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MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

Transportation Challenges in the Hampton Roads, VA, Region

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June 2012

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TRANSPORTATION CHALLENGES IN THE HAMPTON ROADS, VA, REGION

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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

The overall purpose of this MBA project is to provide an overview of all aspects of transportation in the Hampton Roads region to include highways, port traffic, rail, light-rail and tunnels. It also focuses on the importance the transportation system in Hampton Roads is to the military in the region. It includes an analysis and recommendations for potential improvements and future considerations for transit in the Hampton Roads region.

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LIST OF ACRONYMS AND ABBREVIATIONS

CA	Chesapeake and Albemarle Railroad
CEO	Chief Executive Officer
CIDMMA	Craney Island Dredged Material Management Area
CONUS	Continental United States
DoD	Department of Defense
DOT	Department of Transportation
DRPT	Department of Rail and Public Transportation
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FTZ	Foreign Trade Zones
HND	Highways for National Defense
HND	Highways for National Defense
HOV	High Occupancy Vehicle
HRBT	Hampton Roads Bridge Tunnel
HRMG	Hampton Roads Mobility Group
HRT	Hampton Roads Transit
HRTPO	Hampton Roads Transportation Planning Organization
MARAD	Maritime Administration
MPA	Metropolitan Planning Area
MPO	Metropolitan Planning Organization
NAS	Naval Air Station
NED	National Economic Development
NEPA	National Environmental Policy Act
NHS	National Highway System
ODU	Old Dominion University
PND	Ports for National Defense
PPO	Port Planning Orders
RND	Railroads for National Defense
SDDCTEA	Surface Deployment and Distribution Command Transportation Engineering Agency
STRACNET	Strategic Rail Corridor Network
STRAHNET	Strategic Highway Network

TRB	Transportation Research Board
TTAC	Technical Transportation Advisory Committee
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USJFCOM	United States Joint Forces Command
VDOT	Virginia Department of Transportation
VMT	Vehicle-Miles of Travel
VPA	Virginia Port Authority

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I. INTRODUCTION

“Hampton Roads” is the historic name for the five-mile wide, and the approximately last 10 miles, of the James River before it empties into Chesapeake Bay. Chesapeake Bay is an ocean estuary, the lower end of which is about 15 miles wide, and Hampton Roads is about 15 miles from the Atlantic Ocean. A line from Old Point Comfort to the west end of Willoughby Spit comes close to demarking the point where Hampton Roads becomes Chesapeake Bay; and the Hampton Roads Bridge-Tunnel also crosses close to that line. Maintaining a viable transportation system is crucial to the Hampton Roads economy. Pillars of the Hampton Roads economy—the military, the ports, and tourism—all depend on the region’s transportation system. The military needs a working transportation system to get civilian and military personnel and goods to the bases, and deploy troops and equipment as necessary for nation defense. The ports require an effective transportation system to get freight to and from the ports to warehouses both inside and outside Hampton Roads.

A. REGIONAL DEMOGRAPHICS

Hampton Roads is ranked as the eighth largest metropolitan area in the southeast United States. The Hampton Roads region consists of the cities of Norfolk, Chesapeake, Suffolk, Virginia Beach, Portsmouth, Hampton and Newport News, and together they comprise the second largest metropolitan area between Washington, DC and Atlanta, Georgia. Hampton Roads has a population of approximately 1.6 million and is home to the largest naval bases in the world. The region consists of a great deal of military personnel; this workforce is better skilled than most, especially in highly skilled areas. The area is in close proximity to numerous key U.S. commercial markets. The Port of Hampton Roads is an unobstructed ice free harbor with channel depths in excess of 50 feet and located within 18 miles of the open ocean. “Hampton Roads is linked to domestic markets by one of the country’s most modern highway systems. Interstate I-64, a major east-west route, encircles the metropolitan area and connects Hampton Roads to interstate I-95, a principle north-south route. The Chesapeake Bay Bridge Tunnel saves

90 miles to the New York/New Jersey corridor and gives coastal highway traffic direct access to Hampton Roads.”¹ The Hampton Roads region is home to one of the largest geographic foreign trade zones (FTZs) in the United States. This aspect alone shows the importance the Port of Virginia, and the rail transportation will continue to play a vital role for growth and continued trade stability in the Hampton Roads region in the future.

B. CURRENT STATE OF TRANSPORTATION IN THE REGION

The total amount of roadway usage in Hampton Roads, measured in terms of vehicle-miles of travel (VMT), was just over 40 million miles each day in 2009. Between 2000 and 2009, the total amount of roadway travel in Hampton Roads increased by nearly four million miles per day, or a total of approximately 11 percent. This amount is higher than the growth experienced both throughout Virginia (9 percent) and the United States (7 percent). However, most of the growth in roadway travel occurred early in the decade; therefore, the VMT in Hampton Roads has remained steady between 2003 and 2009. During the peak traffic months of June through August, the number of vehicles crossing the Hampton Roads Bridge-Tunnel regularly exceeds 100,000 per day.

¹ “Virginia's Hampton Roads Regional Overview,” (n.d.), <http://www.slideshare.net/HREDA/virginias-hampton-roads-regional-overview>.

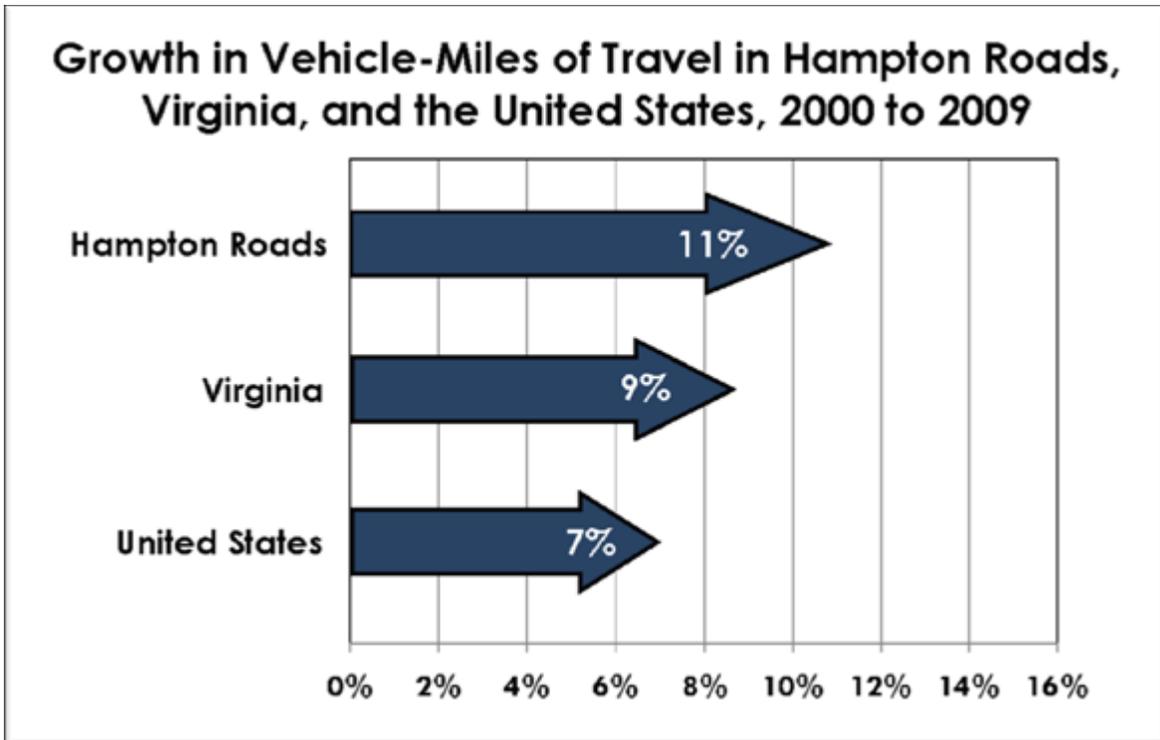


Figure 1. Growth in VMT

The recent downturn in the economy has had an effect on Hampton Roads transportation as well. The amount of travel on the roadways and the public transportation system has been impacted by fewer people going to work. In addition, funding levels for transportation improvements have been cut even further as state coffers have been drained.

Many changes are already happening to the transportation infrastructure of Hampton Roads. The APM Terminal, which was recently leased by the Virginia Port Authority and is among the most technologically advanced container terminals in the country, opened in 2007 in Portsmouth. It is the largest privately owned terminal in North America. In 2011, The Tide light rail system also began operation in Norfolk, which provides a new mode of transportation in the region.

C. MILITARY IN THE HAMPTON ROADS REGION

The Hampton Roads region contains one of the largest natural harbors in the world, which makes the region an attractive location for military facilities. The region’s military presence is comprised of the Norfolk Naval Base, the largest in the world, and dozens of other military facilities, all together having more than 110,000² active duty military personnel. 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). The total direct economic impact of the Navy alone on Hampton Roads was \$14.8 billion³ in 2009. The total military population—including active duty, reserve, retirees and family members—totals approximately 300,000⁴ or almost 20% of the area’s total population of 1.6 million.⁵ Table 1 shows active duty and civilian personnel employees. Hampton Roads is the nation’s 35th largest metropolitan area.⁶ The Hampton Roads Metropolitan Planning Area (MPA) (Map 1) encompasses nearly 1,900 square miles in nine cities and four counties and hosts five predominant economic engines that stimulate the regional economy, including that of the military, tourism, maritime industries, research and technology, and higher education.

Branch	Military Site	Active-Duty Personnel	Civilian Personnel	Total Personnel
Navy/Marines	Naval Station Norfolk	54,151	14,570	68,721
Navy/Marines	Naval Air Station Oceana	7,803	2,206	10,009
Navy/Marines	Norfolk Naval Shipyard	1,311	7,904	9,215
Navy/Marines	Naval Air Station Oceana Dam Neck Annex	4,088	1,490	5,578
Navy/Marines	Naval Weapons Station Yorktown	1,311	839	2,150
Navy/Marines/ Army	Naval Amphibious Base Little Creek-Fort Story	12,468	5,623	18,091
Army	Fort Eustis	7,700	5,700	13,400

² United States Joint Forces Command (USJFCOM), January 2011, www.jfcom.mil.

³ Navy Region Mid-Atlantic Public Affairs Office News Release, January 5, 2011.

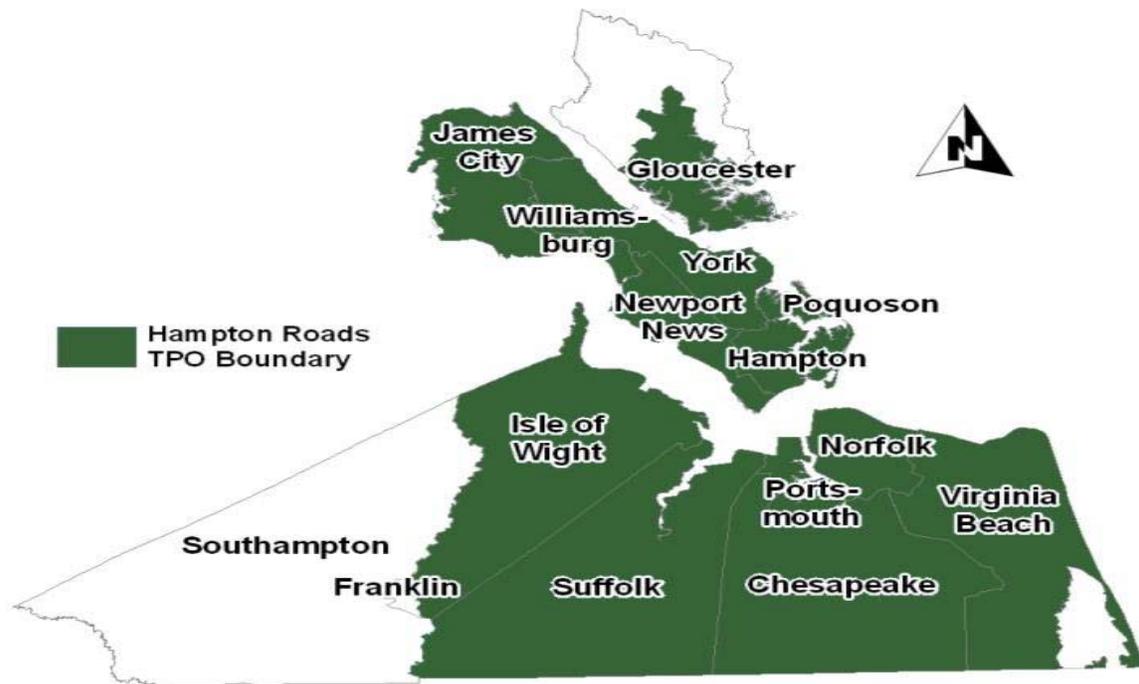
⁴ United States Joint Forces Command (USJFCOM).

⁵ Hampton Roads 2009 Socioeconomic Data.

⁶ Hampton Roads Regional Benchmarking Study, (n.d).

Branch	Military Site	Active-Duty Personnel	Civilian Personnel	Total Personnel
Army	Fort Monroe	1,118	1,702	2,820
Air Force	Langley Air Force Base	7,400	2,500	9,900
Coast Guard	U.S. Coast Guard- Base Portsmouth	1,300	200	1,500
Coast Guard	U.S. Coast Guard Training Center Yorktown	536	105	641
	Total	99,186	42,839	142,025

Table 1. Hampton Roads Military and Civilian Employment by Military Site, 2010



Map 1. Hampton Roads Metropolitan Planning Area

Efficient military operations require a sufficient transportation network so that cargo and personnel can be moved as quickly and as safely as possible. 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. According to the Transportation Research Board (TRB) Military Transportation Committee,⁷ most U.S.

⁷ Transportation Research Board (TRB) Annual Meeting, January 2011.

metropolitan planning areas with military installations currently have a disconnect between DoD military bases, Metropolitan Planning Organizations (MPOs), Department of Transportation (DOTs), and local communities. The Hampton Roads Transportation Planning Organization (HRTPO), however, has a long-standing relationship with the military community and has taken steps to increase related efforts in recent years. For many years, the military community has worked with the HRTPO to help steer HRTPO transportation studies and to participate, as non-voting members in the HRTPO Technical Transportation Advisory Committee (TTAC). In June 2007, the HRTPO staff worked with various stakeholders and completed a traffic management study⁸ by the U.S. Navy and the City of Norfolk that recommended solutions to maximize efficiency and decrease delays leading into and out of Naval Station Norfolk. In May 2009, invitations were extended to all military branches in the region requesting their participation in the planning process and at monthly HRTPO board meetings. Two military liaisons (U.S. Navy and U.S. Coast Guard) are currently participating as non-voting HRTPO Board members. Through participation in these monthly meetings, local military representatives are engaged with VDOT, HRTPO, local communities, and various other stakeholders on a regular basis and are able to communicate their transportation concerns and provide valuable input. These military representatives suggested that transportation congestion and problems may hinder the ability to maintain or bring additional military personnel to the region. Mobility, which is one of the primary keys to success, is currently impeded by insufficient local transportation infrastructure. They also requested consideration of time savings associated with high-speed and intercity passenger rail service connecting Hampton Roads to Richmond, Washington, DC and beyond. A high-speed rail connection would allow military servicemen and officials to conduct a full day's business in Washington, DC without remaining overnight.

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

D. TRANSPORTATION PROJECT RECOMMENDATIONS BY THE LOCAL MILITARY

In January 2011, commanding offices from the U.S. Navy, U.S. Coast Guard, and the U.S. Army in Hampton Roads sent letters in response to the Virginia Department of Transportation's (VDOT) request to identify and comment on transportation projects that would enhance access to local military facilities. A summary follows of the recommended transportation projects by military branch.⁹

1. U.S. Navy Recommendations

- I-564 Intermodal Connector, with Air Terminal Interchange
- Light Rail Transit, including the extension to Naval Station Norfolk
- Improved Harbor crossing—Hampton Roads Bridge Tunnel (HRBT) expansion or Third Crossing
- Maintenance of interstates, primary arterials and bridges that comprise the Strategic Highway Network (STRAHNET)

2. U.S. Coast Guard Recommendations

- Patriots Crossing to alleviate port commerce and naval base traffic
- Midtown and Downtown Tunnel expansion and modernization
- I-64 expansion to Richmond
- Consider moving to HOV-3 from HOV-2 in High Occupancy Vehicle (HOV) lanes
- Create E-ZPass system as tolls are implemented
- Consider military decals for HOV lanes for certain time windows
- Expand Norfolk Light Rail system to other location on the Hampton Roads Peninsula and Southside
- Consider a freight/passenger rail connection paralleling the Third Crossing

3. U.S. Army Recommendations

- I-64 Widening in the Fort Eustis area

⁹ Hampton Roads Transportation Planning Organization, "Roads Military Transportation Needs Survey," September 2011.

- HRBT expansion
- Metro transit system
- Passenger rail service connecting Southside Hampton Roads to the National Capitol Region

E. FINANCIAL

As with the rest of the nation, the Hampton Roads region has experienced major impacts from the December 2007 recession, including a struggling housing market, increased foreclosures, high gasoline prices, and increased regional unemployment. This economic strain has compounded the already present shortfalls in transportation funding. Limited traditional transportation revenue, the uncertainty of a dedicated transportation funding stream at the national level, and the lack of said stream at the state level have resulted in a bleak financial forecast for transportation needs and improvements. However, recognizing that funding transportation is one of the key challenges facing the Commonwealth, Governor Bob McDonnell announced a plan in early 2011 to invest billions of dollars in the Commonwealth's transportation system over the next three years without raising taxes. In addition to the Governor's Omnibus Transportation Funding Package, the HRTPO has investigated the application of other non-traditional funding sources to advance projects, including local funding, tolls, and public-private partnerships.

F. TRANSPORTATION PROGRAMS AND INFRASTRUCTURE FOR NATIONAL DEFENSE

Before identifying "Roadways Serving the Military in Hampton Roads," it is necessary to provide a clear definition of national defense programs and networks, such as the STRAHNET. This section defines and describes the national transportation programs and infrastructure significant to the military, including transportation components in Hampton Roads. A general overview of the Railroads, Ports, and Highways for National Defense Programs is intended to provide an understanding of the DoD initiatives established to ensure defense readiness and national security. Furthermore, several agreements between DoD and transportation agencies have been

established to ensure appropriate command and control of transportation infrastructure in the event of an emergency or crisis.¹⁰

The DoD currently has three major programs¹¹ to ensure defense readiness capability of U.S. transportation infrastructure:

1. Railroads for National Defense (RND)—ensures the readiness capability of the national railroad network to support defense deployment and peacetime military needs. The Strategic Rail Corridor Network (STRACNET) was created under this initiative.
2. Ports for National Defense (PND)—ensures the identification, adequacy, and responsiveness of defense-important Continental United States (CONUS) port infrastructure in both peacetime and wartime. Strategic Seaports and Port Planning Orders (PPOs) were created under this initiative.
3. Highways for National Defense (HND)—identify the minimum public highway infrastructure that the DoD needs to fulfill its mission, ensure the defense readiness capability of the public highway infrastructure, and establish policy on how the DoD uses the highway system. STRAHNET, which is part of the National Highway System (NHS), was created under this initiative.

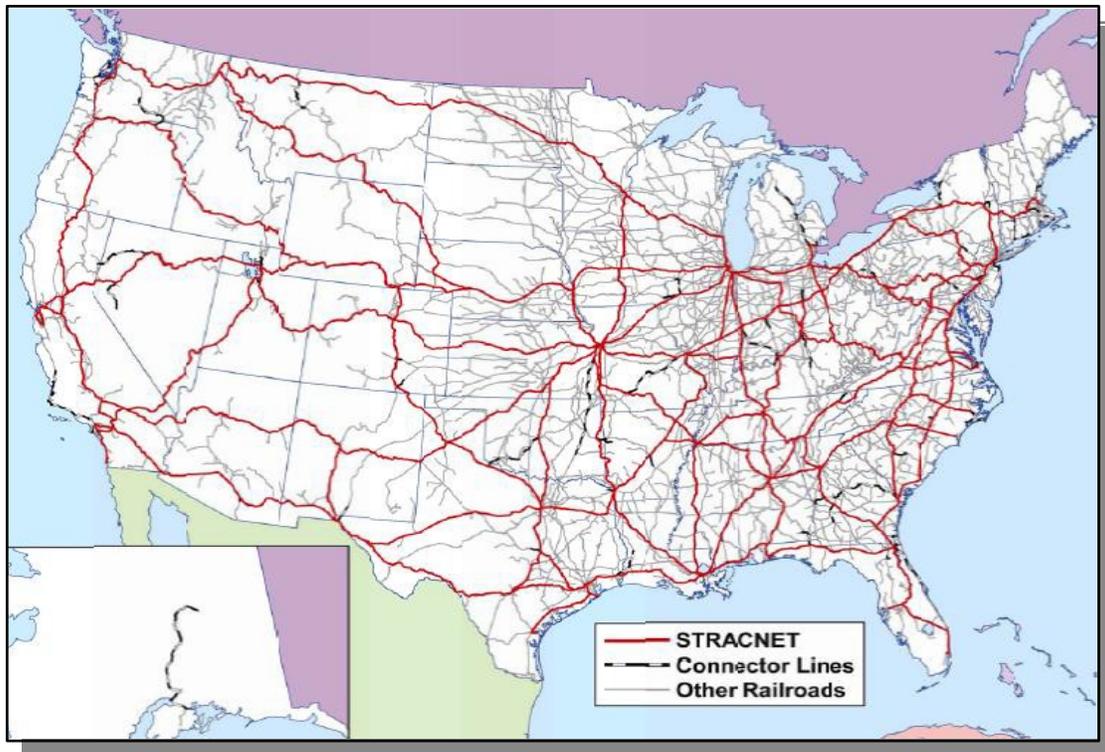
G. RAILROADS FOR NATIONAL DEFENSE (RND)

The DoD's RND program, along with the U.S. Federal Railroad Administration (FRA), established the STRACNET to identify the DoD's rail needs and to coordinate with the appropriate transportation authorities. STRACNET is an interconnected and continuous rail network consisting of approximately 32,500 miles of track critical for movement of military equipment to ports located around the United States, as well as approximately another 5,000 miles of track essential to connect 193 defense installations (Map 2).¹²

¹⁰ HRTPO, Hampton Roads Military Transportation Needs Study, September 2011.

¹¹ Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), 2010, www2.tea.army.mil/.

¹² HRTPO, Hampton Roads Military Transportation Needs Study.



Map 2. U.S. Strategic Rail Corridor Network (STRACNET) and Other Rail Connectors

H. PORTS FOR NATIONAL DEFENSE (PND)

The DoD PND program identifies, maintains, and activates the necessary port infrastructure during peacetime, wartime, and in the event of other military emergencies. The DoD, along with the Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) and the Maritime Administration (MARAD), has designated 22 U.S. strategic seaports (17 commercial strategic seaports and five military strategic seaports) to handle the mobilization, deployment, and resupply of U.S. forces during major conflicts (Map 3). More recently, U.S. strategic seaports have been used to support relief missions and natural disasters in the United States and overseas, such as Operations Enduring Freedom, Iraqi Freedom, and various other humanitarian relief efforts. According to SDDCTEA, a military strategic seaport is owned and operated by any branch of the DoD and designated strategic by SDDCTEA. Military strategic seaports can be used for the loading and unloading of military cargo.

The “strategic seaport” designation is based upon the DoD’s needs and is established through planning, modeling and analysis of potential future national defense deployment requirements.¹³



Map 3. U.S. Strategic Seaports

I. PORT PLANNING ORDERS (PPO)

The ability of the nation to respond adequately to military operations requires the usage and the availability of U.S. commercial port facilities. The DoD, in conjunction with MARAD, negotiates a PPO with each designated commercial strategic seaport and specifies which facilities will be needed to conduct a military mobilization or deployment. While commercial ports primarily move cargo that affects everyone’s daily lives, they also ship military cargo in support of U.S. military operations. According to SDDCTEA, the PPO is not needed for normal use of a port by the military. In

¹³ HRTPO, Hampton Roads Military Transportation Needs Study.

emergencies, the PPO would be activated and those facilities identified by the PPO would be made immediately available to the DoD.¹⁴

J. HIGHWAYS FOR NATIONAL DEFENSE (HND)

The DoD's HND program identifies the minimum public highway infrastructure STRAHNET needed to fulfill its mission and to ensure defense readiness capability. This program also establishes policy on how the DoD uses the highway system. STRAHNET, which is a part of the NHS and designated under this program, was designed to move military equipment and personnel efficiently.

K. NATIONAL HIGHWAY SYSTEM (NHS)

The NHS comprises 160,000 miles of highway that are important to the nation's mobility and economy, but also to the nation's defense. According to the U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA), the NHS includes the following subsystems of roadways (note that a specific highway route may be on more than one subsystem).¹⁵

1. Interstate

The Eisenhower interstate system of highways retains its separate identity within the NHS. Nationwide, the interstate system forms the backbone for the STRAHNET; in Hampton Roads, all interstate highways are designated as STRAHNET.

2. Other Principal Arterials

Roadways in rural and urban areas provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility. These roadways are also known as "Other NHS Routes."

¹⁴ HRTPO, Hampton Roads Military Transportation Needs Study.

¹⁵ U.S. Department of Transportation & Federal Highway Administration, National Highway System, (n.d.).

3. Strategic Highway Network (STRAHNET)

STRAHNET is a network of highways important to the United States' strategic defense policy that provide access, continuity and emergency capabilities for defense purposes. STRAHNET includes both interstate highways, as well as other non-interstate primary routes leading into and out of strategic locations. STRAHNET and STRAHNET connectors are the total minimum defense highway network to support defense emergency.

4. Major Strategic Highway Network Connectors

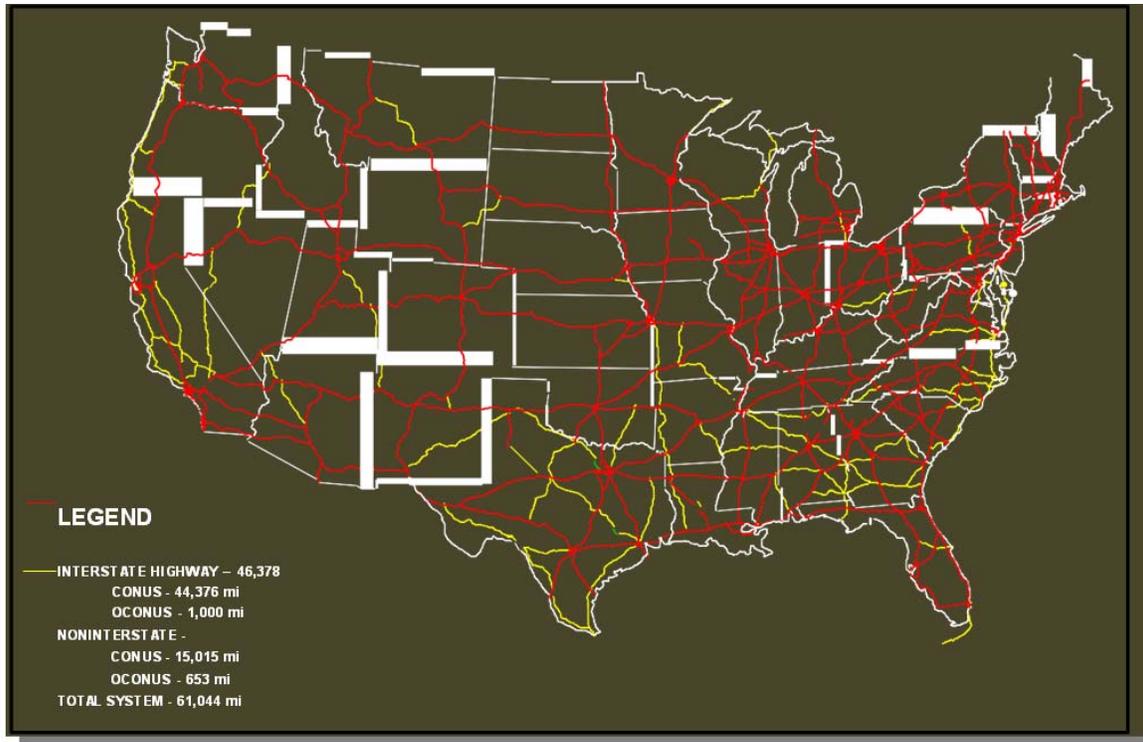
These highways provide access between major military installations and other highways that are part of the strategic highway network.

5. NHS Intermodal Connectors

These roadways provide access between major inter-modal facilities and other NHS highways. These connectors provide access and include rail facilities, public transit facilities, airports, and port terminals. NHS intermodal connectors provide an intermodal option to shippers and the defense industry in the event of a national or local emergency.

L. U.S. STRATEGIC HIGHWAY NETWORK (STRAHNET) AND STRAHNET CONNECTORS

The military SDDCTEA is the DoD-designated agent for public highways, including STRAHNET and STRAHNET connectors (Map 4). Part of the DoD's Highways for National Defense (HND) program, the SDDCTEA, identified STRAHNET and the connector routes in coordination with the FHWA, state transportation departments, military services and installations, and ports.



Map 4. U.S. Strategic Highway Network (STRAHNET)

The STRAHNET is a 61,044-mile system of roads (45,000 miles of interstate and close to 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. STRAHNET connectors covering approximately 1,700 miles are additional roadways that link over 200 important military installations and ports. Combined, STRAHNET and the connectors define the total minimum defense public highway network needed to support a defense emergency. The SDDCTEA, along with these organizations, are continually updating and confirming the designation of STRAHNET and STRAHNET connector routes in the national highway system.¹⁶

¹⁶ HRTPO, Hampton Roads Military Transportation Needs Study.

II. HAMPTON ROADS BRIDGE-TUNNEL (HRBT)

The Hampton Roads tunnel network is comprised of several tunnels connecting communities in the Hampton Roads area of Virginia, as well as the Chesapeake Bay Bridge-Tunnel that spans the mouth of the bay, and connects Virginia Beach to Cape Charles in Northampton County on the Eastern Shore. This bridge-tunnel is a time-saving shortcut for travelers from Delaware, Maryland, Pennsylvania and New York. It was built in 1964, and the 17.6 mile span is the world's largest bridge-tunnel. Unlike the other bridge-tunnels in the region, the Chesapeake Bay Bridge-Tunnel is owned, operated and maintained by the Chesapeake Bay Bridge and Tunnel Commission, not the VDOT.¹⁷

The HRBT is a 3.5-mile-long Hampton Roads crossing for Interstate 64. The HRBT and I-64 connect the South Hampton Roads cities of Norfolk and Virginia Beach with the peninsula cities of Hampton and Newport News. The facility is toll-free and is operated and maintained by the VDOT. The HRBT tunnel holds a place as an engineering milestone: the world's first underwater tunnel connected to man-made islands. The Hampton Roads Bridge-Tunnel has two 12-foot-wide lanes each way, on separately built structures; the original, now westbound, opened on November 1, 1957, and the eastbound structure opened on June 3, 1976. The HRBT was tolled from 1957 until the second span opened in 1976, and the tolls were removed the day the parallel structure opened to traffic.¹⁸

The twin tunnels on the Hampton Roads Bridge-Tunnel are each 7,479 feet long, and the roadway is 108 feet below sea level at the lowest point. The bridge roadways are located at an elevation of 17.5 feet above the average high tide sea level, and span the remainder of the crossing. The North Approach Bridges are 3,250 feet long each, and the South Approach Bridges are 6,150 feet long each. Two manmade portal islands transition the roadways between bridge and tunnel, and the roadways on each are about 1,500 feet

¹⁷ VDOT Travel Center, June 2011, <http://www.virginiadot.org/travel/hro-tunner-default.asp>.

¹⁸ Kozel, "Roads to the Future," 2007, http://www.roadstothefuture.com/I64_VA_HRBT.html#top.

long, and the portal islands are built to an elevation of 11 feet above the average high tide sea level.

The Hampton Roads tunnels were built by the immersed sunken tube method, comprised of shipyard-built prefabricated tunnel elements each about 300 feet long, placed by lay-barges and joined together in a trench dredged in the bottom of the harbor, and backfilled over with earth.¹⁹

The Monitor-Merrimac bridge tunnel (I-664) opened in 1992 at a cost of \$400 million and was designed to help ease traffic at the Hampton Roads Bridge-Tunnel. “But fewer motorists than hoped are using it.”²⁰ When it opened, many drivers and highway officials cautiously hoped it would flush out the annoying clog of traffic at the Hampton Roads Bridge-Tunnel. Their hopes quickly sank. After a slight reduction of traffic in 1992, the Hampton Roads Bridge-Tunnel resumed its steady climb from 74,657 vehicles a day in 1992 to 86,687 vehicles a day in 2001, which is an increase of 16 percent on a bridge-tunnel designed for 70,000 vehicles a day. Traffic counts on the Monitor-Merrimac have nearly doubled from 1992 to 2002. However, old driving habits die hard, and many drivers still resist Interstate 664’s unknown territory, said Mike Dangerfield, maintenance manager for the bridge-tunnel. “The Monitor-Merrimac seems like the best-kept secret in Hampton Roads,” he said. This resistance does not mean the Monitor-Merrimac is a dud. Traffic may still be bad at the Hampton Roads Bridge-Tunnel, but it would be even worse without the Monitor-Merrimac, according to the Virginia Department of Transportation (VDOT).²¹

A. PROPOSED NEW HRBT

To continue to provide capacity for commuters across the Hampton Roads region, VDOT is proposing a new tunnel 250 feet to the outside of the existing I-64 tunnel matching the distance between the existing eastbound and westbound tunnels to allow for

¹⁹ Kozel, “Roads to the Future.”

²⁰ “Our Best Secret,” *Hampton Roads Daily Press*, April 2002.

²¹ *Ibid.*

the excavation and placement of the new tunnel without impacting the existing tunnels while also providing flexibility in the future should the existing tubes need to be replaced.

The Virginia Department of Transportation in 2008 identified six potential alternatives for consideration to mitigate the recurring congestion at the HRBT. The department contracted with a team of engineering consultants to study and assess each of the six alternatives relative to the capability of managing congestion at the HRBT and present the findings in a facility expansion feasibility study. The goal of the study was to review the six identified alternatives and develop concept-level drawings, construction cost estimates and estimates of right-of-way impacts for each alternative and develop estimates of congestion-reduction benefits of the alternatives through traffic analysis and provide policy-level guidance on the feasibility and long-term benefits of the alternatives.²²

The six study alternatives are defined as follows.

- **Alternative 1:** Add two additional lanes of bridge-tunnel capacity to provide a contiguous, six-lane facility; approximate corridor limits are from Settlers Landing Road Interchange to I-64/I-564 Interchange. Estimated cost \$2.2 billion (2008 dollars)
- **Alternative 2:** Add two additional lanes of reversible bridge-tunnel capacity to provide greater peak period and evacuation capacity; approximate corridor limits are from I-64/I-664 Interchange to I-64/I-564 Interchange. Estimated cost \$2.3 billion
- **Alternative 3:** Add four additional lanes of bridge-tunnel capacity; approximate corridor limits are from I-64/I-664 Interchange to I-64/I-564 Interchange. Estimated cost \$3.3 billion
- **Alternative 4:** Add four additional lanes of bridge-tunnel capacity, including two multimodal lanes; approximate corridor limits are from I-64/I-664 Interchange to I-64/I-564 Interchange. Estimated Cost \$3.3 billion
- **Alternative 5:** Add two additional lanes of bridge capacity to provide a contiguous, six-lane facility; approximate corridor limits are from I-64/I-664 Interchange to I-64/I-564 Interchange. Eliminated from consideration due to similarities with alternative ones.

²² HRBT Expansion Feasibility Study, December 2008, http://www.virginiadot.org/news/resources/Hampton_Roads/HRB_Expansion_Feasibility_Final_Report.pdf.

- **Alternative 6:** Add four additional lanes of bridge capacity; approximate corridor limits are from I-64/I-664 Interchange to I-64/I-564 Interchange. Estimated cost \$3.2 billion

After the study was completed, VDOT did not act on any of the alternatives and the study was shelved until 2011 when another alternative was introduced to the community as the Patriots' Crossing. The preliminary analysis shows it would cost half as much as expanding the Hampton Roads Bridge-Tunnel and require only half as high a toll. This new crossing would consist of a four-lane bridge and tunnel system from I-564 in Norfolk near the port and naval station, across the Elizabeth River and Hampton Roads Harbor to the Monitor-Merrimac Memorial Bridge-Tunnel. It would also include a connection to Craney Island in Portsmouth, where the port has plans to expand. Port officials have pledged \$300 million toward the project.²³

Preliminary analysis by the Hampton Roads Transportation Planning Organization indicates that the Patriot's Crossing would cost \$2 billion, compared to the previous study proposals that ranged from \$2.1 billion to \$3.3 billion. To help pay for the construction, tolls of \$2 to \$4 would be charged at the new crossing, the HRBT and the Monitor-Merrimac, but not on the James River Bridge.²⁴

Traffic models indicate that the new crossing would divert enough traffic at the HRBT to bring traffic volumes down to its design capacity. Today, it is over capacity with five-mile backups during rush hour. According to Dwight Farmer, executive director of the planning organization, traffic models indicate that the new crossing would divert enough traffic at the HRBT to bring traffic volumes down to design capacity. "It appears the Patriots' Crossing would eliminate all of the severe congestion at the Hampton Roads Bridge-Tunnel through 2030," Farmer said. "At half the cost and half the tolls, it appears the Patriots' Crossing gives that optimal solution." With this new data in hand, Hampton Roads leaders asked the VDOT to update and re-evaluate parts of the third crossing

²³ Debbie Messina, "PilotOnline.com," January 2011, <http://hamptonroads.com/2011/01/plan-looks-new-bridgetunnel-option-hampton-roads>.

²⁴ Ibid.

study, completed in 2001, so the Patriots' Crossing portion of it can be ready to build if money becomes available or a private partnership develops.



Figure 2. Patriots Crossing

B. ANALYSIS PRODUCE DIFFERENT RESULTS

A new model developed by the Transportation Planning Organization ranked the Hampton Roads Bridge-Tunnel improvements slightly higher than the Patriots' Crossing. It measured congestion relief, economic benefit and viability, such as whether the project has permits and funding. The new crossing was rated the top interstate project by the Virginia Modeling, Analysis and Simulation Center, affiliated with Old Dominion University. It measured travel time improvements throughout the region during peak hours in 2034.²⁵

Norfolk Mayor Paul Fraim is pushing for the Patriots' Crossing. According to him, "The VMASC study changed some of the dynamics about what's the best way to

²⁵ Chris Collins, "2030 Long-Range Transportation Plan Amendment and FY 2009–2012 Transportation Improvement Program Amendments: Patriots' Crossing Study and Hampton Roads Bridge-Tunnel Study," *Virginia Department of Transportation*, January 20, 2011, http://www.hrtpo.org/MTG_AGNDS/HRTPO/2011/012011/P7_P8_TPO_Patriots_HRBT.pdf.

improve the crossing of the harbor,” he said. “It’s really gaining momentum.” Representative Glenn Oder of Newport News has been the biggest proponent of the HRBT, even sponsoring legislation that resulted in the submission of the private proposal for the expansion. Despite saying he does not trust the validity of preliminary analysis, Oder said he sees the merits of the Patriot’s Crossing.²⁶

C. PRIVATE PROPOSAL BY HAMPTON ROADS MOBILITY GROUP

In February 2011, Hampton Roads Mobility Group (HRMG) submitted a proposal to the VDOT to solve the transportation problems on the Hampton Roads Bridge Tunnel and the I-64 Corridor. It is a public private conceptual proposal that would provide the following.

- Provide 34 miles of I-64 Express Lanes, from Ft. Eustis to I-264, within existing right of way
- Double the capacity of the HRBT from four to eight lanes from I-664 in the north to the I-564 in the south
- Extend the useful life of the existing HRBT through a capital maintenance and investment program
- Preserve the Monitor-Merrimac and James River Bridge as free crossings

According to HRMG, the traffic problems experienced daily at the HRBT are not limited to the tunnel. The transportation challenges extend throughout much of the I-64 corridor, from Hampton and Newport News on the Peninsula, to Norfolk and Virginia Beach on the Southside. HRMG’s solution is to develop a 34 mile-long express lane system extending from Ft. Eustis Blvd. in Newport News to I-264 on the Norfolk/VA Beach border that would use tolls to limit the amount of traffic using the facility to sustain a minimum travel speed while maintaining the existing general purpose lanes toll free.

²⁶ Messina, “PilotOnline.com.”

D. HRMG NEW TUNNEL PROPOSAL

The HRMG is proposing the construction of two express and two general purpose lanes in the tunnel configuration illustrated in Figure 3. Implementation of this configuration would eliminate the current over-height truck problem on the westbound span of the HRBT. The combined capital program for the I-64 Express Lanes, including doubling HRBT capacity and providing funding for a capital replacement and investment program, is in the range of \$3 to \$4 billion.

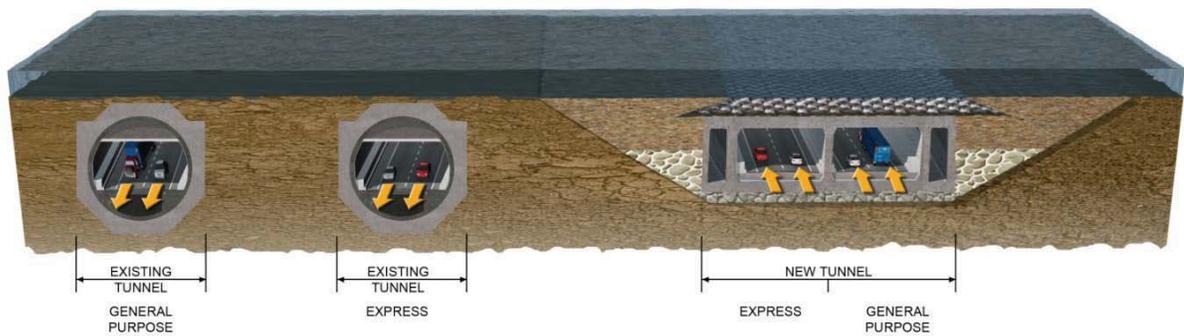


Figure 3. HRMG Tunnel Proposal

To pay for the project, HRMG is proposing a toll on the existing HRBT general purpose spans. The express lanes from Ft. Eustis to I-264 would be tolled based on driver demand for the express lanes. The HRBT general purpose lanes would be \$1–2 toll for cars and \$2–4 toll for trucks. HRMG also admits that the tolls alone cannot support the cost of building a new crossing of Hampton Roads. A significant public sector commitment will also be necessary to fund these improvements. The HRMG proposed a long-term partnership to plan, design, build, operate and maintain the I-64 Express Lanes. Combined with the tolls, it would be a contribution similar to other states. Over 50 years, such an approach would yield a private sector/user fee share of 66% to 71%, and a public sector share of 34% to 29%.²⁷

²⁷ HRMG, HRMG I-64 Express Proposal. Hampton Roads Mobility Group, 2011.

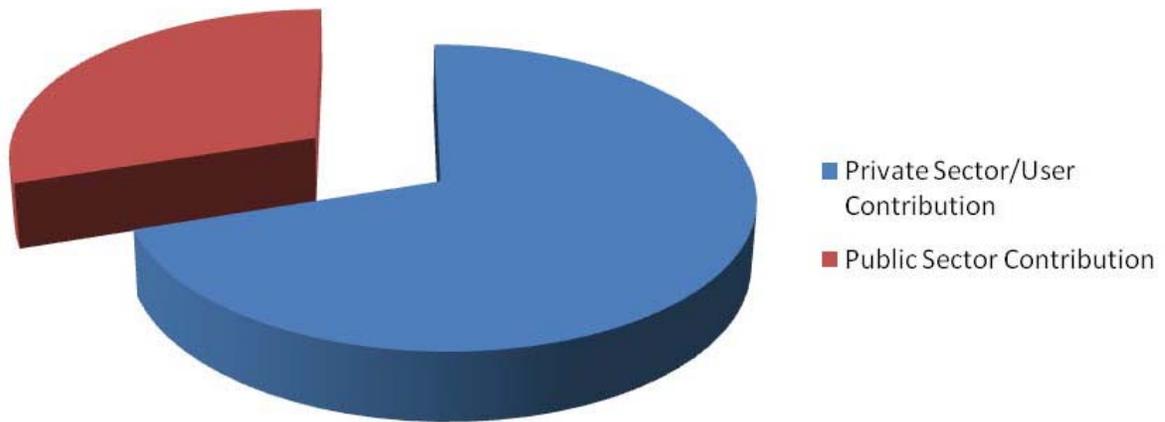


Figure 4. Public/Private Funding

E. RAIL SERVICE

The rail service in the Hampton Roads region consists of a network extending over 270 miles and these rail lines play a critical role in the movement of cargo and people in and out of the region. These rail lines serve commercial freight transport, as well as military freight transport between the Port of Virginia and local military installations. The U.S. Government places a high priority on them.²⁸ “Rail is one of the primary methods of transporting goods to and from the Port of Virginia. According to the Port, twenty-eight percent of all general cargo handled by the Port in 2010 was transported by rail. This percentage does not include coal, which is hauled into Hampton Roads by rail and exported to other countries.”²⁹ A complex rail network is utilized to move cargo from around the region and the Port of Virginia. Two Class I railroad companies operate in Hampton Roads, Norfolk Southern and CSX Transportation. Four Class III short-line railroads also operate in the region: Commonwealth Railway, Bay Coast Railroad, Chesapeake and Albemarle Railroad (CA), and the Norfolk and Portsmouth Beltline Railroad. All maintenance and capacity improvements in the Hampton Roads regional freight rail network are accomplished by the oversight of the

²⁸ HRTPO, Hampton Roads Military Transportation Needs Study.

²⁹ Dale Stith and Benito Perez, *Hampton Roads 2034 Long-Range Transportation Plan* (Chesapeake: Hampton Roads Transportation Planning Organization, 2012).

private railroad companies with a few federal/state supported public-private partnership agreements. The CSX freight railway is utilized by Amtrak for intercity passenger rail service in the region and is currently only provided in the Hampton Roads region's peninsula locations of Newport News and Williamsburg. An increase in customer usage of passenger rail in Hampton Roads is expected since the Commonwealth Transportation Board recently approved funding for new direct Amtrak service to the Southside, possible as early as 2013.³⁰

Extending Amtrak services to the Southside of the Hampton Roads area is crucial to increasing the utilization of Amtrak services for travelling to the northeastern United States. "The Department of Rail and Public Transportation (DRPT) is working to increase access to passenger rail transportation to Virginia's major population centers. Projections show that the Hampton Roads region will be one of the Commonwealth's most populated regions by 2035."³¹ As of today, Amtrak only provides service to the north by either stations in Newport News or Williamsburg that discourages commuters from the Southside of Hampton Roads because they would have to travel through at least one tunnel to get to the train. Travelling through the tunnels in the Hampton Roads area can be very congested at times with delays lasting more than an hour depending on traffic, accidents, or vehicle breakdowns in the tunnels. The DRPT is working to change this congestion by extending commuter rail services to south Hampton Roads by establishing a station in Norfolk. Figure 5 shows the location of the new station and the "orange line" depicts the travel route for Amtrak train services.

³⁰ Stith and Perez, *Hampton Roads 2034 Long-Range Transportation Plan*.

³¹ Virginia Department of Rail and Public Transport, March 2012.



Figure 5. Location of New Station in Norfolk

The state of Virginia has provided Rail Enhancement Funds and the DRPT is collaborating with Norfolk Southern, CSX Transportation, and Amtrak to extend Richmond's Amtrak regional service to Norfolk, VA.³² After completion, Southside residents of Hampton Roads will have "one-seat" train services from Norfolk to as far north as Boston, MA. Some discussion remains concerning the Norfolk multi-model station facility improvements and design support because it must flow inter-connectedly with The Tide light rail line, Hampton Roads Transit Ferry (linking the watersides of Norfolk and Portsmouth), as well as Hampton Roads and Amtrak bus services. For the service to be feasible, the DRPT, Norfolk Southern, and CSX Transportation are coordinating work efforts so it will flow seamlessly at the Petersburg Collier Connection site. The Norfolk transfer station will be located next to Harbor Park and will provide a central location for cities in South Hampton Roads that will coincide with the light-rail station as well.³³ Figure 6 shows the added benefits for passenger rail transportation in the Hampton Roads region after all projects are completed.

³² Virginia Department of Rail and Public Transport.

³³ Ibid.

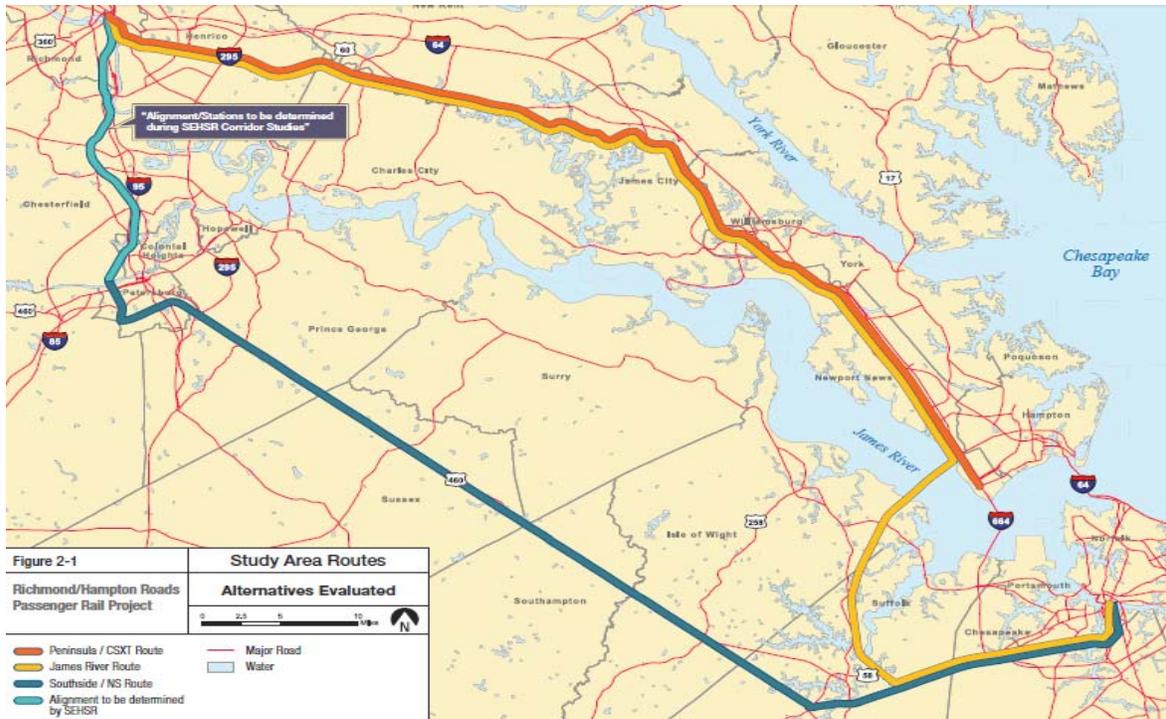


Figure 6. Added Benefits for Passenger Rail Transportation in the Hampton Roads Region

Norfolk Southern is a Class I railway with its headquarters located in Norfolk, VA. Norfolk Southern operates over 21,000 miles of track in 22 states and mainly operates in the southeast and Midwest parts of the United States. Norfolk Southern’s railway capabilities also extend to Ontario, Canada. Norfolk Southern recently opened its “Heartland Corridor” that greatly expanded its service capabilities to the Midwest. The state of Virginia allocated over \$22 million to partially fund the necessary improvements to the railways. The Heartland Corridor project raised 28 railroad tunnels between the Hampton Roads region and Ohio that now gives Norfolk Southern the capability to operate double-stacked trains along this route. These updates and improvements shaved approximately 233 miles along Norfolk Southern’s main route between Norfolk and Chicago and shaved off one and half days of travel time.³⁴ These updates will not only increase the capabilities of Norfolk Southern Railways, but will have the opportunity to

³⁴ Hampton Roads Economic Development Alliance.

make the Port of Virginia more attractive as well. The expanding railways will increase the amount of ships heading to the Port of Virginia once the expansion is complete on the Panama Canal.

CSX Transportation has the ability to conduct a variety of rail shipments, as well as container shipping, intermodal, trucking, barge, and contract logistics management services, which makes them an important asset to the Hampton Roads region. CSX operates approximately 22,000 miles of track in 23 states. It also provides services to the District of Columbia and two Canadian provinces. The state of Virginia recently approved the plans for funding improvements to railways to help expedite rail travel between Portsmouth, Virginia and Atlanta, Georgia by adding double-stack freight service to a 560-mile market.³⁵ Virginia's investment in the regions railways shows the importance rail service is to effective transportation in the region, as well as an increased potential for economic growth.

The Four Class III short-line railroads, Commonwealth Railway, Bay Coast Railroad, Chesapeake and Albemarle Railroad, and the Norfolk and Portsmouth Beltline Railroad, also play an important part for rail services in the region. Commonwealth Railway operates a 19-mile stretch of track connecting the Port of Virginia to the major hubs of Norfolk Southern and CSX Transportation. Commonwealth Railway mainly carries intermodal containers and chemicals. The Bay Coast Railroad is a unique railway because it operates a 96-mile operations area that includes 70 miles of rail service, as well as a 26-mile barge service. The Bay Coast Railroad operates a strategic stretch of track that is the quickest route connecting the Port of Norfolk to the northeastern United States.³⁶ The Chesapeake and Albemarle Railroad is a short-line railroad operated by the North Carolina and Virginia Railroad. Primary commodities are stone and chemicals. The over 6,000 cars per year moving over the CA network reflects the importance of this road to the metropolitan area between Chesapeake, VA and Edenton, NC. (Chesapeake and Albemarle Railroad). The Norfolk and Portsmouth Beltline Railroad is co-owned by

³⁵ Hampton Roads Economic Development Alliance.

³⁶ Virginia Railroad Association, "Bay Coast Railroad, Inc.," (n.d.), <http://www.varail.com/baycoast.htm>.

Norfolk Southern Corporation (57%) and CSX Transportation (43%) and is a terminal switching company that owns 36 miles of track along with 27 miles of trackage rights. The Norfolk and Portsmouth Beltline plays a vital role in linking commerce movement around the Norfolk International Terminal, Newport News Marine Terminal, Portsmouth Marine Terminal, and also including parts of the Southern Branch of the Elizabeth River.³⁷ All these companies play different and vital roles in moving cargo and commodities around the region, as well as the United States.

The Commonwealth Railway Mainline Project was recently completed after two and a half years of construction. Its purpose was to improve rail services going in and out of the Port of Virginia. The new railway mainline is now a secure, dual purpose railway corridor that effectively eliminated 12 “at-grade” crossings in Virginia. The new rail route is approximately 4.5 miles in length and now allows for double-stack trains to move from container terminals located in and around the Port of Virginia to the Heartland Corridor route heading to the Midwest.³⁸ The Commonwealth Railway Mainline Project effectively reduced the amount of truck traffic, eliminated 12 “at grade” railroad crossings, moved from densely populated areas, and increased safety for public travel throughout the area.

F. THE PORT OF VIRGINIA

The Port of Virginia consists of five individual terminals: the Newport News Marine Terminal, Norfolk International Terminals, Portsmouth Marine Terminals, Port of Richmond, and the Virginia Inland Port. In 2010, The Port of Virginia was ranked as the eighth largest port in the United States in regards to the dollar value of transported cargo and as the sixth largest U.S. port in regards to tons of cargo transported. One of the Port of Virginia’s best attributes is the fact it has the lowest pilferage rate among all ports

³⁷ Norfolk and Portsmouth Beltline Railroad, (n.d.), <http://www.npblrr.com>.

³⁸ Peter T. Leach, “Commonwealth Railway to Start Double-Stack Service,” *Journal of Commerce* (2010): 2.

on the East Coast.³⁹ The Port of Virginia currently has 20 different shipping companies that provide weekly service to both Europe and Asia.

The Port of Richmond is serviced twice a week from the Hampton Roads Port via barge service along the James River. The Port of Richmond is an ideal trans-shipment location because of its proximity to I-64, I-95, and I-85.⁴⁰

The Newport News Marine Terminal consists of over 140 acres and is the main break-bulk terminal for the Port of Virginia. This port has over 42,700 feet of direct rail access and rail track provided through CSX. The Newport News Marine Terminal has a total of 3,480 feet of pier space serviced by four cranes. The port is directly accessible from three of Virginia's major roadways and all cargo loading on and off of ships to CSX's break-bulk rail service. Along with CSX's break-bulk rail service, the port terminal also provides covered storage and container storage.⁴¹

The Norfolk International Terminals are located in the center of Hampton Roads and consist of approximately 648 acres that make it the largest terminal for the Port of Virginia. The main channel that leads into the Norfolk International Terminal is currently 50 feet deep, but the Virginia Port Authority has already approved and authorized the channel to be dredged to a depth of 55 feet when deemed necessary. Norfolk International Terminal consists of five berths, 14 container cranes, three finger piers, one roll-on/roll-off berth, both covered and container storage facilities and has the capacity to handle all cargo types efficiently. The 14 cranes at the Norfolk international Terminal are ZPMC cranes and are currently the only cranes capable of handling the "ships of tomorrow." The cranes have a reaching length stretching approximately 245 feet and are capable of offloading ships loaded with up to 27 containers wide of cargo. As of today, Norfolk International Terminal has approximately 89,300 feet of direct rail access, and in the near future, will be expanded to connect directly with the Commonwealth Railway Project.⁴²

³⁹ "Virginia's Hampton Roads Regional Overview," (n.d.).

⁴⁰ Virginia Port Authority, The Port of Virginia, (n.d.).

⁴¹ Ibid.

⁴² Virginia Port Authority.

The Portsmouth Marine Terminal is located a fairly short distance down the river from the Norfolk International Terminal. Sitting on approximately 219 acres, Portsmouth Marine Terminal is the second largest of the Ports of Virginia. The Portsmouth Marine Terminal has over 3,500 feet of wharf space, three berths, and six cranes. The port is capable of handling container, break-bulk, roll-on/roll-off cargo. One of the port's main distinguishing features is its highly automated 30-plus lane transfer zones and automated live e-gates. Unlike the Norfolk International Terminal, the Portsmouth Marine Terminal has direct access to both CSX and Norfolk Southern railways and also will eventually be connected with the Commonwealth Railway Project.⁴³

The Virginia Inland Port is located west of Washington, DC, in Warren County, VA. Cargo from the other three Port of Virginia terminals are transferred there five days out of the week, which brings the Port of Virginia over 220 miles closer to other major U.S. markets and to 75 international shipping lines. Norfolk Southern services the 17,820 of the inland's port on-site rail and is located about one mile from I-66 and less than five miles from I-81. The Virginia Inland Ports has been designated a U.S. Customs port of entry and the full range of its functions is available to customers.⁴⁴

The Port of Virginia will be a key factor in the future for economic growth in the region. The ports already see the change in the “ships of the future” and have already made advanced planning by having cranes capable of handling the larger ships and by also the pre-planning of increasing the dredge depth in the channel to 55 feet to accommodate the larger shipping vessels.

G. CRANEY ISLAND EXPANSION

Dredging is an essential activity that affects the lives of nearly everyone in Hampton Roads. Important components of the Hampton Roads economy—including maritime commerce, ship building, and the military—depend upon deep, clear navigation channels, which in turn, depend upon dredging material from U.S. harbor's waterways.

⁴³ Virginia Port Authority.

⁴⁴ Ibid.

The low cost of dredging in Norfolk Harbor is in part due to the location and availability of dredged material placement at Craney Island. The Eastward Expansion of Craney Island will allow the facility to accept dredged material well beyond 2025, which will extend its useful life by almost 10 years.⁴⁵

The Virginia Port Authority (VPA) and the U.S. Army Corps of Engineers (USACE) are working together to construct the Craney Island Eastward Expansion project.

Craney Island is a federally-owned facility operated by the USACE and is used by private interests, local municipalities, federal and Commonwealth of Virginia government agencies for the disposal of dredged material from the Norfolk Harbor and its adjacent waterways, including the Elizabeth and Nansemond Rivers.

Craney Island was originally designed for a 20-year life span; USACE began studying the possibilities to extend the life of Craney Island Dredged Material Management Area (CIDMMA) in the 1970s. Advancements in engineering and management has allowed the USACE to extend the life of CIDMMA, but in the early 1990s, USACE recognized that other options needed to be considered for long-term disposal of dredge material in Norfolk Harbor.⁴⁶

The VPA recognized a fourth state owned marine terminal would be needed to meet long-term cargo handling needs in Hampton Roads.

In 1997, the U.S. House of Representatives Committee on Transportation and Infrastructure authorized USACE to prepare a feasibility study to determine the feasibility of expanding Craney Island into the east, and to consider rapid filling of the new dredge material site to provide an area for a new marine terminal. The feasibility study determined the existing CIDMMA would reach its capacity by 2025 and the VPA would run out of cargo handling capacity in 2011. Studies would be focused on providing a solution that could address both capacity shortfalls. In accordance with the National Environmental Policy Act (NEPA), USACE assessed all reasonable alternatives to

⁴⁵ The Craney Island Eastward Expansion, 2010, <http://www.craneyisland.info/overview.html>.

⁴⁶ Ibid.

minimize impacts to the environment. The Corps evaluated 51 alternatives for dredged material placement and a total of 25 port alternatives for container handling capacity. The eastward expansion project emerged as the best solution to increase the capacity of CIDMMA for dredged material and provided an area to construct the fourth marine terminal. Construction of the eastward expansion was scheduled to begin in 2010 and the first phase of the marine terminal is planned to be operational after 2020. This project will generate nearly \$6 billion in National Economic Development (NED) benefits over the 50-year life of the project.

H. PROJECT PRIORITIZATION AND LONG RANGE TRANSPORTATION PLAN

1. Project Prioritization

A strategy used by the HRTPO to advance regional transportation investments with scarce financial resources is the Program Priorities Prioritization Methodology (Project Prioritization Tool). The Project Prioritization Tool prioritizes candidate regional transportation projects based on their technical merits and regional benefits in light of scarce financial resources.

2. The Regional Long Range Transportation Plan (LRTP)

All LRTPs must be fiscally constrained; in other words, all projects must have funding identified to cover the costs associated with the projects. The financial plan identifies how much money is reasonably available to help preserve the transportation system and support additional investments over the next 20 years to keep people and goods moving as efficiently as possible.

3. Economic Forecast

Based on VDOT's most current information regarding traditional revenues, the region can expect approximately \$13.6 billion in funding for maintenance and construction of the transportation system over the next 20 years. Since maintaining existing roadways is a federal and state mandated priority, maintenance costs must first

be accounted for before new transportation projects can be considered. Assuming that current trends for maintenance funding continue, maintenance of the region’s transportation system will consume a majority of the anticipated traditional revenues—approximately 90 percent.

Non-traditional revenues identified for the 2034 LRTP include local revenues (funds from localities), tolls, public-private partnerships, and special government earmarks.

Projects with associated tolls and P3 funds include the following.

- Downtown Tunnel/Midtown Tunnel/MLK Extension
- Dominion Boulevard
- US Route 460

4. Total Revenues for the 2034 LRTP

Combining traditional revenue sources, local revenues, projected tolling and private investment, and the Governor’s Omnibus Transportation Funding Package, Hampton Roads can expect more than \$7 billion in the next 20 years (2012–2034) to invest in new transportation projects for the 2034 LRTP.

Traditional (Federal and State) Funding for Construction	\$1.25 B
Local Funding	\$1.31 B
Virginia Port Authority Contribution	\$0.20 B
Governor’s Omnibus Transportation Funding Package	\$0.57 B
Public-Private Partnerships (P3)	\$4.10 B
Private Tolls	\$0.27 B
Total Revenue for New Construction Projects	\$7.70 B

Table 2. Sources of Estimated Revenues (2012–2034)

5. Selecting Projects for the 2034 LRTP

The list of 150 candidate transportation projects for the 2034 LRTP was determined by both technical staff and citizen input. The candidate projects, totaling approximately \$30 billion, include increasing roadway capacity, expanding bridges and

tunnels, replacing aging infrastructure, improving public transportation options, and enhancing the movement of freight in and out of the region. With an estimated total construction cost of approximately \$30 billion and \$7.7 billion identified to fund construction, HRTPO staff had the task of evaluating and prioritizing these 150 candidate transportation projects. To narrow the list, the staff first accounted for those projects automatically included in the plan (committed projects). Next, the Project Prioritization Tool was applied to the remaining projects to help evaluate and rank projects based on their technical merits and regional benefits. High-ranking projects were then selected based on funding sources available.

Project Category	Number of Projects	Estimated Construction Cost*
Highways	113	\$9.4 Billion
Highway Interchanges/Intersections	15	\$1.2 Billion
Bridges and Tunnels	14	\$13.4 Billion
Transit	5	\$2.2 Billion
Intermodal	3	\$0.7 Billion
Total	150	\$26.9 Billion

*Cost estimates in Year-of-Expenditures dollars

Table 3. Summary of 2034 LRTP Candidate Transportation Projects

Due to fiscal constraint issues, not all 150 candidate transportation projects could be incorporated into the 2034 LRTP. The remaining candidate projects become part of the Regional Transportation Vision Plan, an illustrative list of beneficial transportation projects. These projects are unfunded investments (totaling approximately \$19 billion) that warrant future consideration for inclusion in an amended 2034 LRTP should additional funding be identified. The 2034 LRTP is the regional transportation plan that will guide the programming and construction of transportation investments in Hampton Roads. To help improve the transportation network of the region, projects from the LRTP will be built and/or studied, and strategies will be implemented. Additionally, because the LRTP is a dynamic transportation policy document, mechanisms are in place to amend the plan to reflect changing priorities and challenges, as well as incorporate evolving needs.

I. LIGHT RAIL

The Tide is an 11-station light rail system in Norfolk that extends 7.4 miles from the Eastern Virginia Medical Center complex east through downtown Norfolk and parallels Interstate 264 to Newtown Road. This system is Virginia’s first light rail system that opened for services on August 19, 2011. Currently, the 11 stations and nine Siemens S70 Light Rail Vehicles (Figure 7) provide access to dining, shopping and entertainment, as well as the Norfolk State University and Tidewater Community College (Norfolk) campuses. The completion of The Tide in downtown Norfolk is “the first segment of a larger, regional light rail network.”⁴⁷ This chapter discusses the obstacles that The Tide had to overcome before becoming operational, its current status, its future plans to extend, and benefits that the expansion will bring to the military.



Figure 7. Picture of the Tide (Siemens S70 Light Rail Vehicle)⁴⁸

⁴⁷ Hampton Roads Transit, “Norfolk Light Rail Project, Final Project Completion Plan,” (Document Control: PM715), Updated August 2, 2011, <http://www.gohrt.com/public-records/The-Tide-Documents/Construction/Project-Completion-Plan/Final-PCP.pdf>, 1.

⁴⁸ Hampton Roads Transit, “The Tide,” 2012, <http://www.gohrt.com/services/the-tide/>.

1. Slow Start

The first plans for The Tide began in the mid-1980s. The plans met resistance from Virginia Beach residents. “The topic of light rail in Virginia Beach has been a hot button issue since residents first voted the idea down in 1999.”⁴⁹ However, Norfolk stayed persistent in its pursuit for a light rail system. In October 2007, the Federal Transit Administration (FTA) finally approved a Full Funding Grant Agreement with an original estimated cost of the light rail project at \$232.1 million. “Construction began in December 2007 and almost immediately Hampton Roads Transit (HRT) and its contractors confronted changing conditions and schedule delays that would reflect in the cost to complete the project and the start of revenue operations.”⁵⁰ In February 2010, the cost to complete Norfolk’s light rail project jumped up to \$338.3 million.

The factors that drove up the costs from the project’s original \$232.1 million were contributed to “numerous complex and interlocking issues that fell in the general categories of construction, project management, engineering and real estate.”⁵¹ The largest cost driver was the construction costs; moreover, costs were also driven by underground utilities relocations, such as gas, electric, and storm sewer. The extent of the utility work and the time required was drastically under estimated. Another large cost driver was that the engineering and design costs were significantly underestimated from the original projections.

Two important cost thresholds were proclaimed mid-construction that would increase the ultimate cost to finish the project. The first happened in December 2008 when HRT revealed the project cost had increased to \$288 million due to complications with downtown construction, and aesthetic upgrades requested by the city and safety improvements from the Commonwealth of Virginia. Project managers were certain the cost was firm; however, in the fall of 2009, the costs increased again—mostly from the same issues that created the first rise in costs.

⁴⁹ Katie Collett, “Virginia Beach Leaders Talk Light Rail, Options for Taxpayers,” *Wavy.com*, May 8, 2012, http://www.wavy.com/dpp/news/local_news/va_beach/virginia-beach-leaders-talk-light-rail.

⁵⁰ Hampton Roads Transit, “Norfolk Light Rail Project, Final Project Completion Plan,” 4.

⁵¹ *Ibid.*

The rising costs caused political turmoil in the governing body of HRT and for the City of Norfolk. For fear of continual cost overruns, the political climate enforced a change at HRT in January 2010; moreover, a new Chief Executive Officer (CEO) was appointed. Despite all challenges that the project faced, The Tide became operational on August 19, 2011 with a final cost of \$318 million at completion.

2. Success

When The Tide opened in August, the predicted number of weekday passengers was about 2,900. “Six months later, the 7.4-mile light-rail line was drawing an average of 4,642 passengers on weekdays, 4,850 on Saturdays, and 2,099 on Sundays when operating times are reduced. And, those numbers are predicted to continue growing.”⁵²

Philip Shucet, who stepped down as president and CEO of Hampton Roads Transit this spring after getting The Tide up and running, expects the system to reach its 20-year projection of 7,200 daily passengers within three years.⁵³

As seen in Figure 8, all of the 11 stations are located in downtown Norfolk. Currently, military personnel cannot benefit from The Tide unless used out in town. They cannot use The Tide to commute to and in from work unless they use it conjointly with the bus system. Due to The Tide’s recent success, the current expansion planning will benefit military personnel in the Hampton Roads area.

⁵² Elizabeth Cooper, “The Rail Thing, Tide’s Success, New Amtrak Service Offer Hope for Congested Region,” *Virginia Business*, April 27, 2012, <http://www.virginiabusiness.com/index.php/news/article/the-rail-thing>.

⁵³ *Ibid.*

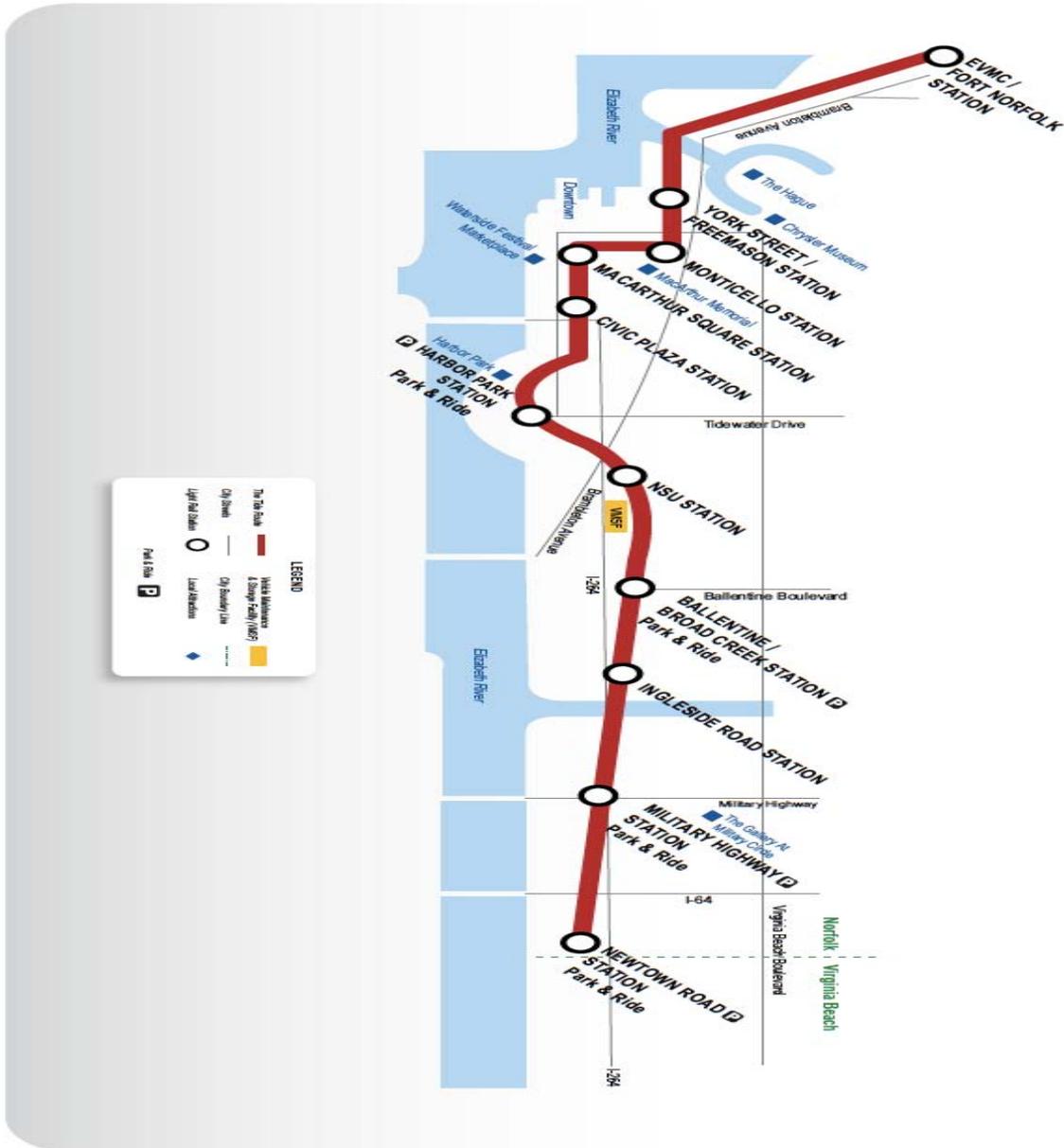


Figure 8. Current Map of The Tide Route⁵⁴

The fares are the same as the bus fares at a \$1.50 for adults, \$1.00 for youth under 18, \$0.75 for seniors and persons with disabilities, and children under 38 inches tall ride for free. Additionally, package deals are offered for frequent riders (Figure 9). The Tide

⁵⁴ Downtown Norfolk, “The Tide Light Rail System,” (n.d.), <http://www.downtownnorfolk.org/documents/lightrailmap.pdf>.

runs from 6:00am until 12:00am Monday through Saturday and from 10:55am until 9:00pm on Sundays with the time schedule shown in Figure 10.

	Price
1-Day GoPass	\$3.50
Bundle of Five 1-Day GoPasses	\$16.50
1-Day GoPass (S,D,Y)	\$1.75
Bundle of Five 1-Day GoPasses (S,D,Y)	\$8.75
7-Day GoPass	\$17.00
30-Day GoPass	\$50.00
30-Day GoPass (S,D,Y)	\$35.00

Figure 9. Fare Rate Deals for Frequent Users

WEEKDAY			SATURDAY			SUNDAY		
From	Then Every	Until	From	Then	Until	From	Then	Until
6:00am	15 Minutes	6:30am	6:00am	30 Minutes	9:00am	10:55am	15 Minutes	9:00pm
6:30am	10 Minutes	9:00am	9:00am	15 Minutes	9:30pm			
9:00am	15 Minutes	3:30pm	9:30pm	30 Minutes	12:00am			
3:30pm	10 Minutes	7:00pm						
7:00pm	15 Minutes	10:00pm						
10:00pm	30 Minutes	11:00pm						
10:00pm Friday Only	30 Minutes	12:00am						

Figure 10. The Tide Schedule⁵⁵

3. The Tide Expansion

The higher than expected number of passengers validates expansion of The Tide in the city and in the region. “The more people ride transit, the more they like it,” says

⁵⁵ Hampton Roads Transit, “The Tide.”

Norfolk Mayor Paul Fraim. “It’s widely accepted.”⁵⁶ In Figure 11, Old Dominion University (ODU) Social Science Research Center conducted a survey and found that more than 91 percent of respondents want to see light rail go beyond Norfolk’s 7.4-mile starter line. Another important number to observe in its survey is the 35.8 percent of the local population who want to see The Tide extended to the naval base. Less than 18% of ODU’s survey were in or had a member of their household in the military; therefore, the percentage would probably be much higher if they included more military families in the sample. Norfolk plans to extend light rail to the Naval Station Norfolk and will ask Hampton Roads Transit to conduct a study to determine the costs.

Transportation	Survey Respondents (weighted sample)
Where would you like to see the light rail extended?/	
Virginia Beach	62.9%
Chesapeake	40.4%
Portsmouth	31.6%
Hampton	37.2%
Newport News	37.6%
Suffolk	27.8%
Naval base	35.8%
Norfolk International Airport	46.9%
Other	12.0%
Don't want light rail extended	6.3%
Don't know	1.3%
Refused	.9%
Within the past month did you avoid visiting a business in a neighboring city due to traffic congestion?	
Yes	46.5%
No	53.2%
Don't know	.2%

Figure 11. Old Dominion University Social Science Research Center Life in Hampton Roads Survey⁵⁷

The Virginia Beach referendum that voted the light rail out of Virginia Beach is now expired. As noted in ODU’s survey, 62.9 percent of the population would like to see The Tide extended all the way to the Virginia Beach oceanfront. “It soon could get the green light for expansion. Virginia Beach Mayor Will Sessoms called for a referendum to

⁵⁶ Cooper, “The Rail Thing, Tide’s Success, New Amtrak Service Offer Hope for Congested Region.”

⁵⁷ Hampton Roads, “Old Dominion University Social Science Research Center, Life in Hampton Roads Survey,” November 1, 2010, <http://www.hrp.org/Site/docs/ResourceLibrary/ODU%20SSRC%20Final%20Weighted%20Results%20Nov%20201%202010.pdf>.

gauge voters’ support for extending The Tide into Virginia Beach.”⁵⁸ In 2010, Virginia Beach contributed the \$15 million in matching funds necessary to purchase the 10.6 mile stretch of the Norfolk-Southern right-of-way that runs from the city’s Newtown Road border with Norfolk to Birdneck Road in Virginia Beach—approximately a mile from the oceanfront. Beginning estimates suggest that it would cost \$807 million to extend it to the oceanfront or \$254 million to go to the town center of Virginia Beach. As seen in Figure 12, extending The Tide to the oceanfront will also benefit the military personnel at Naval Air Station (NAS) Oceana.

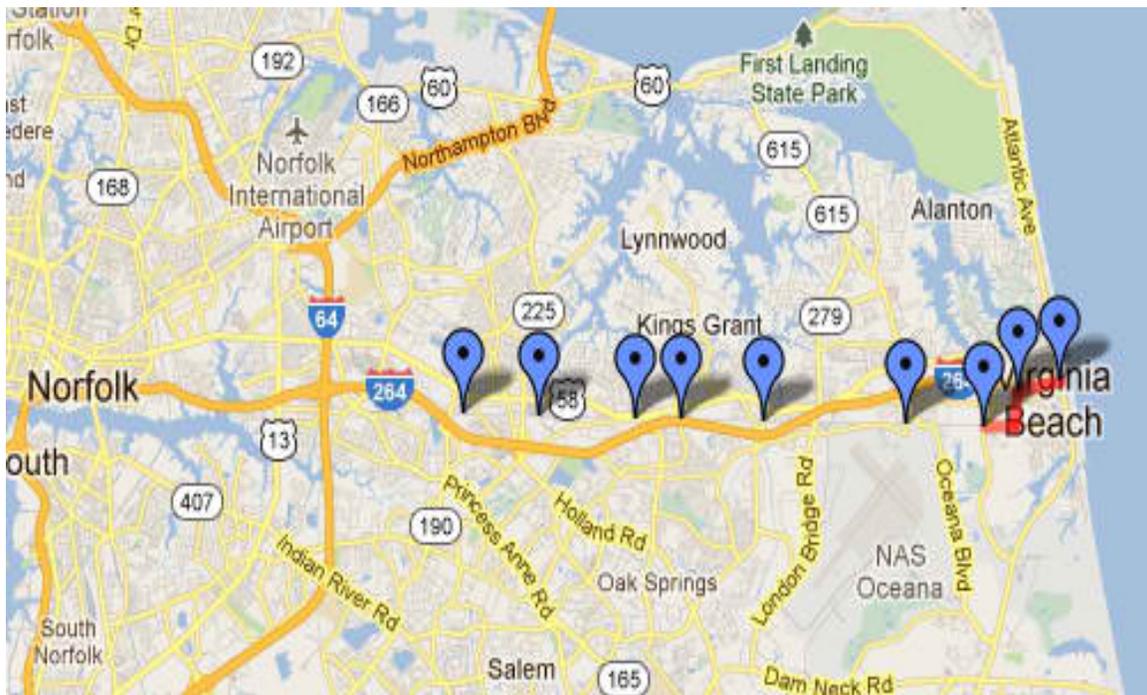


Figure 12. Proposed Light Rail Expansion into Virginia Beach

J. CONCLUSION/RECOMMENDATION

With the recent success of The Tide, the leaders and residents of the Hampton Roads area are becoming more accepting of the light rail system. The expansion of The Tide will help the Hampton Roads region in several ways—more importantly to the

⁵⁸ Cooper, “The Rail Thing, Tide’s Success, New Amtrak Service Offer Hope for Congested Region.”

military. “The light rail initiative is a means to reduce overall traffic congestion but, more specifically, the Norfolk extension to the Naval Station will reduce congestion and associated traffic hazards to and from the world’s largest Naval Base.”⁵⁹ Additionally, for The Tide to become a truly regional transit system it was intended to be, it must extend to the Virginia Beach oceanfront. The extension to the Virginia Beach oceanfront and Norfolk Naval Station will benefit the numerous military personnel in the area. It will provide personnel based at Norfolk Naval Base, Oceana NAS, and the Naval Base at Damn Neck, an inexpensive and efficient means to commute to and from work and around the region from anywhere in the largely spread-out Hampton Roads Region.

⁵⁹ TPO Transportation Planning Organization, “Draft: Hampton Roads, Military Transportation Needs Study, Highway Network, Analysis,” July 2011, <http://www.hrtpo.org/PubNotices/July2011/Military%20Transportation%20Needs%20-%20Highway%20Network%20Analysis%20Draft%20Report.pdf>.

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III. CONCLUSION

The Hampton Roads region is growing faster than the state and national average. Funds for transportation were cut because of the recent recession. As a result, the current infrastructure is not adequate to support the increasing growth rate of Hampton Roads. The military is suffering due to longer transit times getting personnel and goods to and from the bases. Most importantly, delays in the deployment of troops and equipment from the Hampton Roads bases could affect national defense. Therefore, as the economy climbs out of the recession and with the plan to invest billions into the Commonwealth's transportation system, the Hampton Roads transportation infrastructure ranks at the top of priorities.

The Hampton Roads economy is extremely reliant on the military and the military needs Hampton Roads because of its locality and ports; therefore, HRTPO and the military have developed a good relationship. Several efforts are being made to ensure that the Hampton Roads transportation infrastructure accounts for the needs of the ports, civilians, tourists, and the military. Important studies have been conducted to produce solutions that aim to maximize efficiency and decrease delays leading into and out of Naval Station Norfolk. In addition, the military is requesting a high-speed, intercity passenger rail service connecting Hampton Roads to Richmond, Washington, DC and beyond. A high-speed rail connection would allow military servicemen and officials steady flow to and from Washington, DC without having to endure the severe traffic delays on I-64, I-95, and the beltway traffic.

U.S. Navy, U.S. Coast Guard, and the U.S. Army in Hampton Roads have also made other transportation recommendations to VDOT to enhance access to local military facilities. All three services agree on expanding the HRBT or building a third crossing, widening I-64, and extending The Tide light rail system to the bases. Other notable recommendations include building an I-564 Intermodal Connector, with an Air Terminal Interchange, expanding and modernizing the Midtown and Downtown Tunnel, moving to HOV-3 from HOV-2 in High Occupancy Vehicle (HOV) lanes, and creating E-ZPass

system as tolls are implemented. In addition to the military working with the Hampton Roads transportation agencies, three major programs (RND, PND, and HND) are also in place to ensure Hampton Roads' transportation infrastructure exists in the best interest of national defense.

The over-congested HRBT is one of the highest priorities in restructuring transportation in Hampton Roads. Several alternatives have been derived to mitigate the frequent congestion—each with different price tags. The first six alternatives propose adding lanes in different configurations that range from \$2.1 billion to \$3.3 (2008 dollars). The 7th alternative, Patriots' Crossing, proposes to build a four-lane bridge and tunnel system from I-564 in Norfolk near the port and naval station, across the Elizabeth River and Hampton Roads Harbor to the Monitor-Merrimac Memorial Bridge-Tunnel that would also include a connection to Craney Island in Portsmouth, where the port has plans to expand. The estimated price of \$2 billion to build Patriots' Crossing is significantly less than expanding the HRBT. Another alternative is HRMG's proposal that, in addition to doubling the capacity of the HRBT, would provide 34 miles of I-64 Express Lanes from Ft. Eustis to I-264. The estimated cost of HRMG's proposal is between \$3–4 billion. When analyzing the different alternatives, each one produces different results. When measuring congestion relief, economic benefit and viability, improving the HRBT ranks higher. However, when measuring travel time improvements throughout the region during peak hours, Patriots' Crossing ranks higher. HRMG's proposal relies more on tolls to fund the project, but only charges those who wish or need the faster travel time; moreover, appealing to the citizens who oppose paying higher taxes or tolls for general purpose use. The decision on which alternative is chosen rests upon the public officials and voters of Hampton Roads; however, it is crucial to both the community and the military that congestion is eased on the HRBT.

Another priority in the Hampton Roads' transportation restructuring is the extension of Amtrak services to the Southside of the Hampton Roads area and the expansion of Craney Island. The extension of Amtrak to Southside will increase passenger usage, decrease truck traffic, and ultimately, help ease traffic on the HRBT. Additionally, the extension will provide the military, based on the Southside, a means to

commute to and from work if living across the water. It will also provide the military and officials a faster method of travel for personnel and shipment of goods to Richmond, Washington, DC and other important government areas north of Washington, DC. In addition to extending the rail down to the Southside of Hampton Roads, the expansion of Craney Island and the dredging enablers the project can provide will also impact transportation and the economy in the region. This project is estimated to generate \$6 billion in NED benefits over a 50-year life of the project; moreover, dredging and opening up channels north of Norfolk will decrease the amount of truck traffic used on the HRBT.

The Tide light rail system adds another dimension to Hampton Roads' restructuring efforts. With the recent success of The Tide, the leaders and residents of the Hampton Roads area are becoming more accepting of the light rail system. The expansion of The Tide will help the Hampton Roads region in several ways—more importantly the military. “The light rail initiative is a means to reduce overall traffic congestion but, more specifically, the Norfolk extension to the Naval Station will reduce congestion and associated traffic hazards to and from the world's largest Naval Base.”⁶⁰ Additionally, for The Tide to truly become the regional transit system it was intended to be, it must extend to the Virginia Beach oceanfront. The extension to the Virginia Beach oceanfront and Norfolk Naval Station will benefit the numerous military personnel in the area. It will provide personnel based at Norfolk Naval Base, Oceana NAS, and the Naval Base at Damn Neck, an inexpensive and efficient means to commute to and from work and around the region from anywhere in the largely spread-out Hampton Roads Region.

Currently, 150 candidate transportation projects exist: 113 highway projects, 15 interchange/intersections projects, 14 bridges and tunnels projects, five transit projects, and three intermodal projects. Unfortunately, due to economic and financial constraints, not all 150 candidate transportation projects could be incorporated into the 2034 LRTP. The purpose of this thesis is to give an overview of the Hampton Roads' transportation infrastructure, identify key projects at the top of the priority list, and ascertain how

⁶⁰ TPO Transportation Planning Organization, “Draft: Hampton Roads, Military Transportation Needs Study, Highway Network, Analysis.”

transportation and these projects directly impact the military in the area. This interdependent relationship of Hampton Roads and military installations must work together to address the ever-evolving transportation challenges within the region. There are several alternatives and on-going projects, but there is no one single solution. It will take a collaborative, creative, and patient effort in planning and developing an efficient transportation infrastructure in the Hampton Roads' complex environment.

LIST OF REFERENCES

- The Craney Island Eastward Expansion. 2010.
<http://www.craneyisland.info/overview.html>.
- Collett, Katie. "Virginia Beach Leaders Talk Light Rail, Options for Taxpayers."
Wavy.com, May 8, 2012.
http://www.wavy.com/dpp/news/local_news/va_beach/virginia-beach-leaders-talk-light-rail.
- Collins, Chris. "2030 Long-Range Transportation Plan Amendment and FY 2009–2012 Transportation Improvement Program Amendments: Patriots' Crossing Study And Hampton Roads Bridge-Tunnel Study." *Virginia Department of Transportation*. January 20, 2011.
http://www.hrtpo.org/MTG_AGNDS/HRTPO/2011/012011/P7_P8_TPO_Patriots_HRBT.pdf.
- Cooper, Elizabeth. "The Rail Thing, Tide's Success, New Amtrak Service Offer Hope for Congested Region." *Virginia Business*, April 27, 2012.
<http://www.virginiabusiness.com/index.php/news/article/the-rail-thing>.
- Downtown Norfolk. "The Tide Light Rail System." (n.d.).
<http://www.downtownnorfolk.org/documents/lightrailmap.pdf>.
- Hampton Roads. "Old Dominion University Social Science Research Center, Life in Hampton Roads Survey." November 1, 2010.
<http://www.hrp.org/Site/docs/ResourceLibrary/ODU%20SSRC%20Final%20Weighted%20Results%20Nov%20%201%202010.pdf>.
- Hampton Roads 2009 Socioeconomic Data.
- Hampton Roads Economic Development Alliance. (n.d.)
- Hampton Roads Regional Benchmarking Study. (n.d.).
- Hampton Roads Transit. "Norfolk Light Rail Project, Final Project Completion Plan." (Document Control: PM715), Updated August 2, 2011.
<http://www.gohrt.com/public-records/The-Tide-Documents/Construction/Project-Completion-Plan/Final-PCP.pdf>.
- . "The Tide." 2012. <http://www.gohrt.com/services/the-tide/>.
- Hampton Roads Transportation Planning Organization. "Roads Military Transportation Needs Survey." September 2011.

HRBT Expansion Feasibility Study. December 2008.
http://www.virginiadot.org/news/resources/Hampton_Roads/HRB_Expansion_Feasibility_Final_Report.pdf.

HRMG. HRMG I-64 Express Proposal. Hampton Roads Mobility Group. 2011.

HRTPO. Hampton Roads Military Transportation Needs Study. September 2011.

Kozel. Roads to the Future. 2007.
http://www.roadstothefuture.com/I64_VA_HRBT.html#top.

Leach, Peter T. "Commonwealth Railway to Start Double-Stack Service." *Journal of Commerce* (2010): 2.

Messina, Debbie. "PilotOnline.com." January 2011.
<http://hamptonroads.com/2011/01/plan-looks-new-bridgetunnel-option-hampton-roads>.

Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA). 2010. www2.tea.army.mil/.

Naval Station Norfolk Area Traffic Management Study, HRTPO. June 2007.

Navy Region Mid-Atlantic Public Affairs Office News Release. January 5, 2011.

Norfolk and Portsmouth Beltline Railroad. (n.d.). <http://www.npblrr.com>.

"Our Best Secret." *Hampton Roads Daily Press*. April 2002.

Stith, Dale, and Benito Perez. *Hampton Roads 2034 Long-Range Transportation Plan*. Chesapeake: Hampton Roads Transportation Planning Organization, 2012.

TPO Transportation Planning Organization. Draft: Hampton Roads, Military Transportation Needs Study, Highway Network, Analysis." July 2011.
<http://www.hrtpo.org/PubNotices/July2011/Military%20Transportation%20Needs%20-%20Highway%20Network%20Analysis%20Draft%20Report.pdf>.

Transportation Research Board (TRB) Annual Meeting. January 2011.

U.S. Department of Transportation & Federal Highway Administration. National Highway System. (n.d.).

United States Joint Forces Command (USJFCOM). January 2011. www.jfcom.mil.

VDOT Travel Center. June 2011. <http://www.virginiadot.org/travel/hro-tunner-default.asp>.

“Virginia's Hampton Roads Regional Overview.” (n.d.).
<http://www.slideshare.net/HREDA/virginias-hampton-roads-regional-overview>.

Virginia Department of Rail and Public Transport. March 2012.

Virginia Port Authority. The Port of Virginia. (n.d.).

Virginia Railroad Association. “Bay Coast Railroad, Inc.” (n.d.).
<http://www.varail.com/baycoast.htm>.

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