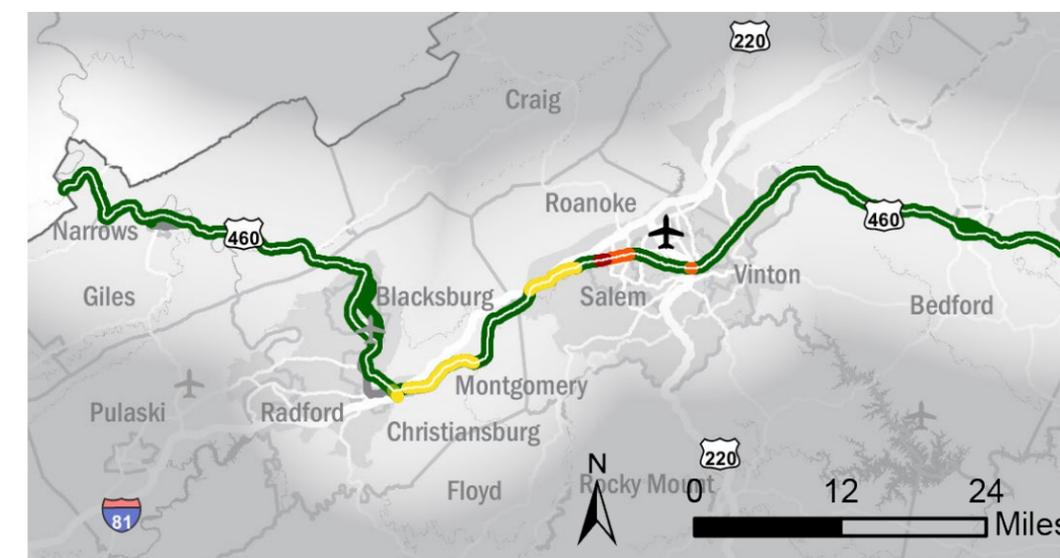
- US 460 at the interchange with I-81 in Christiansburg;
- US 11/460 between I-81 and Route 637 in Montgomery County;
- US 11/460 in Roanoke County east of Route 647;
- US 11/460 between US 11 Alternate and Route 419 in the City of Salem; and
- US 460 just west of the US 221 interchange in the City of Roanoke.

Peak-period freight delays account for only six percent of daily congestion, one of the lowest peak-period shares among CoSS segments, suggesting a significant peaking of truck traffic in the middle of the day.

Daily Person Hours of Delay per Mile



Daily Freight Ton Hours of Delay per Mile



E2 SEGMENT NEEDS

Reliability



Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment E2 ranges from 0.00 to 0.68 in terms of reliability index, with an average value of 0.11. None of the locations along Segment E2 have reliability index values exceeding the statewide threshold.

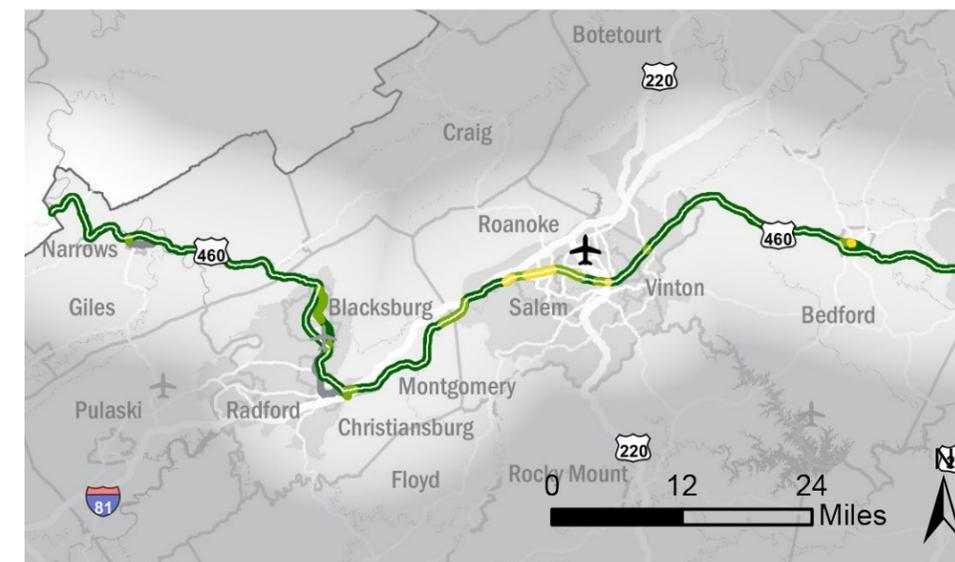
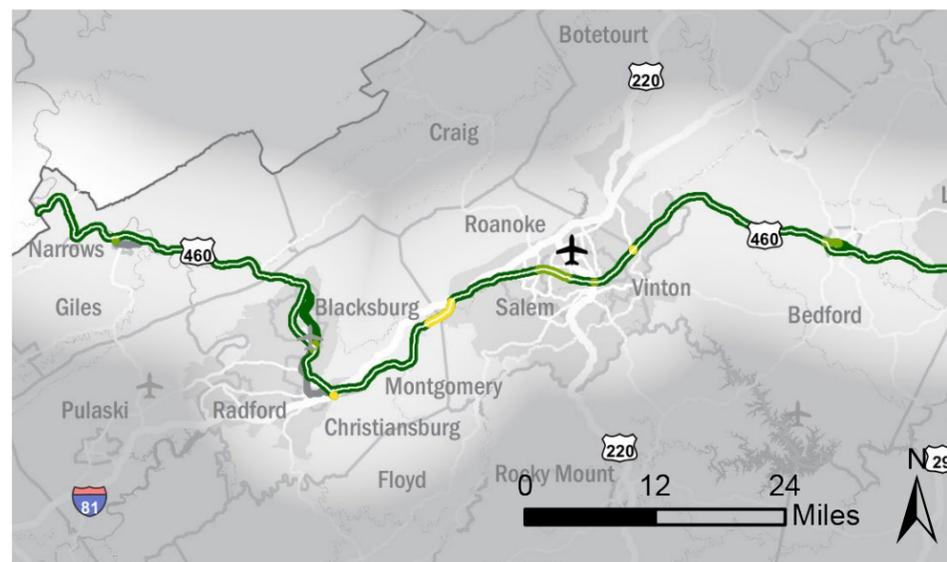
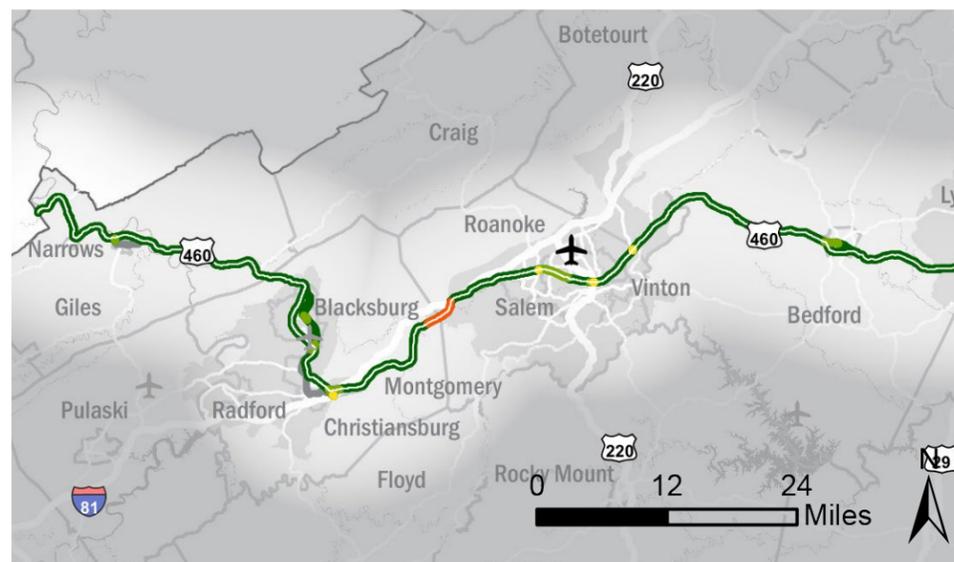
Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 0.60 in terms of reliability index, with an average value of 0.10. Areas in which the weekday reliability index exceeds the statewide threshold include:

- US 460 at the interchange with I-81 in Christiansburg;
- US 11/460 between Route 647 and 603 in Roanoke and Montgomery Counties; and
- US 460 at the interchange with US 220 Alternate in Roanoke County.

Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.51 in terms of reliability index, with an average value of 0.08. None of the locations along Segment E2 have reliability index values exceeding the statewide threshold.

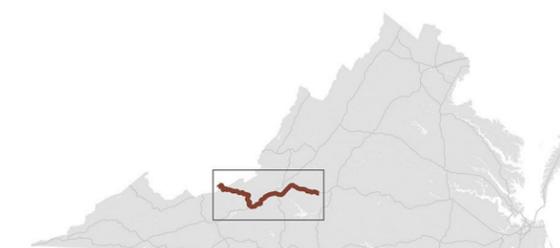


Reliability Index

- < 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- > 0.8
- Primary facility (in white)

Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

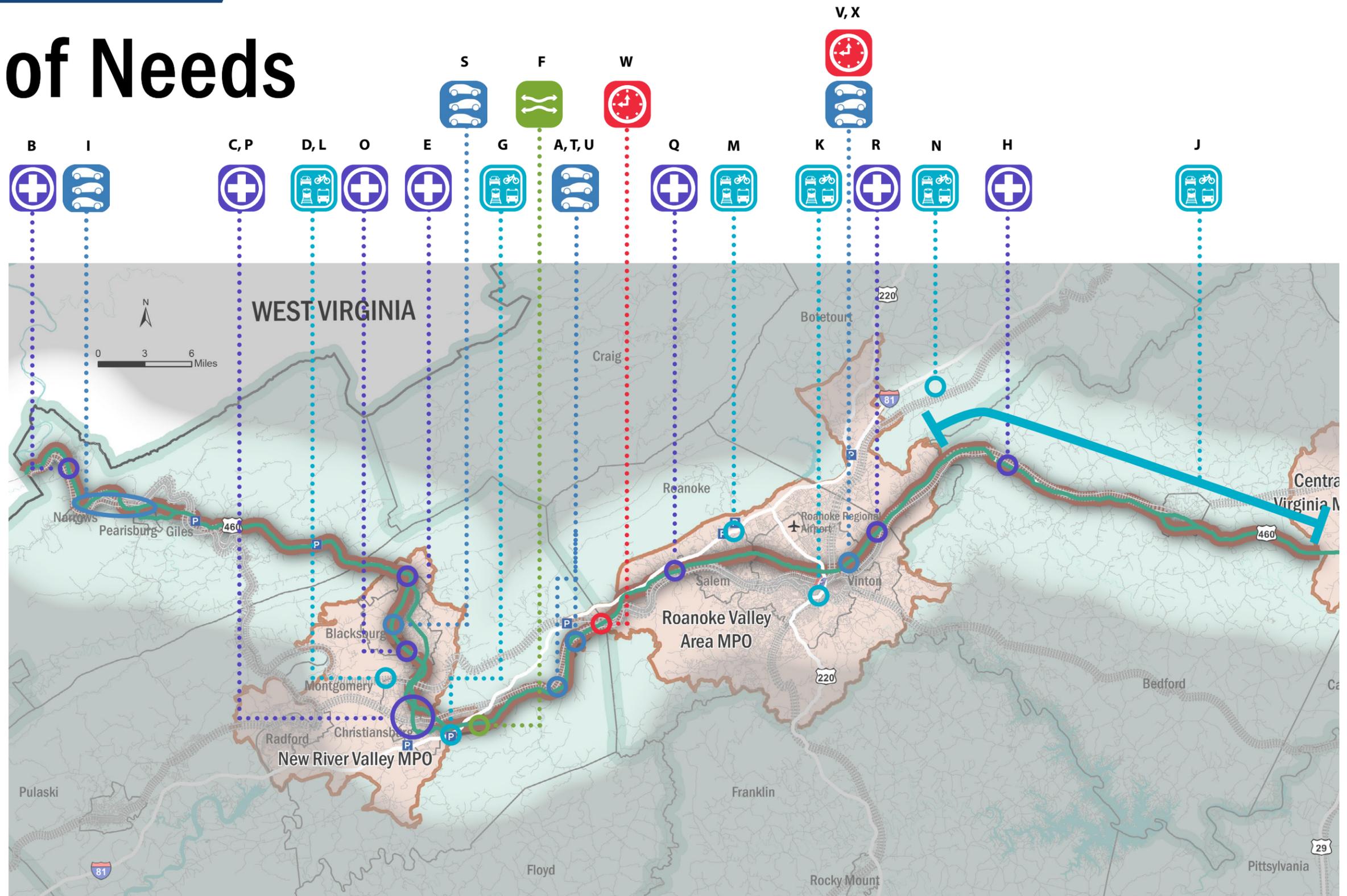
- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



E2 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.



E2 SEGMENT NEEDS

Summary of Needs - E2 Segment

A.		US 460 west of Roanoke: Frequent driveways and access points result in slow moving traffic
B.		Safety Issues at intersection of US 460 and VA 219
C.		Safety Issues at intersection of US 460 and North Franklin (5-way intersection)
D.		No rail connections to Northern Virginia and remainder of Northeast Corridor
E.		Safety concerns at US 460 and Main Street in Blacksburg
F.		US 11/460: Future capacity bottleneck along 2-lane segment between 4-lane segments to the east and west
G.		Informal park-and-ride on VA 8 near I-81 indicates need for additional park-and-ride facility in this location
H.		Safety concerns related to severe S-curve design on US 460, sight of isolated but very severe crashes
I.		US 460 through Pearisburg and Narrows: Frequent driveways and access points result in slow moving traffic
J.		No parallel highway facilities for US 460
K.		No train service from Roanoke to other cities in the corridor

Summary of Needs - E2 Segment

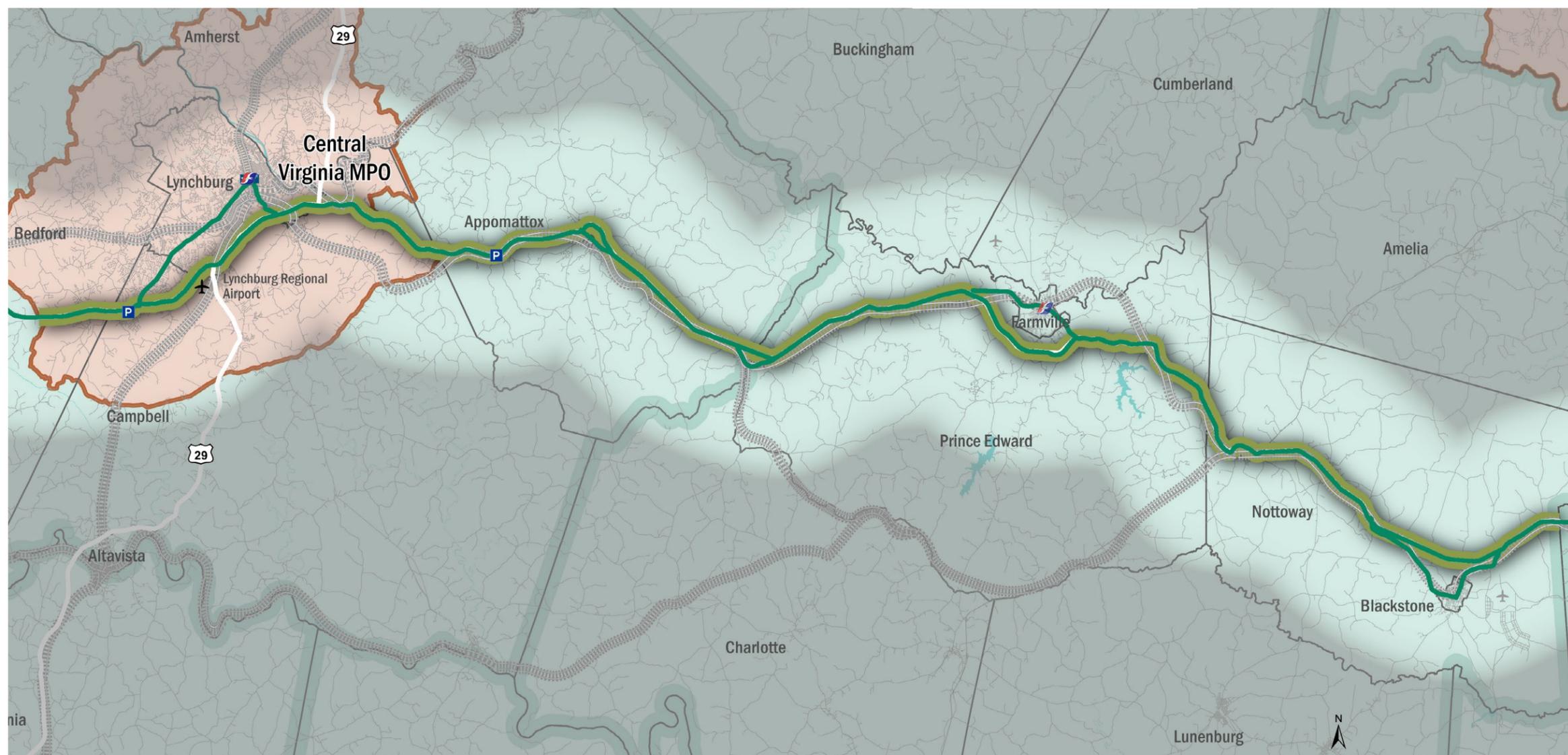
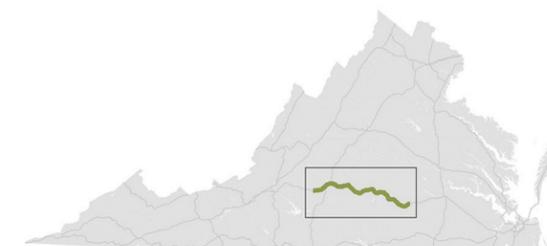
L.		No train service from Blacksburg/Christiansburg to other cities in the corridor, bus service between cities in corridor is limited to Roanoke and Blacksburg/Christiansburg
M.		Park and Ride lots in Roanoke County have higher utilization rates than statewide average
N.		Park and Ride lots in Botetourt County have higher utilization rates than statewide average
O.		US 460-Business between Country Club Dr SW and Hightop Rd in Blacksburg: 21 severe crashes
P.		US 460-Business between Merrimac Rd and Conston Ave in Christiansburg: 21 severe crashes
Q.		US 460/US 11 between Texas Hollow Rd and Green St in Salem: 72 severe crashes
R.		US 460 between Evan Lane and Patrick Rd NE in Roanoke: 21 severe crashes
S.		Congestion issue at US 460 Business and Prices Fork Road (VA Route 412) in Blacksburg
T.		Congestion issue on US 11 /US 460 between I-81 in Christiansburg and Alleghany Spring Road in Shawsville
U.		Congestion issue on US 11/US 460 between Dow Hollow Road (VA Route 647) and South Electric Road (US 11-Alt) in Salem
V.		Congestion issue on US 460/US 221 between US 11 and US 220-Alt in Roanoke
W.		Reliability issue on US 11/US 460 between North Fork Road (VA Route 603) and Dow Hollow Road (VA Route 647)
X.		Reliability issue at US 460 and US 220-Alt east of Roanoke

IV. Segment E3

Corridor Segment E3 Components

- US 460
- US 460 Business
- US 29 Bypass
- Norfolk Southern Heartland Corridor
- Lynchburg Regional Airport

-  E3
-  Corridor Component Road
-  Railroad
-  MPO Area
-  Planning District Area
-  Amtrak Facility
-  Greyhound Facility
-  VRE Facility
-  Metrorail Facility
-  Port Facility
-  Park & Ride Facility
-  Airport Facility



E3 SEGMENT PROFILE

Segment E3 begins in Bedford County and travels east, serving Campbell, Appomattox, Prince Edward, and Nottoway Counties along with the City of Lynchburg. The segment travels through the Central Virginia MPO Area. Segment E3 serves as an alternative east-west thoroughway for passengers and freight, in addition to providing local access to rural communities. Around Lynchburg, Appomattox, and Farmville, US 460 serves as a limited-access highway.

Highway Facilities: US 460 is a rural four-lane highway in Segment E3. A portion of US 460 is limited access and runs concurrently with US 29 through Lynchburg. US 460 also runs concurrently with US 15 around Farmville and with US 360 around Burkeville. A business spur of US 460 serves Lynchburg and the Towns of Appomattox, Pamplin, Farmville, Burkeville, and Blackstone.

Transit Services: In this segment, the corridor is served by two transit providers: the Greater Lynchburg Transit Company serves Lynchburg and the Farmville Area Bus serves Farmville. Amtrak and Greyhound both have stations in Lynchburg, and Greyhound has a station in Farmville. Amtrak provides service along the corridor from Lynchburg along its Northeast Regional and Crescent Routes. Amtrak also operates thruway bus service connecting Lynchburg to Blacksburg, Roanoke, and Bedford. There are two Park-and-Ride facilities within Segment E3, located outside Lynchburg and Appomattox.

Rail Facilities: Norfolk Southern operates its Heartland Corridor line, the most important rail route for transport between the Port of Virginia and markets located west of Virginia. Lynchburg serves as a junction area between rail corridors traveling north-south and east-west.

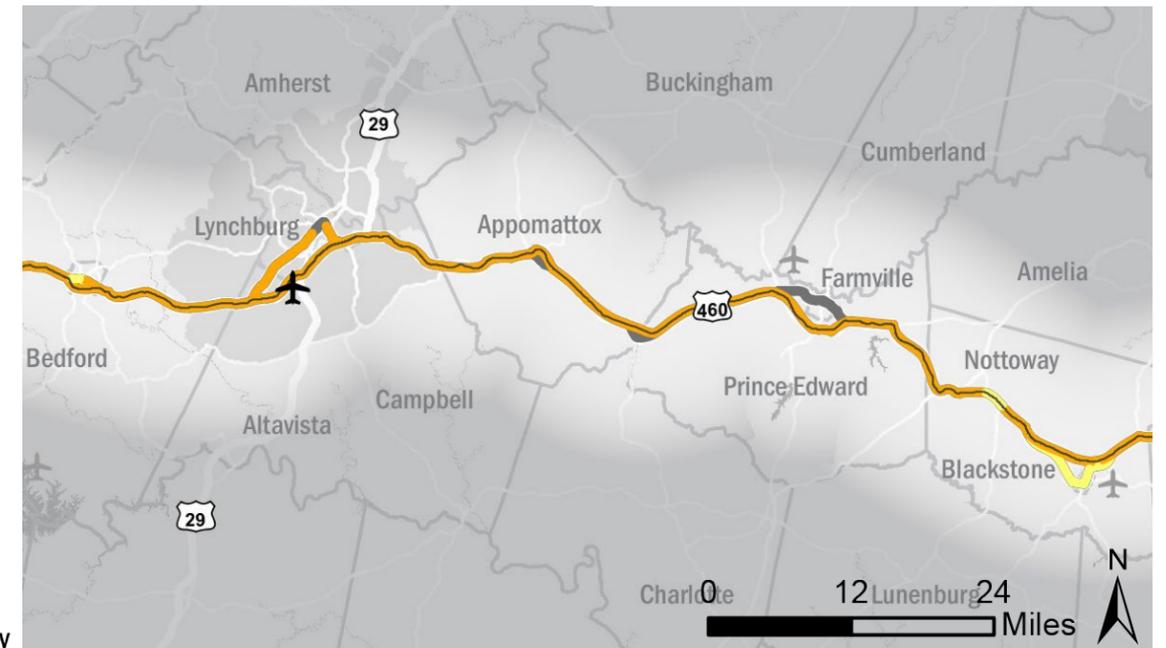
Port Facilities: No port facilities are located directly adjacent to Segment E3, but the Heartland Corridor does provide direct access to the Port of Virginia facilities in the Hampton Roads Area.

Airport Facilities: The Lynchburg Regional Airport is the only commercial airport in this segment. Three other general and local service airports exist in Segment E3.

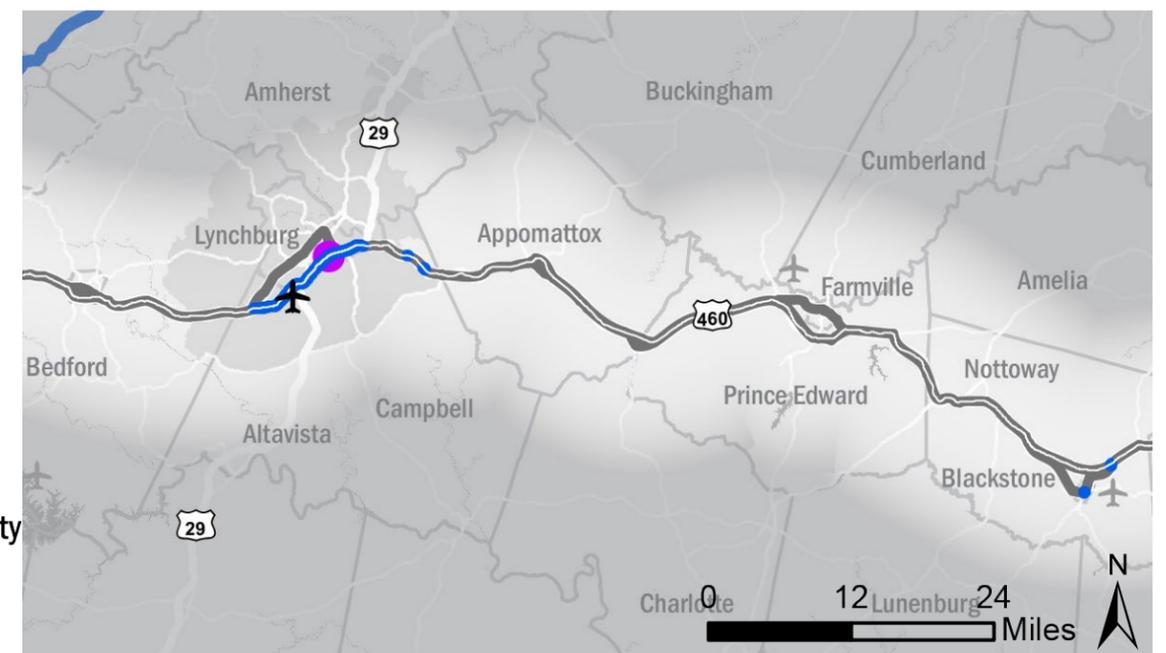
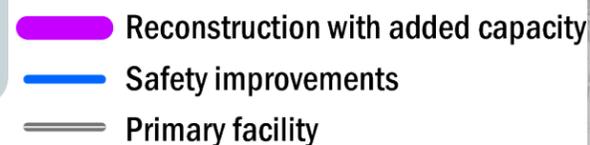
Major planned and future projects include:

- Safety improvements through the use of access management from US 501 (Campbell Avenue) to US 29 (Monacan Parkway) in the City of Lynchburg;
- Adding a right-turn lane at the intersection of eastbound US 460 and Route 752 in Campbell County;
- Adding an offset right-turn lane at the intersection of US 460 and Route 656 in Campbell County; and
- Adding an acceleration lane from US 460 business onto the eastbound US 460 bypass in Nottoway County.

Number of Lanes (both directions)



Future Projects



E3 SEGMENT PROFILE

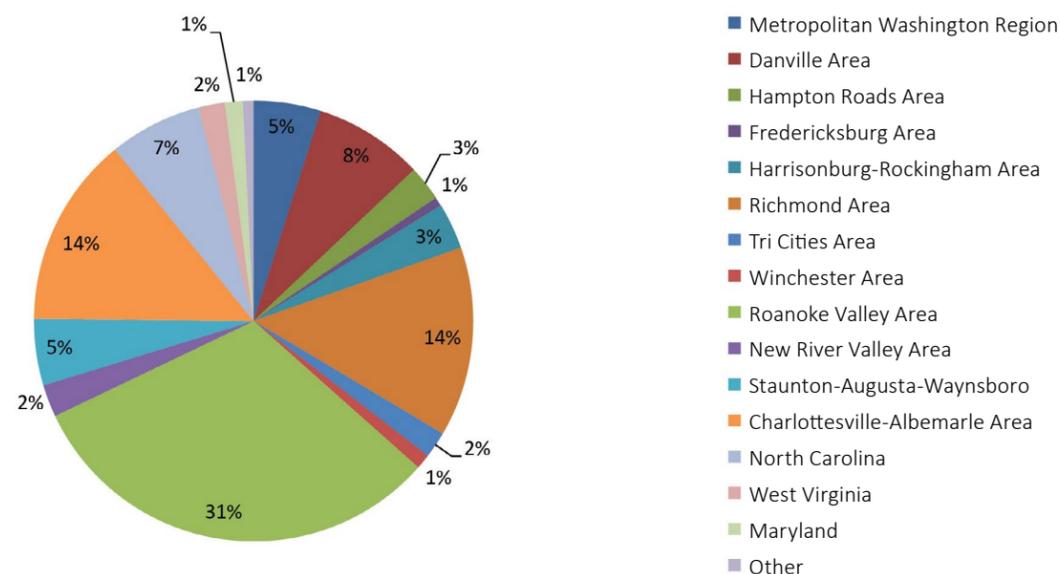
Travel Demand

Passenger Demand

Segment E3 traverses the Lynchburg Area and connects it to the Tri-Cities Area. Of the intercity travel originating in the Lynchburg Area, 14 percent will use Segment E3 to access the Richmond Area. Eastbound traffic to Hampton Roads (three percent) and the Tri-Cities Area (two percent) are also likely to use Segment E3. Of the intercity travel originating in the Tri-Cities Area, smaller proportions are likely to use Segment E3 westbound, limited to the one percent of traffic destined for Lynchburg.

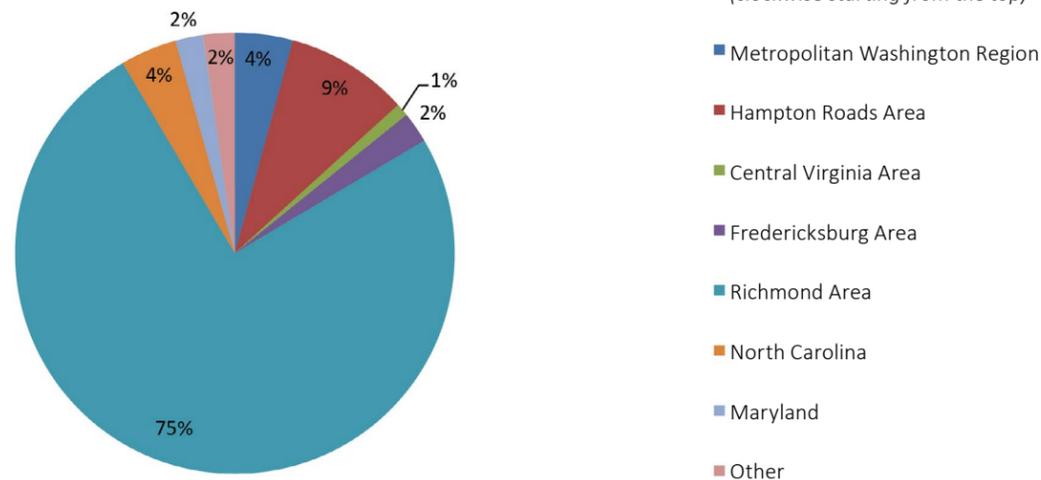
Travel from Central Virginia Area to...

(clockwise starting from the top)



Travel from Tri-Cities Area to...

(clockwise starting from the top)



E3 SEGMENT PROFILE

Freight Demand

By truck, Segment E3 carried four million tons of freight worth \$2 billion in 2012, and is estimated to carry six million tons of freight worth \$5 billion in 2025. A large proportion of truck freight traffic on Corridor E, representing 32 percent of the total truck freight value on the corridor, passes through Virginia. North Carolina is a major generator and attractor of truck freight on Corridor E, with traffic throughout the Mid-Atlantic, the Port of Virginia facilities in the Hampton Roads Area, and the Tri-Cities Area. By tonnage, the jurisdictions adjacent to Segment E3 account for eight percent of the truck freight origins on the corridor and four percent of the truck freight destinations on the corridor. Along this segment, Campbell County and Lynchburg are both significant generators and attractors of truck freight tonnage, with truck freight movements to Tennessee, Pennsylvania, and Texas.

By rail, Segment E3 carried 28 million tons of freight worth \$22 billion in 2012, and is estimated to carry 29 million tons of freight worth \$28 billion in 2025. The largest rail freight flows on Corridor E consist of low-value rail freight travelling from West Virginia to North Carolina, accounting for more than 15 percent of the total rail freight tonnage on the corridor. Rail freight between West Virginia and nearby counties in Virginia to the Port of Virginia in Norfolk accounts for more than 20 percent of the total rail freight tonnage on the corridor. In terms of rail freight value, the largest rail freight traffic patterns on Corridor E are between Illinois and the Port of Virginia, accounting for more than 20 percent of the total rail freight value on the corridor. Ohio and Louisiana are major generators of freight value on Corridor E, while North Carolina and Pennsylvania are major freight attractors. The jurisdictions near Segment E3 are neither major generators nor attractors of rail freight, with flows originating from or destined for this segment comprising one percent or less of the total freight corridor tonnage.

Truck Freight



Rail Freight

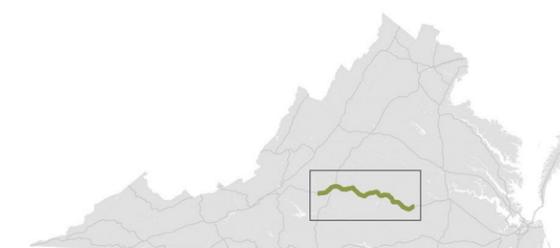


E3 SEGMENT PROFILE

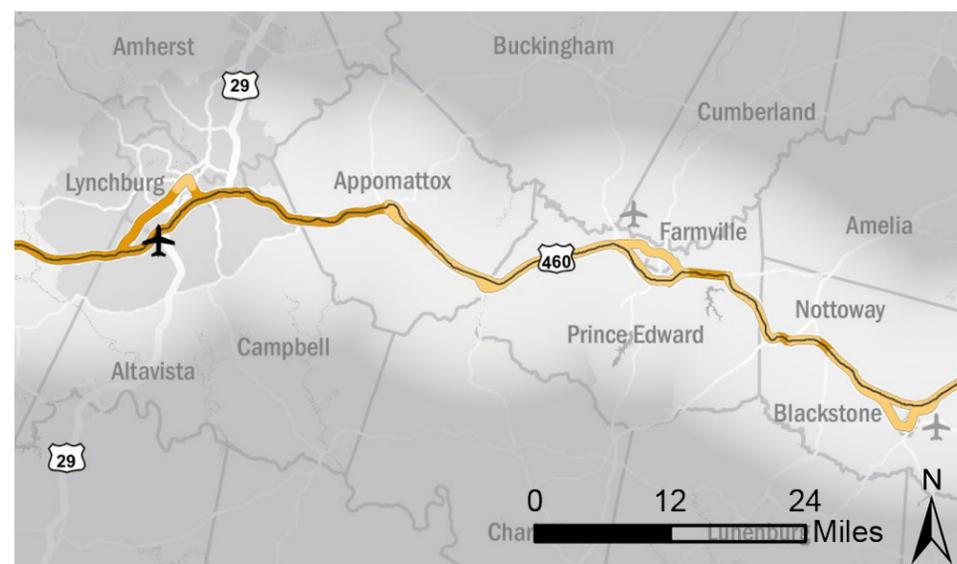
Traffic Conditions

Traffic Volume and AADT

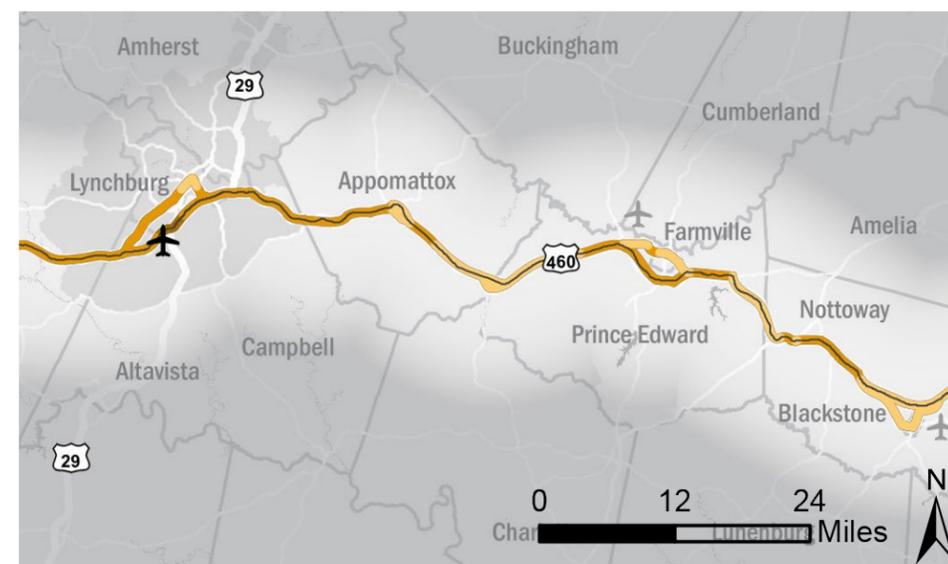
Traffic volume on Segment E3 varies considerably by highway section and is moderate relative to traffic volumes throughout the rest of Corridor E. Along US 460 near Lynchburg, average daily traffic volumes range from 17,000 to 45,000 vehicles, with the highest traffic volumes occurring near the US 29/460 junction. From Appomattox through Prince Edward and Nottoway Counties, average daily traffic volumes range from 5,000 to 14,000 vehicles. US 460 Business generally has lower volumes, although in the City of Lynchburg volumes range between 16,000 and 32,000 vehicles per day. Traffic volumes are projected to increase by 2025 throughout Segment E3, with the greatest increases occurring along US 460 in Lynchburg, ranging from 8,000 to 12,000 additional vehicles per day. Little traffic growth is projected on US 460 Business outside of Lynchburg.



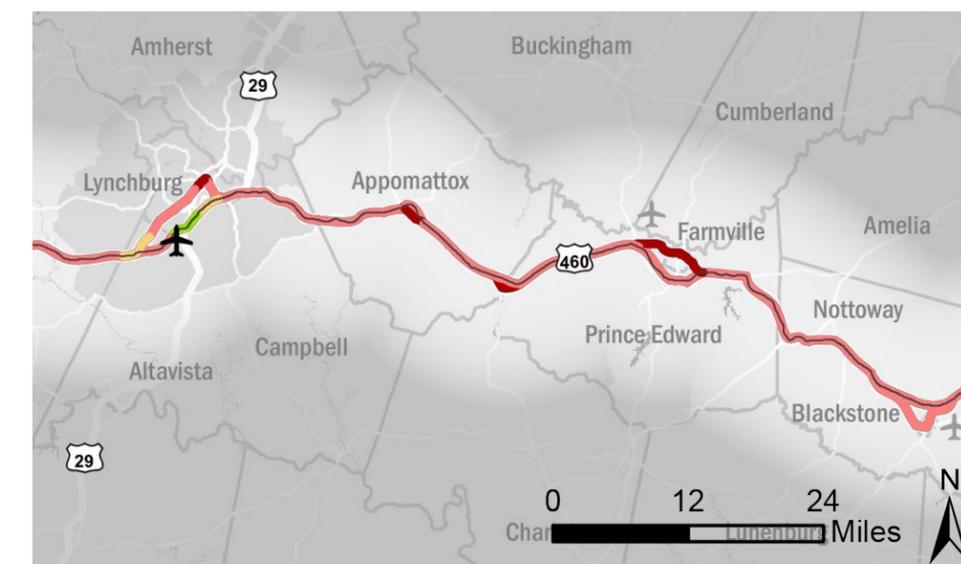
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



E3 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment E3 is distributed throughout the day as shown in the graphs below. Weekday traffic shows morning and evening peak periods over the course of the day, and steady increase in the flow during the midday period. The highest hourly traffic occurs between 4 and 5 p.m. which accounts for 8.0 percent of daily traffic and a less busy morning peak hour between 7 and 8 a.m. accounting for 5.7 percent of daily traffic. The combined weekday traffic from 7 a.m. to 7 p.m. period accounts for 77 percent of total daily traffic. Peaking patterns for truck traffic are different from other traffic, with the peak flow of trucks of 7.0 percent of daily traffic beginning at 10 a.m. Weekend traffic patterns are also different from the typical commute patterns, showing a single peak during the middle of the day with the peak hour flow between 2 p.m. and 3 p.m. (8.0 percent of daily traffic) for all traffic, and noon to 1 p.m. (6.2 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment E3 vary by as much as 29 percent throughout the year, with the highpoint in May (around 10,000 vehicles per day) and the low point in January (around 8,000 vehicles per day). Truck volumes vary somewhat less than passenger volumes throughout the year, with the April high (around 1,100 vehicles per day) 23 percent higher than the January low (around 900 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (May, around 9,000 vehicles per day) are 44 percent higher than January levels (around 6,500 vehicles per day). Weekend truck volumes remain relatively steady throughout the year. Since truck volumes account for a relatively small portion of traffic on Segment E3, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

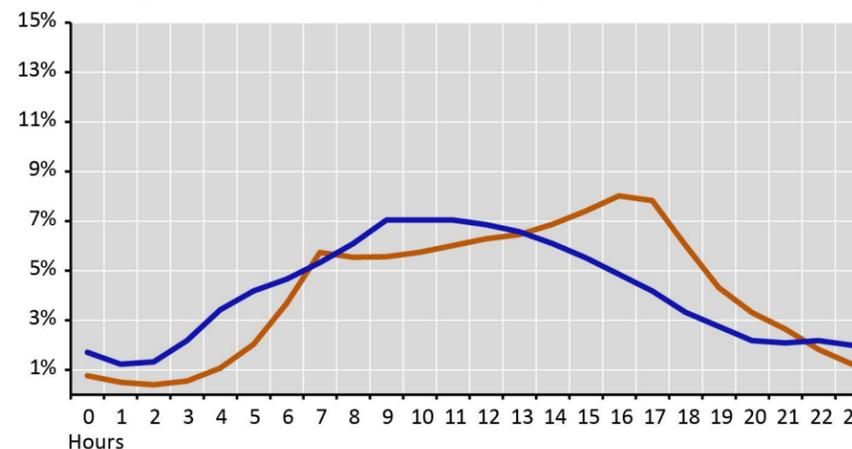
Truck Volumes

The percent of daily traffic comprised of heavy trucks on Segment E3 is high relative to most other segments in Corridor E. Along US 460 southwest of Lynchburg, heavy trucks comprise five to six percent of total traffic. From Lynchburg to Appomattox, heavy trucks along US 460 account for three percent of daily traffic. From central Appomattox County through Prince Edward and Nottoway Counties, heavy trucks comprise six to eight percent of total traffic on US 460.

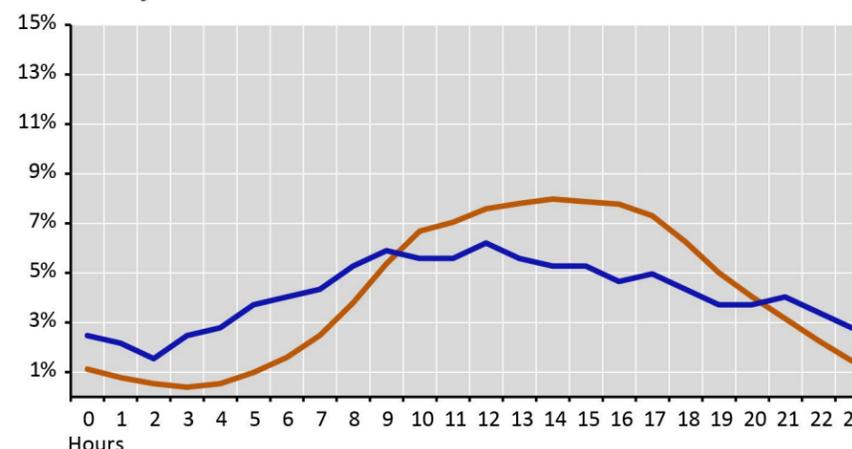
Percent Heavy Trucks



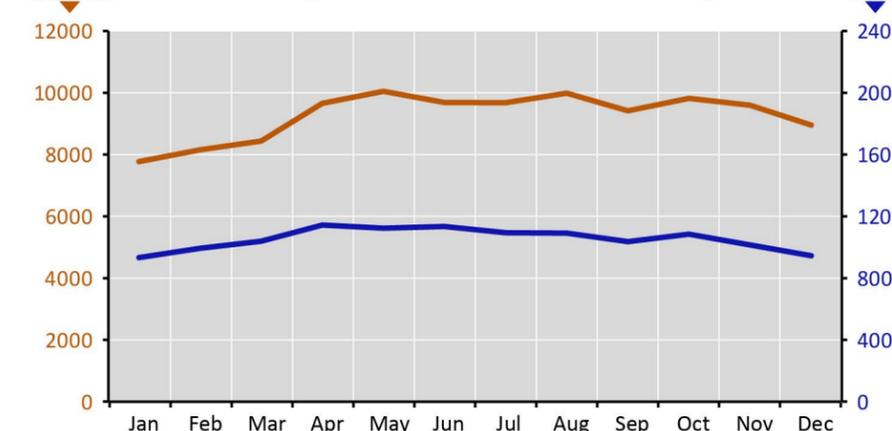
Hourly Traffic Distribution – Weekdays



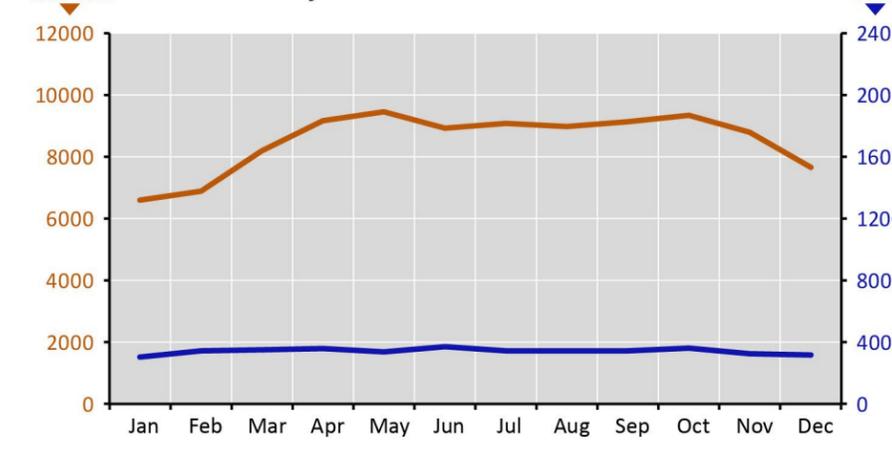
Hourly Traffic Distribution – Weekends



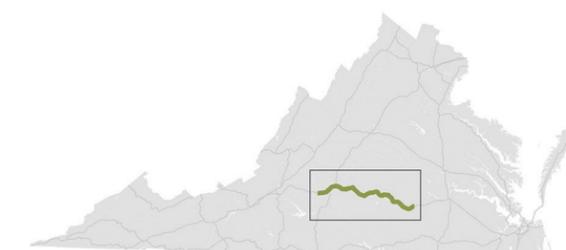
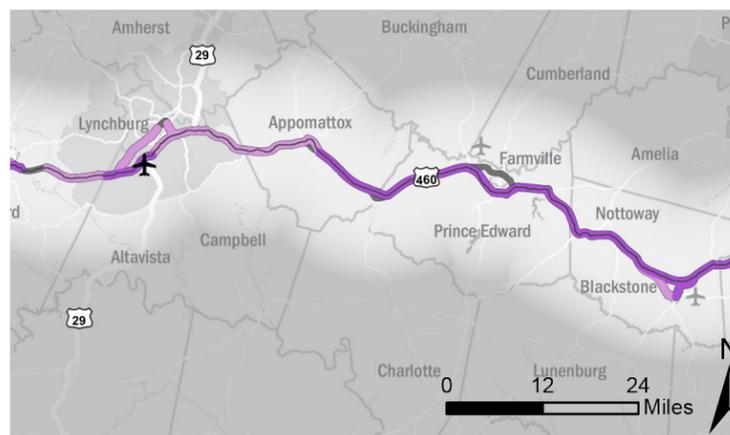
Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks

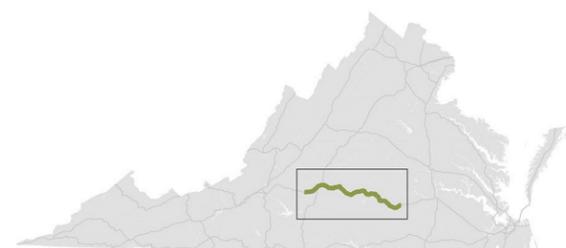


E3 SEGMENT PROFILE

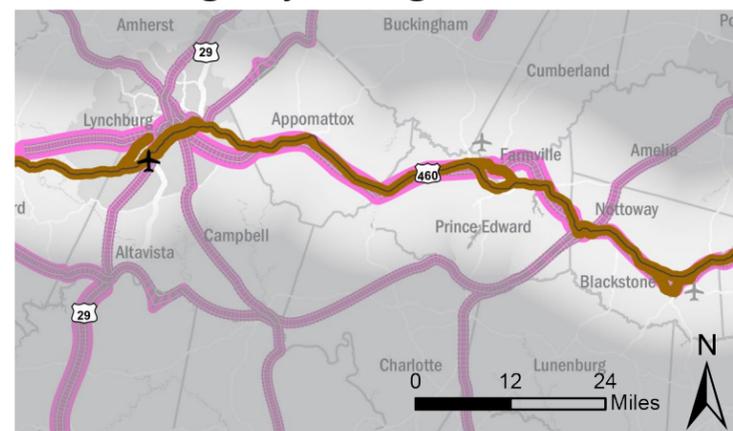
Freight Flows

East of Lynchburg the majority of freight moves by rail, in terms of both tonnage and value. In total, 4 million tons (14 percent) of freight travel through this section of Segment E3 by truck, compared to 28 million tons by rail (86 percent). By value, approximately \$4 billion (15 percent) of freight value travel by truck, compared to \$22 billion by rail (85 percent). On average, a ton of freight traveling through this section of Segment E3 by truck is worth \$909 while a ton of freight traveling by rail is worth \$788. In 2025, both rail and truck freight tonnages and total values in Segment E3 are expected to increase. The percentage of the freight traveling by truck is also likely to increase, by both tonnage and value, to 16 percent. Freight value per ton on trucks and rail is expected to increase to \$939 and \$956, respectively.

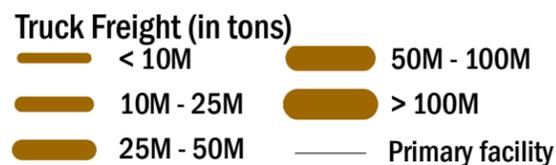
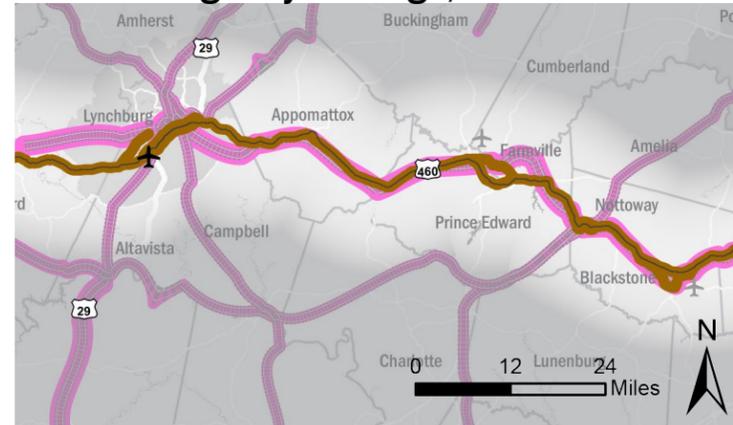
West of Blackstone the majority of freight moves by rail, in terms of both tonnage and value. In total, almost 3 million tons (ten percent) of freight travel through this section of Segment E3 by truck, compared to 24.5 million tons by rail (90 percent). In terms of value, approximately \$2 billion (eight percent) of freight value travels by truck, compared to \$21 billion by rail (92 percent). On average, a ton of freight traveling through this section of Segment E3 by truck is worth \$706 while a ton of freight traveling by rail is worth \$869. In 2025, both rail and truck freight tonnages and total values in Segment E3 are expected to increase. The percentage of the freight traveling by truck is also anticipated to increase by tonnage and value to 13 percent and nine percent respectively. Freight value per ton on trucks and rail is expected to increase to \$735 and \$1,045, respectively.



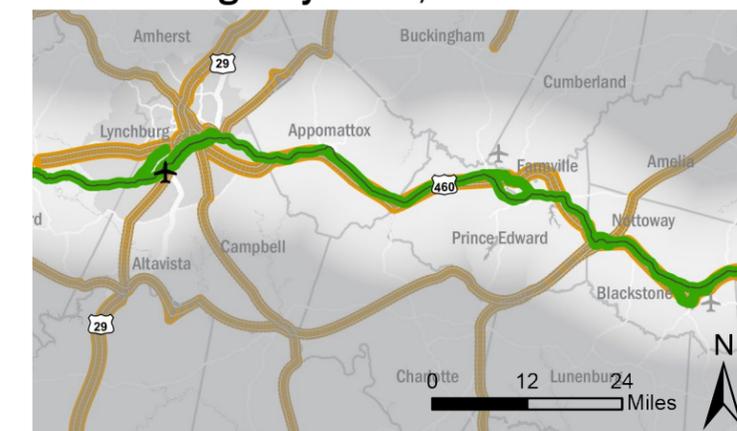
Annual Freight by Tonnage, 2012



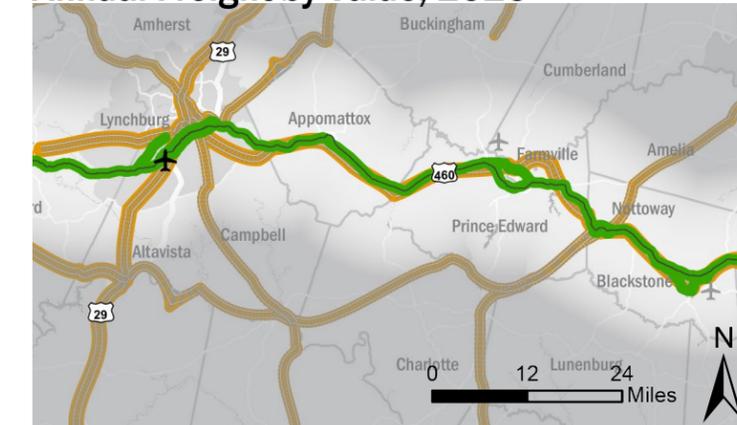
Annual Freight by Tonnage, 2025



Annual Freight by Value, 2012



Annual Freight by Value, 2025



E3 SEGMENT NEEDS

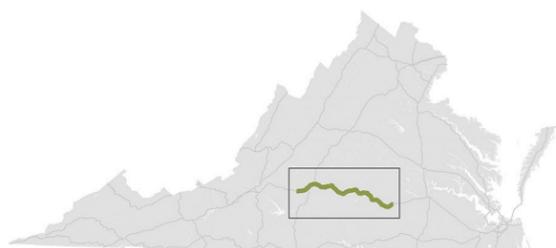
Redundancy and Mode Choice



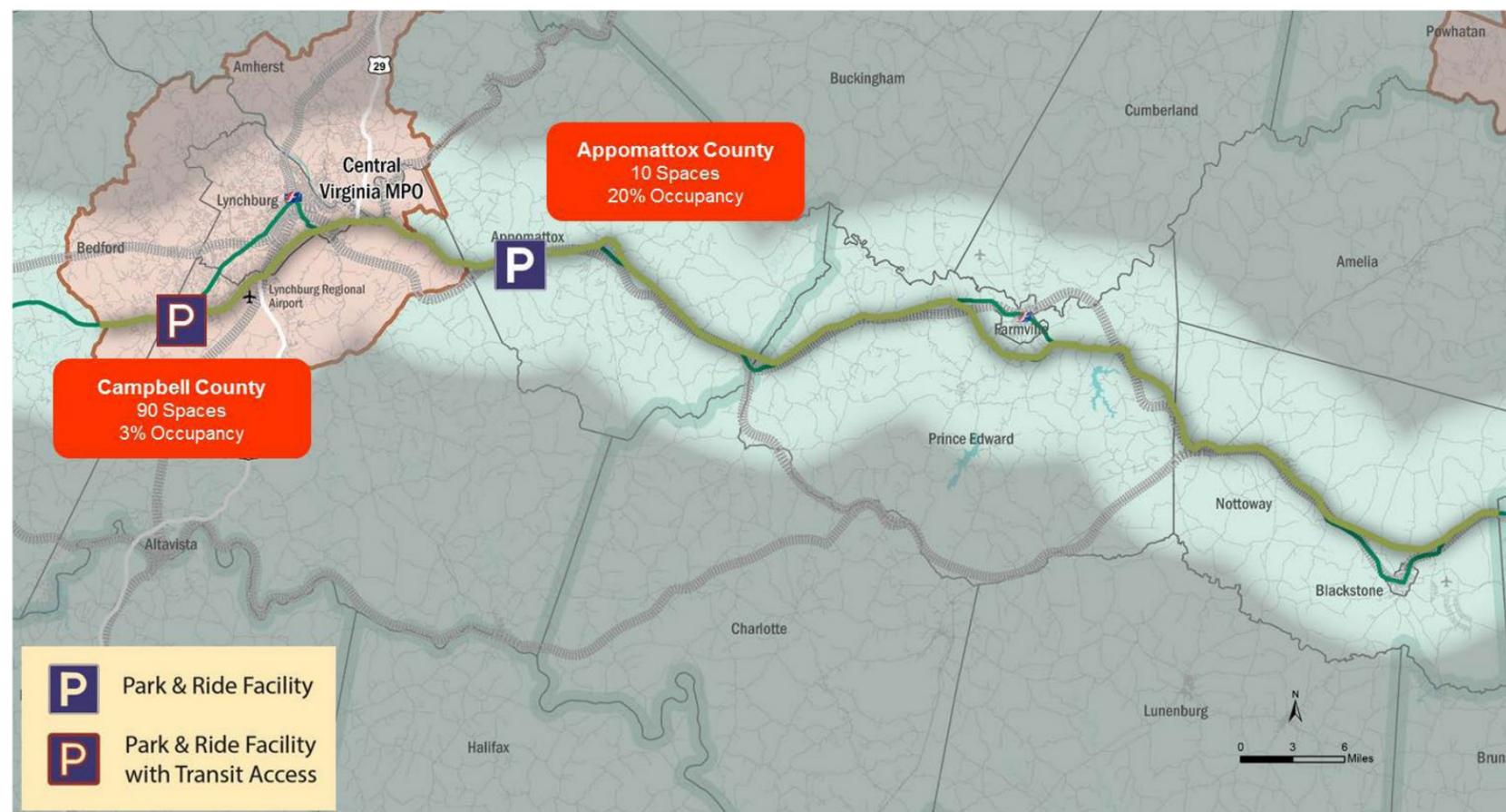
Passenger trips on Segment E3 of the Heartland Corridor have limited travel options, both in terms of travel path and mode choice. Aside from short various US 460 Business routes that provide local access, no parallel highway facilities exist in the segment. Based on the 2014 federal standard mileage rate of 56 cents per mile, long-distance trips would be more expensive by automobile than by bus or rail. However, while travel time for bus is somewhat competitive with automobile travel for trips west of Lynchburg, many trips by bus or rail to other destinations do not run along the Heartland Corridor and require longer, more indirect routes. Greyhound offers service from Lynchburg, as does Amtrak's Crescent Route. Lynchburg Regional Airport does not provide any direct connections to locations on the corridor, as all six of its daily departures are bound exclusively for Charlotte, North Carolina.

Park-and-Ride

Within Segment E3, there are two Park-and-Ride facilities, one located in Campbell County and one located in Appomattox County. The Park-and-Ride location in Campbell County has more spaces and a higher utilization rate (four percent) of the two, though its utilization rate is far below the statewide average for Park-and-Ride utilization, which is 76 percent.



Comparable Travel Options



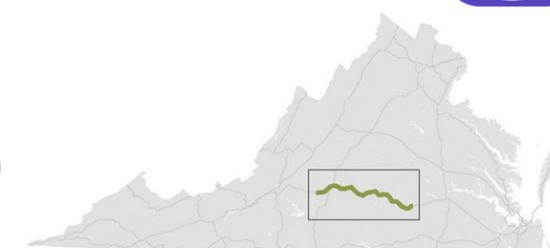
E3 SEGMENT NEEDS

Safety



Between 2010 and 2012, Segment E3 experienced 162 severe crashes. There are several locations along Segment E3 which experienced significant numbers of severe crashes. In Bedford County along US 460 there were 11 collisions at the intersection with Thomas Jefferson Road near the London Downs Golf Club. Along US 460 Business (Timberlake Road) in Lynchburg, there were 66 crashes over 1.6 miles between Tomahawk Drive and Candlewood Court. Of these 66, 46 crashes were at five

intersections; fifteen of these crashes occurred at the intersection with Greenview Drive, and 19 took place at the intersection with Laxton Road. Also along US 460 Business in Lynchburg, there were 21 incidents over a two-mile stretch between Highland Drive and Roundelay Road, where eight of the 21 occurred at the intersection with Graves Mill Road. On US 460 in Appomattox, there were 15 collisions within 5.2 miles between Cherry Street and Rocks Church Road.



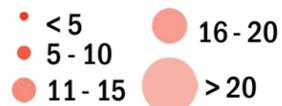
Performance Metrics:

Number of Severe Crashes **162**

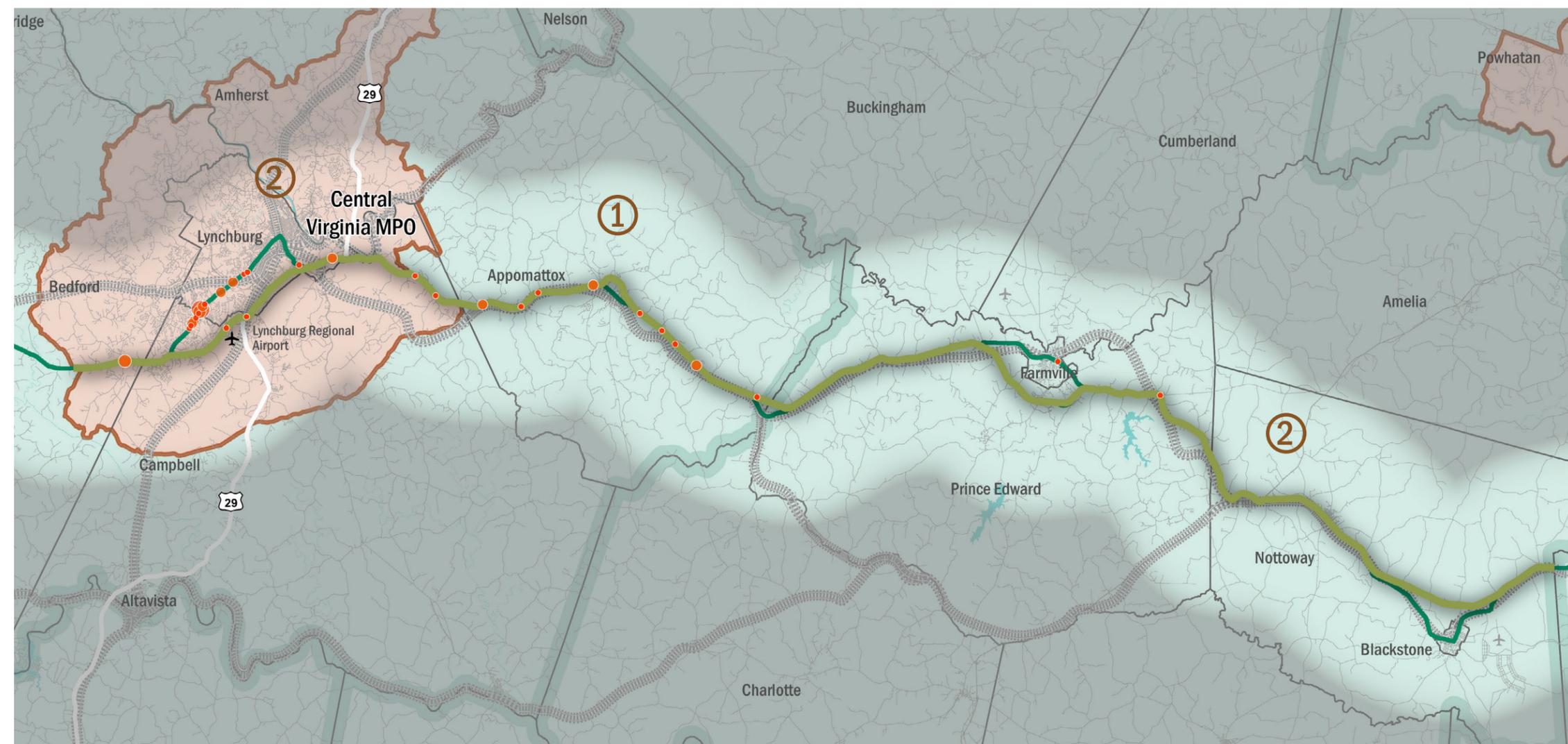
Severe Crashes/Million VMT **0.9**

Number of Railroad Crashes **5**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



E3 SEGMENT NEEDS

Congestion



Performance Metrics:

Person Hours of Delay per Mile **4**

Freight Ton Hours of Delay per Mile **2.1K**

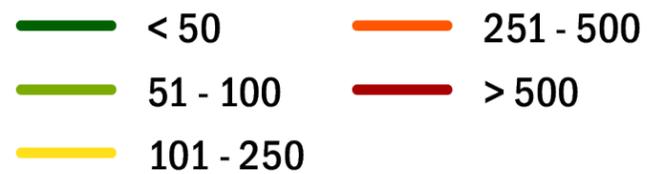
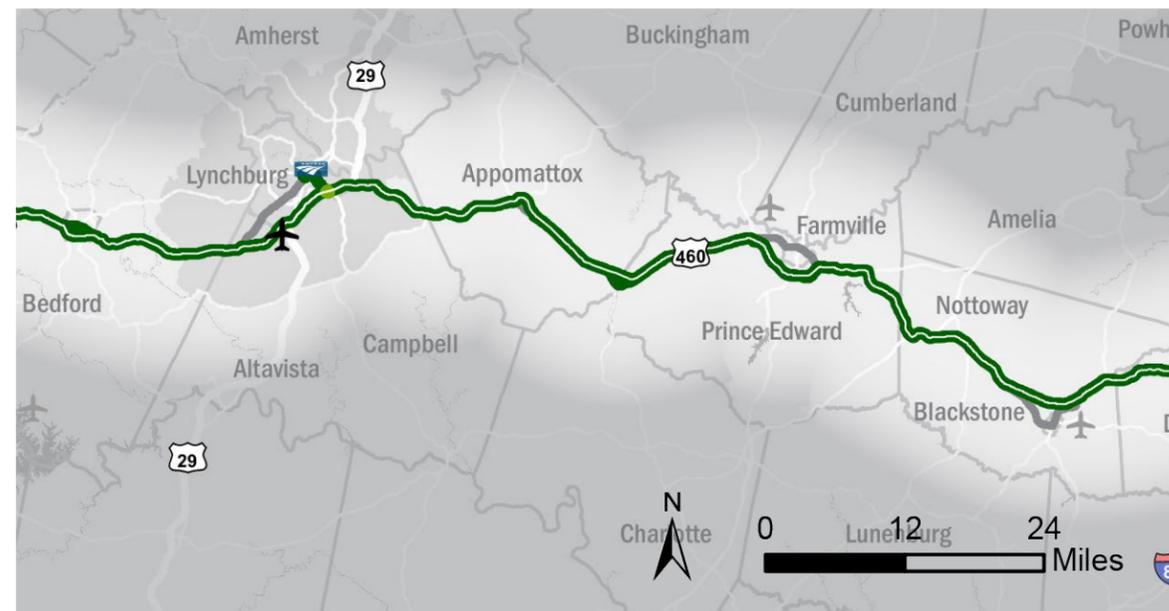
Passenger Delays

Segment E3 experiences some of the lowest passenger delays in Corridor E and in the CoSS segments statewide, with less than 700 person-hours of passenger delays. As such, there are no locations of significant passenger delay along Segment E3. Peak-period passenger delays account for 46 percent of daily total delays, marginally higher than average for the peak-period share of congestion along CoSS segments.

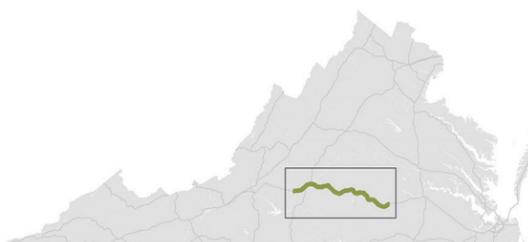
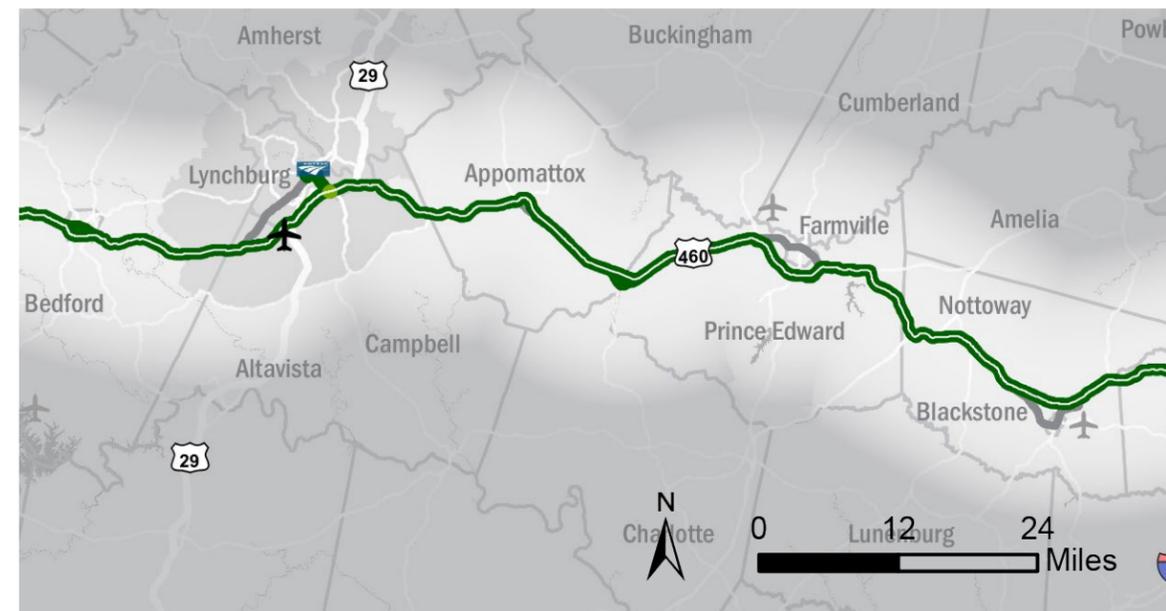
Freight Delays

As with passenger congestion, Segment E3 experiences some of the lowest freight delays in the state, with only around 400,000 ton-hours of freight delay. As such, there are no locations of significant freight delay along Segment E3. Peak-period freight delays account for 40 percent of daily total delays, marginally higher than average for the peak-period share of congestion along CoSS segments.

Daily Person Hours of Delay per Mile



Daily Freight Ton Hours of Delay per Mile



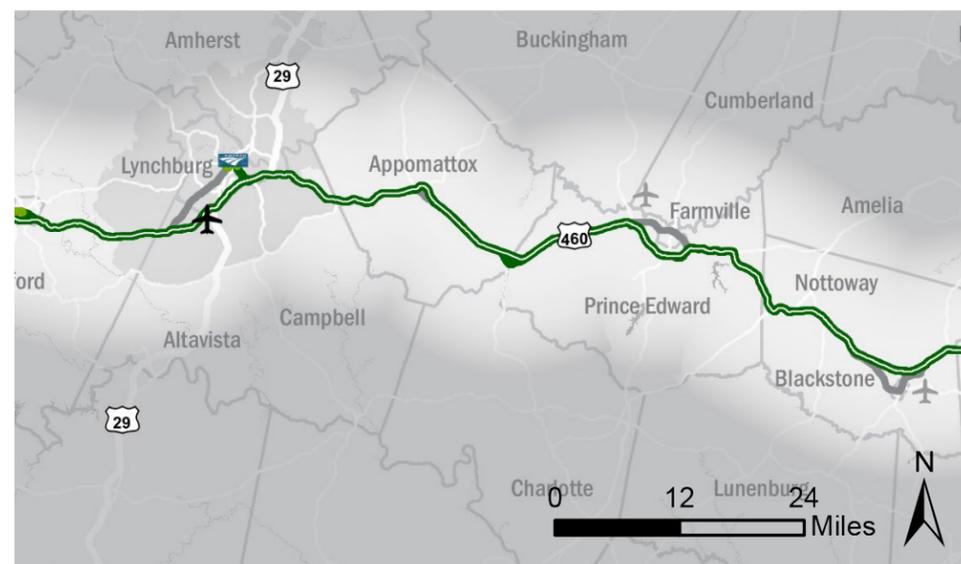
E3 SEGMENT NEEDS

Reliability



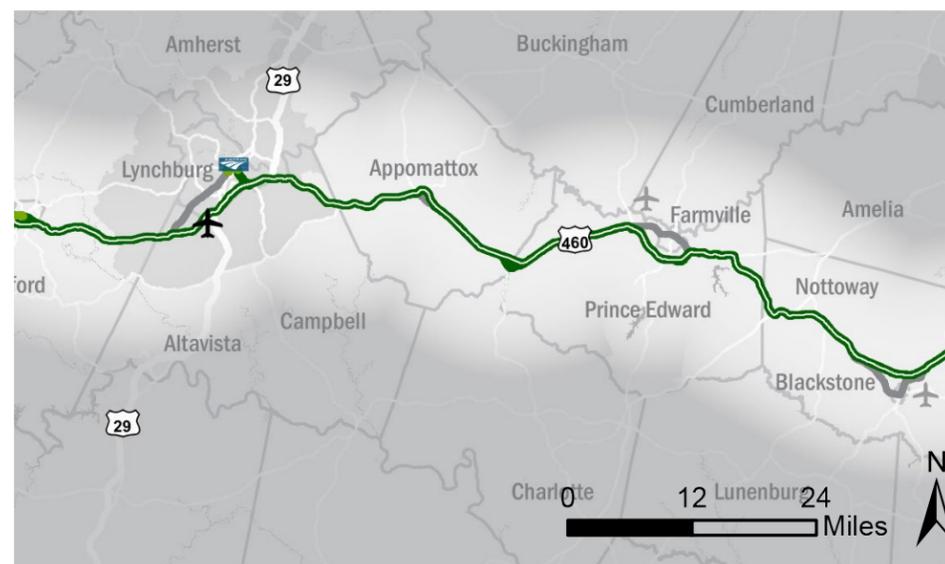
Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment E3 ranges from 0.00 to 0.21 in terms of reliability index, with an average value of 0.05. This segment has a peak period reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment E3 have reliability index values exceeding the statewide threshold.



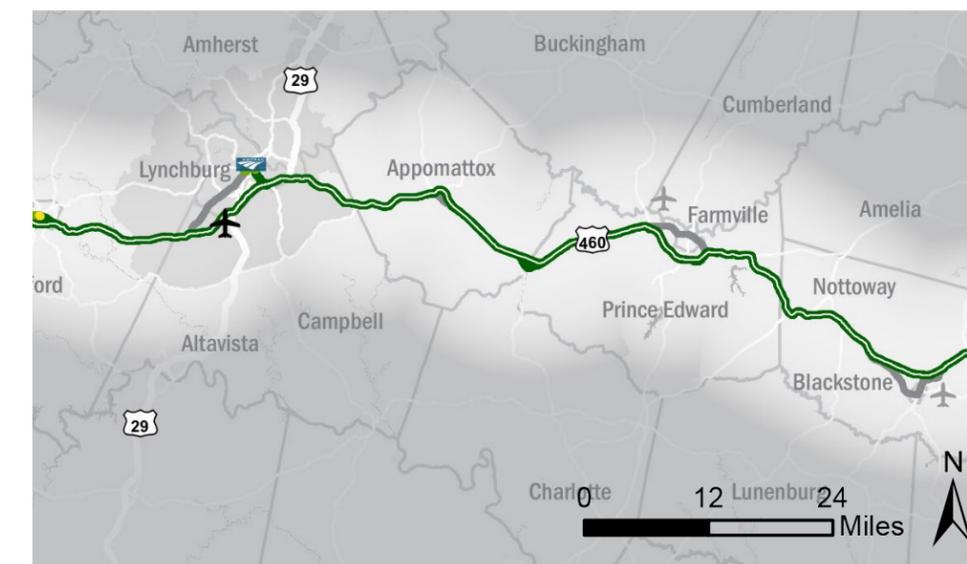
Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 0.33 in terms of reliability index, with an average value of 0.04. This segment has a weekday reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment E3 have reliability index values exceeding the statewide threshold.

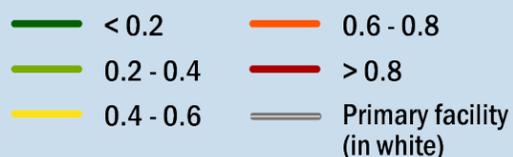


Weekend

Reliability of travel during a typical weekend ranges from 0.01 to 0.33 in terms of reliability index, with an average value of 0.04. This segment has a weekend reliability index much lower than average for the CoSS segments statewide, and none of the locations along Segment E3 have reliability index values exceeding the statewide threshold.

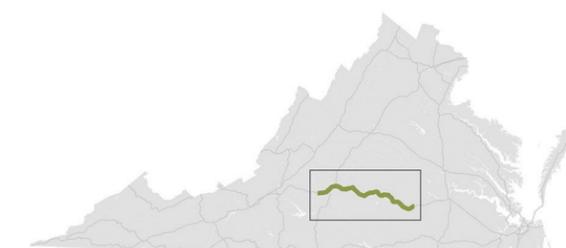


Reliability Index



Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

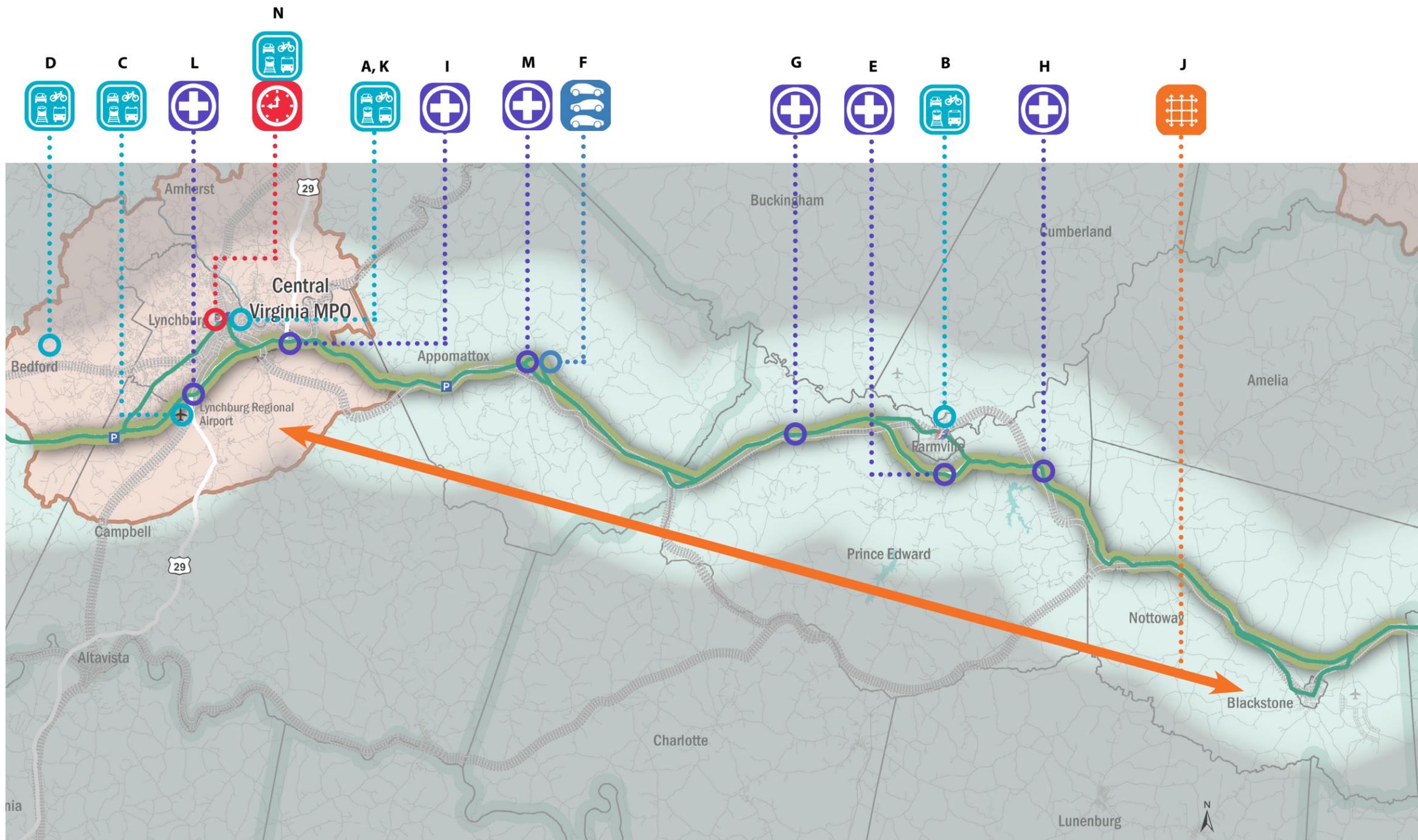
- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



E3 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.



Redundancy **Mode Choice**



Safety



Congestion



Bottlenecks



Reliability



E3 SEGMENT NEEDS

Summary of Needs - E3 Segment

A.		Parking lot at Amtrak station is often over capacity
B.		Intercity bus service between Lynchburg and Farmville is infrequent and there is no bus shelter at the Farmville station
C.		Lynchburg Regional Airport: flights only available to a single destination (Charlotte, NC)
D.		No passenger rail connections to the Town of Bedford
E.		Safety concerns at US 460 near Farmville
F.		Freight trains stopped on the at-grade crossing over Concord Turnpike causes major traffic delays
G.		Safety concerns at intersection of US 460 and Prospect Rd

Summary of Needs - E3 Segment

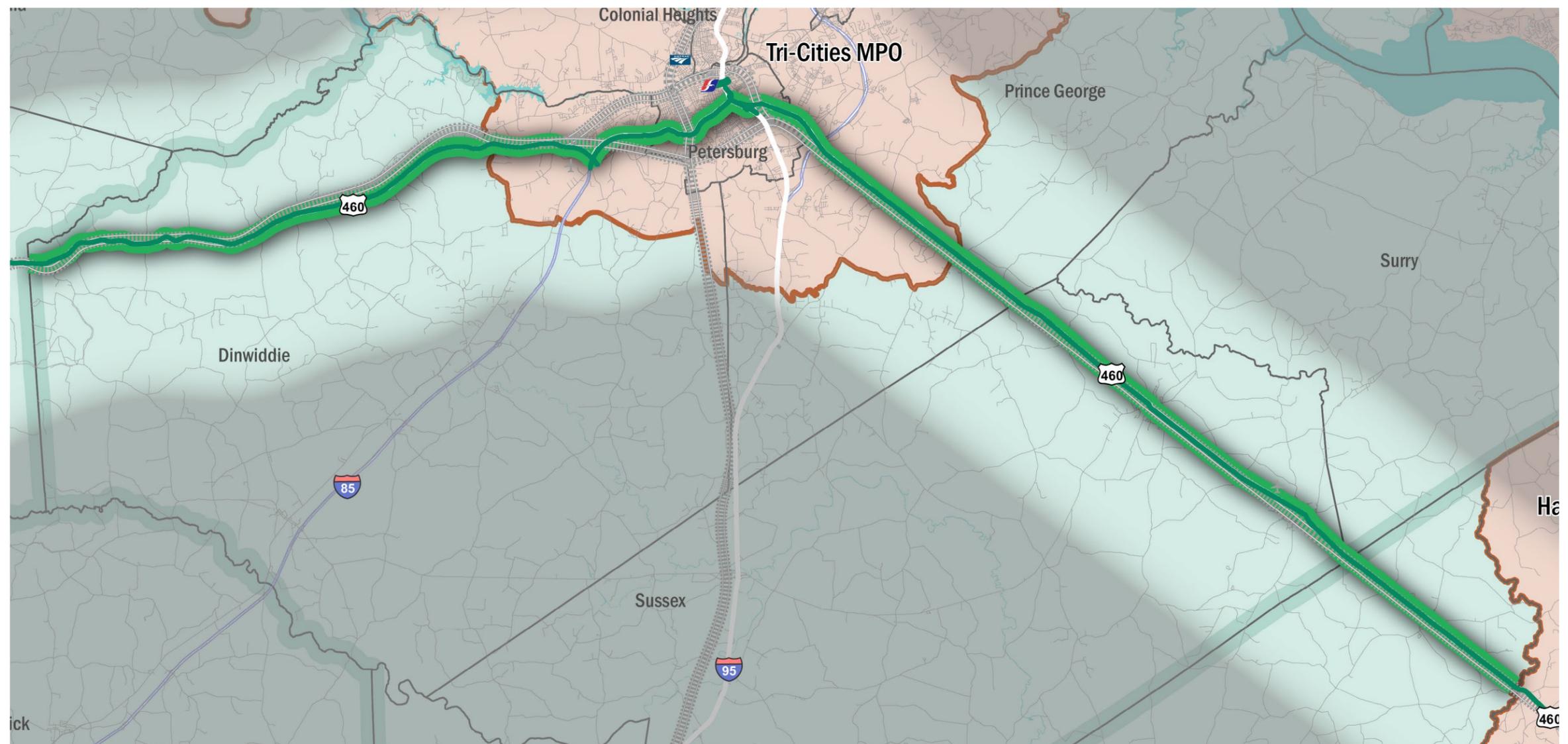
H.		Safety concerns at intersection of US 460 and VA 307
I.		Insufficient merge distance on ramp from US 460 to US 29 South
J.		No parallel highway facilities exist for US 460
K.		No passenger rail service from Lynchburg to other cities in the corridor
L.		US 460-Business between Tomahawk Dr and Roundelay Rd in Lynchburg: 87 severe crashes
M.		US 460 between Cherry St and Rocks Church Rd in Appomattox: 15 severe crashes
N.		Unreliable Amtrak service from Lynchburg station. Average departure delay is 23 minutes totaling over 16,200 person-hours of delay from this segment.

V. Segment E4

Corridor Segment E4 Components

- US 460
- US 460 Business
- James River
- Norfolk Southern Heartland Corridor
- Amtrak
- Richmond International Airport

-  E4
-  Corridor Component Road
-  Railroad
-  MPO Area
-  Planning District Area
-  Amtrak Facility
-  Greyhound Facility
-  VRE Facility
-  Metrorail Facility
-  Port Facility
-  Park & Ride Facility
-  Airport Facility



E4 SEGMENT PROFILE

Segment E4 serves Dinwiddie, Prince George, Sussex, and Southampton Counties along with the City of Petersburg. The segment travels through the Tri-Cities Area and includes I-85, I-95, portions of US 460 and US 460 Business. Segment E4 serves as an alternative east-west throughway for passengers and freight, in addition to providing local access to rural communities.

Highway Facilities: US 460 is a four-lane highway in Segment E4. A portion of US 460 is limited access and runs concurrently with I-85 and I-95 through Petersburg. A business spur of US 460 serves Petersburg.

Transit Services: In this area, the corridor is served by Petersburg Area Transit. Amtrak and Greyhound both have stations in the Tri-Cities Area. Amtrak provides service from near Petersburg (in Ettrick) along its Northeast Regional, Carolinian/Piedmont, and Silver Service/Palmetto Routes. There are no Park-and-Ride facilities in Segment E4.

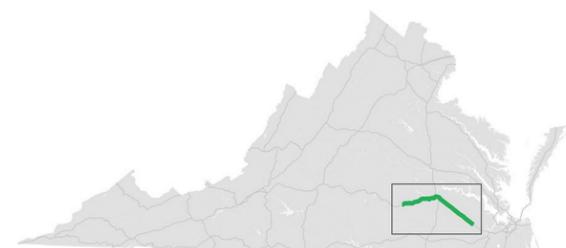
Rail Facilities: Norfolk Southern operates its Heartland Corridor line, the most important rail route for transport between the Port of Virginia and markets located west of Virginia. Petersburg serves as a junction area between rail corridors traveling north-south and east-west and is classified as a Thoroughbred Bulk Transfer Terminal. Fort Lee is the home of the US Army Quartermaster Corps and uses US 460, as well as connecting highways and local roads, to distribute freight to military facilities throughout the region.

Port Facilities: No port facilities are located directly adjacent to Segment E3, but the Heartland Corridor does provide direct access to the Port of Virginia facilities in the Hampton Roads Area.

Airport Facilities: The Richmond International Airport is the only commercial service airport near the segment. General aviation service is available at Dinwiddie Airport.

Major planned and future projects include:

- Study of a potential southbound I-95 off-ramp connection to South Crater Road in the City of Petersburg; and
- Construction of a northbound left-turn lane from VA 630 to US 460 for westbound traffic in Prince George County.



Number of Lanes (both directions)

- 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- Primary facility



Future Projects

- Reconstruction with added capacity
- Safety improvements
- Primary facility



E4 SEGMENT PROFILE

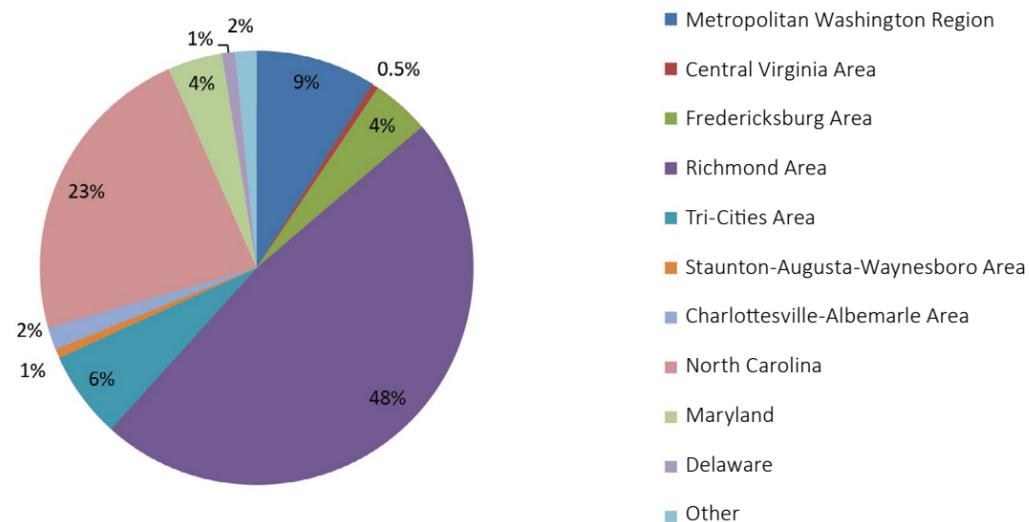
Travel Demand

Passenger Demand

Segment E4 traverses the Tri-Cities Area and connects it to the Hampton Roads Area to the east. Very little of the intercity traffic originating in the Tri-Cities Area is likely to use Segment E4 to travel westbound (only one percent of traffic is destined for Lynchburg). However, the eastern portion of the segment makes up nine percent of intercity traffic originating in the Tri-Cities Area that is destined for Hampton Roads. Similarly, of the intercity passenger travel originating in the Hampton Roads Area, six percent will likely use Segment E4 to access the Tri-Cities Area.

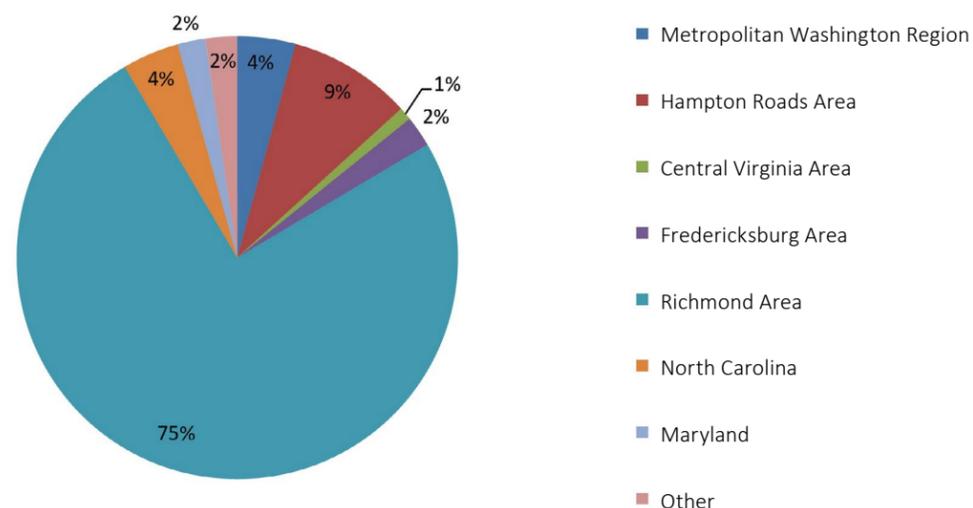
Travel from Hampton Roads Area to...

(clockwise starting from the top)



Travel from Tri-Cities Area to...

(clockwise starting from the top)





E4 SEGMENT PROFILE

Freight Demand

By truck, Segment E4 carried four million tons of freight worth \$3 billion in 2012, and is estimated to carry six million tons of freight worth \$5 billion in 2025. A large proportion of truck freight traffic on Corridor E, representing 32 percent of the total truck freight value on the corridor, passes through Virginia. North Carolina is a major generator and attractor of truck freight on Corridor E, with traffic throughout the Mid-Atlantic, the Port of Virginia facilities in the Hampton Roads Area, and the Tri-Cities Area. By tonnage, the jurisdictions adjacent to Segment E4 account for between five and seven percent of the truck freight origins on the corridor and eight percent of the truck freight destinations on the corridor. Chesterfield County, located near Segment E4, is a major attractor of truck freight traffic, accounting for between four and five percent of the truck freight tonnage on the corridor, with major truck freight flows originating in North and South Carolina.

By rail, Segment E4 carried 26 million tons of freight worth \$22 billion in 2012, and is estimated to carry 28 million tons of freight worth \$28 billion in 2025. The largest rail freight flows on Corridor E consist of low-value rail freight travelling from West Virginia to North Carolina, accounting for more than 17 percent of the total rail freight tonnage on the corridor. Rail freight between West Virginia and nearby counties in Virginia to the Port of Virginia in Norfolk accounts for more than 20 percent of the total rail freight tonnage on the corridor. In terms of rail freight value, the largest rail freight traffic patterns on Corridor E are between Illinois and the Port of Virginia, accounting for more than 20 percent of the total rail freight value on the corridor. Ohio and Louisiana are major generators of freight value on Corridor E, while North Carolina and Pennsylvania are major freight attractors. By tonnage, the jurisdictions adjacent to Segment E4 account less than three percent of the rail freight origins on the corridor and four percent of the rail freight destinations on the corridor. By tonnage, Chesterfield County is the largest attractor of rail freight tonnage on Segment E4, while the City of Petersburg is the largest generator of rail freight along Corridor E by value.

Truck Freight



Rail Freight



E4 SEGMENT PROFILE

Traffic Conditions

Traffic Volume and AADT

Aside from high traffic volumes where US 460 runs concurrently with I-85 in Petersburg, traffic volume on other sections of Segment E4 are relatively low to moderate compared with other segments throughout the corridor. Traffic volumes along US 460 in Dinwiddie County range from 6,000 to 15,000 vehicles per day. In the City of Petersburg, daily traffic volumes can reach as high as 53,000 vehicles. East of Petersburg, average daily traffic volumes along US 460 range from 10,000 to 15,000 vehicles. By 2025, traffic volumes on almost all sections of US 460 in Segment E4 are projected to increase by fewer than 2,500 vehicles per day, except for in the Petersburg Area. In Segment E4 the highest traffic volume increases by 2025 are projected to occur on I-85, ranging from 7,000 to 10,000 additional vehicles per day.



Traffic Volume 2014 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility



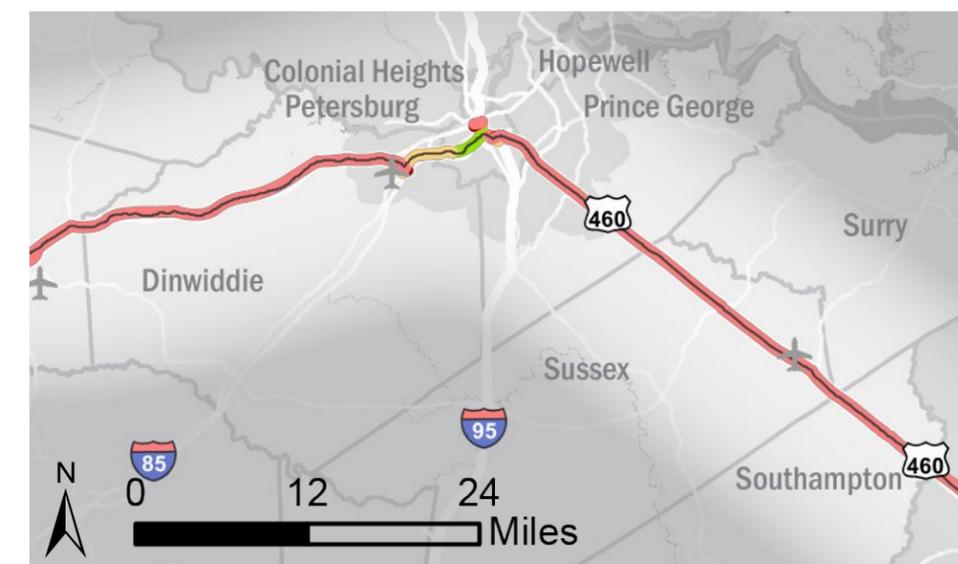
Traffic Volume 2025 (AADT)

- < 10,000
- 10,000 - 50,000
- 50,000 - 100,000
- 100,000 - 200,000
- > 200,000
- Primary facility



Change in Traffic Volume 2014- 2025 (AADT)

- Decreased
- 0 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- > 20,000
- Primary facility



E4 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment E4 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 5 and 6 p.m. which accounts for 7.8 percent of daily traffic. The morning peak hour is less busy, with the 7 to 8 a.m. hour accounting for 6.1 percent of daily traffic. The combined weekday traffic in the two peak periods (from 6 to 10 a.m. and from 3 to 7 p.m.) accounts for 50 percent of total daily traffic. Peaking patterns for truck traffic are different from commuter traffic with a single peak during the midday period. Weekend traffic patterns are different from the typical commute patterns, showing a single peak during the middle of the day with the peak hourly flow between 2 and 3 p.m. (7.5 percent of daily traffic) for all traffic, and 9 to 10 a.m. (5.8 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment E4 vary by as much as 56 percent throughout the year, with the highpoint in May (around 20,000 vehicles per day) and the low point in September (around 13,000 vehicles per day). Truck volumes also vary less throughout the year, with the June high (around 2,500 vehicles per day) 54 percent higher than the September low (around 1,600 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (July, around 18,000 vehicles per day) are 60 percent higher than September levels (around 11,000 vehicles per day). Since truck volumes account for a relatively small portion of traffic on Segment E4, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

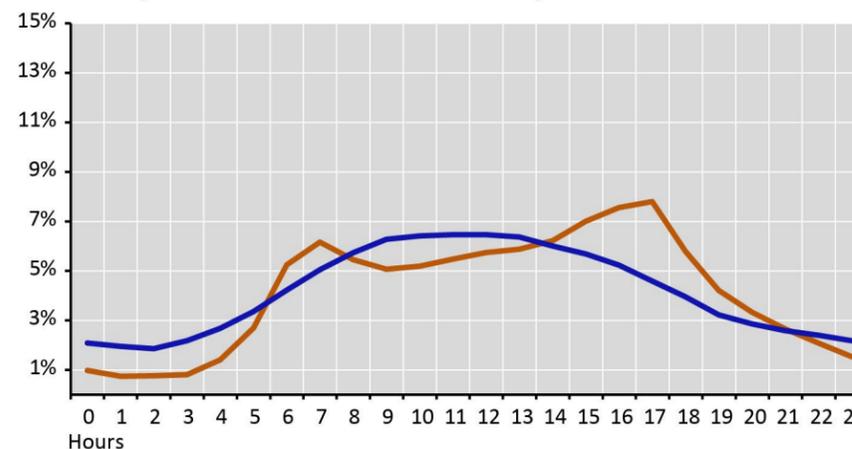
Truck Volumes

The percent of average daily traffic comprised of heavy trucks on Segment E4 is high relative to the other segments in Corridor E. Throughout Segment E4, heavy trucks comprise five to eight percent of daily traffic, with the highest percentage of trucks east of Petersburg.

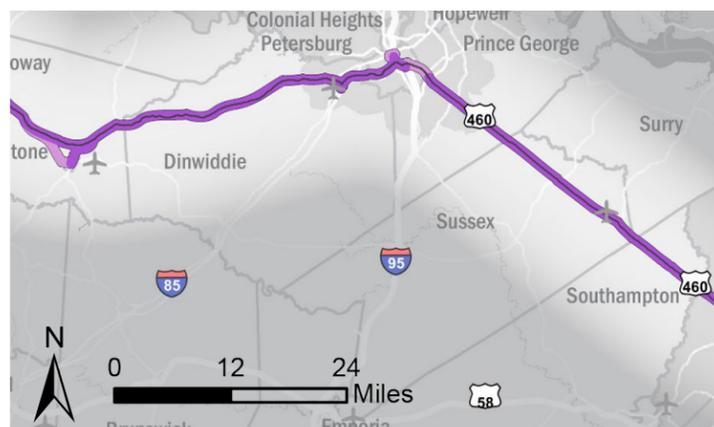
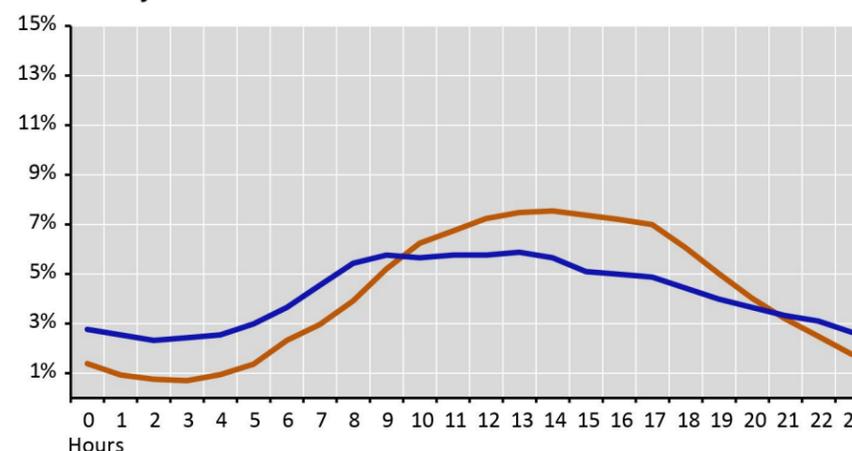
Percent Heavy Trucks



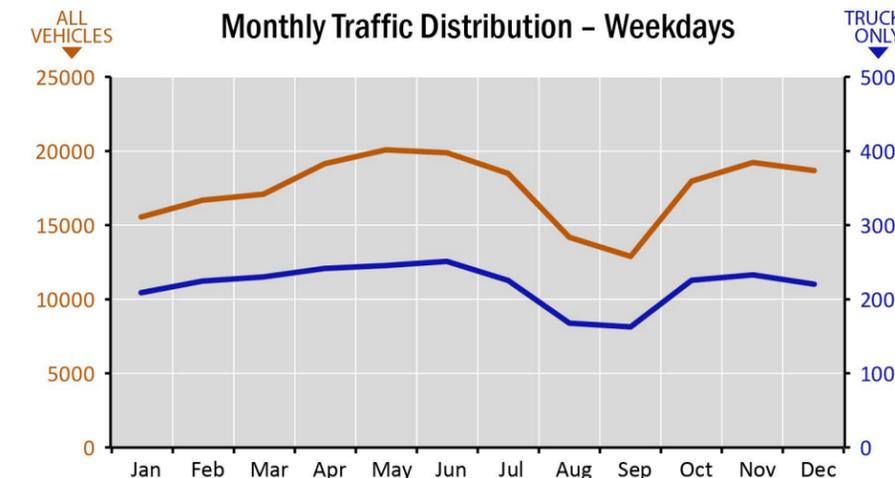
Hourly Traffic Distribution – Weekdays



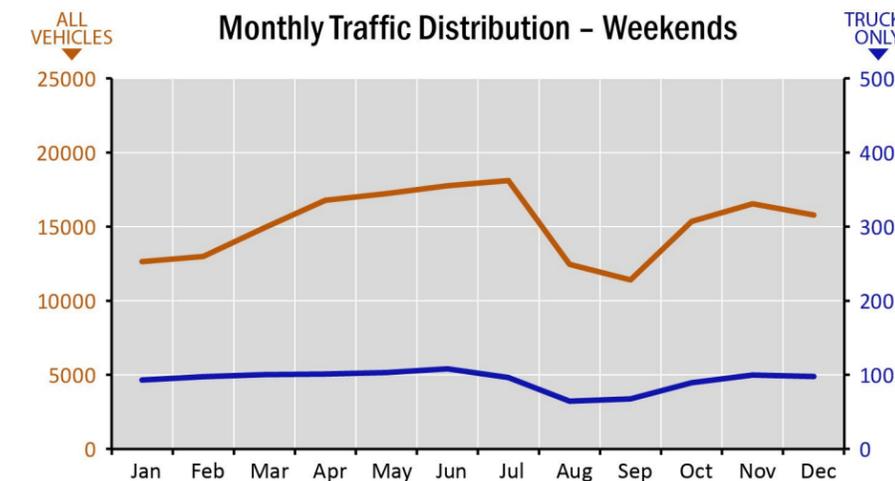
Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks



E4 SEGMENT PROFILE

Freight Flows

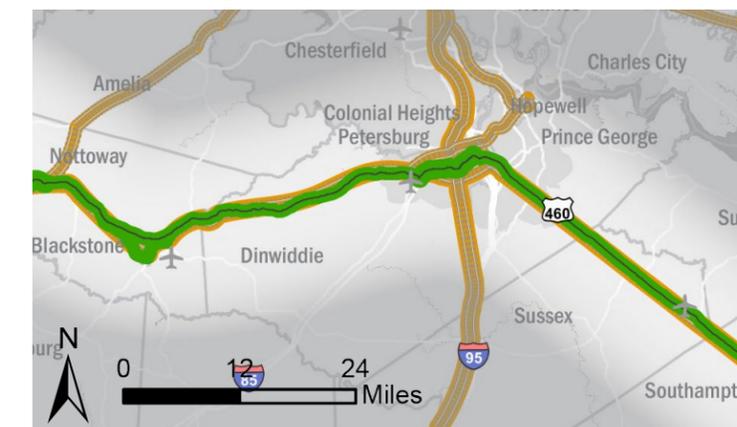
Near the Dinwiddie County Airport the majority of freight moves by rail, in terms of both tonnage and value. In total, 1.5 million tons (six percent) of freight travels through this section of Segment E4 by truck, compared to 24.5 million tons by rail (94 percent). With respect to value, approximately \$1.5 billion (seven percent) of freight value travels by truck, compared to \$21 billion by rail (93 percent). On average, a ton of freight traveling through this section of Segment E4 by truck is worth \$1,012 while a ton of freight traveling by rail is worth \$870. In 2025, both rail and truck freight tonnages and total values in Segment E4 are expected to increase. The percentage of the freight traveling by truck is also projected to increase by tonnage and value to eight percent. Value per ton on trucks and rail is expected to increase to \$996 and \$1,046, respectively.

In the City of Petersburg the majority of freight moves by rail, in terms of both tonnage and value. In total, three million tons (ten percent) of freight travels through this section of Segment E4 by truck, compared to 26 million tons by rail (90 percent). By value, approximately \$3 billion (ten percent) of freight value travels by truck, compared to \$23 billion by rail (90 percent). On average, a ton of freight traveling through this section of Segment E4 by truck is worth \$905 while a ton of freight traveling by rail is worth \$872. In 2025, both rail and truck freight tonnages and total values in Segment E4 are expected to increase. The percentage of the freight traveling by truck is also expected to increase by tonnage and value to 15 percent and 14 percent, respectively. Freight value per ton on trucks and rail is expected to increase to \$911 and \$1,012, respectively.

Annual Freight by Tonnage, 2012



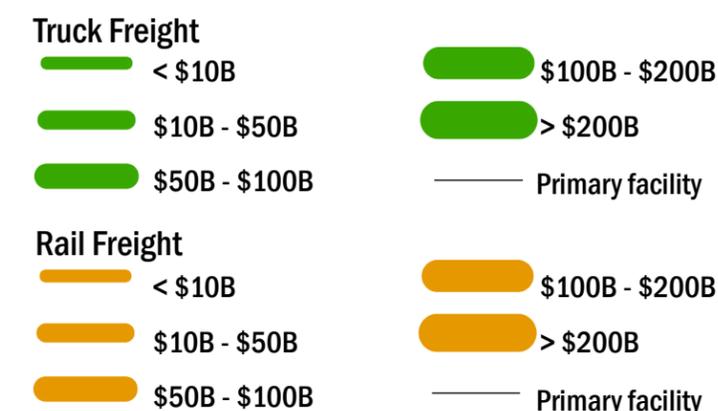
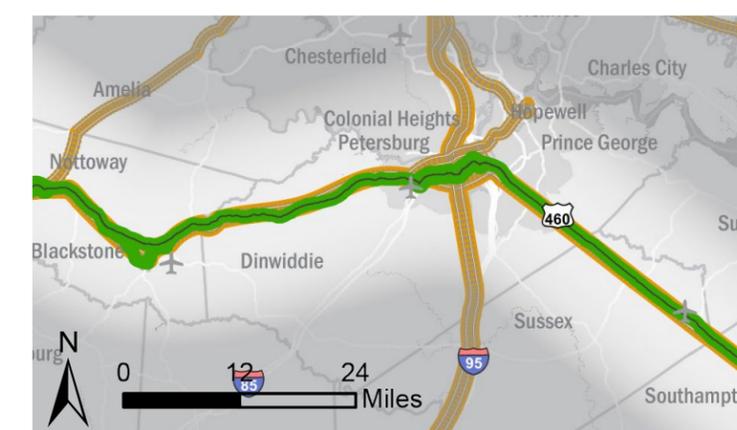
Annual Freight by Value, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2025



E4 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment E4 of the Heartland Corridor have few travel options, both in terms of travel path and mode choice. There are no parallel highway facilities to US 460 in Segment E4. Based on the 2014 federal standard mileage rate of 56 cents per mile, long-distance trips would be more expensive by automobile than by rail. However, Amtrak service, which has a station in the Petersburg Area, is limited by the frequency of service and is not as fast as the typical automobile trip. Trips by bus, from the Greyhound station in Petersburg, and by rail, from Petersburg to any location on the corridor aside from Hampton Roads, do not run along the Heartland Corridor and require longer, more indirect routes.

Park-and-Ride

Within Segment E4, there are no Park-and-Ride facilities. However, two new Park-and-Ride locations are proposed for Petersburg by VDOT's Park-and-Ride Investment Strategy.

Comparable Travel Options

Hampton Roads (Norfolk) to Petersburg

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 1 Trip per Day 1:27 Travel Time \$18 Est. Cost
Auto Via Rt. 460: 1:30 Travel Time \$43 Est. Cost	

Petersburg to Lynchburg

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 5 Trips per Day 6:53 Travel Time \$58 Est. Cost
Auto Via Rt. 460: 2:00 Travel Time \$64 Est. Cost	

Hampton Roads (Norfolk) to Richmond

Inter-City Bus 5 Trips per Day 2:00 Travel Time \$11 Est. Cost	Train 5 Trips per Day 2:03 Travel Time \$23 Est. Cost
Auto Via Rt. 460: 1:56 Travel Time \$57 Est. Cost	

Lynchburg to Richmond

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 8 Trips per Day 3:30 Travel Time \$42 Est. Cost
Auto Via Rt. 460: 2:01 Travel Time \$63 Est. Cost	

Roanoke to Richmond

Inter-City Bus 3 Trips per Day 3:55 Travel Time \$46 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
Auto Via Rt. 460: 3:04 Travel Time \$92 Est. Cost	

Blacksburg / Christiansburg to Richmond

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 0 Trips per Day 0:00 Travel Time \$0 Est. Cost
Auto Via Rt. 460: 3:37 Travel Time \$114 Est. Cost	

E4 SEGMENT NEEDS

Safety



Between 2010 and 2012, Segment E4 experienced only 14 severe crashes, resulting in the lowest crash rate on the Heartland Corridor. All of these crashes occurred on US 460 Business (County Drive) in Petersburg over approximately two miles between Hickory Hill Road and Route 106 (Courthouse Road).



Performance Metrics:

Number of Severe Crashes **14**

Severe Crashes/Million VMT **0.3**

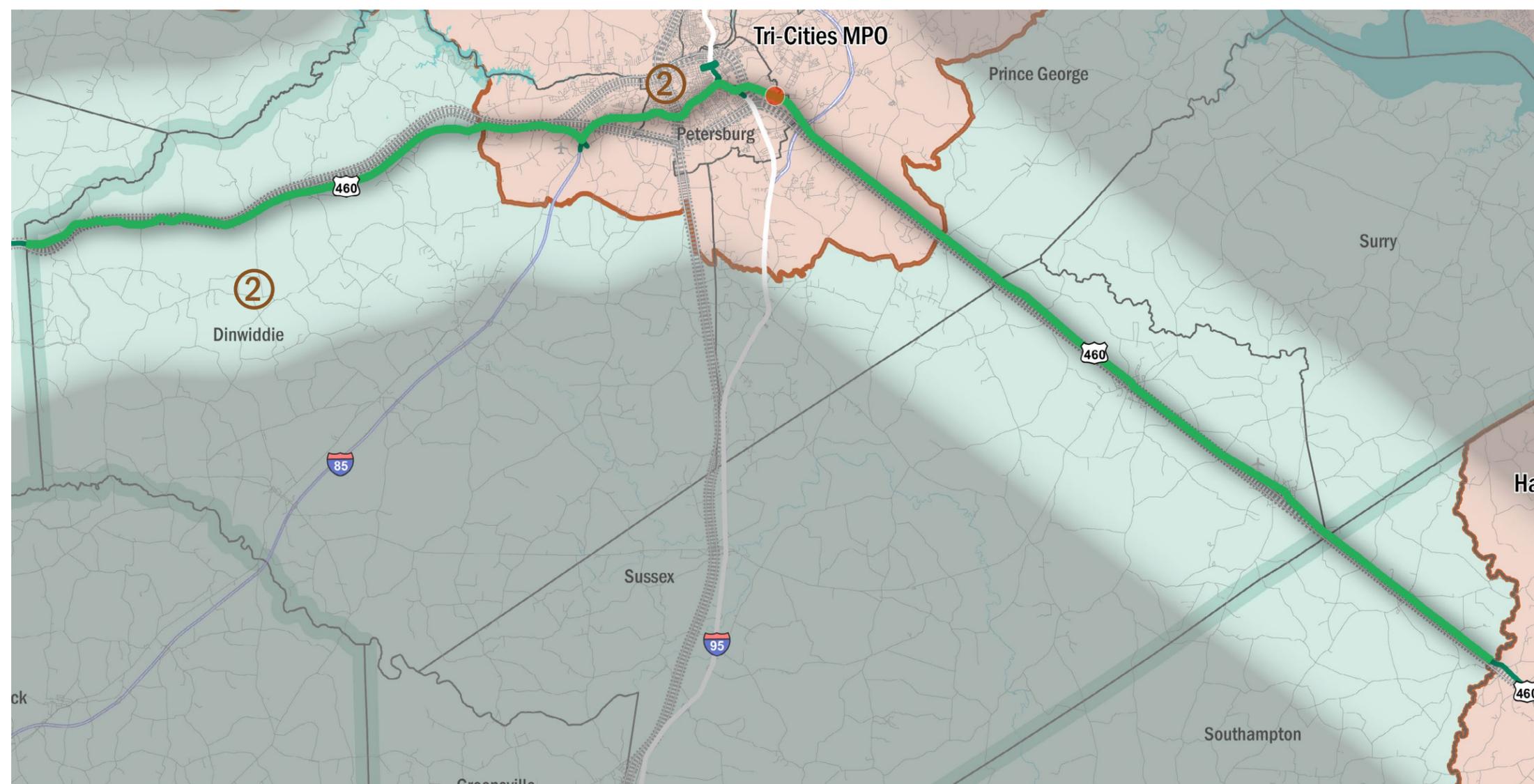
Number of Railroad Crashes **4**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)

#



E4 SEGMENT NEEDS

Congestion



Passenger Delays

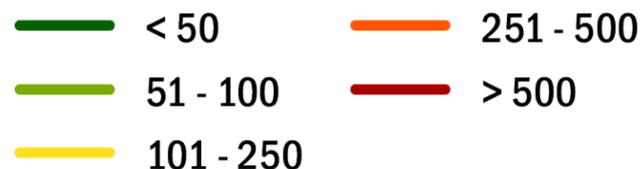
Segment E4 experiences some of the lowest passenger delays in Corridor E and in the CoSS segments statewide, with around 400 person-hours of passenger delays. As such, there are no locations of significant passenger delay along Segment E4. Peak-period passenger delays account for 47 percent of daily total delays, marginally higher than average for the peak-period share of congestion along CoSS segments.

Performance Metrics:

Person Hours of Delay per Mile **3**

Freight Ton Hours of Delay per Mile **2.4K**

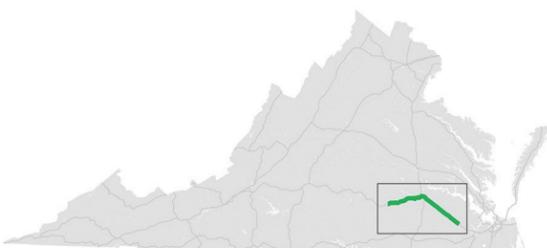
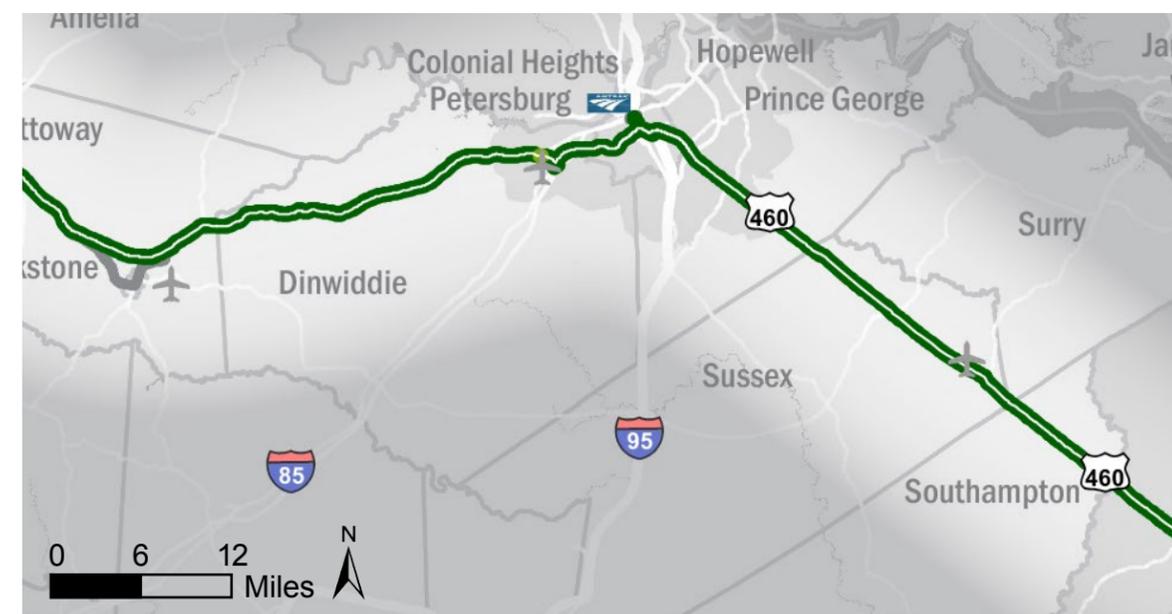
Daily Person Hours of Delay per Mile



Freight Delays

As with passenger congestion, Segment E4 experiences some of the lowest freight delays in the state, with just over 325,000 ton-hours of freight delay. As such, there are no locations of significant freight delay along Segment E4. Peak-period freight delays account for 43 percent of daily total delays, higher than average for the peak-period share of congestion along CoSS segments.

Daily Freight Ton Hours of Delay per Mile



E4 SEGMENT NEEDS

Reliability



Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment E4 ranges from 0.00 to 0.71 in terms of reliability index, with an average value of 0.07. This segment has a peak period reliability index significantly lower than average for the CoSS segments statewide, and none of the locations along Segment E4 have reliability index values exceeding the statewide threshold.



Weekday

Reliability of travel during a typical weekday ranges from 0.00 to 0.48 in terms of reliability index, with an average value of 0.06. This segment has weekday reliability index significantly lower than average for the CoSS segments statewide, and only a short portion of US 460 (at Route 226 in Dinwiddie County) has a reliability index value exceeding the statewide threshold.

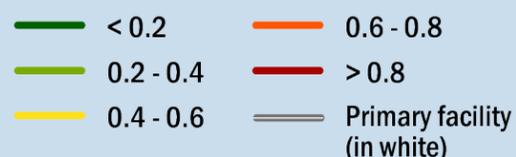


Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.36 in terms of reliability index, with an average value of 0.06. This segment has a weekend reliability index significantly lower than average for the CoSS segments statewide, and none of the locations along Segment E4 have reliability index values exceeding the statewide threshold.



Reliability Index



Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



E4 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Redundancy **Mode Choice**



Safety



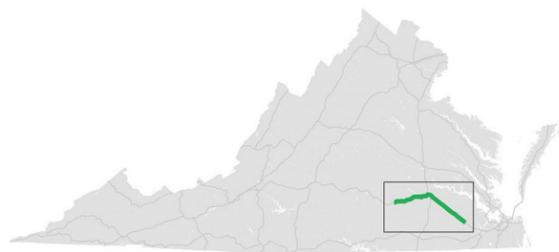
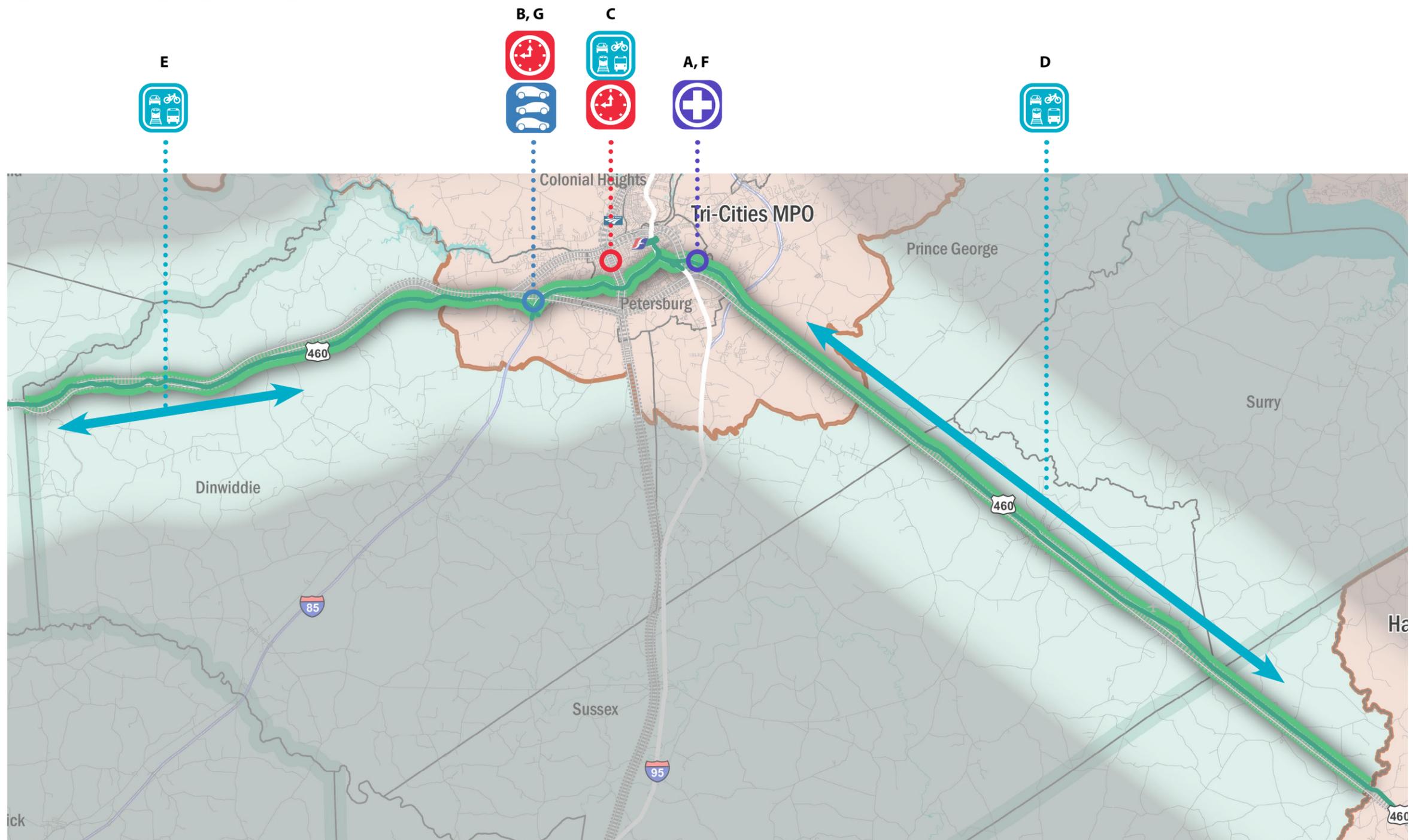
Congestion



Bottlenecks



Reliability



E4 SEGMENT NEEDS

Summary of Needs - E4 Segment

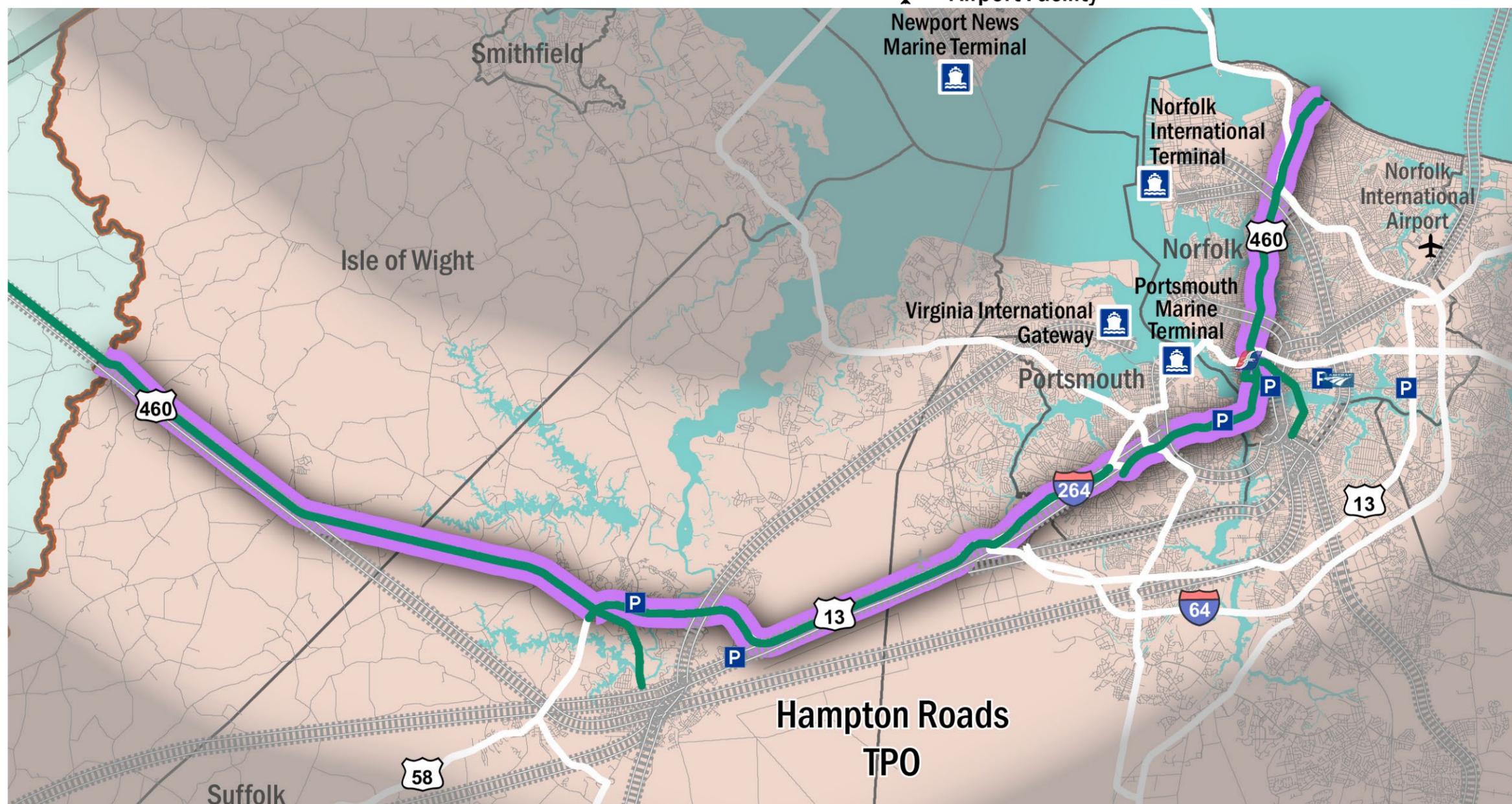
A.		Unsafe ramp at interchange of I-95 and US 460
B.		Capacity issues at Truck Plaza on US 1 near I-85 and US 460: truck plaza often full or overflowing
C.		Unreliable Amtrak service from Petersburg's Ettrick station. Average departure delay is 34 minutes totaling over 8,200 person-hours of delay from this segment.
D.		Rail capacity limited between Peterburg and Hampton Roads region - trains often full; no intercity bus available
E.		No comparable transit options to Lynchburg: no buses available, trains require long travel times, inconvenient transfers
F.		US 460 in Petersburg (Hickory Hill Rd - Courthouse Rd): 14 crashes in two mile portion of segment
G.		Reliability issue at US 460 and I-85 junction near Dinwiddie County Airport

VI. Segment E5

Corridor Segment E5 Components

- US 460
- US 460 Business
- US 460 Alt
- Route 168
- Newport News Marine Terminal
- Norfolk International Terminal
- Portsmouth Marine Terminal
- Virginia International Gateway
- James River
- Norfolk Southern Heartland Corridor
- Amtrak
- Norfolk International Airport
- Newport News/Williamsburg International Airport

- E5
- Corridor Component Road
- Railroad
- MPO Area
- Planning District Area
- Amtrak Facility
- Greyhound Facility
- VRE Facility
- Metrorail Facility
- Port Facility
- P Park & Ride Facility
- ✈ Airport Facility



E5 SEGMENT PROFILE

Segment E5 traverses the area covered by the Hampton Roads TPO Area and begins in Isle of Wight County, continuing east and serving the Cities of Suffolk, Chesapeake, Portsmouth, and Norfolk. The segment includes portions of US 460, US 460 Business, US 460 Alt, and Route 168, Segment E5 serves as an alternative east-west throughway for passengers and freight, in addition to providing local access in the Hampton Roads Area. Segment E5 provides a connection to the Port of Virginia and the numerous military facilities found in Hampton Roads. The segment also serves as an important evacuation route for Hampton Roads, as it does not cross any major waterways.

Highway Facilities: US 460 is primarily a local-access corridor in the Hampton Roads Area, with four lanes west of downtown Suffolk and a variable cross section of up to six lanes further east. Portions of US 460 are limited access, and the route runs concurrently with US 13 around Suffolk and I-264 in Portsmouth and Norfolk. US 460 runs parallel with I-64 north of downtown Norfolk. A business spur of US 460 serves Suffolk. Also, an alternate route, known as US 460 Alternate, travels through Chesapeake and Portsmouth.

Transit Services: In this segment, the corridor is served by Hampton Roads Transit (HRT). HRT operates the Metro Area Express bus routes, connecting Portsmouth and Norfolk. HRT also operates The Tide, a 7.4-mile light rail line that intersects the corridor in Norfolk. Amtrak and Greyhound both have stations in Norfolk. Amtrak provides service from Norfolk along its Northeast Regional Route. Multiple Park-and-Ride facilities are located near I-264, the largest cluster of which is located in Norfolk.

Rail Facilities: Norfolk Southern operates its Heartland Corridor line, the most important rail route for transport between the Port of Virginia and markets located west of Virginia. The Hampton Roads region serves as a junction area between rail corridors traveling north-south and traveling west and is classified as an Intermodal Terminal.

Port Facilities: Segment E5 includes various ports including the Virginia International Gateway, Portsmouth Marine Terminal, and Norfolk International Terminal. The Newport News Marine Terminal is located just outside the corridor.

Airport Facilities: Norfolk International Airport and Newport News–Williamsburg International Airport provide commercial service to Segment E5.

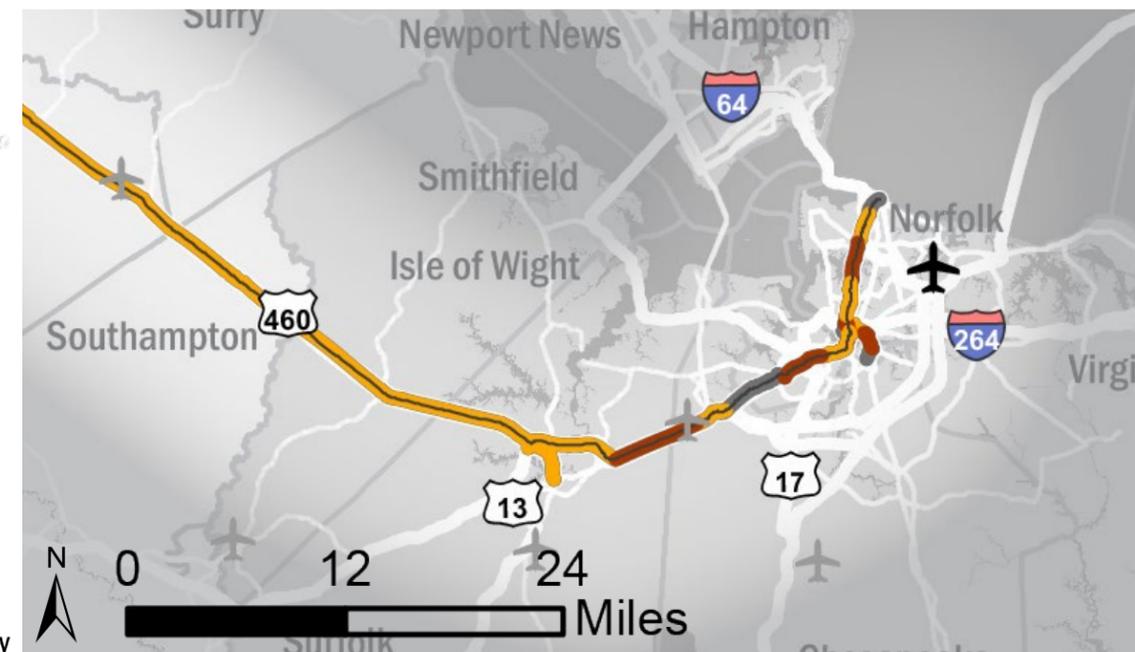
Major planned and future projects include:

- Rehabilitating and replacing the electrical and mechanical systems of Berkeley Bridge on I-264/US 460 in the City of Norfolk.



Number of Lanes (both directions)

- 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- Primary facility



Future Projects

- Reconstruction with added capacity
- Safety improvements
- Primary facility

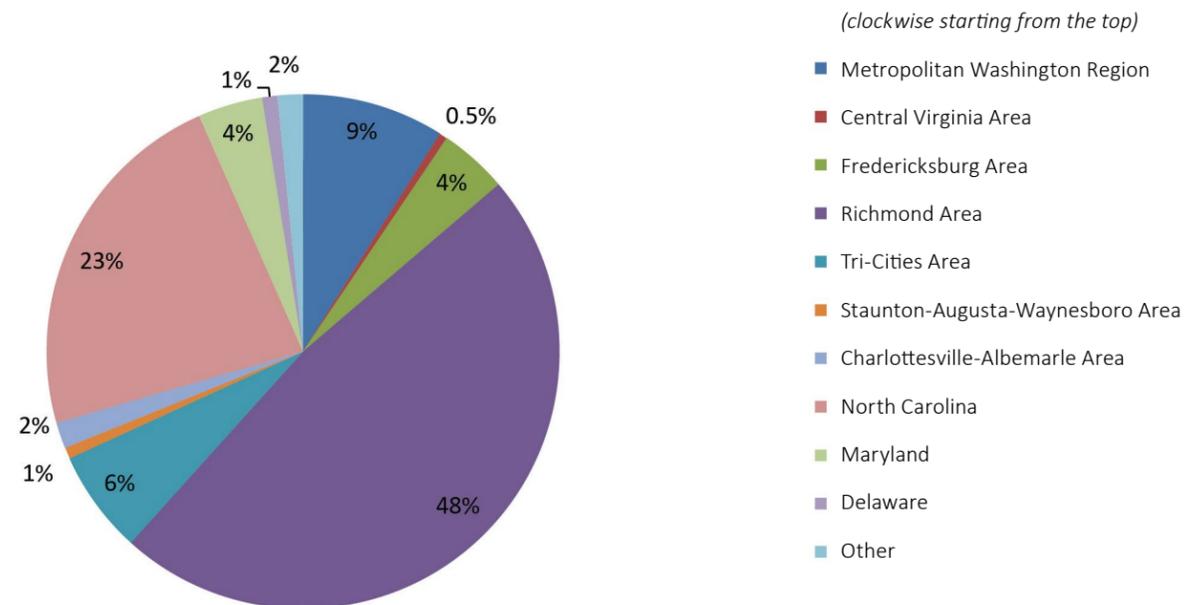
E5 SEGMENT PROFILE

Travel Demand

Passenger Demand

Segment E5, the easternmost segment of Corridor E, exists entirely within the Hampton Roads TPO Area, and accommodates large amounts of traffic local to the region. Of the intercity traffic originating in this region, six percent is destined for the Tri-Cities Area and a small portion is destined for the Lynchburg area. These trips are likely to make use of Segment E5.

Travel from Hampton Roads Area to...



E5 SEGMENT PROFILE

Freight Demand

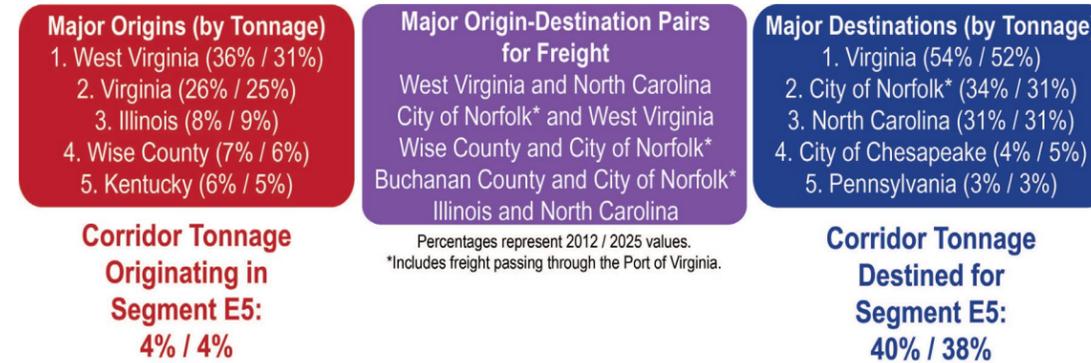
By truck, Segment E5 carried ten million tons of freight worth \$18 billion in 2012, and is estimated to carry 15 million tons of freight worth \$28 billion in 2025. A large proportion of truck freight traffic on Corridor E, representing 32 percent of the total truck freight value on the corridor, passes through Virginia. North Carolina is a major generator and attractor of truck freight on Corridor E, with traffic throughout the Mid-Atlantic, the Port of Virginia facilities in the Hampton Roads Area, and the Tri-Cities Area. By tonnage, between eight and ten percent of the truck freight on the corridor originates in jurisdictions adjacent to Segment E4 and more than 12 percent of the truck freight on the corridor is destined for the segment. This includes freight that travels through the Port of Virginia facilities for which the ultimate origin or destination may be overseas. The major truck freight flows along Segment E4 are between North Carolina and the Port of Virginia facilities in the Hampton Roads Area, as well as significant flows between the port facilities and Florida.

By rail, Segment E5 carried 26 million tons of freight worth \$23 billion in 2012, and is estimated to carry 28 million tons of freight worth \$28 billion in 2025. The largest rail freight flows on Corridor E consist of low-value rail freight travelling from West Virginia to North Carolina, accounting for more than 17 percent of the total rail freight tonnage on the corridor. Rail freight between West Virginia and nearby counties in Virginia to the Port of Virginia in Norfolk accounts for more than 20 percent of the total rail freight tonnage on the corridor. In terms of rail freight value, the largest rail freight traffic patterns on Corridor E are between Illinois and the Port of Virginia, accounting for more than 20 percent of the total rail freight value on the corridor. Ohio and Louisiana are major generators of freight value on Corridor E, while North Carolina and Pennsylvania are major freight attractors. In terms of value, the jurisdictions adjacent to Segment E5 are major generators and attractors of freight on the corridor, with around 20 percent of freight origins and more than 30 percent of freight destinations on Corridor E. This includes freight that travels through the Port of Virginia facilities for which the ultimate origin or destination may be overseas.

Truck Freight



Rail Freight



E5 SEGMENT PROFILE

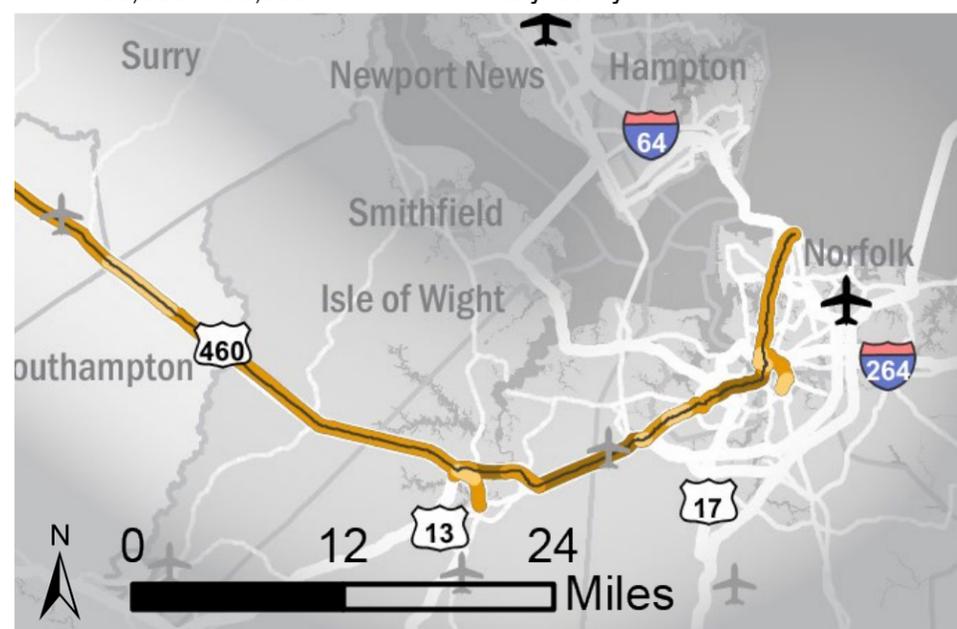
Traffic Conditions

Traffic Volume and AADT

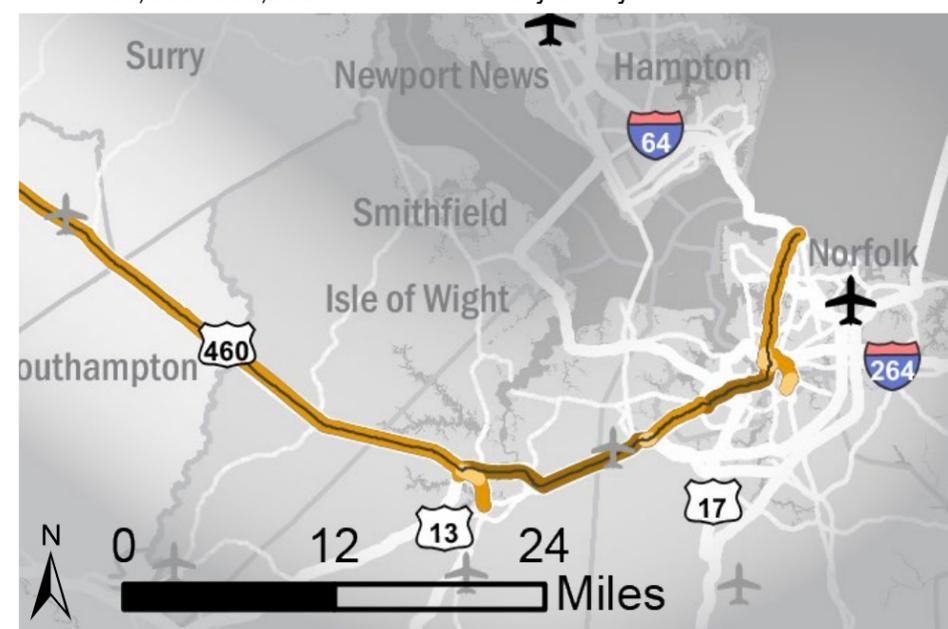
Traffic volume on Segment E5 is high relative to traffic volumes on most segments of Corridor E. Along US 460 west of US 13, average daily traffic volumes range from 10,000 to 18,000 vehicles. Along US 13/460 from US 13 to I-664, average daily traffic volumes range from 47,000 to 69,000 vehicles. On Route 460 in Norfolk, traffic volumes range from 12,000 to 36,000 vehicles per day on average. Traffic volumes are projected to increase by 2025 throughout Segment E5, with the greatest increases (26,000 additional vehicles per day) projected for I-264/I-464/US 460 Alternate near the Downtown Tunnel and the Berkley Bridge in the Cities of Portsmouth and Norfolk.



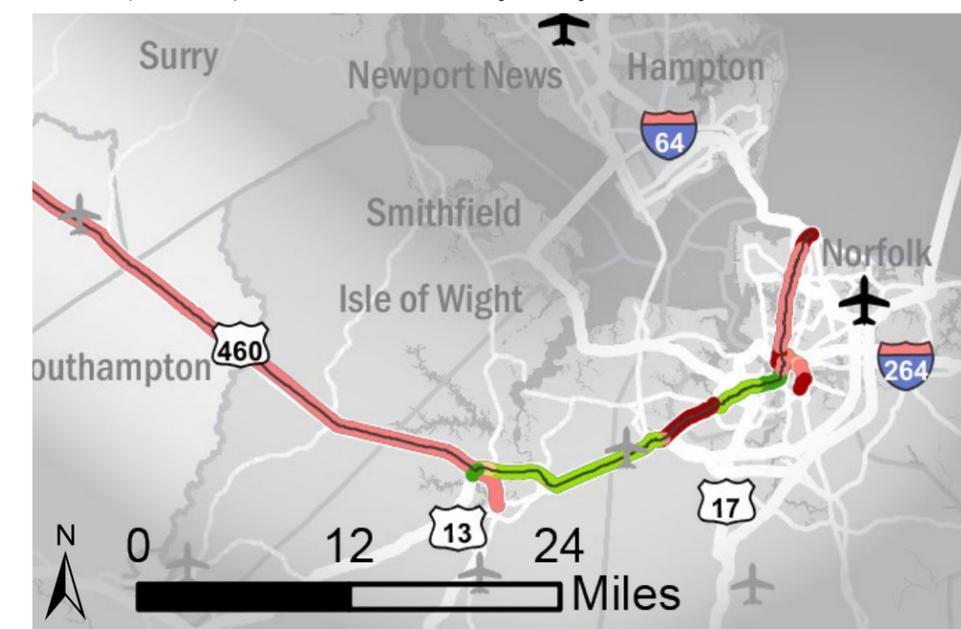
Traffic Volume 2014 (AADT)



Traffic Volume 2025 (AADT)



Change in Traffic Volume 2014- 2025 (AADT)



E5 SEGMENT PROFILE

Traffic Distribution

On average, traffic on Segment E5 is distributed throughout the day as shown in the graphs below. Weekday traffic shows two peak periods over the course of the day, with the highest hourly traffic occurring between 4 and 5 p.m. which accounts for 8.1 percent of daily traffic and morning peak between 7 and 8 a.m. accounting for 7.2 percent of daily traffic. The combined weekday traffic in the two peak periods (from 6 to 10 a.m. and from 3 to 7 p.m.) accounts for 54 percent of total daily traffic. Peaking patterns for truck traffic are different from other traffic with a single peak during the midday period and a peak hourly flow of 7.4 percent of daily traffic. Weekend traffic patterns also show a single peak during the middle of the day with the peak hour flow between 2 and 3 p.m. (7.4 percent of daily traffic) for all traffic, and 10 to 11 a.m. (7.2 percent of daily traffic) for truck traffic.

Weekday traffic volumes on Segment E5 vary by as much as 27 percent throughout the year, with the highpoint in August (around 77,000 vehicles per day) and the low point in January (around 60,000 vehicles per day). Truck volumes also vary throughout the year, with the August high (around 6,000 vehicles per day) 23 percent higher than the January low (around 5,000 vehicles per day). Weekend traffic levels also vary over the course of the year, and the highest levels of weekend traffic (June, around 59,000 vehicles per day) are 32 percent higher than January levels (around 45,000 vehicles per day). Weekend truck traffic varies similarly, and the September high is 29 percent higher than the January low. Since truck volumes account for a relatively small portion of traffic on Segment E5, traffic conditions are much more responsive to variations in automobile traffic than truck traffic.

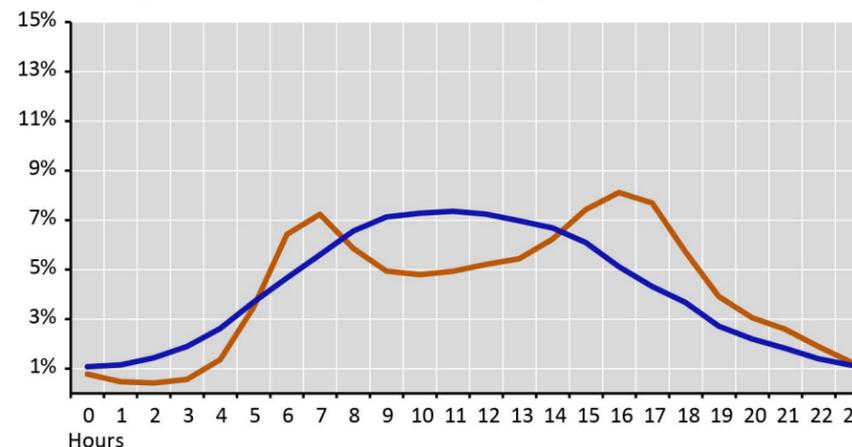
Truck Volumes

The percent of daily traffic comprised of heavy trucks on Segment E5 varies by location. Along US 460 west of the junction with US 13 in the City of Suffolk, heavy trucks comprise eight percent of total traffic. Throughout the rest of Segment E5, trucks comprise less than five percent of daily traffic volumes.

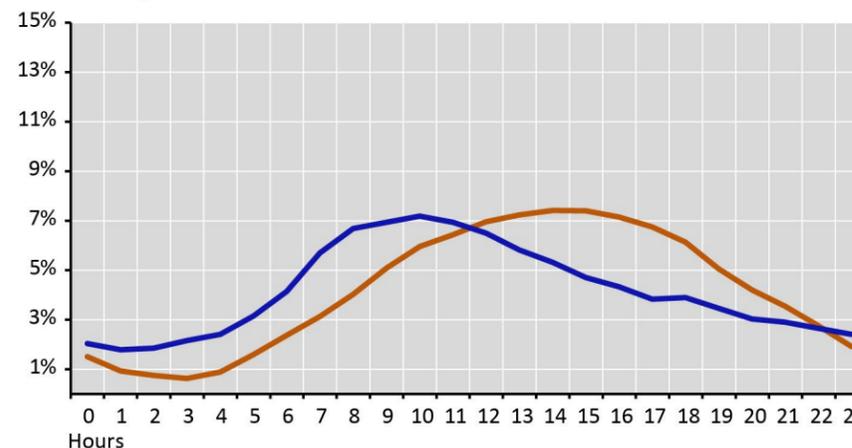
Percent Heavy Trucks



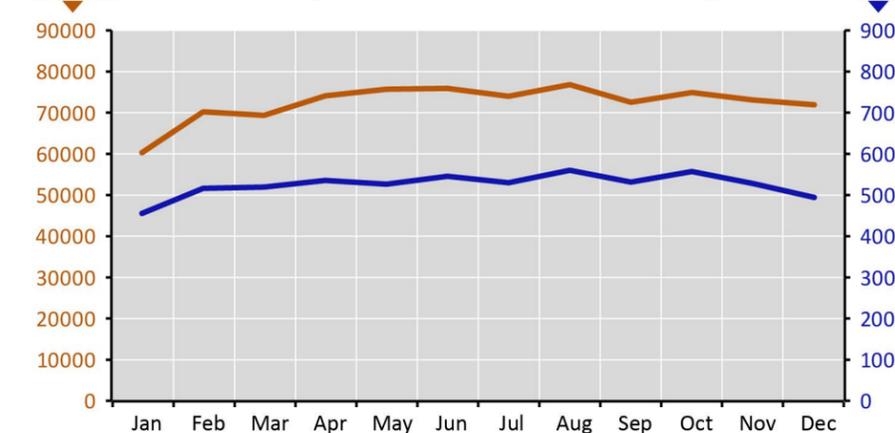
Hourly Traffic Distribution – Weekdays



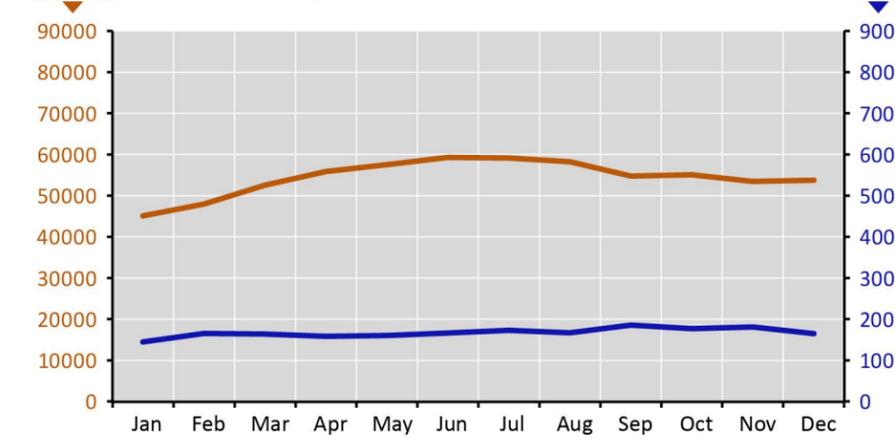
Hourly Traffic Distribution – Weekends



Monthly Traffic Distribution – Weekdays



Monthly Traffic Distribution – Weekends



 All Vehicles
 Trucks



E5 SEGMENT PROFILE

Freight Flows

In the Suffolk area, the majority of freight moves by rail, in terms of both tonnage and value. In total, almost 4 million tons (12 percent) of freight travels through this section of Segment E5 by truck, compared to 26 million tons by rail (88 percent). By value, approximately \$3 billion (12 percent) of freight travels by truck, compared to \$23 billion by rail (88 percent). On average, a ton of freight traveling through this section of Segment E5 by truck is worth \$874 while a ton of freight traveling by rail is worth \$873. In 2025, both rail and truck freight tonnages and total values in Segment E5 are expected to increase. The percentage of the freight traveling by truck is also expected to increase by both tonnage and value to 18 percent and 15 percent, respectively. Freight value per ton on trucks is expected to decrease to \$850 while the value on rail is expected to increase to \$1,012.

In the Portsmouth area, the majority of freight moves by rail in terms of tonnage. In total, more than 10 million tons (32 percent) of freight travels through this section of Segment E5 by truck, compared to 22.5 million tons by rail (68 percent). By value, the majority of freight moves by truck, with approximately \$18 billion (56 percent) of freight traveling by truck, compared to \$14 billion by rail (44 percent). On average, a ton of freight traveling through this section of Segment E5 by truck is worth \$1,709 while a ton of freight traveling by rail is worth \$616. In 2025, both rail and truck freight tonnages and total values in Segment E5 are expected to increase. The percentage of the freight traveling by truck is also expected to increase in terms of both tonnage and value to 18 percent and 15 percent, respectively. Freight value per ton on trucks is expected to increase to \$1,960 and \$756, respectively.



Annual Freight by Tonnage, 2012



Annual Freight by Tonnage, 2025



Annual Freight by Value, 2012



Annual Freight by Value, 2025



E5 SEGMENT NEEDS

Redundancy and Mode Choice



Passenger trips on Segment E5 of the Heartland Corridor have limited travel options, both in terms of travel path and mode choice. There are no directly parallel highway facilities to Segment E5, though it does access other major highway facilities in Hampton Roads, including I-64, I-264, I-664, US 13, US 17, and US 58. Based on the 2014 federal standard mileage rate of 56 cents per mile, long-distance trips would be more expensive by automobile than by bus. However, Greyhound bus service, which has stations in Norfolk, Hampton, and Virginia Beach, is limited by the frequency of service and is not as fast as the typical automobile trip. Amtrak does have stations in Newport News, Norfolk and Virginia Beach; however, routes from these stations serve the Northeast Corridor and offer limited connections to the Heartland Corridor.

Park-and-Ride

Within Segment E5, commuters can utilize many Park-and-Ride facilities, as well as commuter bus service provided by HRT. Park-and-Ride locations are evenly spread throughout the region. Virginia Beach provides the highest number of Park-and-Ride spaces and has the highest utilization rate of spaces in the region. However, no city within the Segment E5 area has a rate higher than the statewide average for Park-and-Ride utilization, which is 76 percent.

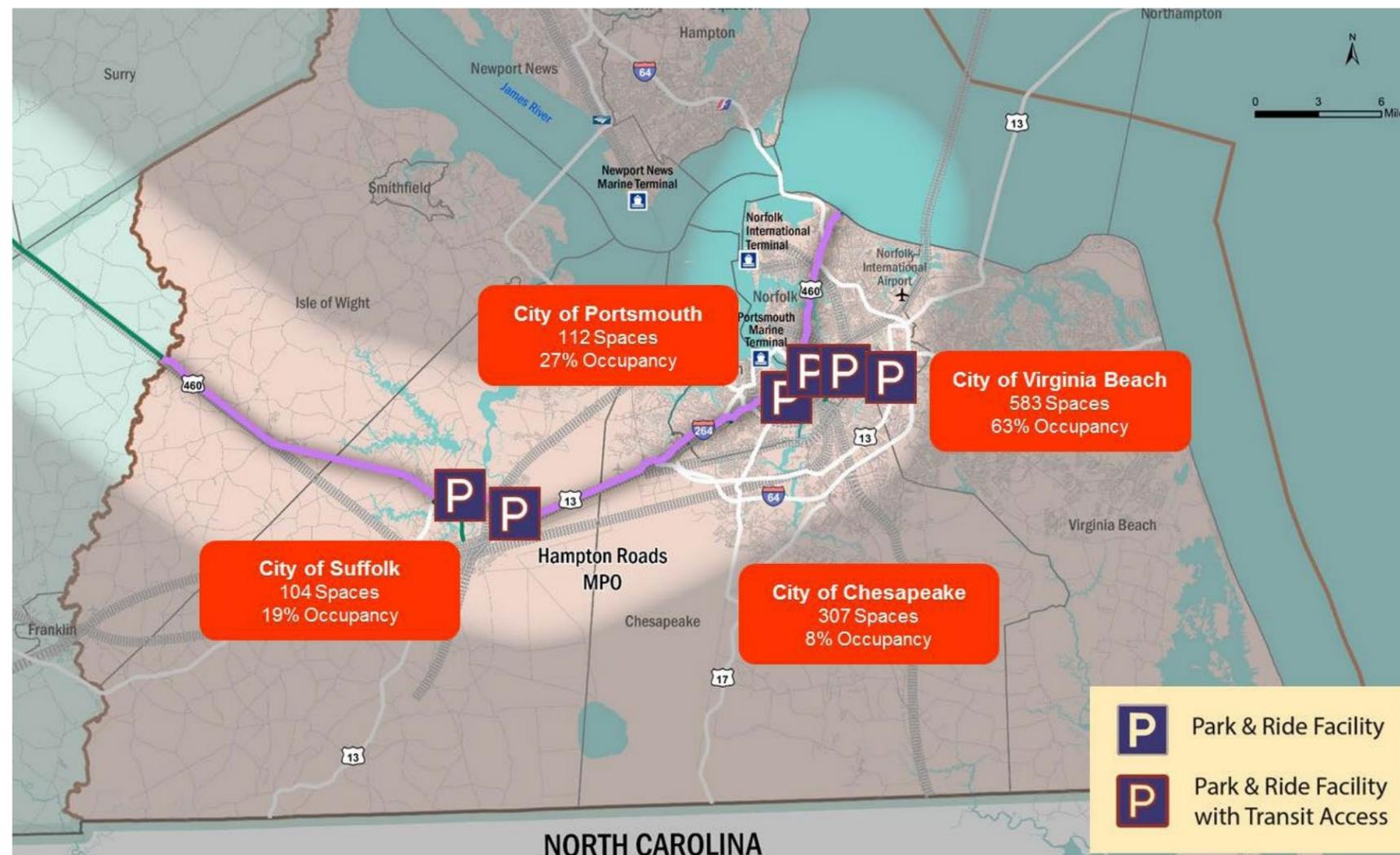
Comparable Travel Options

Hampton Roads (Norfolk) to Richmond

Inter-City Bus 5 Trips per Day 2:00 Travel Time \$11 Est. Cost	Train 5 Trips per Day 2:03 Travel Time \$23 Est. Cost
Auto Via Rt. 460: 1:56 Travel Time \$57 Est. Cost	

Hampton Roads (Norfolk) to Petersburg

Inter-City Bus 0 Trips per Day 0:00 Travel Time \$0 Est. Cost	Train 1 Trip per Day 1:27 Travel Time \$18 Est. Cost
Auto Via Rt. 460: 1:30 Travel Time \$43 Est. Cost	



E5 SEGMENT NEEDS

Safety



Between 2010 and 2012, 161 severe crashes occurred on Segment E5, which are concentrated in several areas. In Suffolk, on US 460 Business (North Main Street), there were 31 collisions over a one mile stretch between Edgewood Avenue and Lawshes Lane. In Norfolk, there were 22 crashes at the intersection of US 460 (East Brambleton Avenue) and Park Avenue adjacent to Norfolk State University, 18 incidents at the intersection of US 460 (East Brambleton Avenue) and Church Street, and 26 crashes at

the intersection of US 460 (Monticello Avenue) and East 26th Street. On US 460 (Granby Street) in Norfolk, 23 collisions took place over a distance of approximately one mile between Elvin Road and Ridgeley Road.



Performance Metrics:

Number of Severe Crashes **161**

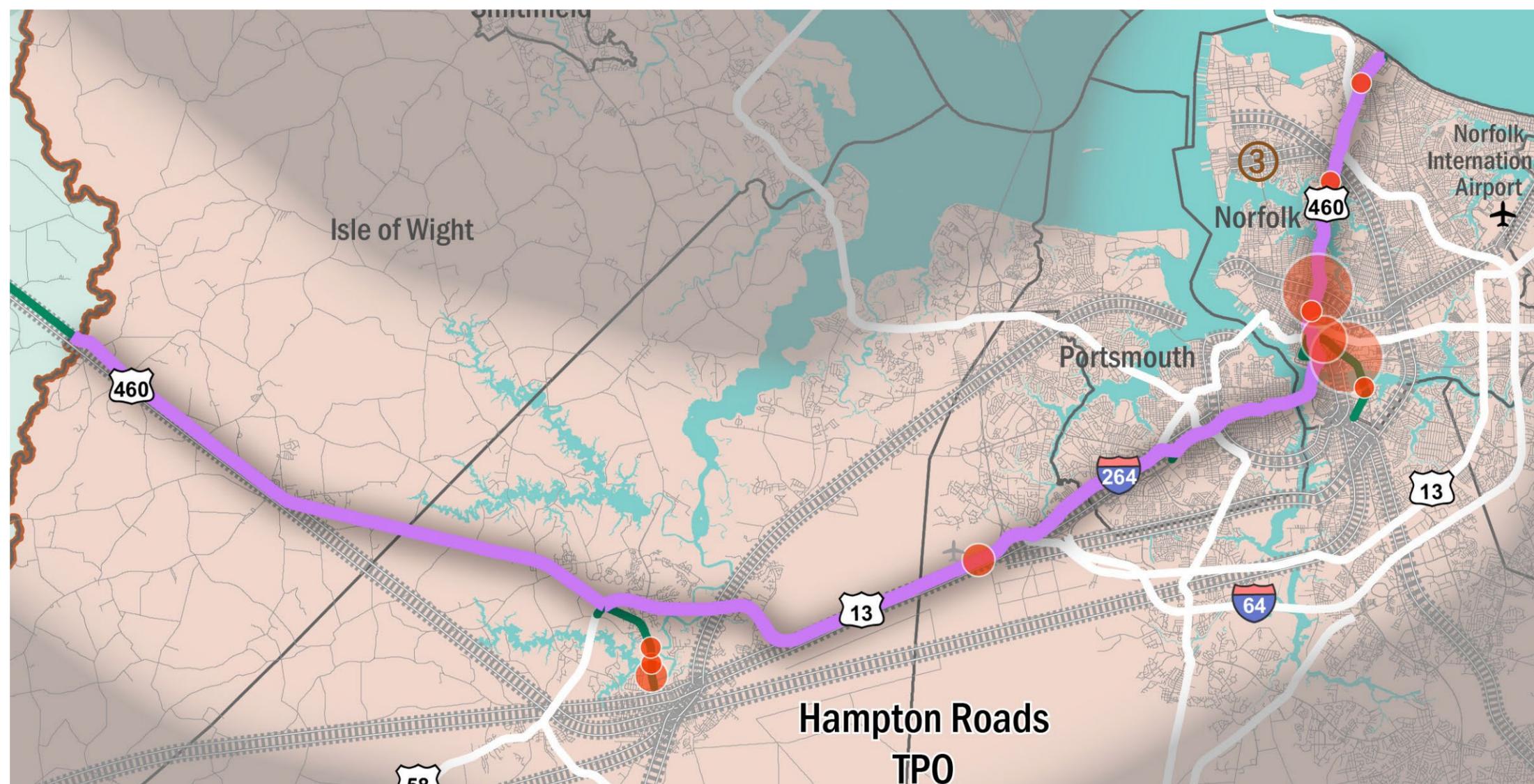
Severe Crashes/Million VMT **1.5**

Number of Railroad Crashes **3**

Fatality and Injury Crashes (2010 - 2012)



Railroad Incidents/Accidents per County (2011-2014)



E5 SEGMENT NEEDS

Congestion



Passenger Delays

Segment E5 experiences the greatest passenger delays of all Corridor E segments with over 4,000 person-hours of delay and by far the highest average delay per mile in the corridor (39 person hours per mile). In the Cities of Portsmouth and Norfolk, there are locations of significant passenger delays on US 460 and US 460 Alternate between I-264 and I-564. Delays exceed 500 person-hours per mile at the intersection of US 460 and US 58. In the City of Chesapeake, there are significant passenger delays on Route 166 near the I-464 interchange, with delays approaching 600 person-hours per mile near Freeman Avenue. In the City of Suffolk, there are significant passenger delays on US 460 Business south of US 13. Peak-period passenger delays account for 38 percent of daily congestion, which is slightly lower than average for the peak-period share of congestion along CoSS segments.

Performance Metrics:

Person Hours of Delay per Mile

39

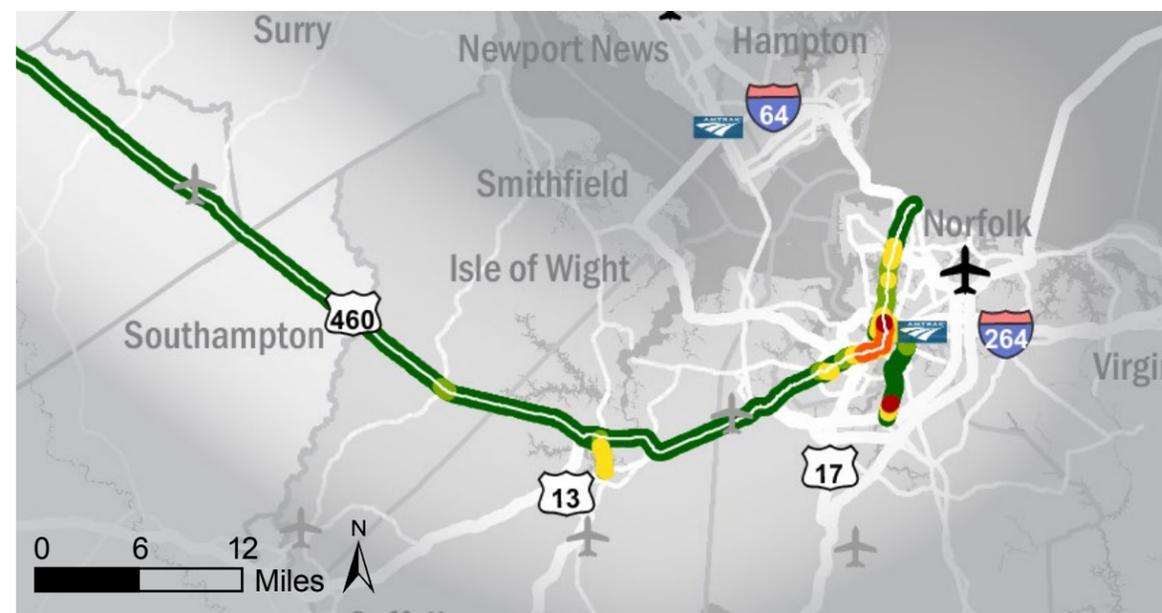
Freight Ton Hours of Delay per Mile

33.4K

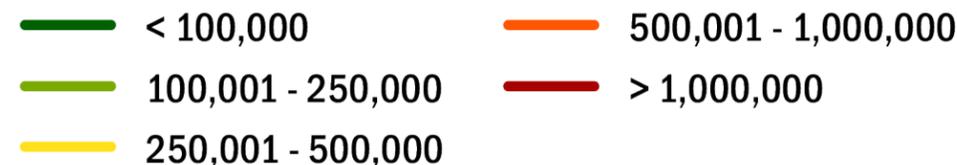
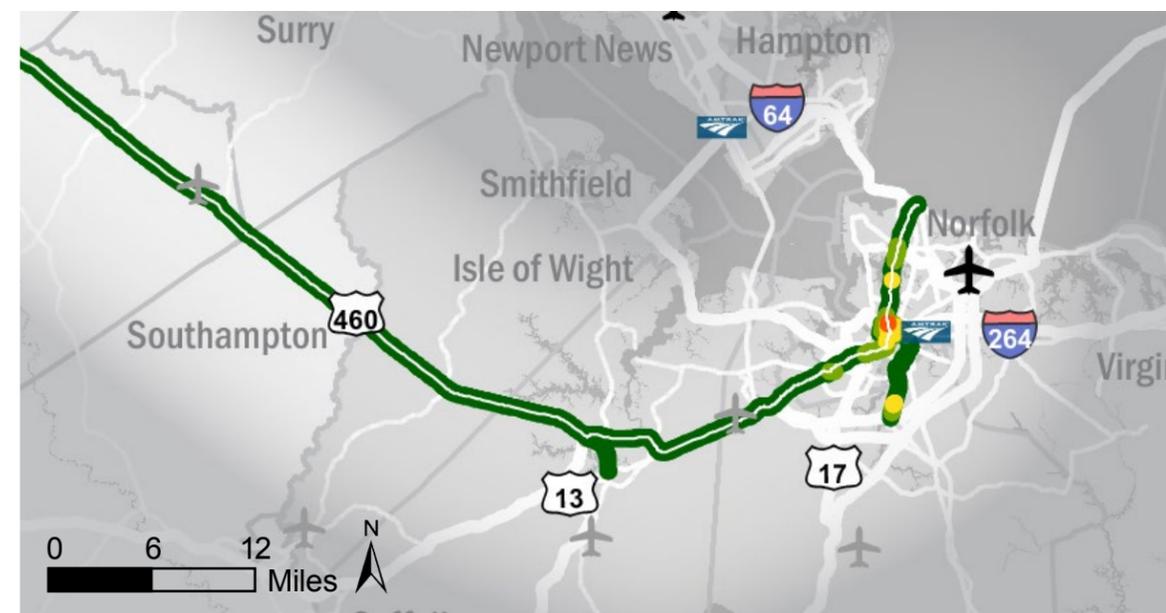
Freight Delays

Segment E5 experiences the second greatest freight delay of all Corridor E segments, behind Segment E2, with over 3.5 million ton-hours of delay. On a per-mile basis, freight traffic on this segment experiences over 33,000 ton-hours per mile delay. In the City of Norfolk, significant freight delay occurs on US 460 and US 460 Alternate south of US 58. In the City of Chesapeake, there is a location of significant freight delay on US 460 near Freeman Avenue. Peak-period freight delays account for 35 percent of daily congestion, which is marginally higher than average for the peak-period share of congestion along CoSS segments.

Daily Person Hours of Delay per Mile



Daily Freight Ton Hours of Delay per Mile



E5 SEGMENT NEEDS

Reliability



Weekday Peak

Reliability of travel during the peak period on a typical weekday on Segment E5 ranges from 0.02 to 0.59 in terms of reliability index, with an average value of 0.18. While this segment does have a peak period reliability index higher than average for the CoSS segments statewide, none of the locations along Segment E5 have reliability index values exceeding the statewide threshold.

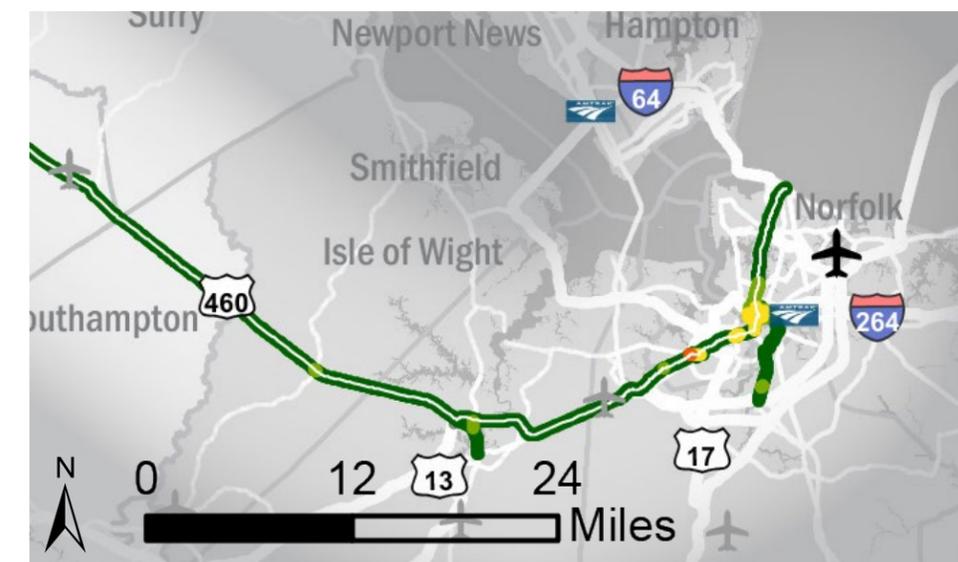
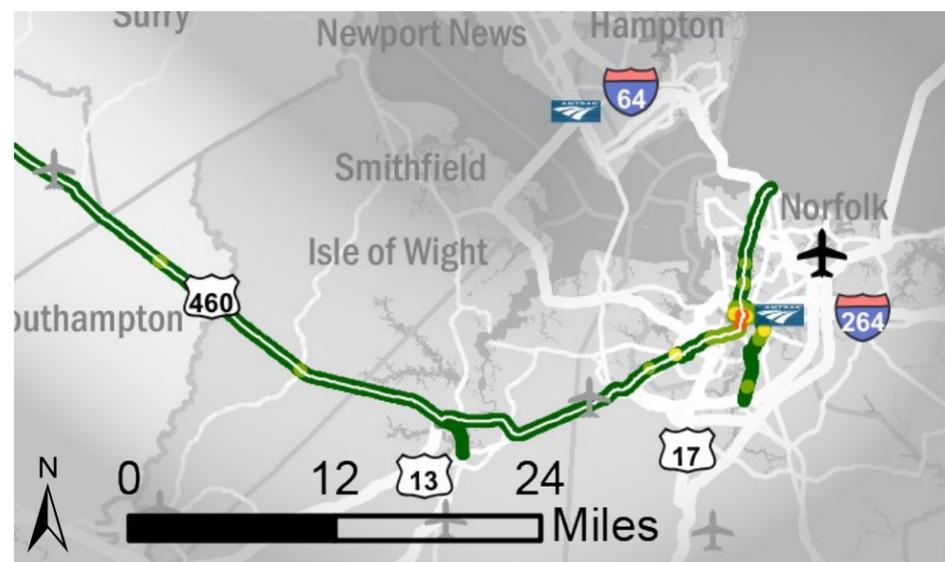
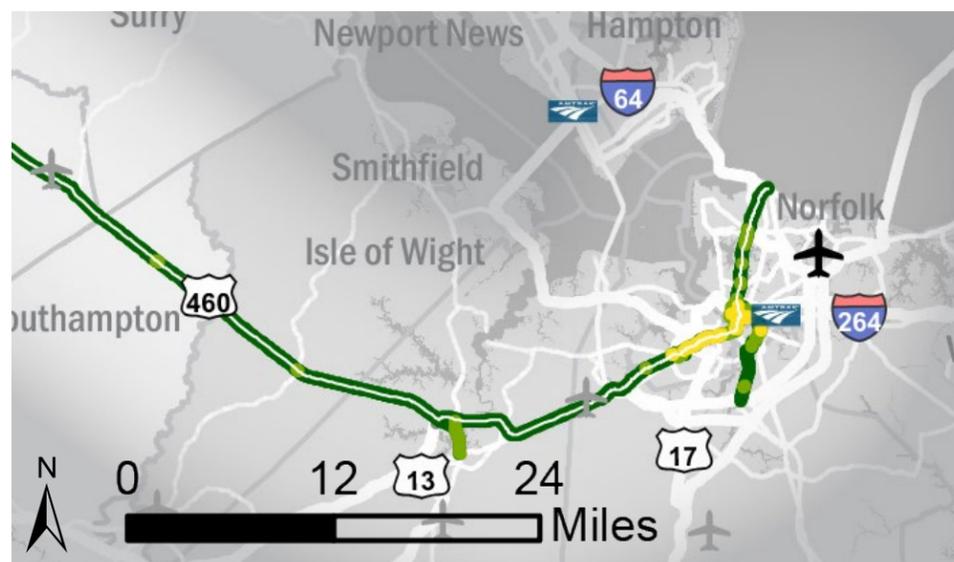
Weekday

Reliability of travel during a typical weekday ranges from 0.02 to 0.64 in terms of reliability index, with an average value of 0.16. This segment has a weekday reliability index much higher than average for the CoSS segments statewide, and includes several locations where the reliability index value exceeds the statewide threshold:

- US 460 Alternate at Route 337 in the City of Portsmouth;
- East City Hall Avenue near US 460 in the City of Norfolk; and
- On US 460 southbound on the Berkley Bridge in the City of Norfolk.

Weekend

Reliability of travel during a typical weekend ranges from 0.00 to 0.78 in terms of reliability index, with an average value of 0.15. While this segment does have a weekend reliability index higher than average for the CoSS segments statewide, only a short segment on US 460 Alternate at Route 337 in the City of Portsmouth has a reliability index value exceeding the statewide threshold.



Reliability Index

- | | |
|-----------|-----------------------------|
| < 0.2 | 0.6 - 0.8 |
| 0.2 - 0.4 | > 0.8 |
| 0.4 - 0.6 | Primary facility (in white) |

Statewide reliability index thresholds have been set for weekday peak, weekday and weekend travel to assess the reliability of travel on each segment on all corridors of statewide significance. A higher reliability index indicates that travel times are more unreliable. The following are the reliability index thresholds:

- Weekday Peak - 0.80
- Weekday - 0.40
- Weekend - 0.60



E5 SEGMENT NEEDS

Summary of Needs

Identified locations are approximate. See "Summary of Needs" table on the following page for details.

Redundancy **Mode Choice**



Safety



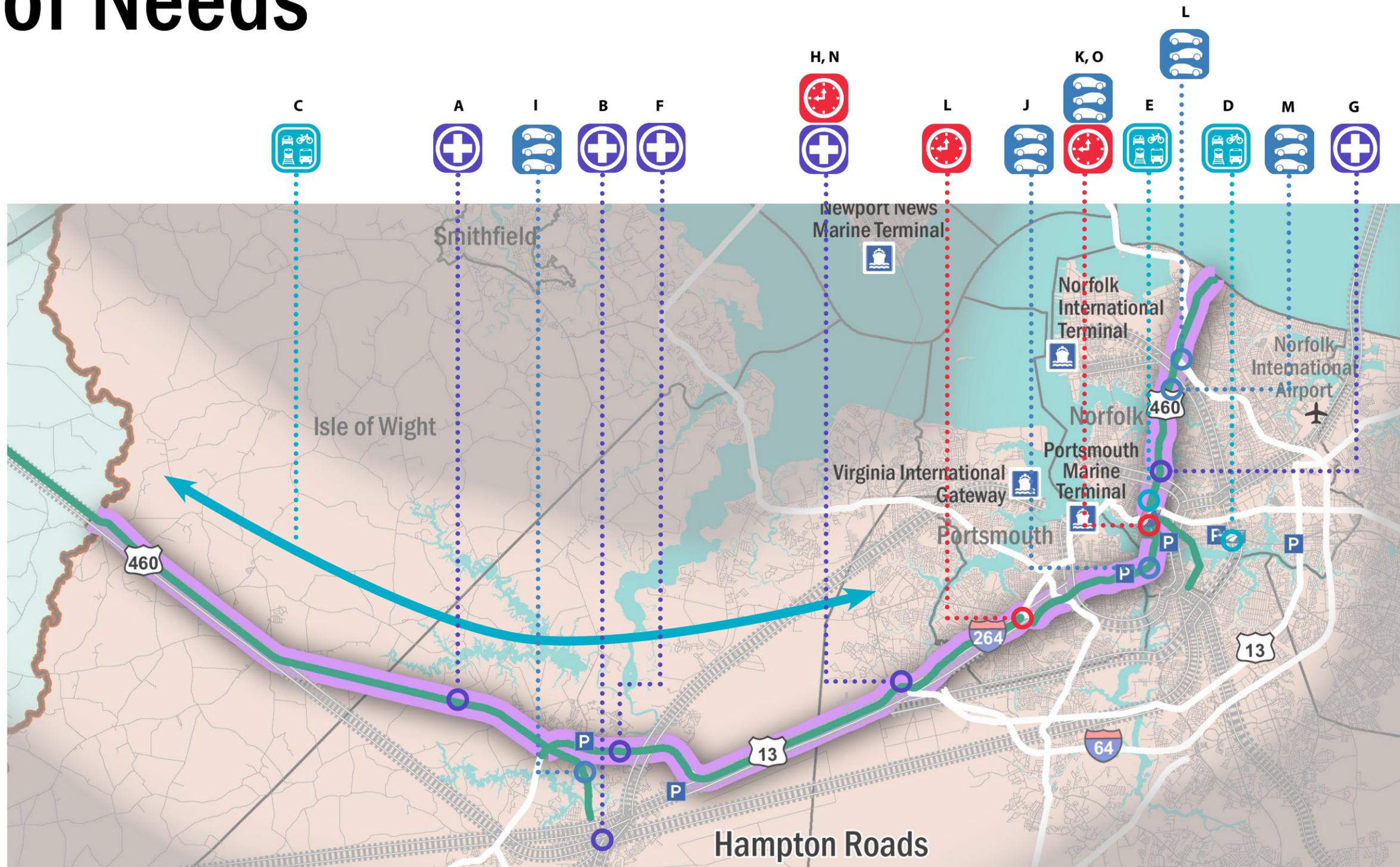
Congestion



Bottlenecks



Reliability



E5 SEGMENT NEEDS

Summary of Needs - E5 Segment

A.		Safety concerns on US 460 in Suffolk related to lack of median on heavily trafficked roadway
B.		Safety concerns related to numerous at-grade rail crossings in downtown Suffolk
C.		No parallel highway facility for US 460 exists
D.		Passenger rail service does not offer direct connections to corridor communities west of Petersburg; rail service to Petersburg is only once per day
E.		Bus service does not offer direct connection to any other cities in the corridor
F.		US 460-Business in downtown Suffolk: 31 severe crashes
G.		US 460 from Park Avenue to E 26th Street in Norfolk: 66 severe crashes
H.		US 460 at Hampton Roads Executive Airport in Chesapeake: 15 severe crashes

Summary of Needs - E5 Segment

I.		Congestion issue on US 460 Business between US 58/US 460/US 13 and US 58 Business/US 460 Business in Suffolk
J.		Congestion issue on US 460-Alt/I-264 between US 17 in Portsmouth and VA Route 168 (East Brambleton Avenue) in Norfolk
K.		Congestion issue at US 460 and US 58 in Norfolk
L.		Congestion issue at US 460 and I-564 in Norfolk
M.		Congestion issue at US 460 and Willow Wood Road in Norfolk
N.		Reliability issue on US 460 at I-664 intersection in Chesapeake
O.		Reliability issue on US 460 at US 58 intersection in downtown Norfolk