1. PURPOSE AND NEED FOR THE PROPOSED ACTION

The Federal Railroad Administration (FRA), in partnership with the North Carolina Department of Transportation (NCDOT) and the Virginia Department of Rail and Public Transportation (DRPT) have prepared this Environmental Impact Statement (EIS) for the proposed development of the Southeast High Speed Rail (SEHSR) Corridor between Richmond, VA and Raleigh, NC (Richmond to Raleigh Project) as required by the National Environmental Policy Act (NEPA). This document contains a Tier II Final EIS (FEIS) for the Richmond to Raleigh Project, as a continuation of the Tier II Draft EIS (DEIS), which was published for review in 2010.

The Tier II DEIS and FEIS documents draw upon and summarize the purpose and need from the base Tier I EIS for the SEHSR Corridor between Washington, DC and Charlotte, NC, which was completed in 2002. Public and agency comments on the Richmond to Raleigh Project Tier II DEIS indicated a strong interest in having more information and a fuller discussion on the relation of the Richmond to Raleigh Project to the history of the overall SEHSR Corridor. Specifically, Chapter 1 provides an expanded discussion on the history, benefits/costs, and the purpose and need for the portion of the SEHSR Corridor project covered by this Tier II EIS. In addition, Chapter 1 contains updated ridership and revenue projections and updated project need data. A condensed format was used for this Richmond to Raleigh Project Tier II EIS, as explained in the Executive Summary of this document.

A condensed format was used for this Richmond to Raleigh Project Tier II EIS, as explained in the Executive Summary of this document.

The Tier II DEIS and FEIS documents include an analysis and presentation of the benefits and impacts related to the physical route and operating conditions for the Richmond to Raleigh Project as an independent component of the larger SEHSR Corridor.

1.1 HIGH SPEED RAIL (HSR) HISTORY

1.1.1 NATIONAL HSR PROGRAM

Federal interest dates back at least to 1965, with the passage of the HSGT Act.

Federal interest in high speed rail (HSR) dates back at least to 1965, with the passage of the High Speed Ground Transportation (HSGT) Act, which called for the comprehensive planning, development and demonstration of contemporary and advanced HSGT technologies. Under the HSGT Act, the Federal Railroad Administration (FRA) Office of High Speed Ground Transportation introduced modern HSGT to America in 1969 by deploying the self-propelled Metroliner cars and the Turbotrain in the Northeast Corridor (NEC), which extends from Boston, MA to New York, NY and Washington, D.C. The HSGT program prompted public/private partnerships between freight railroad companies, equipment suppliers, states, localities and the FRA, as well as research and development that benefitted private manufacturers of advanced technologies, such as tracked air-cushion vehicles and linear electric motors.

The Rail Passenger Service Act of 1970 led to the creation of the National Railroad Passenger Corporation (Amtrak) in 1971 as a way of ensuring continued operation of an intercity rail passenger network in the United States. On May 1, 1971, Amtrak took over from the freight railroads the responsibility for operating intercity rail service in most of the United States, including the NEC.

After the HSGT Act appropriations ended in 1975, Congress passed the Railroad Revitalization and Regulatory Reform Act of 1976, which financed billions of dollars for the Northeast Corridor Improvement Project (NECIP), which upgraded and improved the NEC infrastructure to enhance reliability, create shorter trip times (particularly between New York, NY and Washington, D.C.) and increase operating flexibility. The successful completion of the original phases of the NECIP led to the development of Amtrak's maximum 150 mph Acela train service between Boston, MA and Washington, D.C.

With the marketplace success of HSGT in the NEC, Federal HSGT emphasis in the 1980s shifted to studies of other potential HSGT corridors across the country, in an effort to replicate this successful high speed intercity passenger rail service beyond the NEC. Among those efforts was a series of reports on "Emerging Corridors," developed by FRA in conjunction with Amtrak, which were issued in 1980 and 1981. In 1984, as authorized under the Passenger Railroad Rebuilding Act of 1980, Congress set aside grants of $4 million in September 2012 for engineering and design studies of HSGT corridors on the state level. This program funded seven major HSGT analyses in various corridors.

As Federal involvement in HSGT planning continued during the 1980s, state involvement also increased. By 1986, at least six states had formed HSR entities, and ultimately Florida, Ohio, Texas, California, and Nevada awarded franchises to private sector consortia to build and operate intercity HSR or Maglev systems. By 1997, more than 15 states had passed enabling legislation facilitating HSGT activities with some states attempting to implement HSGT, such as the Florida Overland Express.

A key element of Congressional interest in HSGT has been to ensure the safety of new technologies. As such, the Rail Safety Improvement Act of 1988 was adopted to expand the safety provisions of the Federal Railroad Safety Act of 1970 to apply to "all forms of non-highway ground transportation that runs on rails or electromagnetic guideways," including "new technology high speed ground transportation systems." As a result, FRA examined a variety of HSGT safety issues - including collision avoidance and accident survivability, biological effects of Maglev magnetic field exposures, and fire safety - to determine regulatory requirements for HSGT systems.

In 1991, the *Intermodal Surface Transportation Efficiency Act of 1991* (ISTEA) was adopted, authorizing the USDOT and the states to develop nationwide HSR corridors as one component of a nationwide intermodal transportation network (PL102-240, Section 1036). As stated in ISTEA:

"It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy and will move people and goods in an energy efficient manner."

Section 1036 of ISTEA also funded this National High Speed Ground Transportation Program at $800 million, including $725 million for development of a US-designed Maglev prototype, $50 million for demonstration of new HSGT technologies and $25 million for research and development. Separately, Section 1010 of ISTEA authorized the designation of five HSR corridors by the Secretary of Transportation, and provided $30 million for the elimination of highway/rail grade crossings in these corridors.

The first five originally designated ISTEA HSR corridors included –

- Midwest HSR Corridor - Linking Chicago, IL with Detroit, MI, St. Louis, MO and Milwaukee, WI. (October 15, 1992)

- Florida HSR Corridor - Linking Miami, FL with Orlando, FL and Tampa, FL. (October 16, 1992)
- California HSR Corridor - Linking San Diego, CA and Los Angeles, CA with the Bay Area and Sacramento, CA via the San Joaquin Valley. (October 19, 1992)
- **Southeast HSR Corridor** - Initially connecting Charlotte, NC, Richmond, VA, and Washington, DC. (October 20, 1992). Extended in 1995 from Richmond, VA, to Hampton Roads, VA. Extended again in 1998 from Charlotte, NC, to Greenville, SC, to Atlanta, GA and to Macon, GA, and from Raleigh, NC, to Columbia, SC, to Savannah, GA, and to Jacksonville, FL. Extended again in 2000 from Macon, GA, to Jesup, GA.
- Pacific Northwest HSR Corridor - Linking Eugene, OR and Portland, OR with Seattle, WA and Vancouver, BC, Canada. (October 20, 1992)

In June 1998, the Transportation Equity Act for the 21st Century (TEA-21) (PL 105-178) became law. TEA-21 continued the National High Speed Ground Transportation Program begun with ISTEA. Section 1103 (c) authorized six additional HSR corridor designations, for a total of eleven. Those new corridors included: a Gulf Coast HSR corridor; a Keystone HSR corridor from Philadelphia, PA to Harrisburg, PA; an Empire State HSR corridor from New York, NY to Albany, NY and Buffalo, NY; and several other new and extended corridors.

In 2009, FRA issued the "High Speed Rail Strategic Plan" under the American Recovery and Reinvestment Act of 2009 (ARRA) and Passenger Rail Investment and improvement Act of 2008 (PRIIA). This strategic plan was proposed to help address the nation's transportation challenges by investing in an efficient, high speed passenger rail network of 100 to 600-mile intercity corridors that connect communities across America. This vision (illustrated in Figure 1-1) was built on the successful highway and aviation development models with a 21st century solution that focused on a clean, energy-efficient option. Implementing these corridor projects and programs is intended to serve as a catalyst to promote economic expansion (including new manufacturing jobs), create new choices for travelers in addition to flying or driving, reduce national dependence on oil, and foster livable urban and rural communities.

> Implementing these corridor projects and programs is intended to promote economic expansion, create new choices for travelers, reduce national dependence on oil, and foster livable communities.

The High Speed Rail Strategic Plan has a near-term investment strategy that seeks to:

- Advance new Express High Speed Corridor services (operating speeds above 150 mph on primarily dedicated track) in select corridors of 200–600 miles.
- Develop Emerging and Regional High Speed Corridor services (operating speeds up to 90–110 mph and 110–150 mph respectively, on shared and dedicated track) in corridors of 100–500 miles.
- Upgrade reliability and service on Conventional Intercity Rail services (operating speeds up to 79–90 mph).

Under the High Speed Rail Strategic Plan, FRA identified the SEHSR Corridor as an Emerging Corridor.

1.1.2 SOUTHEAST HIGH SPEED RAIL (SEHSR)

1.1.2.1 *SEHSR CORRIDOR*

As discussed in Section 1.1.1, the SEHSR Corridor is part of the nationwide HSR network being planned by USDOT, the states, and Amtrak. The NCDOT Rail Division and Virginia DRPT, with their Federal partners, FRA and the Federal Highway Administration (FHWA), have been working together since the early 1990s to improve rail transportation options through development of the SEHSR Corridor. By being one of the five originally designated ISTEA HSR corridors, Federal monies may be spent on improvements to the existing rail system in order to achieve higher speed rail service.

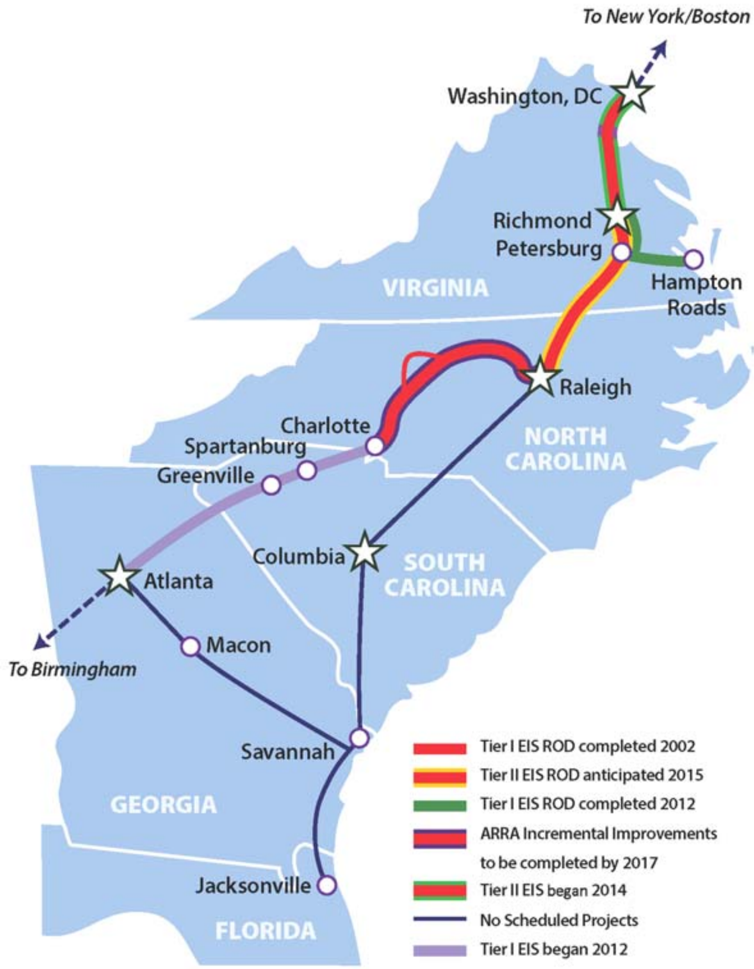
The SEHSR Corridor will extend from Washington, DC, to Jacksonville, FL.

The SEHSR Corridor is currently planned to extend from Washington, D.C. to Jacksonville, FL (see Figure 1-2). Eventually, HSR service is planned to extend south of Atlanta, GA and north of Washington, D.C. to the NEC, which would allow HSR travel to New York, NY, Boston, MA and beyond. As discussed in Section 1.1.2.2, the union of these two high speed corridors would create the greatest trip lengths within the national passenger system, and thus the greatest potential revenues.

Figure 1-1
Vision for High Speed Rail in America

Source: Federal Railroad Administration High Speed Rail Corridor Route Map, 2009

Figure 1-2
Southeast High Speed Rail Corridor



Source: NCDOT, September, 2014

1.1.2.2 SEHSR STUDIES AND ACTIONS

1997 SEHSR Market and Demand Study

Between 1995 and 1997, the states of Virginia, North Carolina, South Carolina, Georgia, and Florida prepared a "SEHSR Market and Demand Study" that examined the travel market and forecast travel demand for intercity and HSR service improvements in the Southeastern United States (KPMG, 1997). Key elements of the study included:

- Determining travel preference through the distribution of over 15,000 travel surveys throughout the Southeast. Collection and analysis of responses received from over 3,800 automobile, 650 air, 300 rail, and 50 intercity bus surveys were assembled into a multimodal intercity passenger travel market database that were combined with separate state department of transportation highway surveys that:
  - Quantified existing volumes by mode, origin-destination and trip purpose
  - Provided a sound basis for estimating intercity trips between city pairs

  - Obtained information on traveler characteristics (including trip purpose) and modal preferences to support the development of travel forecasting models.
- Developing new travel forecasting models, based on both revealed preferences (choices) and stated preferences (intentions) that are responsive to different market segments, travel time, travel cost, frequency of service, and other key independent variables.
- Preparing future forecasts of ridership and revenue for a variety of future intercity and HSR service improvement scenarios.
- Providing the Southeastern states (North Carolina, Virginia, South Carolina, Georgia, and Florida) with the necessary software, data, and documentation for the travel demand model forecasting system so that new improvement scenarios could be examined after completion of the study. These models and study results have served as the basis for developing the ridership/revenue model that has been used to date to evaluate different routings through the region, including the 2013 updated ridership/revenue study and forecast prepared for the SEHSR Corridor (AECOM, 2013) to support the Richmond to Raleigh Project Tier II EIS. For additional discussion on updated forecasts, refer to Section 1.5.

1997 High Speed Ground Transportation Commercial Feasibility Study

This commercial feasibility study (CFS) report, prepared by FRA for Congress, examined the costs/benefits and economics of bringing HSGT to well-populated groups of cities throughout the United States (FRA, 1997). The study drew nationwide conclusions from projections of the likely investment needs, operating performance, and benefits of HSGT in a set of illustrative corridors in several regions, including the SEHSR Corridor (using the historic "Atlantic Coast Line," which currently operates as the CSX "A" Line between Richmond, VA and Raleigh, NC). The study looked at HSR from a market-driven, performance-based perspective, recognizing that total trip time (including access to and from stations), rather than just speed, influences passengers' choices among transportation options in a region; and that travelers evaluate each mode in relation to the performance of other available choices.

The CFS report compared the full range of benefits and costs attributable to three optional HSGT systems for the SEHSR Corridor, treating each as an extension of the NEC, including: Accelerail 110 (110 mph to match with Amtrak's existing electrified service in the NEC); and, new HSR or Maglev systems on both the Southeast and Northeast HSR Corridors (required so that both have matching technologies). Note that "Accelerail" is a term used in this 1997 CFS report that refers to a lower cost implementation strategy (compared to construction of an entirely new HSR corridor, or magnetic levitation technology), that would increase speeds and improve operational efficiencies largely by upgrading and improving existing rail corridors.

Table 1-1 summarizes the quantifiable results of the CFS report.

Table 1-1
1997 Projected Costs/Benefits of SEHSR
Summarized by System Type

SEHSR in Year 2020 (Washington – Charlotte)	Accelerail 110 (Extension to NEC)	New HSR (Integrated with NEC)	New Maglev (Integrated with NEC)
Line-haul Travel Time (hr)	5.7	3.0	2.1
Trains/Day, each direction	27	53	65
Ave. Fare per Passenger Mile (dollars)	$0.176	$0.303	$0.327
Passengers, Millions of Trips (2020)	5.7	32.5	36.5
Passenger-Miles (in millions) Attributed to SEHSR Corridor Proper	1,689	2,550	4,100
Total Benefits (in millions)	$6,519	$37,665	$49,920
Total Costs (in millions)	$2,567	$33,197	$39,836
Total Benefits – Total Cost	$3,952	$4,468	$10,085
Total Benefits / Total Cost	**2.54**	**1.1**	**1.3**

The CFS report quantified the following benefits for each system –

- System Revenues
- User's Consumer Surplus - the difference between the amount an individual would be willing to pay for HSGT service and amount actually required for them to pay
- Benefits to the Public at Large (avoiding delays and reducing emissions) – through diversion of travelers from air and highway modes to HSGT.

Other benefits of the systems were not quantified, but were discussed in the study, including:

- Airport Investment Deferrals
- Highway Infrastructure Savings
- Commuter Rail Travel Efficiency Benefits
- Transportation Safety Improvements
- Economic Development Benefits (HSGT Construction and Operation, Station Development Effects, Growth of US HSGT Manufacturing Industry)
- Energy Benefits (reducing dependence of foreign oil).

Costs were quantified in the CFS report for system users as well as the public at large as follows:

- Initial Investment
- Operation and Maintenance
- Continuing Investments.

Major findings and conclusions from the CFS report include:

A. The benefits of the SEHSR Corridor (using the 110 mph option) far outweigh the costs, if fully connected to the NEC through Washington, DC. It was estimated to create $2.54 in benefits for every $1.00 spent to build and operate the SEHSR Corridor. This was substantially greater than the New HSR and New Maglev technologies in the SEHSR Corridor, which only produced $1.10 and $1.30 for every $1.00 spent, respectively.

B. Due to the high cost recovery in system revenues for the Accelerail 110 option on the SEHSR Corridor, the ratio of public benefits to publicly-borne costs are over 200 to 1, or nearly 26 times higher than any other scenario modeled nationwide.

C. Although no HSR corridor in the nation was projected to be commercially feasible (i.e., cover both its capital and operating costs), the Accelerail 110 option on the SEHSR Corridor performed very well on a purely commercial basis, projected to be self-sustaining (independent of public subsidies), once the investment is in place and paid for, covering over 90% if its full costs with systems revenues alone. This is in comparison with other corridors studied across the nation, which showed only between 17% and 39% initial investment covered by surplus.

D. Though having lower speeds, the Accelerail 110 option on the SEHSR Corridor will have more benefits than corridors that invest more public funds to achieve higher speeds.

E. With increased speed and frequencies, revenues from SEHSR Corridor between Charlotte, NC, and Washington, DC, should pay for not only the operations but may also cover much of the capital costs of new equipment, stations and track.

F. Although the projections of system performance for the SEHSR do not meet the traditional private-sector criterion for "commercial feasibility," they may provide a basis for public/private partnerships.

G. The less expensive Accelerail technologies that rely on upgrading existing rail lines and freight railroad cooperation generally provide higher ratios of benefits to costs (both in total and for the public) than new HSR or new Maglev technologies.

Joint Memorandum of Understanding

In early 1998, FRA, FHWA, NCDOT Rail Division, and Virginia DRPT entered into a joint Memorandum of Understanding (MOU) to coordinate and document each agency's respective roles and responsibilities in developing environmental documentation for the proposed HSR programs in both states. This cooperation has greatly benefited both Virginia and North Carolina.

1999 Feasibility Study Summary and Implementation Plan

The NCDOT Rail Division's Southeast High Speed Rail Corridor Feasibility Study Summary and Implementation Plan (April 1999), compiled and summarized the following other SEHSR Corridor planning and engineering studies completed prior to April 1999 and provided recommendations to assist NCDOT on project implementation and future actions:

Engineering Evaluation – In a September 1996 engineering evaluation, NCDOT identified the possible speeds, alignments, and costs for the SEHSR Corridor sections between Charlotte, NC and Raleigh, NC and between Richmond, VA and Raleigh, NC. Between Richmond, VA and Raleigh, NC, NCDOT determined that rebuilding and upgrading the historic "Seaboard Air Line" (a portion of which is currently operated as the CSX "S" Line between Raleigh, NC and Norlina, NC) would be the most cost effective method to achieve 110 mph maximum service between the two state capitals.

Train Performance and Train Dispatch Simulations - These simulations of the routes modeled the speeds of various conventional and high speed train sets on the route to suggest which equipment would work best along the SEHSR Corridor.

Station and Station Area Standards – Standards for the proper planning and construction of HSR stations along the SEHSR Corridor were developed. The specific recommendations on site, location, parking, etc., developed in the study will be used in the future planning and construction of new stations and the renovation of existing stations to high speed standards. (These standards are discussed in Sections 1.4.3 and 4.14.4).

Environmental Screening – In the study, NCDOT also recommended that a detailed EIS be completed of the entire Washington, DC to Charlotte, NC corridor (further discussed in Section 1.2.1).

Demand Modeling and Ridership/Revenue Projections – Demand modeling of potential passenger ridership and revenue from the high speed operations determined that increasing speeds to 100 mph (even along a non-electrified corridor) and adding frequencies (i.e., additional trips per day) would increase ridership by over 300% and revenues by more than 600% (with enhanced fares) over current levels. The projects also demonstrated some of the benefits of HSR to the increased capacity to the overall transportation network and the increased ability for people to travel. The modeling illustrated that improved passenger rail service will reduce auto and air trips along the SEHSR Corridor through trip diversion (which will ease congestion on highways and at airports), as well as have a high level of induced travel (i.e., cause travel that otherwise would not have been undertaken).

Operating Cost and Profitability Analysis – The analysis shows that, with modifications to the current Amtrak cost centers, the SEHSR Corridor will have projected revenues greater than projected annual operation expenses (i.e., it would not require an annual operating subsidy). This concurs with the findings from the 1997 CFS report summarized above, which declared the SEHSR Corridor as the most commercially feasible HSR corridor in the United States. However, this commercial feasibility is dependent upon the extension of HSR to Washington, DC, and the NEC.

With modifications to the Amtrak cost centers, the SEHSR will have projected revenues greater than projected annual operation expenses.

Economic and Fiscal Impact Analysis – This analysis identified the economic and fiscal impacts of the construction and operations of the SEHSR Corridor as a system. The analysis showed that over $10.5 billion in earnings and over $719 million in state tax revenues would be realized from construction and operation of the SEHSR Corridor alone over a 20 year period (using 1999 dollars). (This is further discussed in Section 4.11.1).

Benefit/Cost Analysis – This modeling exercise (completed in 1998 by Science Application International Corporation and Corporate Strategies) determined the full costs and benefits of the SEHSR Corridor. However, this study measured benefits differently than the CFS report discussed previously. Also, this analysis evaluated the CSX S-Line between Richmond, VA and Raleigh, NC rather than the CSX A-Line as was evaluated in the CFS report. The reason for this difference is that the rebuilding of the CSX S-Line was determined by the 1996

Engineering Evaluation (discussed previously) to be the most cost effective method to achieve 110 mph maximum service. This study determined the value of benefits of the SEHSR Corridor using such factors as time savings and reduced auto emissions, as shown in Table 1-2. This table summarizes the results of this study for one of the scenarios evaluated (#6), which assumed 8 round trips between Charlotte, NC and Raleigh, NC, with 4 extending on the SEHSR Corridor from Raleigh, NC to New York, NY.

Table 1-2
1997 Cost/Benefit Analysis Results for the CSX S-Line (Scenario 6)

SEHSR Corridor	Present Value over 20 Years (1997 dollars)	Distribution of Benefits/Costs
Benefits to Rail Users:		
Time savings and service quality benefits	$800,725,998	65%
Time savings for other rail passengers	$200,081,436	19%
Benefits to Users of Other Modes:		
Time savings, accident reduction, vehicle operating cost	$89,766,679	7%
Accident reductions at grade crossings	$71,449,927	6%
Non-User Benefits:		
Emission reductions	$32,345,322	3%
Capital Costs:		
Infrastructure	($730,745,924)	89%
Rolling Stock	($91,374,182)	11%
Net Present Value	**$412,249,255**	
Benefit-Cost Ratio	**1.46**	
Rate of Return	**5.61%**	

Cost Benefit Analysis of the Piedmont High Speed Corridor, Dec 9, 1998, by Science Application International Corporation and Corporate Strategies (SAIC), as summarized in the Southeast High Speed Rail Corridor (Charlotte – Raleigh – Richmond – Washington DC) Feasibility Study Summary & Implementation Plan, by NCDOT Rail Division, April 1999.

In summary, through this analysis, NCDOT concluded that HSR service from Charlotte, NC to the NEC via the CSX S-Line would have between $317 and $412 million in benefits to the states of North Carolina and Virginia, depending on the level of service. In addition, the SEHSR Corridor will have, depending on number of round trips, $1.39 to $1.46 in benefits for every dollar spent to build and operate the system.

HSR from Charlotte, NC to the NEC via the "S" Line would have between $317 and $412 million in benefits to NC and VA. The SEHSR will have $1.39 to $1.46 in benefits for every dollar spent to build and operate the system.

Public/Private Partnership Study - Alternatives were investigated to determine the various public and private sector partnerships possible for ownership and operation of the SEHSR Corridor. This analysis suggested that advantageous partnerships are possible, particularly in the form of operation and/or use of the corridor for passenger and freight by the private sector.

Analysis of Financing Alternatives – This comprehensive study investigated the various cost centers, revenues, funding and financing scenarios that are possible with the SEHSR Corridor as a system. It determined various revenue, funding and financing scenarios that could be used for the construction and operations of the SEHSR Corridor, with the following conclusions: an operating contract or concession between the State of North Carolina and the private sector is possible; and, private and public financing may be available for construction of the SEHSR Corridor.

Virginia-North Carolina Interstate High Speed Rail Compact

During 2004 legislative sessions in Virginia and North Carolina, the Virginia-North Carolina Interstate High Speed Rail Compact was authorized. The Compact was formed pursuant to 49 USC 24101 to assist in developing a plan for the design, construction, financing, and operation of the SEHSR Corridor. The inaugural meeting of the Compact was held in July 2010.

Richmond to Hampton Roads SEHSR Corridor Tier I EIS

As mentioned earlier, US DOT added the Richmond to Hampton Roads SEHSR Corridor to the Federally-designated SEHSR Corridor in 1995. Since then, Virginia has been investigating a program of rail improvements or new rail that would be necessary to enhance conventional freight and passenger rail operations through the Richmond to Hampton Roads SEHSR Corridor.

In 2009, FRA and Virginia DRPT completed a Tier I DEIS examining the potential routes and possible environmental impacts for the development of the extension of the SEHSR Corridor from Richmond, VA to the Hampton Roads area of Virginia (Richmond/Hampton Roads Passenger Rail Study Tier I EIS) - (Virginia DRPT, FRA, 2009). Under NEPA, the Richmond to Hampton Roads SEHSR Corridor Tier I EIS is considered separate and independent from the SEHSR Corridor Tier I EIS from Washington, DC to Charlotte, NC, as well as this Richmond to Raleigh Project Tier II EIS. Because the Richmond to Hampton Roads SEHSR Corridor Tier I EIS has its own independent utility (i.e., it is a usable and reasonable expenditure separate from the Richmond to Raleigh Project Tier II EIS), and has its own logical termini (i.e. the Richmond to Raleigh Project can accommodate any of the Richmond to Hampton Roads SEHSR Corridor Tier I EIS options), FRA deemed it appropriate for the projects to be studied separately under NEPA.

The Richmond to Hampton Roads SEHSR Corridor Tier I EIS evaluated potential routes for higher speed rail service from Richmond, VA to the Hampton Roads area of Virginia, either sharing the SEHSR Corridor from Richmond, VA to Petersburg, VA, then along the Norfolk Southern (NS) Route 460 corridor to Norfolk, VA (Alternative 1), or the existing Amtrak Corridor from Richmond, VA to Williamsburg, VA to Newport News, VA on the CSX Peninsula Branch along I-64 (Alternative 2). The Richmond to Hampton Roads SEHSR Corridor Tier I EIS has been coordinated with the Richmond to Raleigh Project Tier II EIS to ensure compatibility and connectivity.

Public hearings for the Richmond to Hampton Roads SEHSR Corridor Tier I EIS were held in January 2010. In February 2010, based on the evaluation and public comments received, the Virginia Commonwealth Transportation Board (CTB) recommended Alternative 1 as the preferred alternative for the extension of the SEHSR Corridor between Richmond, VA, Petersburg, VA and Norfolk, VA. Additionally, the CTB recommended the expansion of conventional intercity passenger rail service on the existing Amtrak route to Newport News, VA. Furthermore, the CTB approved $93 million in funding for the incremental reintroduction of conventional passenger rail service from Richmond, VA to Norfolk, VA via Petersburg, VA in June 2010. In December 2012, Virginia DRPT initiated Amtrak NEC Regional service to Norfolk, VA with one daily round trip train extending from Richmond, VA through Petersburg, VA. Virginia DRPT also has plans to extend two more daily round trip trains from Richmond to Norfolk.

FRA approved the Richmond to Hampton Roads SEHSR Corridor Tier I FEIS document in August 2012. In December 2012, FRA issued a Record of Decision (ROD) selecting the route from Richmond Main Street Station through Petersburg, VA to Norfolk, VA (Alternative 1) as the designated extension of the SEHSR Corridor to Hampton Roads. The ROD also selected the route from Richmond Main Street Station through Williamsburg, VA to Newport News, VA along the CSX railroad for expanded conventional passenger rail service to Hampton Roads. (FRA, 2012a). For more information on the Richmond to Hampton Roads SEHSR Corridor project, see http://www.rich2hrrail.info/.

Washington, DC to Richmond Southeast High Speed Rail Tier II EIS

In 2014, FRA and the Virginia DRPT initiated a Tier II EIS for the development of the SEHSR Corridor between Washington, DC and Richmond, VA. This effort will complete the NEPA review and preliminary engineering necessary to expand the capacity on the existing CSX Richmond, Fredericksburg and Potomac (RF&P) corridor between Washington, DC and Richmond, VA to accommodate the existing and planned passenger and freight service on the SEHSR Corridor.

Transportation Planning Report for the Richmond-Charlotte Corridor

In 2004, FRA released this independent engineering study that examined specific infrastructure improvements needed to implement HSR between Richmond, VA and Charlotte, NC, to achieve a travel time goal of 4 hours and 25 minutes. The report supports and complements the findings of the Tier I EIS (see Section 1.2.1). It also provides technical assistance that will be used in developing the Tier II documents for the Corridor (see Section 1.2.2).

1.1.3 OTHER RAIL PROJECTS AND ACTIONS

1.1.3.1 *INITIATIVES BY THE COMMONWEALTH OF VIRGINIA*

Amtrak Virginia

Amtrak Virginia is a program developed by Virginia DRPT and Amtrak to provide more rail travel choices in Virginia. The Commonwealth is investing in intercity passenger rail service through Amtrak to bring new service to Virginia with direct connections to Amtrak's NEC. In order to better serve citizens of the Commonwealth, Amtrak Virginia has expanded service along multiple corridors and to several cities. These services include one daily round trip from Lynchburg, VA to Washington DC; two daily round trips from Richmond, VA to Washington DC; and one daily round trip trains from Norfolk, VA to Washington DC. Virginia DRPT's long range plan includes an expansion of the state-supported services to Lynchburg, VA and Roanoke, VA and Norfolk, VA and Newport News, VA, as described later in this document.

Richmond to Washington Third Track

Virginia DRPT, in cooperation with VRE and CSX, has an initiative to install a third mainline track on the CSX RF&P Corridor between Washington, DC and Richmond, VA. Since 2008, Virginia DRPT has installed approximately 10.5 miles of third track for one fifth of the 50-mile VRE commuter territory on this corridor between Fredericksburg, VA and Washington, DC. The completed third track projects include: 7.6 miles from Alexandria, VA to Franconia/Ravensworth (AF-RW) and 3.1 miles from Fredericksburg, VA to Hamilton, VA (FB-HA). Separately, Virginia DRPT is currently building 2.5 miles from Hamilton, VA to Crossroads (HA-XR) in partnership with VRE, and eleven miles of third track from Arkendale to Powells Creek through an FRA High Speed Intercity Passenger Rail grant. Upon completion of the Hamilton to Crossroads and Arkendale to Powell's Creek Third Track projects, Virginia DRPT, Amtrak, VRE and CSX will have additional capacity on three tracks for nearly half of the 50-mile VRE commuter territory or one quarter of the 109-mile RF&P Corridor between Richmond and Washington.

National Gateway

The CSX National Gateway is a corridor improvement project to clear the route from the Mid-Atlantic and Southeastern States to the Midwest to accommodate double-stack freight trains. The SEHSR Corridor shares the alignment of the CSX National Gateway for most of the route from Raleigh, NC to Washington, DC, primarily the CSX A-Line from south of Petersburg, VA through Richmond, VA to Washington, DC. Virginia DRPT is partnering with CSX to incrementally upgrade bridge and tunnel clearances along the National Gateway freight corridor.

1.1.3.2 *INITIATIVES BY THE STATE OF NORTH CAROLINA*

Raleigh, NC to Charlotte Rail Improvements

Since completion of the SEHSR Corridor Tier I EIS, North Carolina has worked to enhance passenger rail service within the state, particularly on the North Carolina Railroad Company (NCRR) corridor from its intersection with the CSX A-Line in Selma, NC to the connection with the CSX S-Line in Raleigh, NC and onto the Piedmont Corridor between Raleigh, NC, Greensboro, NC and Charlotte, NC. Particularly, NCDOT has invested in incremental infrastructure improvements to the Piedmont Corridor to enhance reliability, reduce travel times, improve safety, and improve station facilities.

At the completion of the SEHSR Corridor Tier I EIS, passenger service on the Piedmont Corridor consisted of two daily round trip trains, including: the *Carolinian*, which operates over the NCRR corridor from Charlotte through Raleigh, NC to Selma, NC and onto the CSX A-Line from Selma, NC to Richmond, VA, Washington, DC, and New York; and the *Piedmont*, which operates solely between Raleigh, NC and Charlotte, NC. Based on recommendations from the Transit 2001 Commission, and completion of SEHSR Corridor Tier I EIS, NCDOT set a long-term goal to reduce to two hours the rail travel time on the Piedmont Corridor, which took approximately three hours and forty-five minutes to travel the 174 miles between Raleigh, NC and Charlotte, NC.

North Carolina Railroad Improvement Program (NCRRIP)

In 2002, NCDOT, NS and NCRR initiated the North Carolina Railroad Improvement Program (NCRRIP) to dramatically improve the quality of passenger rail service over the Piedmont Corridor. The first series of NCRRIP projects from 2003 to 2005, totaled approximately $50 million, including extending sidings, changing the slope of tracks, straightening curves, and installing centralized train control signals. These initial improvements helped alleviate freight and passenger delays on the heavily used corridor and reduced travel time by 30 minutes between Raleigh, NC and Charlotte, NC.

NCDOT continued work on NCRRIP through 2010 with approximately $45 million in additional investments, which have further improved reliability, and supported the addition of a third daily Piedmont Corridor train.

NCDOT Piedmont Improvement Program

Since the passage of the Passenger Rail Investment and Improvement Act of 2008, FRA has awarded approximately $570 million to NCDOT for passenger rail improvements in North Carolina. The majority of the investment includes $520 million for the “Piedmont Improvement Program” from the FRA for additional equipment, station and maintenance facility upgrades, and additional track capacity to support the introduction of the third and fourth frequencies Piedmont Corridor. Through cooperation with NCDOT, NS, NCRR and Amtrak, these improvements will deliver the third and fourth frequency with increased operating speeds, a reduced trip time, and a commitment for on-time performance. In addition, these improvements provide a reserve capacity for up to five Piedmont Corridor trains between Raleigh, NC and Charlotte, NC, with partial capacity for a sixth frequency between Greensboro, NC and Charlotte, NC. FRA and NCDOT advanced the projects in the Piedmont Improvement Program with individual Tier II NEPA reviews under the SEHSR Corridor Tier I EIS. Refer to Section 1.4 for a description of some of these projects.

NCDOT Sealed Corridor Program

NCDOT has also been working with the host railroads and FRA to improve grade-crossing safety through its Sealed Corridor initiative along the Piedmont Corridor since 1994. The Sealed Corridor initiative includes an incremental approach to improve safety at grade-crossings along the corridor through the installation of improved warning devices, construction of grade separations, or elimination through closure or consolidation. Since 1990, NCDOT has reduced the number of grade crossings on the Piedmont Corridor from approximately 208 to 149, with the remaining crossings receiving appropriate warning systems. By 2017, NCDOT intends to have closed an additional 50 crossings.

NCDOT Station Improvements

As part of the NCDOT Rail Program, the department was involved in restoration work on historic passenger stations in the SEHSR Corridor at Salisbury, High Point, and Greensboro, NC. New stations have been constructed in Kannapolis, NC and Durham, NC. In addition, major multimodal transportation centers are currently planned for Charlotte, NC and Raleigh, NC. The station work represents a current investment of over $78 million in the SEHSR Corridor alone. As part of the project to construct a new Raleigh Union Station, NCDOT and the City of Raleigh are rebuilding the intersection of the CSX S-Line and the NCRR H-Line at Boylan Junction. This improvement will support the future installation of the double-track connection with the SEHSR Corridor as presented in this Richmond to Raleigh Tier II EIS.

HSR Engineering Feasibility Studies

NCDOT has also been involved in several efforts to develop the SEHSR Corridor and advocate for Federal funding of HSR. NCDOT has worked with FRA and the states of South Carolina and Georgia, to complete an engineering feasibility study in 2008 for the SEHSR Corridor from Charlotte, NC through Greenville, SC and Spartanburg, SC to Atlanta, GA and Macon, GA. Based on the 2008 feasibility study, FRA has initiated a Tier I EIS to extend the SEHSR Corridor from Charlotte, NC to Atlanta, GA. NCDOT also worked with the Southeastern Economic Alliance (16 Chambers of Commerce from the six states that compose the Alliance), which seeks congressional support for the establishment of a Federal funding program for rail.

1.2 PROJECT BACKGROUND

1.2.1 SEHSR CORRIDOR TIER I ENVIRONMENTAL IMPACT STATEMENT (EIS)

A prime recommendation from the 1999 Feasibility Study discussed in Section 1.1.2.2 was the preparation of an EIS pursuant to the requirements of NEPA, for the portion of SEHSR Corridor between Washington, DC, and Charlotte, NC. Because of the magnitude of the SEHSR Corridor study area (approximately 500 miles long), the numerous alternative study areas, and the conceptual level of project detail, NCDOT, Virginia DRPT, FRA and FHWA chose a "tiered" (or phased) approach in developing the environmental documents for this portion of the SEHSR Corridor (as defined in the NEPA regulations issued by the Council on Environmental Quality (CEQ) (see 40 CFR §§ 1502.20 and 1508.38). In October 1999, these state and Federal agencies began preparation of the first phase of the study – referred to as the Tier I EIS for the SEHSR Corridor. This portion of the SEHSR Corridor would extend HSR service from the NEC southward along a Federally-designated HSR corridor from Washington, DC to Charlotte, NC. The Tier I EIS prepared for the project was, therefore, a program level environmental document that presented a corridor level review of the study area alternatives on an "apples-to-apples" basis. All known potential impacts to environmental resources were presented at the macro level in order to determine the general corridor for further study during subsequent Tier II reviews.

> A prime recommendation from the 1999 Feasibility Study was the preparation of an EIS for the portion of SEHSR between Washington, DC, and Charlotte, NC.

The HSR service evaluated in the Tier I EIS consisted of four round trips per day between Charlotte, NC and Washington, DC and four additional trips between Raleigh, NC and Charlotte, NC. Station stops were not determined, but it was assumed that the SEHSR Corridor would serve all stations where Amtrak currently provides service; however, every train would not stop at all stations. Nine study area alternatives and one no-build alternative were examined for the proposed corridor. The buffer area used to analyze each resource to help identify potential impacts ranged from a width of 300 feet to six miles centered on existing rail rights-of-way. The No Build Alternative included existing and committed improvements to highway, air travel, intercity bus, passenger rail (Amtrak and VRE), public transit, and freight services, without any new HSR passenger service. The estimated end-to-end travel time for the nine build alternatives ranged from 6 hours to 7.5 hours, compared to 10 hours for the no-build alternative. The projected total ridership in 2025 for the nine alternatives ranges from 1.3 million to 1.8 million passengers. Fossil fuel powered trains were proposed to be used with a top operating speed of 110 mph (180 kph).

Through the results of the feasibility studies and modeling discussed in Section 1.1.2.2 of this chapter, Federal and state agencies determined that the SEHSR Corridor should be analyzed and implemented in the Tier I EIS using an "Incremental Approach." A set of basic assumptions of this approach include the following:

- Following the results of the 1997 CFS report (which showed that the SEHSR Corridor could provide substantial benefits relative to costs), transportation service in the SEHSR Corridor would be provided on standard gauge railroad tracks capable of also supporting North American standard heavy-haul freight trains as well as high speed passenger trains.
- By maximizing use of existing infrastructure, the initial capital investment required by the system is reduced.
- While some segments of the high speed service may be operated on tracks dedicated to high speed, much of the route could involve incremental improvements to tracks owned by commercial freight lines operating at conventional speeds.
- Shared trackage will place certain technological requirements and operational limitations on the high speed trainsets and other technology choices.
- Accommodating higher passenger train speeds and increasing the capacity of the existing rail infrastructure to handle additional passenger and freight rail traffic will require modifications to the existing signal and control systems, as well as other improvements at various locations within the travel corridor.
- FRA requires an approved barrier or warning system for at-grade highway crossings on railroads with speeds of 79 to 110 mph, as defined in the Code of Federal Regulations: 49 CFR, Section 213.347. On such high speed railroad corridors, the railroad shall submit, for FRA approval, a complete description of the proposed barrier or warning system to address the protection of the highway traffic and high speed trains.
- At-grade highway crossings are permitted for speeds up to 110 mph. However, FRA guidance (*Highway-Rail Grade Crossing Guidelines for High-Speed Passenger Rail*, FRA 2009) states that public and private crossings where train speeds are between 79 and 110 mph must be equipped with special crossing protection devices, grade separated, or closed. Specific detail is included in the FRA's Track Safety Standards in the Code of Federal Regulation: 49 CFR, Section 213.347.
- The overall safety of the existing rail system would be improved by the implementation of a HSR system, which would upgrade not only the track, crossings and rolling stock, but also the stations and associated facilities.
- This "Incremental Approach" will minimize impacts to both the human and natural environments by using existing rail infrastructure, an established transportation corridor and rail right of way (ROW) as much as possible.

By maximizing use of existing infrastructure, the initial capital investment required by the system is reduced.

The study noted that daily existing freight train traffic peaked at over 40 trains per day in the segments from Richmond, VA, to Selma, NC and from Greensboro, NC, to Charlotte, NC. There were no freight trains on the four segments where track has been removed and there were six segments with fewer than five freight trains per day. For the Raleigh, NC to Greensboro, NC to Charlotte, NC portion of the SEHSR Corridor, proposed improvements included signalization, curve and interlocking improvements, and additional track.

The Tier I DEIS, competed in 2001, examined the purpose and need for the SEHSR Corridor project as well as evaluated the potential impacts on both natural and human environments at a program level of assessment for the nine different Study Area Build Alternatives compared to a No Build Alternative. Public involvement was critical during this phase with 26 public information workshops and 18 public hearings held in North Carolina and Virginia to solicit feedback about the project. Throughout the Tier I EIS process, meetings with the public, political leaders, planners, resource agencies, railroads and other interested parties were held to obtain input on the project.

The Tier I FEIS indicated that the route with the best potential for HSR service and the fewest environmental impacts would be the "S-Line."

The Tier I FEIS, completed in June 2002, indicated that the route with the best potential for HSR service and the fewest environmental impacts would be: the "S-Line" (which runs from Richmond, VA through South Hill, VA, to Norlina, NC and then Raleigh, NC); plus the NCRR from Raleigh, NC to Greensboro, NC; plus the "K-Line" (which runs from Greensboro, NC to Winston-Salem, NC); plus the WSSB (which runs from Winston-Salem, NC back to the NCRR); and finally, the NCRR (which runs to Charlotte, NC). This recommended alternative from the Tier I EIS, consisting of Alternative B in combination with Alternative A, follows a combination of existing railroads and preserved rail corridors.

FRA and FHWA issued a ROD for the Washington, DC, to Charlotte, NC, SEHSR Tier I EIS in October 2002, approving the preferred corridor route and modal choice for the Corridor, along with its purpose and need.

In October 2002, FRA and FHWA issued a ROD for the Washington, DC, to Charlotte, NC, SEHSR Corridor Tier I EIS, confirming and approving the preferred corridor route and modal choice for the Corridor, along with its purpose and need. In the ROD. FRA and FHWA selected the alternative described above as the Preferred Alternative, rather than the No Build Alternative, to be carried forward into the current Tier II process because of the following benefits that only this Build Alternative would provide:

- Providing the traveling public – particularly special populations such as the elderly and the disabled – with improved transportation choices;
- Helping ease existing and future congestion (air, highway, passenger rail) within the Corridor;
- Improving safety and energy effectiveness within the transportation network;
- Reducing the overall air quality related emissions per passenger mile traveled within the Corridor; and,
- Improving overall transportation system efficiency within the Corridor, with a minimum of environmental impact. The No Build Alternative would not provide these benefits; therefore, it was discarded from further study.

More information about the Tier I preferred route, modal choice, purpose and need and evaluation process can be found on the program's website at www.sehsr.org.

1.2.2 SEHSR CORRIDOR RICHMOND TO RALEIGH PROJECT TIER II EIS

This current Richmond to Raleigh Project Tier II study builds upon the results of the SEHSR Corridor Tier I EIS (see Section 1.2.1). This Tier II study further evaluates the Preferred Alternative for the portion of the Tier I SEHSR Corridor between Richmond, VA, and Raleigh, NC. Separately evaluating the Richmond, VA to Raleigh, NC portion of the SEHSR Corridor was necessary because the areas south of Raleigh, NC and north of Richmond, VA within the preferred corridor have existing service, which will require a different level of analysis. Ongoing studies and/or active projects are currently under way in these segments of the SEHSR Corridor.

Preparation of the Tier II DEIS began in February 2003 for the portion of SEHSR Corridor between Petersburg, VA and Raleigh, NC. In 2006, the northern study limit was extended to Richmond, VA (approximately 30 miles).

Because this Richmond to Raleigh Project Tier II EIS is part of the second phase of the larger SEHSR Corridor project, it does not revisit or reconsider the results determined during the Tier I study, including the purpose or need for SEHSR Corridor (see Sections 1.6 and 1.7 of this FEIS) or the preferred HSR corridor and modal choice (see Section 1.4 of this FEIS). Additional NEPA environmental documentation (either EA, CE or Tier II EIS documents) will be prepared separately for implementation of the remainder of the Tier I SEHSR Corridor (i.e., south of Raleigh, NC to Charlotte, NC, and north of Richmond, VA area to Washington, DC), as well as the development of each of the proposed stations between Richmond and Raleigh.

The Richmond to Raleigh Project Tier II DEIS was published in May 2010 and included detailed environmental analysis. Copies of the DEIS and maps are available at http://www.sehsr.org/deis/deis.html.

The Richmond to Raleigh Project Tier II DEIS was published in May 2010 and included detailed environmental analysis of the impact of the various project elements, including detailed design, track location, and bridge and roadway work. Copies of the DEIS and maps are available at http://www.sehsr.org/deis/deis.html.

In April 2012, Virginia and North Carolina provided FRA with a Recommendation Report recommending the preferred rail alternatives for each of the 26 sections evaluated in the Richmond to Raleigh Project Tier II DEIS. These recommendations were based on consideration of impacts to the human and natural environment, costs, and operability/constructability, along with the public and agency comments received following the publication of the Tier II DEIS in May 2010. The recommendations in the report addressed only the selection of preferred rail alignments (i.e., it did not address associated roadway changes because those are independent of the selection of rail alternative) and required additional design and engineering.

This Tier II FEIS is based on further evaluation and engineering subsequent to the Recommendation Report and presents FRA's and the Project Sponsors' preferred rail alignment alternatives for the project, as well as all associated roadway changes (see Section 1.4 and Chapter 2). The format of the current document – a Condensed Final Tier II EIS - is further explained in the Executive Summary. It should be noted that the overall Tier II EIS for the SEHSR Corridor Richmond to Raleigh project consists of two parts: 1) this condensed FEIS, and 2) the DEIS, as published in May 2010. For a full understanding of the project, both documents should be reviewed.

1.3 PROJECT TIMELINE

Tier II Draft EIS Published	-	May 2010
8 Public Hearings Held on DEIS (4 in VA, 4 in NC)	-	July 2010
Public Update Meetings (2 in VA and 3 in NC)	-	July 2011 through February 2013
Recommendation Report Published	-	April 2012
Tier II FEIS Published	-	August 2015
Tier II Record of Decision (ROD)	-	January 2016 (Projected)
Design Public Hearing	-	After signature of ROD
Property Acquisition	-	Schedule subject to funding
Construction (with 3-5 year Build Out)	-	Schedule subject to funding, at least two years after ROD
Begin SEHSR Passenger Service	-	Schedule subject to funding

1.4 PROJECT DESCRIPTION

The preferred corridor identified in the SEHSR Corridor Tier I EIS runs from Washington, DC through Richmond, VA, Petersburg, VA, Henderson, NC, Raleigh, NC, and Greensboro, NC, to Charlotte, NC, with a connection to Winston-Salem, NC (NCDOT and Virginia DRPT, 2002). This Richmond to Raleigh Project Tier II EIS evaluation is focused on the portion of the SEHSR Corridor between Richmond, VA, and Raleigh, NC (Figure 1-3).

This evaluation is focused on the SEHSR Corridor between Richmond, VA, and Raleigh, NC

Although there are active freight and passenger rail operations between Richmond, VA, and Petersburg, VA, there is no current rail connection between Petersburg, VA, and Raleigh, NC, in the Richmond to Raleigh Project corridor (approximately 132 miles along the old CSX S-Line). From Petersburg, VA, to Norlina, NC (approximately 76 miles), there is a largely intact right of way, but rail service was discontinued in the mid-1980s and the tracks were removed. From Norlina, NC, to Raleigh, NC, there is only minor active freight service (approximately 1-4 trains per day).

The Richmond to Raleigh Project would provide a completely new, fully road/rail grade separated Class 6 railroad (speeds up to 110 mph) to allow high speed passenger and intermodal freight movement, as well as providing opportunities for conventional passenger service (i.e., same speeds and equipment, but more stopping locations), commuter passenger service, and standard freight service. The nature of this action merits a single EIS under the umbrella of the overall Tier I EIS performed for the whole Washington, DC to Charlotte, NC SEHSR Corridor.

Both Virginia and North Carolina have active rail improvement programs in the remainder of the SEHSR Corridor. There is existing freight and passenger rail service operating within the SEHSR Corridor from Petersburg, VA, north to Washington, DC, and from Raleigh, NC, west to Charlotte, NC. Planned and anticipated rail improvements in these portions of the SEHSR Corridor are needed for safety, capacity, and congestion management, and thus while they facilitate the overall higher speed rail system, they have independent utility from HSR (i.e., they need to be completed whether or not the overall SEHSR Corridor system is developed). Each of these projects will have environmental documentation appropriate to the specific action.

Examples of those current and planned projects and their level of environmental documentation are as follows.

Washington, DC, to Richmond, VA:

- Richmond Area to Washington, DC, Tier II EIS
- Long Bridge Pre-NEPA Study
- Arkendale to Powell's Creek Finding of No Significant Impact (FONSI) to construct of 3rd Main Line and improve Quantico Station
- Categorical Exclusion (CE) to install crossover tracks and improve commuter rail service in Stafford County
- Supplemental environmental document to dismiss the alignment from Main Street Station to Doswell on the former C&O line (Alternative Considered but Dismissed)

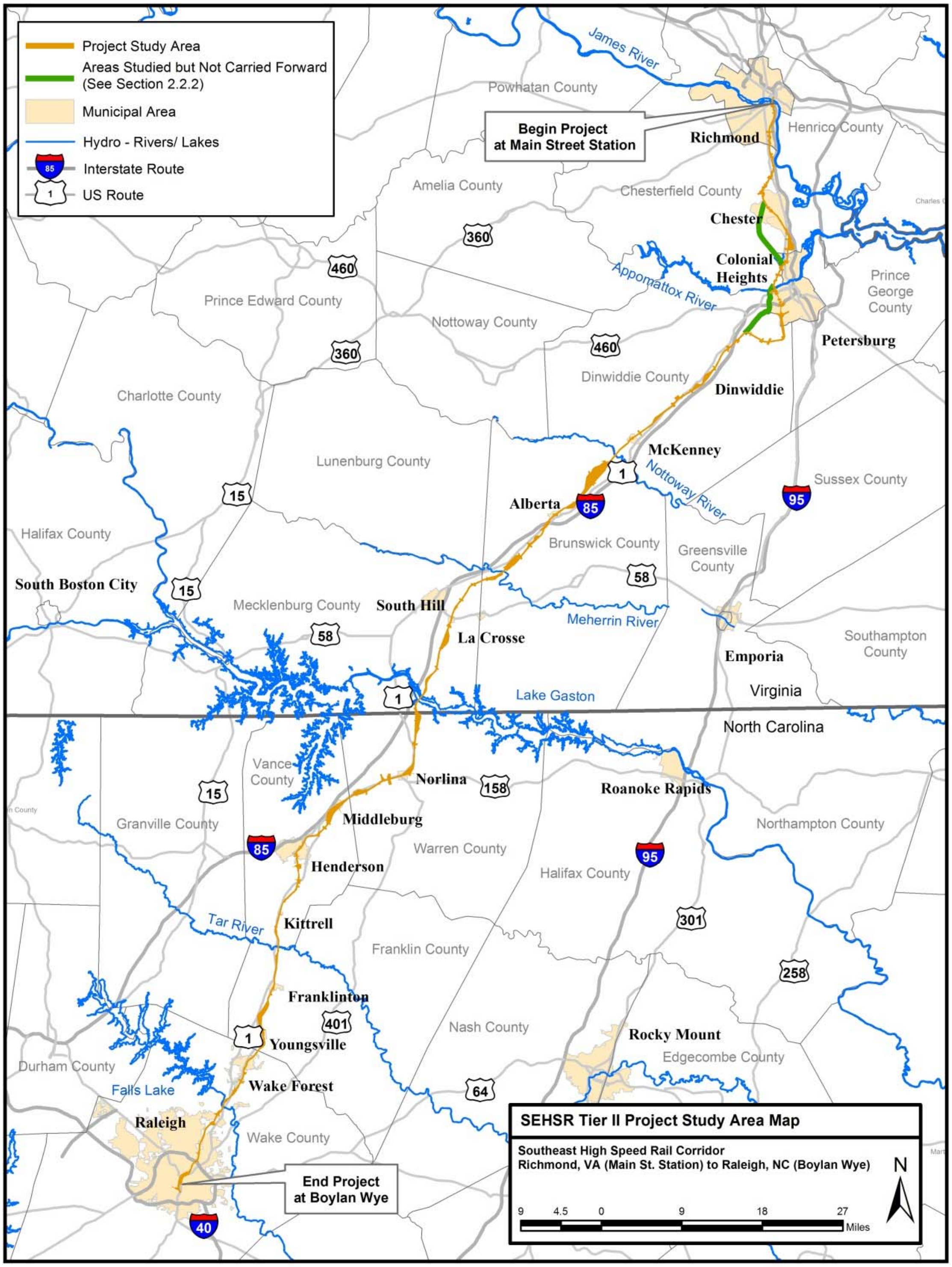
Raleigh, NC, to Charlotte, NC:

- Charlotte Rail Improvement & Safety Program (CRISP) (EA)
- CSXT/NS Mainline Grade Separation (EA)
- Charlotte Sugar Creek Grade Separation (EA)
- Charlotte Rail Maintenance Facility (EA)
- McLeansville Road Grade Separation (EA)
- Haw River Siding (EA)
- Hopson Road Grade Separation (EA)
- Clegg to Nelson Siding and Track Improvement (CE)
- Ethyl Jukebox Crossing Consolidation in China Grove (CE)
- Bowers to Lake, Haydock to Junker, and Reid/North Kannapolis Double Track Projects (EA)
- Klumac Road Grade Separation (EA)
- New Raleigh Union Station (EA)
- CSXT Boylan Crossover and Track Improvement (CE)
- Cary, Kannapolis, High Point and Burlington Station Upgrades (EAs)
- Morrisville Parkway Grade Separation (EA)
- New Locomotives and Passenger Cars (CE)
- Duke Curve Realignment (CE)

Richmond, VA, to Hampton Roads, VA

- Richmond to Hampton Roads Passenger Rail Study Tier I EIS
- CE to construct a multimodal Amtrak station in Newport News

Figure 1-3


Project Study Area
Areas Studied but Not Carried Forward (See Section 2.2.2)
Municipal Area
Hydro - Rivers/ Lakes
Interstate Route
US Route
Begin Project at Main Street Station
End Project at Boylan Wye
Richmond
Chester
Colonial Heights
Petersburg
Dinwiddie
McKenney
Alberta
South Hill
La Crosse
Emporia
Norlina
Roanoke Rapids
Middleburg
Henderson
Kittrell
Franklinton
Youngsville
Wake Forest
Raleigh
Rocky Mount
South Boston City
James River
Appomattox River
Nottoway River
Meherrin River
Lake Gaston
Tar River
Falls Lake
Virginia
North Carolina
Powhatan County
Henrico County
Amelia County
Chesterfield County
Prince Edward County
Nottoway County
Prince George County
Dinwiddie County
Charlotte County
Lunenburg County
Sussex County
Halifax County
Brunswick County
Greensville County
Mecklenburg County
Southampton County
Vance County
Granville County
Warren County
Northampton County
Halifax County
Franklin County
Nash County
Edgecombe County
Durham County
Wake County
SEHSR Tier II Project Study Area Map
Southeast High Speed Rail Corridor
Richmond, VA (Main St. Station) to Raleigh, NC (Boylan Wye)
N
Miles

1.4.1 PROJECT ASSUMPTIONS

Some assumptions are relevant to the entire SEHSR Corridor, while others are specific to the Richmond to Raleigh Project, as indicated below.

1.4.1.1 *TECHNOLOGY*

As determined in the SEHSR Corridor Tier I ROD, the system for the entire SEHSR Corridor is being designed for trains to be powered by fossil fuel. Early feasibility studies established an "incremental approach" to higher speeds, making use of existing rail ROW and fossil fuel locomotives. This approach minimizes the impacts to both the human and natural environments. By using existing infrastructure, the initial capital investment required by the system is also reduced.

> The entire SEHSR Corridor is being designed for trains powered by fossil fuel. Early feasibility studies established an "incremental approach" to higher speeds, making use of existing rail ROW and fossil fuel locomotives. This minimizes impacts to both the human and natural environments. By using existing infrastructure, the initial capital investment is reduced.

It should be noted that the current Richmond to Raleigh Project designs will not preclude conversion to electricity in the future, thus allowing higher speeds. Conversion to electricity and higher speeds would require additional environmental evaluation at the appropriate time. Likewise, the potential use of dual-mode locomotives, which allow trains to operate along routes that are only partially electrified without switching locomotives, will be evaluated in the future as the technology advances.

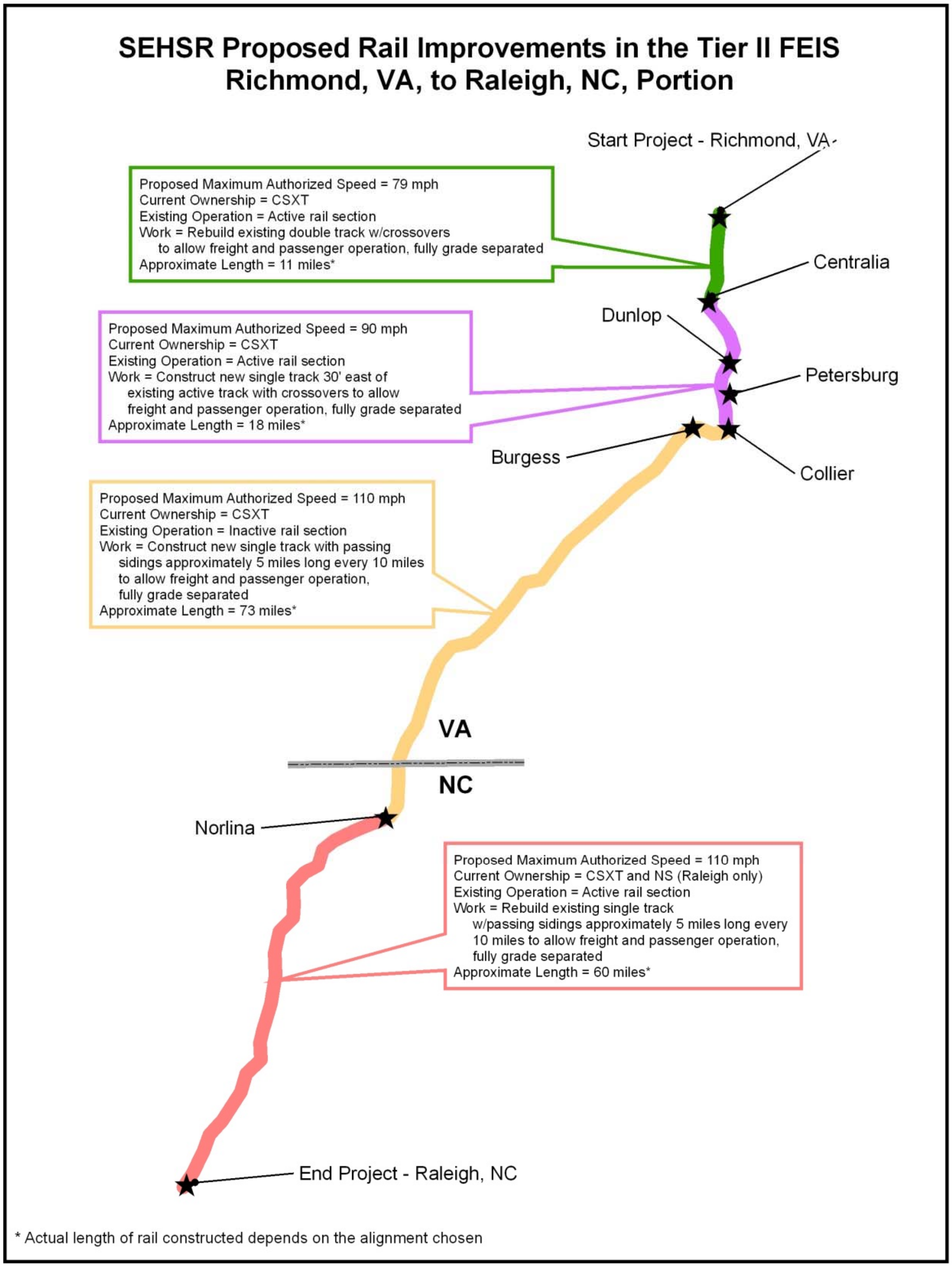
1.4.1.2 *RAIL IMPROVEMENTS*

Rail designs for the Richmond to Raleigh Project use existing rail lines or segments of existing rail lines in conjunction with areas of new alignment. The proposed designs for all rail alignment alternatives call for new ballast (the rock surface underneath the railroad ties); concrete ties, and welded steel rails. Throughout the Richmond to Raleigh Project corridor, the alternatives provide for a combination of high speed passenger service, conventional passenger service, conventional freight, and intermodal freight. The level of work required to achieve this shared system differs depending on the nature of the existing rail operations, as well as the existing conditions of the railroad and rail bed. A schematic map of the proposed rail improvements for the Richmond to Raleigh Project is provided in Figure 1-4. Depending on the location, the proposed rail designs include:

- Construction of new single track with approximate 5 mile long passing sidings approximately every 10 miles - on new segments of the corridor (CSX S-Line between Collier, VA and Norlina, NC)
- Rebuilding existing single track with approximate 5 mile long passing sidings approximately every 10 miles - on active freight segments of the corridor (CSX S-Line between Norlina, NC and north of Raleigh, NC)
- Construction of new single track adjacent to existing active track, with 30 feet of separation; and with crossovers to allow passing for freight and passenger operations – on segments with heavy mainline freight traffic (CSX A-Line between Collier and Centralia, VA)

- Rebuilding existing double track, with crossovers to allow passing for freight and passenger operations – in urban segments of the corridor near Richmond (CSX S-Line between Centralia and Downtown Richmond).

Figure 1-4


SEHSR Proposed Rail Improvements in the Tier II FEIS
Richmond, VA, to Raleigh, NC, Portion
Start Project - Richmond, VA
Proposed Maximum Authorized Speed = 79 mph
Current Ownership = CSXT
Existing Operation = Active rail section
Work = Rebuild existing double track w/crossovers
to allow freight and passenger operation, fully grade separated
Approximate Length = 11 miles*
Centralia
Dunlop
Proposed Maximum Authorized Speed = 90 mph
Current Ownership = CSXT
Existing Operation = Active rail section
Work = Construct new single track 30' east of
existing active track with crossovers to allow
freight and passenger operation, fully grade separated
Approximate Length = 18 miles*
Petersburg
Burgess
Collier
Proposed Maximum Authorized Speed = 110 mph
Current Ownership = CSXT
Existing Operation = Inactive rail section
Work = Construct new single track with passing
sidings approximately 5 miles long every 10 miles
to allow freight and passenger operation,
fully grade separated
Approximate Length = 73 miles*
VA
NC
Norlina
Proposed Maximum Authorized Speed = 110 mph
Current Ownership = CSXT and NS (Raleigh only)
Existing Operation = Active rail section
Work = Rebuild existing single track
w/passing sidings approximately 5 miles long every
10 miles to allow freight and passenger operation,
fully grade separated
Approximate Length = 60 miles*
End Project - Raleigh, NC
* Actual length of rail constructed depends on the alignment chosen

Information about the rail alternative alignments within each section is presented in Section 2.2.3. This information includes design objectives, new bridges or underpasses, river crossings, and schematic maps. Detailed designs are found in Appendix R.

The proposed rail designs were developed in accordance with FRA regulations, and in coordination with CSX Transportation and Norfolk Southern railroads, to ensure that the proposed designs do not conflict with existing freight and conventional passenger operations. All the project alternatives increase rail capacity, which would enhance existing operations; and would also provide adequate separation of high speed train operations from freight operations in a fully grade separated corridor. The level of increased capacity is expected to be the same for all rail alternatives.

All the project alternatives increase rail capacity, which would enhance existing operations and provide adequate separation of high speed train operations from freight operations in a fully grade separated corridor.

With these improvements, the Richmond to Raleigh Project corridor will support the introduction of four daily round trip SEHSR Corridor trains between Richmond and Raleigh while preserving capacity for the continued operation of the current freight and passenger services on the existing active segments of the corridor.

Note: The segment of the corridor between Collier and Centralia, VA includes the construction of a new HSR track adjacent to the active CSX mainline track to provide additional capacity to support the introduction of the four SEHSR Corridor trains for the Richmond to Raleigh Project only. Where this segment of the corridor is also planned to support the six additional SEHSR Corridor trains for the Richmond to Hampton Roads Project, any additional track capacity required to support that service will be considered in a future Richmond to Hampton Roads Tier II EIS document.

1.4.1.3 *SPEED*

Maximum authorized speed (MAS) is the maximum allowable speed a train may operate based on authorization from the owner of the rail corridor and FRA. Currently, the future MAS for the Project (as shown in Figure 1-4) is anticipated to be:

- Richmond, VA, to Centralia, VFA – 79 mph
- Centralia, VA, to Collier, VA (south of Petersburg) – 90 mph
- Collier, VA, to Raleigh, NC – 110 mph.

MAS is similar to a speed limit on a highway; it represents the highest speed trains are allowed to operate and is based on factors such as curvature, grade, equipment, and host railroad operating policies.

The actual track designs for the Richmond to Raleigh Project will allow for higher speeds in the future with changes in technology and design assumptions. Design speed is the maximum safe speed that can be maintained over a specified section of rail. It is based on several factors such as type of rail equipment, curvature, grade, and superelevation (i.e., cant, camber, or cross slope).

Limiting speed is a subset of design speed. It is the maximum train speed through the most restrictive curve within a section of the Richmond to Raleigh Project corridor based on current design assumptions. Limiting speed was used to evaluate the rail alternatives presented in the Richmond to Raleigh Project Tier II DEIS. In the absence of average running speed, limiting speed is the most useful measure of how well an alternative meets the need of a proposed project to reduce travel time and improve fuel efficiency.

Average running speed is based on the total amount of time it takes a train to go a set distance. It accounts for "dwell time" (such as station stops), schedule recovery time, acceleration and deceleration, and speed restrictions below MAS for curves and other features. The average running speed for the Richmond to Raleigh Project (with 2 intermediate station stops) is anticipated to be 74 miles per hour.

The average running speed for the Project is anticipated to be 74 miles per hour.

1.4.1.4 *NUMBERS OF TRAINS*

The Richmond to Raleigh Project Tier II FEIS assumes the operation of eight new passenger trains per day (four round trips) along the SEHSR Corridor between Richmond, VA, and Raleigh, NC (with most of the trains continuing either south or north). These projected SEHSR Corridor passenger trains are in addition to the number of conventional speed Amtrak trains that were in operation when the Richmond to Raleigh Project Tier II DEIS was published in 2010. This Richmond to Raleigh Project Tier II FEIS also assumes the continued operation of the Amtrak Carolinian service with two conventional passenger trains (one round trip) on the SEHSR Corridor between Petersburg, VA, and Richmond, VA, then following the CSX A-line to continue south. In addition, this Richmond to Raleigh Project Tier II FEIS assumes the continued operation of the Amtrak Norfolk service with two conventional trains (one round trip) on the SEHSR Corridor between Petersburg, VA, and Richmond, VA, extending to Norfolk, VA. See Section 1.4.4.4 below for more information on the routing of the various passenger trains in the SEHSR Corridor.

In areas where there is existing rail service, the SEHSR Corridor trains would be in addition to the existing freight and passenger trains. This Richmond to Raleigh Project Tier II FEIS estimated that up to 29 freight trains per day currently use the CSX A-Line in Virginia between Richmond, VA, and Petersburg. In North Carolina, up to two freight trains per day use the CSX S-Line between Norlina, NC, and Youngsville, NC, and up to four freight trains per day use the CSX S-Line between Youngsville, NC, and Raleigh, NC. The numbers of existing freight trains are estimates only due to the nature of freight service, which does not run on specific, published schedules.

This Tier II FEIS also estimates a total of 24 freight trains operating through downtown Raleigh, including six on CSX and 18 on NS. The CSX estimate includes up to two additional freight trains per day on the CSX S-Line between the CSX rail yard north of downtown Raleigh, NC, through the terminus of the Richmond to Raleigh Project at Boylan Junction. The NS estimate includes up to eight freight trains per day in the NS corridor on a parallel alignment to the CSX S-Line between the NS rail yard north of downtown Raleigh through Boylan Junction. Beyond Boylan Junction, an additional estimated 10 NS freight trains per day extend to points south and west.

The improvements to the rail corridor associated with the Richmond to Raleigh Project are anticipated to induce or attract additional freight (including intermodal) trains to use the SEHSR Corridor. For the purposes of analysis, the Richmond to Raleigh Project Tier II DEIS estimated that eight new intermodal trains would use the full length of the Richmond to Raleigh Project corridor. In addition the Richmond to Raleigh Project Tier II DEIS estimated that two new non-intermodal freight trains per day (one round trip) would use the northern portion of the corridor between Petersburg, VA, and Youngsville, NC; and four new non-intermodal freight trains per day (two round trips) would use the southern portion of the corridor between Youngsville, NC, and Raleigh, NC. In total, 10 additional freight trains would use the Richmond to Raleigh Project corridor between Petersburg, VA, and Youngsville, NC, and 12 would use the corridor between Youngsville, NC, and Raleigh, NC. In Raleigh, NC, it is assumed all additional freight trains would remain in the CSX corridor and not cross over Capital Boulevard with the SEHSR Corridor passenger trains.

The Richmond to Raleigh Project Tier II FEIS recognizes that additional SEHSR Corridor service is envisioned to operate between Richmond, VA, and Newport News/Norfolk, VA, as defined in the Richmond to Hampton Roads SEHSR Corridor Tier I FEIS. However, the operation, schedule, ridership, and revenue impacts of that expanded service is not applied to the forecasts in this Tier II FEIS for the Richmond to Raleigh Project.

1.4.1.5 *FREIGHT TRACKAGE*

The entire SEHSR Corridor system is being designed as a shared system for passenger and freight use. Freight service already exists in most sections, and could be reinstituted by the freight railroads in the currently discontinued section between Petersburg, VA, and Norlina, NC. For the Richmond to Raleigh Project, the design of SEHSR Corridor will vary at different locations, allowing MAS from 79 mph to 110 mph.

The operating efficiency for both passenger and freight service will increase significantly as a result of improvements to the SEHSR Corridor. The overall track upgrades and straightening of curves will allow all trains to operate at higher and more consistent speeds with lower maintenance cost. The Richmond to Raleigh Project includes proposed 5-mile long double track sections approximately every 10 miles that will greatly increase overall corridor capacity, allowing slower freight trains and faster passenger trains to pass each other without the need to come to a complete stop and wait.

The operating efficiency will increase significantly as a result of improvements to the SEHSR Corridor. The track upgrades and straightening of curves will allow all trains to operate at higher and more consistent speeds with lower maintenance cost.

1.4.1.6 *TRANSPORTATION/MULTIMODAL CONNECTIVITY*

One goal throughout the entire SEHSR Corridor is to plan for connections to other forms of transit, which would enhance regional connectivity. As discussed in Section 3.11.3., at all proposed stations/stops for the Richmond to Raleigh Project there is at least one public bus transit service agency that either currently provides, or is anticipated to be expanded to provide, bus or van services for HSR travelers. Additionally, rail transit plans for the Richmond, VA, region include several commuter rail and light rail lines providing service to Main Street Station, as well as a proposed commuter rail line that could potentially share the same ROW as the Richmond to Raleigh Project corridor between Main Street Station and Petersburg, VA. Rail transit plans for the Raleigh, NC region involve a light rail line that could potentially share the same general corridor as the Richmond to Raleigh Project corridor from north Raleigh to downtown Raleigh, NC.

Equipment specifications and policies related to bicycle transport will be developed later in the project when funding has been secured. Ease of train entry/exit for cyclists is affected by the platform height and train equipment.

1.4.1.7 GRADE SEPARATIONS AND CROSSING CONSOLIDATIONS

The design of the Richmond to Raleigh Project is to consolidate and grade separate all railroad-roadway crossings for safety and operability purposes.

The overarching philosophy of the design of the Richmond to Raleigh Project is to consolidate and grade separate all railroad-roadway crossings for safety and operability purposes. Grade separations replace at-grade crossings (i.e., locations where railroads and roadways cross at the same elevation) with bridges or underpasses. The primary reason for removing at-grade crossings is safety; however, there are several other reasons:

- Absolute collision avoidance: At-grade crossings inherently have risk of train-automobile collisions. A collision at a crossing on a higher speed track is a significant event often causing a death in the vehicle and in the case of larger, heavier trucks, the possible derailment of the train. These accidents also disrupt operation of both the rail and roadway systems for many hours.
- Elimination of railroad/roadway traffic issues: Under normal railroad operation, the event of a train crossing at-grade may cause delay of up to several minutes for vehicular traffic depending on type and speed of train.
- Elimination of possible system failure and associated delays: Crossing signal systems are very complex computer and electronics systems that operate in harsh environments. When a signal system fails, trains are often required to stop at the crossing with a crew member stopping vehicle traffic by flagging.
- Elimination of easy trespasser access: Trespassing is a major safety and security problem for railroads. At-grade crossings provide attractive locations for trespassers to access the railroad right-of-way.
- Elimination of horn noise: Trains are required to sound horns on approach to an at-grade crossing. By eliminating crossings, trains will not be required to whistle, significantly reducing unwanted noise.
- Comparable capital cost to grade-separated structure: On a high speed track, the cost of the signal system, approaches, crossing surface, and lifelong maintenance for an at-grade crossing can approach that of the cost of a grade separated structure.
- Improved long term cost of maintenance: There are many ongoing costs for at-grade crossings with active warning devices, including inspections, replacement of damaged or worn out parts, and replacement of crossing surfaces when a track is surfaced and ties are replaced.
- Allows for future speed increases: FRA regulations require grade separations for speeds above 125 mph.

The Richmond to Raleigh Project proposes to close all existing road/rail at-grade crossings located between proposed and existing grade separations along the study corridor and to re-route vehicular traffic to the nearest grade separation. Grade separations are typically located less than one mile apart. The locations chosen for grade separations were based on input from local officials, connectivity to the existing road network, minimizing impacts to natural and cultural resources, and constructability.

Design of grade separations along the Richmond to Raleigh Project corridor often necessitated changes to the design of adjacent roads. These changes primarily address: (1) realignments of existing roads to accommodate a bridge or overpass, and (2) new roads to maintain connectivity to the existing road network. The proposed roadwork associated with each rail alignment was considered part of that alternative (e.g., VA1, VA2, VA3 in Virginia, and NC1, NC2, NC3 in North Carolina). The impacts associated with the preferred alternatives (Chapter 4) address changes from both rail and roadway alignments.

1.4.1.8 *FENCING AND LANDSCAPING*

The Richmond to Raleigh Project corridor will not be completely sealed from any unauthorized access through the use of fencing. In developed areas along the corridor, fencing may be used to direct pedestrians to bridges/underpasses that have been designed to accommodate pedestrian access. Fencing locations and types will be determined during final design based on coordination between the owner of the rail corridor, the operator of the railroad, and adjacent communities.

Along the rail alignment, landscaping will be consistent with what currently exists. Along road work, landscaping will be addressed during final design using VDOT or NCDOT standards/procedures. Details for landscaping in historic districts may be specified under the Section 106 Memorandum of Agreement (with input from property owners and other consulting parties).

1.4.1.9 *PEDESTRIAN ACCOMMODATIONS*

Due to the fact that the Richmond to Raleigh Project returns rail to communities that developed along rail corridors, it will have an effect on community connectivity. Steps have been taken throughout the Richmond to Raleigh Project to minimize negative effects. All of the new bridges will have sufficient width so as not to create a hazard for pedestrian movement. In locations where existing pedestrian accommodations (e.g., sidewalks) currently exist, these accommodations will be provided on the bridges/underpasses. At other locations, pedestrian accommodations on the bridges/underpasses will be evaluated during final design based on the current NCDOT and Virginia pedestrian policies. In general, these policies consider the provision of pedestrian accommodations in more populous locations where pedestrian activity currently exists. In addition, throughout the Richmond to Raleigh Project corridor one existing public pedestrian-only underpass has been maintained and twelve new pedestrian-only bridges or underpasses are proposed for construction. The locations of these pedestrian crossings were determined in coordination with local government representatives and in response to comments from the public on the DEIS. Additional requests for pedestrian accommodations will be considered as they are received and added to the final designs where appropriate.

The new bridges will have sufficient width so as not to create a hazard for pedestrian movement.

It should be noted that Section 4.16 of the DEIS mistakenly stated that all roadway bridge designs would include sidewalks to facilitate pedestrian access. While pedestrians will be able to cross at all roadway bridges, the inclusion of sidewalks will depend on the current NCDOT and Virginia pedestrian policy at the time the Richmond to Raleigh Project is constructed.

1.4.1.10 *USE OF EXISTING BRIDGES*

It is the intention of NCDOT and Virginia DRPT to use existing bridges (both road and rail) wherever possible, unless shown otherwise on the Richmond to Raleigh Project designs (see Appendix R), In most cases, the Richmond to Raleigh Project can utilize the piers and substructure of existing bridges and replace the superstructure (e.g., girders, decking, and track) as necessary. During the final design stage of the Richmond to Raleigh Project, geotechnical studies will be performed to verify that existing structures are safe for continued use. If those studies indicate that any bridges need to be replaced, the proper environmental documentation will be undertaken at that time.

1.4.2 PROJECT FUNDING

Funding has not yet been secured or identified.

Funding for the right of way acquisition and construction of this Richmond to Raleigh Project has not yet been secured or identified. At this time, Richmond to Raleigh Project proponents anticipate that North Carolina and Virginia will pursue Federal funding through the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), reauthorization of Federal transportation programs and other Federal funding sources (which was anticipated by the Federal government as needed as part of the overall Federal HSR investment). Public-private partnership funding opportunities may also be sought along with Federal and state funding. Decisions regarding future funding of the Richmond to Raleigh Project will be made at the completion of the environmental review process. The Richmond to Raleigh Project is not anticipated to be funded by local governments.

It should be noted that the construction costs for the Richmond to Raleigh Project were never intended to be fully financed by the system's ridership; however, most long-term operational costs are estimated to be covered through ridership fees (see Section 1.4.4.2 below). Construction costs for the nationwide HSR system will be a public investment in a new national transportation network, similar to the 1950s when the Federal government created the Interstate Highway System. In developing the vision for the HSR network, the Federal government recognized the substantial economic and environmental benefits such an investment will provide to all elements of the country for decades to come. As was the case for interstate highways, the initial cost to construct such a massive new public transportation system cannot be fully funded by private sources or alone by individual users (riders).

1.4.3 STATIONS

The DEIS provided background to identify five municipal locations for SEHSR stops. Richmond, VA, Petersburg, VA, and Raleigh, NC, have existing passenger service and stations, and La Crosse, VA, and Henderson, NC, do not currently have passenger service or stations.

The Richmond to Raleigh Project Tier II DEIS provided background on earlier modeling that was used to identify five municipal locations for SEHSR Corridor stops within the Richmond to Raleigh Project corridor: Richmond, VA, Petersburg, VA, and Raleigh, NC, which have existing passenger service and stations, and La Crosse, VA, and Henderson, NC, which do not currently have passenger service or stations.

This Richmond to Raleigh Project EIS does not evaluate environmental impacts related to specific station locations within the five municipalities. Potential station locations are evaluated generally in terms of accessibility to the larger transportation network. Specific station locations within municipalities will be determined in the future by the municipalities and passenger service operator, and appropriate levels of environmental documentation will be undertaken at that time.

All proposed rail alternatives have been designed to accommodate operational requirements of 600 feet to 800 feet of straight alignment for station platforms at each stop location. The alternative rail designs also allow for flexibility in final station designs by ensuring the ability to meet Americans with Disabilities Act (ADA) standards for platform design at each stop location.

The public involvement process revealed a strong interest in conventional passenger rail service that would utilize the same equipment and speeds as high speed service, but would provide access opportunities to smaller towns along the route. This option will be given further consideration as the system develops based on user demand along the route.

1.4.3.1 *RICHMOND, VA*

Each high speed train will stop in central Richmond, VA, the northern terminus for the Richmond to Raleigh Project. As discussed in the Richmond to Raleigh Project Tier II DEIS, in 2006 FRA issued a Notice of Intent (NOI) advising the public of a revision to the study corridor for this Tier II EIS (Richmond to Raleigh Project Tier II DEIS Appendix A). As described in the NOI, FRA changed the Northern terminus from Petersburg, VA (Collier Yard) to Richmond, VA (Main Street Station). Main Street Station was opened in 1901 and has remained one of Downtown Richmond's most visible landmarks. The station was closed in 1975 due to a decline in passenger rail service. The historic reopening of Main Street Station in 2003 marked the culmination of years of renovation to this 102-year-old landmark, and the return of passenger train service to downtown Richmond, VA. The importance of Main Street Station to the City of Richmond and to the larger region is illustrated by ongoing regional and local planning efforts as described in Section 3.11.

1.4.3.2 *PETERSBURG, VA*

Each high speed train will stop at a station in the vicinity of Petersburg, VA. The Richmond to Raleigh Project Tier II DEIS identified four potential station locations, including the existing Amtrak Ettrick Station as well as three alternative station locations: Dunlop, Washington Street, and Collier.

FRA has had an historical interest in evaluating alternative station sites in Petersburg, VA. There is a desire to determine whether or not alternative sites could better serve the Petersburg, VA, area by offering greater accessibility.

The current Ettrick Station was erected in the 1950s to allow Atlantic Coast Line (ACL) Florida-bound trains to avoid downtown Petersburg streets as well as the steep grades on the north side of the Appomattox River. Following the 1967 merger between the ACL and the Seaboard Air Line (SAL), passenger trains of both railroads stopped at Ettrick's red brick depot, making it the primary rail station in the Petersburg, VA, area. Passenger use of the Ettrick station continued when Amtrak took over intercity passenger service in 1971. The station currently accommodates ten passenger trains (five round-trip) daily, including: three Amtrak long distance trains (Silver Star, Silver Meteor, and Palmetto); the NCDOT-supported Carolinian; and the Virginia DRPT-supported Amtrak Regional train to Norfolk.

In 2014, the Tri-Cities Area Metropolitan Planning Organization (MPO), the Crater Planning District Commission (CPDC) initiated an Environmental Assessment to select a location for a Tri-Cities Area Multimodal Passenger Station, which will evaluate the feasibility for continued service at the existing Ettrick Station or relocation to a new site in the Tri-Cities area. The FRA is serving as the lead Federal agency for this Project, with support from the

Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA) acting as cooperating agencies. While the existing Ettrick Station supports the current Amtrak passenger rail service, additional investment is required to attract and accommodate increased ridership, improve accessibility to the local and regional transportation network, improve ADA accessibility, and provide capacity to support future high speed rail service.

1.4.3.3 *LA CROSSE, VA, AND HENDERSON, NC*

There has been strong public support for HSR stations in Southside Virginia and northern North Carolina. Evaluation and ridership-revenue modeling (see Section 1.5) support one daily train stop in each of these areas. Specific locations of stations in La Crosse, VA, and Henderson, NC, have not been determined. However, sites in both towns have adequate spacing for platforms. All alternatives are on common alignment through these two locations. The local municipalities will develop plans for the stations and conduct the required environmental documentation for these stations.

1.4.3.4 *RALEIGH, NC*

Each high speed train will stop in Raleigh, NC. The southern terminus for this project is the Boylan Wye, in downtown Raleigh, NC. Alternatives NC1, NC2, NC3, and NC5 are on different alignments approaching the terminus, but come together on common alignment along a straight section of the CSX S-line near Jones Street, approximately three blocks north of the Boylan Wye.

The Southern Railway Company built the current Amtrak station in 1950, which is located on the NCRR H-Line south of the Boylan Wye. Southern Railway discontinued passenger service to their Raleigh station in 1964. Service resumed in 1984, when Amtrak moved from the old Raleigh Seaboard station. Amtrak has completed renovations to expand the waiting room and to add a First Class passenger lounge and long-term parking facility to the Raleigh station, one of the busiest in North Carolina and in the South. Unfortunately, the station's location is not desirable for the SEHSR Corridor routing because it would require a backing movement for both southbound and northbound trains. In addition, the station is serving a ridership which far exceeds its waiting area and parking capacity.

Since publication of the Richmond to Raleigh Project Tier II DEIS, the City of Raleigh has made several advancements towards development of a new, larger, multimodal center that would be located within the Boylan Wye. This would allow all existing and proposed intercity and commuter trains to use a single facility. In September 2012, the US Department of Transportation (DOT) announced that the City had been selected for funding under DOT's TIGER (Transportation Infrastructure Generating Economic Recovery) grant program that would partially fund a new Raleigh Union Station, including all the necessary track work. A second DOT TIGER grant was awarded to the City in 2013 to fund the remainder of the station construction cost, and the City agreed to pay the non-Federal matching funds. An EA was approved by FRA in March, 2014, followed by completion of a FONSI document in June, 2014 (NCDOT, 2014). The project to build the station is a partnership among the City, FRA, NCDOT, and Triangle Transit (TT). The City also has partnered with Norfolk Southern, Amtrak and the North Carolina Railroad Company. Project design is complete, and construction will is scheduled to begin in late 2015. The funded portion of the Raleigh Union Station project includes the construction of a new station terminal building with two dedicated passenger tracks on the NCRR H-Line. Additional track and station amenities required to support the SEHSR Corridor trains from the Richmond to Raleigh Project at Raleigh Union Station will require additional funding.

1.4.4 OPERATIONS

1.4.4.1 *OPERATING CHARACTERISTICS*

Operations in the SEHSR Corridor must be consistent from Washington, DC, to Charlotte, NC. Therefore, the general characteristics for service between Richmond, VA, and Raleigh, NC are the same as those that were adopted in the SEHSR Corridor Tier I EIS.

In the SEHSR Corridor Tier I EIS, the operational model assumed a MAS of 110 mph in the SEHSR Corridor, with a desired average speed of 85 to 87 mph. Based on the SEHSR Corridor Tier I EIS analysis, estimated end-to-end travel time for the SEHSR Corridor service from Washington, DC, to Charlotte, NC, ranged from six hours to seven and one-half hours, depending on the design of the system. The SEHSR Corridor Tier I EIS service assumed eight round trips per day between Charlotte, NC, and Raleigh, NC, with four of these trips continuing on to Richmond, VA, Washington, DC, and northward.

Subsequent to publication of the Richmond to Raleigh Project Tier II DEIS, Virginia DRPT and NCDOT updated the conceptual service operation model to more accurately reflect expected speeds, and to be consistent with the NEC Futures planning effort (in cooperation with Amtrak), as well as with the Virginia Corridor Synthesis Report (DRPT, 2009). Although actual schedules will vary in the future, this analysis provided more accurate information for use in updated ridership and revenue forecasting discussed below in Section 1.5.

The train schedules from the updated service operation model, which includes proposed SEHSR Corridor trains and existing Amtrak trains, allow departures approximately every two hours throughout the day in each direction, from approximately 5:00 a.m. to 9:00 p.m. The updated service operation model still evaluated eight round trips on the SEHSR Corridor between Charlotte, NC, and Raleigh, NC, with four round trips extending to Richmond, VA, Washington, DC, and northward. Of the four SEHSR Corridor trains extending to Richmond, VA, and northward, three would originate in Charlotte, NC, and one would originate in Raleigh, NC, to allow better start and end times.

The service operation model assumes that all existing Amtrak stations will receive one or more trains. Potential new stations in La Crosse (South Hill), VA, and Henderson, NC, would initially receive one round trip daily.

Table 1-3 shows average travel times between cities in the SEHSR Corridor and NEC to New York, NY, as estimated by the updated service operation model. The updated model estimates the end-to-end travel time for SEHSR Corridor service from Washington, DC, to Charlotte, NC, will be approximately seven and one-half hours, which is consistent with the highest estimated travel time from the SEHSR Corridor Tier I EIS. The travel time for SEHSR Corridor service between Richmond, VA and Raleigh, NC will be approximately two hours and fourteen minutes. Future improvements on the SEHSR Corridor, either between Washington, DC, and Richmond, VA, and Raleigh, NC, or Raleigh, NC, and Charlotte, NC, could be implemented to further reduce the SEHSR Corridor travel time

The travel time between Richmond and Raleigh will be approximately 2 hours and 26 minutes.

between Washington, DC, and Charlotte, NC. It should be noted that schedules and travel times will vary in the future due to other operating factors or corridor constraints.

Table 1-3
Projected Average Travel Time Between Cities
(In Hours : Minutes)*

	Current Service	SEHSR Corridor (Full Build, S-Line Trains Only)
New York - Raleigh	9:57	7:25
Washington - Raleigh	5:59	4:22
Richmond - Raleigh	3:36	2:14
New York - Charlotte	13:25	10:16
Washington - Charlotte	9:27	7:14
Richmond – Charlotte	7:03	5:07
Raleigh – Charlotte	3:13	2:49

Source: "S-Line Trains Only" travel times are derived from the schedules used in the Southeast High Speed Rail Ridership Report, AECOM, 2013.
* Dwell times at station stops are included in the average travel time. Please note that travel times vary by time of day and direction; therefore, there may be slight differences in travel times between city pairs.

1.4.4.2 *OPERATING COSTS*

Operations on the Richmond to Raleigh Project must be considered within the context of service in the overall SEHSR Corridor. The operating expense projections for the SEHSR Corridor Tier I EIS applied cost factors developed by Amtrak's Intercity Business Unit for the state-supported service pricing model. Amtrak developed this model to assess the performance of and establish state-supported service pricing for individual routes. This model was developed after Section 403(b) of the Rail Passenger Service Act, which previously governed state-supported service pricing, was repealed as part of the Amtrak Reform and Accountability Act of 1997. The base year for all expenses was 1997, and they were inflated to 2000 dollars for the SEHSR Corridor Tier I EIS document using Amtrak inflation rates ranging from 3-5% annually.

For the SEHSR Corridor Tier I EIS, passenger ridership, passenger miles, and ticket revenue were forecast by KPMG (now AECOM Consult, Inc.), using the Southeast Corridor Model, which assumed constant 2000 dollars for two forecast years, 2015 and 2025. The projected operating expense of service in the SEHSR Corridor Tier I EIS between Washington, DC, and Charlotte, NC, was $81.7 million in the year 2015 and $83.75 million in the year 2025. It was projected to have a net operating income (revenues less operating and maintenance costs) of $13.9 million in the year 2015, and $ 21.6 million in the year 2025 (NCDOT and Virginia DRPT, 2002).

Updated cost and revenue information has been prepared for inclusion in this Richmond to Raleigh Project Tier II FEIS using more complete designs (including the Preferred Alternative for the Richmond to Raleigh Project), and revenue forecasts from the 2013 ridership and revenue model update. Operation and maintenance costs were updated for the proposed SEHSR Corridor service, which includes eight round trip trains as described in the SEHSR Corridor (Full Build) scenario in Section 1.5 below. The operating and maintenance costs for these trains are estimated at $193.6 million in 2030 and $263.2 million in 2040, with projected farebox revenues (including food and beverage) of $206.6 million in 2030 and $313.1 million in 2040 (Vanness Company, Inc., 2014).

Based on the updated estimates, the SEHSR Corridor service is projected to have a net operating income (revenues less operating and maintenance costs) of $22.6 million in 2030 and $62.1 million in 2040. It should be noted, however, that this income does not account for future required new or replacement capital investments (such as replacement locomotives). FRA develops Capital Asset Renewal (CAR) estimates to account for such future required investments using a forward-looking method that accounts for when the investments are likely to occur. The CAR estimate for the SEHSR Corridor service is approximately $16.8 million annually through 2040. Accounting for these additional costs results in estimated annual incomes (net operating income less capital investments) of $5.8 million in 2030 and $45.3 million in 2040. More details on these calculations are included in Appendix C.

1.5 PATRONAGE (RIDERSHIP AND REVENUE)

In order to meet the purpose and need for the Richmond to Raleigh Project, stations must be placed at reasonable intervals while still serving the population centers along the route. The SEHSR Corridor Tier I EIS outlined an operational model for proposed service consisting of four round trips per day between Washington, DC, and Charlotte, NC, and four additional round trips between Raleigh, NC, and Charlotte, NC. The service model established that SEHSR Corridor would serve all locations where Amtrak currently provides service. Within the Richmond to Raleigh Project Tier II EIS corridor, the cities of Richmond, VA, Petersburg, VA, and Raleigh, NC, are currently served by Amtrak's conventional passenger trains. Because all proposed stations outside of the Richmond to Raleigh Tier II EIS corridor currently have passenger rail service, there are no actions required outside of the corridor that would impact the ability of the Richmond to Raleigh Project to meet its purpose.

There is no existing passenger rail service within the SEHSR Corridor between Petersburg, VA, and Raleigh, NC, a distance of approximately 138 miles. The Richmond to Raleigh Project Tier II DEIS provided background on the decision that was made by Virginia DRPT and NCDOT subsequent to the SEHSR Corridor Tier I FEIS, to add two intermediate stations as "skip stops" between Petersburg, VA, and Raleigh, NC, to the SEHSR Corridor service. Skip stops ensure that all stations get a daily train, although every train does not stop at every station. Based on feedback from the public involvement process and on the size of the accessible population, Virginia DRPT and NCDOT determined that La Crosse (South Hill), VA, and Henderson, NC, were most suitable for intermediate stations with skip stops.

The ridership and revenue model that was updated in 2013 provides revised forecasts for passenger service in the SEHSR Corridor, and feeder line corridors in Virginia and North Carolina (AECOM 2013). Scenarios were also evaluated to anticipate the addition of further supporting services in both Virginia and North Carolina. Additional services for North Carolina included connecting service to Asheville, NC, and Wilmington, NC; additional services for Virginia included the Richmond to Hampton Roads Project service on the SEHSR Corridor through Richmond, VA and extending Lynchburg, VA service to Roanoke, VA and adding one additional round trip on that route on a parallel NS corridor west of the SEHSR Corridor. Refer to Appendix C for additional information from the update.

The assumptions for a Baseline ("No Build") and the SEHSR Corridor ("Full Build") scenarios used in the ridership and revenue 2013 update are described below:

Baseline (No Build) In summary, the Baseline consists of:

- Conventional service originating in North Carolina, providing five round trips between Raleigh, NC, and Charlotte, NC, with:
  - Four conventional round trips for the current Piedmont service operating solely between Raleigh, NC, and Charlotte, NC
  - One conventional round trip (the current Carolinian service) continuing into Virginia along the CSX A-Line via Selma, NC, to Richmond, VA, Washington, DC, and New York, NY.
- Conventional service originating in Virginia, providing five round trips between Hampton Roads, Richmond, VA, Washington, DC, and points north including:
  - Two round trips originating in Richmond, VA
  - Two round trips originating in Newport News, VA
  - One round trip originating in Norfolk, VA.
- Conventional service originating in Virginia on a parallel NS corridor west of the SEHSR Corridor, except for where it shares the SEHSR Corridor between Alexandria, VA and Washington, DC, including:
  - One round trip originating in Lynchburg, VA, through Alexandria, VA
- Conventional Amtrak Long Distance service originating in Georgia and Florida, providing four round trips that pass through Virginia and North Carolina, including:
  - One round trip Silver Star that would move to the SEHSR Corridor along the CSX S-Line Petersburg, VA, and Raleigh, NC
  - Two round trips of the Silver Meteor and Palmetto that would remain on the CSX A-Line between Petersburg, VA, Selma, NC, and continue to points south
  - One round trip of the Crescent that would remain on its current NS route west of the SEHSR Corridor, except between Alexandria, VA, and Washington, DC, where it shares the SEHSR Corridor.

SEHSR (Full Build) is a combination of the proposed service along with the baseline conventional service that is anticipated regardless of the project.

SEHSR (Full Build) is a combination of the proposed service associated with the implementation of the Richmond to Raleigh Project along with the baseline conventional service that is anticipated regardless of the Project. This scenario supplements the Baseline North Carolina trains with new SEHSR Corridor trains. Note that additional service along the Richmond to Hampton Roads SEHSR Corridor, as well as service to Asheville, NC, Wilmington, NC, and Roanoke, VA, were modeled separately as "Full Build with Additional Services." See Appendix C for details on those model results.

In summary and as shown in Figure 1-5, the SEHSR (Full Build) includes:

- SEHSR Corridor service originating in North Carolina, providing eight round trips between Raleigh, NC, and Charlotte, NC with:
  - Four new round trips continuing into Virginia along the CSX S-Line between Raleigh, NC, and Petersburg, VA, and then to Richmond, VA, Washington, DC, and New York, NY (three of which would originate in Charlotte, NC, and one in Raleigh, NC) – *these trains would use the Preferred Alternative presented in this Richmond to Raleigh Project Tier II FEIS*
  - Four round trips for the Baseline Piedmont service operating solely between Raleigh, NC, and Charlotte, NC

  - One round trip for the current Carolinian service continuing into Virginia along the CSX A-Line via Selma, NC, to Richmond, VA, Washington, DC, and New York, NY.
- SEHSR Corridor and conventional service originating in Virginia, providing five round trips between Hampton Roads, Richmond, VA, and Washington, DC, including:
  - Five round trips between Richmond, VA, Washington, DC, New York, NY, and Boston, MA, with two extending to Newport News, VA, and one extending to Norfolk, VA
- Conventional service originating in Virginia on a parallel NS corridor west of the SEHSR Corridor, but sharing the SEHSR corridor between Alexandria, VA and Washington, DC including:
  - One round trip originating in Lynchburg, VA through Alexandria, VA
- Four conventional Amtrak Long Distance round trips originating in Georgia and Florida, providing three round trips that pass through Virginia and North Carolina, as defined in the Baseline (No-Build) scenario, noting:
  - The Silver Star (one round trip) is assumed to reroute to the S-Line between Petersburg, VA, and Raleigh, NC (i.e., *one additional round trip conventional train on the Preferred Alternative presented in this Richmond to Raleigh Project Tier II FEIS*).

Table 1-4 shows the proposed service (round trips) for the Baseline ("No Build") and SEHSR Corridor ("Full Build") scenarios. Table 1-5 shows the updated ridership and ticket revenue forecasts for Baseline ("No Build") and SEHSR Corridor ("Full Build") scenarios for design year 2030, and a SEHSR Corridor ("Full Build") scenario forecast for the year 2040. Current Amtrak fares were used in the analysis; however 25% higher fares were assumed for the faster SEHSR Corridor service.

Figure 1-5

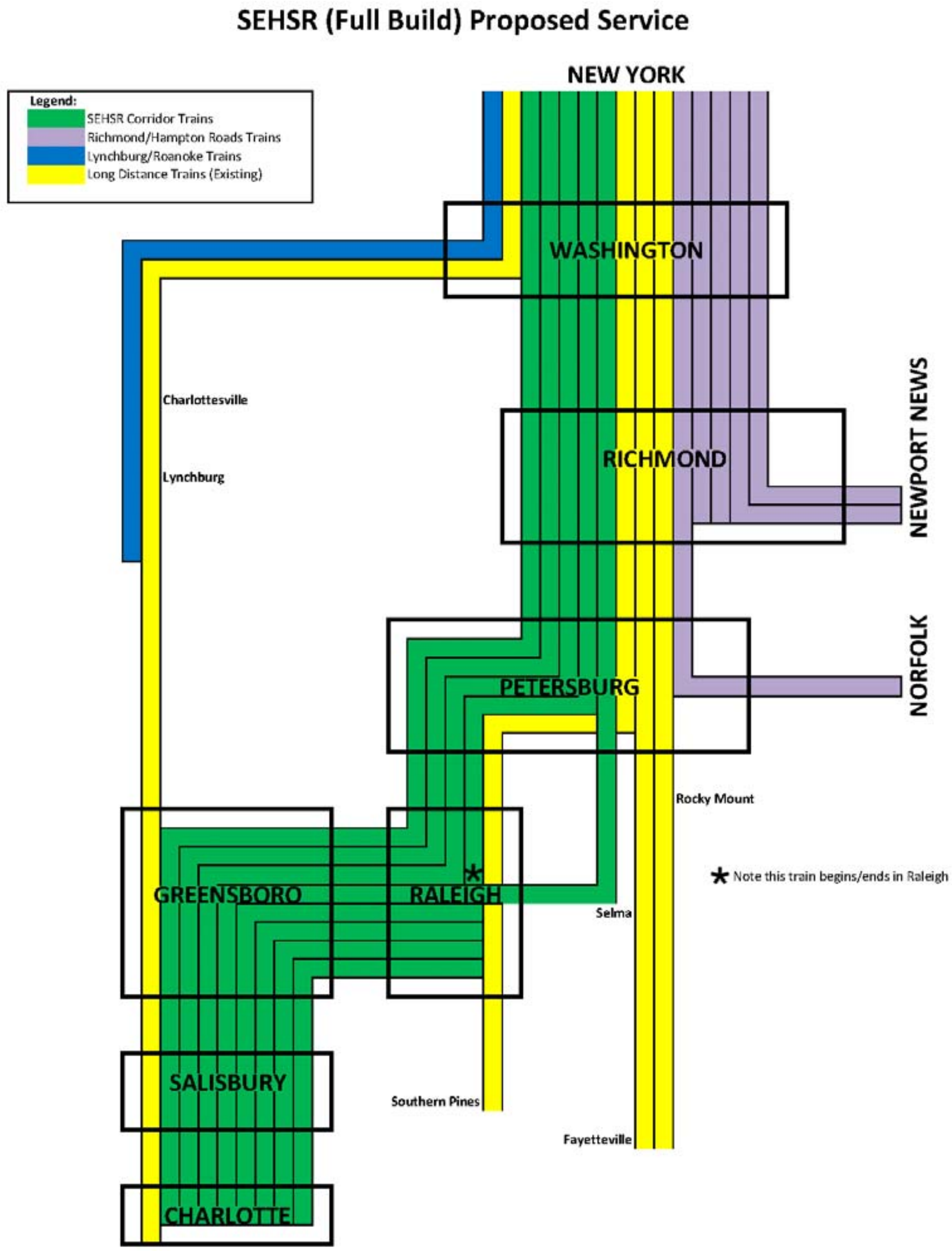

SEHSR (Full Build) Proposed Service
Legend:
SEHSR Corridor Trains
Richmond/Hampton Roads Trains
Lynchburg/Roanoke Trains
Long Distance Trains (Existing)
NEW YORK
WASHINGTON
Charlottesville
Lynchburg
RICHMOND
NEWPORT NEWS
PETERSBURG
NORFOLK
Rocky Mount
GREENSBORO
RALEIGH
Note this train begins/ends in Raleigh
Selma
SALISBURY
Southern Pines
Fayetteville
CHARLOTTE

Table 1-4
Proposed Service - Number of Round Trips

	Service	Route[1]	Baseline No Build	SEHSR Full Build[2]
Trains Originating in North Carolina				
Raleigh-Charlotte (Intrastate)	*Piedmont*	NS/NCRR	4	4
Washington-Raleigh-Charlotte	*Carolinian*	CSX A-Line	1	1
Washington-Raleigh	*SEHSR Corridor*	CSX S-Line	-	1
Washington-Raleigh-Charlotte			-	3
		Subtotal:	**5**	**9**
Trains Originating in Virginia				
Washington-Richmond	*NEC Regional*	CSX A-Line	2	2
Washington-Richmond-Newport News		CSX A-Line	2	2
Washington-Richmond-Norfolk		CSX A-Line	1	1
Washington-Alexandria-Lynchburg		NS-Crescent	1	1
		Subtotal:	**6**	**6**
Amtrak Long Distance Service[3]				
Washington-Richmond-Points South	*Palmetto Silver Meteor*	CSX A-Line	2	2
Washington-Richmond-Raleigh-Points South	*Silver Star*	CSX A-Line	1	-
		CSX S-Line	-	1
Washington- Alexandria-Lynchburg-Charlotte-Points South	*Crescent*	NS-Crescent	1	1
		Subtotal:	**4**	**4**
		Total Trains:	**15**	**19**

Source: Southeast High Speed Rail Ridership, AECOM, 2013

1. Trains operating on the CSX S-Line route follow the CSX A-Line in Virginia between Centralia and Collier Yard.

2. The "Full Build" scenario does not include the full implementation of the Richmond-Hampton Roads project. Those trains were modeled separately as "Full Build with Additional Services" in the ridership and revenue assessment. See Appendix C for more information.

3. These do not include the Amtrak auto-train, which travels through Virginia and North Carolina, but does not influence ridership and revenue estimates.

As described above, the Baseline ("No Build") reflects current service plus two new planned frequencies between Charlotte and Raleigh. In comparison, the SEHSR ("Full Build") ***supplements*** these Baseline North Carolina trains with four new SEHSR Corridor trains utilizing the proposed SEHSR Corridor improvements (i.e., along the CSX S-Line between Petersburg, VA and Raleigh). Table 1-5 shows that ridership and ticket revenue forecasts increase significantly with the SEHSR Corridor service. The analysis showed that ridership associated with the North Carolina trains increases to more than twice the Baseline, and ticket revenue associated with the North Carolina trains increases more than three-fold. These higher increases in ticket revenue reflect the greater level of improvement through increased frequency and the significantly faster travel times offered by the proposed SEHSR Corridor improvements along with 25% higher fares charged for the improved service. A comparison of how the SEHSR Corridor service compares to other modes of transportation is presented in Table 1-6.

Table 1-5
Summary of Forecast Results

	Base Line[1] (No Build)	SEHSR Corridor[3] (Full Build)	SEHSR Corridor[3] (Full Build)
	Year 2030	**Year 2030**	**Year 2040**
Ridership			
North Carolina Service			
Charlotte/Raleigh Trains	996,100	2,075,500	2,526,900
Virginia Service			
Richmond/Norfolk/Virginia Beach Trains	808,300	805,600	911,100
Lynchburg Trains	241,300	261,600	301,200
Amtrak Long Distance Trains[2]	241,900	241,900	282,400
Total Ridership	2,287,600	3,384,600	4,021,600
Ticket Revenue (2013 dollars)			
North Carolina Service			
Charlotte/Raleigh Trains	$39,034,000	$138,667,000	$165,575,000
Virginia Service			
Richmond/Norfolk/Virginia Beach Trains	$45,947,000	$57,799,000	$64,867,000
Lynchburg Trains	$15,070,000	$16,474,000	$18,825,000
Amtrak Long Distance Trains[2]	$30,474,000	$30,460,000	$35,277,000
Total Ticket Revenue	$130,525,000	$243,400,000	$284,544,000

Source: Southeast High Speed Rail Ridership, AECOM 2013

1. Baseline (No Build): NC service includes 5 round trips Raleigh to Charlotte, w/1 round trip (the Carolinian) continuing to NY via the A-Line. VA service includes 6 round trips that begin/end in Virginia including 5 round trips Rich to NY/Boston, w/ 2 extending to/from Newport News and 1 extending to/from Norfolk, and 1 round trip Lynchburg to NY/Boston; and 4 round trips provided by Amtrak Long Distance trains that pass though NC and VA

2. Activity from NEC through NC only; includes connecting buses. Activity from NEC through NC only; includes connecting buses

3. Full Build scenarios include SEHSR Corridor service for 8 round trips Raleigh to Charlotte, w/3 continuing to NY, and 1 starting in Raleigh and continuing to NY; and 1 (the Carolinian) beginning in Charlotte continuing to NY via the CSX A-Line. Note that additional service associated with the Richmond-Hampton Roads project was modeled separately.

Table 1-6
Transportation Mode Comparison

Travel Corridor	Current / Proposed Travel Mode	Full Cost[1] / Incremental Cost[2] ($)	Line-Haul Travel Time[3] (HH:MM)	Access/ Egress/ Terminal Time[4] (HH:MM)	Service Reliability
Washington to Richmond	Automobile	$ 60/15	02:30	00:00	NA
	Bus	$ 35	03:00	01:40	NA
	Airlines	$ 276	01:49	02:30	67 %
	Rail – conventional	$ 32	02:18	01:50	83 %
	Rail – SEHSR Corridor	$ 40	02:04	01:50	90 %
Richmond to Raleigh	Automobile	$ 102/23	02:43	00:00	NA
	Bus	$ 30	04:00	01:30	NA
	Airlines	$ 233	01:53	02:20	80 %
	Rail – conventional	$ 46	03:36	01:40	74 %
	Rail – SEHSR Corridor service	$ 58	02:26	01:40	90 %
Raleigh to Charlotte	Automobile	$ 91/20	03:16	00:00	NA
	Bus	$ 35	04:00	01:30	NA
	Airlines	$ 163	02:39	02:20	83 %
	Rail – conventional	$ 31	03:13	01:40	73 %
	Rail – SEHSR Corridor	$ 39	02:49	01:40	90 %

Source: Transportation Mode Comparison Table Transmittal, AECOM June, 2014 (see Appendix C)

[1] Internal Revenue Service (IRS) 2014 business trip mileage rate of 55 cents per mile includes gasoline, deductible cost of automobile usage, depreciation, and insurance.
[2] IRS 2014 non-business rate of 15 cents per mile includes gasoline only.
[3] Line-Haul measures time spent on the main travel vehicle (i.e. does not include travel to/from the station).
[4] Includes time for both ends of a trip (i.e. time travel to/from the station).

1.6 NEED FOR THE PROPOSED PROJECT

This section is largely unchanged from the Richmond to Raleigh Project Tier II DEIS as the need for the SEHSR Corridor improvements was established in the Tier I EIS. However, in response to comments on the Richmond to Raleigh Project Tier II DEIS related to the Richmond to Raleigh Project's purpose and need, a new section has been added to this FEIS with updated data and information. Refer to Section 1.8 of this chapter for updated information related to the overall purpose and need for the SEHSR Corridor improvements.

The Tier I EIS for the SEHSR Corridor between Washington, DC, and Charlotte, NC, established the overall need for the SEHSR Corridor project:

- Growth – Population and economic growth rates in Virginia and North Carolina have been higher than national averages over the past several decades and are projected to remain high over the next few decades. If transportation systems do not provide options for reliable and convenient movement of goods and people, the region's economy will suffer.

- Congestion – Population growth and economic development have led to increasing vehicle use on interstates and major highways in the region, as well as increasing demand for air travel. The majority of intercity automobile travel in the Washington, DC, to Charlotte, NC, travel corridor utilizes I-85 and I-95, where daily traffic volumes regularly exceed design capacities. Airport congestion in the corridor has resulted in growing delays. This Raleigh to Richmond Project encompasses portions of both I-95 and I-85, as well as the airports of Richmond, VA and Raleigh, NC.
- Travel Time – Currently, within the SEHSR Corridor, conventional passenger rail travel times are not competitive with travel by airplane or auto. If meaningful reductions in travel time and improvements to equipment are achieved, modeling indicates that the competitiveness of rail passenger service will increase, and travelers will divert from other modes of transportation.
- Connectivity – Implementation of HSR service could enhance regional connectivity. VA and NC have both evaluated the feasibility of adding conventional passenger train service to eastern and western portions of the states. The proposed SEHSR Corridor service would serve as the spine to these added routes, allowing conventional rail service passengers to connect to the proposed SEHSR Corridor service and other points in the Northeast, Southeast, and beyond. The Richmond to Raleigh Project section of the SEHSR Corridor enhances the connectivity through greatly enhanced speed, reliability, and reductions in travel time.
- Air Quality – A number of counties within the SEHSR Corridor are presently experiencing air quality impacts from mobile source emissions. The movement of passengers by HSR offers significantly less pollution per passenger mile traveled than other mobile sources. Diverting some of the traveling public from automobiles to trains will aid in reducing emissions throughout the Corridor.
- Safety – For SEHSR Corridor service to divert travelers from other transportation modes, potential riders must have confidence that the service is not only fast and reliable, but as safe as or safer than other modes. Rail has a safety record similar to air travel, and rail has proven exponentially safer than automobile travel. Figures from the National Safety Council show that Amtrak experienced .04 fatalities per 100 million passenger miles, while automobile fatalities equaled 1.29 fatalities per 100 million passenger miles. Virginia DRPT and NCDOT have been working in their respective states to improve safety along active rail lines within the SEHSR Corridor since the 1990's.
- Energy Efficiency – Additional rail improvements could also result in less energy use and a corresponding decrease in pollution within the SESHR Corridor. Intercity rail is 45% more energy-efficient than domestic commercial airline service and 76% more energy-efficient than general aviation. These numbers reflect Amtrak equipment in use in 1994 - both fossil fuel and electric - and represent BTUs/passenger mile as compared with air travel. As well, passengers traveling by rail use 21% less BTUs per mile on average than those traveling by automobile.

Passengers traveling by rail use 21% less BTUs per mile on average than those traveling by automobile

The Richmond to Raleigh Project proposed improvements address all of the above needs because they would result in a shorter trip with improved connectivity and safer operation for the entire Washington, DC, to Charlotte, NC, SEHSR Corridor. More information about the need for the SEHSR Corridor can be found in the 2002 SEHSR Corridor Tier I EIS and on the program's website at www.sehsr.org.

1.7 PURPOSE OF THE PROPOSED RICHMOND TO RALEIGH PROJECT

This section is largely unchanged from the Richmond to Raleigh Project Tier II DEIS as the purpose of the improvements to the SEHSR Corridor was established in the Tier I EIS. However, in response to comments on the Richmond to Raleigh Project Tier II DEIS related to the Richmond to Raleigh Project's purpose and need, a new section has been added to this FEIS with updated data and information. Refer to Section 1.8 for updated information related to the overall purpose and need for the SEHSR Corridor improvements.

The Richmond, VA, to Raleigh, NC, portion of SEHSR is an integral part of the overall Washington, DC, to Charlotte, NC, SEHSR Corridor. It constitutes 162 miles of the approximately 450-mile SEHSR Corridor that was evaluated in the 2002 Tier I EIS. The purpose for the segment from Richmond, VA to Raleigh, NC is tied to implementation of the larger SEHSR Corridor. Therefore, the purpose of the Richmond to Raleigh Project proposed action is to facilitate the previously approved purpose for the SEHSR Corridor Tier I EIS, which includes the following and is applicable to the Richmond to Raleigh Project section:

- Divert trips from air and highway within the travel corridor, thus reducing the growth rate of congestion (the I-95 portion of the corridor is included in this Richmond to Raleigh Project section and it carries a significant portion of the automobile traffic)
- Provide a more balanced use of the travel corridor's transportation infrastructure
- Increase the safety and effectiveness of the transportation system within the travel corridor
- Serve both long-distance business and leisure travelers between and beyond Virginia and North Carolina, including Amtrak's Northeast Corridor, which extends from Washington, DC, to Boston, MA (with extensions planned beyond Boston), as well as points south (this specific project section serves as the key link for these travelers to the busy Northeast).

More information about the purpose of the SEHSR Corridor can be found in the 2002 SEHSR Corridor Tier I EIS and on the program's website at www.sehsr.org.

1.8 UPDATED PROJECT NEED DATA

As noted above, the Tier I EIS and ROD for the SEHSR Corridor between Washington, DC and Charlotte, NC, established the overall need for the project. This approved need was summarized in the Richmond to Raleigh Project Tier II DEIS, and is repeated in Section 1.6 of this FEIS. In response to the comments and questions received on the Richmond to Raleigh Project Tier II DEIS, updated and additional information about the need for the SEHSR Corridor project is presented in this section. This expanded discussion with more recent data shows that the needs initially demonstrated in the SEHSR Corridor Tier I EIS more than 10 years ago are still present, and re-confirms and substantiates the conclusions made in the SEHSR Corridor Tier I EIS/ROD and Richmond to Raleigh Project Tier II DEIS documents.

1.8.1 GROWTH

The US population is growing rapidly, from 280 million people in 2000 to a projected 364 million in 2030. At the same time, the US population is aging. By 2030, the population of those over 65 years of age is expected to double to 70 million (USDOT, RITA, 2008). In order to go about their daily lives, the aging population may increasingly look to efficient alternatives to motor vehicle transportation, as discussed in the sections below.

1.8.1.1 POPULATION

As shown in Table 1-7, since 1970, population growth rates in Virginia and North Carolina have been higher than the national average. Between 1960 and 2010, the population of Virginia has increased 102% and the population of North Carolina has increased 110%, while the US population increased by 72%. And even with the recent recession, population growth rates in Virginia and North Carolina are projected to remain substantially higher than the US as a whole over the next two decades.

Population growth in VA and NC has been higher than the national average since 1970. Between 1960 and 2010, the population of VA increased 102%, and the population of NC increased 110%, while the U.S. population increased by 72%.

Table 1-7 also shows the 10 year growth rates for the counties and independent cities in the Richmond to Raleigh Project study area. Although many of the counties have shown highly fluctuating growth rates, most of the urban areas continue to show positive growth, with Chesterfield, Dinwiddie, Franklin and Wake Counties showing the greatest growth, with the City of Richmond and the more rural counties (e.g. Brunswick, Mecklenburg, and Warren Counties) showing the slowest growth rates.

1.8.1.2 DEPENDENCY

Dependency is defined as the ratio of the dependent-age population (young or old) to the working-age population. This ratio is the total population of young (under age 20) and old (65 and older) divided by the age of the caretaking population (ages 24 to 64). As demonstrated in Table 1-8, the dependency ratios in North Carolina and Virginia between 2000 and 2010 were less than the US averages. Consistent with the nationwide trend, this table shows that both North Carolina and Virginia have been gaining a greater percentage of old-age dependents as the baby boomers continue to age and retire. The ratio of dependent youth has decreased slightly between 2000 and 2010, but is expected to increase above current levels in the coming decades.

NC and VA project significant increases in the under-20 and over-65 populations between now and 2050. Fewer working age people will be taking care of more dependents, and a greater percentage of the population may depend on others for transportation.

As shown on Figure 1-6, by the year 2050, the youth and old-age dependency ratios nationally are projected to stabilize at 48 and 37, respectively, but not before reaching a total dependency ratio of 85, a 37% increase in overall dependency from 2000. Following this national trend, North Carolina and Virginia are projected to experience significant increases in the under 20 and over-65 populations between now and 2050. This means that fewer and fewer working age people will be taking care of even more dependents in the coming decades, and a greater percentage of the population may be dependent on others for their transportation needs. As discussed further in Section 3.11.1.3, the increase in the over-65 population is especially significant because of the increased mobility within this age group and the resulting increase in demand this will place on public transportation alternatives.

Table 1-7
Population Change / 10 Year Growth Rates

	Census Population Estimates						Population Projections	
	1960(2)	**1970(2)**	**1980(2)**	**1990(2)**	**2000(1)(5)**	**2010(3)**	**2020(1)(4)**	**2030(1)(4)**
UNITED STATES	179,323,175	203,211,926	226,545,805	248,709,873	281,421,906	308,745,538	**335,804,546**	**363,584,435**
		13.3%	11.5%	9.8%	13.2%	9.7%	8.8%	8.3%
Virginia	**3,966,949**	**4,648,494**	**5,346,818**	**6,187,358**	**7,078,515**	**8,001,024**	**8,917,396**	**9,825,019**
		17.2%	**15.0%**	**15.7%**	**14.4%**	**13.0%**	**11.5%**	**10.2%**
Richmond City	219,958	249,621	219,214	203,056	197,790	204,214	187,066	187,066
		13.5%	-12.2%	-7.4%	-2.6%	3.2%	-8.4%	0.0%
Chesterfield County	71,197	76,855	141,372	209,274	259,903	316,236	372,532	430,266
		7.9%	83.9%	48.0%	24.2%	21.7%	17.8%	15.5%
Colonial Heights City	9,587	15,097	16,509	16,064	16,897	17,411	19,204	20,454
		57.5%	9.4%	-2.7%	5.2%	3.0%	10.3%	6.5%
Petersburg City	36,750	36,103	41,055	38,386	33,740	32,420	30,734	30,730
		-1.8%	13.7%	-6.5%	-12.1%	-3.9%	-5.2%	0.0%
Dinwiddie County	22,183	25,046	22,602	20,960	24,533	28,001	33,075	37,563
		12.9%	-9.8%	-7.3%	17.0%	14.1%	18.1%	13.6%
Brunswick County	17,779	16,172	15,632	15,987	18,419	17,434	18,258	18,258
		-9.0%	-3.3%	2.3%	15.2%	-5.3%	4.7%	0.0%
Mecklenburg County	31,428	29,426	29,444	29,241	32,380	32,727	32,511	32,755
		-6.4%	0.1%	-0.7%	10.7%	1.1%	-0.7%	0.8%

	Census Estimates						Population Projections	
	1960[2]	**1970[2]**	**1980[2]**	**1990[2]**	**2000([1][5]**	**2010[3]**	**2020[1][4]**	**2030[1][4]**
North Carolina	**4,556,155**	**5,082,059**	**5,881,766**	**6,628,637**	**8,081,986**	**9,535,483**	**10,616,077**	**11,631,895**
		11.5%	**15.7%**	**12.7%**	**21.9%**	**18.0%**	**11.3%**	**9.6%**
Warren County	19,652	15,810	16,232	17,265	19,900	20,972	20,783	20,557
		-19.6%	2.7%	6.4%	15.3%	5.4%	-0.9%	-1.1%
Vance County	32,002	32,691	36,748	38,892	43,155	45,422	46,922	48,441
		2.2%	12.4%	5.8%	11.0%	5.3%	3.3%	3.2%
Franklin County	28,755	26,820	30,055	36,414	47,636	60,619	72,701	84,586
		-6.7%	12.1%	21.2%	30.8%	27.3%	19.9%	16.3%
Wake County	169,082	228,453	301,327	423,380	633,333	900,993	1,099,385	1,292,106
		35.1%	31.9%	40.5%	49.6%	42.3%	22.0%	17.5%

(1) NC Office of State Budget and Management, County/State Population Estimates and Projections. http://www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/county_projections.shtm

(2) US Census Bureau, County Population Census Counts 1900-90. http://www.census.gov/population/www/censusdata/cencounts/files/nc190090.txt

(3) US Census Bureau, 2010 Census Interactive Population Search. http://www.census.gov/2010census/

(4) Virginia.gov Virginia Workforce Connection, LMI Data, Population Projections. http://www.vawc.virginia.gov/gsipub/index.asp?docid=359

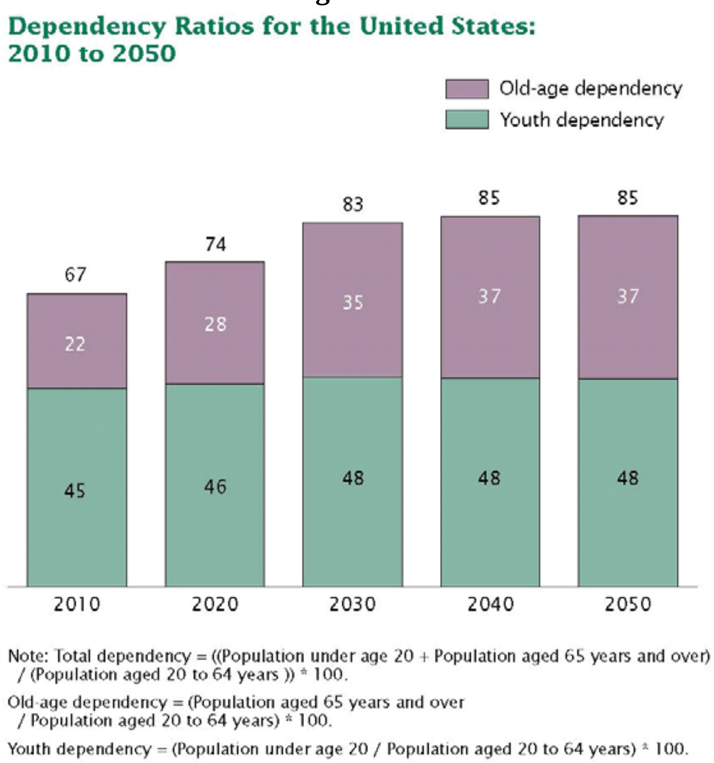
(5) US Census Bureau, PCT001-POPGROUP-Total population; Census 2000 Summary File 1 (SF 1) 100-Percent Data Virginia http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_00_SF1_P001&prodType=table

Table 1-8
Age Dependency Ratios

	2000 Census Estimate			2010 Census Estimate		
	Total	**Youth**	**Old-Age**	**Total**	**Youth**	**Old-Age**
US	61.6	41.5	20.1	58.9	38.2	20.7
VA	55.6	38.2	17.4	54.7	35.9	18.9
NC	57.3	38.4	19.0	58.4	37.9	20.5

NOTES: See Figure 1-6 for definitions. The year 2010 data in Figure 1-6 does not precisely match the 2010 data in Table 1-8, as Figure 1-6 was created using projection data from 4 years prior to the Census results presented in Table 1-8. Also, the projections in Figure 1-6 were based on pre-recession growth rates. Source: US Census Bureau, 2011. Table GCT-T6-R.

Figure 1-6



Source: US Census Bureau, 2010.

1.8.1.3 *ECONOMIC GROWTH*

Based on data from projections of long-term economic growth, Virginia and North Carolina are estimated to have higher than average job growth through 2022 (projections.com, 2015).

Socio-economic characteristics represent the key independent variables in forecasting growth in total travel volumes, irrespective of change in the level of service provided by competing travel modes. The three socio-economic indicators used to estimate travel growth include:

- Population
- Employment
- Per-capita Income

Socio-economic data and forecasts for the updated ridership and revenue forecasts were obtained from AECOM's national vendor, Moody's Economy.com; which provides the forecasting data at annual intervals up to 2040 by county (AECOM, 2013). These county-level forecasts were allocated to sub-county zones, were such geographic detail exists, using US 2010 Census data. Growth in population, employment, and per-capita income are forecast for all the major markets in the SEHSR Corridor. Table 1-9 shows growth forecasts for the year 2030 from the updated ridership/revenue report for selected markets in the SEHSR Corridor. Overall growth rates and annualized growth rates are also shown.

Table 1-9
Population, Employment, and Per-Capita Income Forecasts

Selected Markets	Year 2012	Year 2030	Overall Growth Rate	Annualized Growth Rate
Population (in thousands)				
Charlotte Metro, NC, Rockingham, SC	2,313	3,339	44.36%	2.06%
Raleigh Metro, Henderson, Durham, Chapel Hill, NC	2,016	2,890	43.35%	2.02%
Richmond Metro, VA	1,407	1,644	16.84%	0.87%
Washington Metro, DC, VA, MD, WV	5,652	6,793	20.19%	1.03%
Employment (in thousands)				
Charlotte Metro, NC, Rockingham, SC	1,000	1,387	38.70%	1.83%
Raleigh Metro, Henderson, Durham, Chapel Hill, NC	902	1,271	40.91%	1.92%
Richmond Metro, VA	665	776	16.69%	0.86%
Washington Metro, DC, VA, MD, WV	2,994	3,521	17.60%	0.90%
Per Capita Income				
Charlotte Metro, NC, Rockingham, SC	$33,952	$38,337	12.92%	0.68%
Raleigh Metro, Henderson, Durham, Chapel Hill, NC	$34,230	$40,870	19.40%	0.99%

Table 1-9
Population, Employment, and Per-Capita Income Forecasts

Selected Markets	Year 2012	Year 2030	Overall Growth Rate	Annualized Growth Rate
Richmond Metro, VA	$36,248	$46,161	27.35%	1.35%
Washington Metro, DC, VA, MD, WV	$51,289	$66,480	29.62%	1.45%

1.8.2 CONGESTION

Congestion results when traffic demand approaches or exceeds the available capacity of the system. While this is a simple concept, it is not constant. Traffic demands vary significantly depending on the season of the year, the day of the week, and even the time of day. Also, the capacity, often mistaken as constant, can change because of weather, work zones, traffic incidents, or other non-recurring events (FHWA, 2012).

Both job and population growth have burdened the Virginia and North Carolina airport and highway networks that provide for intercity travel between Richmond and Raleigh, which are experiencing capacity problems that are projected to worsen, despite planned improvements, as detailed in the following subsections. Population trends such as migration from rural to urban areas and aging and more dependent populations also puts additional and unique burdens on the transportation network.

Job and population growth have burdened the VA and NC airport and highway networks between Richmond and Raleigh.

The Richmond, VA to Raleigh, NC intercity travel corridor includes interstate highways I-85 and I-95, as well as the airspace between the Raleigh-Durham (RDU) and Richmond (RIC) international airports. The travel corridor does not include the entire metropolitan areas around Richmond, VA and Raleigh, NC, or the entirety of each county through which the Richmond to Raleigh Project corridor passes. Within this intercity corridor, traffic consists of both intercity travelers who focus their travel on the interstates, as well as local and regional travelers who may use a portion of the interstate for a portion of their trip, but mostly use local arterials and collectors. Although congestion on this intercity corridor may be composed of all three traveler types (i.e., intercity, local and regional), the method of managing this congestion will be different for each travel type. For example, local and regional traffic is mostly composed of commuters who contribute to peak travel congestion because of similar work schedules and who may benefit from improved traffic signalization on arterials and carpool lanes on highways or additional roadway lanes. However, these improvements will not benefit intercity travelers, who are composed mostly of business and leisure travelers, who may be traveling alone. While these travelers also could benefit in the short term from more roadway lanes (where feasible), they are mostly benefitted in the long term by the provision of high capacity public or private transportation options that provide an alternative to driving on the interstates altogether (e.g., airplanes, passenger rail).

Rapid population growth in VA and NC has caused congestion on the transportation network.

Rapid population growth in Virginia and North Carolina has caused congestion on the existing and proposed transportation network. This growth also causes strains on the natural and human environment, and makes it increasingly difficult to increase the capacity of the existing transportation network with an acceptable level of negative impacts. Congestion also decreases safety and reliability on the existing network, while increasing energy consumption and travel times.

As travel demand grows, intercity transportation by air and auto increasingly suffers from congestion and delay, particularly within already congested areas, including metropolitan areas, at and around airports, and during weekend, holiday, and bad weather periods. This congestion causes declining quality of service, which adversely affects intercity travelers, other transportation system users, carriers, the general public, and eventually the economic development of a region. If Virginia and North Carolina's transportation systems do not provide efficient options for reliable and convenient movement of goods and people both between cities as well as within metropolitan areas themselves, the economies of the region will suffer.

1.8.2.1 *AIR TRANSPORTATION*

As evaluated in the 1997 High Speed Ground Transportation Commercial Feasibility Study on the SEHSR Corridor (detailed in Section 1.1.2.2), domestic intercity air travel nationally and in the travel corridor has grown much faster than population and income since 1950. For example, between 1980 and 2005, domestic enplanements (e. g., number of passengers flying on domestic flights) increased from 275 million to 657 million (USDOT, RITA, BTS, 2010). With this expansion, air traffic has far outpaced the growth of airport capacity, which has resulted in the growth of airline flight delays.

According to the Federal Aviation Administration (FAA), delays in the air traffic control system are registered when flights are delayed 15 minutes or longer. As shown in Table 1-10, current data indicate that prior to the economic decline in 2006-2007, flight delays had reached a peak of 36-40% in Richmond and 31-35% in Raleigh, both of which were higher than the national average of 23-24%. The average flight delay was 54-56 minutes during this peak. As shown in Table 1-10, almost all delays are related to issues with the carrier, national aviation system, security or an aircraft arriving late (all affected by constraints to system capacity), and not due to extreme weather.

> Prior to the economic decline in 2006-2007, flight delays had reached a peak of 36-40% in Richmond and 31-35% in Raleigh, both of which were higher than the national average of 23-24%.

Although the percentage of delayed flights had decreased during the 2008-2012 recession, this was related to a decrease in the total number of flights, rather than improved operational performance, with the total number of scheduled flights decreasing from a peak of 7.5 million in 2007 to 6.5 million in 2009 (USDOT, RITA, BTS, 2010). Without substantial improvements in airport capacity, it is anticipated that flight delays will return to pre-recession rates with improvement to the economy in the next 5-10 years.

Flight delays substantially affect operating costs; in 1994, FAA estimated this cost to average $1,587 per hour of delay. Other costs of aircraft delays include environmental impacts of noise and emissions, as well as effects on passengers who increasingly spend more time waiting for delayed flights than actually traveling to their destinations, which affects both leisure and business travelers (including the cost of missed work, meetings, connections and business opportunities). Even with plans to increase capacity by building new airports and

> The FAA considers HSR to be a means of relieving pressure on short-haul air traffic by diverting air trips of 500 miles or less.

expanding and extending runways, the FAA determined that improvements alone would not adequately meet the projected growth in demand at many of the larger metropolitan airports on the East and West Coasts, including Washington-Dulles, Washington National, Raleigh-Durham and Charlotte-Douglas, which are considered "problem airports" with more than 20,000 airline flight delay-hours per year. The FAA considers HSR, including the SEHSR Corridor, to be a potential means of relieving the pressure on short-haul air traffic by diverting air trips of 500-miles or less (USDOT, FRA, 1997).

Table 1-10
Airline Delays

Year	% of Flights Delayed			National Average		
	Richmond	Raleigh	National Average	Total Passenger Flights (thousands)	Ave Minutes of Delay	% Delay Minutes NOT Weather Related
2003	22%	25%	n/a	n/a	n/a	n/a
2004	29%	30%	20%	7,129	51	93%
2005	33%	32%	21%	7,141	52	94%
2006	40%	35%	23%	7,142	54	94%
2007	36%	31%	24%	7,455	56	94%
2008	33%	30%	22%	7,008	57	95%
2009	27%	24%	19%	6,450	54	97%
2010	29%	27%	n/a	n/a	n/a	n/a
2011	29%	25%	n/a	n/a	n/a	n/a
2012*	31%	26%	n/a	n/a	n/a	n/a

Note: * = Through June 2012
Sources: State statistics from USDOT, RITA, 2012. National averages from USDOT, RITA, BTS, 2010 (Table 4-30).

1.8.2.2 *HIGHWAY TRANSPORTATION*

Between 1980 and 1999, the miles of highways in the US increased 1.5% while vehicle miles of travel increased 76%. As shown in Figure 1-7, between 2000 and 2010, the US population increased 10%, while the vehicle-miles traveled increased by 19%. Both measurements reflect a consistent trend in modern America - automobile use continues to expand faster than the rate of population growth, and construction of new highway capacity cannot keep pace with growth in travel demand. These are both signs that roadway congestion will continue to pose a problem for future urban transportation systems.

In 2005, the urban congestion problem in the US (i.e., congestion in 439 metropolitan areas) resulted in 4.2 billion hours of travel delay, 2.9 billion gallons of wasted fuel, and a net urban congestion cost of nearly $80 billion (USDOT, RITA, 2008). In just five years (by 2010), the Texas A&M Transportation Institute estimated that this urban travel delay had increased by 14% to 4.8 billion hours. And, although vehicle-miles traveled had increased by 6%, increases in automotive fuel efficiency had reduced the amount of wasted fuel by 34% to only 1.9 billion gallons (Texas A&M Transportation Institute, 2012). However, the total cost of this congestion had increased by 26%, to $101 billion, reflecting the exceptionally high price of gasoline during this time.

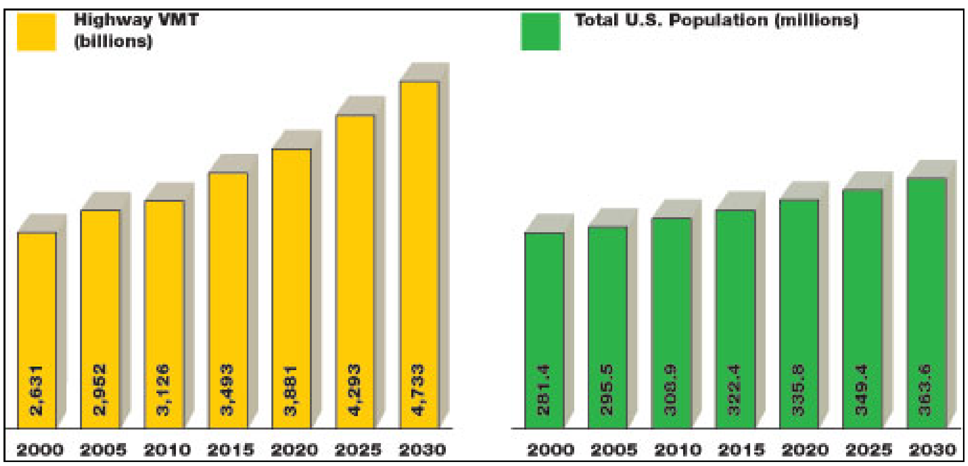
According to the 2010 FHWA Vehicle Miles of Travel Report (FHWA, 2012a), total vehicle miles traveled has been slightly declining over the past several years. As shown in Figure 1-7, per capita highway vehicle miles traveled (VMT) are projected to grow 60%, from 2,952 billion miles traveled in 2005 to 4,733 billion miles traveled by 2030. The volume of freight movement is also forecast to nearly double by 2020 (USDOT, RITA, 2008). According to the USDOT, transit use in the top 50 urbanized areas of the United States has been increasing (USDOT, 2012). During this period, Automobile ownership in the United States has also declined (University of Michigan, 2013).

Per capita highway VMT are projected to grow 60%, to 4,733 billion miles traveled by 2030. The volume of freight movement is also forecast to nearly double by 2020.

Congestion trends for the Richmond, VA, and Raleigh, NC, metropolitan areas between 1985 and 2010 are shown in Tables 1-11 and 1-12. While the numbers of peak commuters in Richmond, VA increased by only 98% between 1985 and 2010, the number of lane miles increased by 108% and the volume of VMT increased by 182%, leading to a 154% increase in congested travel, a 300% increase in the annual number of hours stuck in delays, and a 558% increase in the congestion cost paid by each commuter. Over the same 25 year period in Raleigh, NC peak commuters increased by 265% and the number of lane miles increased by 148% and the volume of VMT increased by 238%, leading to a 188% increase in congested travel, a 178% increase in the annual number of hours stuck in delays, and a 333% increase in the congestion cost paid by each commuter.

Figure 1-7

US Population and Highway Vehicle Miles Traveled (VMT) 2000–2030



Sources: U.S. Department of Energy/Energy Information Administration
U.S. Census Bureau

Source: USDOT, RITA, 2008. Page 6.

Table 1-11
1985 – 2010 Mobility Data for Richmond, VA
(from the Texas A&M Transportation Institute annual Urban Mobility Report)

	1985	1990	1995	2000	2005	2010
Inventory Measures						
Peak Travelers (1000s)	272	310	347	408	500	539
Peak Commuters (1000s)	255	291	326	383	468	505
Total Daily Vehicle-Miles of Travel (1000s)	7,640	11,285	15,340	17,625	21,440	21,550
Total Freeway & Arterial Lane-Miles	1,600	1,900	2,260	2,750	3,245	3,321
System Performance						
Congested Travel (% of peak VMT)	13%	19%	26%	23%	28%	33%
Congested System (% of lane-miles)	22%	30%	28%	30%	30%	36%
Congested Time (number of "Rush Hours")	N/A	N/A	N/A	N/A	N/A	2.50 hrs
Annual Delay (1000s of person-hours) / Rank	2,087 hrs / 66	3,862 hrs / 60	8,348 hrs / 51	7,457 hrs / 63	11,137 hrs / 59	13,800 hrs / 53
Annual Delay per Peak Auto Commuter (pers-hr) / Rank	5 hrs / 75	8 hrs / 73	16 hrs / 62	13 hrs / 88	17 hrs / 83	20 hrs / 64
Congestion Cost ($ per Peak Auto Commuter) / Rank	$57 / 82	$116 / 77	$278 / 63	$255 / 90	$380 / 88	$375 / 68

Notes:
Peak Commuters – Number of travelers who begin a trip during the morning or evening peak travel periods (6 to 10 a.m. and 3 to 7 p.m.). "Commuters" are private vehicle users unless specifically noted.
Annual Delay per Commuter – A yearly sum of all the per-trip delays for those persons who travel in the peak period (6 to 10 a.m. and 3 to 7 p.m.). This measure illustrates the effect of the per-mile congestion as well as the length of each trip.
Total Delay – The overall size of the congestion problem. Measured by the total travel time above that needed to complete a trip at free-flow speeds. The ranking of total delay usually follows the population ranking (larger regions usually have more delay).
Rank – Annual ranking from 1 to 100 for similar size cities where 1 is the worst performance and 100 is the best.
Source: Texas A&M Transportation Institute, 2012.

Table 1-12
1985 – 2010 Mobility Data for Raleigh-Durham, NC
(from the Texas A&M Transportation Institute annual Urban Mobility Report)

	1985	1990	1995	2000	2005	2010
Inventory Measures						
Peak Travelers (1000s)	175	222	293	391	541	636
Peak Commuters (1000s)	162	206	272	363	503	591
Total Daily Vehicle-Miles of Travel (1000s)	7,135	10,225	13,425	17,300	20,950	24,097
Total Freeway & Arterial Lane-Miles	1,330	1,680	1,980	2,495	2,905	3,303
System Performance						
Congested Travel (% of peak VMT)	17%	26%	34%	40%	47%	49%
Congested System (% of lane-miles)	26%	36%	38%	43%	48%	51%
Congested Time (number of "Rush Hours")	N/A	N/A	N/A	N/A	N/A	4.00 hrs
Annual Delay (1000s of person-hours) / Rank	2,487 hrs / 60	5,698 hrs / 44	8,381 hrs / 49	13,080 hrs / 47	19,777 hrs / 40	19,247 hrs / 40
Annual Delay per Peak Auto Commuter (pers-hr) / Rank	9 hrs / 46	17 hrs / 35	21 hrs / 47	26 hrs / 43	31 hrs / 40	25 hrs / 42
Congestion Cost ($ per Peak Auto Commuter) / Rank	$124 / 46	$274 / 35	$386 / 46	$561 / 41	$762 / 40	$537 / 40

Notes:
<u>Peak Commuters</u> – Number of travelers who begin a trip during the morning or evening peak travel periods (6 to 10 a.m. and 3 to 7 p.m.). "Commuters" are private vehicle users unless specifically noted.
<u>Annual Delay per Commuter</u> – A yearly sum of all the per-trip delays for those persons who travel in the peak period (6 to 10 a.m. and 3 to 7 p.m.). This measure illustrates the effect of the per-mile congestion as well as the length of each trip.
<u>Total Delay</u> – The overall size of the congestion problem. Measured by the total travel time above that needed to complete a trip at free-flow speeds. The ranking of total delay usually follows the population ranking (larger regions usually have more delay).
<u>Rank</u> – Annual ranking from 1 to 100 for similar size cities where 1 is the worst performance and 100 is the best.
Source: Texas A&M Transportation Institute, 2012.

Travel by public transportation riders has also increased 40% since 1982 in the 101 urban areas studied in the report, including Richmond, VA and Raleigh, NC. Transit passenger miles traveled (PMT) increased by 15.8%, from 40.2 billion in 1997 to 46.5 billion in 2004 (Texas A&M Transportation Institute, 2012). In 2004, 41% of PMT was on motorbus, 31% was on heavy rail, 21% was on commuter rail, and 3% was on light rail. To reduce the rate of congestion growth, the USDOT has promoted efforts such as the SEHSR Corridor to increase transit ridership by 2% or more each year (USDOT, RITA, 2008).

This raises the question of why congestion has increased even though there are more roads and more transit service. The Texas A&M Transportation Institute (Institute) annual Urban Mobility Report stated that the answer is slow growth in supply of both roads and public transportation in the last 20 years. After analyzing over 25 years of national urban traffic growth, the Institute concluded that one general trend appears to hold that the more that travel growth outpaces roadway expansion, the more the overall mobility levels decline (Texas A&M Transportation Institute, 2012).

In conclusion, traffic congestion levels nationally and in the Richmond to Raleigh Project area has increased since 1985. Congestion extends to more time of the day, more roads, affects more of the travel and creates more extra travel time than in the past. And congestion levels have risen in all size categories, indicating that even the smaller areas are not able to keep pace with rising demand (Texas A&M Transportation Institute, 2012). In addition to increased delay, travel time and fuel consumption, the costs of roadway congestion include increased vehicle emissions and reduced air quality, increased transportation costs of goods (passed on to consumers) and increased aggravation to drivers (USDOT, FRA, 1997).

To address congestion fully, the Institute concluded that the growth of roadway facilities has to be at a rate slightly greater than travel growth in order to maintain constant travel times. If roadways are added at about the same rate as traffic grows, the growth of congestion will slow, but not be entirely reduced. However, only 13 of the 101 studied urban areas were able to accomplish that rate, given the high financial cost of building additional lane-miles and new highways (Texas A&M Transportation Institute, 2012).

Growth of roadway facilities has to be at a rate slightly greater than travel growth to maintain constant travel times. If roadways are added at the same rate as traffic grows, the growth of congestion will slow, but not be entirely reduced. Only 13 of the 101 studied urban areas were able to accomplish that rate, given the high cost of building additional lane-miles and new highways.

Other solutions that could alleviate the congestion problem include:

- Application of congestion pricing, such as electronic tolling;
- Implementation of intelligent transportation systems; and,
- Provision of intracity and intercity alternatives to the automobile (including high speed rail) (USDOT, FRA, 1997).

1.8.3 TRAVEL TIME/SERVICE RELIABILITY

Travel time and service reliability are key factors that impact the traveling public's choice of transportation mode. Amtrak operates America's current national intercity passenger rail system with 305 weekday trains over 21,100 route-miles, serving 46 states and 3 Canadian provinces. The Amtrak routes through the SEHSR Corridor include:

- North Carolina: Carolinian (Charlotte, NC-New York, NY) and Piedmont service (Raleigh, NC-Charlotte, NC)
- Virginia: Extended Northeast Regional service to Lynchburg, VA and some of the Northeast Regional services to Richmond, VA; new service between Norfolk, VA and Washington, DC, began in December 2012.

As reported in the Tier I EIS, Amtrak's travel times and history of delays have not historically been competitive with travel by airplane or automobile. For example, in North Carolina and Virginia in 1999, the Carolinian arrived more than 10 minutes behind schedule 43.8% to 58.1% of the time, and the Piedmont arrived more than 10 minutes behind schedule 22.2% to 40.8% of the time. (On-time performance was defined as the percentage of trains arriving within 10 minutes of scheduled arrival time.) The Tier I EIS identified these travel delays as due to the increasing volumes of both passenger and freight service within SEHSR Corridor.

Contributing to this is the fact that for 70% of Amtrak's trains (i.e., all of Amtrak's trains outside the NEC), Amtrak contracts with freight railroads for the right to operate over their tracks. These "host railroads" are responsible for the condition of their tracks and for the dispatching on their tracks. Amtrak reports that the total number of delay minutes per 10,000 train miles in 2011 was 347 on Amtrak-responsible routes as compared to 919 minutes on host-responsible routes, a 157% difference. Overall Amtrak performance has declined since 2013 (Washington Post 2014). On-time performance for individual Amtrak lines can be found at http://www.amtrak.com/historical-on-time-performance.

Under current rail passenger service, annual rail ridership along the corridor connecting Washington, DC, with Charlotte, NC, is projected to grow from its current level (2012) of 1.4 million, to approximately 2.34 million in 2030 and to 2.82 million in 2040 or approximately 2.5% per year. Existing and committed rail improvements in Virginia and North Carolina are projected to reduce the rail trip time from Washington, DC, to Charlotte, NC from ten hours to between eight hours thirty minutes and nine hours. The planned improvements to the existing rail lines will improve capacity, reliability and travel times along some segments of the SEHSR Corridor, while other segments will continue to operate at slow speeds and experience delays until such time they can be improved.

> Annual rail ridership along the corridor connecting Washington, DC, with Charlotte, NC, is projected to grow to approximately 2.34 million in 2030 and to 2.82 million in 2040.

> Reductions in travel time and equipment improvements are required for rail passenger service to be more competitive, to divert existing travelers from other modes, and to attract future travelers. An improved rail transportation mode with significantly shorter travel times, increased frequencies, and enhanced reliability should achieve a more balanced use of the overall transportation system.

For the Washington, DC, to Charlotte, NC, traveler, these ongoing, but relatively small, improvements will make rail transportation incrementally more attractive. At the same time, they still will not make the rail system entirely competitive with automobile and air travel on a strictly travel time basis, at least in the short term.

Meaningful reductions in travel time, along with improvements to equipment, are required for rail passenger service to be more competitive, to divert significant numbers of existing travelers from other modes, and to attract future travelers that otherwise would contribute to the growing congestion in our highway and aviation systems. An improved rail transportation mode with significantly shorter travel times, increased frequencies, and enhanced reliability should achieve a more balanced use of the overall transportation system.

1.8.4 CONNECTIVITY

One goal throughout the entire SEHSR Corridor is to plan for connections to local transit systems in each metropolitan region (e.g., commuter rail, light rail, buses, etc.) to serve a variety of important local origins and destinations located outside of the SEHSR Corridor, which would enhance regional connectivity. This would facilitate system linkages, increasing destinations that could be reached by conventional rail service, and the other modes, through a direct connection with the HSR system. North Carolina and Virginia have both evaluated the feasibility of adding conventional passenger train service to eastern and western portions of the states. The proposed SEHSR Corridor service would serve as the spine to these added routes, allowing conventional rail service passengers to connect to the proposed SEHSR Corridor service and other points in the Northeast, Southeast, and beyond. These new passenger train routes in North Carolina and Virginia would provide linkages to the SEHSR Corridor from parts of eastern and western North Carolina and Virginia not currently served by rail. Passenger rail linkages would also be provided to existing and planned commuter rail services at multimodal stations, allowing for connections to suburbs and airports in Washington, DC; Richmond, VA; Greensboro-High Point-Winston-Salem, NC (the Triad), Raleigh-Durham-Chapel Hill, NC (the Triangle), and Charlotte, NC. The Metrorail in Washington, DC, and Northern Virginia would connect to the SEHSR Corridor at Union Station and Alexandria, VA. The Virginia Railway Express (VRE) in Northern Virginia currently provides daily commuter rail service from Manassas, VA, and Fredericksburg, VA, to Washington, DC, and would connect to the SEHSR in Fredericksburg, VA, Alexandria, VA, and Washington, DC. In North Carolina, the Triangle, Triad, and Charlotte metropolitan areas are currently considering and planning for commuter rail that could potentially connect with the SEHSR Corridor service.

As summarized in Section 3.11.3 of this Richmond to Raleigh Project FEIS, local government and planning agencies in the Richmond to Raleigh Project corridor have been working to plan, fund and develop new and improved local transit systems to link local transit operations with the proposed HSR service. For example, Bus Rapid Transit is being planned for Richmond, VA that would provide connectivity to Main Street Station. In North Carolina, planning is in place to develop transit service to connect Raleigh’s planned Union Station, which will serve future SEHSR Corridor trains with the city and the larger region. As mentioned above in Section 1.4, and further discussed in Section 3.11.3 at all proposed stations/stops for the Richmond to Raleigh Project there is currently at least one public bus transit service agency that either currently provides, or is anticipated to be expanded to provide, bus or van services for HSR travelers at the planned station locations. This includes the following bus transit agencies/systems (listed by proposed station location) –

- Richmond, VA - Greater Richmond Transit Company (GRTC)
- Petersburg, VA - Petersburg Area Transit (PAT)
- La Crosse, VA - Lake Area Bus (LAB)
- Henderson, NC - Kerr Area Rural Transportation System (KARTS)
- Raleigh, NC - Capital Area Transit (CAT), Triangle Transit (TT), and Wake Coordinated Transportation System.

Towns that are not designated to receive a HSR stop initially could benefit by the potential for conventional passenger rail service in the future, based upon demand. However, those conventional needs extend beyond the scope of the Richmond to Raleigh Project and therefore, will need to be addressed by separate public transit projects developed through the coordinated activities of various other regional and local transportation planning agencies located along the corridor.

1.8.5 AIR QUALITY

The US Department of Energy reported that between 2004 and 2009 transportation end-users continue to represent the largest US sector related to green-house gas emissions, representing 33% of all emissions (compared to residential at 21%, commercial at 19% and industrial at 26%) (USDOT, RITA, BTS, 2010). As demonstrated in Table 1-14, motor vehicles consistently contribute the vast majority of all greenhouse gas emissions compared to other modes of transportation. A number of counties within the SEHSR Corridor are presently experiencing air quality impacts from mobile source emissions (i.e., motor vehicles). As new standards come into effect and as traffic volumes increase, the need to reduce transportation related mobile emissions will become even more imperative, given that transportation funding is tied to air quality.

The movement of passengers by HSR offers significantly less pollution per passenger mile traveled as compared to auto travel. Diverting some of the traveling public from automobiles to rail will aid in reducing emissions throughout the corridor. HSR provides an alternative that is time competitive with the automobile and produces significantly less pollution, which may facilitate the overall development of the transportation system.

Moving passengers by HSR offers significantly less pollution per passenger mile traveled than auto travel. Diverting some of the traveling public from automobiles to rail will reduce emissions through the corridor.

Table 1-14
National Greenhouse Gas Emissions by Transportation Mode: 2004–2008

Year	Motor Vehicles		Buses		Aircraft		Marine		Rail		Other		Total, All Modes
	CO_2*	% of All Modes	CO_2*	% of All Modes	CO_2*	% of All Modes	CO_2*	% of All Modes	CO_2*	% of All Modes	CO_2*	% of All Modes	
2004	1,549.5	82%	14.8	1%	184.5	10%	39.5	2%	49.7	3%	43.1	2%	1,881.15
2005	1,563.6	82%	11.8	1%	195.9	10%	44.5	2%	50.3	3%	44.1	2%	1,910.23
2006	1,563.9	83%	12.0	1%	171.1	9%	47.7	3%	52.4	3%	44.1	2%	1,891.11
2007	1,572.8	82%	12.1	1%	171.5	9%	54.4	3%	51.6	3%	46.6	2%	1,909.01
2008	1,499.8	83%	11.7	1%	155.5	9%	38.1	2%	47.9	3%	46.5	3%	1,799.42

* = Millions of metric tons of CO_2, domestic activities only
Note – Percentage figures may not total to 100 due to rounding.
Source: USDOT, RITA, BTS, 2010 (Table 5-2).

1.8.6 SAFETY

In order for the proposed Richmond to Raleigh Project improvements to divert travelers from other transportation modes, potential riders must have confidence that the service is not only fast and reliable, but also as safe, or safer, than other modes.

According to the Centers for Disease Control, accidents (unintentional injuries) are the 5th leading cause of death in the US. Transportation accidents account for 31.9% of the accidental deaths reported in 2010. Motor vehicle accidents or highway fatalities are responsible for the largest share, accounting for 93% of transportation-related deaths, as shown in Table 1-15 (Centers for Disease Control, 2012). However, motor vehicle crashes have been trending downward, decreasing by 20.2% over the past 10 years, which has resulted in fewer motor vehicle fatalities and injuries (except for motorcycle fatalities, which have been increasing) (USDOT, NHTSA, 2012a). Many factors have contributed to the improvement in motor vehicles safety, such as safety awareness, education, traffic enforcement, and infrastructure-based and in-vehicle crash avoidance protection technologies. Safety belt and motorcycle helmet use have also increased. However, distracted and drunk driving have been counteracting the gains made in the number of lives saved made by these safety measures, resulting in 18 and 41% of the fatal crashes in 2011, respectively (USDOT, NHTSA, 2012b).

Nationally, passenger rail has consistently been one of the safest ways to travel, as demonstrated in Table 1-15. Since 1970, over 94% of all transportation fatalities have been motor vehicle related, while less than 4% have been related to rail operations (and the majority of those are due to highway-rail collisions or trespassers, as opposed to train accidents that result in passenger fatalities). In 2009, highway accidents made up 99.8% of all transportation accidents and 95.8% of all transportation fatalities, while railroads represented 2% of all fatalities and airlines had 1.6% of all fatalities. The only mode of travel safer was transit, with 0.6% of all fatalities (USDOT, RITA, 2011). The SEHSR Corridor Tier I DEIS, reported that in Amtrak's 30-year history, it only had 100 fatalities, while moving over 600 million passengers. Data for the years subsequent to the publication of the SEHSR Corridor Tier I DEIS shows that passenger rail continues to be one of the safest modes of travel. For the years 2001 through 2013, Amtrak reported 10 passengers killed in train accidents or crossing incidents, while moving over 350 million passengers (FRA, 2014).

In 2009, highway accidents made up 99.8% of all transportation accidents and 95.8% of all transportation fatalities, railroads represented 2% of all fatalities, and airlines had 1.6% of all fatalities.

Expressed differently, the National Safety Council routinely compares the four modes of transportation by passenger mile traveled: scheduled airlines, railroad passenger trains (including Amtrak and commuter rail), buses, and passenger automobiles (excluding vans and pickup trucks). Again, buses, trains and airlines have much lower death rates than automobiles when the risk is expressed as passenger deaths per passenger mile of travel. (Automobile drivers are considered passengers, but operators and crew of planes, trains and buses are not.) In 2008, the national passenger death rate in automobiles was 0.55 per 100 million passenger-miles. The rates for buses, trains and airlines were 0.08, 0.13, and 0.00 respectively (National Safety Council, 2011).

Table 1-15
Transportation Safety in NC and VA

	North Carolina		Virginia		US Total	
	2004	**2010**	**2004**	**2010**	**2004**	**2010**
Automobile						
Total Fatalities	1,557	1,319	925	740	42,636	32,885
Fatality Rate per 100,000 million vehicle-miles traveled	1.60	1.29	1.20	0.90	1.44	1.11
Railroad						
Total No. At-Grade Crossings	7,636	7,186	4,822	4,534	244,196	213,680
Total RR Fatalities	32	19	4	10	898	725
At-Grade Crossing Fatalities	12	1	1	3	368	256
Transit						
Total Fatalities	0	1	2	0	298	314

Source: USDOT, RITA, 2011.

Table 1-16 also shows that railroad safety in the US has steadily improved over the past thirty-plus years despite increases in the volumes of both rail traffic and highway traffic that crosses rail lines at-grade. Between 1975 and 2009, highway-rail at-grade collisions nationally dropped from over 12,000 to 2,000 and related fatalities dropped from over 900 to 250.

Following this national trend, passenger rail has consistently been one of the safest ways to travel in Virginia and North Carolina as well. As demonstrated in Table 1-15 between 2004 and 2010, railroad fatalities declined in North Carolina from 32 to 19 and increased slightly from 4 to 10 in Virginia. When compared to the total transportation fatalities in each state, however, railroad related fatalities represented only 0.1% for both Virginia and North Carolina in 2010. One reason for the reduction in fatalities from at-grade collisions between trains and motor vehicles is the substantial reduction in the total number of at-grade crossings (through closures or creation of grade separations) both nationally and within each state. As shown in Table 1-15, this represents a 12% national reduction, and 6% reduction in both Virginia and North Carolina between 2004 and 2010.

One reason for the reduction in fatalities from at-grade collisions is the substantial reduction in at-grade crossings. This represents a 12% national reduction and a 6% reduction each in VA and NC between 2004 and 2010.

Table 1-16
US Transportation Safety Record (Except Marine and Pipeline)

	Air			Highway			Railroad			Transit			Total Trans. Fatalities
	Fatalities	Accidents	% of All Trans. Fatalities	Fatalities	Accidents	% of All Trans. Fatalities	Fatalities (Total / At-Grade)	Accidents (Total / At-Grade)	% of All Trans. Fatalities	Fatalities	Accidents	% of All Trans. Fatalities	
1970	1,456	4,767	2.6%	52,627	n/a	93.5%	2,225 / 1,440	11,654 / 3,559	3.9% / 2.6%	n/a^	n/a	n/a^	56,308^
1975	1,473	4,232	3.1%	44,525	n/a	93.8%	1,492 / 917	20,117 / 12,076	3.1% / 1.9%	n/a^	n/a	n/a^	47,490^
1980	1,382	3,818	2.6%	51,091	n/a	94.8%	1,417 / 833	18,817 / 10,612	2.6% / 1.5%	n/a^	n/a	n/a^	53,890^
1985	1,595	2,935	3.4%	43,825	n/a	94.3%	1,036 / 582	10,194 / 6,919	2.2% / 1.3%	n/a^	n/a	n/a^	46,456^
1990	866	2,388	1.8%	44,599	6,471,000	94.6%	1,297 / 698	8,594 / 5,715	2.7% / 1.5%	339	58,002	0.7%	47,101
1995	963	2,178	2.2%	41,817	6,699,000	94.0%	1,146 / 579	7,092 / 4,633	2.6% / 1.3%	274	25,683	0.6%	44,470
2000	764	1,985	1.7%	41,945	6,394,000	95.5%	937 / 425	6,485 / 3,502	2.1% / 1.0%	295	24,261	0.6%	43,941
2005	603	1,781	1.3%	43,510	6,159,000	96.2%	884 / 359	6,332 / 3,066	2.0% / 0.8%	236	8,851	0.5%	45,233
2009	547	1,556	1.6%	33,808	5,505,000	95.8%	695 / 249	3,836 / 1,930	2.0% / 0.7%	230	3,513	0.6%	35,280

Notes –
Air includes all types of aviation; Highway includes cars, motorcycles trucks, pedestrians and cyclists; Railroad Total includes passengers, RR workers (Amtrak and freight operations), motor-vehicle collisions, as well as trespassers; Railroad At-Grade includes accidents and incidents occurring at highway-rail crossings resulting from freight and passenger rail operations including commuter rail; Transit includes motor bus, commuter rail, heavy rail, light rail, van pool and other demand response and automated transit systems.
^ - Fatality data was not available, therefore Total Transportation Fatality figures for year 1970-1985 are not included in totals.
n/a – data is not available
Source – USDOT, RITA, BTS, 2010 (Tables1-3 and 1-4)

As reported in the SEHSR Corridor Tier I EIS, Virginia DRPT has been working in cooperation with VDOT to make special efforts to improve crossing safety, including construction of highway and pedestrian bridges over rail lines, expanding the use of protection devices at private crossings, and participating in the testing of active physical barriers to prevent motorists from violating the highway-grade crossing warning devices. For example, in 2002 VDOT completed a grade separation project just north of CSX's Collier Yard. The crossing, located at Halifax Road at the intersection of Vaughan Road at the SCL south of Petersburg, VA was identified for separation due to high crash rates. In addition, some at-grade crossings south of Richmond, VA on the I-95 corridor have been upgraded with safety devices such as Constant Warning Time (CWT) Predictors (which serve to activate warning devices for at-grade crossings at a constant warning time) and Event Recorders.

Likewise, NCDOT has also been working since the early 1990s to improve safety along active rail lines within the SEHSR Corridor. NCDOT and Norfolk Southern began working together in 1994 to “seal” the North Carolina Railroad corridor between Raleigh, NC Greensboro, NC and Charlotte, NC by using traffic control devices to separate all vehicular and rail traffic. CSX also was involved in a segment of the SEHSR Corridor between Raleigh, NC and Cary, NC. As part of this 10 to 12-year “sealed corridor” project, the use of specific devices and technology for particular crossings was based on factors such as intersection geometrics, road width and other local conditions, and evaluations were made on a case-by-case basis. In addition to crossing closures, gates with extended arms, median barriers, and four-quadrant gate projects were implemented, either singularly or in combination. Some 190 of the 216 total at-grade crossings between Charlotte, NC and Raleigh, NC were improved or closed, and studies have estimated that 19 fatalities were prevented as a result of these safety measures. Today, only 149 at-grade crossings remain on the corridor between Raleigh and Charlotte, and NCDOT intends to have closed an additional 50 at-grade crossings by 2017.

At the Sugar Creek Road crossing in Charlotte, NC, replacing standard dual gates with four quadrant gates and installing median separators produced a 98% reduction in crossing violations. In addition, NCDOT has installed video surveillance equipment at some crossing locations and worked with local law enforcement to decrease the number of violators at highway-rail crossings. Along the lower freight density line from Raleigh, NC north to Norlina, NC, NCDOT has worked with CSX and local communities to close 6 crossings since 2000, and to install or upgrade signals and gates at another 13 locations.

Additionally, through the Private Crossing Safety Initiative program (PCSI) NCDOT uses a share of Federal and state funds to provide safety improvements at private crossings on the Raleigh to Charlotte Sealed Corridor. The safety improvements can range from installing signage, signals and gates and locked gates. The ultimate goal of the program is complete removal of the crossing which eliminates the potential for conflict at the crossing. In certain locations, NCDOT has been able to provide alternate access to the users of the private crossing and in return the property owner gives up any right they have to the private crossing. NCDOT then coordinates with the railroad for the physical removal of the private crossing.

The safety improvements discussed above, along with the Richmond to Raleigh Project being fully grade separated, will result in improved overall rail passenger safety within the SEHSR Corridor when compared to existing rail service and other modes of transportation currently serving the area.

1.8.7 ENERGY EFFICIENCY

Energy, its sources, and uses are becoming more critical considerations in government decisions to implement and invest in transportation programs and improvements as well as in private citizen decisions regarding their personal transportation choices. Oil prices have been highly unstable for the past three decades with prices since 2007 nearly tripling from about $50 per barrel in early 2007 to nearly $140 per barrel in mid-July 2008 and back to around $45 per barrel by December 2008. Oil price forecasts show these wide variations for the future as well. Americans have reacted to these high fuel prices by driving less and using public transit more.

Automobiles use 89% of energy consumed on a national basis for transportation purposes, while air uses 8%, freight (rail) uses 2%, transit uses less than 1%, and Amtrak uses around 0.05%.

Table 1-17 and data included in the Tier I EIS show that, even with the high prices and resulting increase in transit use beginning in 2007, automobiles consistently use around 89% of all energy consumed on a national basis for transportation purposes, while air uses 8%, freight (rail) uses 2%, transit uses less than 1%, and Amtrak uses around 0.05%. Previous sections of this chapter demonstrated that all forms of travel in the US are predicted to grow in the future, reaching and exceeding pre-recession levels in the next 5 to 10 years. With this increased travel will be an increase in energy consumption and a resultant increase in air pollutant emissions.

As reported in the Tier I EIS, trains are more energy efficient than aircraft and autos on a per passenger mile basis. This is due to such factors as superior aerodynamics and the low rolling resistance of steel wheels on steel rails. A typical passenger train driven by a diesel locomotive consumes about 350,000 British Thermal Units (BTUs) of energy per mile, whereas a typical automobile uses about 6,200 BTUs of energy per vehicle mile. Because of the higher passenger capacity of the train, it is more efficient than a single occupant vehicle. Further, intercity rail is 45% more energy-efficient than domestic commercial airline service and 76% more energy-efficient than general aviation.

Improving the modal balance in the SEHSR Corridor such that even a small portion of the automobile use is replaced with HSR use could result in a decrease in the amount of energy used for transportation, as well as a decrease in the amount of air pollution produced in the project area.

Table 1-17
Energy Consumption by Mode of Transportation: 2004–2008
(Trillion Btu, domestic activities only)

	2004	2005	2006	2007	2008
Air	2,101	2,128	2,104	2,080	1,970
Highway	22,041	22,243	22,279	22,430	21,728
Transit	143	146	152	157	162
Rail, Class I (freight service)	563	571	585	567	542
Amtrak	11	11	11	11	11
TOTALS	**24,859**	**25,099**	**25,131**	**25,245**	**24,413**

Source: USDOT, RITA, BTS, 2010 (Table 5-7).

1.9 SUMMARY AND CONCLUSION

1.9.1 SUMMARY

Federal interest in HSR dates back at least to 1965, with the passage of the High Speed Ground Transportation Act. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) identified the SEHSR Corridor as one of the first five Federally designated HSR corridors. Sections 1.1 and 1.2 of this chapter provide details on the development of the SEHSR Corridor, including studies of the market and demand for the project.

The preferred corridor identified in the SEHSR Corridor Tier I EIS runs from Washington, DC through Richmond, VA, Petersburg, VA, Henderson, NC, Raleigh, NC, and Greensboro, NC, to Charlotte, NC, with a connection to Winston-Salem, NC. This Richmond to Raleigh Project Tier II FEIS is focused on the portion of the SEHSR Corridor between Richmond, VA, and Raleigh, NC. The project timeline presented in Section 1.3 of this chapter notes that project construction of the Richmond to Raleigh Project will begin no earlier than two years from the signature of the Record of Decision (ROD) and is dependent on the ability of Virginia DRPT and NCDOT to secure project funding.

Studies of other portions of the larger SEHSR Corridor are being completed separately, including the Richmond to Hampton Roads SEHSR Corridor EIS and the Washington, DC to Richmond Southeast High Speed Rail Tier II EIS. Rail improvements are also currently in development between Raleigh, NC and Charlotte, NC. Section 1.4 of this chapter identifies current and planned projects within the SEHSR Corridor and their level of environmental documentation.

Section 1.4 also describes the improvements proposed by the Richmond to Raleigh Project, which would create a fully grade separated rail system (i.e., no at-grade crossings) between Richmond, VA, and Raleigh, NC, with fossil fuel locomotives. Maximum authorized speeds would be 79 mph from Richmond, VA, to Centralia, VA; 90 mph from Centralia, VA, to Collier, VA; and 110 mph between Collier, VA, and Raleigh, NC. This Tier II FEIS assumes the operation of eight new passenger trains per day (four round trips) along the SEHSR Corridor between Richmond, VA, and Raleigh, NC (with most of the trains continuing either south or north).

Five municipal locations have been identified for SEHSR Corridor stops within the Richmond to Raleigh Project corridor: Richmond, VA, Petersburg, VA, and Raleigh, NC, which have existing passenger service and stations, and La Crosse, VA, and Henderson, NC, which do not currently have passenger service or stations.

Patronage (ridership and revenue) information is presented in Section 1.5 of this chapter. The most recent evaluation of ridership and revenue was completed in 2013 and supports previous findings that SEHSR Corridor service would be competitive with other modes of transportation. It also confirms that SEHSR Corridor service is anticipated to generate revenue in excess of operation and maintenance costs.

The Tier I EIS for the SEHSR Corridor between Washington, DC, and Charlotte, NC, established the overall need and purpose for the entire SEHSR Corridor. Sections 1.6 and 1.7 of this chapter present a summary of the purpose and need information included in the SEHSR Corridor Tier I EIS. Section 1.8 of this chapter presents updated and additional information about the need for the SEHSR Corridor in response to the comments and questions received on the Richmond to Raleigh Project Tier II DEIS. This expanded discussion with more recent data shows that the needs initially demonstrated in the SEHSR Corridor Tier I EIS more than 10 years ago are still present, and re-confirms and substantiates the conclusions from the Tier I process. Updated data are included for:

- Growth – population, age-dependency, and economic growth
- Congestion – air and highway transportation
- Travel time/service reliability – on-time performance
- Connectivity – connections to local transit systems
- Air Quality – national greenhouse emissions by transportation mode
- Safety – passenger rail fatalities compared to automobile and transit
- Energy Efficiency – energy consumption by mode of transportation.

1.9.2 CONCLUSION

The history of the Richmond to Raleigh Project, from initial Federal interest in HSGT through multiple studies of the SEHSR Corridor from Washington, DC, to Charlotte, NC supports the need and market demand for the proposed improvements. The Richmond to Raleigh Project will help address the needs identified for the SEHSR Corridor by:

- Providing the traveling public, particularly special populations such as age-dependent (youth and old age) and the disabled, with improved transportation choices;
- Helping ease existing and future congestion (air, highway, passenger rail) within the SEHSR Corridor;
- Improving safety and energy effectiveness within the transportation network;
- Reducing the overall air quality related emissions per passenger mile traveled within the SEHSR Corridor; and
- Improving overall transportation system connectivity and efficiency within the SEHSR Corridor, with a minimum of environmental impact.