INTERSTATE 64 PENINSULA STUDY

PURPOSE AND NEED TECHNICAL MEMORANDUM



OCTOBER 2012


VDOT
Virginia Department of Transportation

1401 EAST BROAD STREET
RICHMOND, VA 23219

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
FHWA	Federal Highway Administration
HOV	High Occupancy Vehicle
I	Interstate
LOS	Level of Service
MPO	Metropolitan Planning Organization
NHS	National Highway System
PCE	Passenger Car Equivalent
SSD	Stopping Sight Distance
STRAHNET	Strategic Highway Network
VDOT	Virginia Department of Transportation

I. Study Area

A. Description

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is evaluating options to improve the 75 mile long Interstate 64 (I-64) corridor from the Interstate 95 (I-95) (Exit 190) interchange in the City of Richmond to the Interstate 664 (I-664) (Exit 264) interchange in the City of Hampton (**Figure 1**). This study is known as the Interstate 64 Peninsula Study (hereinafter referred to as the I-64 Study in this document).

The number of lanes on existing I-64 varies throughout the study area. In the vicinity of the City of Richmond, from Exit 190 to Exit 197, there are generally three travel lanes in each direction. Between Exit 197 and mile marker 254, there are generally two travel lanes in each direction. Beginning at mile marker 254 and continuing east to the City of Hampton area, I-64 widens to four lanes in each direction with three general purpose lanes and one 2+ person High Occupancy Vehicle (HOV 2+) lane during the AM and PM peak periods. There are some additional lanes between closely spaced interchanges at the eastern end of the corridor to provide for easier merging of traffic on and off of the I-64 mainline.

B. Corridor Functions

I-64 runs east to west through the middle of the state from West Virginia to the Hampton Roads region, for a total of 298 miles. Within the study area, I-64 connects the Richmond metropolitan area to the Norfolk/Hampton Roads area and is an important link in the interstate system. I-64 is part of the National Highway System (NHS) and the Strategic Highway Network (STRAHNET) and is designated by VDOT as a Corridor of Statewide Significance in VTrans 2035 (Virginia's statewide multimodal transportation policy plan). In addition to being a connecting corridor between urban areas, the corridor serves numerous purposes, including:

- Daily commuting for residents and business trips.
- Providing access to tourist attractions throughout the region.
- Providing access to, from and between military facilities.
- Transporting freight in and out of the Port of Virginia.
- Acting as an emergency evacuation route, particularly during hurricane events affecting the Hampton Roads region.

Within the 75 mile long study area, the I-64 corridor includes 25 interchanges and 109 major bridge structures on or over the interstate. There are several park and ride lots near interchanges along the corridor, along with two rest stops (one in each direction) which includes a Welcome Center in New Kent County. Additionally there are weigh stations in each direction between Exits 200 and 205. The corridor is also paralleled by a CSX railroad, which also supports Amtrak passenger rail operations between Richmond and Newport News.

II. History

Construction of the interstate within the project study area was initiated in the early 1960s. Since then, a number of studies and improvement projects have been completed along the corridor including:

- Major Investment Study (June 1999).
- Widening projects (various projects between 1979 and 2006).
- Interchange upgrades (various projects between 1981 and 2006).
- Addition of HOV lanes in the Hampton Roads area (2001).

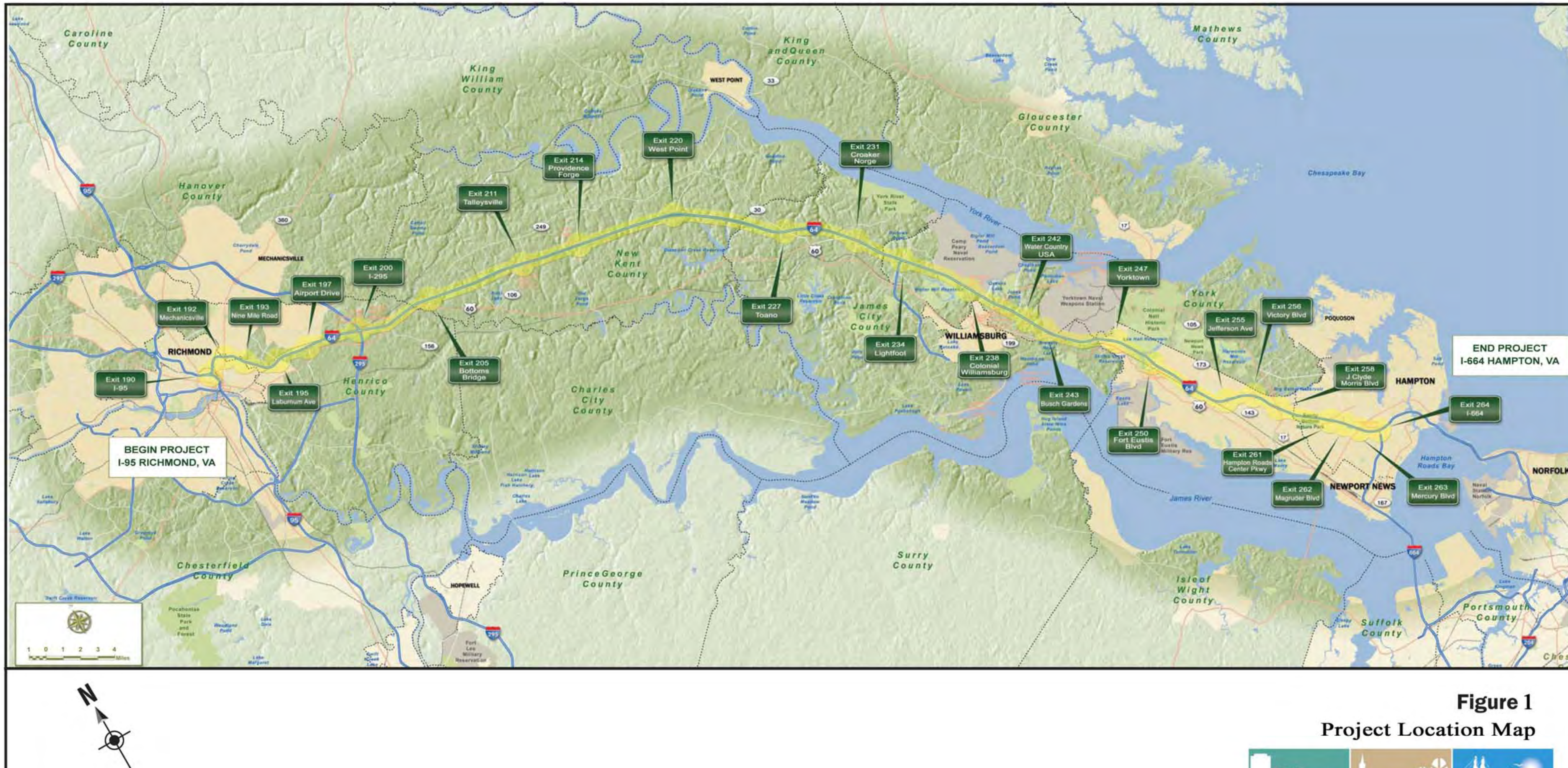


Figure 1
Project Location Map

I-64 PENINSULA STUDY ENVIRONMENTAL IMPACT STATEMENT

- A contraflow lane reversal system from I-295 to Route 60 east of the Hampton Roads Bridge-Tunnel, put in place to help evacuate motorists from the Hampton Roads area in the event of a hurricane event (2006).

Over the last 30 years, 24 of the major bridge structures on or over I-64 have been reconstructed beginning in 1977 with the Route 641 (Penniman Road) bridge in York County and the most recent in 2006 at Meadow Road in Henrico County. A few of the major improvement projects along this corridor include:

- The 6.5 mile long section of I-64 in Hampton from just west of Route 134 (Magruder Boulevard), to Route 143 (Mallory Street) just west of the Hampton Roads Bridge-Tunnel was widened from four lanes to six lanes, built in sections from 1979 to 1988.
- The I-64/I-664 interchange and 1.2 miles of I-664 in Hampton was completed and opened in 1981, and the first widening project on I-64 of one mile in the I-664 interchange area was part of that project.
- The 4.0 mile I-64 section from Route 17 (J Clyde Morris Boulevard) to east of Hampton Roads Center Parkway, was widened from four lanes to six lanes in two projects from 1990 to 1995.
- A new flyover ramp from I-295 southbound to I-64 eastbound was completed and opened in June 2001.
- The new Exit 243 interchange for the entrance to Busch Gardens near Williamsburg was completed in 2002.
- An eight-lane widening project was completed in July 2006 along a 10.7 mile stretch of I-64 from 0.5 miles west of Bland Boulevard in Newport News to the I-664/I-64 interchange in Hampton.

III. Needs

The following sections present the identified needs to be addressed during this the I-64 Study. The specific needs were developed based on a comprehensive review of previous studies along with the analysis of current data compiled for this study, including information collected through numerous meetings with federal, state and local agencies; cooperating and participating agencies; project stakeholders and the public.

The major planning documents and studies utilized to prepare this Purpose and Need Technical Memorandum include:

- 2035 Long Range Transportation Plan (Richmond Area Metropolitan Planning Organization).
- 2035 Long Range Transportation Plan (Hampton Roads Transportation Planning Organization).
- 2035 Rural Long Range Transportation Plan (Richmond Area Metropolitan Planning Organization).
- 2035 Rural Long Range Transportation Plan (Hampton Roads Planning District Commission).
- VTrans 2025.
- VTrans 2035.
- Virginia Statewide Multimodal Freight Study (2011).
- Locality Comprehensive Plans:
    - City of Richmond Master Plan and associated documents (2001).
    - Henrico County 2026 Comprehensive Plan (2009).
    - Vision 2020 New Kent County Comprehensive Plan (2003).
    - James City County Comprehensive Plan (2009).
    - City of Williamsburg Comprehensive Plan (2006).
    - York County Comprehensive Plan (various dates).
    - Framework for the Future 2030 (City of Newport News, 2008).

- o City of Hampton Community Plan (2006).
- I-64 Major Investment Study (June 1999).
- Richmond/Hampton Roads Passenger Rail Tier I DEIS (2010).
- Hampton Roads Military Transportation Needs Study (Hampton Roads Transportation Planning Organization, September 2011).

A. Base Conditions

After reviewing the many elements and conditions throughout the I-64 study area corridor, it was determined that multiple conditions exist creating numerous needs for improvements within the I-64 corridor. These identified needs have been grouped into three categories and include:

1. Capacity

- Provide for increased capacity in order to reduce travel delays.
- Improve access to tourist attractions throughout the region.
- Improve connectivity to, from and between military installations.
- Provide for increased demand from the freight industry.
- Provide for the efficient transporting of freight in and out of the Port of Virginia.
- Support the current economic development needs along the corridor and in the region.

2. Roadway Deficiencies

- Minimize roadway geometric and structure deficiencies on the I-64 mainline and at the interchanges.

3. Safety

- Improve safety by reducing congestion and improving roadway design geometrics to meet current standards for interstate highways.

Further descriptions of each of these identified needs are presented in the following sections.

1. Capacity

Problem Statement *– The 2011 traffic volumes on I-64 are higher than the current facility can adequately accommodate, particularly during peak travel times. Traffic volumes are anticipated to increase in the future, exacerbating existing congestion issues.*

a. Travel Delays and Tourism Access

According to the 2010 *Highway Capacity Manual* published by the Transportation Research Board, to maintain stable flow, an interstate corridor in urban areas should not exceed 65,000 to 75,000 vehicles per day (also known as Average Daily Traffic, or ADT) for a four-lane freeway (two lanes in each direction) and 100,000 to 113,000 vehicles per day for a six-lane freeway (three lanes in each direction). This would apply to the eastern and western ends of the I-64 corridor. The middle of the corridor, which is considered a rural area, should not exceed 50,000 to 55,000 vehicles per day for a four-lane freeway and 74,000 to 82,000 vehicles per day for a six-lane freeway. This information is summarized in **Table 1**. **Figure 2** represents 2011 Base Conditions. In this study, "Base" Conditions refers to the worst peak conditions that occur during any hours or seasons. As shown in **Figure 2**, current traffic volumes on I-64 range from 38,500 ADT between Exits 197 and 200 to 155,800 ADT between Exits 262 and 263. As indicated in **Figure 2**, traffic volumes are generally highest between Exits 190 and 192 in the City of Richmond and between Exits 255 and 264 in Cities of Newport News and Hampton. After reviewing the traffic data collected and obtained, it was determined that the weekday morning peak period for the project area is generally 6:30 AM to 9:00 AM, while the weekday evening peak period falls between 4:00 PM and 6:00 PM. The summer peak periods in the eastern portion of the study area are during Saturday mornings (9:00 AM – 10:00 AM) and Sunday afternoons (2:00 PM – 3:00 PM). More detailed traffic information can be found in the ***Traffic and Transportation Technical Memorandum***.

Table 1: General Ranges of ADT for Urban and Rural Freeway Facilities Operating at LOS C

Element	Urban Areas	Rural Areas
Four-Lane Highway (2 Lanes in Each Direction)	65,000 – 75,000 ADT	50,000 – 55,000 ADT
Six-Lane Highway (3 Lanes in Each Direction)	100,000 – 113,000 ADT	74,000 – 82,000 ADT
Eight-Lane Highway (4 Lanes in Each Direction)	134,000 – 150,000 ADT	99,000 – 110,000 ADT

Note: Vehicles per day are shown assuming a Level of Service C
Source: Highway Capacity Manual, 2010

The traffic studies for this project focused on weekday morning and afternoon peak hour periods throughout the year (i.e. typical rush hour conditions) as well as conditions during summer weekends. In many parts of the corridor, summer Saturday or Sunday conditions can have higher volumes and worse congestion than weekday morning and afternoon peak periods, due to the high levels of tourist traffic destined for tourist attractions within the corridor (e.g., Busch Gardens, Colonial Williamsburg, Water Country USA) and/or tourist attractions outside the corridor (e.g., the Northern Neck region of Virginia, Virginia Beach, the Outer Banks region of North Carolina). As a result of a speed study conducted for this project, it was determined that travel speeds drop to as low as 20 mph between Mileposts 244-250 and approaching Exit 264, as shown in **Figures 3A and 3B**. Furthermore, this congestion and decrease in travel speeds can negatively affect incident response, which is related to safety concerns described later in this chapter.

Figure 2: 2011 Base Conditions Average Daily Traffic

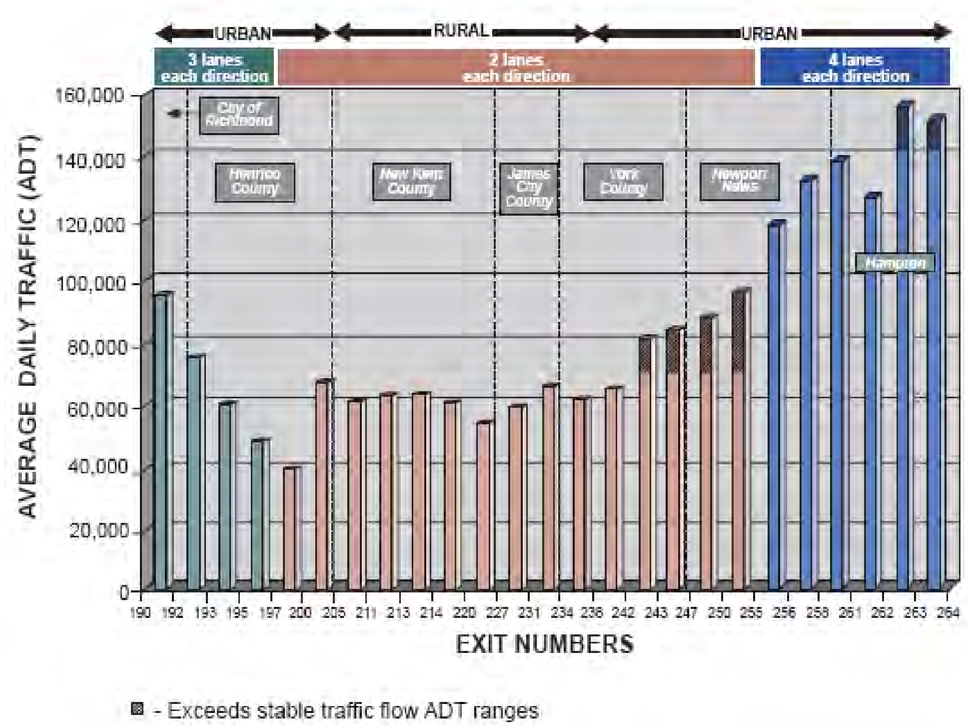
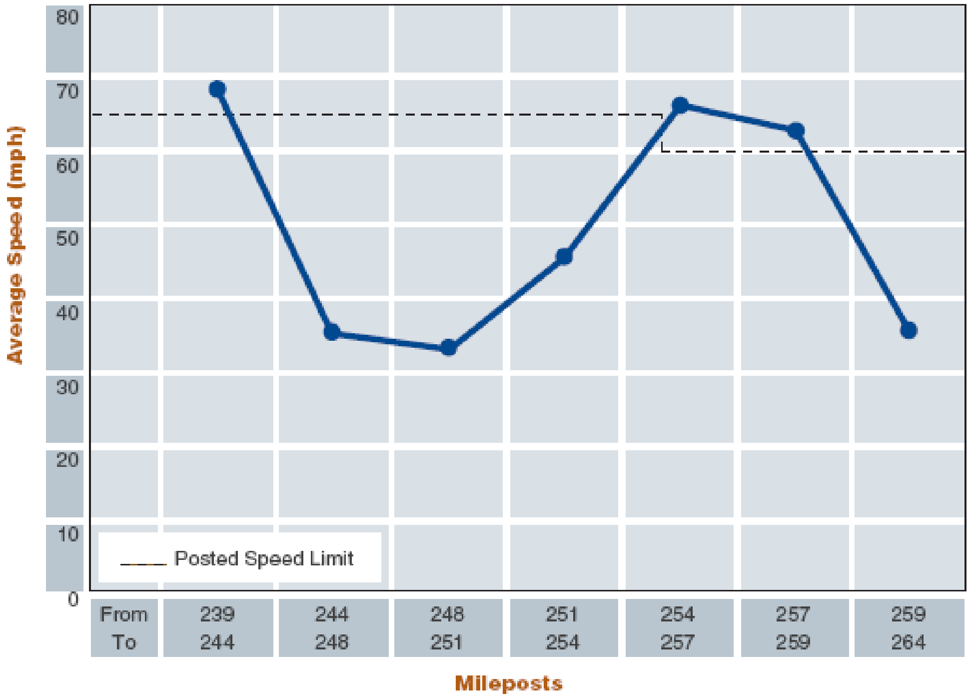
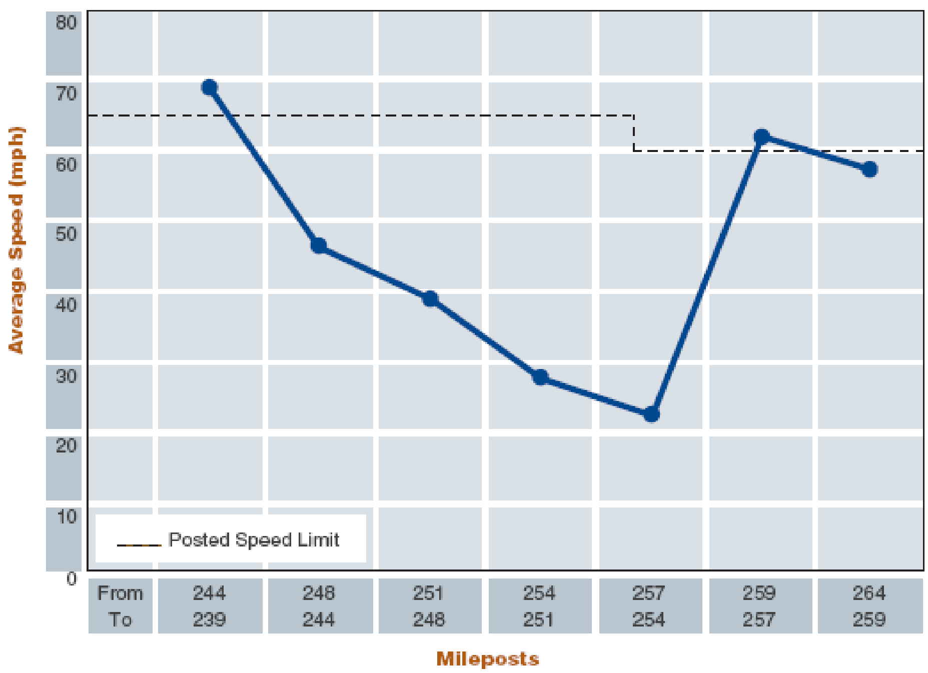


Figure 3A: 2011 Average Travel Speeds Between Exits 239 and 264 (Eastbound)



Source: McCormick Taylor, Inc., *I-64 Travel Time Study*, 2011

Figure 3B: 2011 Average Travel Speeds Between Exits 239 and 264 (Westbound)

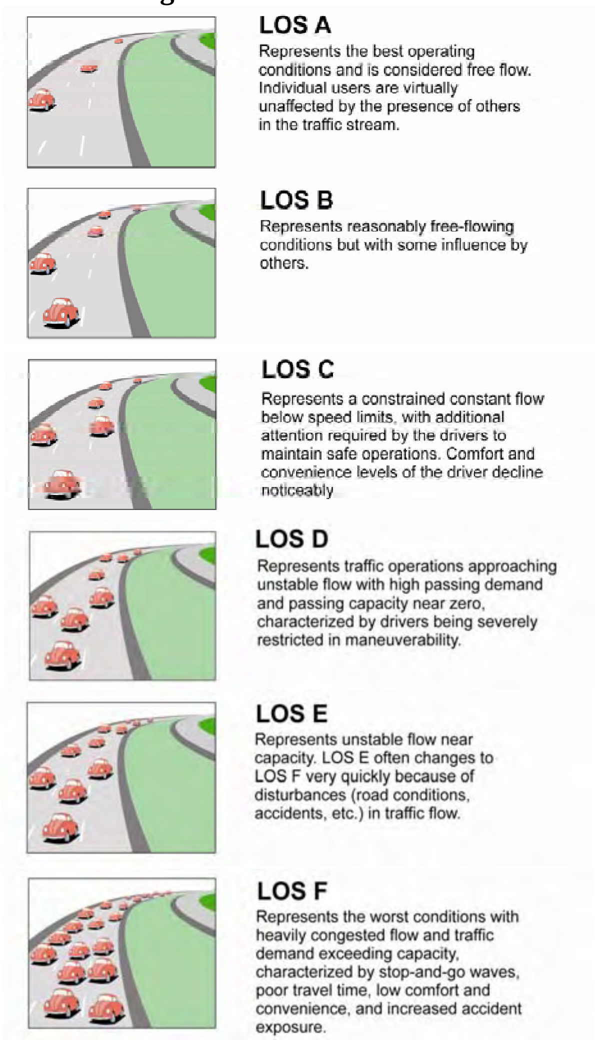


Source: McCormick Taylor, Inc., *I-64 Travel Time Study*, 2011

Level of Service (LOS) is a letter grade (A-F) which represents a qualitative measure of operational conditions within a traffic stream, generally in terms of such measures as speed and travel time, freedom to maneuver and traffic interruptions. For this study, LOS was determined using the procedures of the

2010 *Highway Capacity Manual*. **Figure 4** shows LOS grades corresponding to different traffic conditions/operations.

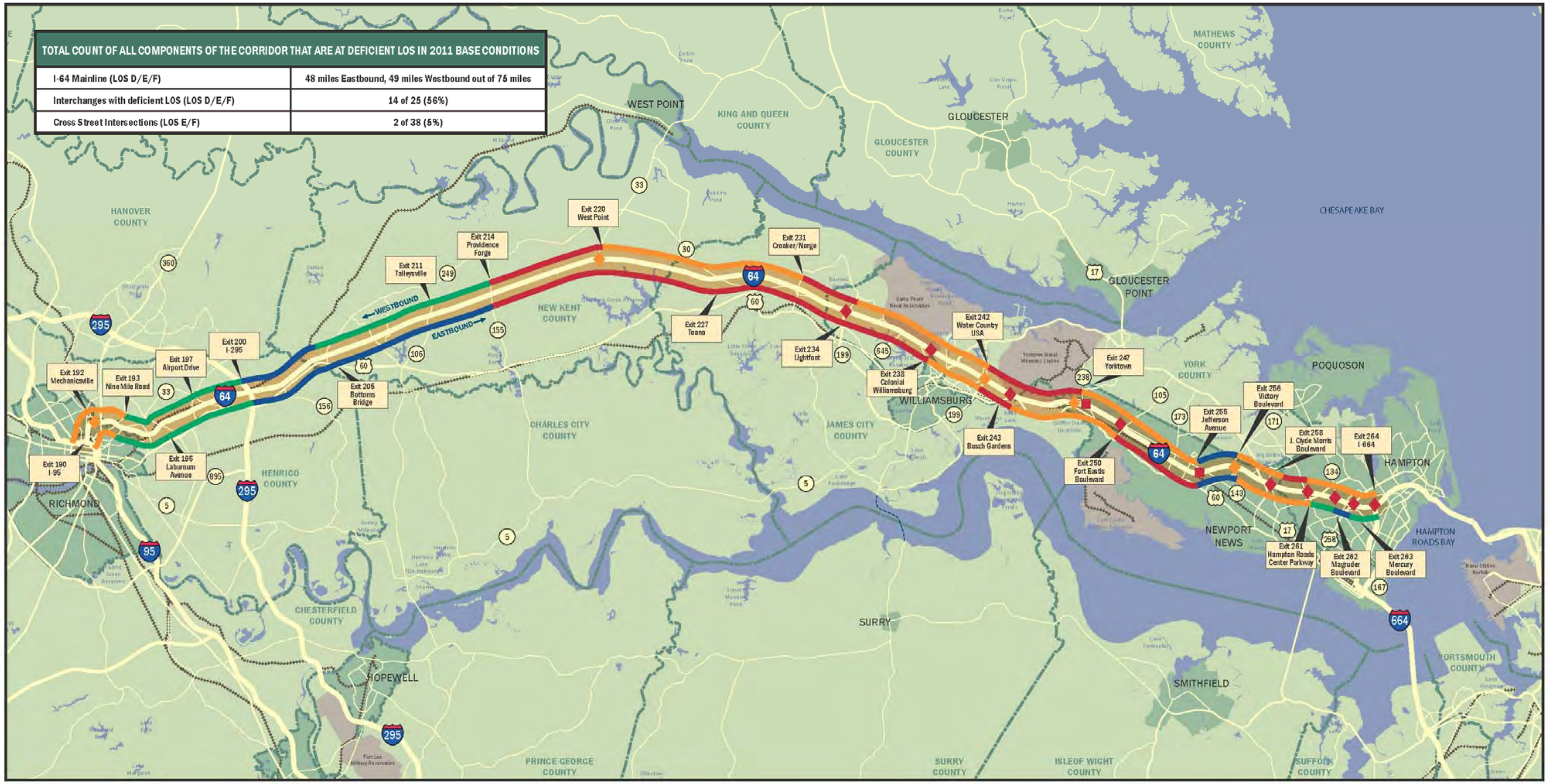
Figure 4: Levels of Service



A Policy on Geometric Design of Highways and Streets, published by the American Association of State Highway and Transportation Officials (AASHTO), is referenced in the Code of Federal Regulations and is used to provide the LOS standard for highways on the NHS, which includes I-64. The LOS standard for mainline operations along freeway facilities is LOS B in rural areas and LOS C in urban areas. Based on FHWA guidelines, I-64 is considered both a rural and an urban freeway in different sections of the corridor. To be consistent, a goal of LOS C or better was established for all mainline segments of I-64. The same goal was be applied to the ramps and weave areas (the crossing of two or more traffic streams traveling in the same direction along a substantial length of highway) on I-64.

As shown in **Figure 5**, there are numerous mainline segments, ramps, weaving areas, and intersections within the corridor that currently operate below those acceptable LOS thresholds during 2011 Base

TOTAL COUNT OF ALL COMPONENTS OF THE CORRIDOR THAT ARE AT DEFICIENT LOS IN 2011 BASE CONDITIONS	
I-64 Mainline (LOS D/E/F)	48 miles Eastbound, 49 miles Westbound out of 75 miles
Interchanges with deficient LOS (LOS D/E/F)	14 of 25 (56%)
Cross Street Intersections (LOS E/F)	2 of 38 (5%)



N

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LEGEND

- = Freeway Level of Service A/B
- = Freeway Level of Service C
- = Freeway Level of Service D
- = Freeway Level of Service E/F
- = Ramp/Weave at Level of Service D
- = Cross Street Intersection at Level of Service D
- = Ramp/Weave at Level of Service E/F
- = Cross Street Intersection at Level of Service E/F

Note:
Level of Service indicated represents worst case of AM, PM, Saturday and/or Sunday peak period analyses.

Figure 5
I-64 Eastbound and Westbound Level of Service – Mainline and Deficient Ramp/Weave/Intersection 2011 Base Conditions

I-64 PENINSULA STUDY ENVIRONMENTAL IMPACT STATEMENT

Conditions. **Table 2** summarizes the corridor components that are experiencing a LOS D or worse during peak periods.

Table 2: Total Count of all Components of the Corridor that are at Deficient LOS in 2011 Base Conditions

Element	Deficient LOS
I-64 Mainline (LOS D/E/F)	48 of 75 miles eastbound (64%) 49 of 75 miles westbound (65%)
Interchanges (LOS D/E/F)	14 of 25 (56%)
Cross Street Intersections (LOS E/F)	2 of 38 (5%)

Approximately two-thirds of the I-64 mainline operates at a deficient LOS during Base Conditions, particularly the segment closest to I-95 at the western end of the corridor and virtually the entire stretch of I-64 from Exit 214 (Providence Forge) in New Kent County to Exit 264 (I-664) in Hampton.

There are two ramps along westbound I-64 (at Exits 258 and 261) and one weaving area along eastbound I-64 (between Exits 262 and 263) that currently operate at LOS F during the PM peak hour. Some of the intersections at the ramp termini, particularly at Exits 247 and 255 are also over capacity (LOS E/F). The traffic volumes exceed what the roadway is able to accommodate. These capacity constraints cause ramp backups that can extend onto the I-64 mainline, creating serious operational and safety concerns. Full details on current peak hour traffic operations and LOS can be found in the ***Traffic and Transportation Technical Memorandum***.

In addition to the daily commuting and tourist needs, there are a number of other key factors that are contributing to the capacity issues within the I-64 corridor from Richmond to Hampton, including:

- Military personnel, civilian workforce and freight movements to, from and between military facilities.
- Freight traffic in and out of the Port of Virginia.
- Economic development needs along the I-64 corridor and in the region.

The following sections further describe these user groups and their needs in relation to I-64's capacity issues.

b. Military Facilities and Movement

There is a large military presence in Hampton Roads and throughout the Tidewater area, with each branch of the armed forces represented contributing over 11 billion dollars into the local economy annually. Located at the eastern end of the I-64 Study, the Hampton Roads area has the world's largest naval facility. The Navy owns 36,000 acres and more than 6,750 buildings in the area. The Hampton Roads area has been divided into five sub-areas; Norfolk, Little Creek, Portsmouth, Newport News and Yorktown. These installations serve as homeports for approximately 127 ships and 29 aircraft squadrons. Together they comprise the Navy in Hampton Roads.

Overall, there are some 108,000 Navy and Marine Corps personnel currently stationed in the area, and the Navy employs more than 41,000 civilians. There are more than 23,000 retired Navy men and women living in Hampton Roads, and approximately 118,300 dependents of active duty, and civilian personnel. The total Hampton Roads Navy community numbers some 318,000 people, which is about 20% of the region's population.

There are a number of Naval commands in the Hampton Roads area, including the Naval Station Norfolk; Norfolk Naval Shipyard, Portsmouth; Fleet Combat Training Center Atlantic, Dam Neck; Naval Amphibious Base, Little Creek; and Naval Weapons Station, Yorktown; Naval Air Station, Norfolk; Naval Air Station, Oceana. Located at these installations are hundreds of commands, large and small, afloat and ashore. Other military facilities within the corridor include Langley Air Force Base, Fort Eustis Military Reservation and Camp Peary Naval Reservation.

In September 2011, the Hampton Roads Transportation Planning Organization completed the *Hampton Roads Military Transportation Needs Study* outlining a number of issues involving military mobility throughout the Hampton Roads region, including along I-64. The following describes conditions and the identified needs of these military facilities in relation to the I-64 corridor:

- During a typical weekday, there are approximately 125,000 Navy personnel traveling to the military facilities.
- Military troop and supply movement is hindered between the facilities and installations along the I-64 corridor and within the region due to existing (2011) traffic congestion and inadequate capacity, particularly during peak travel periods.
- As a result of recent reorganization, many military personnel and their families have been relocated from Fort Monroe to Fort Eustis, thus shifting travel patterns and increasing the volume of commuters in and around the Fort Eustis area.
- Congestion limits the military's mission capabilities, including their ability to maintain military personnel or even bring additional personnel to the Hampton Roads region. Traffic not only affects daily commuting but also travel times between installations during business hours and during times of emergency.

c. Freight Movement and the Port of Virginia

As described in the intermodal section of the ***Traffic and Transportation Technical Memorandum***, and shown in **Table 3** and **Figure 6**, most of the freight in the region is shipped via truck (54.93%), with 34.66% shipped via rail. All other modes of shipping are used much less frequently.

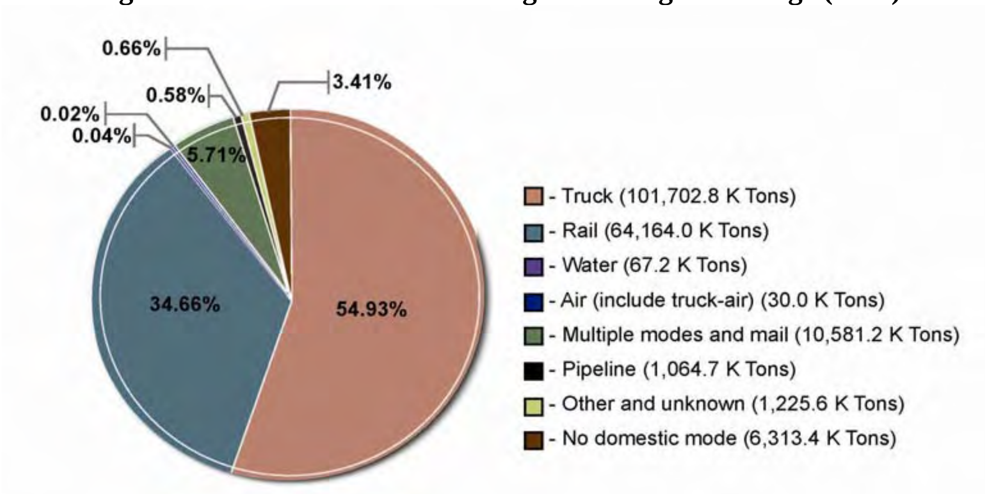
Table 3: Mode Share of Freight (2007*)*

Mode	Total Kilotons in 2007
Truck	101,702.8
Rail	64,164.0
Water	67.2
Air (include truck-air)	30.0
Multiple modes and mail	10,581.2
Pipeline	1,064.7
Other and unknown	1,225.6
No domestic mode	6,313.4

Source: Federal Highway Administration, *Freight Analysis Framework, Version 3*, 2011

Within the I-64 corridor, the percentage of trucks are lower at the two ends (2-4% at Henrico and Newport News), and higher in the middle (7-8% at New Kent, James City and York Counties). This is mainly due to the volume of urban commuting traffic being higher on either end due to the locations of higher population centers of the Richmond and Hampton areas. Although the percentage of trucks is relatively small in comparison to all vehicular traffic, a truck has a greater impact on congestion than a car. On congested highways, the passenger car equivalent (PCE) of a truck could be 3.0, meaning one truck would use the capacity of three passenger cars. Congestion during peak travel periods is an issue, particularly in Hampton Roads, and many of the congested areas (such as I-64 in Hampton and Newport News) are heavily traveled by trucks.

Figure 6: Mode Share of Total Regional Freight Tonnage (2007)



Source: Federal Highway Administration, *Freight Analysis Framework, Version 3*, 2011

At the western end of the I-64 study area, the I-95/I-64 interchange (Exit 190) is one of FHWA's 100 identified freight bottlenecks. Average speeds that are below free flow speeds (55 miles per hour) reflect congestion. In 2010, the average speed at the I-95/I-64 interchange was 53 miles per hour, peak average speed was 48 miles per hour, and nonpeak average speed was 54 miles per hour. The nonpeak/peak ratio was 1.12. In 2009, the average speed at this interchange was 53 miles per hour, peak average speed was 50 miles per hour, and nonpeak average speed was 55 miles per hour. The nonpeak:peak ratio was 1.10.

The intermodal chapter of the ***Traffic and Transportation Technical Memorandum*** discusses the needs and assumptions used to determine ongoing and future expansion efforts affecting freight movement within the region. The following describes conditions and the identified needs associated with freight movement in relation to the I-64 corridor:

- The existing I-64 facility cannot effectively accommodate the truck and freight traffic in addition to the passenger vehicle volumes, which greatly contributes to the overall traffic congestion and safety concerns.
- Due to continued economic development and ongoing expansion projects at the Port of Virginia, the importance of I-64 to freight movement and therefore to the regional and state economy has continued to increase.

d. *Economic Development*

The I-64 study area is made up of a variety of land use types. From the urban areas surrounding the cities of Richmond, Williamsburg, Newport News and Hampton to the more rural areas of New Kent, York and James City Counties, there are numerous opportunities for economic development. These opportunities occur in vacant lands along with the re-use of existing developed areas adjacent to the I-64 corridor, in and around the 25 interchange locations and throughout the region. As Virginia's overall population has grown, numerous developments along the I-64 corridor and within the region have continued to add traffic to the I-64 corridor. In addition, economic development occurring as a result of the proposed Port growth throughout the Tidewater area along with growth to the numerous tourist attractions and destinations within the I-64 corridor and the region have continued to attract visitors to this part of Virginia serviced by I-64.

In reviewing the existing economic development growth and opportunities for the corridor, numerous data sets on planned developments were obtained from each of the counties and cities within the I-64 study area. In addition, a review of possible developable areas was conducted based on existing and planned infrastructure and existing land use conditions. Overall, within the counties that this 75 mile section of I-64 traverses, there is a large amount of land available for economic development.

The following describes conditions and the identified needs of economic development in relation to the I-64 corridor:

- When considering locations and sites for new development and business relocations, transportation access and mobility is an important consideration.
- As previously described, the current capacity and operating concerns surrounding the I-64 corridor are carefully considered in locating any future developments.
- Any additional traffic added to I-64 by any new developments would add to the already unacceptable levels of service caused by the existing traffic volumes on I-64, and therefore travel conditions would continue to decline.

2. Roadway Deficiencies

Problem Statement *– Due to changes in the interstate design standards and almost 50 years of traffic volumes creating wear and tear on the corridor infrastructure, there are a number of roadway and structure deficiencies throughout the corridor.*

When I-64 was constructed in the 1960s, it was designed for considerably less traffic than it currently experiences and was based on the roadway design standards of that time. At the time, little was known about safety requirements for high-capacity and high-speed facilities. As time has passed, the data has accumulated and roadway design standards have been revised based on the knowledge gained.

For this reason, there are areas of the I-64 corridor which are deficient based on today's standards for clear zone widths, side slope grading requirements, and shoulder widths. For example, the clear zone requirements for a road which services 5,000 vehicles per day is less than a road which services 100,000 vehicles per day, due to the nature of the traffic flow. Also, as speeds increase along the corridor, sight distance requirements grow substantially, which leads to deficiencies based on current design standards compared to design standards at the time I-64 was initially constructed in the 1960s.

The following sections further describe the identified roadway deficiencies for the I-64 mainline, the 25 existing interchange locations, and the major bridge structures which are on or cross over I-64.

a. I-64 Mainline

Due to changes in design standards since the corridor was constructed, there are a few locations along the I-64 corridor which do not meet the current AASHTO and VDOT requirements for mainline interstate geometry. In particular, there are a few existing vertical curve deficiencies, as shown in **Figure 7**; however, there are no horizontal curves along the corridor that currently fall below the minimum radius threshold. It should be noted, however, that several crest vertical curves narrowly meet the minimum requirements for stopping sight distance (SSD) of 820 feet for a 75 mph design speed (rural interstate), or 730 feet for a 70 mph design speed (urban interstate). **Table 4** includes the tabulation of vertical geometry deficiencies throughout the corridor.

N
1 0 4 Miles

LEGEND

- ○ = Substandard Vertical Clearance
- ◆ = Substandard Interchange
- □ = Substandard Vertical Curve

Figure 7
Roadway Deficiencies

Table 4: Locations with Deficient Vertical Geometry

Mile Marker	Design Speed (mph)	Curve Length (feet)	Curve Type	Required SSD (feet)	Actual SSD (feet)	Notes
238 EB	75	700	Sag	NA	NA	-
243 EB	70	1000	Crest	730	699	-
258.5 EB	70	1400	Crest	730	720	I-64 over US 17
258.5 WB	70	1400	Crest	730	719	I-64 over US 17

Source: Data measured from VDOT GIS Mapping, 2011

b. Interchanges

As with the mainline, due to similar changes in design standards over the past number of years, there are several interchanges which also do not meet the current AASHTO and VDOT requirements for interchange geometry. As depicted in **Figure 7**, 14 of the 25 interchanges are considered substandard according to today's standards. **Table 5** summarizes the geometric features of the existing interchanges which do not meet the current design criteria.

It should be noted that required SSD for interchange ramps is dependent on several factors, including ramp design speed, vertical and horizontal curvature, and stopping conditions at the ramp terminal (i.e. full-stop vs. free-flow). The interchanges along the corridor were evaluated on a case-by-case basis an in some cases, there are numerous deficiencies within the same interchange. The results for SSD existing interchange deficiencies are shown in **Table 5**.

Table 5: Interchanges with Deficient Geometry

Deficient Feature	Minimum Standard (feet)	Number of Locations with Deficiencies	Exit Number
Acceleration Length	1200	40	192, 193, 195, 197, 200, 205, 211, 214, 220, 227, 231, 234, 238, 242, 247, 250, 255, 256, 258, 261, 263
Deceleration Length	800	36	192, 193, 195, 197, 200, 205, 211, 214, 220, 227, 231, 234, 238, 242, 243, 247, 250, 256, 258, 261
Taper Length	300	15	197, 238, 247, 250, 258, 261, 263
Weave Length	1200	37	190, 192, 193, 197, 200, 231, 234, 242, 250, 255, 256, 258, 261
Ramp SSD	Varies	28	190, 193, 195, 197, 200, 205, 211, 214, 220, 227, 231, 234, 238, 242, 247, 250

Source: Data measured from VDOT GIS Mapping, 2011

c. Structures

There are 109 major bridge structures along the I-64 study corridor. Of this total, 47 are located on the I-64 mainline and 62 cross over the interstate. The oldest structures were constructed in 1964 with the newest structure constructed in 2005. In addition, 24 of these structures have been reconstructed during the timeframe of 1977 to 2006. Older bridges were constructed with the expectation that after approximately 30 years they would be in need of reconstruction (refurbishment) and that in approximately another 20 to 30 years, the structure would then need to be totally replaced.

Bridges are evaluated using a measurement called the sufficiency rating. This measurement is represented by a percentage varying from 0-100, with 100 being excellent condition. The sufficiency rating takes into account aspects of the structure such as its structural adequacy and safety, necessity of the structure to the surrounding community, and serviceability and functional obsolescence. A bridge is typically considered eligible for federal funds for reconstruction if its sufficiency rating falls below 80 and is typically eligible for funds for replacement when the sufficiency rating falls below 50.

Due to the current traffic volumes creating wear and tear on the infrastructure within the I-64 study corridor, there are a number of structures that are continuing to deteriorate. The average rating is 80.1, which indicates that a number of the structures may be at or nearing the point of needing reconstruction.

In addition, there are several bridges crossing over the interstate which do not have the required vertical clearances per AASHTO and VDOT interstate design standards which require that a minimum of 16.5 feet of vertical clearance be present for overhead structures. **Table 6** summarizes which structures do not meet the required standards and **Figure 7 i**ndicates each structure's approximate location.

Table 6: Existing Bridges with Deficient Vertical Clearances

Clearance	Number of Structures Over I-64	VA Structure Number
<16.5 feet	12	063-1031(2), 063-1034, 063-1035, 047-6026, 047-1030, 047-1031, 099-6004, 099-6002, 121-2202, 114-8000, 099-1027

Source: VDOT Bridge Inspection Reports, 2011

3. Safety

Problem Statement *– Existing traffic congestion along with aging roadway and structural deficiencies have exacerbated safety concerns within the corridor.*

A safety analysis of the I-64 corridor was conducted to examine crash locations along the corridor. The most current VDOT crash data from January 2008 to December 2010 was analyzed and plotted. This data does not include minor "fender-bender" collisions that were not reported to police or did not meet the $1,500 threshold for reportable crashes and are therefore not included in VDOT's Statewide Crash Database.

The results of this analysis revealed that there were 3,802 crashes over the three year period from mile marker 191, just east of Exit 190 (I-95), to mile marker 264, east of Exit 264 (I-664). While 31% of crashes resulted in injuries, 68% of the crashes resulted only in property damage. There were 20 fatal crashes in that period, representing 0.5% of total crashes. The 20 fatal crashes were spread throughout the corridor; however a majority (15 of 20) occurred within the rural four-lane section of the corridor between I-295 (Exit 200) and Busch Gardens Boulevard (Exit 243).

The crash analysis indicated that the collision types included the following:

- 48% of the crashes were rear end.
- 30% of the crashes involved a fixed object.
- 10% of the crashes were sideswipe collisions involving vehicles traveling in the same direction.
- 3% of the crashes were angle.
- 3% of the crashes were non-collision (which can include crashes resulting from things like vehicles overturning, hitting debris in the road, or other crashes not a result of the driver running off the road or hitting/being hit by another vehicle).
- 3% of the crashes involved deer.
- 3% of the crashes were categorized as "other".

Crash rates were calculated for the I-64 corridor and compared to the statewide average for similar type facilities. The most recent available statewide average crash rate (2008) for interstate roads was 72 crashes per 100 million vehicle miles traveled. Crash rates were calculated for each mile and segments with rates above the statewide average are listed in **Table 7** and shown in **Figure 8**.

Table 7: Crash Rates above the Statewide Average (72) per Mile Segment

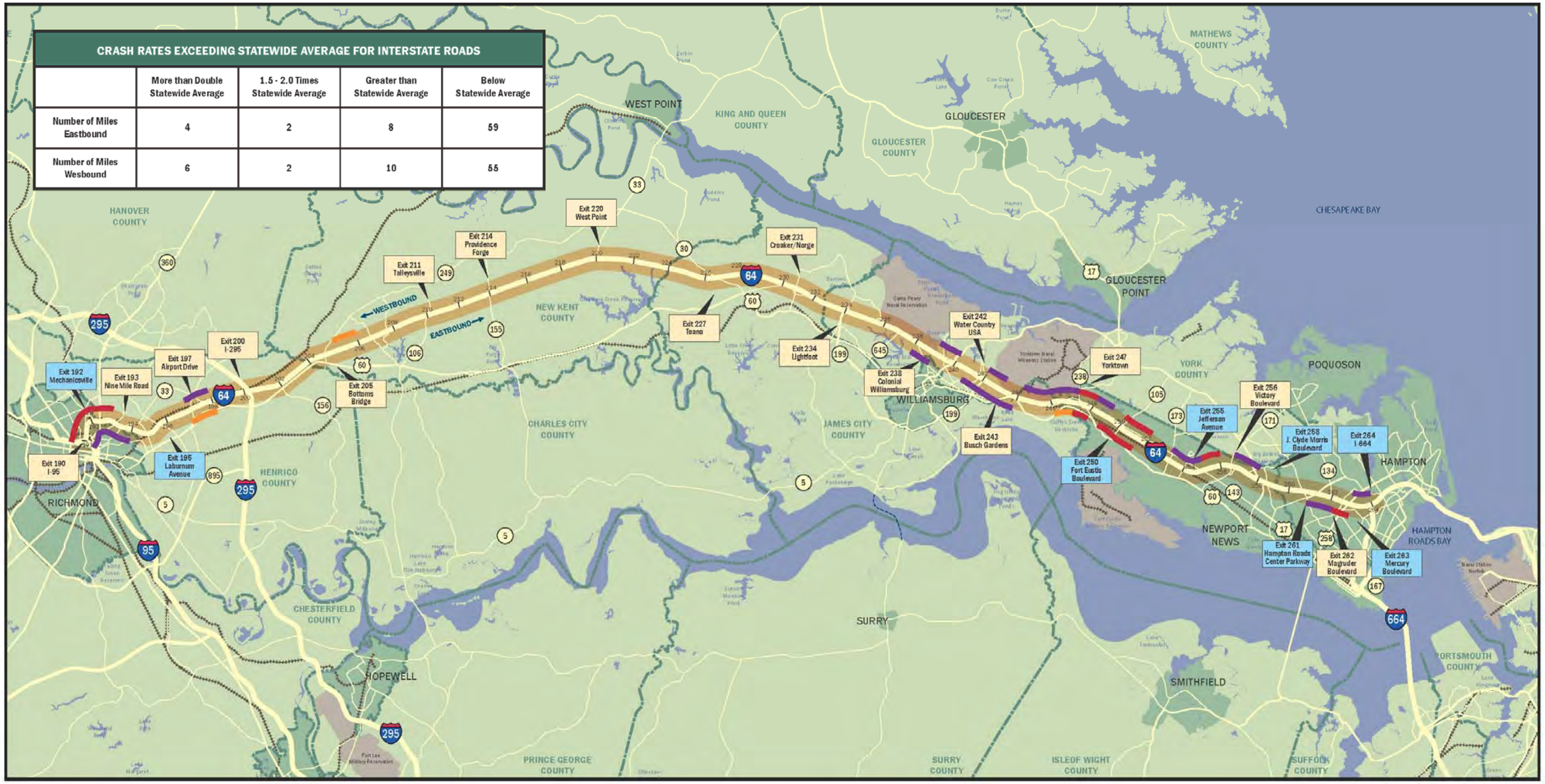
Segment	Locality	Crash Rates (per 100 million vehicle miles traveled)		Ratio of Crash Rates to Statewide Average (72) (percentage)	
		Eastbound	Westbound	Eastbound	Westbound
MP 191 - 192	Richmond	85	261	1.2	3.6
MP 192 - 193	Richmond/Henrico	79	161	1.1	2.2
MP 193 - 194	Richmond/Henrico	88	67	1.2	0.9
MP 194 - 195	Henrico	43	52	0.6	0.7
MP 195 - 196	Henrico	48	51	0.7	0.7
MP 196 - 197	Henrico	51	34	0.7	0.5
MP 197 - 198	Henrico	115	85	1.6	1.2
MP 198 - 199	Henrico	47	48	0.7	0.7
MP 199 - 200	Henrico	43	29	0.6	0.4
MP 200 - 201	Henrico	52	52	0.7	0.7
MP 201 - 202	Henrico	47	27	0.7	0.4
MP 202 - 203	Henrico	64	33	0.9	0.5
MP 203 - 204	Henrico	56	46	0.8	0.6
MP 204 - 205	New Kent	33	51	0.5	0.7
MP 205 - 206	New Kent	52	113	0.7	1.6
MP 206 - 207	New Kent	30	54	0.4	0.8
MP 207 - 208	New Kent	24	45	0.3	0.6
MP 208 - 209	New Kent	30	33	0.4	0.5
MP 209 - 210	New Kent	12	45	0.2	0.6
MP 210 - 211	New Kent	48	24	0.7	0.3
MP 211 - 212	New Kent	39	57	0.5	0.8
MP 212 - 213	New Kent	32	30	0.4	0.4
MP 213 - 214	New Kent	26	33	0.4	0.5
MP 214 - 215	New Kent	42	78	0.6	1.1
MP 215 - 216	New Kent	18	37	0.3	0.5
MP 216 - 217	New Kent	12	21	0.2	0.3
MP 217 - 218	New Kent	21	31	0.3	0.4
MP 218 - 219	New Kent	15	34	0.2	0.5
MP 219 - 220	New Kent	15	70	0.2	1.0
MP 220 - 221	New Kent	19	36	0.3	0.5
MP 221 - 222	New Kent	21	21	0.3	0.3
MP 222 - 223	New Kent	21	28	0.3	0.4
MP 223 - 224	New Kent	31	35	0.4	0.5
MP 224 - 225	York	7	21	0.1	0.3
MP 225 - 226	York	34	21	0.5	0.3
MP 226 - 227	York	27	24	0.4	0.3
MP 227 - 228	York	25	47	0.3	0.7
MP 228 - 229	York	28	13	0.4	0.2

Segment	Locality	Crash Rates (per 100 million vehicle miles traveled)		Ratio of Crash Rates to Statewide Average (72) (percentage)	
		Eastbound	Westbound	Eastbound	Westbound
MP 229 - 230	York	38	22	0.5	0.3
MP 230 - 231	York	34	22	0.5	0.3
MP 231 - 232	York	53	36	0.7	0.5
MP 232 - 233	York	39	34	0.5	0.5
MP 233 - 234	York	14	11	0.2	0.2
MP 234 - 235	York	27	48	0.4	0.7
MP 235 - 236	York	6	21	0.1	0.3
MP 236 - 237	York	35	36	0.5	0.5
MP 237 - 238	York	68	30	0.9	0.4
MP 238 - 239	York	104	65	1.4	0.9
MP 239 - 240	York	26	98	0.4	1.4
MP 240 - 241	York	14	40	0.2	0.6
MP 241 - 242	York	88	26	1.2	0.4
MP 242 - 243	York	90	105	1.3	1.5
MP 243 - 244	York	72	43	1.0	0.6
MP 244 - 245	James City	54	81	0.8	1.1
MP 245 - 246	James City	52	102	0.7	1.4
MP 246 - 247	James City	122	98	1.7	1.4
MP 247 - 248	Newport News	188	168	2.6	2.3
MP 248 - 249	Newport News	89	73	1.2	1.0
MP 249 - 250	Newport News	156	36	2.2	0.5
MP 250 - 251	Newport News	317	268	4.4	3.7
MP 251 - 252	Newport News	87	175	1.2	2.4
MP 252 - 253	Newport News	55	68	0.8	0.9
MP 253 - 254	Newport News	38	103	0.5	1.4
MP 254 - 255	Newport News	36	103	0.5	1.4
MP 255 - 256	Newport News	39	198	0.5	2.8
MP 256 - 257	Newport News	42	43	0.6	0.6
MP 257 - 258	Newport News	21	63	0.3	0.9
MP 258 - 259	Newport News	71	99	1.0	1.4
MP 259 - 260	Hampton	34	43	0.5	0.6
MP 260 - 261	Hampton	46	24	0.6	0.3
MP 261 - 262	Hampton	75	63	1.0	0.9
MP 262 - 263	Hampton	153	49	2.1	0.7
MP 263 - 264	Hampton	52	98	0.7	1.4

Source: VDOT Statewide Crash Database, 2008-2010

Legend	1.1 to 1.4	1.5 to 2.0	≥ 2.1

Higher crash rates predominately occurred in the areas of the corridor with deficient LOS, including the Richmond area and the section from Williamsburg east to Exit 264. Nearly 50% of the collisions along the entire corridor were rear-end crashes, with an even higher percentage of rear-ends, 50 to 85%, in the



CRASH RATES EXCEEDING STATEWIDE AVERAGE FOR INTERSTATE ROADS

	More than Double Statewide Average	1.5 - 2.0 Times Statewide Average	Greater than Statewide Average	Below Statewide Average
Number of Miles Eastbound	4	2	8	59
Number of Miles Wesbound	6	2	10	55

LEGEND

- 1.0 to 1.5 times statewide average
- > 1.5 to 2.0 times statewide average
- > 2.0 times statewide average
- 206 Approximate milepost location
- Ramps/Intersections with > 10 crashes from 2008 - 2010

1 0 4 Miles

Notes:

1. Crashes data provided by VDOT from statewide database. Does not include crashes not reported to the state system.
2. Statewide average crash rate is based on VDOT analysis of crashes that occurred on all Virginia interstates in the year 2008.
3. Crash rates calculated per one-mile segment.

Figure 8
Crash Rates Above the Statewide Average per Direction 2008 – 2010 Crashes

I-64 PENINSULA STUDY ENVIRONMENTAL IMPACT STATEMENT

segments with deficient LOS. Changes in speed and stop and go traffic are often contributing factors to rear-end crashes.

In addition to the mainline collisions, each interchange and associated at-grade intersection was reviewed to identify where high numbers of crashes were occurring. **Table 8** notes ramps and intersections where a high number of crashes (greater than 10) occurred over the three year period from 2008 to 2010.

Similar to the I-64 mainline data, the higher number of crashes occurred in the congested areas of the corridor. Exits 250 and 255 had mainline collisions more than twice the statewide average and a high number of ramp/intersection collisions. Based on VDOT's Statewide Crash Database (2008-2010), the majority of ramp crashes occurred at the merge/diverge area with I-64 mainline or with the merge/diverge of the adjacent street.

Table 8: Ramps and Intersections with a High Number of Crashes (Greater than 10)

Exit	Locality	Ramp/Intersection	Number of Crashes	Comments
192	Richmond	Route 360 and I-64 WB off-ramp/Magnolia St intersection	17	
195	Henrico	Laburnum Ave and I-64 EB ramps	17	
195	Henrico	Laburnum Ave and I-64 WB ramps	13	
250	Newport News	I-64 EB to Route 105 EB off-ramp (loop ramp)	15	Majority of collisions fixed object – off road
250	Newport News	Ft. Eustis Blvd (Route 105) and Jefferson Ave (Route 143) intersection	20	High proportion of rear-end collisions
255	Newport News	I-64 WB off-ramp to Route 143 WB	24	
255	Newport News	Jefferson Ave (Route 143) and Wal-Mart Way/Brick Kiln Blvd intersection	47	
258	Newport News	On-ramp from US 17 NB to I-64 WB	11	
261	Hampton	I-64 EB off-ramp to Hampton Roads Center Pkwy WB (loop ramp)	11	
261	Hampton	I-64 WB off-ramp to Hampton Roads Center Pkwy WB (loop ramp)	17	
263	Hampton	I-64 EB off-ramp to Route 258 EB	19	
263	Hampton	I-64 WB on-ramp from Route 258 WB	32	25 crashes at the diverge point
264	Hampton	I-64 EB to I-664 SB ramp	16	
264	Hampton	I-664 NB to I-64 EB ramp	15	
264	Hampton	I-664 NB to I-64 WB ramp	13	

Source: VDOT Statewide Crash Database, 2008-2010

B. Future Conditions

The demand for travel between and within the Richmond and Hampton Roads areas is expected to continue to increase over the coming years. This increase in demand is projected to lead to an increased number of vehicles using the I-64 corridor, exacerbating the potential for delays and collisions already experienced under the current conditions. The following factors, many of which are interrelated, contribute to the future needs for improvements to the study corridor:

- Projected increases in traffic volumes.
- Continued aging of the mainline and structures along the corridor.
- Increased safety concerns resulting from increased traffic volumes.
- Access to, from and between military facilities and installations during peak hours of travel and times of emergency.
- Future port expansion increasing the demand for freight transportation.
- Local and regional plans for economic development.

As previously stated in the Base Conditions section, multiple conditions exist that create several needs for improvements within the I-64 corridor. These identified needs would continue into the future and are projected to worsen over time. They have been grouped into three categories including: capacity, roadway deficiencies and safety. Further descriptions of each of these identified needs are presented as follows.

1. Capacity

Problem Statement *– The existing facility would be unable to accommodate the projected future (2040) traffic volumes within the corridor at an acceptable LOS, particularly during peak travel times.*

Future traffic volumes were projected to the year 2040 using the Tidewater Super-regional Traffic Model (the Tidewater Model), a VDOT travel demand model that incorporates the models and the future population and employment forecasts estimated by the Richmond, Tri-Cities, and Hampton Roads Metropolitan Planning Organizations (MPOs). The Tidewater Model also encompasses the inter-regional areas (generally New Kent and James City Counties) between the Richmond and Hampton Roads metropolitan areas.

The Tidewater Model includes all other projects within the corridor that are on the Richmond or Hampton Roads MPO's Constrained Long Range Plans, as well as the Rural Long Range Transportation Plans (which are not fiscally constrained) for the Richmond and Hampton Roads Planning District Commissions. Those projects form a part of the Base Conditions, and the effects of these projects on I-64 traffic are accounted for in all 2040 No-Build analyses. Some of the major projects included on these Long-Range Plans include the following:

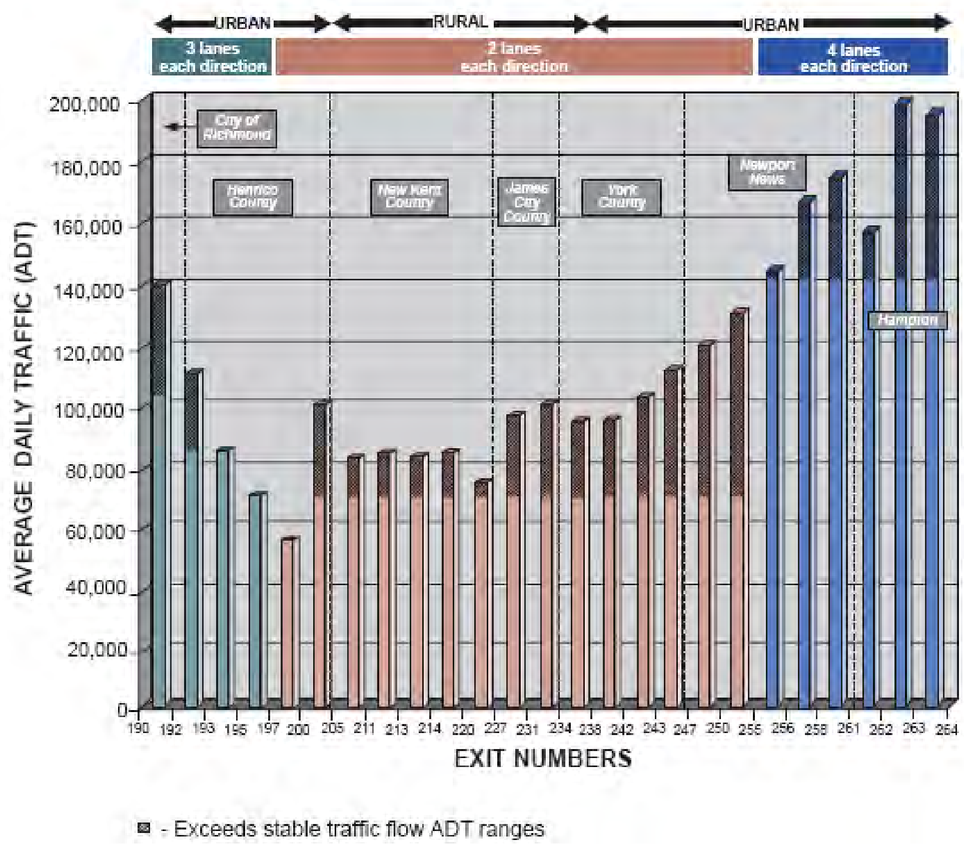
- The US 460 Corridor Improvements Project, a proposed toll road paralleling existing US 460 between Petersburg and Chesapeake.
- The proposed Stony Run Parkway interchange on I-64 in Henrico County between Exits 193 (Nine Mile Road) and Exit 195 (Laburnum Avenue). (This project was deleted in the 2035 Constrained Long-Range Plan recently adopted by the Richmond Area MPO. However, this project is still included in the Tidewater Super-regional Model being used for this project.)
- Widening of I-64 between Exit 197 and Exit 220 (This project was deleted in the 2035 Constrained Long-Range Plan recently adopted by the Richmond Area MPO. However, this project is still included in the Tidewater Super-regional Model being used for this project.)
- The proposed Richmond-Hampton Roads passenger rail improvements, including the new rail service from Richmond through Petersburg to Norfolk.

Projects which are not included on the Constrained Long Range Plans are not included under the No-Build analyses for this study. Some major projects not included are:

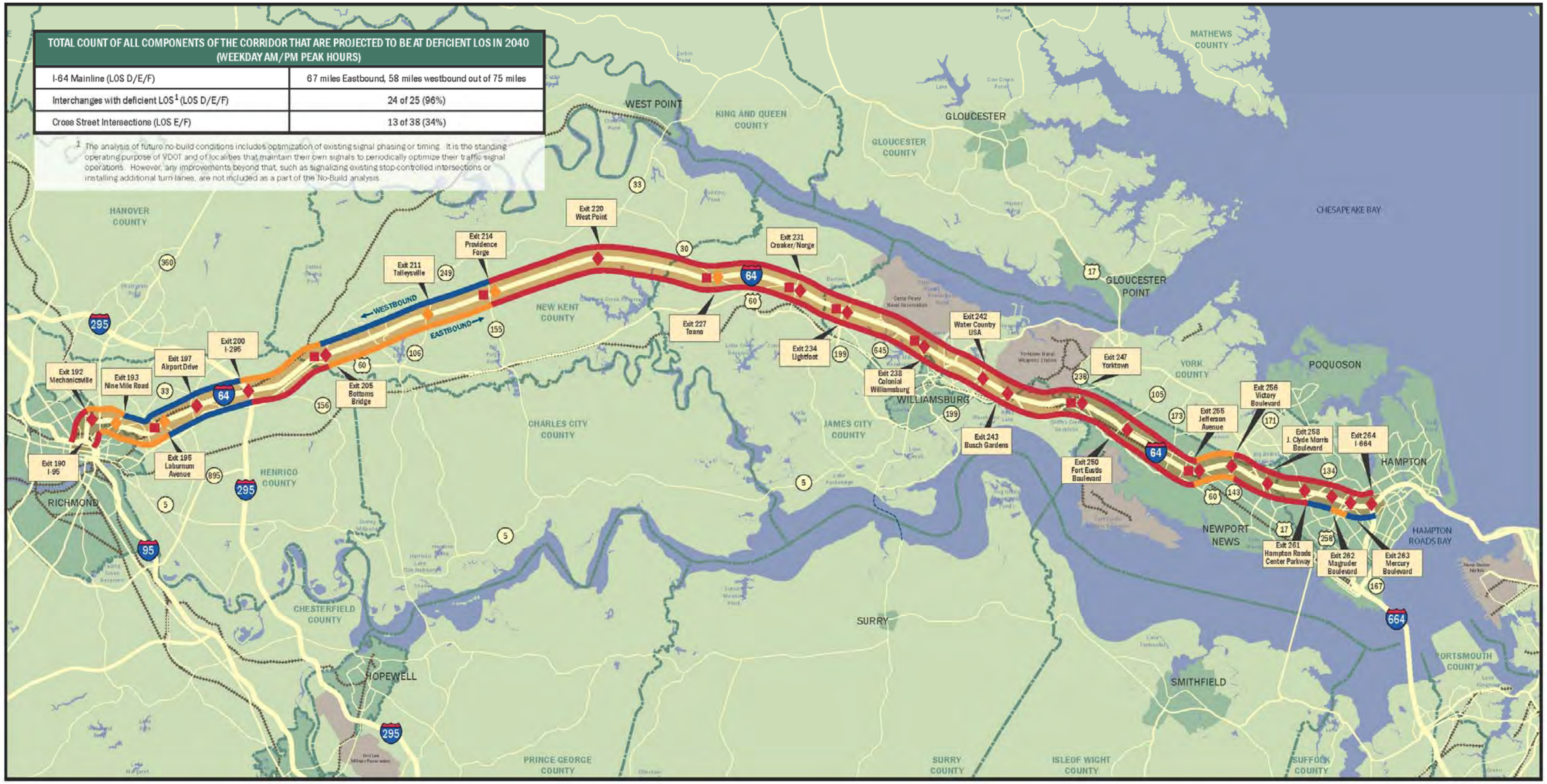
- Potential widening of the Hampton Road Bridge-Tunnel.
- Potential Patriot's Crossing or Third Crossing of the Hampton Roads Harbor.
- Potential I-64/Bland Blvd interchange.

As shown in **Figure 9**, 2040 No-Build traffic volumes on I-64 range from 55,300 ADT between Exits 197 and 200 to 199,200 ADT between Exits 262 and 263. Traffic volumes are generally highest between Exits 190 and 192 in the City of Richmond and between Exits 255 and 264 in Newport News and Hampton. More detailed traffic information can be found in the ***Traffic and Transportation Technical Memorandum***.

Figure 9: 2040 No-Build Future Conditions Average Daily Traffic



As previously stated, it has been determined that this project should meet a LOS C or better for the mainline interstate facility and LOS D or better for intersection facilities. **Figure 10** shows that there are a greater number of mainline segments, ramps, weaving areas, and intersections within the corridor that are projected to operate below those acceptable LOS thresholds during the weekday morning and evening peak hour periods, as compared to Base Conditions. **Table 9** summarizes the corridor components that are experiencing a LOS D or worse during all peak periods.



TOTAL COUNT OF ALL COMPONENTS OF THE CORRIDOR THAT ARE PROJECTED TO BE AT DEFICIENT LOS IN 2040 (WEEKDAY AM/PM PEAK HOURS)	
I-64 Mainline (LOS D/E/F)	67 miles Eastbound, 58 miles westbound out of 75 miles
Interchanges with deficient LOS[1] (LOS D/E/F)	24 of 25 (96%)
Cross Street Intersections (LOS E/F)	13 of 38 (34%)

[1] The analysis of future no-build conditions includes optimization of existing signal phasing or timing. It is the standing operating purpose of VDOT and of localities that maintain their own signals to periodically optimize their traffic signal operations. However, any improvements beyond that, such as signalizing existing stop-controlled intersections or installing additional turn lanes, are not included as a part of the No-Build analysis.

LEGEND

- = Freeway Level of Service A/B
- = Freeway Level of Service C
- = Freeway Level of Service D
- = Freeway Level of Service E/F
- = Ramp/Weave at Level of Service D
- = Cross Street Intersection at Level of Service D
- = Ramp/Weave at Level of Service E/F
- = Cross Street Intersection at Level of Service E/F

N

1 0 4 Miles

Note:
Level of Service indicated represents worst case of AM, PM, Saturday and/or Sunday peak period analyses.

Figure 10
I-64 Eastbound and Westbound Level of Service – Mainline and Deficient Ramp/Weave/Intersection 2040 No-Build Condition

I-64 PENINSULA STUDY ENVIRONMENTAL IMPACT STATEMENT

As previously noted, there are numerous future development and growth factors included in the Tidewater Model that would result in continued future growth within the I-64 corridor and within the region. This growth would result in increased traffic volumes that are anticipated to cause future capacity issues and projected increased congestion throughout the I-64 corridor.

Table 9: Total Count of all Components of the Corridor that are Projected to be at Deficient LOS in 2040 No-Build Conditions

Element	Deficient LOS
I-64 Mainline (LOS D/E/F)	67 of 75 miles eastbound (89%) 58 of 75 miles westbound (77%)
Interchanges (LOS D/E/F)	24 of 25 (96%)
Cross Street Intersections (LOS E/F)*	13 of 38 (34%)

*Note: The analysis of future no-build conditions includes optimization of existing signal phasing or timing. It is the standing operating purpose of VDOT and of localities that maintain their own signals to periodically optimize their traffic signal operations. However, any improvements beyond that, such as signalizing existing stop-controlled intersections or installing additional turn lanes, are not included as a part of the No-Build analysis.

Also as described in the Base Conditions section, there are a number of other key factors contributing to the capacity issues within the I-64 study corridor which are expected to be maintained and/or increase in the future, including: military personnel, civilian workforce and freight movements to/from/between military facilities; a wide variety of freight traffic in and out of the Port of Virginia; and economic development needs associated with new and expanding facilities along the I-64 corridor and in the region. Specifically, freight traffic is expected to increase within the region by 50% mainly as a result from the Port of Virginia expansions and improvements discussed in the intermodal section of the ***Traffic and Transportation Technical Memorandum***. Furthermore, future development of residential, commercial, and industrial facilities is expected to continue to increase in future years according to the data in the Tidewater Model. Overall, each of these components is anticipated to add to the existing capacity issues and would thus result in continued and additional unacceptable LOS for the I-64 mainline and the interchanges.

2. Roadway Deficiencies

Problem Statement *– Future increase in traffic volumes and continued aging of the corridor would cause deterioration of the mainline infrastructure. Existing structures would continue to deteriorate in future years without major rehabilitation or replacement.*

Increasing traffic volumes between 2011 and 2040 would continue to contribute to the wear and tear of the mainline, interchanges and bridge structures along the I-64 study corridor. As previously stated, there are currently horizontal/vertical roadway and bridge clearance issues. If not corrected and combined with increased traffic volumes, these deficiencies would lead to exacerbated operational and safety concerns. By 2040, the age of most of the bridge structures would range from 35 to 80 years old with the majority of these structures being well over 50 years old. As previously explained, bridges are typically reconstructed after 30 years of age and are often replaced after 50 to 60 years of age. The 2011 bridge sufficiency ratings would continue to worsen if no action is taken to repair and/or reconstruct these structures.

3. Safety

Problem Statement *– Increased traffic congestion along with aging roadway and structural deficiencies would result in increased safety considerations within the corridor.*

As previously noted, a high percentage of existing crashes in the corridor are rear-end crashes. In examining the crash data, it was determined that the areas with the highest rear-end crashes directly correlate with the areas experiencing the greatest traffic congestion. As traffic congestion continues to grow and the I-64 corridor experiences slowed or stopped traffic for an increased number of hours in the day, the number of rear-end crashes and crashes in general are expected to increase. Overall, it is anticipated that, if no improvements are made, the number of crashes within the I-64 corridor would increase over time as traffic volumes increase.

IV. Purpose/Summary

The purpose of the I-64 Peninsula Study is to alleviate existing congestion and accommodate future capacity and improve roadway deficiencies and safety in the corridor between Richmond and Hampton in Virginia. This study builds on previous analyses by compiling and developing the information necessary to best identify a full range of reasonable alternatives to address the existing and future needs identified for the I-64 corridor.

REFERENCES

A Policy on Geometric Design of Highways and Streets, Fifth Edition, AASHTO, Washington DC, 2004

American Transportation Research Institute, Freight Performance Measures, 2009-2010

Federal Highway Administration, *Freight Analysis Framework, Version 3*, 2011

Hampton Roads Transportation Planning Organization, *Hampton Roads Military Transportation Needs Study*, September 2011

Hampton Roads Transportation Planning Organization, *Traffic Impact of an Inland Port in Hampton Roads,* September 2011

United States Department of Transportation, Federal Highway Administration, *New Freight Traffic Data Point to More Congestion on Key Highways*, Press Release, September 21, 2011

Virginia Department of Transportation, *Virginia Statewide Multimodal Freight Study, Final Report*, 2010


Richmond
West
Ft Eustis Blvd
Ft Eustis
East
Ft Eustis Blvd
Yorktown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