Hampton Roads Military Transportation Needs Study

2018 Update

Prepared by:
Hampton Roads
Transportation Planning Organization

T18-07

the *heartbeat* of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION
July 2018

HAMPTON ROADS TRANSPORTATION PLANNING ORGANIZATION

Robert A. Crum, Jr.
Executive Director

VOTING MEMBERS:

CHESAPEAKE
Rick West
Ella P. Ward – Alternate

FRANKLIN
Barry Cheatham
Frank Rabil – Alternate

GLOUCESTER COUNTY
Phillip Bazzani
John C. Meyer, Jr. – Alternate

HAMPTON
Donnie Tuck
Jimmy Gray – Alternate

ISLE OF WIGHT COUNTY
Joel Acree
Rudolph Jefferson – Alternate

JAMES CITY COUNTY
Michael Hipple
Vacant – Alternate

NEWPORT NEWS
McKinley Price
Herbert H. Bateman, Jr. – Alternate

NORFOLK
Kenneth Alexander
Martin A. Thomas, Jr. – Alternate

POQUOSON
W. Eugene Hunt, Jr.
Herbert R. Green, Jr. – Alternate

PORTSMOUTH
John Rowe – Vice Chair
Paige Cherry – Alternate

SOUTHAMPTON COUNTY
Barry T. Porter
R. Randolph Cook – Alternate

SUFFOLK
Linda T. Johnson
Leroy Bennett – Alternate

VIRGINIA BEACH
Louis Jones
James Wood – Alternate

WILLIAMSBURG
Paul Freiling
D. Scott Foster, Jr. – Alternate

YORK COUNTY
Thomas G. Shepperd, Jr. – Chair
Sheila Noll – Alternate

MEMBERS OF THE VIRGINIA SENATE
The Honorable Mamie E. Locke
The Honorable Frank W. Wagner

MEMBERS OF THE VIRGINIA HOUSE OF DELEGATES
The Honorable Christopher P. Stolle
The Honorable David Yancey

TRANSPORTATION DISTRICT COMM OF HAMPTON ROADS
William E. Harrell, President/Chief Executive Officer
Ray Amoruso – Alternate

VIRGINIA DEPARTMENT OF TRANSPORTATION
Christopher Hall, Hampton Roads District Administrator
Dawn Odom – Alternate

VA DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION
Jennifer Mitchell, Director
Jennifer DeBruhl – Alternate

VIRGINIA PORT AUTHORITY
John Reinhart, CEO/Executive Director
Cathie Vick – Alternate

WILLIAMSBURG AREA TRANSIT AUTHORITY
Zach Trogdon, Executive Director
Joshua Moore – Alternate

HAMPTON ROADS TRANSPORTATION PLANNING ORGANIZATION

NON-VOTING MEMBERS:

CHESAPEAKE	**HAMPTON**	**NEWPORT NEWS**	**PORTSMOUTH**	**VIRGINIA BEACH**
James E. Baker	Mary Bunting	Cynthia Rohlf	Lydia Pettis Patton	David Hansen
FRANKLIN	**ISLE OF WIGHT COUNTY**	**NORFOLK**	**SOUTHAMPTON COUNTY**	**WILLIAMSBURG**
R. Randy Martin	Randy Keaton	Douglas Smith	Michael W. Johnson	VACANT
GLOUCESTER COUNTY	**JAMES CITY COUNTY**	**POQUOSON**	**SUFFOLK**	**YORK COUNTY**
J. Brent Fedors	William Porter	J. Randall Wheeler	Patrick Roberts	Neil A. Morgan

FEDERAL HIGHWAY ADMINISTRATION
Jessie Yung, Division Administrator, Virginia Division

FEDERAL AVIATION ADMINISTRATION
Jeffrey W. Breeden, Washington Airports Office District

PENINSULA AIRPORT COMMISSION
Michael A. Giardino, Executive Director

CITIZEN TRANSPORTATION ADVISORY COMMITTEE
Theresa Danaher, Chair

MILITARY LIAISONS
Michael R. Moore, Captain, U.S. Navy
Dean VanderLey, Captain, U.S. Navy – Alternate
Rick Wester, Captain, U.S. Coast Guard
Herbert Joliat, Colonel, Langley-Eustis

FEDERAL TRANSIT ADMINISTRATION
Terry Garcia-Crews, Regional Administrator, Region 3

VIRGINIA DEPARTMENT OF AVIATION
Mark Flynn, Director

NORFOLK AIRPORT AUTHORITY
Robert S. Bowen, Executive Director

FREIGHT TRANSPORTATION ADVISORY COMMITTEE
Arthur Moye, Jr , Co-Chair (Nonvoting Board Member)
Christopher P. Stolle., Co-Chair (Voting Board Member)

INVITED PARTICIPANT
John Malbon, Commonwealth Transportation Board
Stephen A. Johnsen, Commonwealth Transportation Board

HRTPO PROJECT STAFF

Michael S. Kimbrel	Deputy Executive Director, HRTPO
Samuel Belfield	Senior Transportation Engineer
Keith Nichols	Principal Transportation Engineer
Michael Long	General Services Manager
Chris Vaigneur	Assistant General Services Manager

HAMPTON ROADS
MILITARY TRANSPORTATION NEEDS STUDY

2018 UPDATE

PREPARED BY:

the *heartbeat* of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

JULY 2018

T18-07

REPORT DOCUMENTATION

TITLE:
DRAFT Hampton Roads Military Transportation Needs Study:
2018 Update

AUTHOR:
Samuel S. Belfield

PROJECT MANAGER:
Keith M. Nichols, P.E.

REPORT DATE
July 2018

ORGANIZATION CONTACT INFORMATION
Hampton Roads Transportation Planning Organization
723 Woodlake Drive
Chesapeake, Virginia 23320
(757) 420-8300
www.hrtpo.org

ABSTRACT

Hampton Roads is home to many U.S. military and supporting sites that are important to the defense and security of our nation. As a result of the area's large military presence, much of the local economy is driven by the U.S. Department of Defense (DoD). Defense readiness and efficient military operations require a sufficient transportation network so that cargo and personnel can be moved as quickly and safely as possible. The overall purpose of this study is to determine military transportation needs and to provide an efficient and safe transportation network for the military in Hampton Roads.

For this study, the HRTPO staff worked with many stakeholders—local military representatives, federal agencies, Virginia Department of Transportation (VDOT), Hampton Roads Transit (HRT), Virginia Port Authority (VPA) and local jurisdictions—to determine transportation concerns and needs of the local military. This 2018 update to the Hampton Roads Military Transportation Needs Study provides an update to Phase I (Highway Network Analysis, September 2011) and III (Roadways Serving the Military and Sea Level Rise/Storm Surge, July 2013) using the most recent data and analysis. Based on stakeholder input, HRTPO staff identified a roadway network that includes both the Strategic Highway Network (STRAHNET) and additional roadways that serve the military sites and intermodal facilities not included in the STRAHNET. Staff reviewed this "Roadways Serving the Military in Hampton Roads" network to determine deficient locations, such as congested segments, deficient bridges, low bridge and tunnel vertical clearances, lane widths below military preferences, and segments vulnerable to flooding. The HRTPO staff will incorporate this work into future iterations of the Congestion Management Process (CMP) and the regional Long-Range Transportation Plan (LRTP) Project Prioritization Tool to assist decision makers as they select future transportation projects.

ACKNOWLEDGMENT & DISCLAIMERS

Prepared in cooperation with the U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), and Virginia Department of Transportation (VDOT). The contents of this report reflect the views of the Hampton Roads Transportation Planning Organization (HRTPO). The HRTPO is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the FHWA, VDOT or Hampton Roads Planning District Commission. This report does not constitute a standard, specification, or regulation. FHWA or VDOT acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.

NON-DISCRIMINATION

TABLE OF CONTENTS

Introduction

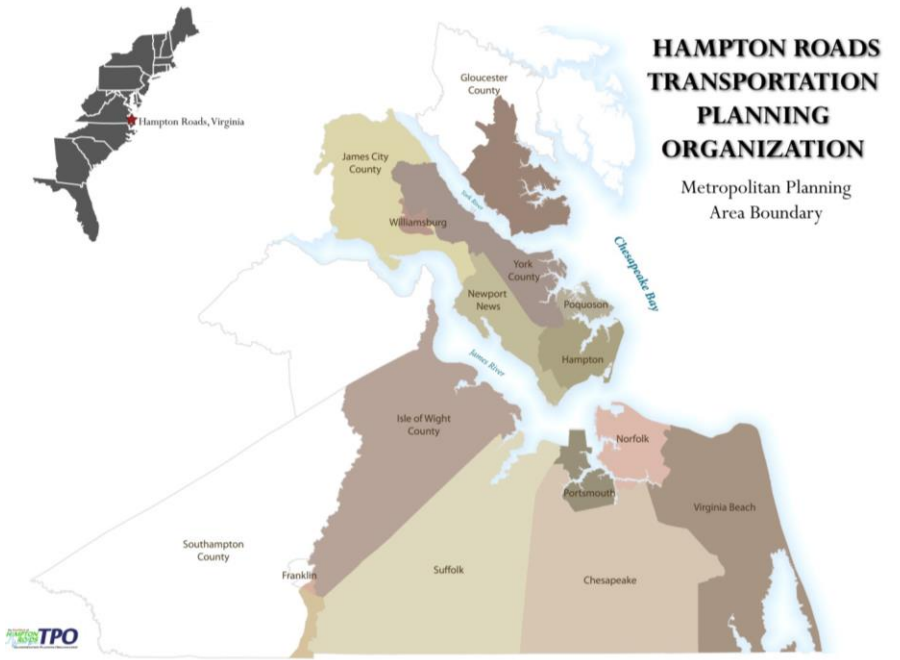
The Hampton Roads region contains one of the largest natural harbors in the world, making the region an attractive location for military facilities. The region's military presence is comprised of 9 major military installations (including 3 joint-base complexes that span multiple locations), employing approximately 78,000 active-duty and reserve personnel and over 40,000 civilians[1]. The largest military installation in the region is Naval Station Norfolk, which is the largest Naval base in the world by population. Hampton Roads is also home to dozens of other military and supporting sites with representation from all five branches of the military—Navy, Army, Air Force, Coast Guard, and Marine Corps.

According to the Hampton Roads Chamber of Commerce, the total military population in the region is approximately 150,000[2] (active duty and civilian), in a regional area that has a total population of 1.7 million[3]. As a result of the area's large military presence, much of the local economy is driven by the U.S. Department of Defense (DoD). Efficient military operations require a transportation network that moves cargo and personnel quickly and safely. Not only does the condition of the Hampton Roads transportation network impact the future viability of the region as a military hub, but it impacts national security as well.

Late in 2009, several local military representatives told the Hampton Roads Transportation Planning Organization (HRTPO) Board that congestion and delays at bridges and tunnels hurt mission performance effectiveness and efficiency. Rear Admiral Byron E. Tobin (Retired U.S. Navy) addressed the HRTPO Board in February 2010, stating:

> "…we are dependent, in large measure, upon the resources and support of this region for the efficient and successful conduct of our mission. One of the key components of that success is mobility, [which is currently impeded] because our transportation infrastructure is in decline and struggling to meet our needs."

Map 1 – Hampton Roads Metropolitan Planning Area



Naval Station Norfolk

Source: Beth Bergman Nakmura The Virginian-Pilot

[1] *Hampton Roads Economic Development Alliance, www.hreda.com/data-research/military, December 2017.*

[2] *Hampton Roads Chamber of Commerce, www.hamptonroadschamber.com/page/our-military, December 2017.*

[3] *U.S Census Bureau, HRPDC, 2016.*

In response, the HRTPO Board placed greater emphasis on military transportation planning in the region and endorsed annual military briefings by military representatives to the HRTPO Board and to the Commonwealth Transportation Board, and included a new Hampton Roads Military Transportation Needs Study in its work program (FY 2011 Unified Planning Work Program) to identify and address the transportation needs of the military in Hampton Roads.

The overall purpose of this planning effort is to determine military transportation needs and to provide an efficient and safe transportation network for the military in Hampton Roads. This update identifies the major Military and Supporting Sites and "Roadways Serving the Military in Hampton Roads". It determines deficiencies within this roadway network in order to prioritize transportation projects and solutions that improve military travel.

The original Hampton Roads Military Transportation Needs Study was comprised of three phases:

1. Highway Network Analysis (September 2011)[4]
2. Military Commuter Survey (September 2012)[5]
3. Roadways Serving the Military and Sea Level Rise/Storm Surge (July 2013)[6]

This report updates the data and analysis contained in **Phase I (Highway Network Analysis)** and **Phase III (Roadways Serving the Military and Sea Level Rise/Storm Surge)** with the most recent data available.

The Hampton Roads Military Transportation Needs Study was developed to be an integral part of the HRTPO's Hampton Roads Congestion Management Process[7] (CMP). The Hampton Roads CMP is an on-going systematic process for managing congestion that provides information and analysis on multimodal transportation system performance and on strategies to alleviate congestion and enhance the mobility of persons and goods regionwide. During this process, the HRTPO works with state and local agencies to develop these strategies and mobility options. The CMP is a federal requirement for urbanized areas over 200,000 in population. The main goals of the CMP are to reduce congestion/travel time delays, encourage the use of alternative modes of transportation, and improve air quality. The CMP is used as a guide to develop project recommendations for the Transportation Improvement Program (TIP) and the Long-Range Transportation Plan (LRTP).

[4] *Hampton Roads Military Transportation Needs Study: Highway Network Analysis*, HRTPO, September 2011.

[5] *Hampton Roads Military Transportation Needs Study: Military Commuter Survey*, HRTPO, September 2012.

[6] *Hampton Roads Military Transportation Needs Study: Roadways Serving the Military and Sea Level Rise/Storm Surge*, HRTPO, July 2013.

[7] *Hampton Roads Congestion Management Process*, HRTPO, October 2014.

Hampton Roads Military Transportation Needs Study: Summary of Prior Phases

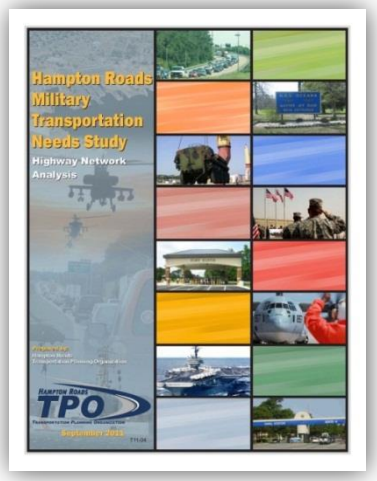
Phase I: Highway Network Analysis

Phase I of the Hampton Roads Military Transportation Needs Study was completed and approved by the HRTPO Board in September 2011. In this first phase, HRTPO staff worked with various stakeholders – local military representatives, state and federal agencies, port officials and local jurisdictions – to determine transportation concerns and needs of the local military. HRTPO staff identified a roadway network that includes both the Strategic Highway Network (STRAHNET) and additional roadways that serve the military sites and intermodal facilities not included in the STRAHNET. STRAHNET (developed by the U.S. Department of Defense (DoD)) serves as the minimum national defense public highway network needed to support a defense emergency and day-to-day military cargo movement. Staff analyzed this "Roadways Serving the Military" network to determine deficient locations, such as congested segments, deficient bridges, and inadequate geometrics. The study made numerous recommendations to address existing deficiencies and to accommodate future military travel needs, including revisions to STRAHNET designations, increasing vertical clearance of bridges and tunnels, expanding the width of highway lanes to accommodate military vehicles, rehabilitating or replacing structurally deficient bridges, extending light rail transit to Naval Station Norfolk and creating high-speed passenger rail service to Washington, D.C.

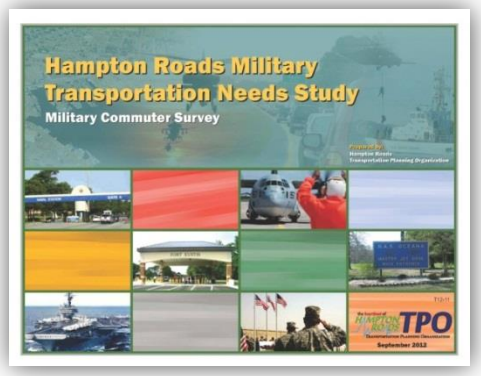
Phase II: Military Commuter Survey

The HRTPO staff continued this study with the creation of the first region-wide Military Commuter Survey, which was conducted from November 8, 2011 to February 24, 2012. Via the survey, the HRTPO collected information about the commuting experience of military personnel (active-duty, civilians, contractors, reservists and others) travelling to/from the region's military bases, receiving a total of 10,994 survey responses. The survey was developed by HRTPO staff in concert with the commands of the region's military installations and other various transportation stakeholders. The purpose of the survey was to determine the transportation challenges facing local military personnel during their daily commutes in Hampton Roads.

Phase I:
Highway Network Analysis



Phase II:
Military Commuter Survey



The survey was developed using Google documents and hosted on the HRTPO website. Even though survey responses were sought from all military commuters in the region, military commuters were specifically targeted who travel to/from 29 of the 38 military and supporting sites identified in Phase I of the study. These 29 military sites are the primary locations for military-related employment. The remaining 9 locations are supporting sites, such as port terminals and airports, which move military personnel and goods in the event of a national or local emergency. One benefit of hosting the survey on the HRTPO website was that thousands of military personnel who reside within Hampton Roads were introduced to the HRTPO, some learning about its metropolitan planning process and activities for the first time.

Respondents were asked to identify items such as length of morning and afternoon commutes, mode of transportation, transportation problems, and any locations of recurring trouble along their commute. The top reported transportation problems by military commuters were traffic congestion (79%), traffic backups at military gates (67%), and poor roadway maintenance (42%). At the end of the survey, respondents were asked to submit any suggestions they had regarding transportation in the region. Not

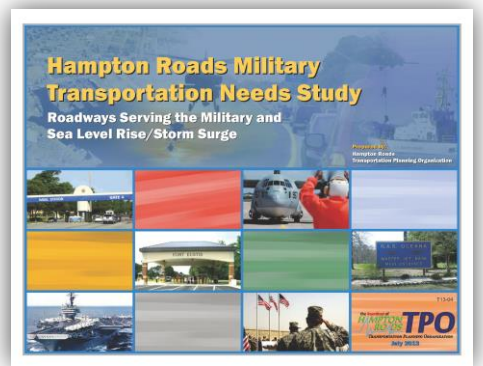
only was excellent feedback provided, but many expressed thanks for having the opportunity to communicate their transportation challenges.

Phase III: Roadways Serving the Military and Sea Level Rise/Storm Surge

The Hampton Roads region contains one of the largest natural harbors in the world, making the region an attractive location for military facilities. This coastal location also makes many of these military facilities susceptible to projected relative sea level rise and potential storm surge threats, impacting overall defense readiness. The threat of flooding is a concern for the military in the region since military operations require a transportation network that moves cargo and personnel quickly and safely.

The impacts of relative sea level rise and storm surge have been recognized along the southeast coast for many years, particularly for low-lying communities such as Hampton Roads. National, state, regional, and local organizations have participated (or are currently participating) in initiatives that address this pressing issue in order to raise awareness and develop potential solutions. Phase III builds on previous studies and related work to estimate the relative sea level rise and potential storm surge threats to the "Roadways Serving the Military" network established in phase one of the Hampton Roads Military Transportation Needs Study. In Phase I, HRTPO staff reviewed the "Roadways Serving the Military" to determine deficient locations, such as congested segments, deficient bridges, and inadequate geometrics. This third phase of the study continued the work in Phase I by determining flooding-based deficient locations along the roadway network. It expanded upon the work and methodologies developed by the Hampton Roads Planning District Commission (HRPDC) and the Virginia Institute of Marine Science (VIMS) by identifying military roadway segments vulnerable to submergence. Additionally, submergence of other local roadways that provide access to and from the "Roadways Serving the Military", which may be vulnerable to flooding, were also identified.

Phase III:
Roadways Serving the Military and
Sea Level Rise/Storm Surge



Downtown Portsmouth near Naval Medical Center Portsmouth during Nor'easter in November 2009.

MILITARY INVOLVEMENT

For many years, the Hampton Roads military community has worked with the HRTPO to provide input on regional transportation studies and to participate, as non-voting members, in the HRTPO Transportation Technical Advisory Committee (TTAC). One liaison from the Navy is currently participating as a non-voting member on the HRTPO TTAC.

In May 2009, invitations were extended to all military branches in the region requesting their participation at monthly HRTPO Board meetings. Three military liaisons (U.S. Navy, U.S. Coast Guard, and U.S. Army/U.S. Air Force) are currently participating as non-voting HRTPO Board members. The invitation remains open to all interested military parties.

Local military branches have also been actively engaged with the HRTPO in military-related transportation studies. In June 2007, HRTPO staff worked with various stakeholders and completed a traffic management study[8] requested by the U.S. Navy and the City of Norfolk that recommended solutions to decrease delays moving into and out of Naval Station Norfolk. Military representatives from the Navy, Army, Coast Guard, and Air Force worked with HRTPO staff on the original Hampton Roads Military Transportation Needs Study.

Through participation in these meetings and studies, local military representatives are engaged with VDOT, HRTPO, local communities, and various other stakeholders on a regular basis, communicating their transportation concerns and providing valuable input.

HRTPO Military Transportation Needs Study Participation

HRTPO staff obtained input from military stakeholders at various points throughout this study. Specific comments were received in September/October 2017 on the draft list of Military and Supporting Sites and Roadways Serving the Military.

The HRTPO staff would like to acknowledge and thank members from the following organizations for their input, guidance, and participation in this initiative:

- U.S. Department of Transportation Federal Highway Administration (FHWA)
- Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA)
- U.S. Navy and Marine Corps
- U.S. Army
- U.S. Air Force
- U.S. Coast Guard
- Hampton Roads Military and Federal Facilities Alliance (HRMFFA)
- Virginia Department of Transportation (VDOT)
- Virginia Port Authority (VPA)
- Hampton Roads Transit (HRT)
- Transportation Research Board (TRB)
- Hampton Roads jurisdictions

Hampton Roads Joint Land Use Studies (JLUS)

Several Joint Land Use Studies (JLUS) have recently been completed and begun at various military locations throughout Hampton Roads. JLUS are community-driven, cooperative, strategic planning processes among localities, states, and military installations. The goal of each JLUS is to encourage local governments to work closely with the military installations to implement measures that prevent the introduction of incompatible civilian development that may impair the continued operational utility of the military installation, and to preserve and protect the public health, safety, and welfare of those living near an active military installation.

JLUS efforts are conducted to mitigate future issues and improve coordination between military installations and surrounding Cities, Counties, and regional stakeholders. For many of these JLUS, the Hampton Roads Planning District Commission (HRPDC), on behalf and in cooperation with local Hampton Roads cities, coordinates these efforts. The HRPDC staff coordinates between localities and state and federal agencies, including the military, and acts as a sponsor for JLUS projects. HRTPO staff also participates as a regional stakeholder for all JLUS projects and provides data and technical assistance as needed.

[8] *Naval Station Norfolk Area Traffic Management Study*, HRTPO, June 2007.

For information about specific JLUS projects in the Hampton Roads region, please use the links below.

Ongoing JLUS Projects:

- Fort Eustis Joint Land Use Study
- Norfolk and Virginia Beach Joint Land Use Study
- Portsmouth and Chesapeake Joint Land Use Study
- Hampton-Langley Joint Land Use Study – Addendum (sea level rise/flooding)

Completed JLUS Projects:

- Hampton Roads Joint Land Use Study (NAS Oceana, Chambers Field, NALF Fentress), 2005
- Hampton-Langley Joint Land Use Study, 2010

Report Contents

This report is organized into the following sections:

1) Introduction
2) Military Personnel and Economic Impact
3) Strategic Highway Network (STRAHNET)
4) Military and Supporting Sites
5) Roadways Serving the Military
6) Deficiencies in Roadways Serving the Military
    a. Congested Roadways
    b. Deficient Bridges
    c. Vertical Clearance below Preferred Height
    d. Lane Widths below 12 Feet
    e. Flooding Vulnerability
7) Integration into the Long-Range Transportation Plan
8) Summary of Recommendations and Next Steps

Military Personnel and Economic Impact

Virginia

According to a recent Department of Defense (DoD) report[9] on Defense Spending by State (FY2015), Virginia was the top state in defense spending at $53.0 Billion, which is 13% of the total U.S. defense spending (**Figures 1 and 2**). Virginia also had the largest defense spending as a share of state GDP at 11.8 percent, followed by Hawaii at 9.8 percent (**Figure 3**). Five of the top ten military personnel (includes active duty, civilian, and Reserve and National Guard) locations in Virginia are located within Hampton Roads—Norfolk, Virginia Beach, Portsmouth, Newport News, and Hampton (see Figure 1).

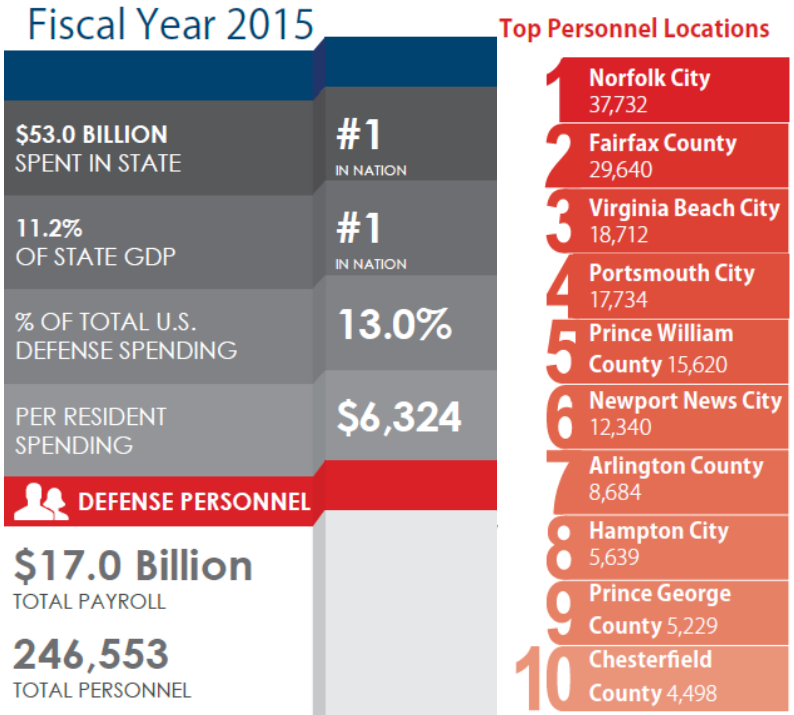


Figure 1 – Virginia Defense Spending and Personnel
Source: U.S. Department of Defense, Defense Spending by State, FY2015

[9] *Defense Spending by State: Fiscal Year 2015*, U.S. Department of Defense, Office of Economic Adjustment, FY2015.

Figure 2 – Top 10 States by Total Defense Spending
Source: U.S. Department of Defense, Defense Spending by State, FY2015

Rank	State	Defense Spending (in billions)
1	Virginia	$53.0
2	California	$49.3
3	Texas	$37.9
4	Maryland	$20.5
5	Florida	$17.6
6	Pennsylvania	$12.7
7	Georgia	$12.6
8	Washington	$12.6
9	Alabama	$12.2
10	Massachusetts	$12.2
Total for Top 10 States		$240.7
Total for United States		$408.5

Sources: Defense Manpower Data Center and Chmura Economics & Analytics.

Figure 3 – Highest Defense Spending as a % of State GDP
Source: U.S. Department of Defense, Defense Spending by State, FY2015

Rank	State	Share of State GDP
1	Virginia	11.2%
2	Hawaii	9.8%
3	Alaska	6.1%
4	Alabama	5.9%
5	Maryland	5.7%
6	District of Columbia	5.7%
7	Mississippi	4.9%
8	Maine	4.7%
9	Kentucky	4.7%
10	Connecticut	3.8%

Sources: Bureau of Economic Analysis, Defense Manpower Data Center, and Chmura Economics & Analytics.

Hampton Roads

The Department of Defense (DoD) serves as the primary driver of the Hampton Roads economy. Hampton Roads hosts one of the largest military populations in the United States with representation from all five branches of the military—U.S. Navy, U.S. Army, U.S. Air Force, U.S. Coast Guard, and U.S. Marine Corps. This region is home for many military personnel, military families, federal civilian employees, military contractors, and numerous military veterans. According to the Hampton Roads Planning District Commission (HRPDC), the DoD supports approximately 40% of all regional employment through direct, indirect, and induced impacts[10].

Approximately 76% of the military personnel in Hampton Roads are from the U.S. Navy branch (**Figure 4**). According to a recent report[11], the total direct impact of the U.S. Navy and Marines on the Hampton Roads economy was $12.3 Billion in FY 2016 (10/1/15-9/30/16). It is estimated that the U.S. Navy alone owns more than 36,000 acres and more than 6,750 buildings in the area. In FY 2016, the Navy and Marines had approximately 83,183 active duty/reserve personnel and 49,961 civilian employees and a total estimated Navy "Family" of 301,322, including retired Navy, survivors, and family members in the region. The Navy and Marines active duty and civilian personnel represented about 11% of the total employment in Hampton Roads in 2016[12].

In addition to the U.S. Navy and Marines, the Hampton Roads region hosts numerous bases and installations for the U.S. Army, Coast Guard, and Air Force. **Figure 5** on the following page provides military personnel and economic impacts for some of the major military sites in Hampton Roads.

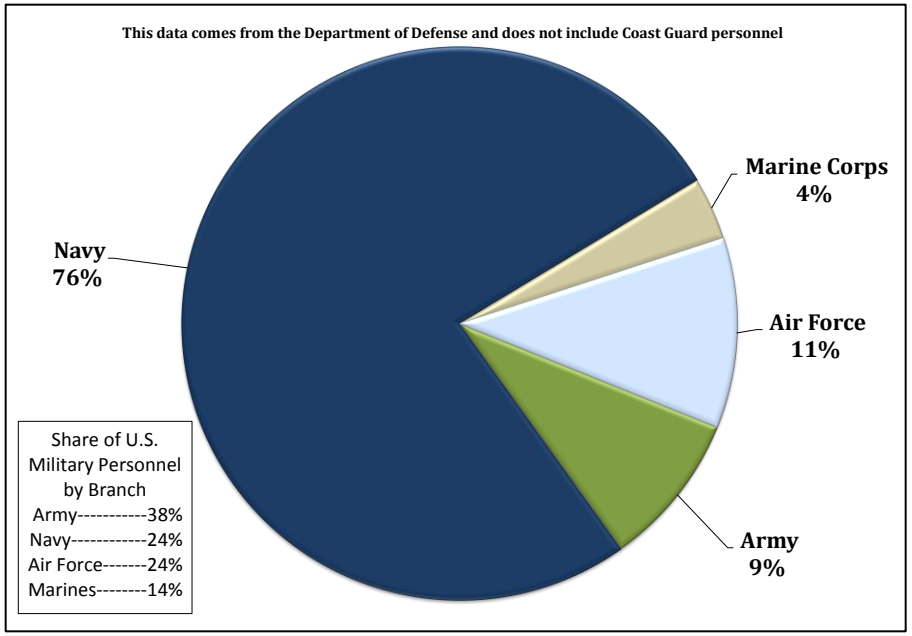


Figure 4 – Hampton Roads Military Share by Branch
Source: U.S. Department of Defense Structure Report FY2015, HRPDC Hampton Roads Benchmarking Study, October 2017.

[10] *Hampton Roads Benchmarking Study*, Hampton Roads Planning District Commission, 12th Edition, October 2017.

[11] *Navy Region Mid-Atlantic Hampton Roads Area FY 2016 Economic Impact Report,* November 2017.

[12] *Navy Region Mid-Atlantic, Bureau of Economic Analysis,* NRMA Integrated Shore Requirements Office (N5), HRPDC, November 2017.

Figure 5 – Military Personnel and Economic Impacts of Major Military Installations in Hampton Roads (FY16)

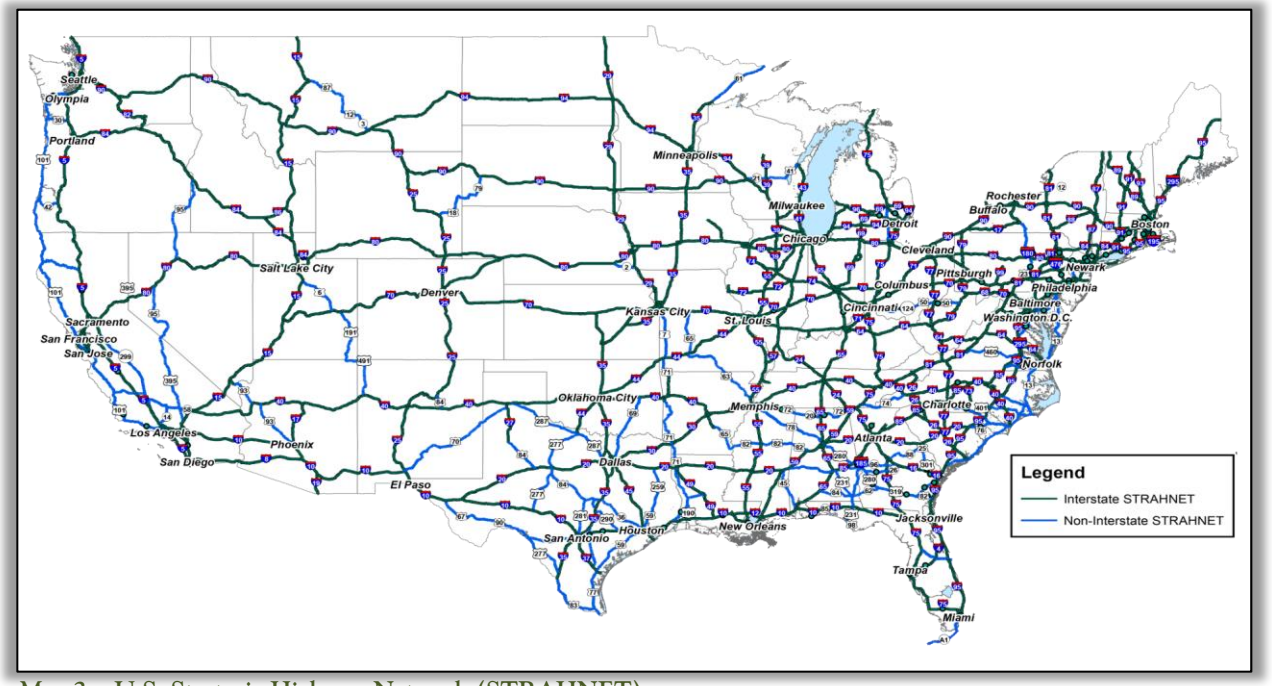
Military Installation	Highlights
Naval Station Norfolk	• Largest Navy base in the world - 6,200 acres with special areas (Craney Island) and 12.4 miles of waterfront • 75,803 personnel (active duty, reservists, students, civilians and contractors) in FY16 • $6.05 Billion Economic Impact to the Hampton Roads region in FY16
Naval Air Station (NAS) Oceana & Dam Neck Annex	• 8,500 acres of land with 4 runways • 17,366 personnel (active duty, reservists, students, civilians and contractors) in FY16 • $1.36 Billion Economic Impact to the Hampton Roads region in FY16
Joint Expeditionary Base Little Creek – Fort Story (JEBLCFS)	• 4,000 acres of land and 7.5 miles of beachfront training area with 61 piers • 23,400 personnel (active duty, reservists, students, civilians and contractors) • $1.16 Billion Economic Impact to the Hampton Roads region in FY16
Naval Support Activity (NSA) Hampton Roads	• NSA HR includes the HQ site (150 acres) and 6,000 acres of special areas • 11,424 personnel (active duty, reservists, students, civilians and contractors) in FY16 • $1.0 Billion Economic Impact to the Hampton Roads region in FY16
Norfolk Naval Shipyard	• 800 acres, 4 miles of waterfront, and 7 dry docks • 12,906 personnel (active duty, reservists, students, civilians and contractors) in FY16 • $794 Million Economic Impact to the Hampton Roads region in FY16
Naval Weapons Station Yorktown	• 10,624 acres • 3,081 personnel (active duty, reservists, students, civilians and contractors) in FY16 • $283 Million Economic Impact to the Hampton Roads region in FY16
Joint Base Langley-Eustis (JBLE)	• 7,933 acres (Ft Eustis), 3,152 acres (Langley) • 20,000 personnel (active duty and civilians) • $2.1 Billion Economic Impact to the Hampton Roads region in FY16
Fifth Coast Guard District	• Located in Portsmouth, Virginia • 6,148 personnel (5,338 active duty and 810 reservists)

Sources: Navy Region Mid-Atlantic Hampton Roads Area FY 2016 (10/1/15-9/30/16) Economic Impact Report, November 2017
Joint Base Langley-Eustis, Economic Impact Analysis FY 2016
www.militarybases.us
https://cumulis.epa.gov
http://www.hamptonroadschamber.com/page/our-military/

STRATEGIC HIGHWAY NETWORK (STRAHNET)

U.S. STRAHNET

The Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) is the U.S. Department of Defense's (DoD) designated agent for public highway matters, including STRAHNET and STRAHNET Connectors. As a part of DoD's Highways for National Defense program, the SDDCTEA identified STRAHNET and the Connector routes in coordination with the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), U.S. Congress, State transportation departments, military services and installations, and the ports.



Map 2 – U.S. Strategic Highway Network (STRAHNET)
Source: Department of Defense SDDCTEA.

The STRAHNET is a 61,000-mile system of roads (approximately 45,000 miles of Interstate and nearly 16,000 miles of other important public roadways) deemed necessary for emergency mobilization and peacetime movement of heavy armor, fuel, ammunition, repair parts, food, and other commodities to support U.S. military operations (**Map 2**).

The two primary functions of STRAHNET are[13]:

- Identify the minimum public highway infrastructure that DoD needs to fulfill its mission; then integrate these public highway needs into civil policies, plans, and programs.
- Ensure the defense readiness capability of public highway infrastructure and establish policy on how DoD uses the public highway system.

SDDCTEA addresses policy inquiries and provides guidance on safe and efficient DoD use of the public highway system. As needed, the SDDCTEA assists the military in highway movement problems, works to ensure highway safety, and helps guarantee the highways' readiness condition for deployment.

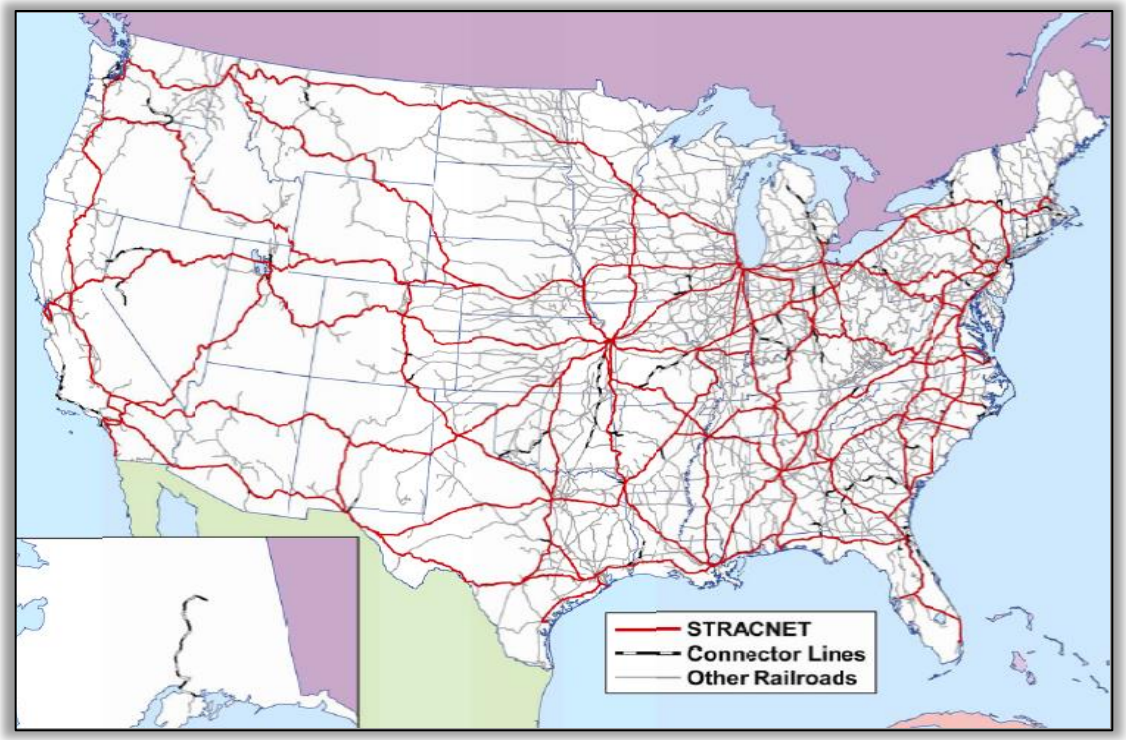
STRAHNET Connectors (approximately 1,700 miles) are additional "last mile" roadways that link over 200 important military installations and ports to the network. Together, STRAHNET and the Connectors define the total minimum defense public highway network needed to support a defense emergency. The SDDCTEA continues to work with these organizations to update and confirm the designation of STRAHNET and STRAHNET Connector routes in the National Highway System.

[13] *www.sddc.army.mil*, August 2017.

U.S. STRACNET

DoD's Railroads for National Defense program, in conjunction with the U.S. Federal Railroad Administration (FRA), established the Strategic Rail Corridor Network (STRACNET) to identify DoD's minimum rail needs and to coordinate with appropriate transportation authorities. STRACNET is an interconnected and continuous rail network consisting of approximately 32,500 miles of track critical for movement of essential military equipment to ports located around the country as well as another 5,000 miles of track essential to connect 193 defense installations (**Map 3**).

The Hampton Roads region contains Norfolk Southern and CSX rail lines with STRACNET. Since these rail lines serve commercial freight transport between the Port of Virginia and local military installations, the U.S. government places a high priority of them. For this study, planning efforts were focused on STRAHNET rather than STRACNET within Hampton Roads as highway planning is the primary focus for the HRTPO.



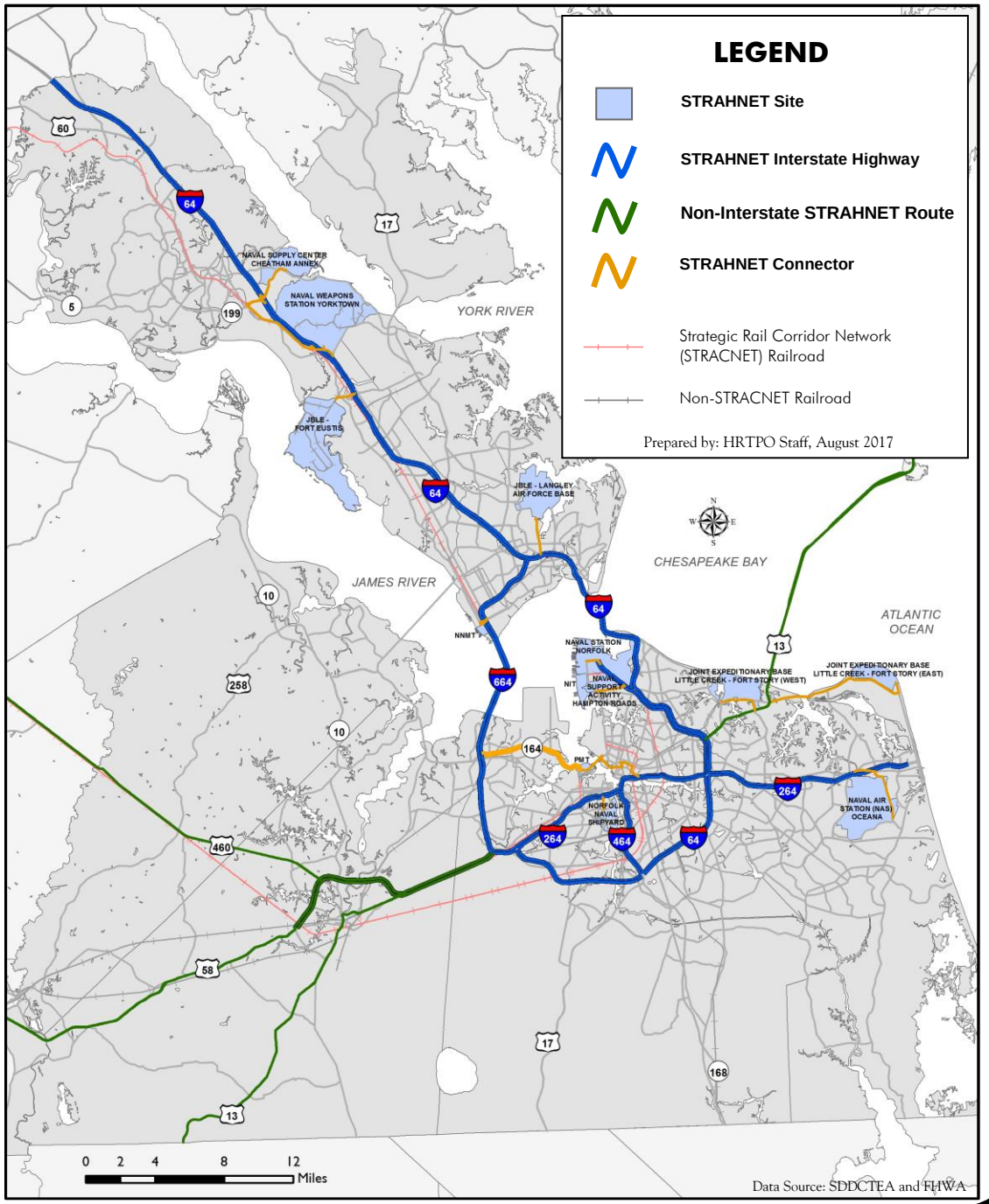
Map 3 – U.S. Strategic Rail Corridor Network (STRACNET)
Source: U.S. Department of Defense & FRA Courtesy of SDDCTEA.

STRAHNET in Hampton Roads

For this update to the Military Transportation Needs Study, HRTPO staff obtained the latest changes to STRAHNET sites and STRAHNET from the DoD's SDDCTEA in August 2017.

The Hampton Roads region contains thirteen STRAHNET sites, consisting of major military installations and port facilities. The STRAHNET system that serves those locations consists of all Interstate highways (I-64, I-264, I-464, I-564, I-664), several non-Interstate STRAHNET routes (U.S. Routes 13, 58, 460), and STRAHNET Connectors (**Map 4**). Since these roadways serve as the minimum defense public highway network needed to support a defense emergency and are used for day-to-day military cargo movement, it is important to give priority to these facilities in regional transportation planning.

Map 4 – Strategic Highway Network (STRAHNET) – Hampton Roads



MILITARY AND SUPPORTING SITES

For this study, HRTPO staff worked with local military and regional stakeholders to review and identify the major military and supporting sites in the region. These sites were first identified by stakeholders in 2011 in the initial Hampton Roads Military Transportation Needs Study - Highway Network Analysis[14]. In September 2017, HRTPO staff contacted all regional stakeholders to verify that all military and supporting sites were up-to-date and included.

Since the STRAHNET serves as the minimum public highway network necessary to support defense emergencies, all sites already identified within the national STRAHNET system in Hampton Roads were included. STRAHNET sites include military installation sites and intermodal port facilities deemed critical by the DoD. In addition, the region contains several other intermodal facilities that may be needed to support the military in the event of a national or local emergency. For regional planning purposes, it is important to account for all of the major military-related sites in Hampton Roads, i.e. those being accessed on a regular basis by military personnel. The military and supporting sites included in this study consist of STRAHNET sites, other intermodal facilities, and other military sites.

[14] *Hampton Roads Military Transportation Needs Study: Highway Network Analysis*, HRTPO, September 2011.

STRAHNET SITES

STRAHNET routes and STRAHNET Connectors link over 200 important military installations and ports in the United States. Currently, there are thirteen STRAHNET sites located within Hampton Roads (See **Figure 6 and Maps 5 and 6** on pages 21-22). Note that STRAHNET sites and roadways are subject to change upon periodic DoD SDDCTEA reviews.

STRAHNET Site	Hampton Roads Jurisdiction
1. Joint Base Langley-Eustis(JBLE) - Fort Eustis	Newport News
2. Joint Expeditionary Base Little Creek - Fort Story (East)	Virginia Beach
3. Joint Expeditionary Base Little Creek - Fort Story (West)	Norfolk/ Virginia Beach
4. Joint Base Langley-Eustis(JBLE) - Langley Air Force Base	Hampton
5. Naval Air Station Oceana	Virginia Beach
6. Naval Supply Center Cheatham Annex	York County
7. Naval Weapons Station Yorktown	York County/ Newport News
8. Naval Station Norfolk	Norfolk
9. Naval Support Activity Hampton Roads	Norfolk
10. Norfolk Naval Shipyard	Portsmouth
11. Port of Virginia – Norfolk International Terminals	Norfolk
12. Port of Virginia – Newport News Marine Terminal	Newport News
13. Port of Virginia – Portsmouth Marine Terminal	Portsmouth

Figure 6 – STRAHNET Sites in Hampton Roads.
Source: Department of Defense SDDCTEA & Hampton Roads Military Stakeholders, September 2017.

Other Intermodal Facilities

The Federal Highway Administration (FHWA) maintains a list of National Highway System (NHS) intermodal facilities and connectors to those locations. Following the events of September 11, 2001, FHWA requested States and MPOs give priority to roadway connections for many National Highway System (NHS) Intermodal Facilities for national security issues. These intermodal facilities are able to provide military support by moving military personnel and goods in the event of a national or local emergency.

There are currently 46 NHS intermodal facilities identified within Virginia with 9 of the 46 located in Hampton Roads. In Hampton Roads, this list formed the basis for identifying additional intermodal facilities that support or have the potential to support the military. Three of the NHS intermodal facilities within Hampton Roads—Norfolk International Terminals, Newport News Marine Terminal, and Portsmouth Marine Terminal—are already included as STRAHNET sites.

Six additional intermodal facilities considered important to the military are listed in **Figure 7** and depicted in **Maps 5 and 6**.

Other Military Sites

HRTPO staff worked with local military representatives and other stakeholders to develop a list of eighteen other DoD-related military sites within Hampton Roads (see **Figure 8 and Maps 5 and 6**). Many of these sites are Special Areas, which provide support to major military installations in the region. All of the locations are owned and operated by the DoD except for Newport News Shipbuilding, a division of Huntington Ingalls Industries. Huntington Ingalls Industries is a private company that designs, builds and maintains nuclear and non-nuclear ships for the U.S. Navy and Coast Guard and provides after-market services for military ships around the globe.

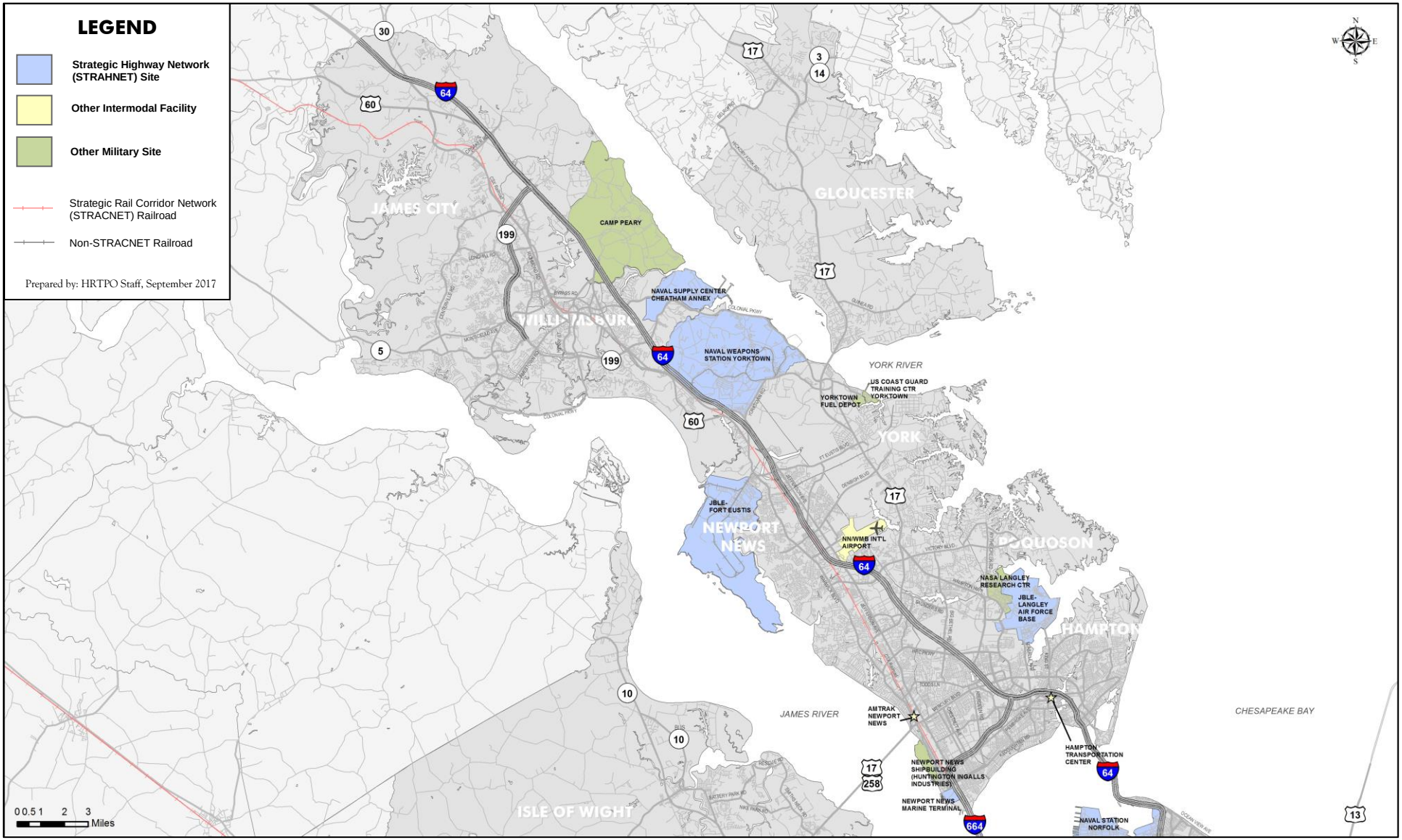
Other Intermodal Facility	Hampton Roads Jurisdiction
1. Amtrak – Newport News	Newport News
2. Chesapeake Intermodal – Norfolk Southern	Chesapeake
3. Hampton Transportation Center	Hampton
4. Lambert's Point Docks	Norfolk
5. Newport News/Williamsburg International Airport	Newport News
6. Norfolk International Airport	Norfolk

Figure 7 – Other Intermodal Facilities in Hampton Roads.
Source: FHWA & Hampton Roads Military Stakeholders, September 2017.

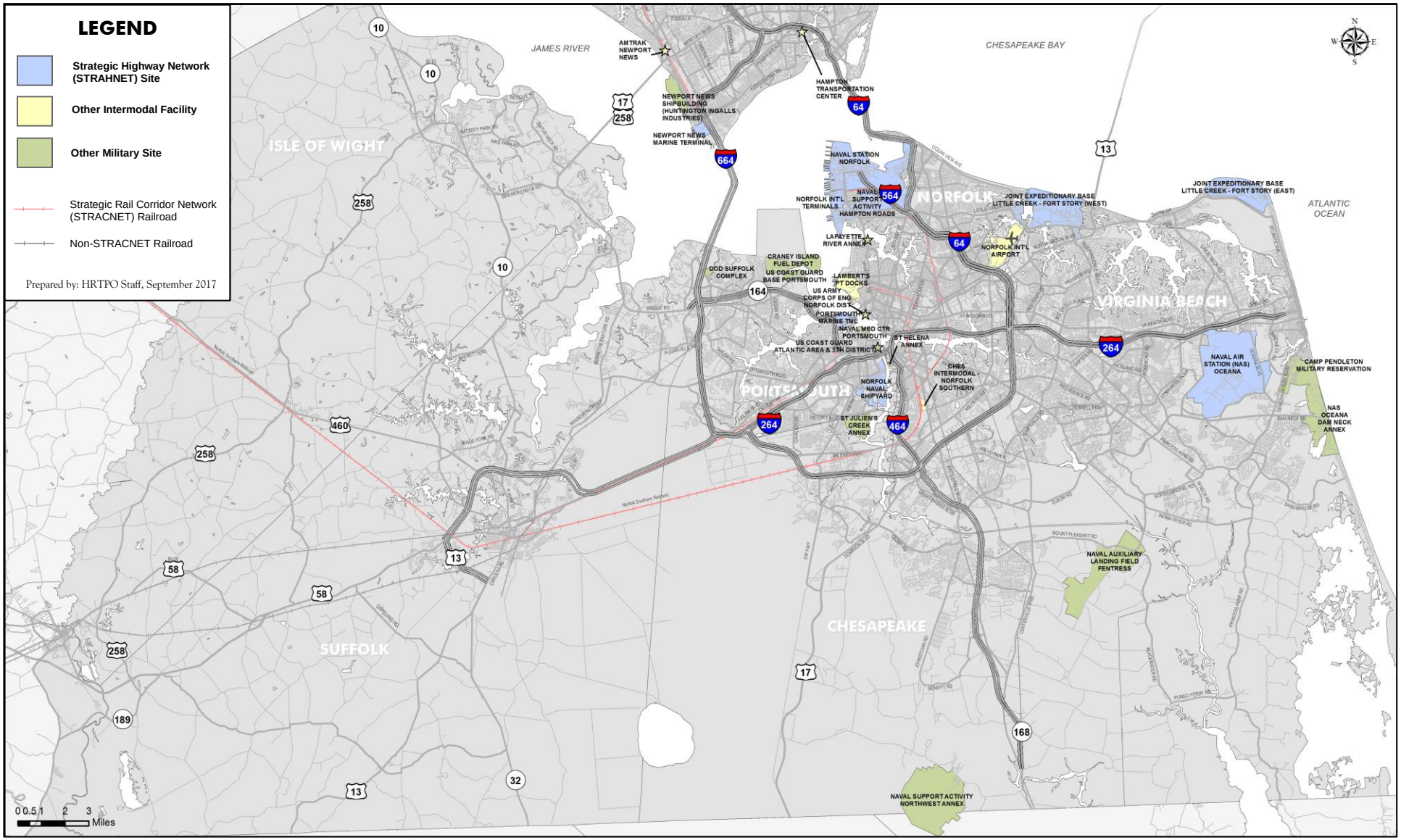
Other Military Site	Hampton Roads Jurisdiction
1. Camp Peary	York County
2. Camp Pendleton – Military Reservation	Virginia Beach
3. Lafayette River Annex	Norfolk
4. NASA Langley Research Center	Hampton
5. NAS Oceana Dam Neck Annex	Virginia Beach
6. Naval Auxiliary Landing Field Fentress	Chesapeake
7. Naval Medical Center Portsmouth	Portsmouth
8. Naval Support Activity Northwest Annex	Chesapeake
9. Newport News Shipbuilding – Huntington Ingalls Industries	Newport News
10. Saint Helena Annex – Norfolk Naval Shipyard	Norfolk
11. Saint Julien's Creek Annex – Norfolk Naval Shipyard	Chesapeake
12. U.S. Army Corps of Engineers – Norfolk District	Norfolk
13. U.S. Coast Guard – Atlantic Area and Fifth District (Portsmouth Federal Building)	Portsmouth
14. U.S. Coast Guard Base Portsmouth	Portsmouth
15. U.S. Coast Guard Training Center Yorktown	York County
16. Department of Defense (DoD) Suffolk Complex	Suffolk
17. Craney Island Fuel Depot	Portsmouth
18. Yorktown Fuel Depot	York County

Figure 8 – Other Military Sites in Hampton Roads.
Source: Hampton Roads Military Stakeholders, September 2017.

Map 5 – Military and Supporting Sites – Hampton Roads Peninsula



Map 6 – Military and Supporting Sites – Hampton Roads Southside



Roadways Serving the Military

It is important for the region to ensure that roadways used by the military are capable of supporting day-to-day operations to and from military-related sites as well as for national defense deployment. In order to achieve this objective, a comprehensive list of "Roadways Serving the Military in Hampton Roads" must first be identified. The previous section identified all of the major military and supporting sites in Hampton Roads. This section identifies Strategic Highway Network (STRAHNET) roadways as well as non-STRAHNET roadways that serve military sites or intermodal facilities. A list of the "Roadways Serving the Military in Hampton Roads" developed in this section is included in **Appendix A**.

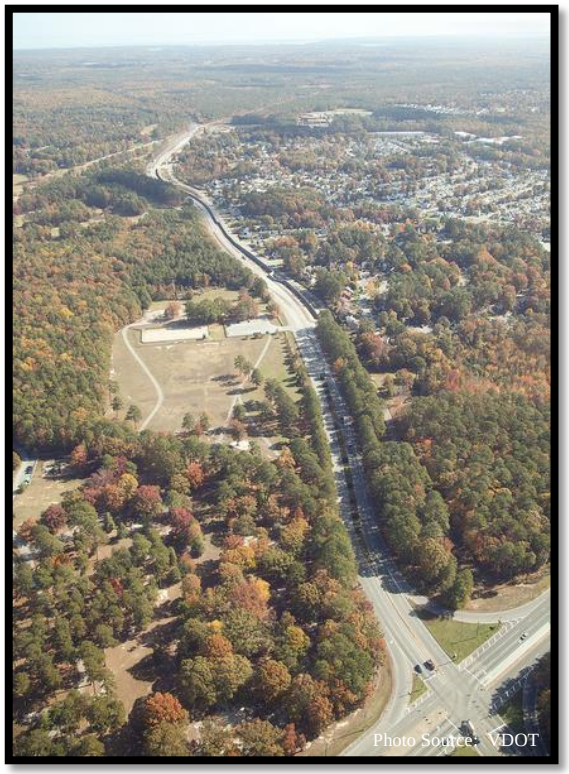
STRAHNET Roadways

As stated previously, the Strategic Highway Network (STRAHNET) is the minimum public highway network, designated by FHWA in coordination with DoD, necessary to support national defense emergencies. In Hampton Roads, all Interstate highways (I-64, I-264, I-464, I-564, I-664), several U.S. Routes (13, 58, 460), and several STRAHNET Connectors, which provide access to 13 military installations and port facilities, currently comprise the STRAHNET.

Within STRAHNET, the STRAHNET Connectors provide "last mile" access to the STRAHNET sites via a single primary route. According to the Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), STRAHNET Connectors generally end at the port boundary or the installation gate used for mobilization or deployment. However, if the installation gate that is used for mobilization or deployment is usually closed, then the STRAHNET Connector is designated as the route between the primary peacetime gate and the STRAHNET. While military installations may have multiple access and egress routes, the STRAHNET Connector is generally the most direct and highest functional class roadway.

For this study, all existing STRAHNET roadways were included as part of the "Roadways Serving the Military in Hampton Roads" (See roadways colored in blue on **Maps 8 and 9**).

In March 2018, Langley Air Force Base submitted a comment to HRTPO staff that the currently designated STRAHNET Connector (La Salle Avenue from I-64 to Langley gate) is restricted to personal-owned vehicles and commercial vehicles access the base via the Armistead Avenue/Sweeney Boulevard gate. In May 2018, the City of Suffolk suggested to HRTPO staff that the currently designated Non-Interstate STRAHNET Route 13 (Portsmouth Blvd, Constance Rd, Main St, and Carolina Rd) be replaced with the SW Suffolk Bypass (Holland Rd to Carolina Rd) since military trucks are using this route instead of traveling through downtown Suffolk. Both of these comments have been forwarded to SDDCTEA to see if the current STRAHNET designations are valid. If these STRAHNET roadways or other STRAHNET route designations change in the future, this list of "Roadways Serving the Military in Hampton Roads" will be adjusted accordingly.



Aerial view of Fort Eustis Boulevard (Newport News/York County), which is included as one of the "Roadways Serving the Military".

Non-STRAHNET Roadways Serving Military Sites or Intermodal Facilities

This section identifies the non-STRAHNET roadways that serve STRAHNET sites, other military sites, and other intermodal facilities. Criteria used in selecting the Non-STRAHNET Roadways that serve Military Sites or Intermodal Facilities are:

- Routes that are commonly used for access/egress for commuting & daily activities, generally the most direct and highest functional class roadway
- Routes that provide access/egress to/from the main entry gate
- Routes that provide access/egress to/from other entry gates (STRAHNET currently provides one connector roadway usually to the main gate)
- Routes that are currently identified as National Highway System (NHS) Intermodal Connectors
- Routes that provide connectivity to/from STRAHNET or between Military Sites
- Routes that provide access/egress to and from locations outside of Hampton Roads for military-related travel

Non-STRAHNET roadways serving military sites or intermodal facilities are shown in red on **Maps 8 and 9**.

In September 2017, HRTPO staff requested input from military stakeholders on any potential changes to the "Roadways Serving the Military in Hampton Roads" from the original study. Based on military stakeholder comments, the following roadways were added as non-STRAHNET roadways:

- South Norfolk Jordan Bridge (Route 337) in Chesapeake and Portsmouth.
- Hampton Hwy/Magruder Blvd (Route 134) from Route 17 to Commander Shepard Blvd (South) in York County/Hampton.
- Commander Shepard Blvd from Big Bethel Rd to Wythe Creek Rd in Hampton.
- Big Bethel Rd from Hampton Hwy (Route 134) to Commander Shepard Blvd/Saunders Rd in York County/Hampton.
- Semple Farm Rd from Big Bethel Rd to Bellgrade Dr in Hampton.

Map 7 – I-564 Intermodal Connector Project

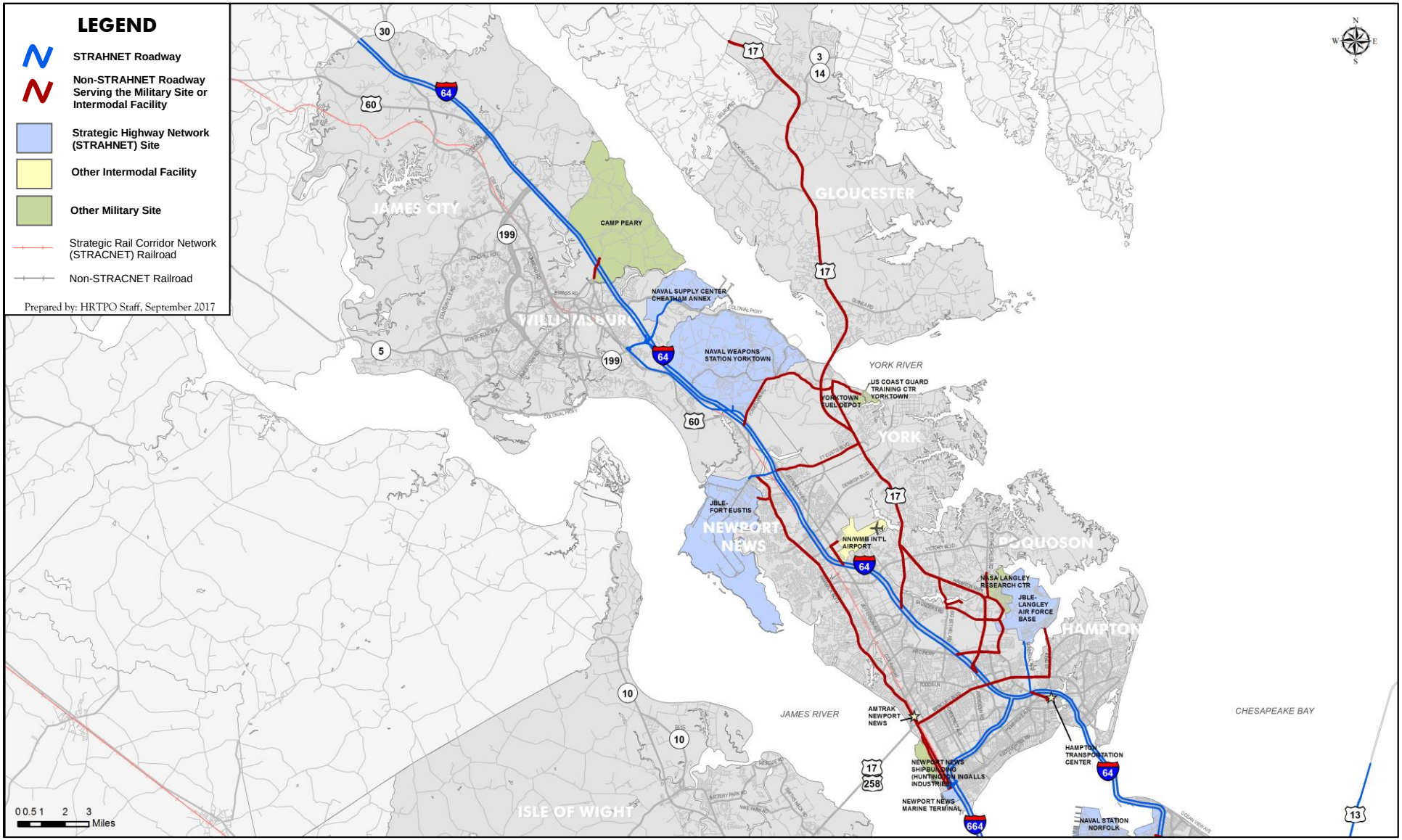
Future Roadways

It is important to note that the I-564 Intermodal Connector (see **Map 7**) opened to Norfolk International Terminals in 2017, but is not scheduled to open to Naval Station Norfolk until Fall 2018. Upon completion, this roadway will be added as a Non-STRAHNET Roadway Serving the Military. If the DoD SDDCTEA identifies this new roadway as a STRAHNET connector, it will be added as a STRAHNET roadway.

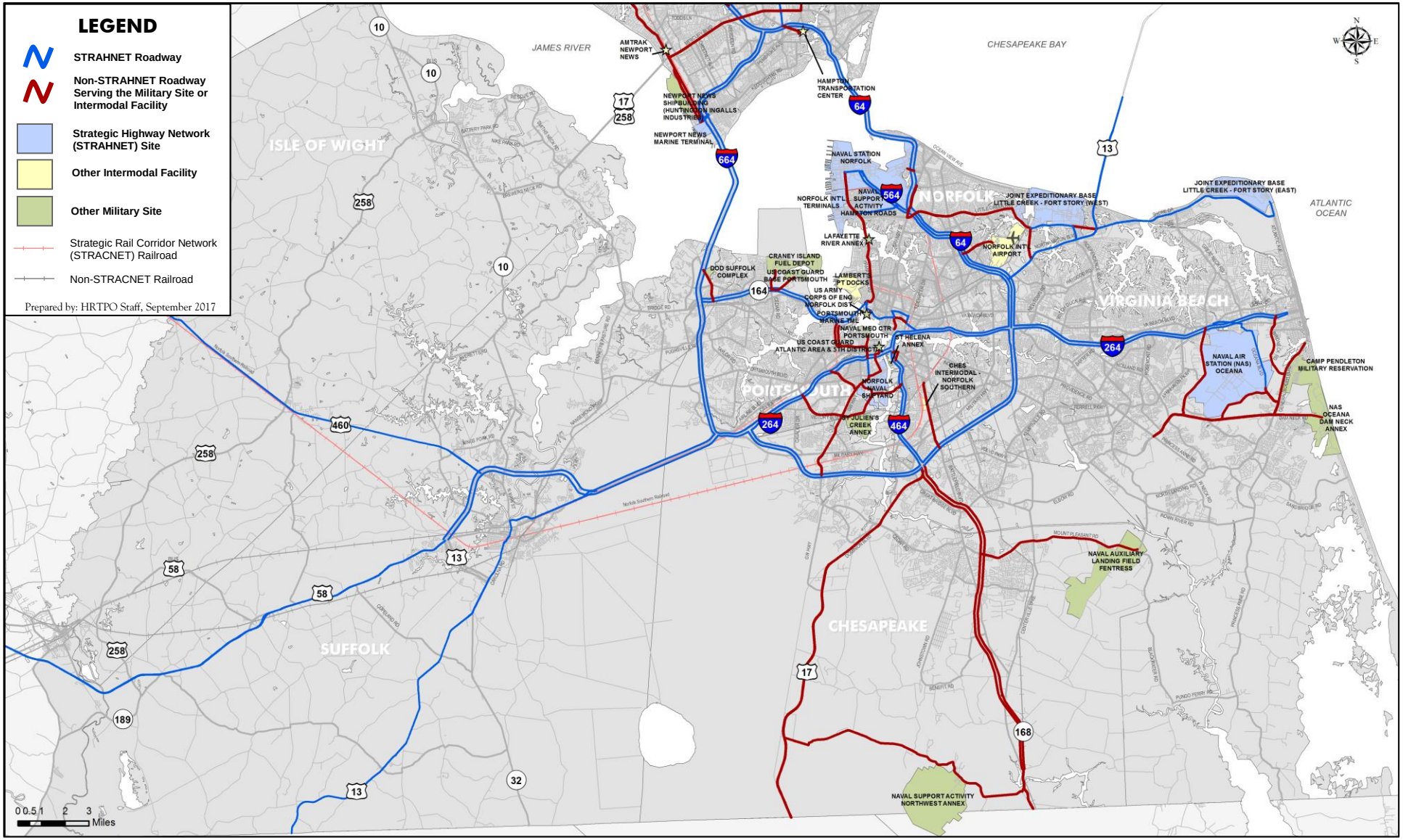
Recommendation

- Governor Terry McAuliffe signed House Bill 2 into law in 2014, which directs the Commonwealth Transportation Board (CTB) to develop and use a statewide prioritization process—SMART SCALE—to select transportation projects to be funded in Virginia. As the CTB considers possible changes to the SMART SCALE process in the future, it is recommended that a measure related to the "Roadways Serving the Military" network be added to the project evaluation methodology.

Map 8 – Roadways Serving the Military – Hampton Roads Peninsula



Map 9 – Roadways Serving the Military – Hampton Roads Southside



Deficiencies in Roadways Serving the Military

Maintenance of the "Roadways Serving the Military in Hampton Roads" network is important for emergency mobilization and peacetime movement of heavy armor, fuel, ammunition, repair parts, food and other commodities to support U.S. military operations. These roadways are also important to military commuters and the daily operations of military facilities.

The purpose of this section is to determine current deficiencies in the "Roadways Serving the Military in Hampton Roads" so that countermeasures can be developed for them to maximize mission performance and efficiency for the local military. This section identifies severely congested roadway segments, deficient bridges, bridge and tunnel vertical clearances and lane widths below military preferences, roadways vulnerable to flooding as well as other issues that may hinder the military function of this region.

Congested Roadways

Congestion levels for the "Roadways Serving the Military in Hampton Roads" were obtained from HRTPO's latest Congestion Management Process (CMP) document – HRTPO Annual Roadway Performance Report[15]. The Congestion Management Process is an on-going process that identifies, develops, evaluates, and implements transportation strategies to enhance mobility regionwide. The CMP congestion analysis determines weekday congestion levels by roadway segment for all vehicles including trucks. Roadway segment congestion levels were determined using INRIX speed data and *Highway Capacity Manual*[16] (HCM) traffic volume-based level of service methods for roadways where speed data is not available.

INRIX is a private company that has deployed new technologies to collect travel time and speed data on a continuous basis throughout the nation. INRIX's primary data source is millions of GPS-enabled fleet vehicles – such as taxis, service vehicles, and long haul trucks. This data was purchased by VDOT and provided to Metropolitan Planning Organizations throughout the state.

Congestion levels for roadways in Hampton Roads with INRIX speed data are determined based on travel time index (TTI). The TTI represents the ratio of the actual travel time during the peak hour to the travel time in free-flow conditions. For example, a TTI of 1.20 means a trip that takes 20 minutes under free-flow conditions takes 24 minutes (20% longer) in the peak hour.

Congestion Levels for Roadways with Speed Data

Congestion Level		Freeway	Arterial
Low	LOW	TTI < 1.15	TTI < 1.25
Moderate	MOD	1.15 ≤ TTI < 1.3	1.25 ≤ TTI < 1.4
Severe	SEV	TTI ≥ 1.3	TTI ≥ 1.4

Congestion levels for roadways in Hampton Roads without INRIX speed data are based on traffic volumes and *Highway Capacity Manual* (HCM) level of service (LOS) methods. The HCM is a widely accepted engineering standard. The HCM describes LOS as a measure of operating conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver traffic interruptions, and comfort and convenience.

Level of service is measured on a scale of "A" through "F," with LOS A representing the best operating conditions and LOS F representing the worst. LOS A through D are considered acceptable operating conditions, while LOS E and F (indicated in red in upcoming maps) are considered unacceptable operating conditions with severe congestion. LOS D is the "warning" level condition where favorable conditions are on the verge of becoming unfavorable.

Congestion Levels for Roadways without Speed Data

Congestion Level		HCM LOS
Low	LOW	A-C
Moderate	MOD	D
Severe	SEV	E-F

[15] *HRTPO Annual Roadway Performance Report – 2017 Edition*, HRTPO, September 2017.

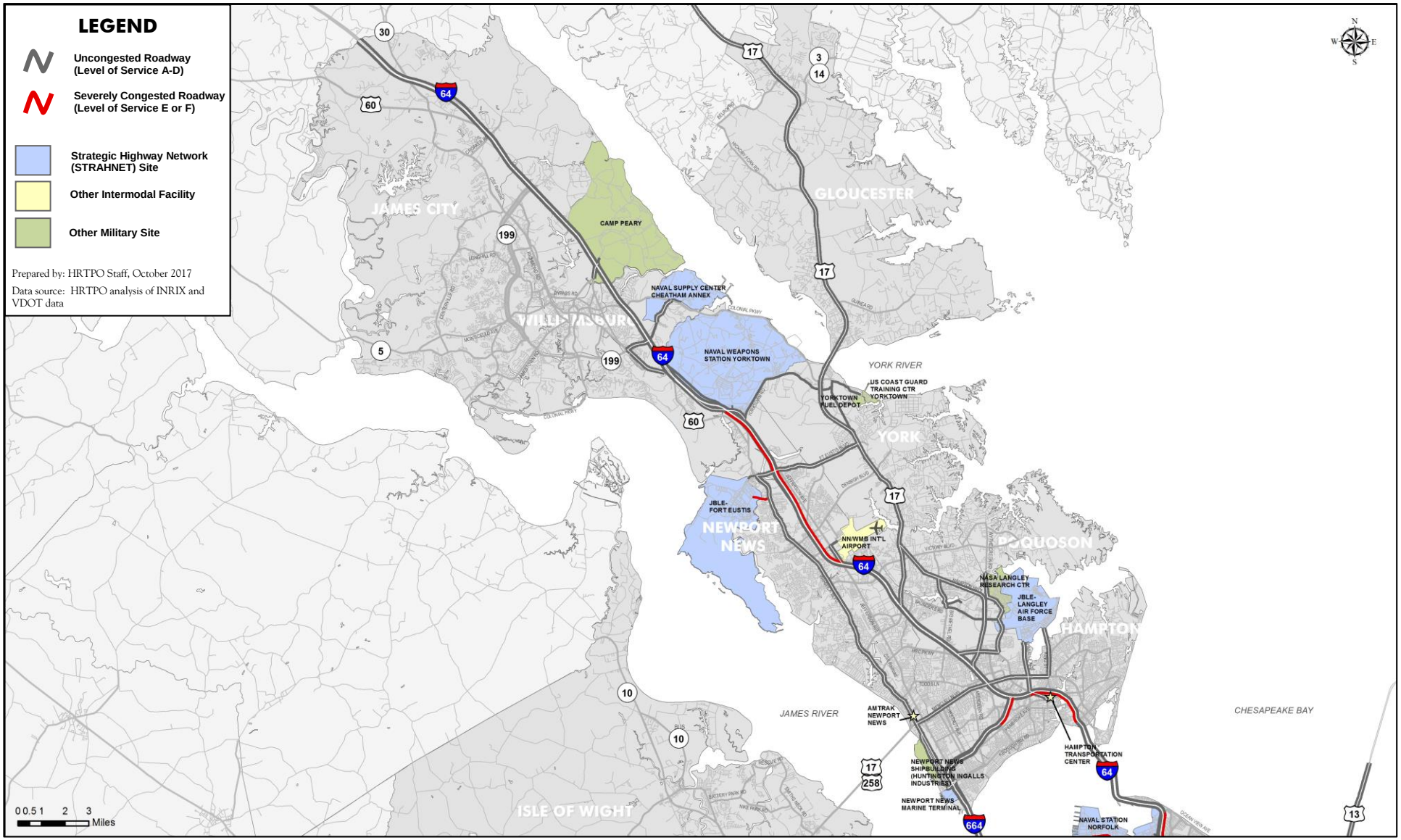
[16] *Highway Capacity Manual*, Transportation Research Board, 2010.

Congestion levels for "Roadways Serving the Military in Hampton Roads" are provided on **Maps 10 and 11** (2016 AM Peak) and **Maps 12 and 13** (2016 PM Peak) and in tabular form in **Appendix A**. Traffic congestion results represent the 2016 existing operating conditions for the AM and PM peak hour during a typical weekday (Tuesday-Thursday) for all vehicles. **Severely congested roadways (LOS E and F) are shown in red** and uncongested roadways (LOS A – D) are shown in dark grey.

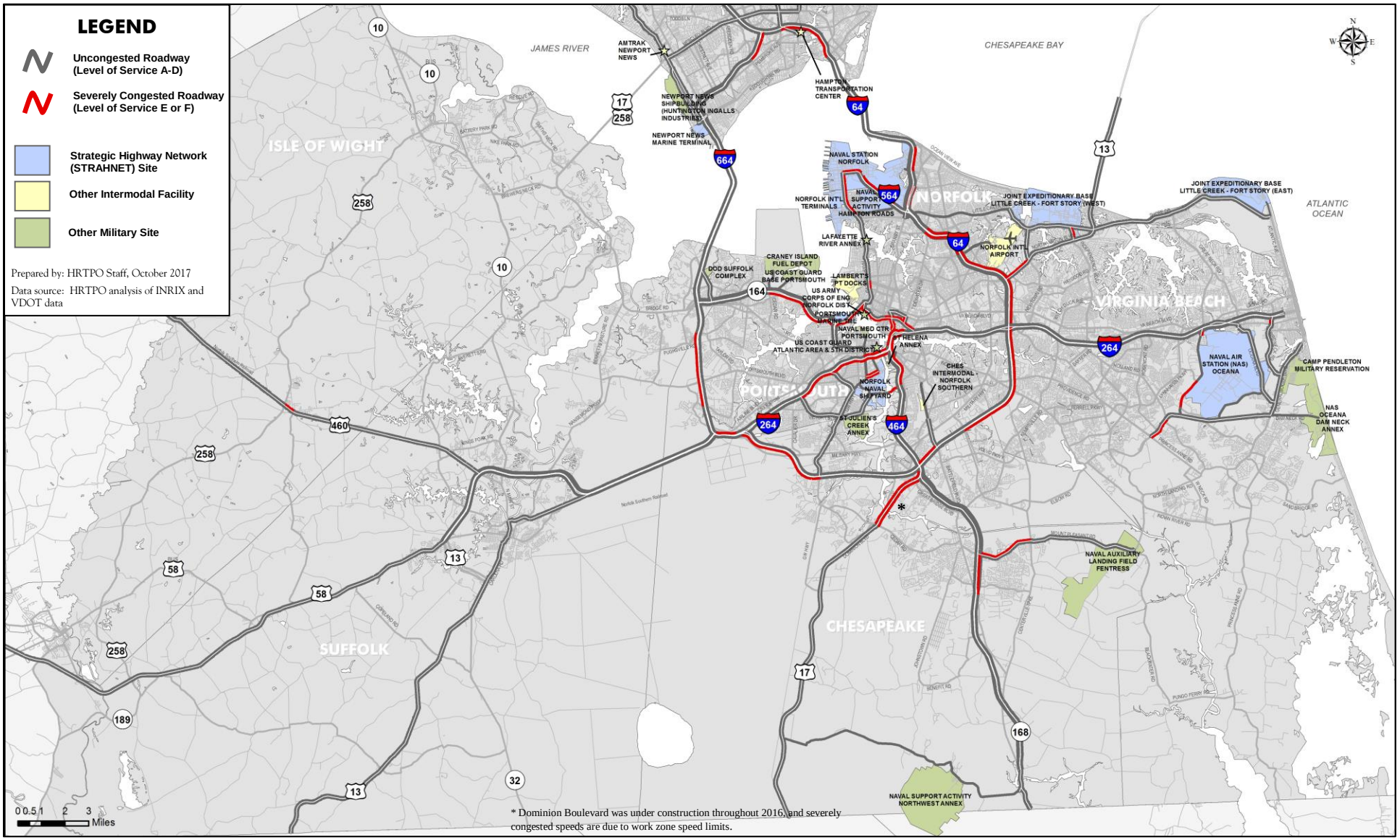
Congestion Summary

"Roadways Serving the Military in Hampton Roads" comprise a total of 2,214 lane miles. The congestion analysis shows that 6% (129 lane miles) of total lane miles were severely congested (LOS E and F) during the 2016 AM Peak. Furthermore, it shows that 12% (266 lane miles) of the total lane miles were severely congested (LOS E and F) during the 2016 PM Peak.

Map 10 – Severely Congested Roadways Serving the Military (2016 AM Peak) – Hampton Roads Peninsula

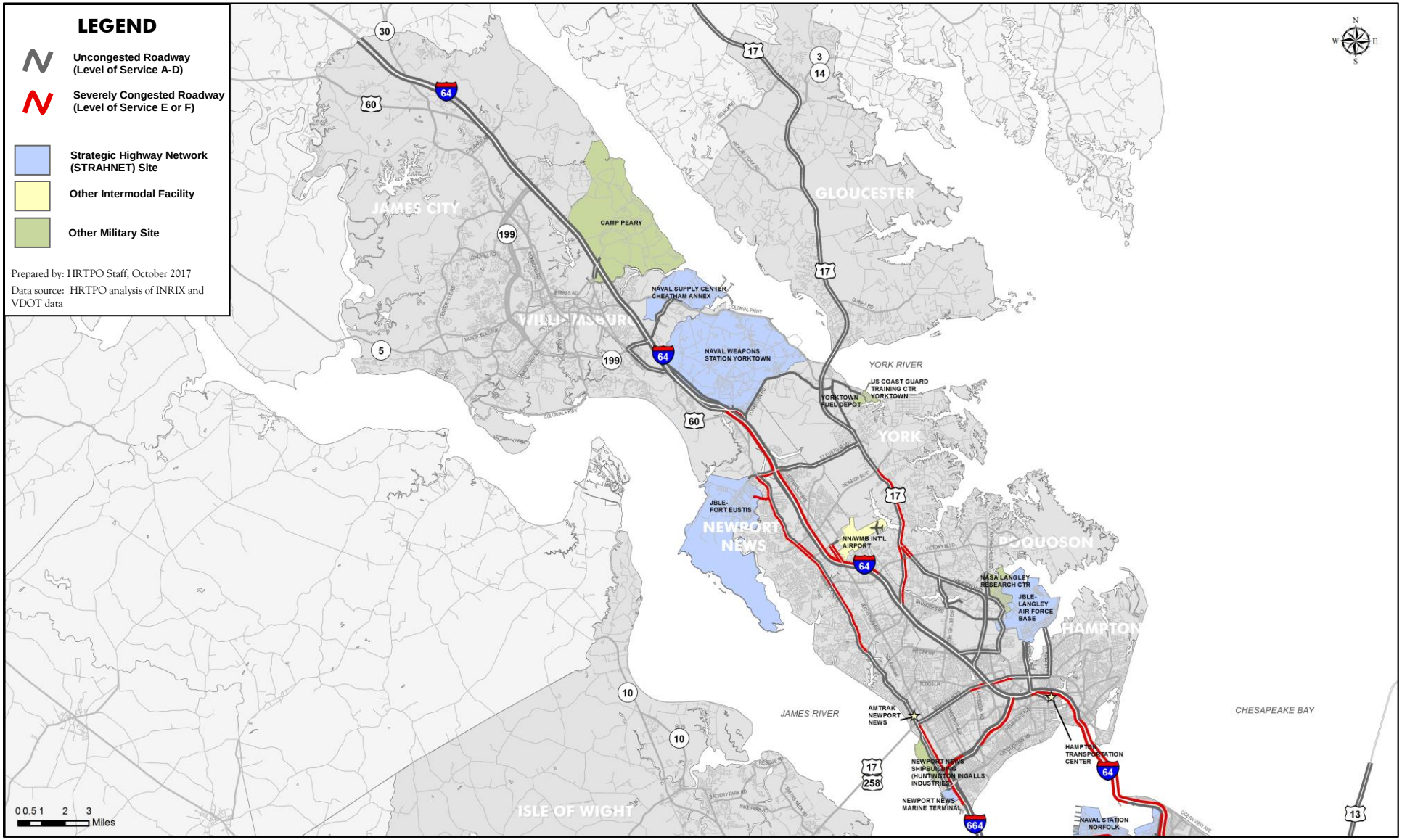


Map 11 – Severely Congested Roadways Serving the Military (2016 AM Peak) – Hampton Roads Southside

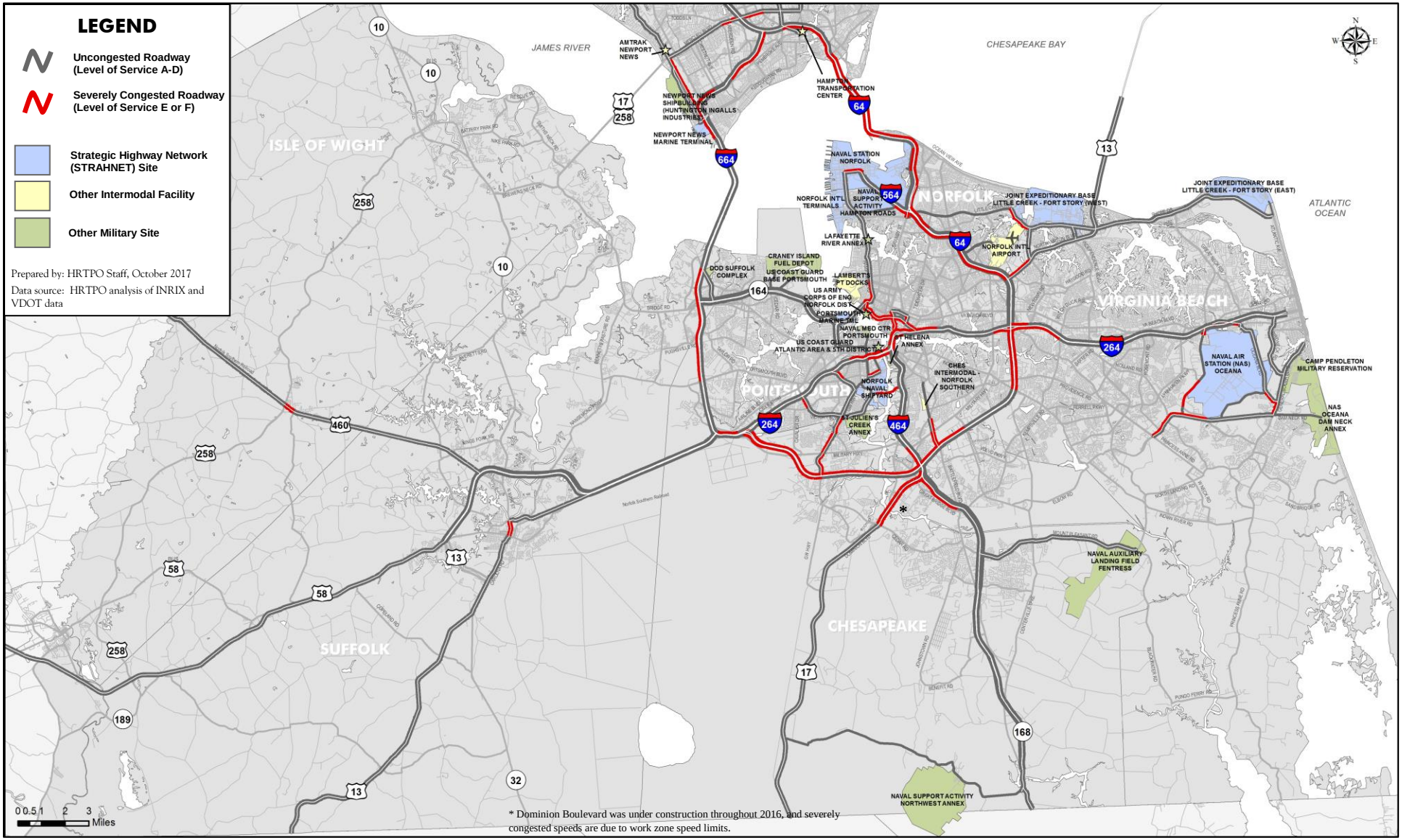


* Dominion Boulevard was under construction throughout 2016, and severely congested speeds are due to work zone speed limits.

Map 12 – Severely Congested Roadways Serving the Military (2016 PM Peak) – Hampton Roads Peninsula



Map 13 – Severely Congested Roadways Serving the Military (2016 PM Peak) – Hampton Roads Southside



* Dominion Boulevard was under construction throughout 2016, and severely congested speeds are due to work zone speed limits.

Roadway congestion can be reduced by either increasing capacity or lowering travel demand. The addition of roadway capacity is primarily out of the military's control; however, the military can influence and reduce the demand side. Working off-peak hours, telecommuting, ridesharing, active transportation and using public transit are several strategies which lower congestion. Recent experience in these areas has been mixed in Hampton Roads. Over 100 local military commands (with over 2,200 participants) are actively participating in travel demand management programs offered by TRAFFIX (a cooperative public service designed to promote transportation alternatives) to eliminate or shift single-occupancy automobile trips to other alternatives. However, the overall percentage of Hampton Roads commuters that drive alone to work has increased from 73% in 1990 to 82% in 2015[17]. According to the HRTPO's 2012 Military Commuter Survey[18], 90% of the 10,994 military respondents said that they drive alone to work.

The Department of Defense (DoD) Instruction 1000.27 established a mass transit benefit program for eligible active duty military members and civilian employees. In accordance with this instruction, the Department of the Navy (DON) has implemented the Transportation Incentive Program (TIP) for employees to help reduce their daily contribution to traffic congestion and air pollution, as well as expand their commuting alternatives. Effective January 1, 2018, DON transit benefit participants are eligible for transit benefits of up to $260 per month (parking fees not included) for specific pre-approved commuter mass transit transportation costs not to exceed actual expenses. TIP is designed to pay for mass transit (e.g. bus and rail transportation and vanpooling) costs incurred by personnel in their local commute from residence to permanent duty station throughout the Hampton Roads area. Military employees as far south as cities in North Carolina and as far north as Richmond, VA commute to our area and are active participants. Throughout the Hampton Roads region, it is estimated that over 2,500 military commuters (all DoD installations) are participating in the TIP.

Due to the prevalence of the military in Hampton Roads, in order to reduce regional congestion, the role of military leadership in increasing participation in demand reduction programs is paramount. Therefore, it is important for local military leaders and commands to modify policies concerning work times and work location and to solidify partnerships with Hampton Roads Transit (HRT), Williamsburg Area Transit Authority (WATA), Suffolk Transit, TRAFFIX, and other regional stakeholders to increase travel options for military personnel and reduce congestion near bases and across Hampton Roads.

Recommendations

- Evaluate, develop, and apply congestion mitigation strategies to all severely congested (Level of Service E or F) "Roadways Serving the Military in Hampton Roads" in the next Hampton Roads Congestion Management Process (CMP) update.
- When evaluating projects using the Project Prioritization Tool for the Hampton Roads Long-Range Transportation Plan (LRTP), it is recommended that the HRTPO continue to take into account projects that improve severe traffic conditions on the "Roadways Serving the Military" network.
- It is recommended that local military leaders and commands modify policies concerning work times and work location and solidify partnerships with Hampton Roads Transit (HRT), Williamsburg Area Transit Authority (WATA), and other regional stakeholders to increase travel options for military personnel through travel demand management strategies such as working off-peak hours, telecommuting, ridesharing, and using public transit.
- It is recommended that all eligible military employees consider participating in the Transportation Incentive Program (TIP) to help reduce their daily contribution to traffic congestion and air pollution, as well as expand their commuting alternatives.

[17] U.S. Census Bureau.

[18] *Hampton Roads Military Transportation Needs Study: Military Commuter Survey*, HRTPO, September 2012.

Deficient Bridges

Bridge data for Hampton Roads was obtained from the Virginia Department of Transportation's (VDOT) Structure and Bridge Division (October 2017) and, for federally-maintained bridges, the Federal Highway Administration's (FHWA) National Bridge Inventory (NBI) database (2016). All bridges are inspected on a 24-month cycle, unless conditions warrant more frequent inspections. All bridge data was downloaded from these sources in October 2017.

Definitions for structurally deficient and functionally obsolete bridges are provided below.

Structurally Deficient Bridges[19] – A structurally deficient bridge is a structure with elements that need to be monitored and/or repaired. These bridges typically require more frequent inspections, maintenance and repair and eventually need to be rehabilitated or replaced to address deficiencies. In spite of these deficiencies, a structurally deficient bridge is not necessarily unsafe. Bridge inspectors will close or impose limits on bridges they feel are unsafe.

For a bridge to be classified as structurally deficient, at least one of the following conditions must be true*:

- Deck Condition Rating ≤ 4
- Superstructure Condition Rating ≤ 4
- Substructure Condition Rating ≤ 4
- Culvert Condition Rating ≤ 4
- Structural Condition Rating ≤ 2
- Waterway Adequacy Rating ≤ 2

**As of January 1, 2018, Structural Condition Rating and Waterway Adequacy Rating are not included in the structurally deficient classification definition. However, since the data used in this analysis is prior to this date, they are included in this report.*

Functionally Obsolete Bridges[20] – A functionally obsolete bridge is a structure that was built to geometric standards that are no longer used today. Functionally obsolete bridges may not have adequate lane widths, shoulder widths, or vertical clearances for the current traffic demand on the bridge. Functionally obsolete bridges may also occasionally be flooded, or have approaches that are difficult to navigate. In spite of these geometric deficiencies, functionally obsolete bridges are not inherently unsafe. Inspectors will close or impose limits on bridges that they feel are unsafe.

For a structure to be classified as functionally obsolete, at least one of the following conditions must be true:

- Structural Condition Rating = 3
- Waterway Adequacy Rating = 3
- Deck Geometry Rating ≤ 3
- Underclearances Rating ≤ 3
- Approach Roadway Alignment Rating ≤ 3

By rule, any structure that is classified as structurally deficient cannot also be classified as functionally obsolete. Structures that have ratings that would qualify the bridge to be classified as both structurally deficient and functionally obsolete are classified as structurally deficient.

For this study, a total of 625 bridges located on "Roadways Serving the Military in Hampton Roads" (including those which span the network) were analyzed. Deficient bridges are those bridges that are classified as "Structurally Deficient" or "Functionally Obsolete". Of the 625 bridges, 126 or 20% are currently deficient, as shown below in **Figure 9**.

Figure 9 – Summary of Deficient Bridges on Roadways Serving the Military

	Number	Percent
Total Bridges (on Roadways Serving the Military)	**625**	
Structurally Deficient Bridges	**6**	**1%**
Functionally Obsolete Bridges	**120**	**19%**
Deficient Bridges	**126**	**20%**

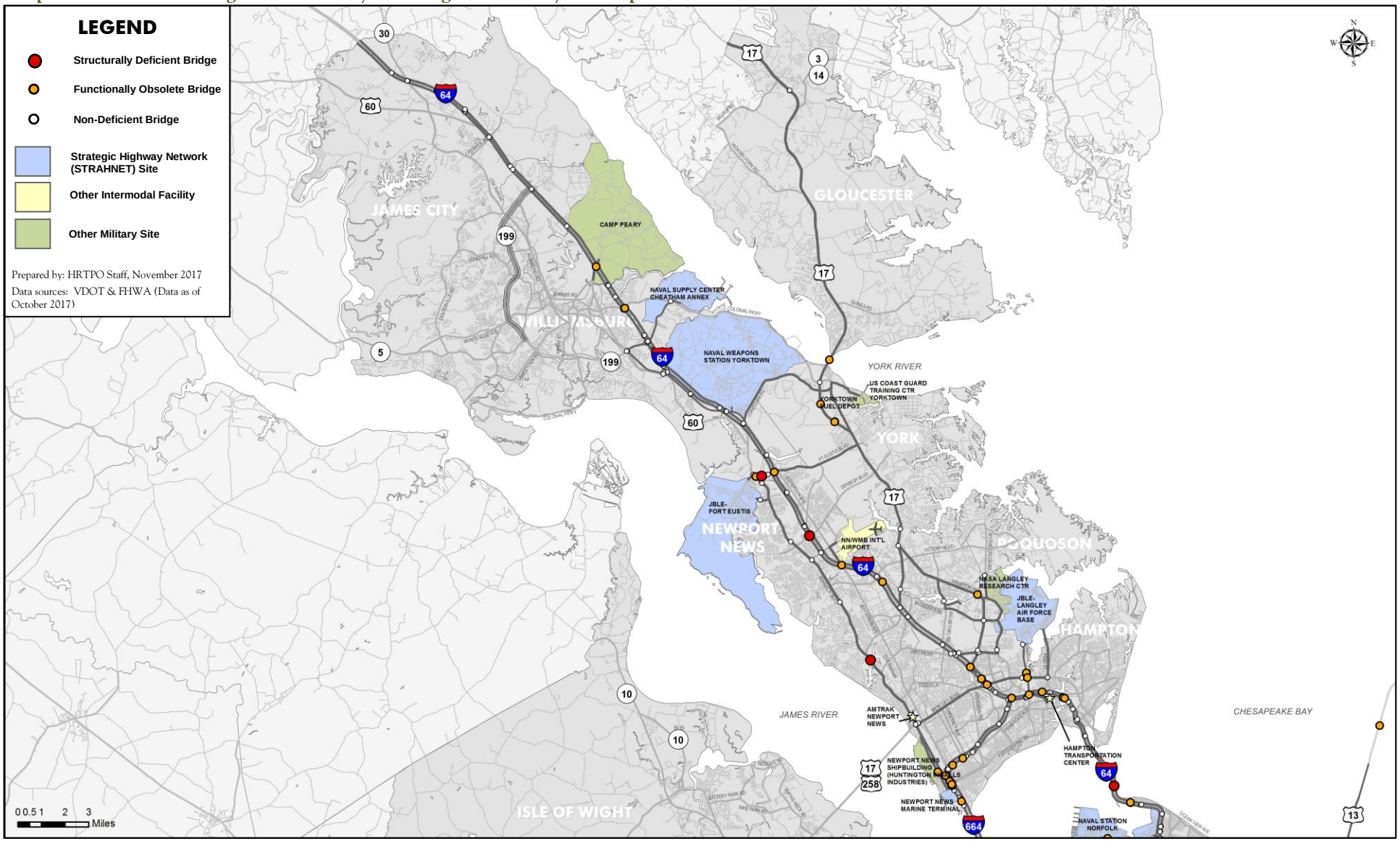
These deficient bridges are shown in **Maps 14 and 15** on pages 36-37. The 6 Structurally Deficient Bridges are also shown in **Figure 10** on page 38, and the 120 Functionally Obsolete Bridges are shown in **Figure 11** on pages 38-40.

[19] Hampton Roads Regional Bridge Study, HRTPO, November 2012.
[20] Ibid.

Recommendations

- Rehabilitate or replace the following Structurally Deficient bridges that are located on "Roadways Serving the Military in Hampton Roads" and do not currently have identified funding:
  - Victory Boulevard over Paradise Creek in Portsmouth (Federal ID: 21217)
  - I-264 over First Colonial Road in Virginia Beach (Federal ID: 22239)
- Closely monitor the remaining 4 Structurally Deficient bridges and give priority to these facilities for rehabilitation or replacement.
- Continue to monitor the 120 Functionally Obsolete bridges and make improvements as conditions warrant.

Map 14 – Deficient Bridges on Roadways Serving the Military – Hampton Roads Peninsula



Map 15 – Deficient Bridges on Roadways Serving the Military – Hampton Roads Southside

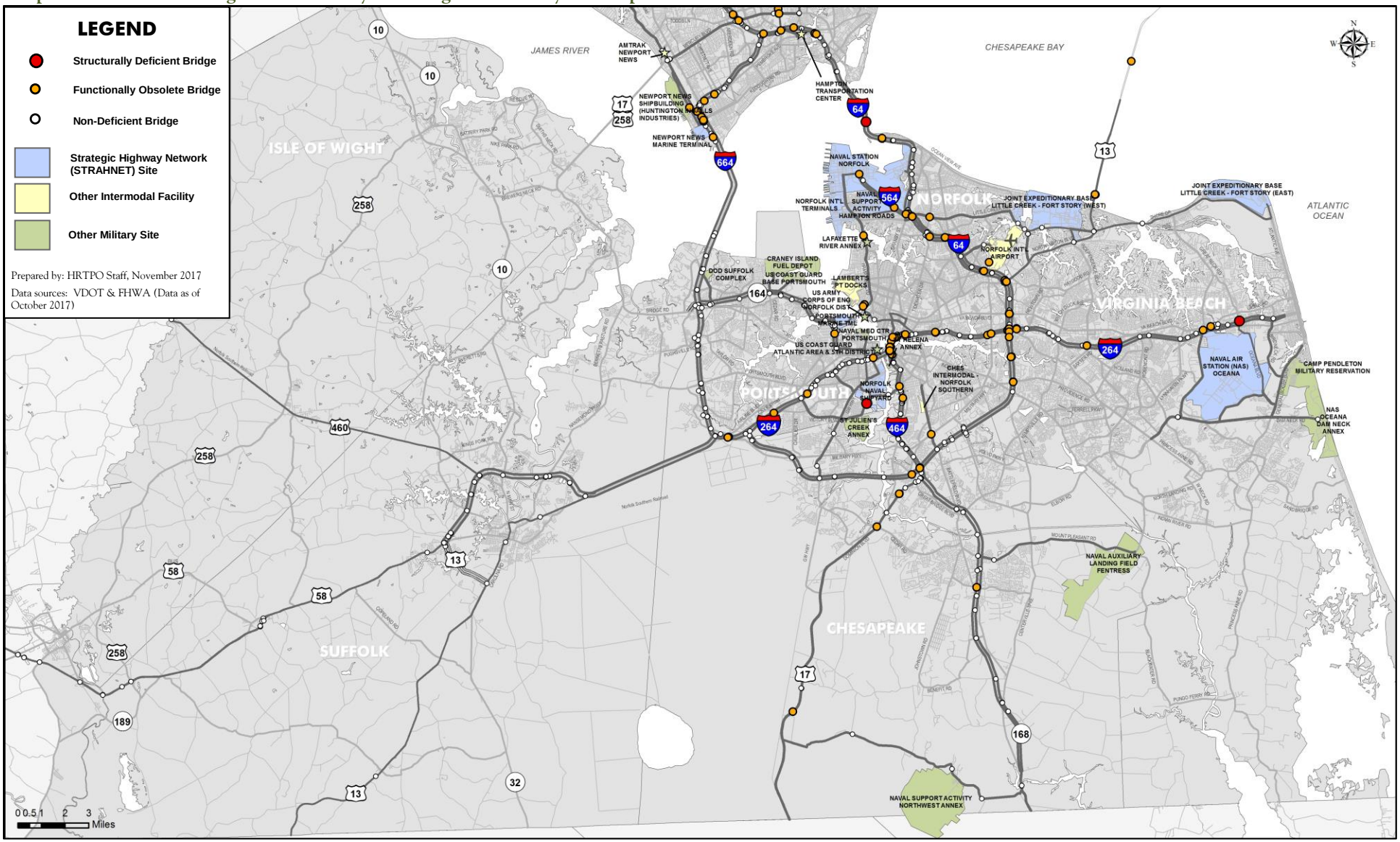


Figure 10 – Structurally Deficient Bridges on Roadways Serving the Military

Source: VDOT, FHWA. Data as of October 2017.

Jurisdiction	Federal Structure ID	Route	FACILITY	CROSSING	Year Built	Year Reconstructed	Deficiency	Funded Project (Programmed)?
Hampton	20353	64	HAMPTON ROADS BRIDGE-TUNNEL WB	HAMPTON ROADS	1957		Superstructure Cond. = 4, Substructure Cond. = 4	
Newport News	20679	60	WARWICK BLVD	LAKE MAURY	1931	1960	Superstructure Cond. = 4	Yes
Newport News	20720	105	FORT EUSTIS BLVD	NEWPORT NEWS RESERVOIR	1960	1985	Superstructure Cond. = 4	Yes
Newport News	20727	173	DENBIGH BLVD	I-64 & CSX R/R	1965	1977	Substructure Cond. = 4	Yes
Portsmouth	21217	239	VICTORY BLVD	PARADISE CREEK	1944		Substructure Cond. = 4, Structural Cond. = 2	
Virginia Beach	22239	264	I-264	FIRST COLONIAL ROAD	1967	1986	Superstructure Cond. = 4	

Figure 11 – Functionally Obsolete Bridges on Roadways Serving the Military

Source: VDOT, FHWA. Data as of October 2017.

Jurisdiction	Federal Structure ID	Route	FACILITY	CROSSING	Year Built	Year Reconstructed	Deficiency	Funded Project (Programmed)?
James City	10498	64	I-64 WB	SIX MT ZION ROAD	1975		Underclearances = 3	
Virginia Beach	12747	13	CBBT NB	CHESAPEAKE BAY & LOOKOUT RD	1964		Deck Geometry = 2	
Virginia Beach	12750	13	CBBT NB	CHESAPEAKE BAY	1964		Deck Geometry = 3	
Virginia Beach	12752	13	CBBT NB	CHESAPEAKE BAY	1964		Deck Geometry = 3	
Virginia Beach	12753	13	CBBT SB	FISHERMAN'S INLET	1964		Deck Geometry = 3	
Virginia Beach	12754	13	CBBT NB	CHESAPEAKE BAY	1964		Deck Geometry = 3	
Virginia Beach	12755	13	CBBT NB	CHESAPEAKE BAY	1964		Deck Geometry = 3	
York	19820	17	GEORGE WASHINGTON HWY NB	YORKTOWN BATTLEFIELD TOUR ROAD	1968		Underclearances = 2	
York	19822	17	GEORGE WASHINGTON HWY SB	YORKTOWN BATTLEFIELD TOUR ROAD	1968		Underclearances = 2	
York	19824	17	COLEMAN BRIDGE	YORK RIVER & ROUTE 238	1952	1996	Underclearances = 2	
York	19838	64	I-64 EB	COLONIAL PKWY	1965		Underclearances = 3	
York	19840	64	I-64 WB	COLONIAL PKWY	1965		Underclearances = 3	
York	19855	134	MAGRUDER BLVD WB	BRICK KILN CREEK	1930		Deck Geometry = 2	Yes
York	19857	143	ROUTE 143	I-64	1965		Deck Geometry = 2	
Hampton	20316	64	I-64 EB	PEMBROKE AVENUE & HAMPTON RIVER	1958	1987	Underclearances = 2	
Hampton	20320	64	I-64	RIP RAP ROAD	1959	1984	Underclearances = 3	
Hampton	20324	64	I-64	ARMISTEAD AVENUE	1957	1986	Underclearances = 2	
Hampton	20328	664	I-664 SB RAMP	I-64 & NEW MARKET CREEK	1981		Underclearances = 3	
Hampton	20346	64	I-64 WB	PEMBROKE AVENUE & HAMPTON RIVER	1985		Underclearances = 2	
Hampton	20362	152	CUNNINGHAM DRIVE EB	I-64	1974		Deck Geometry = 3	
Hampton	20364	152	CUNNINGHAM DRIVE WB	I-64	1974		Deck Geometry = 3	
Hampton	20367	167	LASALLE AVENUE NB	NEWMARKET CREEK	1965		Deck Geometry = 3	
Hampton	20368	167	LASALLE AVENUE SB	NEWMARKET CREEK	1965		Deck Geometry = 3	
Newport News	20643		OLD OYSTER POINT ROAD	I-64	1991		Underclearances = 3	
Newport News	20647		34TH STREET EB	I-664/WARWICK BLVD/CSX R/R	1988		Underclearances = 3	
Newport News	20649		34TH STREET WB	I-664/WARWICK BLVD/CSX R/R	1988		Deck Geometry = 2	
Newport News	20651		26TH STREET	I-664 & CSX R/R	1987		Underclearances = 3	
Newport News	20653		23RD-25TH STREET	I-664/WARWICK BLVD/CSX R/R	1988		Deck Geometry = 2, Underclearances = 2	
Newport News	20661		HUNTINGTON AVENUE	FORMER SHIPYARD R/R SPUR	1899		Underclearances = 2	Yes
Newport News	20663		28TH STREET	I-664/WARWICK BLVD/CSX R/R	1980		Underclearances = 3	
Newport News	20681	60	WARWICK BLVD WB	FORT EUSTIS BLVD	1960	1985	Underclearances = 2	
Newport News	20710	64	I-64 EB	FORT EUSTIS BLVD	1965		Underclearances = 3	
Newport News	20738	664	I-664	ROANOKE AVENUE	1985		Underclearances = 3	
Newport News	20740	664	I-664	39TH STREET	1987		Underclearances = 3	
Newport News	20761	664	I-664 RAMP	TERMINAL AVENUE	1990		Underclearances = 3	

Figure 11 – Functionally Obsolete Bridges on Roadways Serving the Military (continued)

Source: VDOT, FHWA. Data as of October 2017.

Jurisdiction	Federal Structure ID	Route	FACILITY	CROSSING	Year Built	Year Reconstructed	Deficiency	Funded Project (Programmed)?
Norfolk	20764		FRONTAGE ROAD	I-264	1967		Underclearances = 3	
Norfolk	20767		ROBIN HOOD ROAD	NORFOLK WATER SUPPLY CANAL	1944	1987	Deck Geometry = 2	
Norfolk	20793	264	I-264 WB	KEMPSVILLE ROAD	1967	1992	Underclearances = 3	Yes
Norfolk	20795	264	I-264 EB	KEMPSVILLE ROAD	1967	1983	Underclearances = 2	Yes
Norfolk	20805	58	BRAMBLETON AVENUE WB	HAMPTON BLVD	1962		Underclearances = 3	
Norfolk	20813	64	I-264 EB RAMP	I-264 WB & I-64	1985		Underclearances = 3	
Norfolk	20815	64	I-64 EB	SEWELLS POINT ROAD	1965	1977	Underclearances = 2	
Norfolk	20837	64	I-64 WB	MILITARY HWY	1966		Underclearances = 3	
Norfolk	20852	64	I-64 EB	RAMP FROM NORTHAMPTON BLVD	1967	1977	Underclearances = 2	
Norfolk	20858	64	I-64 EB	NORTHAMPTON BLVD	1967	1977	Underclearances = 2	
Norfolk	20860	64	I-64 WB	NORTHAMPTON BLVD	1967	1977	Underclearances = 2	
Norfolk	20875	64	I-64 EB	VA BEACH BLVD	1968	1986	Underclearances = 2	
Norfolk	20877	64	I-64 WB	VA BEACH BLVD	1968	1992	Underclearances = 2	
Norfolk	20879	64	I-64 EB	I-264 WB	1968	1985	Underclearances = 2	
Norfolk	20881	64	I-64 WB	I-264 WB	1968	1992	Underclearances = 2	
Norfolk	20898	64	I-64 EB RAMP	I-64 WB RAMP AT TIDEWATER DR	1971		Underclearances = 3	
Norfolk	20909	64	I-64 EB	13TH VIEW STREET	1972		Underclearances = 2	
Norfolk	20911	64	I-64 WB	13TH VIEW STREET	1972		Underclearances = 2	
Norfolk	20934	165	LITTLE CREEK ROAD	TIDEWATER DRIVE	1959	2014	Underclearances = 3	
Norfolk	20947	264	I-264 WB	E BR ELIZABETH RIVER	1952	1991	Underclearances = 3	
Norfolk	20949		WATERSIDE DRIVE EB	EAST MAIN STREET	1972	1990	Underclearances = 3	
Norfolk	20953	264	I-264 EB & I-464 NB	I-264 & I-464 RAMPS	1986		Underclearances = 3	
Norfolk	20955	264	I-264 WB	I-264 & I-464 RAMPS	1988		Underclearances = 3	
Norfolk	20957	264	I-264 & I-464 RAMPS	I-264 EB	1986		Underclearances = 3	
Norfolk	20959	264	I-264 WB RAMP	I-264 WB	1988		Underclearances = 3	
Norfolk	20961	264	IBERKLEY AVENUE RAMP	EMERGENCY VEHICLE RAMP	1988		Underclearances = 3	
Norfolk	20971	264	I-264 EB	I-264 EB RAMP	1990		Underclearances = 3	
Norfolk	20973	264	I-264 RAMP	HOLT STREET & NS R/R	1990		Underclearances = 3	
Norfolk	20992	264	I-264 EB	HOLT STREET & NS R/R	1972	1990	Underclearances = 3	
Norfolk	21000	264	I-264 WB	HOLT ST & NS R/R	1972	1991	Underclearances = 3	
Norfolk	21002	264	I-264 EB	BALLENTINE AVENUE	1968		Underclearances = 3	
Norfolk	21004	264	I-264 WB	BALLENTINE AVENUE	1968		Underclearances = 3	
Norfolk	21019	337	HAMPTON BLVD SB RAMP	HAMPTON BLVD NB	1962		Underclearances = 2	
Norfolk	21021	337	ADMIRAL TAUSSIG BLVD	I-564 RAMPS	1977		Underclearances = 3	
Norfolk	21024	337	HAMPTON BLVD NB	LAFAYETTE RIVER	1970		Deck Geometry = 3	
Norfolk	21026	406	INT TERMINAL BLVD WB	I-564 & NS R/R	1975		Deck Geometry = 2	
Norfolk	21037	460	I-264 RAMP	WATERSIDE DRIVE	1990		Underclearances = 3	
Norfolk	21051	464	I-464 SB	I-264 & I-464 RAMPS	1988		Underclearances = 3	
Norfolk	21053	464	I-464 NB	BERKLEY AVENUE	1988		Deck Geometry = 2	
Norfolk	21057	464	I-464 SB	I-264 EB	1987		Underclearances = 3	
Norfolk	21065	464	I-464 SB	EMERGENCY VEHICLE RAMP	1988		Underclearances = 3	
Norfolk	21068	564	I-564 RAMP	I-64 & I-564	1990		Underclearances = 3	
Norfolk	21072	564	I-564 SB	GRANBY STREET	1972	1991	Underclearances = 3	

Figure 11 – Functionally Obsolete Bridges on Roadways Serving the Military (continued)

Source: VDOT, FHWA. Data as of October 2017.

Jurisdiction	Federal Structure ID	Route	FACILITY	CROSSING	Year Built	Year Reconstructed	Deficiency	Funded Project (Programmed)?
Portsmouth	21190		GREENWOOD DRIVE	I-264	1976		Underclearances = 3	
Portsmouth	21193		COURT STREET	I-264 WB	1951	1990	Deck Geometry = 2, Underclearances = 3	
Portsmouth	21220	264	I-264	MCLEAN AVENUE	1964	1979	Underclearances = 2	
Chesapeake	21819		BARNES ROAD	I-464	1983		Underclearances = 3	
Chesapeake	21885	168	BATTLEFIELD BLVD	MILITARY HIGHWAY	1990		Underclearances = 3	
Chesapeake	21906	190	GREAT BRIDGE BLVD	I-64	1967		Underclearances = 2	
Chesapeake	21911	664	I-664 NB	W MILITARY HWY & CSX R/R	1983		Underclearances = 3	
Chesapeake	21913	664	I-664 SB	W MILITARY HWY & CSX R/R	1983		Underclearances = 3	
Chesapeake	21932	337	POINDEXTER STREET	I-464	1980		Underclearances = 3	
Chesapeake	21941	464	I-464 NB	I-64	1967		Underclearances = 3	
Chesapeake	21943	464	I-464 SB	I-64	1967		Underclearances = 3	
Virginia Beach	22222	264	I-264	INDEPENDENCE BLVD	1967	1992	Underclearances = 2	
Virginia Beach	22232	264	I-264	LONDON BRIDGE ROAD	1967	1982	Underclearances = 3	
Virginia Beach	22255	58	VA BEACH BLVD	I-264 WB RAMP	1967		Deck Geometry = 2	
Virginia Beach	22265	64	I-64 WB	E BR ELIZABETH RIVER	1967	1992	Underclearances = 3	
Virginia Beach	22267	64	I-64 EB	E BR ELIZABETH RIVER	1967	1992	Underclearances = 3	
Virginia Beach	22285		PROVIDENCE ROAD WB	I-64	1967		Deck Geometry = 3	
Virginia Beach	22287		PROVIDENCE ROAD EB	I-64	1967		Deck Geometry = 3	
Norfolk	23059	64	I-64 HOV LANES	SEWELLS POINT ROAD	1992		Underclearances = 3	
Norfolk	23214	64	I-64 HOV LANES	I-564 & LITTLE CREEK ROAD	1992		Underclearances = 3	
Norfolk	23216	564	I-564 HOV LANES	LITTLE CREEK ROAD	1992		Deck Geometry = 2	
Norfolk	23272	64	I-64 HOV LANES	VA BEACH BLVD	1992		Underclearances = 3	
Norfolk	23304	64	I-64 HOV LANES	I-264 WB	1992		Deck Geometry = 3, Underclearances = 3	
Norfolk	23306	64	I-64 HOV LANES	I-264 EB	1992		Deck Geometry = 3, Underclearances = 3	
Norfolk	23342	64	I-64 HOV LANES	CNW R/R & CURLEW DR	1992		Deck Geometry = 3	
Hampton	25292	167	LASALLE AVENUE SB	MERCURY BLVD	1998		Deck Geometry = 2	
Hampton	25293	167	LASALLE AVENUE NB	MERCURY BLVD	1998		Deck Geometry = 2	
Chesapeake	25696		HANBURY ROAD	CHESAPEAKE EXPRESSWAY	1998		Underclearances = 3	
Newport News	25809	143	JEFFERSON AVENUE	I-64	2000		Deck Geometry = 2, Underclearances = 3	
Virginia Beach	26056	13	CBBT SB	CHESAPEAKE BAY & LOOKOUT RD	1998		Deck Geometry = 3, Underclearances = 3	
Hampton	26143	134	MAGRUDER BLVD	I-64	2004		Underclearances = 3, Approach Rdwy. Alignment = 3	
Hampton	26145	64	I-64	MERCURY BLVD	2005		Deck Geometry = 2	
Norfolk	26334	13	MILITARY HIGHWAY	I-264	2000		Deck Geometry = 2, Underclearances = 2	
Virginia Beach	26630	13	CBBT SB	CHESAPEAKE BAY	1998		Deck Geometry = 2	
Portsmouth	26653	58	MLK FREEWAY	CLEVELAND STREET & CSX R/R	2005		Underclearances = 3	
Virginia Beach	26721	13	CBBT SB	CHESAPEAKE BAY	1999		Deck Geometry = 3	
Chesapeake	27402	17	ROUTE 17	STREAM	2006		Deck Geometry = 2	
York	90003		YORKTOWN BATTLEFIELD TOUR ROAD	ROUTE 17	1959		Underclearances = 3	
Newport News	29307	664	26th St	I-664	1988		Underclearances = 3	
Chesapeake	28796		ROUTE 17 NBL	BAINBRIDGE BLVD	2014		Underclearances = 3	
Chesapeake	28795		ROUTE 17 SBL	BAINBRIDGE BLVD	2015		Underclearances = 3	
Chesapeake	28792		RTE 17 DOMINION BLVD SB	CEDAR RD	2016		Underclearances = 3	

VERTICAL CLEARANCE BELOW PREFERRED HEIGHT

This section includes "Roadways Serving the Military in Hampton Roads" with vertical clearances of bridge and tunnel structures below preferred height (e.g. bridge overpasses that carry roadways and vertical clearances inside tunnel facilities). It does not include vertical clearance restrictions due to other overhead structures, such as signs, signals, or bridges that only carry railroads, pedestrians, or bicyclists.

According to the Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), there are no separate standard bridge geometric requirements for military purposes[21]. The military expects the Strategic Highway Network (STRAHNET) to meet the design standards for the National Highway System (NHS) established by the Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO).

Interstate Highways with Posted Vertical Clearances Below 16 Feet

According to the SDDCTEA Information Paper[22], the following vertical clearance guidelines are provided for Interstate highways and new structures on urban and rural arterials:

"…all rural Interstate highway bridges will be built to the 16-foot vertical clearance standard. In addition, a 16-foot vertical clearance route shall also be maintained throughout and/or around each urban area. Interstate bridges in urban areas not on the 16-foot vertical clearance route must have a minimum of 14 feet of vertical clearance. Any exceptions to this policy must be approved by FHWA."

All interstate highways with vertical clearances below 16 feet along "Roadways Serving the Military in Hampton Roads" are listed in **Figure 12** and shown in red on **Map 16**.

Non-Interstate Highways with Posted Vertical Clearances

Virginia law dictates that the maximum height for vehicles traveling on Virginia roadways is 13 feet, 6 inches. According to both the Manual on Uniform Traffic Control Devices (MUTCD) and the Virginia Supplement to the MUTCD, bridges shall be posted with a low clearance sign when the vertical clearance of the bridge is less than 14 feet, 6 inches, which is one foot above the statutory maximum vehicle height. The vertical clearance posted on the warning signs shall be 3 inches less than the actual vertical clearance. According to SDDCTEA, the military-preferred minimum vertical clearance for all non-Interstate STRAHNET routes is 14 feet.

As a result of Virginia law and guidance from SDDCTEA, all non-Interstate highways with posted vertical clearances below 14 feet, 6 inches along "Roadways Serving the Military in Hampton Roads", including STRAHNET and non-STRAHNET roadways, have been identified in **Figure 13** and are shown in orange on **Map 16**.

Recommendations

- As the Hampton Roads Bridge-Tunnel is rehabilitated or new tubes are added, ensure that the vertical clearance meets or exceeds the 16-foot threshold, similar to the Monitor-Merrimac Memorial Bridge-Tunnel.
- Use a minimum vertical clearance of 14 feet, 6 inches as non-Interstate bridge and tunnel structures are replaced at the 16 locations shown in **Figure 13** on page 42.

[21] Information Paper: Military Design Standards for the National Highway System, Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), August 31, 2000.
[22] Ibid.

Figure 12 – Interstate Highways with Posted Vertical Clearances below 16 Feet on Roadways Serving the Military

Jurisdiction	Federal Structure ID	Route	FACILITY	CROSSING	Posted Vertical Clearance	Funded Project (Programmed)?
Hampton	20354	64	HAMPTON ROADS BRIDGE-TUNNEL WB*	HAMPTON ROADS	13' 6"	Yes
Hampton	20340	64	HAMPTON ROADS BRIDGE-TUNNEL EB*	HAMPTON ROADS	14' 6"	Yes

*For tunnel facilities, posted vertical clearance (maximum vehicle height) is provided.

Source: VDOT, FHWA. Data as of October 2017.

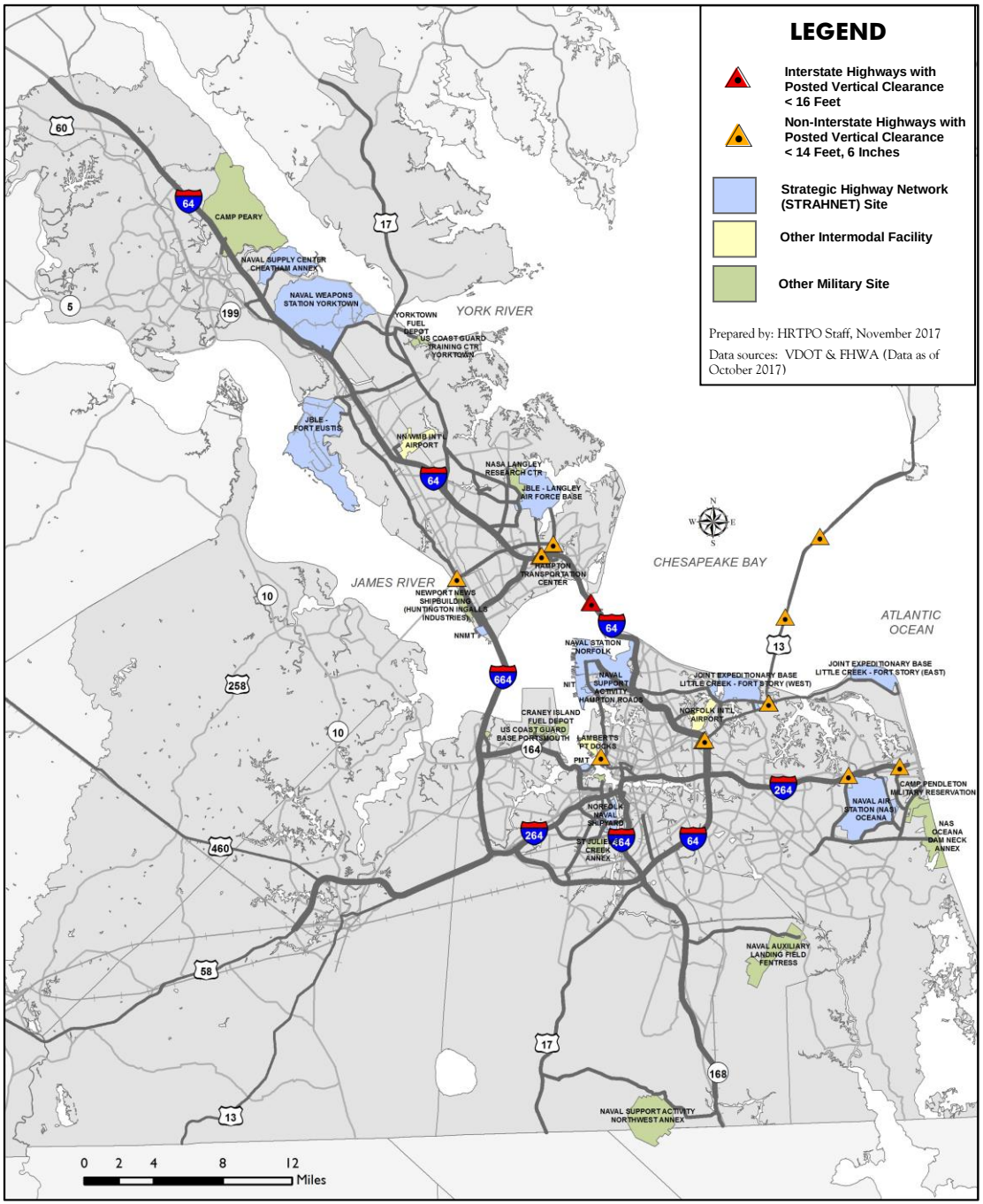
Figure 13 – Non-Interstate Highways with Posted Vertical Clearances below 14 Feet, 6 Inches on Roadways Serving the Military

Jurisdiction	Federal Structure ID	Route	FACILITY	CROSSING	Posted Vertical Clearance	Funded Project (Programmed)?
Hampton	20324	64	I-64	ARMISTEAD AVENUE	13' 8"	
Hampton	20326	64	I-64	LASALLE AVENUE	13' 6"	
Hampton	20384	258	MERCURY BLVD EB	KING ST	14' 2"	
Hampton	20386	258	MERCURY BLVD WB	KING ST	14' 2"	
Newport News	20673	17	MERCURY BLVD EB	WARWICK BOULEVARD	14' 2"	
Newport News	20675	17	MERCURY BLVD WB	WARWICK BOULEVARD	14' 2"	
Norfolk	20805	58	BRAMBLETON AVENUE WB	HAMPTON BLVD	13' 11"	
Norfolk	20856	64	I-64 EB RAMP	NORTHAMPTON BLVD	13' 10"	
Norfolk	20858	64	I-64 EB	NORTHAMPTON BLVD	14' 0"	
Norfolk	20860	64	I-64 WB	NORTHAMPTON BLVD	14' 0"	
Virginia Beach	12749	13	CBBT*	THIMBLE SHOALS CHANNEL	13' 6"	Yes
Virginia Beach	12751	13	CBBT*	CHESAPEAKE CHANNEL	13' 6"	
Virginia Beach	22213	13	NORTHAMPTON BLVD NB	SHORE DRIVE	14' 1"	
Virginia Beach	22215	13	NORTHAMPTON BLVD SB	SHORE DRIVE	14' 1"	
Virginia Beach	22232	264	I-264	LONDON BRIDGE ROAD	13' 8"	
Virginia Beach	22243	264	I-264	BIRDNECK ROAD	14' 1"	

*For tunnel facilities, posted vertical clearance (maximum vehicle height) is provided.

Source: VDOT, FHWA. Data as of October 2017.

Map 16 – Roadways Serving the Military with Vertical Clearances below Preferred Height



Lane Widths below 12 Feet

Average lane widths for most "Roadways Serving the Military in Hampton Roads" were obtained from the Virginia Department of Transportation[23]. For some roadways, the average lane widths were verified using Google Maps. According to the Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), 12-foot lane widths for roadways are preferred if the expected military traffic includes vehicles in the Heavy Equipment Transporter System (HETS) and the Palletized Load System (PLS)[24]. Schematic diagrams of the dimensions and weights of these vehicles are included in **Appendix B**. Roadway segments with average lane widths below 12 feet located on the "Roadways Serving the Military in Hampton Roads" were identified and shown in **Map 17** on page 45 and in **Figure 14** on pages 46-47.

U.S. Route 460 through the City Suffolk, Isle of Wight County, Windsor, and Southampton County has 10 foot lane widths.

[23] Virginia Department of Transportation (VDOT), Statewide Highway Planning System (SHiPS) Database, August 2017.

[24] Information Paper: Military Design Standards for the National Highway System, Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), August 31, 2000.

Map 17 – Roadways Serving the Military with Lane Widths below 12 Feet

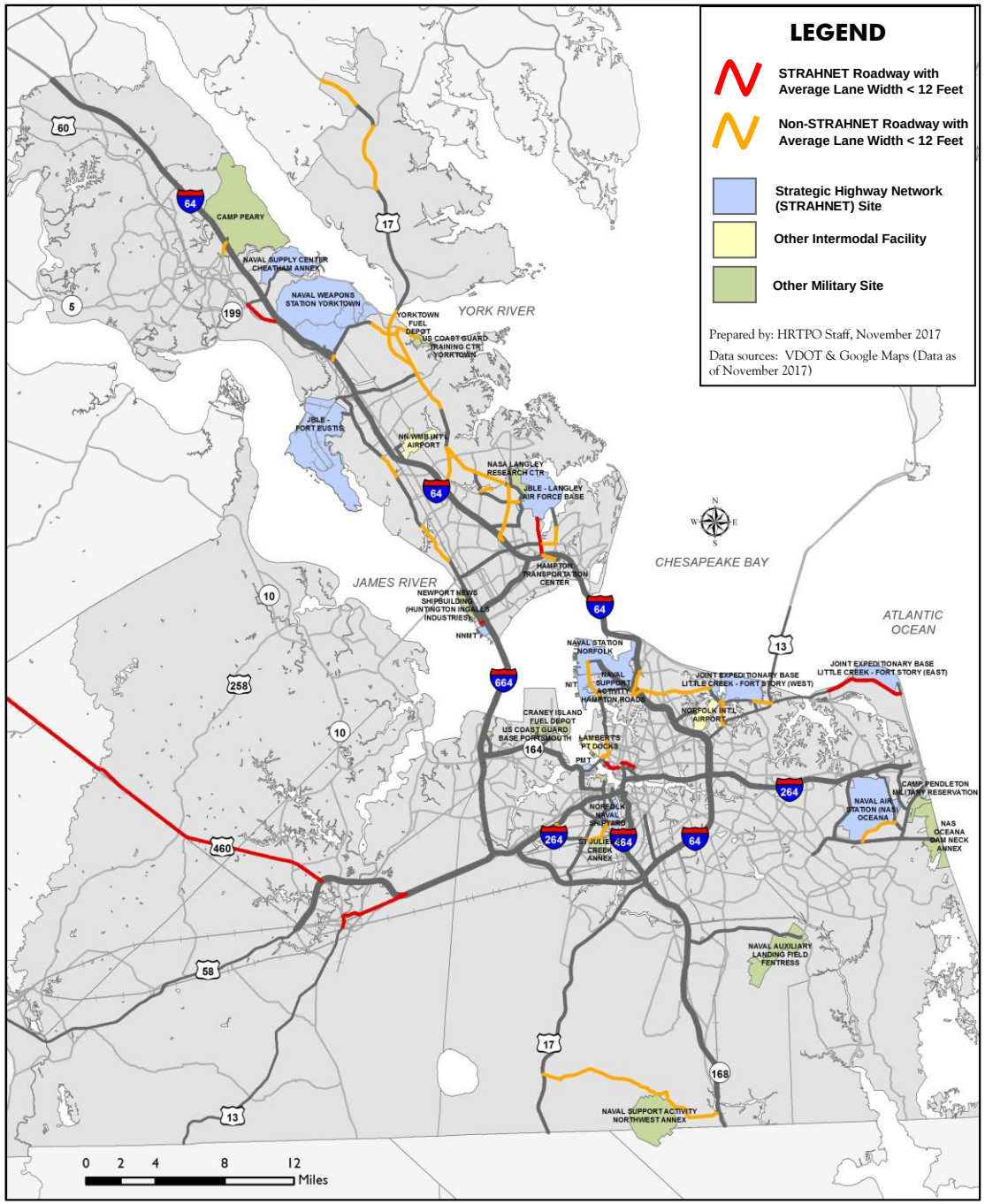


Figure 14 – Roadways Serving the Military with Lane Widths below 12 Feet

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	SEGMENT LENGTH (MILES)	2009 LANES	AVG LANE WIDTH	STRAHNET ROUTE?
CHES	BALLAHACK RD	GEORGE WASHINGTON HWY	OLD BATTLEFIELD BLVD	11.72	2	10	NO
GLO	RTE 17	RTE 614 (HICKORY FORK RD)	RTE 17 BUS S (MAIN ST)	4.76	4	11	NO
GLO	RTE 17	RTE 17 BUS N (MAIN ST)	RTE 606 (ARK RD)	2.38	4	11	NO
GLO	RTE 17	RTE 606 (ARK RD)	ROUTE 14	5.44	4	11	NO
GLO	RTE 17	ROUTES 33/198	MIDDLESEX CL	1.55	4	11	NO
HAM	ARMISTEAD AVE	LASALLE AVE	RIP RAP RD	0.44	4	11	NO
HAM	ARMISTEAD AVE	RIP RAP RD	PEMBROKE AVE	0.37	4	11	NO
HAM	COMMANDER SHEPARD BLVD	MAGRUDER BLVD	ARMISTEAD AVE	0.73	4	11	NO
HAM	KING ST	OLD FOX HILL RD	LITTLE BACK RIVER RD	0.54	4	10	NO
HAM	KING ST	LITTLE BACK RIVER RD	LAMINGTON RD	0.3	4	11	NO
HAM	LASALLE AVE	ARMISTEAD AVE	MERCURY BLVD	0.63	4	11	YES
HAM	LASALLE AVE	MERCURY BLVD	LANGLEY GATE	1.46	4	11	YES
HAM	MAGRUDER BLVD	SEMPLE FARM RD	COMM SHEPARD BLVD (SOUTH)	0.9	4	11	NO
HAM	MAGRUDER BLVD	COMM SHEPARD BLVD (SOUTH)	HRC PARKWAY	1.38	4	11	NO
HAM	MAGRUDER BLVD	HRC PARKWAY	I-64	0.67	4	11	NO
HAM	MERCURY BLVD	LASALLE AVE	KING ST	0.82	8	11	NO
HAM	SEMPLE FARM RD	BIG BETHEL RD	BELLGRADE DR	0.69	2	9	NO
IW	ROUTE 460	SOUTHAMPTON CL	FIRETOWER RD (RTE 644)	0.54	4	10	YES
IW	ROUTE 460	FIRETOWER RD (RTE 644)	WCL WINDSOR	5.56	4	10	YES
IW/WIND	ROUTE 460	WCL WINDSOR	ROUTE 258	0.08	4	10	YES
IW/WIND	ROUTE 460	ROUTE 258	COURT ST (RTE 610)	0.46	4	10	YES
IW	ROUTE 460	COURT ST (RTE 610)	ECL WINDSOR	0.75	4	10	YES
IW	ROUTE 460	ECL WINDSOR	SUFFOLK CL	2.35	4	10	YES
NN	26TH ST	WARWICK BLVD	HUNTINGTON AVE	0.13	2	11	YES
NN	J CLYDE MORRIS BLVD	I-64	HARPERSVILLE RD	0.6	4	11	NO
NN	J CLYDE MORRIS BLVD	HARPERSVILLE RD	YORK CL	0.19	4	11	NO
NN	WARWICK BLVD	BLAND BLVD	OYSTER POINT RD	1.39	4	11	NO
NN	WARWICK BLVD	J CLYDE MORRIS BLVD	HARPERSVILLE RD	1.07	5	11	NO
NN	WARWICK BLVD	HARPERSVILLE RD	MAIN ST	1.49	4	10	NO
NN	YORKTOWN RD	I-64	JEFFERSON AVE	0.15	4	10	NO
NOR	BRAMBLETON AVE	COLLEY AVE	BOUSH ST	0.85	6	11	YES
NOR	GRANBY ST	LITTLE CREEK RD	I-564	0.26	6	11	NO
NOR	GRANBY ST	I-564	I-64	0.18	4	10	NO
NOR	GRANBY ST	I-64	BAYVIEW BLVD	0.99	4	10	NO
NOR	HAMPTON BLVD	BRAMBLETON AVE	PRINCESS ANNE RD	0.4	4	11	NO
NOR	HAMPTON BLVD	PRINCESS ANNE RD	21ST ST	0.48	4	11	NO
NOR	HAMPTON BLVD	21ST ST	26TH ST	0.21	4	11	NO
NOR	HAMPTON BLVD	26TH ST	27TH ST	0.05	4	11	NO
NOR	HAMPTON BLVD	27TH ST	38TH ST	0.18	4	11	NO
NOR	HAMPTON BLVD	LITTLE CREEK RD	INTERNATIONAL TERMINAL BLVD	0.18	6	11	NO
NOR	HAMPTON BLVD	INTERNATIONAL TERMINAL BLVD	INTERMODAL CONNECTOR	1	6	11	NO
NOR	HAMPTON BLVD	INTERMODAL CONNECTOR	ADM TAUSSIG BLVD	0.92	6	11	NO
NOR	LITTLE CREEK RD	GRANBY ST	I-64	0.35	4	11	NO
NOR	LITTLE CREEK RD	I-64	TIDEWATER DR	0.77	6	11	NO
NOR	LITTLE CREEK RD	TIDEWATER DR	SEWELLS POINT RD	0.18	4	11	NO
NOR	LITTLE CREEK RD	SEWELLS POINT RD	CHESAPEAKE BLVD	0.53	4	11	NO
NOR	LITTLE CREEK RD	MILITARY HWY	AZALEA GARDEN RD	1.54	4	11	NO
NOR	LITTLE CREEK RD	AZALEA GARDEN RD	SHORE DR	1.1	4	10	NO
NOR	VA BEACH BLVD	MONTICELLO AVE	CHURCH ST	0.45	4	10	YES
NOR	VA BEACH BLVD	CHURCH ST	TIDEWATER DR	0.3	4	10	YES
PORT	ELM AVE	VICTORY BLVD	BURTONS POINT RD	0.3	4	10	NO
PORT	VICTORY BLVD	I-264	GREENWOOD DR	0.55	4	10	NO
PORT	VICTORY BLVD	GEORGE WASHINGTON HWY	AFTON PKWY	1.24	4	11	NO
PORT	VICTORY BLVD	AFTON PKWY	ELM AVE	0.57	4	11	NO

Source: VDOT and Google Maps, November 2017.

Figure 14 – Roadways Serving the Military with Lane Widths below 12 Feet (continued)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	SEGMENT LENGTH (MILES)	2009 LANES	AVG LANE WIDTH	STRAHNET ROUTE?
SH	ROUTE 58	BUS RTE 58 W	CAMP PKWY (BUS RTE 58 E)	2.5	4	11	YES
SH	ROUTE 460	SUSSEX CL	WCL IVOR	3.72	4	10	YES
SH	ROUTE 460	WCL IVOR	ROUTE 616 (IVOR RD)	0.56	4	10	YES
SH	ROUTE 460	ROUTE 616 (IVOR RD)	ECL IVOR	0.73	4	10	YES
SH	ROUTE 460	ECL IVOR	ISLE OF WIGHT CL	3.59	4	10	YES
SUF	CONSTANCE RD	MAIN ST	WILROY RD	0.88	4	11	YES
SUF	MAIN ST	WASHINGTON ST	MARKET ST	0.15	2	10	YES
SUF	MAIN ST	MARKET ST	CONSTANCE RD	0.52	4	10	YES
SUF	PORTSMOUTH BLVD	WILROY RD	WASHINGTON ST	1.59	4	11	YES
SUF	PORTSMOUTH BLVD	WASHINGTON ST	SUFFOLK BYPASS	1.04	4	11	YES
SUF	PRUDEN BLVD	ISLE OF WIGHT CL	LAKE PRINCE DR	3.08	4	10	YES
SUF	PRUDEN BLVD	LAKE PRINCE DR	KINGS FORK RD	0.58	4	10	YES
SUF	PRUDEN BLVD	KINGS FORK RD	SUFFOLK BYPASS	1.47	4	10	YES
VB	DIAMOND SPRINGS RD	NORTHAMPTON BLVD	SHORE DR	1.32	4	11	NO
VB	HARPERS RD	DAM NECK RD	OCEANA BLVD	2.44	2	10	NO
VB	SHORE DRIVE	NORFOLK CL	DIAMOND SPRINGS RD	0.21	4	11	NO
VB	SHORE DRIVE	INDEPENDENCE BLVD	PLEASURE HOUSE RD	0.64	4	11	NO
VB	SHORE DRIVE	PLEASURE HOUSE RD	NORTHAMPTON BLVD	0.37	4	11	NO
VB	SHORE DRIVE	GREAT NECK RD	ATLANTIC AVE	4.61	4	11	YES
YC	BALLARD ST	COOK RD	COAST GUARD TRAINING CENTER	1.32	2	10	NO
YC	COOK RD	GEORGE WASHINGTON HWY	GOOSLEY RD	2.09	2	11	NO
YC	COOK RD	GOOSLEY RD	BALLARD ST	0.25	2	11	NO
YC	GEORGE WASHINGTON HWY	NEWPORT NEWS CL	VICTORY BLVD (RTE 171)	1.2	4	11	NO
YC	GEORGE WASHINGTON HWY	VICTORY BLVD (RTE 171)	HAMPTON HWY (RTE 134)	0.64	4	11	NO
YC	GEORGE WASHINGTON HWY	DARE RD	DENBIGH BLVD (RTE 173)	1.08	4	11	NO
YC	GEORGE WASHINGTON HWY	DENBIGH BLVD (RTE 173)	FORT EUSTIS BLVD (RTE 105)	1.38	4	11	NO
YC	GEORGE WASHINGTON HWY	FORT EUSTIS BLVD (RTE 105)	COOK RD	0.59	4	11	NO
YC	GEORGE WASHINGTON HWY	COOK RD	GOOSLEY RD (RTE 238)	2.52	4	11	NO
YC	GEORGE WASHINGTON HWY	GOOSLEY RD (RTE 238)	GLOUCESTER CL (COLEMAN BRIDGE	1.06	4	11	NO
YC	GOOSLEY RD	OLD WILLIAMSBURG RD	CRAWFORD RD	0.89	2	11	NO
YC	GOOSLEY RD	CRAWFORD RD	ROUTE 17	0.3	2	11	NO
YC	GOOSLEY RD	ROUTE 17	COOK RD	0.52	2	11	NO
YC	HAMPTON HWY	ROUTE 17	VICTORY BLVD (RTE 171)	0.72	4	11	NO
YC	HAMPTON HWY	VICTORY BLVD (RTE 171)	BIG BETHEL RD (RTE 600)	1.54	4	11	NO
YC	HAMPTON HWY	BIG BETHEL RD (RTE 600)	NCL HAMPTON	1.77	4	11	NO
YC	MERRIMAC TRAIL	BUSCH GARDENS INTERCHANGE	ROUTE 199/JAMES CITY CL	1.75	4	11	YES
YC	ROUTE 143	ROUTE 132	I-64	0.6	4	11	NO

Source: VDOT and Google Maps, November 2017.

Recommendations

- Widen all roadways with average lane widths below 12 feet to a minimum of 12 feet on all "Roadways Serving the Military in Hampton Roads" in order to accommodate military vehicles (See **Figure 14** on pages 46-47). Give priority for widening lanes to the following deficient STRAHNET roadways:
    - Lasalle Avenue from Armistead Avenue to Langley Gate in Hampton*
    - Route 460/Pruden Boulevard from Sussex County line to Suffolk Bypass in Suffolk
    - 26th Street from Warwick Boulevard to Huntington Avenue in Newport News
    - Brambleton Avenue from Colley Avenue to Boush Street in Norfolk
    - Virginia Beach Boulevard from Monticello Avenue to Tidewater Drive in Norfolk
    - Route 58 from Business Route 58 West to Camp Parkway (Business Route 58 East) in Southampton County
    - Constance Road from Main Street to Wilroy Road in Suffolk**
    - Main Street from Washington Street to Constance Road in Suffolk**
    - Portsmouth Boulevard from Wilroy Road to Suffolk Bypass in Suffolk**
    - Shore Drive from Great Neck Road to Atlantic Avenue in Virginia Beach
    - Merrimac Trail from Busch Gardens Interchange to Route 199/James City County line in York County

  Note that some roadway widening projects may include additional travel lanes with average lane widths below 12 feet in order to reduce congestion, right-of-way impacts, and project costs. In these cases, there needs to be a balance between competing goals of reducing congestion and minimizing travel impacts for wider vehicles.

*In March 2018, Langley Air Force Base submitted a comment to HRTPO staff that the currently designated STRAHNET Connector (La Salle Avenue from I-64 to Langley gate) is restricted to personal-owned vehicles and commercial vehicles access the base via the Armistead Avenue/Sweeney Boulevard gate. This comment has been forwarded to SDDCTEA to see if the current STRAHNET Connector is valid. As a result, they recommended that priority for widening lanes should be given to:

- Magruder Boulevard from I-64 to Commander Shepard Boulevard
- Commander Shepard Boulevard from Magruder Boulevard to Armistead Avenue

**In May 2018, the City of Suffolk suggested to HRTPO staff that the currently designated Non-Interstate STRAHNET Route 13 (Portsmouth Blvd, Constance Rd, Main St, and Carolina Rd) be replaced with the SW Suffolk Bypass (Holland Rd to Carolina Rd) since military trucks are using this route instead of traveling through downtown Suffolk. This comment has been forwarded to SDDCTEA to see if the current STRAHNET Connector is valid. If this STRAHNET change is made, then the following roadway segments with average lane widths below 12 feet would be removed from this list:

- Constance Road from Main Street to Wilroy Road in Suffolk
- Main Street from Washington Street to Constance Road in Suffolk
- Portsmouth Boulevard from Wilroy Road to Suffolk Bypass in Suffolk

FLOODING VULNERABILITY

The Hampton Roads region contains one of the largest natural harbors in the world, making the region an attractive location for military facilities. This coastal location also makes many of these military facilities susceptible to projected relative sea level rise and potential storm surge threats, impacting overall defense readiness. The "relative" sea level rise for a given area is the change in sea level relative to the elevation of the land in that same area. Along many coastal regions, relative sea level rise is best described as "the water is rising and the land is sinking". In addition, severe storms, such as a hurricane, tropical storm, or nor'easter, cause storm surge. According to the National Oceanic and Atmospheric Administration, storm surge is water that is pushed toward the shore by the force of the winds swirling around the storm. The threat of flooding from sea level rise and storm surge is a concern for the military in the region since military operations require a transportation network that moves cargo and personnel quickly and safely.

The results in this section were taken from the HRTPO study recently completed in May 2016 – *Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads*[25]. In this study, HRTPO staff partnered with Hampton Roads Planning District Commission staff to conduct a comprehensive GIS-based flooding vulnerability analysis for potential sea level rise and storm surge impacts to regional roadways by 2045 (the upcoming Long-Range Transportation Plan's horizon year). Maps included in this section depict the "Roadways Serving the Military in Hampton Roads" that are vulnerable to flooding by 2045.

Given the uncertainty in how much relative sea level rise (SLR) will occur over time, current research suggests that 2.0 feet of rise could occur in Hampton Roads sometime between 2043 and 2083. With the horizon year of the next HRTPO Long-Range Transportation Plan being 2045, a conservative 2.0 foot relative sea level rise scenario was used in this analysis.

The three scenarios used in the flooding vulnerability analysis were as follows:

1) 2.0 foot relative sea level rise
2) 2.0 foot relative sea level rise + 25-year storm surge
3) 2.0 foot relative sea level rise + 50-year storm surge

[25] *Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads*, HRTPO, May 2016.

For Scenario 2 (2.0 feet of sea level rise plus a 25-year storm surge), the water surface elevation ranged from 2.7 feet NAVD (North American Vertical Datum, 1988) to 10 feet NAVD across Hampton Roads. At Sewell's Point in Norfolk, the water surface elevation in this scenario was approximately 8.1 feet NAVD.

For Scenario 3 (2.0 feet of sea level rise plus a 50-year storm surge) the water surface elevation ranged from 3.1 feet NAVD to 11.1 feet NAVD across the region, with a water surface elevation of approximately 8.8 feet NAVD at Sewell's Point.

The results in this section provide an update to the study conducted by the HRTPO in July 2013 – *Hampton Roads Military Transportation Needs Study – Roadways Serving the Military and Sea Level Rise/Storm Surge*[26]

Results

"Roadways Serving the Military" segments along the "2045 Analysis Network" that are projected to be submerged for the three relative sea level rise and storm surge scenarios are shown in red, orange, and maroon on **Maps 18-20** on pages 50-52: Additionally, six subarea maps that provide a closer view of various Hampton Roads jurisdictions are provided in **Maps 21-26** on pages 54-59:

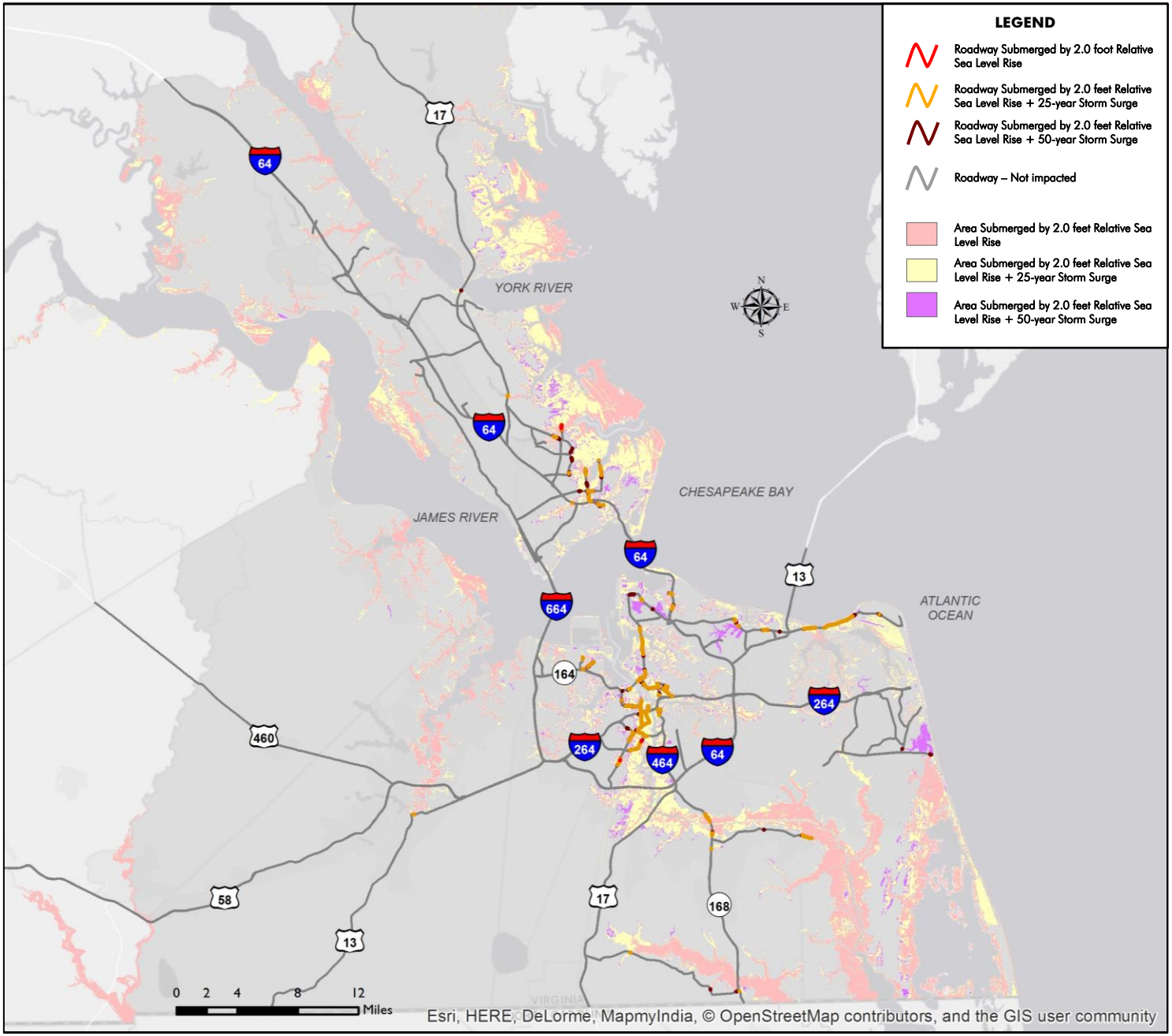
- York County/Gloucester County/James City County
- Newport News/Hampton/Poquoson
- Norfolk
- Virginia Beach
- Portsmouth/Chesapeake
- Chesapeake/Virginia Beach

As part of the HRTPO study recently completed in May 2016 – *Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads*, HRTPO staff created an interactive map that shows the potential sea level rise and storm surge impacts to all regional roadways by 2045.

Click here to view this interactive map.

[26] *Hampton Roads Military Transportation Needs Study: Roadways Serving the Military and Sea Level Rise/Storm Surge*, HRTPO, July 2013.

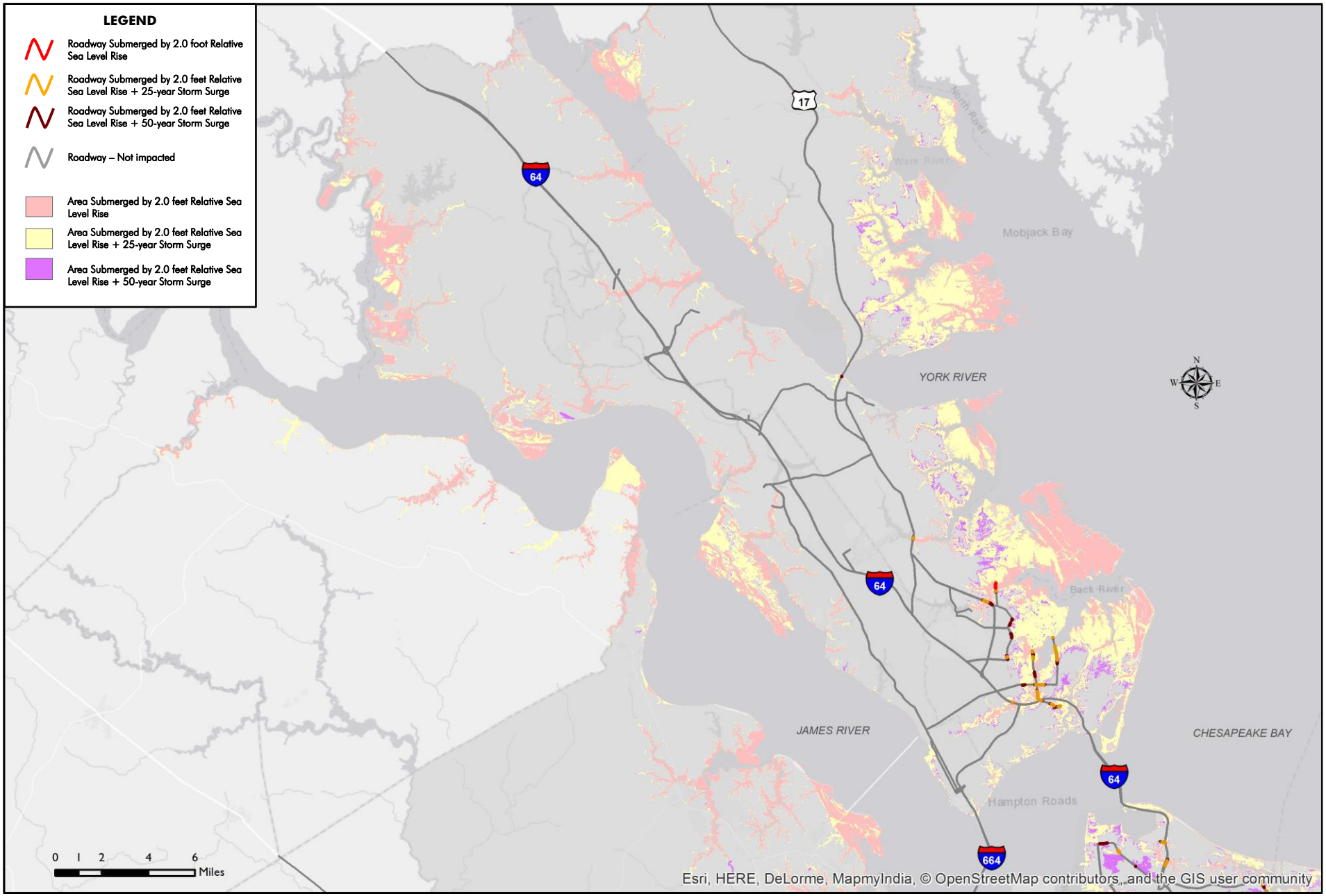
Map 18 – Potential Submergence of Roadways Serving the Military by 2045 – Hampton Roads



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

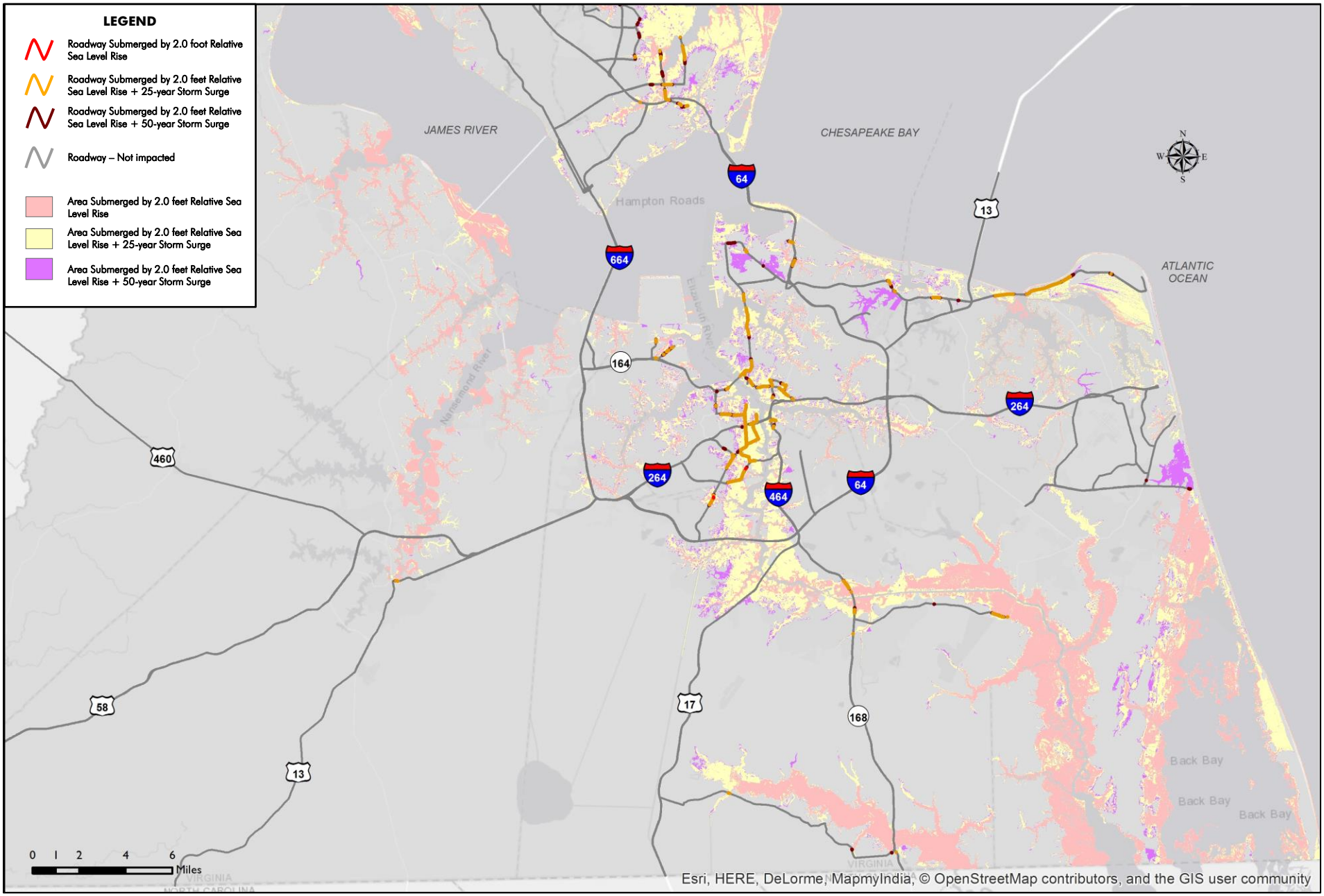
Map 19 – Potential Submergence of Roadways Serving the Military by 2045 – Hampton Roads Peninsula



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

Map 20 – Potential Submergence of Roadways Serving the Military by 2045 – Hampton Roads Southside



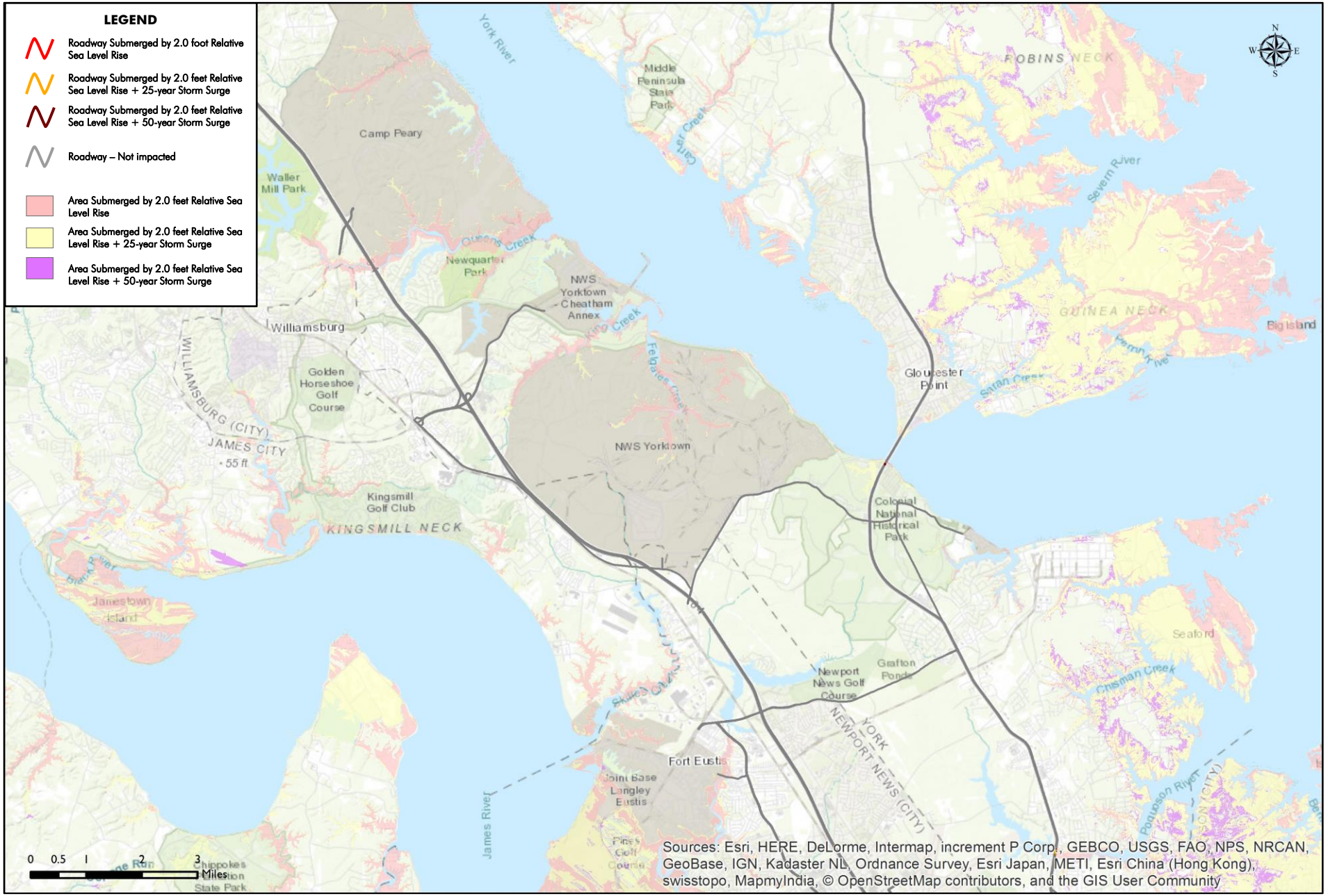
Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

Subarea Maps for Hampton Roads Jurisdictions

Potential Submergence of Roadways Serving the Military

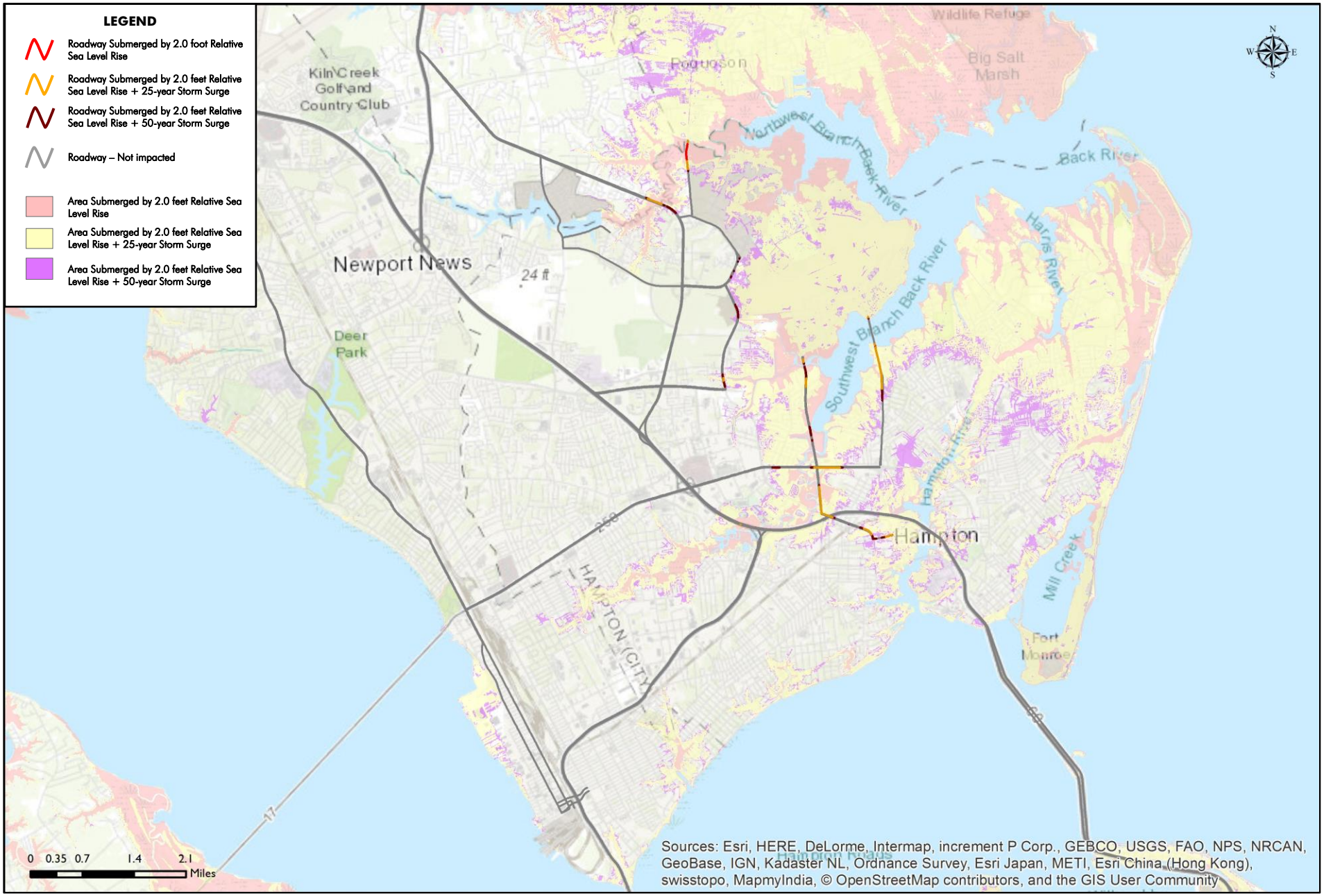
Map 21 – Potential Submergence of Roadways Serving the Military by 2045 – York County/Gloucester County/James City County



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

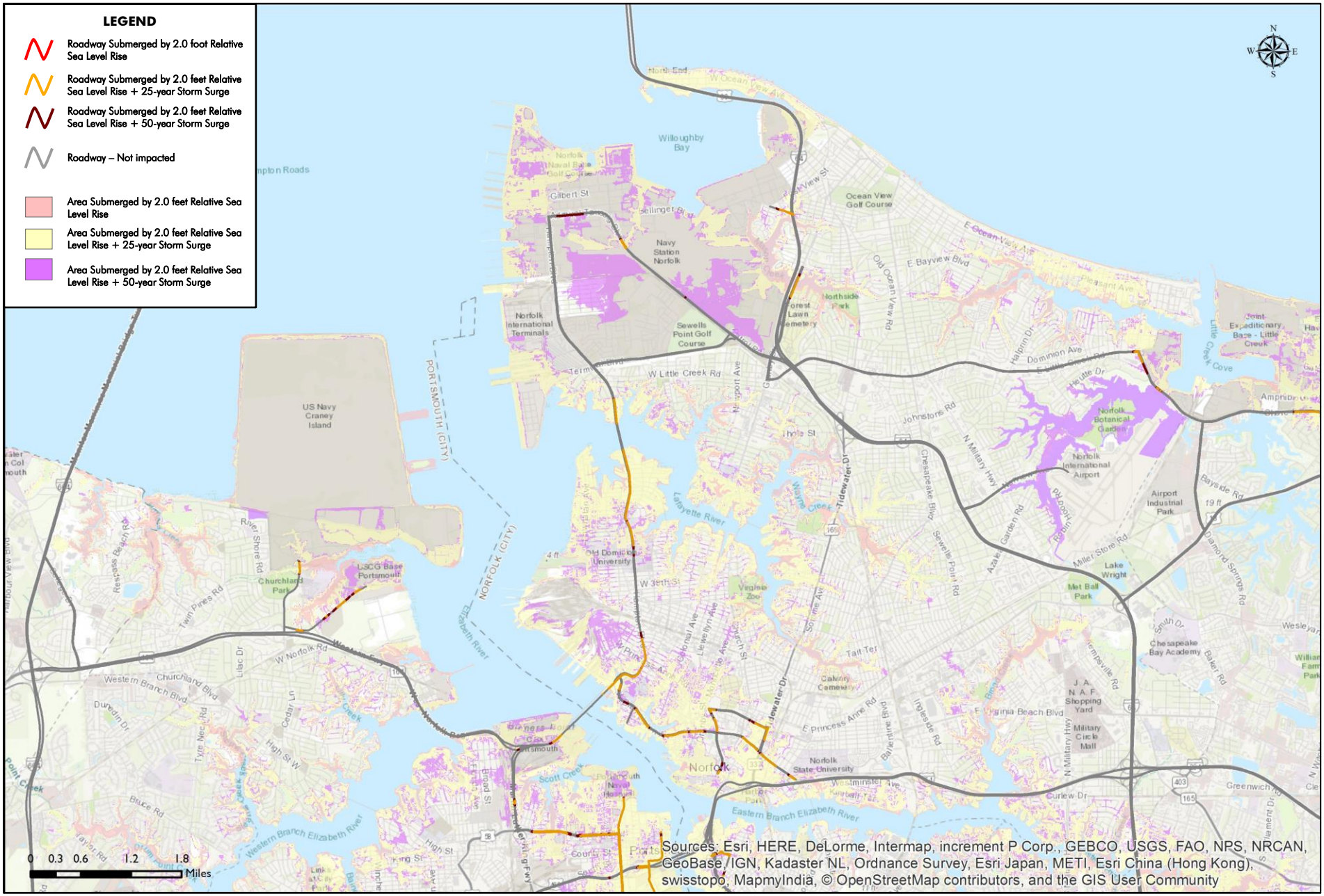
Map 22 – Potential Submergence of Roadways Serving the Military by 2045 – Newport News/Hampton/Poquoson



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

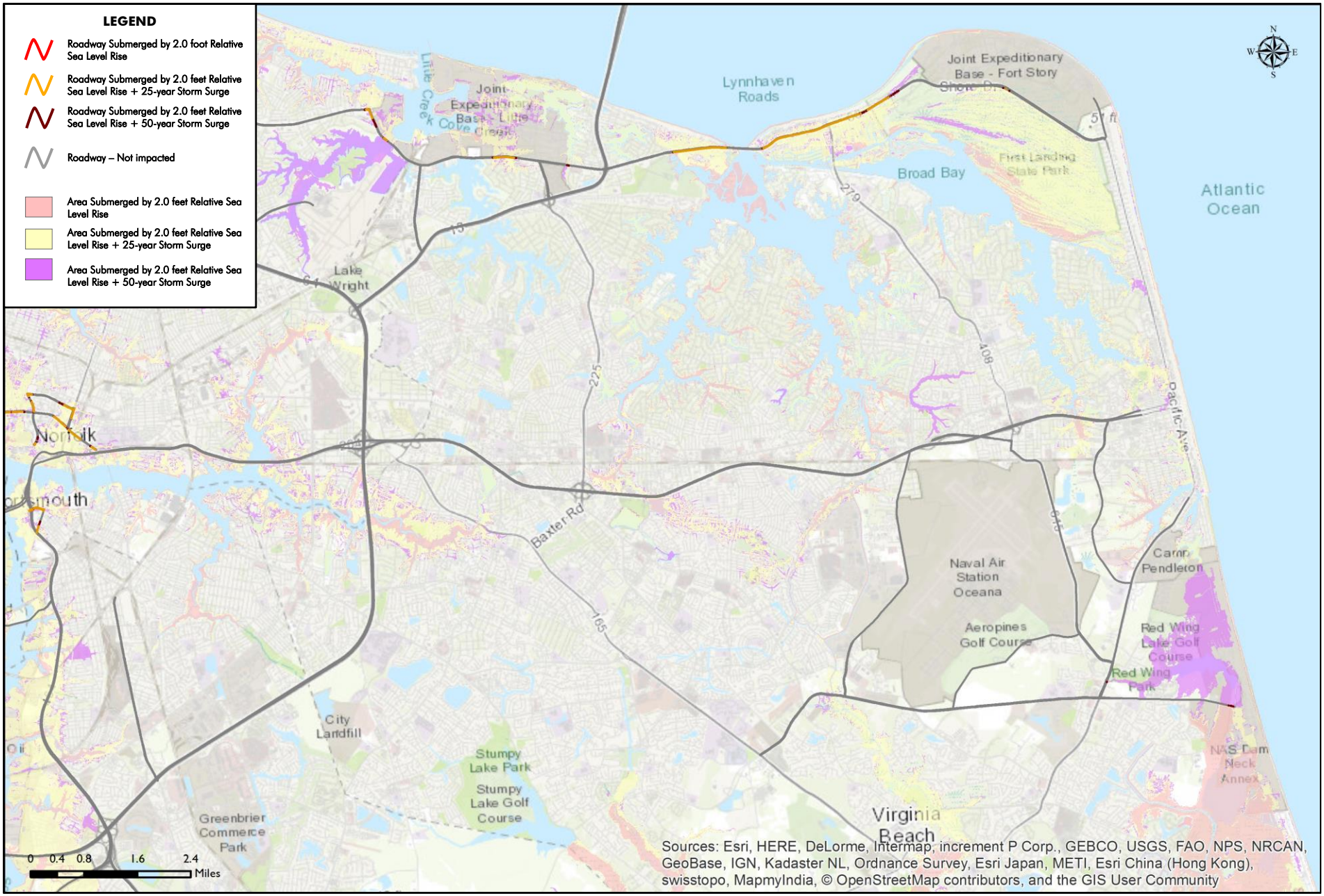
Map 23 – Potential Submergence of Roadways Serving the Military by 2045 – Norfolk



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

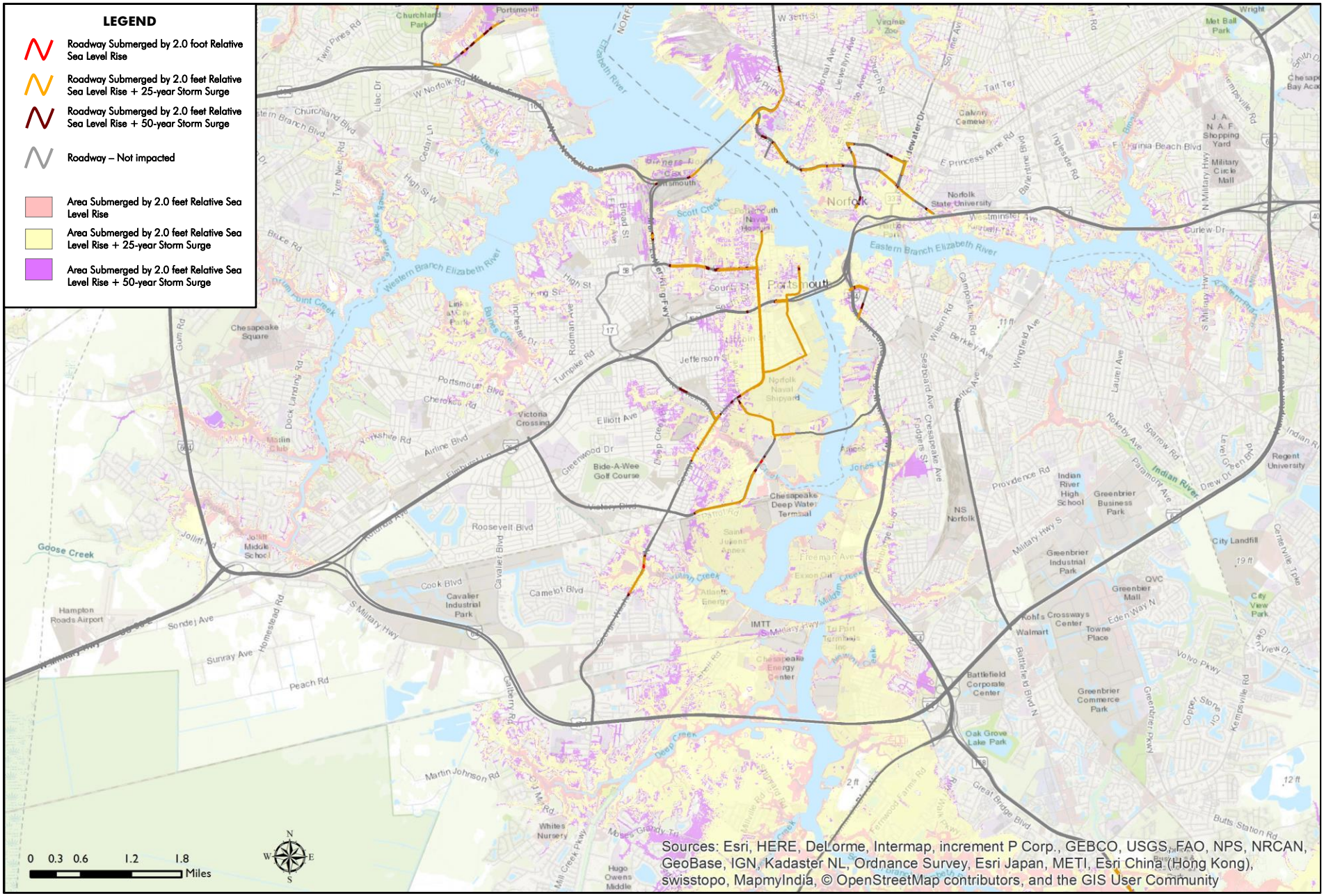
Map 24 – Potential Submergence of Roadways Serving the Military by 2045 – Virginia Beach



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

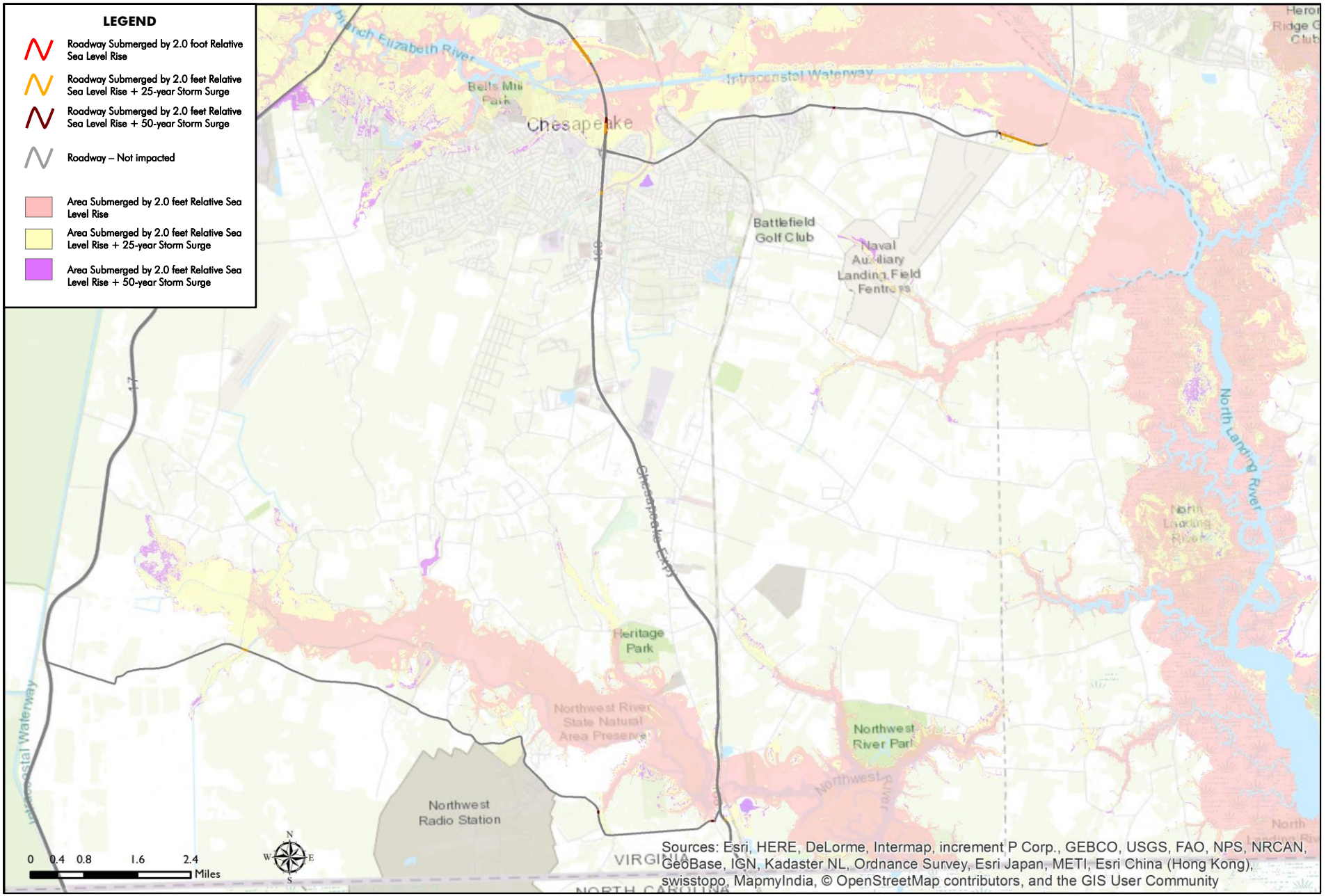
Map 25 – Potential Submergence of Roadways Serving the Military by 2045 – Portsmouth/Chesapeake



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

Map 26 – Potential Submergence of Roadways Serving the Military by 2045 – Chesapeake/Virginia Beach



Prepared by: HRTPO Staff, December 2017

Data source for projected flooded areas: HRPDC Staff, October 2015

Recommendations

- Based on the flooding vulnerability analysis presented in this section, the following recommendations are provided below:
    - It is recommended that the HRTPO Board consider relative sea level rise and potential storm surge impacts when selecting future transportation projects. New/improved roadways can be built at a higher elevation, removing the potential for flooding due to submergence.
    - It is recommended that the operators of military and supporting sites work with the Virginia Department of Transportation (VDOT) and cities to develop detour plans for all "Roadways Serving the Military" that are projected to be submerged by 2 feet of relative sea level rise and/or storm surges by 2045 in order to move military personnel and cargo during these occurrences.
    - It is recommended that VDOT/cities consider the latest projections for relative sea level rise/storm surge when a roadway project is designed.

INTEGRATION INTO THE LONG-RANGE TRANSPORTATION PLAN

A Long-Range Transportation Plan (LRTP) is a multimodal transportation plan that is developed, adopted, and updated by an MPO through the metropolitan transportation planning process. The LRTP addresses a planning horizon of at least 20 years and includes strategies and transportation investments that lead to an integrated multimodal transportation system. The HRTPO, in partnership with local, state, federal, military, freight, transit, and citizen stakeholders, released the 2040 LRTP[27] in July 2016. These key stakeholders worked together to prioritize projects in order to develop a long-term investment framework for addressing the region's transportation system.

Military Consideration in Project Prioritization Tool

As part of the Hampton Roads LRTP, the HRTPO created a Project Prioritization Tool to score candidate transportation projects. This tool was developed to assist decision makers in selecting projects to be included in the 2040 LRTP. The prioritization methodology evaluates projects based on three components: Project Utility, Project Viability, and Economic Vitality. The maximum score that a candidate project can receive is 300 points (100 points per component).

Within the Economic Vitality component in the highways, highway interchanges, and bridges and tunnels categories, projects that significantly reduce travel time to major military bases receive 6 points (high), 3 points (medium) and 0 points (low). Additionally, 4 points are awarded to projects located on the STRAHNET and 3 points to those located on Non-STRAHNET "Roadways Serving the Military in Hampton Roads". Within the Economic Vitality component for fixed guideway transit projects, a maximum of 10 points is awarded to projects that provide or improve transit access for defense installations (¼ mile or less = 10 points, between ¼ mile and ½ mile = 5 points, greater than ½ mile = 0 points).

Recommendations

- Use the Military and Supporting Sites identified in this study update on pages 19-22 in future applications of the LRTP Project Prioritization Tool.
- Use the STRAHNET and Non-STRAHNET "Roadways Serving the Military in Hampton Roads" identified within this study update on pages 23-26 in future applications of the LRTP Project Prioritization Tool.

[27] *2040 Long-Range Transportation Plan*, HRTPO, July 2016.

SUMMARY OF RECOMMENDATIONS AND NEXT STEPS

Hampton Roads is home to many U.S. military and supporting sites that are important to the defense and security of our nation. As a result of the area's large military presence, much of the local economy is driven by the U.S. Department of Defense (DoD). Defense readiness and efficient military operations require a sufficient transportation network so that cargo and personnel can be moved as quickly and safely as possible.

For this study, the HRTPO staff worked with many stakeholders—local military representatives, federal agencies, Virginia Department of Transportation (VDOT), Hampton Roads Transit (HRT), Virginia Port Authority (VPA) and local jurisdictions—to determine transportation concerns and needs of the local military. This 2018 update to the Hampton Roads Military Transportation Needs Study provides an update to Phase I (Highway Network Analysis, September 2011) and III (Roadways Serving the Military and Sea Level Rise/Storm Surge, July 2013) using the most recent data and analysis. Based on stakeholder input, HRTPO staff identified a roadway network that includes both the Strategic Highway Network (STRAHNET) and additional roadways that serve the military sites and intermodal facilities not included in the STRAHNET. Staff reviewed this "Roadways Serving the Military in Hampton Roads" network to determine deficient locations, such as congested segments, deficient bridges, low bridge and tunnel vertical clearances, lane widths below military preferences, and segments vulnerable to flooding. Recommendations have been developed for these deficient locations throughout this report and are reiterated in this section.

SUMMARY OF RECOMMENDATIONS

Based on the analysis presented in this study, the recommendations made in earlier sections are reiterated below:

Roadways Serving the Military

- Governor Terry McAuliffe signed House Bill 2 into law in 2014, which directs the Commonwealth Transportation Board (CTB) to develop and use a statewide prioritization process—SMART SCALE—to select transportation projects to be funded in Virginia. As the CTB considers possible changes to the SMART SCALE process in the future, it is recommended that a measure related to the "Roadways Serving the Military" network be added to the project evaluation methodology.

Congested Roadways

- Evaluate, develop, and apply congestion mitigation strategies to all severely congested (Level of Service E or F) "Roadways Serving the Military in Hampton Roads" in the next Hampton Roads Congestion Management Process (CMP) update.
- When evaluating projects for the Hampton Roads Long-Range Transportation Plan (LRTP), it is recommended that the HRTPO continue to take into account projects that improve severe traffic conditions on the "Roadways Serving the Military" network.
- It is recommended that local military leaders and commands modify policies concerning work times and work location and solidify partnerships with Hampton Roads Transit (HRT), Williamsburg Area Transit Authority (WATA), and other regional stakeholders to increase travel options for military personnel through travel demand management strategies such as working off-peak hours, telecommuting, ridesharing, and using public transit.
- It is recommended that all eligible military employees consider participating in the Transportation Incentive Program (TIP) to help reduce their daily contribution to traffic congestion and air pollution, as well as expand their commuting alternatives.

Deficient Bridges

- Rehabilitate or replace the following Structurally Deficient bridges that are located on "Roadways Serving the Military in Hampton Roads" and do not currently have identified funding:
  - Victory Boulevard over Paradise Creek in Portsmouth (Federal ID: 21217)
  - I-264 over First Colonial Road in Virginia Beach (Federal ID: 22239)
- Closely monitor the remaining 4 Structurally Deficient bridges and give priority to these facilities for rehabilitation or replacement.

- Continue to monitor the 120 Functionally Obsolete bridges and make improvements as conditions warrant.

Vertical Clearances below Military Preferences

- As the Hampton Roads Bridge-Tunnel is rehabilitated or new tubes are added, ensure that the vertical clearance meets or exceeds the 16-foot threshold, similar to the Monitor-Merrimac Memorial Bridge-Tunnel.
- Use a minimum vertical clearance of 14 feet, 6 inches as non-Interstate bridge and tunnel structures are replaced at the 16 locations shown in **Figure 13** on page 42.

Lane Widths below Military Preferences

- Widen all roadways with average lane widths below 12 feet to a minimum of 12 feet on all "Roadways Serving the Military in Hampton Roads" in order to accommodate military vehicles (See **Figure 14** on pages 46-47). Give priority for widening lanes to the following deficient STRAHNET roadways:
    - Lasalle Avenue from Armistead Avenue to Langley Gate in Hampton
    - Route 460/Pruden Boulevard from Sussex County line to Suffolk Bypass in Suffolk
    - 26th Street from Warwick Boulevard to Huntington Avenue in Newport News
    - Brambleton Avenue from Colley Avenue to Boush Street in Norfolk
    - Virginia Beach Boulevard from Monticello Avenue to Tidewater Drive in Norfolk
    - Route 58 from Business Route 58 West to Camp Parkway (Business Route 58 East) in Southampton County
    - Constance Road from Main Street to Wilroy Road in Suffolk
    - Main Street from Washington Street to Constance Road in Suffolk
    - Portsmouth Boulevard from Wilroy Road to Suffolk Bypass in Suffolk
    - Shore Drive from Great Neck Road to Atlantic Avenue in Virginia Beach
    - Merrimac Trail from Busch Gardens Interchange to Route 199/James City County line in York County

Note that some roadway widening projects may include additional travel lanes with average lane widths below 12 feet in order to reduce congestion, right-of-way impacts, and project costs. In these cases, there needs to be a balance between competing goals of reducing congestion and minimizing travel impacts for wider vehicles.

Roadways Vulnerable to Flooding

- Based on the flooding vulnerability analysis presented in this section, the following recommendations are provided below:
    - It is recommended that the HRTPO Board consider relative sea level rise and potential storm surge impacts when selecting future transportation projects. New/improved roadways can be built at a higher elevation, removing the potential for flooding due to submergence.
    - It is recommended that the operators of military and supporting sites work with the Virginia Department of Transportation (VDOT) and cities to develop detour plans for all "Roadways Serving the Military" that are projected to be submerged by 2 feet of relative sea level rise and/or storm surges by 2045 in order to move military personnel and cargo during these occurrences.
    - It is recommended that VDOT/cities consider the latest projections for relative sea level rise/storm surge when a roadway project is designed.

Update LRTP Project Prioritization Tool

- Use the Military and Supporting Sites identified in this study update on pages 19-22 in future applications of the LRTP Project Prioritization Tool.
- Use the STRAHNET and Non-STRAHNET "Roadways Serving the Military in Hampton Roads" identified within this study update on pages 23-26 in future applications of the LRTP Project Prioritization Tool.

Next Steps

The HRTPO plans to continually update the Hampton Roads Military Transportation Needs Study about every five years as part of the Hampton Roads Congestion Management Process (CMP). HRTPO staff will make specific updates to this study as conditions change and warrant additional analysis. The study results can also serve as a basis for future military-related studies.

HRTPO will also continue to integrate military transportation needs into the Hampton Roads Long-Range Transportation Plan (LRTP), the blueprint from the region's multimodal transportation development. Data and analyses within this study feed directly into the LRTP process and provides military-related inputs for the Project Prioritization Tool, which is used to score transportation projects in order to assist decision makers with project selection.

Over the years, the HRTPO has developed a strong working relationship with the military. HRTPO staff plans to continue working with military stakeholders on future/ongoing military-related transportation initiatives, such as Joint Land Use Studies (JLUS) which are currently underway at several military sites across the region. These coordinated efforts will continue to strengthen the transportation planning process for both the military and the surrounding communities.

It is important for regions with a military presence to engage local military leaders and maintain a cooperative exchange of information. A partnership between the military and transportation stakeholders takes time to develop and strengthen. By providing a thorough assessment of the military's views on this vital topic to an MPO Policy Board, MPO staff can enable that Board to respond to those views.

Fort Eustis Joint Land Use Study community workshop at the Denbigh Community Center in Newport News

APPENDICES

APPENDIX A:
TRAFFIC VOLUMES, SPEEDS, AND CONGESTION
(ROADWAYS SERVING THE MILITARY)

The following tables show the results from the HRTPO's latest Congestion Management Process (CMP) document – HRTPO Annual Roadway Performance Report[1]. Weekday traffic volumes have been updated from the HRTPO Congestion Management Process (CMP) database through 2016.

[1] *HRTPO Annual Roadway Performance Report – 2017 Edition*, HRTPO, September 2017.

LEGEND – TRAFFIC VOLUME, SPEED, AND CONGESTION DATA TABLES

JURIS NAME
Includes the names of each jurisdiction as shown below:

CHES – Chesapeake
FR – Franklin
GLO – Gloucester County
HAM – Hampton
IW – Isle of Wight County
JCC – James City County
NN – Newport News
NOR – Norfolk
POQ – Poquoson
PORT – Portsmouth
SH – Southampton County
SUF – Suffolk
SUR – Surry County
VB – Virginia Beach
WMB – Williamsburg
YC – York County

WEEKDAY TRAFFIC VOLUMES
These columns show the most recent weekday traffic count by roadway segment from the HRTPO Congestion Management Process (CMP) database through 2016.

SPEED
Speed data is collected by INRIX on many roadways in Hampton Roads. The yearly average speeds are calculated by direction in 15-minute intervals in the AM Peak Period (5-9 am) and the PM Peak Period (3-7 pm). These speeds represent an average of weekdays (Tuesdays-Thursdays) throughout 2016.

This column shows the slowest 15-minute average speeds that occur in each direction during each peak period.

A "-" indicates that speed data is not available for that segment.

TRAVEL TIME INDEX (TTI)
The travel time index is a measure used to analyze congestion levels. The TTI represents the ratio of travel time in the peak period to travel time in free-flow conditions. A TTI of 1.20 means a 20-minute trip in free-flow conditions takes 24 minutes in the peak period.

The average TTI is calculated by direction for each 15-minute interval in the AM and PM Peak Period. This column shows the highest of these TTIs that occur in each direction. It occurs during the same 15-minute interval as the speed shown in the previous column.

A "-" indicates that speed data is not available for that segment, so the TTI cannot be calculated.

CONGESTION LEVEL
Congestion levels are shown in these columns for the AM and PM peak hour. Congestion levels are based on the travel time index when speed data is available, or Highway Capacity Manual (HCM) level of service (LOS) methods for roadways without speed data.

Congestion levels for roadways **with** speed data are shown based on the table below:

Congestion Level		Freeway	Arterial
Low	LOW	TTI < 1.15	TTI < 1.25
Moderate	MOD	1.15 ≤ TTI < 1.3	1.25 ≤ TTI < 1.4
Severe	SEV	TTI ≥ 1.3	TTI ≥ 1.4

Congestion levels for roadways **without** speed data are shown based on the table below:

Congestion Level		HCM LOS
Low	LOW	A-C
Moderate	MOD	D
Severe	SEV	E-F

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
CHES	MOUNT PLEASANT RD	CHESAPEAKE EXPRESSWAY	CENTERVILLE TNPK		16,850			20,236			28	27	1.31	1.40	MOD	SEV	30	35	1.23	1.08	LOW	LOW
CHES	MOUNT PLEASANT RD	CENTERVILLE TNPK	FENTRESS AIRFIELD RD		9,145			11,002			42	42	1.13	1.13	LOW	LOW	46	42	1.05	1.13	LOW	LOW
CHES	OLD BATTLEFIELD BLVD	BALLAHACK RD	BATTLEFIELD BLVD					988			14	25	1.39	1.05	MOD	LOW	15	26	1.36	1.03	MOD	LOW
CHES	POINDEXTER ST (S NORFOLK JORDAN	PORTSMOUTH CL	I-464				6,159	8,777	10,452	9,655	-	-	-	-	SEV		-	-	-	-	SEV	
CHES	ROUTE 13/58/460	SUFFOLK CL	I-664	EB	36,207	35,095	35,839	35,530	37,118	38,776	57	-	1.01	-	LOW	-	60	-	0.96	-	LOW	-
				WB	36,509	35,065	35,738	35,458	36,925	38,692	-	60	-	1.01	-	LOW	-	62	-	0.98	-	LOW
GLO	RTE 17 (COLEMAN BRIDGE)	YORK CL	RTE 216 (GUINEA RD)		33,659	33,523	33,385	32,780	34,285	34,401	45	46	1.06	1.06	LOW	LOW	42	42	1.13	1.17	LOW	LOW
GLO	RTE 17	RTE 216 (GUINEA RD)	RTE 614 (HICKORY FORK RD)			36,654			38,066		45	46	1.06	1.06	LOW	LOW	42	42	1.13	1.17	LOW	LOW
GLO	RTE 17	RTE 614 (HICKORY FORK RD)	RTE 17 BUS S (MAIN ST)			30,279			31,708		42	45	1.18	1.09	LOW	LOW	40	44	1.23	1.13	LOW	LOW
GLO	RTE 17	RTE 17 BUS S (MAIN ST)	RTE 17 BUS N (MAIN ST)			20,692			20,430		44	44	1.13	1.10	LOW	LOW	45	44	1.10	1.08	LOW	LOW
GLO	RTE 17	RTE 17 BUS N (MAIN ST)	RTE 606 (ARK RD)			16,978			16,486		50	48	1.07	1.08	LOW	LOW	49	45	1.08	1.16	LOW	LOW
GLO	RTE 17	RTE 606 (ARK RD)	ROUTE 14			12,970			12,583		56	55	1.04	1.04	LOW	LOW	56	55	1.03	1.06	LOW	LOW
GLO	RTE 17	ROUTE 14	ROUTES 33/198			7,108			6,733		52	54	1.09	1.07	LOW	LOW	53	56	1.07	1.03	LOW	LOW
GLO	RTE 17	ROUTES 33/198	MIDDLESEX CL			13,596			12,937		53	49	1.04	1.11	LOW	LOW	54	51	1.01	1.08	LOW	LOW
HAM	ARMISTEAD AVE	COMMANDER SHEPPARD BLVD	HRC PARKWAY		24,285		24,797			17,882	28	26	1.30	1.33	MOD	MOD	34	32	1.07	1.10	LOW	LOW
HAM	ARMISTEAD AVE	LASALLE AVE	RIP RAP RD		16,091		14,526			15,646	21	27	1.38	1.17	MOD	LOW	20	28	1.42	1.14	SEV	LOW
HAM	ARMISTEAD AVE	RIP RAP RD	PEMBROKE AVE		16,396		12,014			12,841	26	21	1.14	1.39	LOW	MOD	23	24	1.28	1.22	MOD	LOW

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
CHES	ATLANTIC AVE	CAMPOSTELLA RD	PROVIDENCE RD		15,095			15,960			-	-	-	-	LOW		-	-	-	-	LOW	
CHES	ATLANTIC AVE	PROVIDENCE RD	OLD ATLANTIC AVE		17,228	17,148	17,128	17,182	17,812	18,045	-	-	-	-	LOW		-	-	-	-	LOW	
CHES	BALLAHACK RD	GEORGE WASHINGTON HWY	OLD BATTLEFIELD BLVD		906			988			-	-	-	-	LOW		-	-	-	-	LOW	
CHES	BATTLEFIELD BLVD	NORTH CAROLINA STATE LINE	BALLAHACK RD		21,703	21,977	21,880	22,137	22,842	24,096	45	47	1.16	1.09	LOW	LOW	48	47	1.08	1.11	LOW	LOW
CHES	BATTLEFIELD BLVD	BALLAHACK RD	GALLBUSH RD		21,703	21,977	21,880	22,137	22,842	24,096	45	44	1.17	1.16	LOW	LOW	43	46	1.22	1.10	LOW	LOW
CHES	BATTLEFIELD BLVD	I-64	MILITARY HWY		35,904			37,528			33	31	1.23	1.27	LOW	MOD	28	24	1.43	1.67	SEV	SEV
CHES	BATTLEFIELD BLVD	MILITARY HWY	CAMPOSTELLA RD		22,504			23,542			25	27	1.23	1.12	LOW	LOW	21	26	1.49	1.15	SEV	LOW
CHES	CHESAPEAKE EXPWY	GALLBUSH RD	BATTLEFIELD BLVD (NEAR INDIAN CREEK	NB	3,910						53	-	0.99	-	LOW	-	52	-	1.01	-	LOW	-
				SB	3,910						-	49	-	1.05	-	LOW	-	52	-	0.99	-	LOW
CHES	CHESAPEAKE EXPWY	BATTLEFIELD BLVD (NEAR INDIAN CREEK	HILLCREST PKWY	NB	4,472						60	-	1.01	-	LOW	-	59	-	1.02	-	LOW	-
				SB	4,048						-	59	-	1.04	-	LOW	-	61	-	1.00	-	LOW
CHES	CHESAPEAKE EXPWY	HILLCREST PKWY	BATTLEFIELD BLVD (S OF GREAT BRIDGE	NB	15,865						59	-	1.03	-	LOW	-	60	-	1.00	-	LOW	-
				SB	14,660						-	59	-	1.02	-	LOW	-	59	-	1.02	-	LOW
CHES	CHESAPEAKE EXPWY	BATTLEFIELD BLVD (S OF GREAT BRIDGE	HANBURY RD	NB	15,474			16,239			46	-	1.31	-	SEV	-	59	-	1.03	-	LOW	-
				SB	16,353			14,329			-	61	-	1.01	-	LOW	-	62	-	1.00	-	LOW
CHES	CHESAPEAKE EXPWY	HANBURY RD	MT PLEASANT RD	NB	21,728			24,040			36	-	1.65	-	SEV	-	60	-	0.99	-	LOW	-
				SB	22,619			22,693			-	60	-	1.01	-	LOW	-	61	-	0.99	-	LOW
CHES	CHESAPEAKE EXPWY	MT PLEASANT RD	BATTLEFIELD BLVD (N OF GREAT BRIDGE	NB	32,504			32,602			49	-	1.19	-	MOD	-	59	-	0.99	-	LOW	-
				SB	31,052			30,987			-	57	-	1.03	-	LOW	-	50	-	1.18	-	MOD
CHES	CHESAPEAKE EXPWY	BATTLEFIELD BLVD (N OF GREAT BRIDGE	DOMINION BLVD	NB	33,866			31,321			47	-	1.26	-	MOD	-	58	-	1.00	-	LOW	-
				SB	33,178			31,364			-	58	-	1.02	-	LOW	-	38	-	1.55	-	SEV
CHES	CHESAPEAKE EXPWY	DOMINION BLVD	I-64	NB		26,876					42	-	1.29	-	MOD	-	53	-	1.03	-	LOW	-
				SB		36,195					-	54	-	1.02	-	LOW	-	32	-	1.70	-	SEV
CHES	DOMINION BLVD	GEORGE WASHINGTON HWY	CEDAR RD		11,717						34	38	1.21	1.12	LOW	LOW	38	32	1.11	1.33	LOW	MOD
CHES	DOMINION BLVD/VETERANS BRIDGE	CEDAR RD	DOMINION LAKES BLVD	NB	16,183	16,094	14,300				20	-	1.95	-	SEV	-	28	-	1.40	-	SEV	-
				SB	14,488	14,350	13,048				-	25	-	1.39	-	SEV	-	22	-	1.56	-	SEV
CHES	DOMINION BLVD	DOMINION LAKES BLVD	GREAT BRIDGE BLVD	NB	15,005						20	-	1.95	-	SEV	-	28	-	1.40	-	SEV	-
				SB	12,972						-	25	-	1.39	-	SEV	-	22	-	1.56	-	SEV
CHES	DOMINION BLVD	GREAT BRIDGE BLVD	CHESAPEAKE EXPRESSWAY	NB	21,817						20	-	1.95	-	SEV	-	28	-	1.40	-	SEV	-
				SB	18,526						-	25	-	1.39	-	SEV	-	22	-	1.56	-	SEV
CHES	GEORGE WASHINGTON HWY	NORTH CAROLINA STATE LINE	DOMINION BLVD		12,616	12,540	12,593	12,431	12,698	13,398	62	59	0.99	1.04	LOW	LOW	61	62	1.02	0.98	LOW	LOW
CHES	GEORGE WASHINGTON HWY	I-64	MILITARY HWY		26,220			25,965			21	31	1.39	1.32	MOD	MOD	20	32	1.50	1.27	SEV	MOD
CHES	GEORGE WASHINGTON HWY	MILITARY HWY	CANAL DR		15,056			15,826			23	23	1.13	1.19	LOW	LOW	22	14	1.21	1.85	LOW	SEV
CHES	GEORGE WASHINGTON HWY	CANAL DR	PORTSMOUTH CL		26,037			30,946			24	27	1.29	1.10	MOD	LOW	17	21	1.76	1.38	SEV	MOD
CHES	I-64	VA BEACH CL	GREENBRIER PKWY	EB		69,141					62	-	0.99	-	LOW	-	54	-	1.13	-	LOW	-
				WB	64,959	65,444	65,757	67,927	68,604	69,253	-	40	-	1.51	-	SEV	-	54	-	1.11	-	LOW
CHES	I-64	GREENBRIER PKWY	BATTLEFIELD BLVD	EB		67,141			64,714		49	-	1.23	-	MOD	-	24	-	2.58	-	SEV	-
				WB		66,173			72,566		-	59	-	1.05	-	LOW	-	58	-	1.06	-	LOW
CHES	I-64	BATTLEFIELD BLVD	I-464	EB		60,542			62,014		41	-	1.43	-	SEV	-	20	-	2.95	-	SEV	-
				WB					62,000		-	63	-	0.97	-	LOW	-	62	-	0.99	-	LOW
CHES	I-64	I-464	GEORGE WASHINGTON HWY	EB		44,030		46,947		47,926	49	-	1.23	-	MOD	-	41	-	1.47	-	SEV	-
				WB		44,305		46,653	46,258	48,380	-	51	-	1.17	-	MOD	-	49	-	1.22	-	MOD
CHES	I-64	GEORGE WASHINGTON HWY	MILITARY HWY	EB		39,243		42,143		45,159	55	-	1.11	-	LOW	-	46	-	1.32	-	SEV	-
				WB		38,219		40,215		43,638	-	17	-	3.49	-	SEV	-	29	-	2.09	-	SEV
CHES	I-64	MILITARY HWY	I-264&664	EB	39,068	38,714	39,998	43,398	44,603	46,352	54	-	1.13	-	LOW	-	41	-	1.48	-	SEV	-
				WB	36,640	36,746	37,536	41,174	43,053	44,051	-	21	-	2.96	-	SEV	-	29	-	2.10	-	SEV
CHES	I-264	I-64&664	WCL PORTSMOUTH	EB		27,749				28,783	61	-	0.98	-	LOW	-	62	-	0.97	-	LOW	-
				WB						29,487	-	60	-	1.00	-	LOW	-	56	-	1.07	-	LOW
CHES	I-464	I-64	MILITARY HWY	NB		30,101			32,668	32,259	57	-	0.98	-	LOW	-	57	-	0.99	-	LOW	-
				SB		28,035				32,602	-	54	-	1.00	-	LOW	-	41	-	1.30	-	SEV
CHES	I-464	MILITARY HWY	FREEMAN AVE	NB		28,298			30,395	28,744	60	-	0.98	-	LOW	-	60	-	0.98	-	LOW	-
				SB		21,267			30,720	29,541	-	57	-	1.02	-	LOW	-	50	-	1.16	-	MOD
CHES	I-464	FREEMAN AVE	POINDEXTER ST	NB	26,904	26,728	27,254	26,836	28,010	28,842	47	-	1.27	-	MOD	-	60	-	1.00	-	LOW	-
				SB	23,107	22,983	24,390	25,667	26,938	28,199	-	59	-	1.03	-	LOW	-	62	-	0.98	-	LOW
CHES	I-464	POINDEXTER ST	NORFOLK CL	NB		27,877				29,354	19	-	2.95	-	SEV	-	54	-	1.05	-	LOW	-
				SB		23,692				28,108	-	58	-	1.02	-	LOW	-	60	-	0.97	-	LOW
CHES	I-664	I-64 & I-264	ROUTES 13/58/460	SB		58,490		58,273	65,913		-	55	-	1.09	-	LOW	-	52	-	1.14	-	LOW
				NB					63,637		42	-	1.43	-	SEV	-	29	-	2.08	-	SEV	-
CHES	I-664	ROUTES 13/58/460	DOCK LANDING RD	SB		46,506					-	51	-	1.20	-	MOD	-	55	-	1.10	-	LOW
				NB		46,042			50,747		50	-	1.23	-	MOD	-	51	-	1.21	-	MOD	-

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
CHES	I-664	DOCK LANDING RD	PORTSMOUTH BLVD	SB		45,747		45,623			-	46	-	1.32	-	SEV	-	47	-	1.29	-	MOD
				NB		46,454		47,243	47,206		56	-	1.12	-	LOW	-	59	-	1.05	-	LOW	-
CHES	I-664	PORTSMOUTH BLVD	PUGHSVILLE RD	SB		43,902		43,400			-	47	-	1.34	-	SEV	-	47	-	1.33	-	SEV
				NB		43,633		44,565	45,138		59	-	1.05	-	LOW	-	59	-	1.05	-	LOW	-
CHES	I-664	PUGHSVILLE RD	SUFFOLK CL	SB		42,898					-	49	-	1.27	-	MOD	-	32	-	1.95	-	SEV
				NB		43,000					58	-	1.05	-	LOW	-	53	-	1.15	-	MOD	-
CHES	MOUNT PLEASANT RD	CHESAPEAKE EXPRESSWAY	CENTERVILLE TNPK		16,850			20,236			28	27	1.31	1.40	MOD	SEV	30	35	1.23	1.08	LOW	LOW
CHES	MOUNT PLEASANT RD	CENTERVILLE TNPK	FENTRESS AIRFIELD RD		9,145			11,002			42	42	1.13	1.13	LOW	LOW	46	42	1.05	1.13	LOW	LOW
CHES	OLD BATTLEFIELD BLVD	BALLAHACK RD	BATTLEFIELD BLVD					988			14	25	1.39	1.05	MOD	LOW	15	26	1.36	1.03	MOD	LOW
CHES	POINDEXTER ST (S NORFOLK JORDAN	PORTSMOUTH CL	I-464				6,159	8,777	10,452	9,655	-	-	-	-	SEV		-	-	-	-	SEV	
CHES	ROUTE 13/58/460	SUFFOLK CL	I-664	EB	36,207	35,095	35,839	35,530	37,118	38,776	57	-	1.01	-	LOW	-	60	-	0.96	-	LOW	-
				WB	36,509	35,065	35,738	35,458	36,925	38,692	-	60	-	1.01	-	LOW	-	62	-	0.98	-	LOW
GLO	RTE 17 (COLEMAN BRIDGE)	YORK CL	RTE 216 (GUINEA RD)		33,659	33,523	33,385	32,780	34,285	34,401	45	46	1.06	1.06	LOW	LOW	42	42	1.13	1.17	LOW	LOW
GLO	RTE 17	RTE 216 (GUINEA RD)	RTE 614 (HICKORY FORK RD)			36,654			38,066		45	46	1.06	1.06	LOW	LOW	42	42	1.13	1.17	LOW	LOW
GLO	RTE 17	RTE 614 (HICKORY FORK RD)	RTE 17 BUS S (MAIN ST)			30,279			31,708		42	45	1.18	1.09	LOW	LOW	40	44	1.23	1.13	LOW	LOW
GLO	RTE 17	RTE 17 BUS S (MAIN ST)	RTE 17 BUS N (MAIN ST)			20,692			20,430		44	44	1.13	1.10	LOW	LOW	45	44	1.10	1.08	LOW	LOW
GLO	RTE 17	RTE 17 BUS N (MAIN ST)	RTE 606 (ARK RD)			16,978			16,486		50	48	1.07	1.08	LOW	LOW	49	45	1.08	1.16	LOW	LOW
GLO	RTE 17	RTE 606 (ARK RD)	ROUTE 14			12,970			12,583		56	55	1.04	1.04	LOW	LOW	56	55	1.03	1.06	LOW	LOW
GLO	RTE 17	ROUTE 14	ROUTES 33/198			7,108			6,733		52	54	1.09	1.07	LOW	LOW	53	56	1.07	1.03	LOW	LOW
GLO	RTE 17	ROUTES 33/198	MIDDLESEX CL			13,596			12,937		53	49	1.04	1.11	LOW	LOW	54	51	1.01	1.08	LOW	LOW
HAM	ARMISTEAD AVE	COMMANDER SHEPARD BLVD	HRC PARKWAY		24,285		24,797			17,882	28	26	1.30	1.33	MOD	MOD	34	32	1.07	1.10	LOW	LOW
HAM	ARMISTEAD AVE	LASALLE AVE	RIP RAP RD		16,091		14,526			15,646	21	27	1.38	1.17	MOD	LOW	20	28	1.42	1.14	SEV	LOW
HAM	ARMISTEAD AVE	RIP RAP RD	PEMBROKE AVE		16,396		12,014			12,841	26	21	1.14	1.39	LOW	MOD	23	24	1.28	1.22	MOD	LOW
HAM	BIG BETHEL RD	SAUNDERS RD	SEMPLE FARM RD		14,322		13,308			15,417	27	31	1.18	1.09	LOW	LOW	27	31	1.19	1.09	LOW	LOW
HAM	BIG BETHEL RD	SEMPLE FARM RD	YORK CL				10,632			10,830	27	31	1.18	1.09	LOW	LOW	27	31	1.19	1.09	LOW	LOW
HAM	COMMANDER SHEPARD BLVD	BIG BETHEL RD	NORTH CAMPUS PKWY					5,560	5,876		-	-	-	-	LOW		-	-	-	-	LOW	
HAM	COMMANDER SHEPARD BLVD	NORTH CAMPUS PKWY	MAGRUDER BLVD					5,560	5,876		-	-	-	-	LOW		-	-	-	-	LOW	
HAM	COMMANDER SHEPARD BLVD	MAGRUDER BLVD	ARMISTEAD AVE		5,833		8,139			8,990	-	-	-	-	LOW		-	-	-	-	LOW	
HAM	COMMANDER SHEPARD BLVD	ARMISTEAD AVE	NASA MAIN GATE		18,362		17,615			16,962	36	30	1.08	1.17	LOW	LOW	36	33	1.07	1.09	LOW	LOW
HAM	COMMANDER SHEPARD BLVD	NASA MAIN GATE	WYTHE CREEK RD		18,108		16,629			12,693	36	30	1.08	1.17	LOW	LOW	36	33	1.07	1.09	LOW	LOW
HAM	COMMANDER SHEPARD BLVD	WYTHE CREEK RD	MAGRUDER BLVD			23,264	22,477			20,402	-	-	-	-	MOD		-	-	-	-	LOW	
HAM	HRC PARKWAY	I-64	MAGRUDER BLVD		40,401		42,726			40,940	48	37	1.02	1.31	LOW	MOD	46	46	1.06	1.05	LOW	LOW
HAM	HRC PARKWAY	MAGRUDER BLVD	COLISEUM DR		32,200		33,109			31,574	29	43	1.26	1.07	MOD	LOW	30	42	1.24	1.11	LOW	LOW
HAM	HRC PARKWAY	COLISEUM DR	ARMISTEAD AVE		26,276		27,487			25,136	29	43	1.26	1.07	MOD	LOW	30	42	1.24	1.11	LOW	LOW
HAM	I-64	NEWPORT NEWS CL	HRC PARKWAY	EB			80,824			83,462	63	-	1.01	-	LOW	-	64	-	0.99	-	LOW	-
				WB			80,510			82,935	-	62	-	1.02	-	LOW	-	61	-	1.03	-	LOW
HAM	I-64	HRC PARKWAY	MAGRUDER BLVD	EB							63	-	1.00	-	LOW	-	65	-	0.97	-	LOW	-
				WB			72,014				-	63	-	1.00	-	LOW	-	60	-	1.04	-	LOW
HAM	I-64	MAGRUDER BLVD	MERCURY BLVD	EB	79,577		85,457				62	-	1.00	-	LOW	-	64	-	0.97	-	LOW	-
				WB	71,419		85,375				-	63	-	0.98	-	LOW	-	63	-	0.99	-	LOW
HAM	I-64	MERCURY BLVD	I-664	EB	74,168	72,648	76,909			81,002	58	-	1.07	-	LOW	-	62	-	1.00	-	LOW	-
				WB	73,951	72,531	76,361				-	63	-	0.97	-	LOW	-	62	-	0.98	-	LOW
HAM	I-64	I-664	ARMISTEAD AVE	EB			60,916				49	-	1.25	-	MOD	-	48	-	1.26	-	MOD	-
				WB			62,023			56,973	-	63	-	0.99	-	LOW	-	63	-	0.99	-	LOW
HAM	I-64	ARMISTEAD AVE	RIP RAP RD	EB	56,684		51,785				29	-	2.09	-	SEV	-	30	-	2.01	-	SEV	-
				WB	47,640		52,253			52,648	-	63	-	0.99	-	LOW	-	61	-	1.02	-	LOW
HAM	I-64	RIP RAP RD	SETTLERS LANDING RD	EB	56,684		43,722			45,668	8	-	6.99	-	SEV	-	12	-	5.03	-	SEV	-
				WB	47,640		52,253			52,648	-	62	-	0.98	-	LOW	-	60	-	1.01	-	LOW
HAM	I-64	SETTLERS LANDING RD	MALLORY ST	EB			43,389				13	-	4.23	-	SEV	-	14	-	4.04	-	SEV	-
				WB			47,328				-	62	-	0.98	-	LOW	-	60	-	1.00	-	LOW
HAM	I-64/HRBT	MALLORY ST	NORFOLK CL	EB	45,849	46,088	46,070	44,853		46,899	43	-	1.28	-	MOD	-	40	-	1.40	-	SEV	-
				WB	43,858	44,309	44,200	43,223		45,167	-	50	-	1.10	-	LOW	-	38	-	1.45	-	SEV
HAM	I-664	NEWPORT NEWS CL	ABERDEEN RD	SB			40,717				-	59	-	1.05	-	LOW	-	60	-	1.03	-	LOW
				NB			41,729				63	-	1.00	-	LOW	-	53	-	1.19	-	MOD	-
HAM	I-664	ABERDEEN RD	POWER PLANT PKWY	SB	36,745	36,890	37,114				-	59	-	1.07	-	LOW	-	64	-	0.98	-	LOW
				NB	35,232	36,579	37,118				61	-	1.01	-	LOW	-	40	-	1.55	-	SEV	-
HAM	I-664	POWER PLANT PKWY	I-64	SB			44,656			49,229	-	60	-	1.00	-	LOW	-	57	-	1.06	-	LOW
				NB			45,440				41	-	1.47	-	SEV	-	25	-	2.36	-	SEV	-
HAM	KING ST	MERCURY BLVD	OLD FOX HILL RD					23,201		24,907	25	27	1.13	1.11	LOW	LOW	24	25	1.20	1.19	LOW	LOW
HAM	KING ST	OLD FOX HILL RD	LITTLE BACK RIVER RD		22,226			17,517		18,663	25	27	1.13	1.11	LOW	LOW	24	25	1.20	1.19	LOW	LOW

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
HAM	KING ST	LITTLE BACK RIVER RD	LAMINGTON RD		6,151		7,785		6,775	6,669	25	27	1.10	1.10	LOW	LOW	23	28	1.17	1.06	LOW	LOW
HAM	KING ST	LAMINGTON RD	OLD BUCKINGHAM RD		6,151		7,785		6,775	6,669	25	27	1.10	1.10	LOW	LOW	23	28	1.17	1.06	LOW	LOW
HAM	KING ST	OLD BUCKINGHAM RD	LANGLEY AFB		6,151		7,785		6,775	6,669	25	27	1.10	1.10	LOW	LOW	23	28	1.17	1.06	LOW	LOW
HAM	LASALLE AVE	ARMISTEAD AVE	MERCURY BLVD		13,256		12,317			13,927	41	36	1.04	1.15	LOW	LOW	40	37	1.09	1.12	LOW	LOW
HAM	LASALLE AVE	MERCURY BLVD	LANGLEY GATE		11,975		9,607			10,539	47	45	1.05	1.05	LOW	LOW	46	47	1.07	1.00	LOW	LOW
HAM	MAGRUDER BLVD	YORK CL	SEMPLE FARM RD		23,891		23,739			22,460	41	35	1.10	1.27	LOW	MOD	36	38	1.22	1.19	LOW	LOW
HAM	MAGRUDER BLVD	SEMPLE FARM RD	COMM SHEPARD BLVD (SOUTH)			28,695	26,073			25,422	34	40	1.31	1.07	MOD	LOW	36	36	1.24	1.22	LOW	LOW
HAM	MAGRUDER BLVD	COMM SHEPARD BLVD (SOUTH)	HRC PARKWAY		39,959		29,854			32,895	46	39	1.06	1.18	LOW	LOW	45	40	1.08	1.15	LOW	LOW
HAM	MAGRUDER BLVD	HRC PARKWAY	I-64			29,916	33,191			33,884	33	44	1.23	1.07	LOW	LOW	31	44	1.33	1.07	MOD	LOW
HAM	MERCURY BLVD	NEWPORT NEWS CL	BIG BETHEL RD		50,337	50,028	48,479	48,518	50,203	50,327	33	30	1.11	1.15	LOW	LOW	29	25	1.27	1.38	MOD	MOD
HAM	MERCURY BLVD	BIG BETHEL RD	ABERDEEN RD		49,887		49,808			52,986	34	36	1.14	1.10	LOW	LOW	30	36	1.29	1.10	MOD	LOW
HAM	MERCURY BLVD	ABERDEEN RD	POWER PLANT PKWY				56,129			62,596	24	29	1.34	1.15	MOD	LOW	18	24	1.77	1.38	SEV	MOD
HAM	MERCURY BLVD	POWER PLANT PKWY	I-64		61,155		66,454			75,575	34	21	1.09	1.36	LOW	MOD	33	15	1.11	1.95	LOW	SEV
HAM	MERCURY BLVD	I-64	COLISEUM DR		54,964		60,068			65,831	24	32	1.29	1.02	MOD	LOW	20	25	1.53	1.31	SEV	MOD
HAM	MERCURY BLVD	COLISEUM DR	CUNNINGHAM DR		47,610		44,567			46,842	24	32	1.29	1.02	MOD	LOW	20	25	1.53	1.31	SEV	MOD
HAM	MERCURY BLVD	CUNNINGHAM DR	ARMISTEAD AVE		51,481		51,397			55,946	24	32	1.29	1.02	MOD	LOW	20	25	1.53	1.31	SEV	MOD
HAM	MERCURY BLVD	ARMISTEAD AVE	LASALLE AVE		51,378		51,254				39	33	1.06	1.13	LOW	LOW	41	30	1.01	1.25	LOW	LOW
HAM	MERCURY BLVD	LASALLE AVE	KING ST		55,653		59,349			63,994	38	40	1.07	1.03	LOW	LOW	34	36	1.19	1.13	LOW	LOW
HAM	PEMBROKE AVE	ARMISTEAD AVE	KING ST				9,917			9,093	22	20	1.19	1.21	LOW	LOW	22	17	1.17	1.37	LOW	MOD
HAM	WYTHE CREEK RD	COMMANDER SHEPARD BLVD	POQUOSON CL			15,779	16,581			14,986	32	33	1.13	1.07	LOW	LOW	33	31	1.12	1.13	LOW	LOW
IW	ROUTE 460	SOUTHAMPTON CL	FIRETOWER RD (RTE 644)		9,861			9,279			55	55	1.01	1.00	LOW	LOW	55	54	1.00	1.02	LOW	LOW
IW	ROUTE 460	FIRETOWER RD (RTE 644)	WCL WINDSOR		9,861			9,279			55	55	1.01	1.00	LOW	LOW	55	54	1.00	1.02	LOW	LOW
IW	ROUTE 460	WCL WINDSOR	ROUTE 258		9,861			9,279			55	55	1.01	1.00	LOW	LOW	55	54	1.00	1.02	LOW	LOW
IW	ROUTE 460	ROUTE 258	COURT ST (RTE 610)		14,054			14,326			26	22	1.32	1.50	MOD	SEV	24	23	1.43	1.44	SEV	SEV
IW	ROUTE 460	COURT ST (RTE 610)	ECL WINDSOR		15,315			14,115			49	50	1.01	1.00	LOW	LOW	48	49	1.02	1.00	LOW	LOW
IW	ROUTE 460	ECL WINDSOR	SUFFOLK CL		15,315			14,115			49	50	1.01	1.00	LOW	LOW	48	49	1.02	1.00	LOW	LOW
JCC	I-64	NEW KENT CL	RTE 30	EB	22,929	23,202	23,183	23,496	24,684	25,818	68	-	0.98	-	LOW	-	65	-	1.02	-	LOW	-
				WB	22,383	22,556	22,537	22,957	24,098	24,985	-	67	-	1.00	-	LOW	-	67	-	0.99	-	LOW
JCC	I-64	RTE 30	CROAKER RD (RTE 607)	EB	26,023	26,387	26,497	26,692	27,743	29,033	67	-	0.99	-	LOW	-	69	-	0.96	-	LOW	-
				WB	25,480	25,674	25,719	26,033	27,162	28,205	-	66	-	0.99	-	LOW	-	64	-	1.03	-	LOW
JCC	I-64	CROAKER RD (RTE 607)	YORK CL	EB	29,418	29,765	30,146	30,366	31,700	33,025	67	-	0.99	-	LOW	-	63	-	1.05	-	LOW	-
				WB	28,547	28,696	28,921	29,156	30,434	31,595	-	66	-	0.99	-	LOW	-	64	-	1.03	-	LOW
JCC	I-64	YORK CL	NEWPORT NEWS CL	EB			42,810			40,778	62	-	1.05	-	LOW	-	53	-	1.23	-	MOD	-
				WB			40,993			43,544	-	62	-	1.06	-	LOW	-	59	-	1.11	-	LOW
JCC	MERRIMAC TRL	NEWPORT NEWS CL @ I-64	YORK CL (SOUTH OF GROVE INT)				10,828			11,600	51	47	1.02	1.09	LOW	LOW	47	49	1.11	1.05	LOW	LOW
NN	23RD/25TH CONNECTOR	HUNTINGTON AVE	JEFFERSON AVE				2,503			2,145	24	-	1.27	-	MOD	-	24	-	1.28	-	MOD	-
NN	26TH ST	JEFFERSON AVE	WARWICK BLVD		3,578	3,646	3,347	4,530	3,951	3,075	-	24	-	1.13	-	LOW	-	22	-	1.24	-	LOW
NN	26TH ST	WARWICK BLVD	HUNTINGTON AVE		3,578	3,646	3,347	4,530	3,951	3,075	-	24	-	1.13	-	LOW	-	22	-	1.24	-	LOW
NN	BLAND BLVD	JEFFERSON AVE	McMANUS BLVD		15,395	15,526	15,082	15,685	21,039	23,353	-	-	-	-	LOW		-	-	-	-	LOW	
NN	FORT EUSTIS BLVD	WARWICK BLVD	I-64		36,172	36,576	34,394	36,231	33,932	31,170	42	42	0.99	0.98	LOW	LOW	24	44	1.75	0.94	SEV	LOW
NN	FORT EUSTIS BLVD	I-64	JEFFERSON AVE							26,123	27	28	1.23	1.25	LOW	LOW	24	28	1.35	1.25	MOD	LOW
NN	FORT EUSTIS BLVD	JEFFERSON AVE	.54 MILES EAST OF RTE 143		16,045	15,813	17,203	16,749	17,459	18,504	44	46	1.07	1.06	LOW	LOW	44	48	1.07	1.03	LOW	LOW
NN	FORT EUSTIS BLVD	.54 MILES EAST OF RTE 143	YORK CL		16,045	15,813	17,203	16,749	17,459	18,504	44	46	1.07	1.06	LOW	LOW	44	48	1.07	1.03	LOW	LOW
NN	HUNTINGTON AVE	71ST ST	39TH ST		11,386	10,089	11,633	11,018	11,399	10,657	-	32	-	1.08	-	LOW	-	26	-	1.33	-	MOD
NN	HUNTINGTON AVE	39TH ST	26TH ST		6,756	6,753	7,088	7,322	6,749	6,773	-	25	-	1.22	-	LOW	-	24	-	1.26	-	MOD
NN	HUNTINGTON AVE	26TH ST	23RD ST		6,756	6,753	7,088	7,322	6,749	6,773	-	-	-	-	LOW		-	-	-	-	MOD	
NN	I-64	JAMES CITY CL	RTE 143 (NORTH)	EB			42,810			40,778	62	-	1.05	-	LOW	-	53	-	1.23	-	MOD	-
				WB			40,993			43,544	-	62	-	1.06	-	LOW	-	59	-	1.11	-	LOW
NN	I-64	RTE 143 (NORTH)	YORKTOWN RD	EB			42,950			38,846	36	-	1.78	-	SEV	-	27	-	2.43	-	SEV	-
				WB			41,857			39,459	-	59	-	1.10	-	LOW	-	57	-	1.14	-	LOW
NN	I-64	YORKTOWN RD	FORT EUSTIS BLVD	EB			45,951			41,492	23	-	2.79	-	SEV	-	18	-	3.56	-	SEV	-
				WB			45,161			43,332	-	53	-	1.22	-	MOD	-	55	-	1.17	-	MOD
NN	I-64	FORT EUSTIS BLVD	JEFFERSON AVE	EB			53,460			48,687	53	-	1.18	-	MOD	-	50	-	1.26	-	MOD	-
				WB			48,531			46,610	-	45	-	1.41	-	SEV	-	38	-	1.68	-	SEV
NN	I-64	JEFFERSON AVE	OYSTER POINT RD	EB			61,123			64,810	64	-	0.98	-	LOW	-	56	-	1.12	-	LOW	-
				WB						66,292	-	49	-	1.30	-	MOD	-	37	-	1.69	-	SEV
NN	I-64	OYSTER POINT RD	J C MORRIS BLVD	EB	68,101	67,299	66,889	66,296	68,468	70,430	64	-	0.98	-	LOW	-	58	-	1.09	-	LOW	-
				WB	66,560	65,867	64,969	64,887	67,035	68,564	-	65	-	0.98	-	LOW	-	63	-	1.00	-	LOW
NN	I-64	J C MORRIS BLVD	HAMPTON CL	EB			80,824			83,462	63	-	1.01	-	LOW	-	64	-	0.99	-	LOW	-
				WB			80,510			82,935	-	62	-	1.02	-	LOW	-	61	-	1.03	-	LOW

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
NAME					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
NN	I-664/MMMBT	SUFFOLK CL	TERMINAL AVE	SB	31,148	30,987	31,911	31,826	33,073	33,713	-	62	-	1.00	-	LOW	-	51	-	1.21	-	MOD
				NB	32,718	32,101	33,056	32,844	33,891	34,800	56	-	1.07	-	LOW	-	57	-	1.05	-	LOW	-
NN	I-664	TERMINAL AVE	23RD ST	SB							-	55	-	1.03	-	LOW	-	12	-	4.94	-	SEV
				NB			36,892				61	-	0.99	-	LOW	-	61	-	1.01	-	LOW	-
NN	I-664	23RD ST	CHESTNUT AVE	SB			37,472				-	57	-	1.06	-	LOW	-	18	-	3.30	-	SEV
				NB			38,506				62	-	1.00	-	LOW	-	62	-	1.00	-	LOW	-
NN	I-664	CHESTNUT AVE	HAMPTON CL	SB			40,717				-	59	-	1.05	-	LOW	-	60	-	1.03	-	LOW
				NB			41,729				63	-	1.00	-	LOW	-	53	-	1.19	-	MOD	-
NN	J CLYDE MORRIS BLVD	I-64	HARPERSVILLE RD			42,821	42,979	39,497	42,892	42,323	30	33	1.14	1.16	LOW	LOW	18	36	1.93	1.07	SEV	LOW
NN	J CLYDE MORRIS BLVD	HARPERSVILLE RD	YORK CL		29,278	36,722	36,007	36,956	30,737	29,546	32	29	1.13	1.35	LOW	MOD	23	31	1.57	1.23	SEV	LOW
NN	JEFFERSON AVE	JAMES CITY CL	YORKTOWN RD		15,835	12,823	13,478	13,607	15,560	14,792	37	33	1.10	1.20	LOW	LOW	36	26	1.13	1.50	LOW	SEV
NN	JEFFERSON AVE	BLAND BLVD	I-64				81,507			85,047	33	29	1.11	1.17	LOW	LOW	25	23	1.47	1.48	SEV	SEV
NN	MERCURY BLVD	WARWICK BLVD	JEFFERSON AVE			40,458	40,641	40,373	42,019	39,741	42	46	1.13	1.05	LOW	LOW	39	35	1.21	1.39	LOW	MOD
NN	MERCURY BLVD	JEFFERSON AVE	HAMPTON CL		43,772	43,565	43,859	43,939	42,499	36,226	33	30	1.11	1.15	LOW	LOW	29	25	1.27	1.38	MOD	MOD
NN	SHELLABARGER DR	FORT EUSTIS	WARWICK BLVD		12,219	13,567	12,480		12,698	10,094	-	-	-	-	SEV		-	-	-	-	SEV	
NN	WARWICK BLVD	FORT EUSTIS BLVD	SNIDOW BLVD				29,502	30,645	38,462	37,034	33	30	1.11	1.12	LOW	LOW	29	23	1.26	1.48	MOD	SEV
NN	WARWICK BLVD	SNIDOW BLVD	DENBIGH BLVD		31,345	31,673	32,269	37,845	33,346	32,882	33	30	1.11	1.12	LOW	LOW	29	23	1.26	1.48	MOD	SEV
NN	WARWICK BLVD	DENBIGH BLVD	BLAND BLVD			29,303	31,789	42,519	40,568	43,612	27	27	1.22	1.27	LOW	MOD	17	19	1.94	1.80	SEV	SEV
NN	WARWICK BLVD	BLAND BLVD	OYSTER POINT RD			34,088	37,380	40,543		44,774	31	28	1.13	1.26	LOW	MOD	26	19	1.37	1.83	MOD	SEV
NN	WARWICK BLVD	OYSTER POINT RD	MAXWELL LN		16,963	16,459	16,645	31,733	24,875	22,462	30	28	1.16	1.22	LOW	LOW	25	27	1.41	1.28	SEV	MOD
NN	WARWICK BLVD	MAXWELL LN	DEEP CREEK RD		26,658	26,208	29,018	42,305	42,407	40,778	30	28	1.16	1.22	LOW	LOW	25	27	1.41	1.28	SEV	MOD
NN	WARWICK BLVD	DEEP CREEK RD	J CLYDE MORRIS BLVD		30,035	30,058	32,419	30,276	27,806	39,699	30	28	1.16	1.22	LOW	LOW	25	27	1.41	1.28	SEV	MOD
NN	WARWICK BLVD	J CLYDE MORRIS BLVD	HARPERSVILLE RD		26,745	29,253	25,102	29,448	28,520	32,815	30	36	1.22	1.08	LOW	LOW	33	37	1.14	1.06	LOW	LOW
NN	WARWICK BLVD	HARPERSVILLE RD	MAIN ST		23,091	25,008	23,798	24,853	28,620	32,529	30	31	1.08	1.04	LOW	LOW	29	28	1.12	1.15	LOW	LOW
NN	WARWICK BLVD	MAIN ST	CENTER AVE		24,128	20,344	24,259	25,344		26,773	28	33	1.16	1.04	LOW	LOW	24	31	1.32	1.11	MOD	LOW
NN	WARWICK BLVD	CENTER AVE	MERCURY BLVD		24,474	22,076	22,485	26,012	25,407	25,506	28	33	1.16	1.04	LOW	LOW	24	31	1.32	1.11	MOD	LOW
NN	WARWICK BLVD	MERCURY BLVD	HUNTINGTON AVE		32,319	32,604	32,632	32,914	32,768	25,201	28	32	1.31	1.08	MOD	LOW	25	26	1.47	1.33	SEV	MOD
NN	WARWICK BLVD	23RD ST	39TH ST		3,915	3,487	3,476	3,976	2,776	3,742	20	-	1.16	-	LOW	-	20	-	1.15	-	LOW	-
NN	WARWICK BLVD	39TH ST	HUNTINGTON AVE		13,308	13,593	12,330	12,877	14,462	12,817	28	-	1.31	-	MOD	-	25	-	1.47	-	SEV	-
NN	YORKTOWN RD	I-64	JEFFERSON AVE				11,882			11,320	-	-	-	-	LOW		-	-	-	-	LOW	
NN	YORKTOWN RD	JEFFERSON AVE	CRAWFORD RD		13,266	12,397	12,443	12,619	11,672	10,438	-	-	-	-	MOD		-	-	-	-	MOD	
NN	YORKTOWN RD	CRAWFORD RD	YORK CL		11,325	10,749	9,749	9,698	9,839	9,533	-	-	-	-	LOW		-	-	-	-	LOW	
NOR	ADMIRAL TAUSSIG BLVD	HAMPTON BLVD	I-564			29,196			27,291		27	19	1.28	1.57	MOD	SEV	27	19	1.29	1.57	MOD	SEV
NOR	BAY AVE	FIRST VIEW ST	I-64			18,328			14,023		-	-	-	-	MOD		-	-	-	-	MOD	
NOR	BERKLEY AVE	I-464	STATE ST			14,002					-	-	-	-	MOD		-	-	-	-	MOD	
NOR	BERKLEY AVE	STATE ST	MAIN ST			13,100			12,934		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	BRAMBLETON AVE	HAMPTON BLVD	COLLEY AVE			33,449			30,422		21	28	1.46	1.10	SEV	LOW	20	11	1.54	2.76	SEV	SEV
NOR	BRAMBLETON AVE	COLLEY AVE	BOUSH ST			41,715			38,684		18	25	1.43	1.16	SEV	LOW	14	20	1.85	1.47	SEV	SEV
NOR	BRAMBLETON AVE	BOUSH ST	MONTICELLO AVE			31,941			32,184		15	14	1.41	1.44	SEV	SEV	14	9	1.50	2.13	SEV	SEV
NOR	BRAMBLETON AVE	MONTICELLO AVE	ST PAULS BLVD			31,941			32,184		15	14	1.41	1.44	SEV	SEV	14	9	1.50	2.13	SEV	SEV
NOR	BRAMBLETON AVE	ST PAULS BLVD	CHURCH ST			19,281			23,241		17	15	1.30	1.55	MOD	SEV	12	18	1.88	1.27	SEV	MOD
NOR	BRAMBLETON AVE	CHURCH ST	TIDEWATER DR			27,774			34,849		17	15	1.30	1.55	MOD	SEV	12	18	1.88	1.27	SEV	MOD
NOR	BRAMBLETON AVE	TIDEWATER DR	PARK AVE			33,010			38,112		26	16	1.17	1.70	LOW	SEV	22	16	1.39	1.70	MOD	SEV
NOR	BRAMBLETON AVE	PARK AVE	I-264			45,812			48,658		26	16	1.17	1.70	LOW	SEV	22	16	1.39	1.70	MOD	SEV
NOR	GRANBY ST	LITTLE CREEK RD	I-564			24,588			26,942		21	20	1.15	1.32	LOW	MOD	16	18	1.46	1.42	SEV	SEV
NOR	GRANBY ST	I-564	I-64						25,542		29	27	1.15	1.19	LOW	LOW	26	25	1.28	1.27	MOD	MOD
NOR	GRANBY ST	I-64	BAYVIEW BLVD						22,679		17	23	2.10	1.65	SEV	SEV	27	35	1.37	1.05	MOD	LOW
NOR	HAMPTON BLVD	BRAMBLETON AVE	PRINCESS ANNE RD			35,938			35,824		22	23	1.33	1.25	MOD	LOW	23	12	1.31	2.40	MOD	SEV
NOR	HAMPTON BLVD	PRINCESS ANNE RD	21ST ST			35,938			35,824		22	23	1.33	1.25	MOD	LOW	23	12	1.31	2.40	MOD	SEV
NOR	HAMPTON BLVD	21ST ST	26TH ST			40,704			37,297		20	26	1.40	1.16	SEV	LOW	23	18	1.22	1.68	LOW	SEV
NOR	HAMPTON BLVD	26TH ST	27TH ST			42,727			32,612		20	26	1.40	1.16	SEV	LOW	23	18	1.22	1.68	LOW	SEV
NOR	HAMPTON BLVD	27TH ST	38TH ST			42,727			32,612		21	19	1.24	1.24	LOW	LOW	21	17	1.24	1.35	LOW	MOD
NOR	HAMPTON BLVD	38TH ST	JAMESTOWN CRESCENT		41,351	40,060	39,088	36,014	35,762	36,297	21	19	1.24	1.24	LOW	LOW	21	17	1.24	1.35	LOW	MOD
NOR	HAMPTON BLVD	JAMESTOWN CRESCENT	LITTLE CREEK RD		41,351	40,060	39,088	36,014	35,762	36,297	28	33	1.23	1.09	LOW	LOW	26	34	1.31	1.06	MOD	LOW
NOR	HAMPTON BLVD	LITTLE CREEK RD	INTERNATIONAL TERMINAL BLVD			41,101			34,742		28	33	1.23	1.09	LOW	LOW	26	34	1.31	1.06	MOD	LOW
NOR	HAMPTON BLVD	INTERNATIONAL TERMINAL BLVD	INTERMODAL CONNECTOR						27,141		20	22	1.46	1.22	SEV	LOW	26	24	1.11	1.10	LOW	LOW
NOR	HAMPTON BLVD	INTERMODAL CONNECTOR	ADM TAUSSIG BLVD						27,141		20	22	1.46	1.22	SEV	LOW	26	24	1.11	1.10	LOW	LOW
NOR	I-64/HRBT	HAMPTON CL	OCEAN VIEW AVE	EB	45,849	46,088	46,070	44,853		46,899	43	-	1.28	-	MOD	-	40	-	1.40	-	SEV	-
				WB	43,858	44,309	44,200	43,223		45,167	-	50	-	1.10	-	LOW	-	38	-	1.45	-	SEV

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
NOR	I-64	OCEAN VIEW AVE	4TH VIEW AVE	EB	45,849	46,088	46,070	44,853	39,835	46,899	57	-	1.05	-	LOW	-	50	-	1.19	-	MOD	-
				WB	43,858	44,309	44,200	43,223	44,026	45,167	-	44	-	1.30	-	MOD	-	23	-	2.44	-	SEV
NOR	I-64	4TH VIEW AVE	BAY AVE	EB		46,608		41,705		41,925	55	-	1.11	-	LOW	-	36	-	1.70	-	SEV	-
				WB		41,982		39,778		43,633	-	45	-	1.36	-	SEV	-	13	-	4.72	-	SEV
NOR	I-64	BAY AVE	GRANBY ST	EB		52,964		47,597		50,157	58	-	1.02	-	LOW	-	49	-	1.22	-	MOD	-
				WB		46,937		43,169		45,012	-	52	-	1.16	-	MOD	-	11	-	5.31	-	SEV
NOR	I-64	GRANBY ST	I-564/LITTLE CREEK RD	EB		52,964		47,597		50,157	61	-	0.98	-	LOW	-	31	-	1.96	-	SEV	-
				WB		46,937		43,169		45,012	-	53	-	1.13	-	LOW	-	14	-	4.18	-	SEV
NOR	I-64	I-564/LITTLE CREEK RD	TIDEWATER DR	REV			24,814	21,535	23,280	24,660	-	51	-	1.25	-	MOD	57	-	1.13	-	LOW	-
				EB	52,468	53,199	52,491	59,627	60,789	62,149	54	-	1.11	-	LOW	-	25	-	2.41	-	SEV	-
				WB		56,897			62,713	63,598	-	55	-	1.09	-	LOW	-	36	-	1.67	-	SEV
NOR	I-64	TIDEWATER DR	CHESAPEAKE BLVD	REV			24,814	21,535	23,280	24,660	-	45	-	1.46	-	SEV	56	-	1.19	-	MOD	-
				EB		58,772				58,967	40	-	1.48	-	SEV	-	28	-	2.17	-	SEV	-
				WB	60,739	61,026	60,064	58,977	59,525	62,732	-	44	-	1.38	-	SEV	-	53	-	1.14	-	LOW
NOR	I-64	CHESAPEAKE BLVD	NORVIEW AVE	REV			24,814	21,535	23,280	24,660	-	53	-	1.24	-	MOD	55	-	1.20	-	MOD	-
				EB				62,772	65,449	65,560	40	-	1.49	-	SEV	-	29	-	2.07	-	SEV	-
				WB		69,268		66,843	67,610	70,552	-	42	-	1.44	-	SEV	-	57	-	1.07	-	LOW
NOR	I-64	NORVIEW AVE	MILITARY HWY	REV			24,814	21,535	23,280	24,660	-	58	-	1.13	-	LOW	56	-	1.17	-	MOD	-
				EB		71,105		71,596		75,563	50	-	1.17	-	MOD	-	40	-	1.46	-	SEV	-
				WB	72,101	72,205	71,537	70,774		73,719	-	44	-	1.36	-	SEV	-	58	-	1.03	-	LOW
NOR	I-64	MILITARY HWY	NORTHAMPTON BLVD	REV			24,814	21,535	23,280	24,660	-	53	-	1.23	-	MOD	55	-	1.20	-	MOD	-
				EB		60,374		60,516			52	-	1.13	-	LOW	-	38	-	1.56	-	SEV	-
				WB	71,751	71,756	71,859	70,790		74,189	-	39	-	1.53	-	SEV	-	55	-	1.08	-	LOW
NOR	I-64	NORTHAMPTON BLVD	I-264	REV					23,355	22,420	-	52	-	1.21	-	MOD	47	-	1.36	-	SEV	-
				EB	77,762	75,649				80,592	53	-	1.10	-	LOW	-	45	-	1.29	-	MOD	-
				WB		87,702		86,152		91,875	-	35	-	1.73	-	SEV	-	56	-	1.07	-	LOW
NOR	I-64	I-264	VA BEACH CL	EB	75,325	74,977	75,076	75,688	76,538	79,622	60	-	0.98	-	LOW	-	45	-	1.33	-	SEV	-
				WB	72,998	73,113	72,921	73,302	74,451	77,910	-	34	-	1.72	-	SEV	-	31	-	1.91	-	SEV
NOR	I-264/DOWNTOWN TUNNEL	PORTSMOUTH CL	I-464	EB	47,681	46,851	45,645	35,892	35,876	37,343	18	-	2.53	-	SEV	-	31	-	1.45	-	SEV	-
				WB	50,547	49,934	47,733	37,553	38,173	38,365	-	33	-	1.35	-	SEV	-	27	-	1.66	-	SEV
NOR	I-264/BERKLEY BRIDGE	I-464	WATERSIDE/CITY HALL/TIDEWATER	EB	64,418						35	-	1.58	-	SEV	-	41	-	1.32	-	SEV	-
				WB	46,926						-	28	-	1.60	-	SEV	-	16	-	2.84	-	SEV
NOR	I-264	WATERSIDE/CITY HALL/TIDEWATER	BRAMBLETON AVE	EB		53,382			53,368	51,768	56	-	1.02	-	LOW	-	49	-	1.16	-	MOD	-
				WB		48,752		47,609	46,955	48,135	-	51	-	1.06	-	LOW	-	21	-	2.56	-	SEV
NOR	I-264	BRAMBLETON AVE	BALLENTINE BLVD	EB		66,539		63,851	63,114	65,623	59	-	1.00	-	LOW	-	49	-	1.21	-	MOD	-
				WB		64,988		63,994	63,096	66,088	-	57	-	0.98	-	LOW	-	40	-	1.42	-	SEV
NOR	I-264	BALLENTINE BLVD	MILITARY HWY	EB		64,320		62,580		64,801	60	-	1.00	-	LOW	-	49	-	1.21	-	MOD	-
				WB		64,935		64,512		64,121	-	61	-	0.98	-	LOW	-	57	-	1.05	-	LOW
NOR	I-264	MILITARY HWY	I-64	EB	72,884	63,550		71,467			60	-	1.00	-	LOW	-	38	-	1.57	-	SEV	-
				WB	65,538	57,886					-	63	-	0.99	-	LOW	-	62	-	0.99	-	LOW
NOR	I-264	I-64	NEWTOWN RD/WCL VA. BEACH	EB					117,873		58	-	1.04	-	LOW	-	31	-	1.94	-	SEV	-
				WB					117,436		-	53	-	1.10	-	LOW	-	39	-	1.50	-	SEV
NOR	I-464	CHESAPEAKE CL	SOUTH MAIN ST	NB		27,877			30,574	29,354	19	-	2.95	-	SEV	-	54	-	1.05	-	LOW	-
				SB		23,692			29,095	28,108	-	58	-	1.02	-	LOW	-	60	-	0.97	-	LOW
NOR	I-464	SOUTH MAIN ST	I-264	NB					28,387	24,341	17	-	3.06	-	SEV	-	42	-	1.22	-	MOD	-
				SB						25,230	-	52	-	1.04	-	LOW	-	54	-	1.00	-	LOW
NOR	I-564	ADMIRAL TAUSSIG BLVD	FUTURE INTERMODAL CONNECTOR	NB	19,946	20,363	21,396	19,650		21,062	24	-	2.33	-	SEV	-	52	-	1.07	-	LOW	-
				SB	22,519	22,539	24,496			23,251	-	53	-	1.08	-	LOW	-	51	-	1.12	-	LOW
NOR	I-564	FUTURE INTERMODAL CONNECTOR	INTERNATIONAL TERMINAL BLVD	NB	19,976	20,363	21,396	19,650		21,062	24	-	2.33	-	SEV	-	52	-	1.07	-	LOW	-
				SB	22,519	22,539	24,496			23,251	-	53	-	1.08	-	LOW	-	51	-	1.12	-	LOW
NOR	I-564	INTERNATIONAL TERMINAL BLVD	I-64	NB		38,879			37,087		44	-	1.26	-	MOD	-	55	-	1.00	-	LOW	-
				SB							-	56	-	1.02	-	LOW	-	28	-	2.01	-	SEV
NOR	INTERNATIONAL TERMINAL BLVD	HAMPTON BLVD	I-564		31,283	28,686	27,215	22,523		24,102	-	-	-	-	LOW		-	-	-	-	LOW	
NOR	LITTLE CREEK RD	GRANBY ST	I-64			24,198			27,889		-	-	-	-	MOD		-	-	-	-	MOD	
NOR	LITTLE CREEK RD	I-64	TIDEWATER DR			23,954			24,853		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	LITTLE CREEK RD	TIDEWATER DR	SEWELLS POINT RD			28,312			26,207		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	LITTLE CREEK RD	SEWELLS POINT RD	CHESAPEAKE BLVD			28,312			26,207		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	LITTLE CREEK RD	CHESAPEAKE BLVD	MILITARY HWY			38,980			38,573		-	-	-	-	LOW		-	-	-	-	MOD	
NOR	LITTLE CREEK RD	MILITARY HWY	AZALEA GARDEN RD			27,379			26,826		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	LITTLE CREEK RD	AZALEA GARDEN RD	SHORE DR						24,092		-	-	-	-	LOW		-	-	-	-	LOW	

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
NOR	MIDTOWN TUNNEL	PORTSMOUTH CL	BRAMBLETON AVE		41,390	40,803	40,744	36,356	35,311	34,775	17	38	2.25	1.05	SEV	LOW	33	36	1.18	1.09	LOW	LOW
NOR	MONTICELLO AVE	ST PAULS BLVD	VA BEACH BLVD			26,154	25,598		26,919		17	14	1.22	1.32	LOW	MOD	16	9	1.30	2.01	MOD	SEV
NOR	NORTHAMPTON BLVD	I-64	WESLEYAN DR/VA BEACH CL			81,656					23	23	1.40	1.52	MOD	SEV	24	20	1.33	1.72	MOD	SEV
NOR	NORVIEW AVE	I-64	MILITARY HWY			26,369			25,033		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	NORVIEW AVE	MILITARY HWY	AZALEA GARDEN RD			14,823			13,931		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	NORVIEW AVE	AZALEA GARDEN RD	NORFOLK INT AIRPORT			14,047			13,846		-	-	-	-	LOW		-	-	-	-	LOW	
NOR	SHORE DRIVE	LITTLE CREEK RD	VA BEACH CL		36,751	38,367	34,182		34,772		33	30	1.19	1.31	LOW	MOD	27	28	1.48	1.39	SEV	MOD
NOR	SOUTH MAIN ST	I-464	BAINBRIDGE BLVD			8,884			6,589		-	-	-	-	MOD		-	-	-	-	MOD	
NOR	SOUTH MAIN ST	BAINBRIDGE BLVD	LIBERTY ST			8,884			6,589		-	-	-	-	MOD		-	-	-	-	MOD	
NOR	SOUTH MAIN ST	LIBERTY ST	BERKLEY AVE			8,884			6,589		-	-	-	-	MOD		-	-	-	-	MOD	
NOR	ST PAULS BLVD	CITY HALL AVE	I-264 RAMP/MACARTHUR MALL			44,308					9	4	2.49	3.44	SEV	SEV	7	7	3.02	2.09	SEV	SEV
NOR	ST PAULS BLVD	I-264 RAMP/MACARTHUR MALL	BRAMBLETON AVE			44,308					9	12	2.08	1.44	SEV	SEV	11	8	1.86	2.06	SEV	SEV
NOR	ST PAULS BLVD	BRAMBLETON AVE	MONTICELLO AVE			22,671			23,608		17	14	1.22	1.32	LOW	MOD	16	9	1.30	2.01	MOD	SEV
NOR	TIDEWATER DR	BRAMBLETON AVE	VA BEACH BLVD			33,980			36,620		17	15	1.38	1.65	MOD	SEV	18	12	1.32	2.09	MOD	SEV
NOR	VA BEACH BLVD	MONTICELLO AVE	CHURCH ST			15,176			15,520		19	19	1.27	1.19	MOD	LOW	19	21	1.31	1.11	MOD	LOW
NOR	VA BEACH BLVD	CHURCH ST	TIDEWATER DR			15,176			15,520		19	19	1.27	1.19	MOD	LOW	19	21	1.31	1.11	MOD	LOW
PORT	CEDAR LN	WESTERN FREEWAY	S PERIMETER RD				10,513			9,745	-	-	-	-	MOD		-	-	-	-	LOW	
PORT	COAST GUARD BLVD	CEDAR LN	COAST GUARD BASE GATE				3,101			3,164	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	CRAWFORD ST	LONDON BLVD	HIGH ST				5,327			5,263	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	CRAWFORD ST	HIGH ST	COUNTY ST				5,399			5,811	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	CRAWFORD ST/BART ST	COUNTY ST	COURT ST				5,696			5,585	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	EFFINGHAM ST	PORTSMOUTH BLVD	I-264				23,715			23,972	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	EFFINGHAM ST	I-264	SOUTH ST				30,858			30,358	-	-	-	-	LOW		-	-	-	-	MOD	
PORT	EFFINGHAM ST	SOUTH ST	HIGH ST				25,793				-	-	-	-	LOW		-	-	-	-	LOW	
PORT	EFFINGHAM ST	HIGH ST	LONDON BLVD				22,651				-	-	-	-	LOW		-	-	-	-	LOW	
PORT	EFFINGHAM ST	LONDON BLVD	NORTH ST				16,741				-	-	-	-	MOD		-	-	-	-	MOD	
PORT	EFFINGHAM ST	NORTH ST	CRAWFORD PKWY				16,250			14,790	-	-	-	-	MOD		-	-	-	-	MOD	
PORT	EFFINGHAM ST	CRAWFORD PKWY	NAVAL MEDICAL CENTER				16,724			15,389	-	-	-	-	MOD		-	-	-	-	MOD	
PORT	ELM AVE	GEORGE WASHINGTON HWY	VICTORY BLVD				6,941			5,842	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	ELM AVE	VICTORY BLVD	BURTONS POINT RD				8,760			8,841	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	ELM AVE (S NORFOLK JORDAN BRIDGE	BURTONS POINT RD	CHESAPEAKE CL				6,159	8,777	10,452	9,655	-	-	-	-	MOD		-	-	-	-	SEV	
PORT	FREDERICK BLVD	GEORGE WASHINGTON HWY	PORTSMOUTH BLVD				13,006			15,303	26	28	1.27	1.11	MOD	LOW	25	23	1.36	1.34	MOD	MOD
PORT	FREDERICK BLVD	PORTSMOUTH BLVD	DEEP CREEK BLVD				15,594				23	25	1.30	1.17	MOD	LOW	19	24	1.55	1.24	SEV	LOW
PORT	FREDERICK BLVD	DEEP CREEK BLVD	I-264				21,068				23	25	1.30	1.17	MOD	LOW	19	24	1.55	1.24	SEV	LOW
PORT	GEORGE WASHINGTON HWY	CHESAPEAKE CL	VICTORY BLVD				23,417			32,555	24	27	1.29	1.10	MOD	LOW	17	21	1.76	1.38	SEV	MOD
PORT	GEORGE WASHINGTON HWY	VICTORY BLVD	DAVIS ST				20,102			24,635	28	27	1.05	1.09	LOW	LOW	23	22	1.28	1.36	MOD	MOD
PORT	GEORGE WASHINGTON HWY	DAVIS ST	GREENWOOD DR							24,168	28	27	1.05	1.09	LOW	LOW	23	22	1.28	1.36	MOD	MOD
PORT	GEORGE WASHINGTON HWY	GREENWOOD DR	FREDERICK BLVD							26,954	28	27	1.05	1.09	LOW	LOW	23	22	1.28	1.36	MOD	MOD
PORT	GEORGE WASHINGTON HWY	FREDERICK BLVD	ELM AVE				17,831			18,254	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	GEORGE WASHINGTON HWY	ELM AVE	PORTSMOUTH BLVD				15,880			12,741	-	-	-	-	LOW		-	-	-	-	LOW	
PORT	I-264	WCL PORTSMOUTH	GREENWOOD DR	EB		27,749				28,783	61	-	0.98	-	LOW	-	62	-	0.97	-	LOW	-
				WB						29,487	-	60	-	1.00	-	LOW	-	56	-	1.07	-	LOW
PORT	I-264	GREENWOOD DR	VICTORY BLVD	EB		27,055		25,984	26,053	23,013	59	-	1.01	-	LOW	-	61	-	0.98	-	LOW	-
				WB		27,663		26,285		26,359	-	59	-	1.02	-	LOW	-	56	-	1.07	-	LOW
PORT	I-264	VICTORY BLVD	PORTSMOUTH BLVD	EB	31,901	32,211	32,875	26,257	25,582	27,819	42	-	1.39	-	SEV	-	60	-	0.97	-	LOW	-
				WB	31,459	31,724	31,706	26,222	26,520	27,635	-	59	-	1.02	-	LOW	-	58	-	1.03	-	LOW
PORT	I-264	PORTSMOUTH BLVD	FREDERICK BLVD	EB		32,513		24,566			22	-	2.61	-	SEV	-	57	-	1.01	-	LOW	-
				WB		33,171			28,370		-	58	-	1.00	-	LOW	-	60	-	0.97	-	LOW
PORT	I-264	FREDERICK BLVD	FUTURE MLK FWY	EB		40,279					17	-	3.15	-	SEV	-	48	-	1.13	-	LOW	-
				WB		38,779			31,110		-	57	-	1.01	-	LOW	-	54	-	1.05	-	LOW
PORT	I-264	FUTURE MLK FWY	DES MOINES AVE	EB		40,279					17	-	3.15	-	SEV	-	48	-	1.13	-	LOW	-
				WB		38,779			31,110		-	57	-	1.01	-	LOW	-	54	-	1.05	-	LOW
PORT	I-264	DES MOINES AVE	EFFINGHAM ST	EB		37,254					16	-	3.12	-	SEV	-	46	-	1.10	-	LOW	-
				WB		35,711					-	52	-	1.07	-	LOW	-	35	-	1.56	-	SEV
PORT	I-264/DOWNTOWN TUNNEL	EFFINGHAM ST	NORFOLK CL	EB	47,681	46,851	45,645	35,892	35,876	37,343	18	-	2.53	-	SEV	-	31	-	1.45	-	SEV	-
				WB	50,547	49,934	47,733	37,553	38,173	38,365	-	33	-	1.35	-	SEV	-	27	-	1.66	-	SEV
PORT	LONDON BLVD	M L K FWY	ELM AVE				28,023				-	-	-	-	LOW		-	-	-	-	LOW	
PORT	LONDON BLVD	ELM AVE	EFFINGHAM ST				24,986				-	-	-	-	LOW		-	-	-	-	LOW	
PORT	MIDTOWN TUNNEL	MLK FWY/WESTERN FREEWAY	NORFOLK CL		41,390	40,803	40,744	36,356	35,311	34,775	17	38	2.25	1.05	SEV	LOW	33	36	1.18	1.09	LOW	LOW

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
NAME					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
PORT	M L K FREEWAY	LONDON BLVD	WESTERN FREEWAY/MIDTOWN TUNNE	NB	19,748	18,723					44	-	1.07	-	LOW	-	49	-	0.96	-	LOW	-
				SB	18,756	18,266					-	41	-	1.10	-	LOW	-	44	-	1.03	-	LOW
PORT	PORTCENTRE PKWY	PORTSMOUTH BLVD	CRAWFORD ST							6,943	-	-	-	-	MOD		-	-	-	-	MOD	
PORT	PORTSMOUTH BLVD	EFFINGHAM ST	PORTCENTRE PKWY				4,462			4,328	15	15	1.68	1.59	SEV	SEV	22	17	1.12	1.44	LOW	SEV
PORT	VICTORY BLVD	I-264	GREENWOOD DR							23,605	23	21	1.21	1.23	LOW	LOW	19	18	1.43	1.38	SEV	MOD
PORT	VICTORY BLVD	GREENWOOD DR	DEEP CREEK BLVD				17,642			18,510	24	27	1.20	1.07	LOW	LOW	22	25	1.30	1.13	MOD	LOW
PORT	VICTORY BLVD	DEEP CREEK BLVD	GEORGE WASHINGTON HWY				18,078			19,775	24	27	1.20	1.07	LOW	LOW	22	25	1.30	1.13	MOD	LOW
PORT	VICTORY BLVD	GEORGE WASHINGTON HWY	AFTON PKWY				10,324				32	31	1.03	1.10	LOW	LOW	32	29	1.04	1.15	LOW	LOW
PORT	VICTORY BLVD	AFTON PKWY	ELM AVE				6,691			7,286	32	31	1.03	1.10	LOW	LOW	32	29	1.04	1.15	LOW	LOW
PORT	WESTERN FWY	SUFFOLK CL	TOWNE POINT RD	EB	25,488	25,310	25,985	25,782	27,364	28,540	56	-	1.08	-	LOW	-	62	-	0.97	-	LOW	-
				WB	24,133	25,859	26,305	25,899	27,209	28,310	-	60	-	0.99	-	LOW	-	59	-	1.00	-	LOW
PORT	WESTERN FWY	TOWNE POINT RD	CEDAR LN	EB		27,173					60	-	1.02	-	LOW	-	63	-	0.98	-	LOW	-
				WB		27,466					-	57	-	1.06	-	LOW	-	61	-	1.00	-	LOW
PORT	WESTERN FWY	CEDAR LN	VIG BLVD	EB					24,873		41	-	1.47	-	SEV	-	61	-	0.99	-	LOW	-
				WB					25,090		-	56	-	1.07	-	LOW	-	61	-	0.98	-	LOW
PORT	WESTERN FWY	VIG BLVD	WEST NORFOLK RD	EB	22,930	22,965	23,492		24,873		41	-	1.47	-	SEV	-	61	-	0.99	-	LOW	-
				WB	24,026	24,091	24,567		25,090		-	56	-	1.07	-	LOW	-	61	-	0.98	-	LOW
PORT	WESTERN FWY	WEST NORFOLK RD	MLK FREEWAY/MIDTOWN TUNNEL	EB	25,283	26,754			26,107		28	-	1.89	-	SEV	-	54	-	0.98	-	LOW	-
				WB	26,354	27,107			26,068		-	51	-	1.04	-	LOW	-	52	-	1.02	-	LOW
SH	ROUTE 58	GREENSVILLE CL	ADAMS GROVE RD (RTE 615)			11,935			10,521		62	62	1.00	1.00	LOW	LOW	62	63	1.00	0.99	LOW	LOW
SH	ROUTE 58	ADAMS GROVE RD (RTE 615)	DREWRY RD (RTE 659)			11,696			10,228		62	62	1.00	1.00	LOW	LOW	62	63	1.00	0.99	LOW	LOW
SH	ROUTE 58	DREWRY RD (RTE 659)	PINOPOLIS RD (ROUTE 653)			11,921			10,879		62	62	1.00	1.00	LOW	LOW	62	62	1.00	1.00	LOW	LOW
SH	ROUTE 58	PINOPOLIS RD (ROUTE 653)	ROUTE 35				12,112	12,100	12,884	13,391	61	62	1.01	1.01	LOW	LOW	61	62	1.02	1.01	LOW	LOW
SH	ROUTE 58	ROUTE 35	BUS RTE 58 W			13,449			12,836		59	59	1.01	1.00	LOW	LOW	58	59	1.03	1.00	LOW	LOW
SH	ROUTE 58	BUS RTE 58 W	CAMP PKWY (BUS RTE 58 E)		18,405	18,110	19,457	19,339	20,442	21,065	48	48	1.12	1.10	LOW	LOW	47	46	1.13	1.15	LOW	LOW
SH	ROUTE 58	CAMP PKWY (BUS RTE 58 E)	ARMORY DR (RTE 671)			16,452			15,363		61	62	1.00	1.00	LOW	LOW	61	63	1.01	0.99	LOW	LOW
SH	ROUTE 58	ARMORY DR (RTE 671)	ROUTE 258			16,452			15,363		61	61	1.01	1.02	LOW	LOW	62	61	1.00	1.02	LOW	LOW
SH	ROUTE 58	ROUTE 258	PRETLOW RD (RTE 714)			16,382			16,489		60	61	1.04	1.02	LOW	LOW	62	63	1.00	1.00	LOW	LOW
SH	ROUTE 58	PRETLOW RD (RTE 714)	SUFFOLK CL		17,413			18,964			61	62	1.01	1.00	LOW	LOW	62	63	1.00	0.99	LOW	LOW
SH	ROUTE 460	SUSSEX CL	WCL IVOR		8,784	8,739	9,016	8,940	9,416	10,155	54	54	0.99	1.02	LOW	LOW	54	54	1.00	1.01	LOW	LOW
SH	ROUTE 460	WCL IVOR	ROUTE 616 (IVOR RD)		8,784	8,739	9,016	8,940	9,416	10,155	54	54	0.99	1.02	LOW	LOW	54	54	1.00	1.01	LOW	LOW
SH	ROUTE 460	ROUTE 616 (IVOR RD)	ECL IVOR			8,415			8,562		55	55	1.01	1.00	LOW	LOW	55	54	1.00	1.02	LOW	LOW
SH	ROUTE 460	ECL IVOR	ISLE OF WIGHT CL			8,415			8,562		55	55	1.01	1.00	LOW	LOW	55	54	1.00	1.02	LOW	LOW
SUF	CAROLINA RD	WHALEYVILLE BLVD	TURLINGTON RD		15,668		17,263	17,517			48	45	1.02	1.10	LOW	LOW	46	47	1.06	1.07	LOW	LOW
SUF	CAROLINA RD	TURLINGTON RD	SW SUFFOLK BYPASS		15,668		17,263	17,517			43	43	1.06	1.08	LOW	LOW	42	43	1.08	1.10	LOW	LOW
SUF	CAROLINA RD	SW SUFFOLK BYPASS	FAYETTE ST		10,773			12,507			36	37	1.01	1.02	LOW	LOW	33	35	1.09	1.06	LOW	LOW
SUF	COLLEGE DR	WESTERN FREEWAY	HAMPTON ROADS PKWY		18,661						24	30	1.17	1.03	LOW	LOW	21	25	1.33	1.24	MOD	LOW
SUF	COLLEGE DR	HAMPTON ROADS PKWY	I-664		19,849		17,615	22,153			31	25	1.13	1.20	LOW	LOW	29	22	1.18	1.37	LOW	MOD
SUF	CONSTANCE RD	MAIN ST	WILROY RD		16,188		15,308	15,020			26	26	1.24	1.13	LOW	LOW	26	22	1.22	1.30	LOW	MOD
SUF	I-664	CHESAPEAKE CL	BRIDGE RD	SB		42,898					-	49	-	1.27	-	MOD	-	32	-	1.95	-	SEV
				NB		43,000					58	-	1.05	-	LOW	-	53	-	1.15	-	MOD	-
SUF	I-664	BRIDGE RD	WESTERN FWY	SB							-	49	-	1.25	-	MOD	-	26	-	2.33	-	SEV
				NB							56	-	1.10	-	LOW	-	51	-	1.21	-	MOD	-
SUF	I-664	WESTERN FWY	COLLEGE DR	SB	30,684	30,645	31,414	32,418	33,885	34,923	-	59	-	1.07	-	LOW	-	40	-	1.60	-	SEV
				NB			33,210	33,596	34,805	36,349	51	-	1.23	-	MOD	-	49	-	1.27	-	MOD	-
SUF	I-664/MMMBT	COLLEGE DR	NEWPORT NEWS CL	SB	31,148	30,987	31,911	31,826	33,073	33,713	-	62	-	1.00	-	LOW	-	51	-	1.21	-	MOD
				NB	32,718	32,101	33,056	32,844	33,891	34,800	56	-	1.07	-	LOW	-	57	-	1.05	-	LOW	-
SUF	MAIN ST	FAYETTE ST	WASHINGTON ST					9,979			36	37	1.01	1.02	LOW	LOW	33	35	1.09	1.06	LOW	LOW
SUF	MAIN ST	WASHINGTON ST	MARKET ST		20,941	13,612					16	18	1.33	1.21	MOD	LOW	12	13	1.79	1.61	SEV	SEV
SUF	MAIN ST	MARKET ST	CONSTANCE RD		20,941						16	18	1.33	1.21	MOD	LOW	12	13	1.79	1.61	SEV	SEV
SUF	PORTSMOUTH BLVD	WILROY RD	WASHINGTON ST		16,852		19,371	17,146			36	34	1.12	1.12	LOW	LOW	33	29	1.23	1.31	LOW	MOD
SUF	PORTSMOUTH BLVD	WASHINGTON ST	SUFFOLK BYPASS		23,284		23,463	24,506			49	45	1.07	1.07	LOW	LOW	50	39	1.04	1.22	LOW	LOW
SUF	PRUDEN BLVD	ISLE OF WIGHT CL	LAKE PRINCE DR		14,998	12,973	14,987	15,180			49	50	1.01	1.00	LOW	LOW	48	49	1.02	1.00	LOW	LOW
SUF	PRUDEN BLVD	LAKE PRINCE DR	KINGS FORK RD		18,251			16,910			33	36	1.32	1.22	MOD	LOW	33	39	1.32	1.15	MOD	LOW
SUF	PRUDEN BLVD	KINGS FORK RD	SUFFOLK BYPASS		18,209			22,438			35	36	1.18	1.19	LOW	LOW	38	38	1.10	1.13	LOW	LOW
SUF	ROUTE 13/58/460	SUFFOLK BYPASS	CHESAPEAKE CL	EB		35,095	35,839	35,530	37,118	38,776	57	-	1.01	-	LOW	-	60	-	0.96	-	LOW	-
				WB		35,065	35,738	35,458	36,925	38,692	-	60	-	1.01	-	LOW	-	62	-	0.98	-	LOW
SUF	ROUTE 58	SOUTHAMPTON CL	RTE 189/258		17,413			18,964			61	62	1.01	1.00	LOW	LOW	62	63	1.00	0.99	LOW	LOW
SUF	ROUTE 58	RTE 189/258	RTE 272 (S. QUAY RD)		15,663			16,749			61	62	1.01	1.01	LOW	LOW	62	62	1.00	1.00	LOW	LOW
SUF	ROUTE 58	RTE 272	S. QUAY RD (ROUTE 189)		18,626		21,401	17,714			60	61	1.02	1.01	LOW	LOW	61	61	1.00	1.00	LOW	LOW

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
SUF	ROUTE 58 (HOLLAND BYPASS)	S. QUAY RD (ROUTE 189)	BUS RTE 58 (HOLLAND RD)		18,818			18,297			59	59	1.00	1.00	LOW	LOW	59	59	0.99	1.00	LOW	LOW
SUF	ROUTE 58 (HOLLAND RD)	BUS RTE 58 (HOLLAND RD)	RTE 649 (LUMMIS RD)		22,120			22,520			53	54	1.03	1.02	LOW	LOW	52	53	1.05	1.03	LOW	LOW
SUF	ROUTE 58 (HOLLAND RD)	RTE 649 (LUMMIS RD)	RTE 643 (MANNING BRIDGE RD)		23,276			23,468			53	54	1.03	1.02	LOW	LOW	52	53	1.05	1.03	LOW	LOW
SUF	ROUTE 58 (HOLLAND RD)	RTE. 643 (MANNING BRIDGE RD)	COVE POINT DR		27,861			28,918			53	54	1.03	1.02	LOW	LOW	52	53	1.05	1.03	LOW	LOW
SUF	ROUTE 58 (HOLLAND RD)	COVE POINT DR	SUFFOLK BYPASS		30,165			30,176			39	39	1.06	1.10	LOW	LOW	37	35	1.12	1.23	LOW	LOW
SUF	SUFFOLK BYPASS	HOLLAND RD	PITCHKETTLE RD	EB	17,052			18,581			61	-	0.96	-	LOW	-	61	-	0.96	-	LOW	-
				WB	17,359			18,542			-	53	-	1.00	-	LOW	-	50	-	1.07	-	LOW
SUF	SUFFOLK BYPASS	PITCHKETTLE RD	PRUDEN BLVD	EB	18,186			19,592			58	-	1.04	-	LOW	-	61	-	0.98	-	LOW	-
				WB	17,953			19,972			-	62	-	1.00	-	LOW	-	63	-	0.98	-	LOW
SUF	SUFFOLK BYPASS	PRUDEN BLVD	GODWIN BLVD	EB	19,962	20,008					53	-	1.12	-	LOW	-	60	-	1.00	-	LOW	-
				WB	22,309	22,542					-	61	-	1.00	-	LOW	-	61	-	1.00	-	LOW
SUF	SUFFOLK BYPASS	GODWIN BLVD	WILROY RD	EB	26,262	26,357		30,007			59	-	1.05	-	LOW	-	61	-	1.02	-	LOW	-
				WB	27,192	27,276		29,628			-	60	-	1.02	-	LOW	-	55	-	1.12	-	LOW
SUF	SUFFOLK BYPASS	WILROY RD	ROUTES 13/58/460	EB	22,441	23,121		25,141			54	-	1.14	-	LOW	-	59	-	1.04	-	LOW	-
				WB	21,752	22,366		24,819			-	59	-	1.04	-	LOW	-	61	-	1.02	-	LOW
SUF	WESTERN FWY	I-664	COLLEGE DR	EB	20,216	19,983		22,741			55	-	1.02	-	LOW	-	55	-	1.03	-	LOW	-
				WB	20,292	20,457		21,861			-	50	-	1.01	-	LOW	-	45	-	1.10	-	LOW
SUF	WESTERN FWY	COLLEGE DR	PORTSMOUTH CL	EB	25,488	25,310	25,985	25,782	27,364	28,540	56	-	1.08	-	LOW	-	62	-	0.97	-	LOW	-
				WB	24,133	25,859	26,305	25,899	27,209	28,310	-	60	-	0.99	-	LOW	-	59	-	1.00	-	LOW
SUF	WHALEYVILLE BLVD	NC STATE LINE	RTE 616 (MINERAL SPRING RD)		4,604	4,618	4,614	4,597	4,865	5,117	52	51	1.02	1.05	LOW	LOW	52	53	1.04	1.02	LOW	LOW
SUF	WHALEYVILLE BLVD	RTE 616 (MINERAL SPRING RD)	RTE 677 (GREAT FORK RD)		5,780						52	51	1.02	1.05	LOW	LOW	52	53	1.04	1.02	LOW	LOW
SUF	WHALEYVILLE BLVD	RTE 677 (GREAT FORK RD)	RTE 675 (CYPRESS CHAPEL RD)		7,241			7,253			52	51	1.02	1.05	LOW	LOW	52	53	1.04	1.02	LOW	LOW
SUF	WHALEYVILLE BLVD	RTE 675 (CYPRESS CHAPEL RD)	RTE 759 (BABBTOWN RD)		8,504			8,585			52	51	1.02	1.05	LOW	LOW	52	53	1.04	1.02	LOW	LOW
SUF	WHALEYVILLE BLVD	RTE 759 (BABBTOWN RD)	RTE 32 (CAROLINA RD)		9,090	7,770		10,324			52	51	1.02	1.05	LOW	LOW	52	53	1.04	1.02	LOW	LOW
VB	BIRDNECK RD	GENERAL BOOTH BLVD	NORFOLK AVE		15,325	14,726	15,315	15,502	16,483	14,155	34	31	1.05	1.10	LOW	LOW	33	33	1.07	1.04	LOW	LOW
VB	BIRDNECK RD	NORFOLK AVE	VA BEACH BLVD				20,000				34	31	1.05	1.10	LOW	LOW	33	33	1.07	1.04	LOW	LOW
VB	BIRDNECK RD	VA BEACH BLVD	I-264		35,139	36,729	28,096	29,387	33,752	27,067	27	20	1.10	1.45	LOW	SEV	24	21	1.23	1.33	LOW	MOD
VB	CHESAPEAKE BAY BRIDGE-TUNNEL	SHORE DR	TOLL PLAZA		7,820	7,746	7,850	8,005	8,500	8,959	23	52	1.31	1.02	MOD	LOW	23	50	1.28	1.06	MOD	LOW
VB	CHESAPEAKE BAY BRIDGE-TUNNEL	TOLL PLAZA	NCL VA BEACH		7,820	7,746	7,850	8,005	8,500	8,959	49	53	1.07	1.08	LOW	LOW	51	56	1.05	1.01	LOW	LOW
VB	DAM NECK RD	PRINCESS ANNE RD	ROSEMONT RD		40,050	41,904	40,774	38,239	35,183	37,723	24	25	1.42	1.35	SEV	MOD	25	22	1.39	1.56	MOD	SEV
VB	DAM NECK RD	ROSEMONT RD	HOLLAND RD		40,050	41,904	40,774	38,239	35,183	37,723	24	25	1.42	1.35	SEV	MOD	25	22	1.39	1.56	MOD	SEV
VB	DAM NECK RD	HOLLAND RD	DRAKESMILE RD		46,965	44,562	37,919	41,032	37,606	39,353	33	38	1.34	1.15	MOD	LOW	36	25	1.21	1.77	LOW	SEV
VB	DAM NECK RD	DRAKESMILE RD	LONDON BRIDGE RD		42,492	46,223	45,209	44,024	42,714		33	38	1.34	1.15	MOD	LOW	36	25	1.21	1.77	LOW	SEV
VB	DAM NECK RD	LONDON BRIDGE RD	HARPERS RD		29,575	31,847	29,633	29,582	28,619	28,636	40	40	1.12	1.12	LOW	LOW	39	40	1.13	1.11	LOW	LOW
VB	DAM NECK RD	HARPERS RD	GENERAL BOOTH BLVD		26,528	23,265	23,230	22,508	22,102	22,637	40	40	1.12	1.12	LOW	LOW	39	40	1.13	1.11	LOW	LOW
VB	DAM NECK RD	GENERAL BOOTH BLVD	UPTON DR		34,380	32,796	33,224	33,532	32,797	34,212	-	-	-	-	LOW		-	-	-	-	LOW	
VB	DAM NECK RD	UPTON DR	USN TRAINING CENTER		21,993		22,960	20,512	21,410	20,826	-	-	-	-	LOW		-	-	-	-	LOW	
VB	DIAMOND SPRINGS RD	NORTHAMPTON BLVD	SHORE DR		29,013	30,316	28,006	28,600	28,138	29,582	29	27	1.16	1.25	LOW	MOD	28	30	1.18	1.15	LOW	LOW
VB	DRAKESMILE RD	DAM NECK RD	SHIPPS CORNER RD		20,159	23,185	26,599	21,346	25,004	23,042	-	-	-	-	LOW		-	-	-	-	MOD	
VB	GENERAL BOOTH BLVD	DAM NECK RD	OCEANA BLVD/PROSPERITY RD		50,531	46,089	53,939	51,979	51,440	50,808	31	27	1.17	1.29	LOW	MOD	30	19	1.21	1.79	LOW	SEV
VB	GENERAL BOOTH BLVD	OCEANA BLVD/PROSPERITY RD	BIRDNECK RD		25,794	23,084	29,141	28,282	28,637	28,466	41	36	1.10	1.17	LOW	LOW	40	34	1.12	1.22	LOW	LOW
VB	GENERAL BOOTH BLVD	BIRDNECK RD	HARBOUR POINT			17,452	17,733	17,049	20,169	19,421	38	35	1.07	1.16	LOW	LOW	38	35	1.08	1.16	LOW	LOW
VB	HARPERS RD	DAM NECK RD	OCEANA BLVD		7,698	6,821	10,441	9,440	7,917	6,192	-	-	-	-	LOW		-	-	-	-	LOW	
VB	I-64	NORFOLK CL	INDIAN RIVER RD	EB	75,325	74,977	75,076	75,688	76,538	79,622	60	-	0.98	-	LOW	-	45	-	1.33	-	SEV	-
				WB	72,998	73,113	72,921	73,302	74,451	77,910	-	34	-	1.72	-	SEV	-	31	-	1.91	-	SEV
VB	I-64	INDIAN RIVER RD	CHESEAPEAKE CL	EB		69,141					62	-	0.99	-	LOW	-	54	-	1.13	-	LOW	-
				WB	64,959	65,444	65,757	67,927	68,604	69,253	-	40	-	1.51	-	SEV	-	54	-	1.11	-	LOW
VB	I-264	NEWTOWN RD/ECL NORFOLK	WITCHDUCK RD	EB		100,873			99,420		57	-	1.04	-	LOW	-	34	-	1.76	-	SEV	-
				WB		93,884			106,706		-	51	-	1.19	-	MOD	-	52	-	1.17	-	MOD
VB	I-264	WITCHDUCK RD	INDEPENDENCE BLVD	EB	100,368	98,972	100,693		100,158		60	-	0.99	-	LOW	-	52	-	1.14	-	LOW	-
				WB	101,498	100,609	101,266		100,158		-	49	-	1.21	-	MOD	-	52	-	1.14	-	LOW
VB	I-264	INDEPENDENCE BLVD	ROSEMONT RD	EB		76,570			82,222	83,593	61	-	0.98	-	LOW	-	57	-	1.05	-	LOW	-
				WB		78,647			83,276	83,612	-	48	-	1.25	-	MOD	-	55	-	1.10	-	LOW
VB	I-264	ROSEMONT RD	LYNNHAVEN PKWY	EB		65,194	70,007		74,501	75,829	61	-	0.98	-	LOW	-	57	-	1.04	-	LOW	-
				WB	70,899	70,695	72,096		75,281	77,331	-	50	-	1.22	-	MOD	-	61	-	1.00	-	LOW
VB	I-264	LYNNHAVEN PKWY	LONDON BRIDGE RD	EB		63,098			72,617	56,738	59	-	1.02	-	LOW	-	61	-	0.99	-	LOW	-
				WB		65,014			72,804	56,924	-	59	-	1.01	-	LOW	-	57	-	1.05	-	LOW
VB	I-264	LONDON BRIDGE RD	LASKIN RD	EB		51,349		51,020			59	-	1.02	-	LOW	-	61	-	0.99	-	LOW	-
				WB				52,800			-	59	-	1.01	-	LOW	-	57	-	1.05	-	LOW
VB	I-264	LASKIN RD	FIRST COLONIAL RD	EB	29,460	28,577	28,270		37,787	35,272	57	-	1.06	-	LOW	-	63	-	0.96	-	LOW	-
				WB	38,103	36,991	36,256		42,293	40,234	-	62	-	0.99	-	LOW	-	59	-	1.04	-	LOW

Appendix A: Traffic Volumes, Speeds, and Congestion (Roadways Serving the Military)

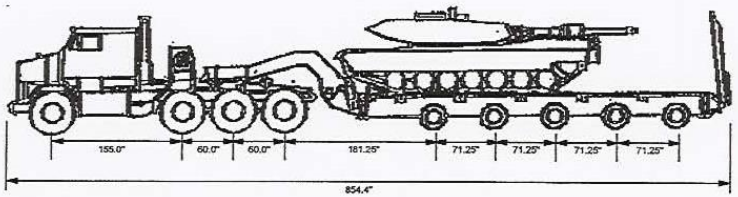
JURIS NAME	FACILITY NAME	SEGMENT FROM	SEGMENT TO	DIR	WEEKDAY TRAFFIC VOLUMES						2016 SPEED AND CONGESTION DATA											
											AM PEAK PERIOD						PM PEAK PERIOD					
											SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL		SPEED (mph)		TRAVEL TIME INDEX		CONGESTION LEVEL	
					2011	2012	2013	2014	2015	2016	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
VB	I-264	FIRST COLONIAL RD	S.E. PARKWAY CORRIDOR	EB		26,986		25,638	25,179	29,424	57	-	1.01	-	LOW	-	59	-	0.97	-	LOW	-
				WB		27,493		26,171	26,383	29,944	-	60	-	0.99	-	LOW	-	59	-	0.99	-	LOW
VB	I-264	S.E. PARKWAY CORRIDOR	BIRDNECK RD	EB		26,986		25,638	25,179	29,424	57	-	1.01	-	LOW	-	59	-	0.97	-	LOW	-
				WB		27,493		26,171	26,383	29,944	-	60	-	0.99	-	LOW	-	59	-	0.99	-	LOW
VB	I-264	BIRDNECK RD	PARKS AVE	EB		12,695		11,804	10,780	14,442	39	-	1.14	-	LOW	-	35	-	1.27	-	MOD	-
				WB		11,963		11,062	13,434		-	51	-	0.99	-	LOW	-	51	-	0.99	-	LOW
VB	INDEPENDENCE BLVD	NORTHAMPTON BLVD	SHORE DR		25,709	24,340	24,783	23,352	24,009	24,352	12	32	2.22	1.13	SEV	LOW	21	33	1.29	1.10	MOD	LOW
VB	LONDON BRIDGE RD	SHIPPS CORNER RD/DRAKESMILE RD	INTERNATIONAL PKWY		31,418	37,772	35,998	37,047	37,600		-	-	-	-	SEV		-	-	-	-	SEV	
VB	LONDON BRIDGE RD	INTERNATIONAL PKWY	POTTERS RD		31,418	28,774	35,358	35,029	34,714		-	-	-	-	LOW		-	-	-	-	LOW	
VB	LONDON BRIDGE RD	POTTERS RD	I-264 RAMP		29,253	34,676			39,491		15	21	1.66	1.34	SEV	MOD	13	21	1.89	1.40	SEV	SEV
VB	NORTHAMPTON BLVD	WESLEYAN DR/NORFOLK CL	DIAMOND SPRINGS RD		65,862	66,084	63,659	61,748	64,329	63,570	23	23	1.40	1.52	MOD	SEV	24	20	1.33	1.72	MOD	SEV
VB	NORTHAMPTON BLVD	DIAMOND SPRINGS RD	INDEPENDENCE BLVD		38,550	38,624	38,284	37,895	37,009		48	40	1.00	1.11	LOW	LOW	48	39	1.02	1.12	LOW	LOW
VB	NORTHAMPTON BLVD	INDEPENDENCE BLVD	SHORE DR		27,719	26,600	25,318	27,729	29,468	27,211	39	39	1.08	1.17	LOW	LOW	35	36	1.23	1.27	LOW	MOD
VB	OCEANA BLVD	GENERAL BOOTH BLVD	HARPERS RD			31,806			32,299	32,479	36	26	1.08	1.31	LOW	MOD	35	20	1.11	1.72	LOW	SEV
VB	OCEANA BLVD	HARPERS RD	TOMCAT BLVD (NAS MAIN ENT)			31,806			32,299	32,479	39	43	1.13	1.04	LOW	LOW	32	42	1.40	1.08	MOD	LOW
VB	OCEANA BLVD/FIRST COLONIAL RD	TOMCAT BLVD (NAS MAIN ENT)	VA BEACH BLVD		36,616	35,291	35,817	34,766	35,994	37,289	39	43	1.13	1.04	LOW	LOW	32	42	1.40	1.08	MOD	LOW
VB	SHORE DRIVE	NORFOLK CL	DIAMOND SPRINGS RD		36,751	38,367	34,182	34,472	35,888	30,070	33	30	1.19	1.31	LOW	MOD	27	28	1.48	1.39	SEV	MOD
VB	SHORE DRIVE	DIAMOND SPRINGS RD	INDEPENDENCE BLVD		33,487	39,262	27,955	26,127	29,758		28	34	1.38	1.22	MOD	LOW	33	35	1.17	1.21	LOW	LOW
VB	SHORE DRIVE	INDEPENDENCE BLVD	PLEASURE HOUSE RD		20,702	19,464		20,935	20,695	20,088	28	26	1.22	1.30	LOW	MOD	27	26	1.27	1.28	MOD	MOD
VB	SHORE DRIVE	PLEASURE HOUSE RD	NORTHAMPTON BLVD		20,702	19,464	21,867	20,935	20,695	20,088	27	22	1.19	1.35	LOW	MOD	23	23	1.39	1.32	MOD	MOD
VB	SHORE DRIVE	NORTHAMPTON BLVD	GREAT NECK RD		39,427	38,451	38,248	37,394	37,534	38,492	31	30	1.13	1.15	LOW	LOW	27	30	1.28	1.16	MOD	LOW
VB	SHORE DRIVE	GREAT NECK RD	ATLANTIC AVE		19,562	17,866	16,494	16,641	16,990	16,949	42	41	1.10	1.15	LOW	LOW	45	43	1.04	1.09	LOW	LOW
VB	VA BEACH BLVD	LASKIN RD	FIRST COLONIAL RD		30,735	28,606	29,503	29,908	30,108	30,802	24	39	1.38	1.02	MOD	LOW	23	38	1.43	1.04	SEV	LOW
YC	BALLARD ST	COOK RD	COAST GUARD TRAINING CENTER				2,900			2,776	-	-	-	-	MOD		-	-	-	-	MOD	
YC	BIG BETHEL RD	HAMPTON CL	HAMPTON HWY (RTE 134)				11,852			9,210	27	31	1.18	1.09	LOW	LOW	27	31	1.19	1.09	LOW	LOW
YC	COOK RD	GEORGE WASHINGTON HWY	GOOSLEY RD				6,256			7,287	-	-	-	-	LOW		-	-	-	-	LOW	
YC	COOK RD	GOOSLEY RD	BALLARD ST				7,330			8,102	-	-	-	-	LOW		-	-	-	-	LOW	
YC	FORT EUSTIS BLVD	NEWPORT NEWS CL	ROUTE 17				18,429			18,635	44	46	1.07	1.06	LOW	LOW	44	48	1.07	1.03	LOW	LOW
YC	GEORGE WASHINGTON HWY	NEWPORT NEWS CL	VICTORY BLVD (RTE 171)				35,050			34,018	32	29	1.13	1.35	LOW	MOD	23	31	1.57	1.23	SEV	LOW
YC	GEORGE WASHINGTON HWY	VICTORY BLVD (RTE 171)	HAMPTON HWY (RTE 134)				38,592				37	27	1.01	1.24	LOW	LOW	27	23	1.39	1.47	MOD	SEV
YC	GEORGE WASHINGTON HWY	HAMPTON HWY (RTE 134)	DARE RD		52,869					48,876	28	29	1.19	1.24	LOW	LOW	23	30	1.44	1.19	SEV	LOW
YC	GEORGE WASHINGTON HWY	DARE RD	DENBIGH BLVD (RTE 173)				37,878				28	29	1.19	1.24	LOW	LOW	23	30	1.44	1.19	SEV	LOW
YC	GEORGE WASHINGTON HWY	DENBIGH BLVD (RTE 173)	FORT EUSTIS BLVD (RTE 105)				36,726			36,487	39	33	1.16	1.34	LOW	MOD	32	35	1.40	1.25	MOD	MOD
YC	GEORGE WASHINGTON HWY	FORT EUSTIS BLVD (RTE 105)	COOK RD				34,284			36,373	39	33	1.16	1.34	LOW	MOD	32	35	1.40	1.25	MOD	MOD
YC	GEORGE WASHINGTON HWY	COOK RD	GOOSLEY RD (RTE 238)				35,113			27,147	39	33	1.16	1.34	LOW	MOD	32	35	1.40	1.25	MOD	MOD
YC	GEORGE WASHINGTON HWY	GOOSLEY RD (RTE 238)	GLOUCESTER CL (COLEMAN BRIDGE)				34,432			34,210	45	46	1.06	1.06	LOW	LOW	42	42	1.13	1.17	LOW	LOW
YC	GOOSLEY RD	OLD WILLIAMSBURG RD	CRAWFORD RD				6,436			6,501	-	-	-	-	LOW		-	-	-	-	LOW	
YC	GOOSLEY RD	CRAWFORD RD	ROUTE 17				6,436			6,501	-	-	-	-	LOW		-	-	-	-	LOW	
YC	GOOSLEY RD	ROUTE 17	COOK RD				1,530			1,558	-	-	-	-	LOW		-	-	-	-	LOW	
YC	HAMPTON HWY	ROUTE 17	VICTORY BLVD (RTE 171)				18,435			16,657	38	27	1.09	1.37	LOW	MOD	29	23	1.42	1.63	SEV	SEV
YC	HAMPTON HWY	VICTORY BLVD (RTE 171)	BIG BETHEL RD (RTE 600)				25,607			24,453	34	34	1.26	1.21	MOD	LOW	30	36	1.40	1.14	MOD	LOW
YC	HAMPTON HWY	BIG BETHEL RD (RTE 600)	NCL HAMPTON				26,040			23,632	41	35	1.10	1.27	LOW	MOD	36	38	1.22	1.19	LOW	LOW
YC	I-64	JAMES CITY CL	RTE 199/646	EB	29,418	29,765	30,146	30,366	31,700	33,025	67	-	0.99	-	LOW	-	63	-	1.05	-	LOW	-
				WB	28,547	28,696	28,921	29,156	30,434	31,595	-	66	-	0.99	-	LOW	-	64	-	1.03	-	LOW
YC	I-64	RTE 199/646	RTE 143	EB	27,660	28,337	28,229	28,092	29,385	30,318	67	-	0.99	-	LOW	-	68	-	0.97	-	LOW	-
				WB	27,746	28,029	27,997	27,810	29,011	29,944	-	66	-	0.99	-	LOW	-	63	-	1.04	-	LOW
YC	I-64	RTE 143	RTE 199 (EAST OF WILLIAMSBURG)	EB			29,301			32,730	66	-	1.00	-	LOW	-	66	-	0.98	-	LOW	-
				WB			28,003			32,688	-	65	-	1.00	-	LOW	-	64	-	1.03	-	LOW
YC	I-64	RTE 199 (EAST OF WILLIAMSBURG)	GROVE CONNECTOR	EB			38,359			41,238	64	-	1.02	-	LOW	-	67	-	0.97	-	LOW	-
				WB			37,767			40,053	-	63	-	0.99	-	LOW	-	61	-	1.04	-	LOW
YC	I-64	GROVE CONNECTOR	JAMES CITY CL	EB			42,810			40,778	62	-	1.05	-	LOW	-	53	-	1.23	-	MOD	-
				WB			40,993			43,544	-	62	-	1.06	-	LOW	-	59	-	1.11	-	LOW
YC	MERRIMAC TRAIL	BUSCH GARDENS INTERCHANGE	ROUTE 199/JAMES CITY CL				18,641			17,754	43	49	1.36	1.05	MOD	LOW	45	51	1.31	1.01	MOD	LOW
YC	OLD WILLIAMSBURG RD	NEWPORT NEWS CL	BAPTIST RD/MAIN RD		11,325	10,749	9,749	9,698	9,839	9,533	-	-	-	-	LOW		-	-	-	-	LOW	
YC	OLD WILLIAMSBURG RD	BAPTIST RD/MAIN RD	GOOSLEY RD				9,179			9,381	-	-	-	-	LOW		-	-	-	-	LOW	
YC	PENNIMAN RD (RTE 641)	ROUTE 199	COLONIAL PKWY		6,033	6,040	6,009	5,979	6,092	6,395	35	45	1.27	1.00	MOD	LOW	43	45	1.03	1.00	LOW	LOW
YC	ROUTE 143	ROUTE 132	I-64				18,870			19,146	22	29	1.20	1.10	LOW	LOW	23	26	1.11	1.22	LOW	LOW
YC	ROUTE 199	RTE 60/RTE 143/JCC LINE	I-64		30,622	30,549	30,661	30,481	30,760	30,857	51	45	1.11	1.03	LOW	LOW	55	48	1.04	0.98	LOW	LOW
YC	ROUTE 199	I-64	MARQUIS PKWY				18,133			18,833	-	-	-	-	LOW		-	-	-	-	LOW	
YC	ROUTE 199	MARQUIS PKWY	RTE 641 (PENNIMAN RD)				9,055			9,572	-	-	-	-	LOW		-	-	-	-	LOW	

APPENDIX B:
SCHEMATIC DIAGRAMS AND SPECIFICATIONS FOR HEAVY EQUIPMENT TRANSPORTER SYSTEM (HETS) AND PALLETIZED LOAD SYSTEM (PLS) MILITARY VEHICLE EXAMPLES

Appendix B: Heavy Equipment Transporter System (HETS) Military Vehicle Example

- ENCLOSURE 2 –

M1070/M1000
HEAVY EQUIPMENT TRANSPORTER
WITH M1A1/M1A2 TANK



AXLE NUMBER:	1	2	3	4	5	6	7	8	9	TOTAL
TIRES PER AXLE: 1/	2	2	2	2	8	8	8	8	8	48
EMPTY LOAD: 2/ (pounds (tons))	18,368 (9.2)	10,513 (5.3)	10,473 (5.2)	10,366 (5.2)	7,120 (3.6)	7,120 (3.6)	7,120 (3.6)	10,160 (5.1)	10,160 (5.1)	91,400 (45.8)
64.5-TON LOAD: 3/ (pounds (tons))	21,340 (10.7)	21,345 (10.7)	21,280 (10.6)	20,660 (10.3)	28,140 (14.1)	28,250 (14.1)	27,840 (13.9)	28,940 (14.5)	28,855 (14.4)	226,650 (113.3)
70-TON LOAD: 3/ (pounds (tons))	21,425 (10.7)	22,354 (11.2)	22,280 (11.1)	21,653 (10.8)	29,793 (14.9)	29,911 (15.0)	29,541 (14.8)	30,411 (15.2)	30,273 (15.1)	237,641 (118.8)

	M1070 Truck Tractor	M1000 Semitrailer	M1A1/M1A2 Tank
WIDTH	102"	144"	144"
HEIGHT	140"	43" (cargo bed) 143.14" (overall)	113.7" (trailer with tank: 156.7")

NOTES:
1/ M1070 Tire size - 16.00R20XZLT LRM
Cross country - 55psi
Highway - 75 psi
M1000 Tire size - 215/75R 17.5XTA(135J)LRH - 95 psi
2/ Axle loads are based on manufacturer's calculated data
3/ Axle loads are based on measured data

Source: SDDCTEA Information Paper: Military Design Standards for the National Highway System, August 31, 2000.

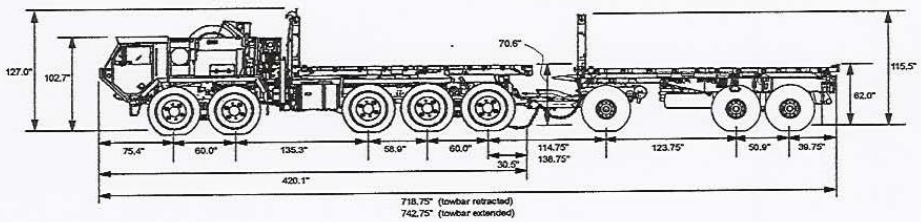
Appendix B: Palletized Load System (PLS) Military Vehicle Example

- ENCLOSURE 3 –

M1074/M1076
PALLETIZED LOAD SYSTEM

M1074 Tire size: 16.00R20XZLT
M1076 Tire size: 15.5X80R20

	Weight (pounds (tons)) Empty	Loaded	Payload (pounds (tons))
M1074 TRUCK	53,810 (26.9)	86,810 (43.4)	33,000 (16.5)
M1074/M1076 TRUCK TRAILER	69,435 (34.7)	135,435 (67.7)	66,000 (33.0)



AXLE NUMBER:	1	2	3	4	5	6	7	8
TIRES PER AXLE:	2	2	2	2	2	2	2	2
EMPTY LOAD: (pounds (tons))	15,605 (7.8)	15,981 (8.0)	6,834 (3.4)	8,072 (4.0)	7,318 (3.7)	6,422 (3.2)	4,703 (2.4)	4,500 (2.3)
GROSS LOAD: (pounds (tons))	15,626 (7.8)	16,147 (8.1)	16,233 (8.1)	19,532 (9.8)	19,272 (9.6)*	17,067 (8.5)	15,949 (8.0)	15,609 (7.8)

Source: SDDCTEA Information Paper: Military Design Standards for the National Highway System, August 31, 2000.

APPENDIX C:
PUBLIC AND STAKEHOLDER COMMENTS

The Hampton Roads Military Transportation Needs Study: 2018 Update DRAFT report was released for HRTPO military stakeholder comment from March 26, 2018 until April 9, 2018. The DRAFT report was revised based on military stakeholder comments and released for public comment from May 2, 2018 until May 29, 2018. All public/military stakeholder and HRTPO staff responses are included in this appendix.

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Peter Begansky (JBLE – Langley Air Force Base)
Date: March 27, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

Sir

I have reviewed the Hampton Roads Military Transportation Needs study and only have one major comment concerning the Connector Roads for Langley AFB.

Though the Primary Road list is La Salle Avenue, from I 64 to the La Salle Gate, this is not accessible for commercial vehicles (restricted to personal owned vehicles) and small width/height vehicles.

Armstead gate, located of the connector route, I 64 to Hwy 134 (Magruder blvd, to Gen Sheppard blvd to Armstead, or I64 to South Hampton parkway to Armstead are the primary connector routes for commercial transports supporting the base.

Based upon this, these routes (or at least one) should have a higher priority for increasing the lane width to above 12 feet.

No other issues were identified.

V/R
Peter Begansky

HRTPO Staff Response (March 28, 2018):
Thank you for reviewing the Hampton Roads Military Transportation Needs Study DRAFT report and for your comment regarding the connector roads for Langley AFB. I have forwarded your comment to Douglas Briggs with the US Army SDDC as they handle the STRAHNET designations and changes. He will be contacting you shortly to discuss this further.

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Rick Dwyer (HRMFFA)
Date: March 27, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

Thanks for sharing. Think the draft looks good. Only thing I noted was on page 9 where the ongoing JLUS efforts are listed. Hampton and Langley AFB are updating the 2010 JLUS with an addendum focused on sea level rise. Don't know if they have a website set up for it. If you need additional info, you can contact Lucy Stoll in their Community Development Department, or Bruce Sturk, Director of Federal Facilities for Hampton.

Rick

HRTPO Staff Response (March 27, 2018):
Yes, thank you for that reminder, as we have also recently been in discussions with Hampton and Langley AFB regarding this effort. I will add this to the JLUS section.

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Travis Willer (JBLE – Langley Air Force Base)
Date: March 30, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

Here are my comments for the HRMTNS. If there are any questions, please let me know.

* Pg 18(pg 15 of the pdf) - Map 4 - Shows STRAHNET Connector to JBLE-Langley as LaSalle Ave which is not able to receive cargo vehicles, etc. This should show the Armistead Gate with Armistead Ave and Hampton Roads Center Parkway as the STRAHNET Connectors. LaSalle Ave Gate does not have the infrastructure to regularly support military convoys and have shifted these operations to Armistead

* Pg 25(pg 22 of the pdf) - Map 8 - Corrects previous comment but calls the actual connectors Non-STRAHNET Roadways serving the Military Site. These sections of Armistead, Hampton Roads Center Parkway, McGruder Blvd, Commander Sheppard Pkwy should be shown as STRAHNET Connectors. These all service the Armistead Gate which houses the Large Vehicle Inspection Station (LVIS) and roadways capable of best supporting convoys of supplies and/or military vehicles

* Pg 38(pg 35 of the pdf) - Figure 10 - Hampton Roads Bridge Tunnel WB at top of page is shown as not having a funded project to correct deficiency but Figure 12 on page 42 shows funded projects to correct. These should be cross-checked to ensure correct information is shown

Thank you as always for the opportunity to comment on important studies such as these. We at JBLE-Langley look forward to the final report with the above noted comments.

V/r,
Travis Willer

HRTPO Staff Response (April 2, 2018):
Thank you for your review of the Hampton Roads Military Transportation Needs Study DRAFT report and for providing comments. Mr. Peter Begansky (USAF) provided a similar comment regarding STRAHNET Connectors to/from Langley (see emails below). We have contacted DoD's SDDC and they are working with Langley AFB and FHWA to get this change made. We will also review the Hampton Roads Bridge Tunnel funding information within the report to verify that is correct in each section.

Thank you again for your participation.

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Bryan Stilley (City of Newport News, Dept. of Engineering)
Date: April 13, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

As I mentioned in my voicemail, staff have developed comments for the Draft but I'm not sure if they were forwarded to you. In case they weren't here they are:

P. 12 - total personnel for JBLE is incorrect - it's about double that for both installations together.
P. 20 - USMC Reserve Center Newport News is no longer a military site and has been turned over to the City. The City is exploring other uses for the parcel.

Figure 13 – Lists Warwick Boulevard as Warwick Road for the two Mercury Boulevard bridge crossings.

Please let me know if you have any questions or need more information.

Regards,
Bryan Stilley, PE

HRTPO Staff Response (April 13, 2018):
Thank you for your review of the DRAFT report and for submitting comments. We will review and incorporate these changes. For page 12, the JBLE total personnel was obtained from the JBLE Economic Impact Analysis FY16 brochure (see attached). Do you have an updated total personnel number (and source)?

Also, did the USMC Reserve Center move to a different location? This is the first that I have heard of this and wanted to see if you had any more information.

Name: Bryan Stilley (City of Newport News, Dept. of Engineering)
Date: April 13, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

I believe that the activity was moved to one of the active stations in the area. The Corps has a presence at Naval Weapon Station Yorktown and Little Creek, those would seem likely destinations.

Our staff used the data included in the Ft. Eustis JLUS documents, which read as though there are 22,000 people on Ft. Eustis itself. I've attached the JLUS fact sheet and I'd expect there is mixing of total JBLE and 'Ft. Eustis alone' data which has led to the confusion. The full JLUS draft is available through https://www.forteustisjlus.com. I put more faith in the numbers from the 633rd flier than the JLUS text.

Bryan

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Mercedes Holland (JEB Little Creek-Fort Story, CPLO)
Date: April 16, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

I'm sorry for missing the deadline. JEBLCFS's current direct employee population is 23,400 (it's 24,600 if you count family members living within the base). 20,000 of the 23,400 report to Little Creek. Independence Blvd in Virginia Beach is the main thru fair for a large percentage of our population. I have coordinated with the JEBLCFS and the consensus is that Independence should be considered a STRAHNET non-interstate military Route.

There is major congestion that occurs during peak military hours 6-8am and 3-5 pm on both Shore Drive and Independence. I wonder if Shore Drive should be considered a STRAHNET non-interstate route since it is critical as the only access to Fort Story and all but one gate of Little Creek. Is there still time to make this change? Thank you.

Very Respectfully,
Mercedes Holland

HRTPO Staff Response (April 16, 2018):
Thank you for your review and comment on the DRAFT report. I have updated the employee population for JEBLCFS in the report to reflect the 23,400.

Regarding STRAHNET changes, all proposed changes need to be coordinated with DoD's SDDC TEA - Doug Briggs, who will coordinate with FHWA (Mike Neathery). I have cc'd Doug Briggs on this email in order for you to coordinate with him to discuss this further. Our analysis within this report was performed on current STRAHNET designations. If changes are made to the STRAHNET within our region, future analysis in our studies will reflect the new STRAHNET routes.

Name: Mercedes Holland (JEB Little Creek-Fort Story, CPLO)
Date: April 20, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

Thank you so much for looking into the updates on behalf of JEBLCFS. I will be out of the country on Temporary Duty for the next 3 months. If you need any help in the meantime please work with Rhonda Murray cc'd. Thank you so much.

Very Respectfully,
Mercedes Holland

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Carl Jackson (City of Portsmouth, Planning Dept.)
Date: May 2, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

Great presentation today "Military Transportation Needs", I'm with Portsmouth, now and we're making progress on replacing the Paradise Creek Bridge. Also I didn't see your full list, but I hope you've also identified the Coast Guard, Navy Fuel Depot and Naval Medical Hospital as important military facilities (may not be STRAHNET but still relevant). And please consider analyzing transit service to all the military facilities in the area.

Thanks.

HRTPO Staff Response (May 2, 2018):
Thank you for your kind remarks. That is great news on the Victory Blvd Bridge over Paradise Creek. I will certainly make a note of that. Yes, all three of the military facilities you listed are included within the 18 "Other Military Sites" we have included within the study.

Best regards with the City of Portsmouth!

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Robert Lewis (City of Suffolk, City Traffic Engineer)
Date: May 4, 2018
Subject: RE: Hampton Roads Military Transportation Needs Study DRAFT report

After reviewing the report presented at the May 2, 2018 meeting of HRTPO, I would like to offer the following comment on the report.

The report shows Route 13 through Downtown Suffolk, (Portsmouth Boulevard and Main Street) as a part of the system. With the completion of the Route 13 bypass around downtown Suffolk and with the bypass being limited access highway, it may be more appropriate for the new Route 13 Bypass to be the STRAHNET highway rather than the route through the downtown area.

I'm not sure who or how we would have this routing reviewed, but it may be worth consideration.

Thanks,
Robert

HRTPO Staff Response (May 9, 2018):
Thank you for your review of the DRAFT report and for submitting comments. We agree with your recommendation to remove Route 13 through Downtown Suffolk (Portsmouth Blvd and Main Street) and add the Route 13 Bypass as a Non-Interstate STRAHNET Route. We will pass this recommendation along to the DOD SDDC-TEA and FHWA for further review and consideration. We will keep you updated on any changes.

~~~~~~

HRTPO Stakeholder Comment (via email)

~~~~~~

Name: Tim Cross (York County, Deputy Director of Planning and Development Services)
Date: May 23, 2018
Subject: RE: Military Transportation Needs Study

I've reviewed the draft Military Transportation Needs Study and found it to be very thorough and well done. The one item that causes me some concern is the recommendation that all roadways designated as "roadways serving the military in Hampton Roads" that have average lane widths below 12' – which includes Route 17 in York County – be widened to a minimum of 12'. I see a potential conflict between this recommendation and another recommendation in the document that severely congested roadways serving the military be addressed.

Last year when working with VDOT and its consultant to scope out the Route 17 widening between Wolf Trap Road and Denbigh Boulevard, one of the options we seriously considered was going down to 11' lane widths in order to minimize the ROW impacts, reduce the project cost, and improve the benefit-cost score. Ultimately, that turned out not to be necessary and we were able to secure SMARTSCALE funding for that project. However, in future years, we will likely be looking at widening additional segments of Route 17 on both ends of the 6-lane section – north of Denbigh Blvd. and south of Route 134, and we might be looking again at 11-foot lanes. I understand the military's desire for wider lanes to accommodate certain vehicles, but if it comes down to a choice between a 4-lane Route 17 with 12' lanes and a 6-lane Route 17 with 11' lanes, I think all stakeholders – the military included – would be better off with the latter option. While I have seen convoys of large military vehicles traveling on Route 17, it has been very infrequent and is probably less common than the oversize trucks that carry modular homes, roof trusses, and such up and down the highway.

Having said all that, I don't have a specific revision to recommend to the document, but maybe some qualifying language could be added to address the issue of striking a balance between competing goals

Also, maybe I'm missing it, but in the diagrams in Appendix B, I don't see any specs regarding the width of these vehicles, which would be helpful in assessing the concern relative to lane widths.

Thanks, and have a great day.

Tim Cross

HRTPO Staff Response (May 24, 2018):

Thank you for your review of the DRAFT report and for submitting comments. This is an excellent comment. We have added the following text to the section on "Lane Widths below Military Preferences":

Note that some roadway widening projects may include additional travel lanes with average lane widths below 12 feet in order to reduce congestion, right-of-way impacts, and project costs. In these cases, there needs to be a balance between competing goals of reducing congestion and minimizing travel impacts for wider vehicles.

Additionally, the diagram for Heavy Equipment Transporter System contains a table on the bottom left of the image that shows the width of the semitrailer as 144" (12 ft), tank 144" (12 ft), and trailer with tank 156.7" (13.06 ft).

~~~~~~

HRTPO Stakeholder Comment (via letter)

~~~~~~

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF TRANSPORTATION
HAMPTON ROADS DISTRICT
1700 NORTH MAIN STREET
SUFFOLK, VIRGINIA 23434

Stephen C. Brich, P.E.
Commissioner

May 23, 2018

Michael S. Kimbrel,
Hampton Roads Transportation Planning Organization
723 Woodlake Drive
Chesapeake, Virginia 23320

Re: District Review of HRTPO Draft Transportation Studies

- DRAFT Hampton Roads Military Transportation Needs Study

Dear Mr. Kimbrel,

The Hampton Roads District Transportation Planning Office has completed a formal review of the Hampton Roads Transportation Planning Organization's (HRTPO) draft report listed above. The primary focus of this review is to ensure consistency with federal and state program requirements as identified in federal transportation code.

The *Hampton Roads Military Transportation Needs* study is a systematic review of the roadways most frequently used by the large military presence in the Hampton Roads region. These roadways include those identified by the Department of Defense as part of the Strategic Highway Network (STRAHNET) and other roadways that serve the military in this region. Several aspects of the road network are evaluated including congestion, lane width, bridge condition, and vertical clearance. The study also recommends measures to be taken in order to keep the road network serving the military efficient. The Hampton Roads District has reviewed the document and finds that it is consistent with state and federal MPO program requirements and will continue to coordinate and provide data with the HRTPO for subsequent updates. We do however have the following comments regarding the document:

- The needs noted in the report promote and align with SMARTSCALE principles.
- Is the recently completed MLK extension in consideration to be included in either STRAHNET or as a non-STRAHNET roadway serving the military?
- Does the study account for national guard services under each military branch that are also housed throughout the region?

WE KEEP VIRGINIA MOVING

Michael S. Kimbrel
May 23, 2018
Page Two

- Does the map on Page 7 (Map 1 – Hampton Roads Metropolitan Planning Area) reflect the new boundary including Franklin and Southampton?
- Is FY15 the latest available data for defense spending (Page 13)? Page 15 references FY16.
- In regards to U.S STRACNET (Page 17), does the study give consideration to the impacts that at-grade rail crossings impact military readiness?
- In regards to the I-564 Intermodal Connector Project (Page 24), what is the time frame for DoD revisions or additions to STRAHNET?
- In regards to the Severely Congested Roadways Serving the Military, have there been any significant changes from the previous report? Consider indicating changes in bridge condition as well.
- We concur with the recommendations on Page 33 and hope that all stakeholders will be privy to any mitigation strategies put in place.
- We concur with the recommendations on Page 60 and hope that all stakeholders will be privy to any mitigation strategies put in place. We also recommend a development of a subcommittee to address or further research these impacted routes.
- In Appendix A, it may be helpful to indicate the potential submergence level of the roadways such that overlap of congestion and submergence can be seen.

Other Issues

- Page 41, 2nd column, first paragraph: please revise to say "Manual on Uniform Traffic Control Devices"

The comments identified are preliminary in nature and provided for your review or revision as deemed appropriate. Please notify Mr. Caleb Brooks at 757-514-3708, should you have any questions.

Sincerely,

Eric L. Stringfield
Hampton Roads Transportation Planning Director

ELS/cbb

VirginiaDOT.org
WE KEEP VIRGINIA MOVING

HRTPO Staff Response (May 29, 2018):

Thank you for your review of the DRAFT report and for submitting comments. Please see our responses in the following attachment.

- The needs noted in the report promote and align with SMARTSCALE principles.
- Is the recently completed MLK extension in consideration to be included in either STRAHNET or as a non-STRAHNET roadway serving the military?
    - *This is an excellent comment as we agree that the Martin Luther King Freeway extension (Route 164) from I-264 to the Western Freeway should be added. We recommend that VDOT submit this roadway for STRAHNET consideration to the DoD USARMY SDDC Doug Briggs (douglas.e.briggs.civ@mail.mil) and FHWA Mike Neathery (mike.neathery@dot.gov). If this roadway is not added to STRAHNET, then we will include it as a non-STRAHNET Roadway Serving the Military in the future.*
- Does the study account for national guard services under each military branch that are also housed throughout the region?
    - *Yes, the Virginia Army National Guard is included within the following sites: Camp Pendleton – Military Reservation in Virginia Beach and JBLE-Langley Air Force Base in Hampton. Other Army National Guard locations are generally smaller recruiting facilities that are not included as this study primarily includes major military installations and supporting sites.*
- Does the map on Page 7 (Map 1 – Hampton Roads Metropolitan Planning Area) reflect the new boundary including Franklin and Southampton?
    - *Yes, it includes the new boundary.*
- Is FY15 the latest available data for defense spending (Page 13)? Page 15 references FYI 6.
    - *The DoD Defense Spending by State FY15 is currently the latest report available. The economic impact data for local military installations is primarily from the Navy Region Mid-Atlantic Hampton Roads Area report for FY16, which is the latest data available.*
- In regards to U.S STRACNET (Page 17), does the study give consideration to the impacts that at-grade rail crossings impact military readiness?
    - *This study did not specifically address impact for at-grade rail crossings on military readiness but we are open to incorporating these into future updates.*
- In regards to the I-564 Intermodal Connector Project (Page 24), what is the time frame for DoD revisions or additions to STRAHNET?
    - *The DoD and FHWA will consider STRAHNET revisions upon request as they receive them. We are not aware of a specific schedule for these STRAHNET reviews/changes; however, the DoD will periodically review them to ensure that the connections to/from STRAHNET sites are still valid. For more specific information, we recommend contacting: DoD USARMY SDDC Doug Briggs (douglas.e.briggs.civ@mail.mil) and FHWA Mike Neathery (mike.neathery@dot.gov).*
- In regards to the Severely Congested Roadways Serving the Military, have there been any significant changes from the previous report? Consider indicating changes in bridge condition as well.
    - *This is a good idea to consider for future updates.*
- We concur with the recommendations on Page 33 and hope that all stakeholders will be privy to any mitigation strategies put in place.
    - *Great, thank you.*
- We concur with the recommendations on Page 60 and hope that all stakeholders will be privy to any mitigation strategies put in place. We also recommend a development of a subcommittee to address or further research these impacted routes.
    - *Great, thank you. Our plan in doing these studies is for jurisdictional staffs to work with military installations within their localities to address these deficiencies. If developing a new subcommittee is necessary, we are open to this idea. However, we also don't want to form additional committees if these can be addressed within the organizational structure or committees we currently have.*

- In Appendix A, it may be helpful to indicate the potential submergence level of the roadways such that overlap of congestion and submergence can be seen.
    - *This idea is something to consider for future updates. However, it may be a complex issue since congestion is based on roadway segments. Potential submergence may only be a problem on a portion of that roadway segment so it may be difficult to categorize that entire segment as "flooded". This is why staff chose to leave the flooding analysis within GIS maps to show which specific roadway segments are vulnerable to flooding rather than CMP (Congestion Management Process) roadway segments.*

OtherIssues

- Page 41, 2nd column, first paragraph: please revise to say "Manual on Uniform Traffic Control Devices"
    - *Thank you, this change has been incorporated.*